

HERPES ZOSTER, ITS EPIDEMICITY, AND ASSOCIATION
WITH CHICKEN POX.

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Thesis for the Degree of M.D.



1924

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INTRODUCTION.

Hutchinson many years ago, while raising the question as to whether Herpes Zoster should be classified as a neurosis or an exanthem, is reported to have said, "My own suspicion is that it belongs to neither of these classes, and further, I feel convinced that whoever may succeed in unravelling the mystery which at present surrounds it, must at the same time make a discovery in Physiology" Quoted by Le Feuvre.¹²⁹

The clinical observations that certain cases of Herpes Zoster are infectious and occur in small epidemics; that the disease may be associated with Chicken Pox; and that its etiology and mode of infection are entirely unknown, add further great interest to this particular malady. These facts amongst others led me to decide to investigate this much discussed and in many respects obscure disease.

SCOPE OF THESIS.

(1) I decided to investigate the records of all the cases of Herpes Zoster, 270 in number, which have been seen in the Dermatological Department/

Department of the Royal Infirmary Edinburgh, during the last sixteen years, that is for the years 1907 to 1922 inclusive, with a view to gaining critical information as to Etiology, Predisposing causes, Distributional characteristics, Age and Seasonal incidence, and Epidemicity of Herpes Zoster.

(2) I have decided to lay special stress on the Epidemicity of Herpes Zoster.

For this part of my Thesis I am very much indebted to Sir Norman Walker and to Dr F. Gardiner who have very kindly given me the necessary permission to investigate the records of their cases.

(3) I will discuss at some length the division of Herpes Zoster into Idiopathic and Symptomatic, such a differentiation being of the greatest importance in connection with the association of certain cases of Herpes Zoster with Chicken Pox.

(4) Much attention has lately been given to the association of Herpes Zoster and Chicken Pox, and realising Herpes Zoster to be infectious and capable not only of infecting another person with Herpes Zoster, but also with Chicken Pox, I decided to investigate the recorded cases in the literature of this association of the two diseases, and also to consult the articles dealing with this subject, in order to make a critical digest of the literature, with a view to drawing some conclusions on this matter. Further, to show/

show from clinical manifestations the association of the Idiopathic variety of Herpes Zoster with Chicken Pox. It would perhaps be as well to make mention of the fact here, that such an investigation would necessarily be curtailed because:- (1) Although the Dermatological Department of the Royal Infirmary probably records more cases of Herpes Zoster than any other institution in Edinburgh, it does not drain all the cases of the Town, many going to other Medical wards, Leith and other hospitals, and many being seen by general practitioners only. Further the disease not being notifiable all the cases cannot be recorded, so that an absolute and true record of the Epidemicity of Herpes Zoster as representing the whole town cannot be given. However the Royal Infirmary consistently and regularly draws a certain class and part of the community, so that from the records of this special department we can draw a conclusion which is constant, accurate, and which will also give us a very near idea as regards the characteristics of this disease for the whole community of Edinburgh. (2) Chicken Pox not being notifiable we cannot give statistics showing that an epidemic of Herpes Zoster occurs at the same time as an epidemic of Chicken Pox, but we can however clinically show the close association of the two diseases, as will be described later.

ANALYSIS OF 270 CASES OF HERPES ZOSTER

representing the number of cases of this disease, of which I have been able to get records, and which have passed through the department of Dermatology of the Royal Infirmary Edinburgh during the last sixteen years, namely from 1907 to 1922.

This is an analysis of Herpes Zoster in general as per records, with no differentiation between Symptomatic and Idiopathic.

On considering the Age Incidence I found that the youngest case was that of a female aged eight months. Age was recorded in 245 cases as follows:-

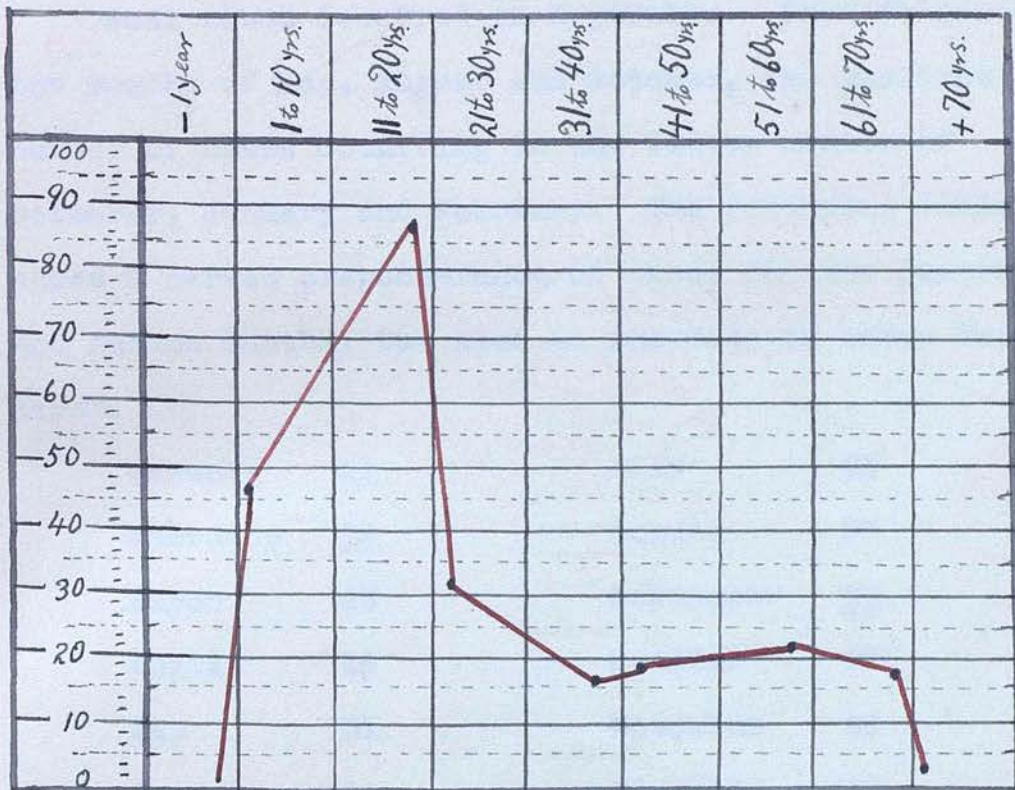
Between 1 and 10 years of age	46 cases or 18.7%
11 to 20 " "	88 cases or 35.9%
21 to 30 " "	31 cases or 12.6%
31 to 40 " "	16 cases or 6.5%
41 to 50 " "	19 cases or 7.7%
51 to 60 " "	23 cases or 9.3%
61 to 70 " "	18 cases or 7.3%
Over 70 years of age	4 cases or 1.6%

their ages being 86, 74, 72 and 71 years.

So it will be seen that most cases occurred between the ages of 11 to 20 years, then follow the ages 1 to 10 years and thirdly 21 to 30 years. The number then decreases with advancing age, with a rise again between the ages of 51 to 60 years.

No age is entirely exempt, but Herpes Zoster seems to be rare in infants and in the very elderly.

The age incidence is here shown in chart form.



Out of the 270 cases 169 or 62.59 per cent were males. Sex then is apparently without influence upon its incidence.

Comparing this with Knowles, quoted by Stelwagon,¹⁴⁹ who made a report on 286 cases of Herpes Zoster. Of these 205 were in males, 52 cases between the ages of 20 to 30 years, 3 cases under the age of 1 year, and youngest in male aged 4 months. Evidently his highest age/

age incidence was between the ages of 20 to 30 years, compared to our highest between 11 to 20 years.

With regard to Seasonal Incidence

Most cases occurred in September. Then followed the months of May, August and October, the smallest number of cases occurring in the Winter months of December, January and February. The following table shows a marked preponderance of cases for the Summer and Autumn months, but also an increase of cases for March.

January	21	July	23
February	<u>13</u>	August	27
March	25	September	<u>33</u>
April	18	October	27
May	31	November	18
June	19	December	<u>15</u>

Again comparing above with the American report by Knowles. Most of his cases, 34 in number, occurred in August, and the smallest number - 13 - in December, while 80 of the cases were observed in three Summer months.

Evidently climatic conditions are an important factor, most cases occurring during the Summer and Autumn months, this latter statement holding good, both for Scotland and America.

DISTRIBUTIONAL/

DISTRIBUTIONAL TENDENCIES.

While looking through the record cards of the cases I found that many cases had more than one spinal segment given for their distribution, thus my total number of spinal segments will be larger than my total number of cases.

The following table analysed from the records will show the preference of Herpes Zoster for certain Posterior Spinal ganglia.

<u>Cervical.</u>	<u>Dorsal.</u>	<u>Lumbar.</u>	<u>Sacral.</u>
(1) 3	(1) 12 5	(1) 9 27	(1) 1 0
(2) 4 1	(2) 8 9	(2) 3 22	(2) 2 1
(3) 21 15	(3) 20 34	(3) 2 5	(3) 3 5
(4) 22 21	(4) 26 38	(4) 1 1	(4) 4
(5) 11 2	(5) 37 38	(5) 1 2	(5) 2
(6) 8 3	(6) 14 20		
(7) 6 5	(7) 11 19		
(8) 5 0	(8) 11 36		
<u>Coccygeal</u>	(9) 7 19	<u>Supra Orbital</u> 7	
(1) 0	(10) 7 26	Total 284	
	(11) 7 22		
	(12) 8 18		

The figures in black show my analysis of our 270 cases. The figures in red are the results of a similar investigation, compiled from records of 392 cases by H. Head and A.W. Campbell¹⁰⁰. Both investigations show/

show the curious fact that some ganglia are more prone to attack than others, and as Head and Campbell put it, "Ganglia most commonly affected are those which receive afferent impulses from the viscera, through the white ramus of the sympathetic (cf. Head 30)".

Head and Campbell further say that any posterior root ganglion consists of two main groups of cells. (1) Large coarsely granular cells. (2) Smaller more pear-shaped cells. The proportion of the large and small cells vary with the position of the ganglion. The 3rd and 4th cervical ganglia show a great preponderance of small cells over large, while 6, 7, 8th cervical show a great preponderance of large cells. From 3rd dorsal to 1st lumbar the small cells predominate. The ganglia receiving fibres from the limbs, especially those from the hand C₉ and foot S_I show a preponderance of coarse large granular cells. These areas give rise to the long fibres of posterior columns, for the posterior Internal column in the cervical region is mainly formed by fibres from leg area, the posterior external by fibres from the arm. Once a ganglion is attacked all the cells large and small, within the area of inflammation suffer. These remarks on the histology of the posterior glands are taken entirely from Head and Campbell.

So on reviewing our list we will see that the agent attacks the posterior root ganglions, but especially/

especially those which contain a preponderance of the smaller type of cells.

Head says that these small cells amongst other functions probably subserve that of pain; hence the intense pain which accompanies an attack of Herpes Zoster.

The important point to note here is that the ganglia mostly affected are those which receive afferent impulses from the viscera. This point is further brought out by the following table, which according to the researches of Head show the spinal segments connected with the chief thoracic and abdominal viscera.

Lungs C 3.4; T 3.4.5.6.7.8.9.

Heart T 2.3.4.5.6.7.8.

Stomach C₄. T 6.7.8.9.10 (?).

Intestines T 9.10.11.12.

Lower part of large bowel S 2.3.4.

Liver and Gall bladder T 7.8.9.10.

Kidney and Ureter T 10.11.12; L 1.2 (?).

Bladder T 10.12; L 1; S 2.3.4.

Prostate T 10.11; S 1.2.3.

Testis T 10.11.12; L 1 (?).

96 of the cases were recorded as right sided and
113 as left sided.

History of enlarged glands in 12 cases, 5 of which
had/

had secondary infection of Vesicles.

As regards post Herpetic pain, its presence is shown in a much higher percentage of cases, the older the individual is.

ASSOCIATED SKIN CONDITIONS.

Quite a number of patients who had Herpes Zoster, had some other skin condition at the same time. Either the patient was already under treatment at the Dermatological department, when he developed the Herpes Zoster, or he came for treatment for his Herpes condition, when some associated skin condition was discovered.

Some of the chronic skin conditions may last a long time, and it may be a coincidence, that the patient should have developed Herpes Zoster at the same time. I am however recording, under appropriate headings, the skin conditions which I found associated with Herpes Zoster, in case other investigators should find that any of the other cutaneous disorders appear to increase its incidence.

I. PROBABLY ORGANISMAL OR TOXIC DISEASES.

- (1) Acne Vulgaris. One case.
- (3) Dermatitis. Two cases.
- (4) Urticaria Papulosa. One case.
- (6)/

- (6) Lupus Erythematosus. Two cases, one of 18 months duration with badly decayed tooth in left upper and right lower jaw.
- (7) One patient had Influenza and Diphtheria eight weeks previously.
- (9) Impetigo Contagiosa. Two cases.
- (10) Another case marked, "Began with cold in Head".
- (11) One patient had a poisoned thumb.
- (12) Dyspeptic symptoms with Rosacea. One case.
- (15) Seborrhoea of scalp or body. Three cases.
- (16) One patient had Psoriasis for three months.
- (17) Another patient had his knee excised. Reason not stated.
- (18) One patient was a painter and was very constipated.
- (19) One patient gave a history of earache a week before the Herpes Zoster eruption.
- (20) Another suffered with boils on the back of his neck.

II. DISEASES CAUSING PERIPHERAL IRRITATION.

- (23) Ichthyosis. Three cases. In Ichthyosis the constant dry skin is more liable to any external irritation, than the normal skin.
- (27) Scabies. Four cases. One with marked Albuminuria.
- (29) Pediculosis Capitis and Corporis. Two cases.
In Scabies and Pediculosis the peripheral irritation may be so intense, as to markedly affect the nervous system.

- (30) One patient had Herpes Zoster in the right Genito crural region, and blamed his truss, which through constant rubbing and friction, acts as a peripheral irritant.
- (31) Another case had a burn with Lysol.

III. ARSENIC.

- (32) One patient with Herpes Zoster had a Lichen Verrucosis of eight months duration, for which he was getting Liquor Arsenicalis.
- (32) Another with Lupus Erythematosus had been getting increasing doses of Liquor Arsenicalis.
- (34) One history read, "Finishing first course of injections of Salvarsan".
- (35) Another had Anti-syphilitic serum.
- (36) Addison's disease. One case. Three months duration. Here not mentioned whether or not Arsenic had been administered, but more than probable Arsenic had been given.

AFFECTIONS OF THE NERVOUS SYSTEM.

- (37) One patient had a history of Neuritis 8 months previously.
- (38) A second patient with a history of Neuralgia two years previously; the Neuralgia was at the back of the scalp, this also being the position of the Herpes Zoster.
- (39)/

- (39) A history of Neuritis behind right ear, one year before Herpes Zoster appeared.
- (40) One patient gave a history to the effect that the Herpes Zoster began with a Nervous breakdown. This was the same patient who had the Addison's disease.
- (41) In one case there was a history of Concussion six weeks previous to appearance of Herpes Zoster attack.
- (43) There were two cases of Herpes Zoster, who had a floating right kidney at the same time. People suffering with this malady are usually somewhat Neurasthenic.

As regards the etiology of Alopecia Ariata there are two views (1) That it is organismal and infective (2) That it is an expression of a Neurosis.

- (46) In the records I found the histories of three patients, who developed Herpes Zoster, while they were suffering with Alopecia Ariata. Shortly their histories were as follows.-

First patient had Alopecia Ariata for months, and had several bald patches on his scalp.

Second patient had the Alopecia Ariata for some time. It affected the back of his head. He only had one group of Herpes Zoster, and it is curious that its situation should have been on the patch of Alopecia Ariata.

The third patient had both old and new spots of Alopecia Ariata.

Peripheral irritation could lower the Nervous System and so predispose to an attack of Herpes Zoster, while should this irritation be of such a severe nature, as to interfere with sleep, the general vitality and system of patient would be lowered and made more susceptible to infection of any kind.

The group of affections which include Neuritis, Neuralgia, and Concussion probably indicates that there is already a lowered and susceptible nervous system. Arsenic probably acts in the same way, but of this more will be said later. From the above it will be seen that in the meantime I am taking for granted that certain cases of Herpes Zoster are due to an organismal infection, and that as in any other organismal disease, the weakly and susceptible are especially liable. This question will also be discussed more fully later.

(48) History of Injury got in two cases.

First case had Herpes Zoster along left Mandible, with a history of injury. Unfortunately it was not mentioned which part had been injured.

Second patient fell and struck his head three weeks ago.

(49) Exposure

One patient gave a history of playing football a few days previous to attack of Herpes Zoster so toxic factors, Peripheral irritation, Arsenic, Nervous factors, injury and exposure may act as predisposing causes to Herpes Zoster, and indeed such predisposing causes are recognised by all authorities on Dermatology.

The possibility of Herpes Zoster infection through a localised abraded area on the skin must not be forgotten, and will be discussed under the mode of infection.

Diseases of the skin may perhaps play an important rôle in the etiology of Herpes Zoster, and may possibly be one of the primary causes producing a susceptibility to an attack, especially those diseases causing peripheral irritation, and those by causing an exposed and inflamed area of skin, may perhaps give a mode of entrance for organisms.

Mention of Chicken Pox was only made in 14 cases, of which four patients with Herpes Zoster are reported to have had Chicken Pox before, and in ten cases there was no previous history of this disease. Obviously very few patients were questioned as regards a Chicken Pox history, so that these statistics on this point are not sufficient.

Regarding/

Regarding the mentioned associated skin diseases from a point of view of mode of infection, attention should be drawn to the following facts.

In 29 of the associated diseases, the skin or other diseases could be localised to a particular surface area of skin, and in thirteen of these, that is in forty-four per cent, the distribution of the Herpes Zoster as marked out on the body by Head's areas of distribution, corresponded to the position or distribution of the associated skin disease.

The following is a short description of the thirteen cases as got from the case cards:-

- (1) H.B. Male. Herpes Zoster D₅. Had Acne Vulgaris at the same time. We know that the chest and back are very often affected in Acne Vulgaris.
- (2) D.W. Male aged 4 years. Herpes Zoster left D₃. Had Ichthyosis for one year. Ichthyosis often affects the Axillary border, thus again corresponding with the distribution of the Herpes Zoster eruption.

With regard to Ichthyosis it must be pointed out that, this disease has a more or less generalised distribution, but that in the milder variety the axillary borders, knees and elbows are especially affected.

- (3) I. McG. Female aged 32 years. Herpes Zoster D₁₂.

This/

This is very near the genital region, which is often affected in Scabies, although the genital region is perhaps more often affected with Scabies in males. This patient had Lupus Erythematosus, mostly round left eye, and Scabies at the same time.

- (4) H.P. Female aged 44 years. Had Alopecia Ariata at the same time, affecting the back of the head. Patient had one group of Herpes Zoster, and that on the patch of Alopecia Ariata.
- (5) H.S. Female, aged 4 years. The Herpes Zoster affected the first division of the 5th Nerve. She had Ichthyosis at the same time. In milder forms of Ichthyosis the face is often affected.
- (6) C.B. Female, aged 17 years. She had a group of small vesicles associated with some pain, and had burnt the affected part with Lysol. Here the diagnosis of Herpes Zoster was not certain.
- (7) B.T. Female, aged 52 years. Herpes Zoster on back of scalp. Great Occipital region on right side. Previous to the Herpes Zoster, she had Neuralgia for two years. The Neuralgia affected the back of the neck, and just before the attack of Herpes Zoster, the pain shot up to her head.

In/

In these cases with Neuralgia and Neuritis, the possibility might be that we have to deal with a lowered and susceptible Nervous system predisposing to an attack of Idiopathic Herpes Zoster. On the other hand the Herpes Zoster might be symptomatic and the direct result of the Neuritis.

- (8) J.L. Female, aged 10 years. Herpes Zoster D₅. Had very marked Scabies and marked Albuminuria. D₅ embraces the area of the breast. Scabies in females often affects the breast region.
- (9) I.M. Female, aged 55 years. Herpes Zoster lower Lumbar and Sacral region. Three months previously she had Seborrhoea of scalp, trunk and limbs, which had lasted for ten months. The lower Lumbar and Sacral regions embrace the legs.
- (10) W.S. Male, aged 38 years. Herpes Zoster D₅. He had three groups of vesicles, one over Scapula, another at Axillary border, and one internal to right nipple. Had large scars on his back. Specific? Had Ichthyosis at same time. There was no history of Arsenic given. Ichthyosis often affects the Axillary borders.
- (11) G.L. Male, aged 39 years. Herpes Zoster right L₃ and 4. Had knee excised seventeen years ago. L₃ embraces the knee area. However no mention made as to which knee was excised.

- (12) Herpes Zoster behind right ear. Had Occipital Neuralgia previously for one year.
- (13) J.N. Male, aged 68 years. Herpes Zoster right Genito crural region, over his Hernia, and blames his truss. It is remarkable that in such a high percentage of cases the distribution of both diseases should be more or less similar.

I have not come across any literature in which a writer has described the above to have occurred in his experience, but it would be interesting in future to note whether the position of any associated skin disease corresponds to that of the concurrent Herpes Zoster. Should this be the case it would afford an important clue as regards one mode of infection in Herpes Zoster, as will be described more fully later.

While the association of these various skin conditions with Herpes Zoster is by no means proved, such a possibility requires to be kept in mind, and ought therefore meantime to be recorded.

THE EPIDEMICITY OF HERPES ZOSTER.

The aim of my analysis on this question is to corroborate the statements made by several Medical men to the effect that Herpes Zoster occurs in small epidemics. Such Medical men have, perhaps at some time or other in their career, noted instances of such epidemicity occurring say in families, or in those closely associated.

The analysis of cases seen in hospital over a period of seventeen years, showing the tendency to epidemicity, although not complete as stated before, will prove of value and will substantiate their statements, and show that such epidemic tendency although small is constant and also affects the general community.

Evidently certain cases, not all, of Herpes Zoster are of an infectious nature, as shown by the following lists of cases, tabulated for each year, and by the experiences and observations of several Medical practitioners.

The following is a tabulated list of the cases as they occurred, and according to the records which I could find.

1907./

1907.

January	1	July	1
February	0	August	<u>6</u>
March	0	September	<u>5</u>
April	0	October	2
May	4	November	1
June	2	December	<u>1</u>
		Total	<u>23</u>

Eleven cases or 47.8% of the total number of cases for the year, appeared in two consecutive months.

1908.

January	1	July	1
February	<u>5</u>	August	0
March	2	September	2
April	0	October	2
May	1	November	0
June	1	December	<u>2</u>
		Total	17

Five or 29.4% of total cases for the year occurring in the month of February.

1909./

<u>1909.</u>				<u>1910.</u>			
Jan.	4	July	2	Jan.	0	July	2
Febr.	0	Aug.	2	Febr.	0	Aug.	0
March	1	Sept.	3	March	3	Sept.	1
April	3	Oct.	<u>6</u>	April	1	Oct.	1
May	1	Nov.	1	May	<u>9</u>	Nov.	4
June	1	Dec.	<u>2</u>	June	0	Dec.	<u>0</u>
		Total	26			Total	21

23% of total cases in
one month.

42.8% of total cases
in one month.

<u>1911.</u>			
January	3	July	0
February	0	August	2
March	1	September	<u>6</u>
April	1	October	1
May	2	November	2
June	3	December	<u>2</u>
		Total	23

26% of total cases for the year in one month.

<u>1912.</u>			
January	4	July	2
February	1	August	2
March	<u>5</u>	September	0
April	2	October	1
May	1	November	3
June	1	December	<u>1</u>
		Total	23

21.7% of total cases for the year in one month.

<u>1913.</u>				<u>1914.</u>			
Jan.	0	July	2	Jan.	1	July	0
Febr.	1	Aug.	1	Febr.	1	Aug.	1
March	2	Sept.	1	March	1	Sept.	<u>4</u>
April	1	Oct.	0	April	1	Oct.	0
May	0	Nov.	1	May	1	Nov.	0
June	1	Dec.	<u>1</u>	June	0	Dec.	<u>1</u>
	Total		<u>11</u>		Total		<u>11</u>

No marked Epidemic
Incidence.

36.3% of total cases
in one month.

<u>1915.</u>			
January	1	July	2
February	1	August	<u>3</u>
March	0	September	1
April	0	October	1
May	1	November	2
June	1	December	0
		Total	<u>13</u>

38.4% of total cases for the year
occurring in two consecutive months.

<u>1916.</u>			
January	0	July	1
February	1	August	0
March	0	September	<u>3</u>
April	0	October	1
May	2	November	0
June	0	December	<u>0</u>
		Total	<u>8</u>

37.5% of total cases occurring in
one month.

<u>1917.</u>				<u>1918.</u>			
Jan.	2	July	2	Jan.	0	July	1
Febr.	0	Aug.	1	Febr.	1	Aug.	0
March	0	Sept.	0	March	<u>4</u>	Sept.	3
April	2	Oct.	1	April	2	Oct.	<u>4</u>
May	0	Nov.	1	May	2	Nov.	0
June	2	Dec.	<u>0</u>	June	2	Dec.	<u>1</u>
		Total	11			Total	20

No marked Epidemic tendency.

20% of total cases occurring in March, and same for October. Two Epidemic tendencies.

<u>1919.</u>			
January	1	July	1
February	0	August	<u>4</u>
March	3	September	1
April	1	October	2
May	3	November	1
June	0	December	<u>1</u>
		Total	18

22.2% of total cases for the year occurring in August.

<u>1920.</u>			
January	0	July	0
February	1	August	0
March	0	September	<u>2</u>
April	1	October	<u>2</u>
May	2	November	1
June	1	December	<u>0</u>
		Total	10

40% of total cases occurring in 2 consecutive months.

1921.

January	2	July	1
February	1	August	<u>3</u>
March	2	September	0
April	0	October	2
May	1	November	0
June	2	December	0
		Total	<u>14</u>

21.4% of total cases occurring
in one month.

1922.

January	1	July	<u>5</u>
February	0	August	2
March	1	September	1
April	3	October	1
May	1	November	1
June	2	December	<u>3</u>
		Total	<u>21</u>

23.8% of total cases occurring
in the month of July.

So with the exception of 1913 and 1917, where no epidemic incidence was shown, all the years from 1907 to 1922 showed an epidemic tendency varying from 20% to 42.8% of total cases for the year occurring in one month. For the years 1907, 1915 and 1920 the epidemic incidence was reckoned for two consecutive months/

months and found to be 47.8%, 38.4% and 40% respectively.

The following incident, brought to my notice by Dr Hook, resident physician at that time, in the Tuberculosis department at the City Hospital Edinburgh, illustrates very well the epidemic tendency of Herpes Zoster, as affecting one ward in a hospital.

Towards the end of April 1923 four cases of Herpes Zoster occurred in rapid succession in one of the Tuberculosis wards of the above mentioned hospital. At the time there were twenty-five patients in the ward, none of them being affected with Chicken Pox. The four patients who developes Herpes Zoster were suffering from a chronic Tuberculosis of the chest.

Patient A, male, about 50 years of age, developed an attack of Herpes Zoster in the Royal Infirmary Edinburgh, where he had been to have an Oesophageal bougie passed. He remained in the Royal Infirmary for a few days and then returned to the City Hospital. The Herpes Zoster was situated about the middle of the right side of chest.

Twelve days later another male patient aged forty five years, who occupied the bed next to first patient, developed a severe attack of Herpes Zoster, affecting the right side of chest.

Ten days later another patient, aged twenty-eight years/

years developed vesicles, resembling an attack of Herpes Zoster. He was in the same ward, but did not occupy a bed next to either that of first or second patient.

The fourth patient developed typical Herpes Zoster affecting the left leg, from the Iliac crest to the knee. His bed was next to third patient's. I could not get the exact number of days interval in this case.

They were all bad cases of Tuberculosis except second patient, and they were all four bedridden. Fourth patient had a positive Wassermann.

Many Medical men have experienced and witnessed the epidemic tendency of Herpes Zoster, occurring in general practice, in hospitals and even in families, where more than one member of such a family becomes affected with this disease at the same time.

Sir Norman Walker¹⁴⁷ on this question said "The disease undoubtedly occurs in epidemics; the larger one's material, the more certainly does he become convinced of that Fact."

H. Taylor¹ wrote in the year 1889: "In the course of one week recently as many as four cases of Herpes Zoster came under my notice. On making inquiry among the other Medical men in the town I learnt that one firm had seen seven or eight cases of Herpes Zoster during the last month, and two this month."

J.D. Halstead^{10A} writes about Herpes Zoster in the/

the month of August: "There would appear to be prevalent at present a mild epidemic of the disease, as within the last month I have had four cases, one in a middle aged adult on the Yorkshire coast, another in a male aged 30 in the West Riding and two cases aged 10 and 4 years in North Devon."

H. Wise¹² similarly writes in August: "I have seen several cases of Herpes Zoster during the last week or two. Moreover for years I have noticed that a number of cases always occur about September. There have also been a few seen usually about February or March."

I.A.W. Pereira²⁷ mentions five cases of Herpes Zoster seen from June 25th to August 2nd 1913, and in June 1914 he saw three cases of Herpes Zoster in three weeks.

E.L. Elliott⁴⁴ writes that he had four cases of Herpes Zoster at about the same time, from the end of December to the beginning of February, and that in a village of only about 1000 population.

M. Kaposi¹²⁶ observed 40 cases of Herpes Zoster during twelve months - 1888 to 1889.

Parkes Weber⁹⁴ quotes Emil Weis: "Ueber Epidemischen Zoster", Archiv. f. Derm. U. Syph. Vienna, 1890, vol. XXII, pages 609 to 629. On page 622 the author says that several cases of Erythema Multiforme were observed during the period of an epidemic of Herpes Zoster.

Besides/

Besides the examples of Epidemic Herpes Zoster in general practice, the literature contains records of instances of a similar nature occurring in hospitals.

B. Jones⁷ writes: "Years ago when Medical Officer to a workhouse I was frequently puzzled by the causation of Shingles which occurred from time to time, generally in twos or threes."

Magda Frei¹⁴³ describes a small epidemic in the Children's Clinic, in which one case of Herpes Zoster was followed by a second case about two weeks later in another child in the same ward.

A. Bacmeister¹⁴¹ reporting on the infectiousness of Herpes Zoster, mentions two cases of this disease that occurred within two or three days, after exposure through shaking hands with the same patient, who had been released from a hospital during the height of the eruption. Bacmeister concludes by saying that evidently a specific virus was involved in this case. There are also cases on record where more than one member of a family become affected with Herpes Zoster within a short interval of time.

Watson^{85A} quotes a case where a father aged 38 years consulted him on January 15th. He had a Herpes Zoster above the right buttock. On January 28th Dr Watson was sent for to see the daughter aged 4 years, who complained of pain and irritation around the Vulva, following an attack of Bronchitis. He found a well marked/

marked vesicular eruption along each Labium. The interval was about twelve or thirteen days.

Parkes Weber⁹⁴ quotes J. Galippe: "Uncas de Zona Cervical", Bull. Soc. de Pediatrie de Paris, 1913, volume XV, page 200, who mentions an instance of Herpes Zoster affecting two boys living in the same house, with an interval of four or five days.

A.J. Hall⁴¹ says: "On January 28th I saw Mr X. aged 53, suffering with a very severe Herpes Zoster of the right upper 5th Nerve. On inquiry I found that he had travelled from Sheffield to London on January 19th, when he spent the night at his sister's house. She was then recovering from an attack of Herpes Zoster on the trunk. The next day he left London and travelled to Newcastle. Whilst there on January 22nd the first symptoms of his attack began by some itching over right forehead. During the next three days he was out of sorts, slightly feverish, restless at night and had acute pain. On the 25th the rash was first noticed, after which it developed rapidly." So three days after exposure symptoms of his attack began, while the rash took six days to develop. According to this case, one need not be exposed to the affected person for long, in order to be infected, as Mr X just stayed over at his sister's house for the night. This is an ideal case, demonstrating how infectious certain cases of Herpes Zoster may be. Hall says that/

that although this case might be a coincidence, it is very suggestive.

Although an absolute demonstration of infectivity in many presumed infectious conditions is always difficult, coincidence may be ruled out, if there are a sufficient number of cases showing this infectiousness.

Hall quotes Ronzier Jolly La Pratique Dermatologique Tome IV, p.919, who records a very important case. A Parisian suffering from Herpes Zoster went to stay in a certain small village in Provence. There had been no case of the disease before his arrival. Within six weeks there were seven cases amongst the inhabitants.

The following is also a very interesting case quoted by O. Hilton⁵⁶: A. a carpenter and B. a painter were working at the same job. Each developed Herpes Zoster on his right arm. A. first felt pain on April 22nd, B. first felt itching on April 25th. A. discovered a herpetic rash on April 24th and came to see me on April 27th. B. came to see me with a well developed eruption on May 2nd."

So there was an interval of 3 days between the commencement of the diseases in the two persons. B. might have been infected from A., or both A. and B. might have been infected from a third person.

Another/

Another case of the infectious nature of Herpes Zoster as shown in same family is quoted by L. Abrahamson⁶⁷. A little girl fell ill with Chicken Pox, a week after the girl had recovered, two members of the household, the Mother and a maid, developed attacks of typical Herpes Zoster. This case also of course belongs to one of the groups showing the connection between Herpes Zoster and Chicken Pox.

Paul Heim⁴ makes mention of a simultaneous epidemic of Herpes Zoster and Varicella which occurred in Buda Pest in April and May 1912.

Parkes Weber⁵ refers to an English epidemic of Herpes Zoster due to beer in 1900, no doubt due to Arsenic. I will later endeavour to show by quoting certain cases, that Herpes Zoster due to Arsenic is not of the Symptomatic variety, but of the Idiopathic variety, in other words that the Arsenic predisposes to an infection with this particular microorganism.

H. Head¹⁰¹ says that his records of the last two and a half years at the London Hospital show an epidemic in the middle of March for the years 1896, 1897 and 1898. In 1897 and 1898 there was an outbreak from the middle to the end of May, while in 1897 a large number of cases appeared during the long drought which lasted from the beginning of July to the beginning of November, and during that period in four months, he saw fifty-eight cases or half of the year's/

year's cases. In 1898 he saw several cases in June, and a marked outbreak from the middle of July to the end of August, during which period he saw twenty-two cases in less than six weeks. There was also another outbreak in the middle of October. Head thinks that the occurrence of large numbers of cases of spontaneous Zoster is associated with some atmospheric influence, and that when this influence is at its highest, people with a weakened resistance are particularly liable to be attacked. The weakened resistance, Head continues, often is due to some intercurrent disease, and many of the children attacked had recently had Whooping Cough, Measles and Diarrhoea, while pregnant women are also liable to such infection.

As regards the time of the year for such epidemics to take place, it will be seen that the experiences of the various men quoted agree with the statistics of my analysis on Seasonal Incidence, most cases occurring about March and in the Summer and Autumn months.

INCUBATION PERIOD OF HERPES ZOSTER.

Having considered the Epidemicity of Herpes Zoster, we are now in a position to consider the Incubation period of this disease.

In trying, from the above mentioned cases, to form an idea as to the incubation period of Herpes Zoster, /

Zoster, when acquired from another case of Herpes Zoster, we find that the periods of actual onset of the disease are not always definitely stated, and that dates are often given as to when patient consulted the doctor, no mention being made of the actual date of onset of the disease.

Presuming that the patient consults his doctor on account of the pain, the affected person will no doubt see his doctor at the earliest opportunity, so that in most cases, we can get a fairly approximate idea of the incubation period from the date of consultation.

Magda Frei definitely gives an interval of about two weeks, while Bacmeister gives an interval of 2 or 3 days. Watson gives an interval of 13 days, counting from the date of consultation of the father.

In Parker Weber's case the two boys developed Herpes Zoster in the same house with an interval of 4 or 5 days. In this case the question arises, did second boy develop Herpes Zoster from the first boy, in which case the incubation period would be 4 or 5 days, or were they both infected from some unknown source, the same for both, and developed the disease, the one four days before the other, in which case the incubation period would be unknown.

The same applies to O. Hilton's case, where the carpenter and the painter developed Herpes Zoster with a three days difference in the commencement of the first/

first symptoms of the disease. This difficulty might be solved by considering A.J. Hall's case.

Here the first symptoms of Herpes Zoster were felt by Mr X. three days after he had stayed with his sister for the night; she then was just recovering from an attack of the same disease. Here we have to take it that Mr X. developed the Herpes Zoster from his sister, after an interval of three days; and all the circumstances point to this having been the case. Here the Incubation period then was three days, so that Parkes Weber's and O. Hilton's cases with incubation periods of 4 or 5 days and 3 days respectively are quite possible, unless Hall's case is considered to be a coincidence.

Ronzier Jolly gives no definite incubation period by saying that in six weeks there were seven cases of Herpes Zoster amongst the inhabitants.

In Abrahamson's case the Mother and the maid developed Herpes Zoster from a Chicken Pox case after a week. This case does not fall under the category of cases, where one Herpes Zoster case infects another individual with the same disease, so that its incubation period will not be considered here.

Considering the epidemic in the Tuberculosis ward of the Fever Hospital Edinburgh, we have two intervals, one of twelve days in the first instance, and/

and one of ten in the second. The case occurring after the twelve days interval was a severe attack, that after the ten days could not have been very severe, as he developed vesicles, resembling an attack of Herpes Zoster. No mention of pain.

So here we have as Incubation periods 2 weeks, 2 or 3 days, 13 days, 4 or 5 days, 3 days and again 3 days, 10 days and 12 days. Incubation period then, according to the above, may vary from 2 or 3 days to 14 days; four out of the eight cases having an Incubation period of four days or less, presuming as I have said, that the one patient developed the Herpes Zoster from the other, after an interval of the stated period, and excluding a third unknown common source of infection. Since no mention is made of the possibility of such third source of infection and since Hall's case definitely shows an interval of three days to be possible, we have no option but to accept Parkes Weber's and O. Hilton's cases with their short incubation periods as well. The shorter the incubation period, the more virulent the organism, and the more severe the attack. This is a well known rule, and in certain diseases as for instance in Tetanus, it forms the basis as regards prognosis, where all cases of under ten days incubation period are given an unfavourable prognosis, while the longer the incubation period is over ten days, the more favourable the prognosis/

prognosis. In Herpes Zoster, one would naturally expect the cases with short incubation periods to be more severe than those with longer periods of interval. Unfortunately in the references as mentioned, the cases are not all described as regards the severity of the case. Dr Watson's case with 12 days interval, complained of pain and irritation and a well marked vesicular eruption was found along the Vulva. Hall's case with three days interval was described as a very severe Herpes Zoster of the right upper 5th Nerve; previous to appearance of eruption, patient was feverish, restless and suffered with acute pain, according to description evidently a more severe case than Watson's, where however age of patient affected was four years, and distribution along the Vulva, as against fifty-three years of age and distribution along 5th Nerve in Hall's case. Herpes Zoster is often more severe in elderly people and also in those cases which affect any of the cerebral nerves. O. Hilton's case with three days interval is not fully described as regards severity, "B came to see me with a well developed eruption on May 2nd."

In conclusion then the recorded cases are not nearly fully enough described. Evidently the recorder's attention was drawn only to the fact of the infectivity of Herpes Zoster, while the question of the duration of incubation period and its influence on the severity of/

of the case was neglected. Thus a very interesting and important observation as regards this disease was lost sight of.

There is one more important point which I wish to emphasise as regards the infectious nature and Epidemicity of Herpes Zoster, and for this we must again see A.J. Hall's case. He says that on inquiry he found that his patient had travelled and slept the night at his sister's house. She was then recovering from an attack of Herpes Zoster on the trunk. If the doctor had not made that inquiry, this case would not have been recorded in the literature, and one wonders how many cases of Herpes Zoster are diagnosed as such, treatment prescribed, but the patient not questioned as regards the possibility of contact with another case of Herpes Zoster.

Also I believe that many general practitioners are not aware of the facts that Herpes Zoster is infectious, and occurs in epidemics, hence the few references in the literature on the infectivity and epidemicity of this disease.

CONCLUSIONS OF ANALYSIS.

1. Herpes Zoster is most common between one and thirty years of age. No age is exempt, but the disease is rare in infants and in the very elderly.
2. Sex apparently has no influence on its incidence.

3. Herpes Zoster is most common in March, and in the Summer and Autumn months.
4. The disease seems to have a special preference for those Posterior Ganglia, which receive afferent impulses from the viscera.
5. It is possible but not proved that diseases of the skin may play an important part in the etiology of Herpes Zoster.
6. Skin diseases may increase susceptibility to an attack of Herpes Zoster, by providing a possible mode of entrance for organisms.
7. Certain cases of Herpes Zoster are infectious and occur in small epidemics.
8. Such epidemics tend to occur usually in March and in the Summer and Autumn months.
9. There is a possibility that climatic conditions influence such epidemics.
10. Incubation period of the disease possibly varies from two to fourteen days. Half the number of recorded cases had an incubation period of four days and less.
11. The importance of questioning as regards infection from another case of Herpes Zoster.

IDIOPATHIC/

IDIOPATHIC AND SYMPTOMATIC HERPES ZOSTER.

Before proceeding with the association of Herpes Zoster and Chicken Pox, I would like some attention to be given to the mode of production of the Herpes Zoster vesicles, and its associated nerve symptoms, and also to distinguish between Symptomatic and Idiopathic Herpes Zoster, this being of the greatest importance for the object which I have in view. Also it would explain many points which otherwise might be obscure.

The essential cause of the production of the characteristic clinical features of Herpes Zoster is Nerve Irritation, irrespective of the locality or position where such irritation is produced, or of the means whereby this occurs, it being understood of course that Herpes Zoster is an affection of the Sensory Nervous System. In 1864 Mitchell, Morehouse and Keen showed that irritation and not section of a nerve was the cause of Zoster. Quoted by Van Harlingen.¹⁰⁷

The following physiological details are taken entirely from Ninian Bruce. A. Ninian Bruce¹⁴⁹ performed a number of experiments, with a view to determining the mechanism of the Sensory nerves, which caused a dilatation of the blood vessels in the initial stages of the reaction of the tissues to an irritant, applied/

applied either locally on the skin or internally, e.g. in the Posterior Root Ganglia.

With these experiments Ninian Bruce showed that in the Sensory nervous system we were dealing with a nervous reflex, the reflex path consisting of an afferent sensory fibre, and an efferent vaso-dilator fibre. Further he showed that this reflex was neither Cerebral nor Spinal, since total section of the Spinal Cord and section of the Posterior Roots central to the Posterior Root Ganglia, did not interrupt the reflex path.

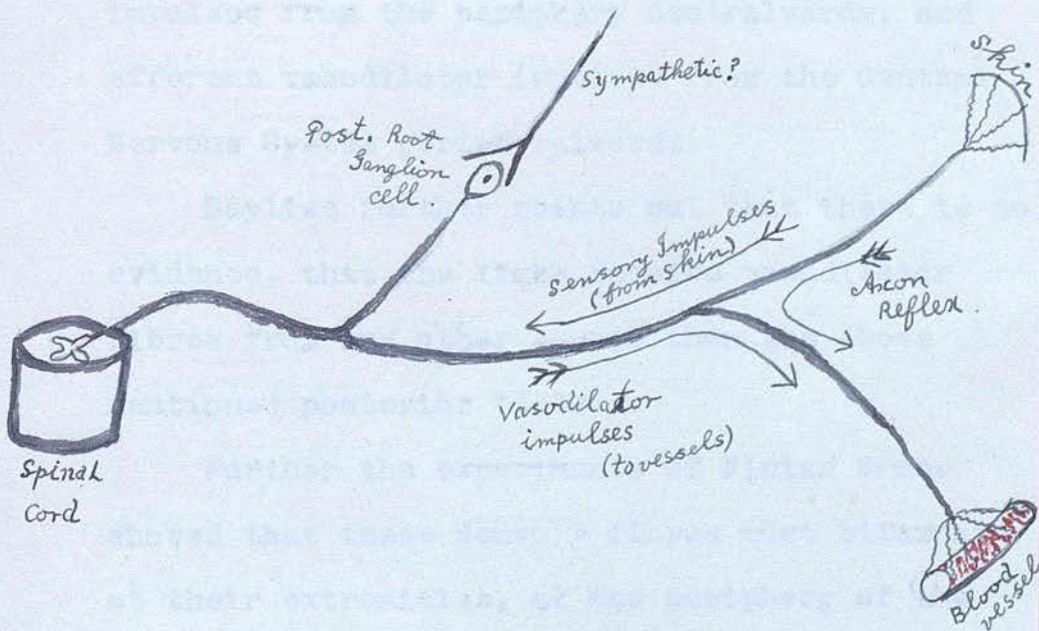


Diagram taken from Ninian Bruce¹⁵⁰

Bayliss quoted by Ninian Bruce has pointed out that if the posterior Roots be divided centrally to the Posterior Root Ganglia, stimulation of the peri-

I. pheral cut end results in a dilatation of the blood vessels in the limb of the same side; such stimulation or excitation may be either electrical, mechanical, chemical or thermal.

These fibres degenerate if the Posterior Root Ganglion be extirpated.

II. These Posterior Root fibres are capable of carrying impulses in both directions, afferent sensory impulses from the periphery centralwards, and efferent vasodilator impulses from the Central Nervous System peripheralwards.

Bayliss further points out that there is no evidence, that the limbs receive vasodilator fibres from any other source than the above mentioned posterior roots.

Further the experiments of Ninian Bruce showed that these Sensory fibres must bifurcate at their extremities, at the periphery of the body, one limb of this bifurcation passing to end in the sensory end organs in the skin, and the other limb passing to the blood vessels. The former carries sensory impulses centralwards, and the latter vasodilator impulses peripheralwards, /

peripheralwards, the common stem conducting impulses therefore upwards and downwards. The dilatation of the vessels found in the initial stages of inflammation, say due to an irritant applied locally on the skin, is the result of a nervous reflex which passes up one branch of this bifurcation and down the other. It is thus an Axon reflex similar to those described by Langley (Journal of Physiology 1900, XXV, p. 364) in the Sympathetic system.

III. Such a reflex is not influenced by section of a sensory nerve, peripherally to its ganglion of origin, unless the peripheral portion of the fibre be degenerated, for if it be degenerated, the reflex path is interrupted and dilatation of the vessels does not take place. Similarly a local anaesthetic by paralysing the terminations of the Sensory fibres prevents this vascular dilatation with an irritant applied say locally to the skin, since it prevents the stimulus from passing up the sensory fibre. In other words, if the Posterior Root Ganglion be entirely excluded, an irritant applied to any part of a sensory nerve between the posterior root ganglion and its periphery in the skin, will produce a dilatation of the vessels of the skin, and an outpouring of fluid in the tissues, /

tissues, provided that the reflex path is not in any way affected. Naturally an irritant in the posterior root ganglion will have the same effect.

Ninian Bruce's experiments afford a very complete explanation of how a lesion in the posterior root ganglia produces the characteristic eruption of Herpes Zoster. If the posterior ganglion cells are irritated say by haemorrhage or other causes, they can originate impulses which pass in two directions, e.g. impulses passing centralwards, causing the intense pain and impulses passing peripheralwards along the fibre and down the limb of the bifurcation, which end in a blood vessel, and there produce a dilatation and outpouring of serum. An extensive involvement of the ganglion will give rise to an extensive eruption, and a smaller involvement will be associated with a smaller eruption.

Ninian Bruce¹⁵⁰ also points out that

IV. in many cases inflammation affecting one branch of a nerve may have associated with it definite inflammatory disturbance in the areas supplied by other branches of the same nerve, and that when inflammation affects one organ, inflammatory phenomena may be sympathetically developed in regions innervated from the same area in the brain/

brain or spinal cord, as in the familiar example of redness, swelling, heat and pain seen on the side of the face accompanying toothache.

The above named experiments and their results, as worked out by Ninian Bruce, help us to explain many important facts as regards the causation of Herpes Zoster, and are especially valuable for our differentiation of Herpes Zoster into Idiopathic and Symptomatic.

- (1) In accordance with No.1 Herpes Zoster may be due to any irritation of the posterior ganglia, whether such irritation be mechanical, chemical or electrical. Thus a bacterial infection in the posterior ganglia will produce Herpes Zoster, so also then can tumours either in the ganglia themselves or of the vertebrae pressing on the posterior ganglia and so causing the necessary irritation. Tuberculous nodules, Tuberculous Meningitis affecting the Spinal Cord May all cause pressure on and irritation of the posterior ganglia, in other words all the above mentioned may by direct excitation produce the pain and typical vesicles of Herpes Zoster.

Most of the above mentioned possible causes of Herpes Zoster, with the exception of bacterial infection, act purely mechanically, due to pressure, producing/

producing a Symptomatic or Secondary Herpes Zoster as opposed to an Idiopathic Herpes Zoster which is due to a direct infection of the posterior ganglia with a microorganism. Although a microorganism has not been definitely discovered yet, the characteristics of the disease in some cases strongly point to its being of bacterial origin.

A tumour pressing on the posterior ganglion may cause pain and the typical Herpes Zoster vesicles, due to dilatation of the affected blood-vessels, and pouring out of serum. In time the affected posterior nerve fibre degenerates, dilatation of the blood vessels at the periphery cease, and so the attack of Herpes Zoster comes to an end.

Many observers have tried to make cultures from the fluid of the vesicles, or have tried staining for organisms, but they have always found the vesicle fluid sterile. The explanation is that the fluid is the result of a nervous dilatation of the affected peripheral blood vessels.

- (2) According to No 2 the posterior root fibres are capable of carrying impulses in two directions, centralwards and peripheralwards. Imagine an Aneurysm or a tumour pressing on and irritating or an injury affecting a posterior nerve say at any part of its course between the posterior ganglia/

ganglia and the periphery in the skin.

Afferent sensory impulses would pass centralwards and so produce the pain, efferent vasodilator impulses would pass peripheralwards and produce the Herpes Zoster vesicles, and so again produce a Symptomatic Herpes Zoster.

This also explains those cases of Herpes Zoster due to injury, injections or lumbar puncture. Such cases have been recorded and will be quoted later.

- (3) According to No. 3 an irritant applied locally on the skin can cause a stimulus to go up one arm of the bifurcation, through the peripheral axon reflex, and down the other arm to the blood vessels, without going up to the posterior ganglion and so to the cerebrum, and so can explain those types of Herpes Zoster where there is little or no accompanying pain.
- (4) One can also imagine an irritant applied locally to the skin, or a tumour pressing on the posterior nerve of a patient who previously has had Herpes Zoster, and so producing a second attack of Herpes Zoster, thus explaining the rare but recorded second attacks of Herpes Zoster. Second attacks then may be due to mechanical injury, not being of an infectious nature.

(5)/

- (5) No. IV explains why Herpes Zoster is sometimes associated with Pneumonia of the lungs, Hepatitis and other diseases of the internal organs. The toxins of these diseases may cause a deferred dilatation of the blood vessels, and so a Herpes Zoster due to that specific irritant, which is also Symptomatic. Such cases have been recorded, and will also be quoted later.

In conclusion we can divide Herpes Zoster into:-

- (1) Secondary or Symptomatic Herpes Zoster due to pressure of tumours, Aneurysms, Cerebro-spinal Meningitis, inflammations of internal organs, injury, and local irritant. These cases need have no temperature, except the temperature due say to the original Cerebro-Spinal Meningitis or Pneumonia, are naturally not infectious, obviously need not occur in epidemic form, and cannot be expected to have any connection with Chicken Pox. Here the Herpes Zoster is a manifestation of some other disease.
- (2) The Idiopathic or Primary Herpes Zoster.
This then must be the type due to an as yet unknown specific virus, whose onset is accompanied by feverishness, which is infectious and occurs in Epidemic form, and where one attack/

attack gives immunity practically for life to second attacks. This is the type of Herpes Zoster which I suggest is associated with Chicken Pox.

Theoretically we have now shown and hinted at the possible causes of Symptomatic or Secondary Herpes Zoster. I will now quote some recorded cases bearing out the statements as to the causation of that type of Herpes Zoster termed Symptomatic.

First of all it must be clearly understood that every case of Herpes Zoster in patients who suffer say with Tuberculosis, Syphilis, Lymphatic Leukaemia etc. need not necessarily be Symptomatic. These diseases may lower the general resistance of the patient and so act as predisposing causes to infection with the Idiopathic infectious type of Herpes Zoster. The same with cases associated say with a head injury, which may lower the resistance of the nervous system. Lumbar puncture and injections might either cause Idiopathic Herpes Zoster by producing a means of local infection for entrance of organisms, or by injuring the Sensory nerves may cause a Symptomatic Herpes Zoster.

Head and Campbell¹⁰⁰ say that it is well known that when the secondary deposits of malignant disease attack the spinal column, intense pain is produced due to the implication in the new growth of the central portion of the peripheral nerve trunks and the nerve roots. Head and Campbell also say that it is however not nearly/

nearly so well known that in such cases an eruption indistinguishable from that of Zoster may make its appearance; and they record such a case where a man aged 40 suffering with Lympho Sarcoma, developed 17 days before his death a severe herpetic eruption over the 4th dorsal area, and on post-mortem the 4th dorsal ganglion of the right side was entirely concealed in a mass of new growth, that filled the foramen in which it lay. The Lympho Sarcoma had invaded the posterior Mediastinum and thence spread to the spine. Obviously a secondary Herpes Zoster. They also record a typical case due to injury in a man aged 36 who was struck on the back while descending a lift and immediately lost motion and sensation below the Umbilicus. Analgesia was shortly limited by the upper border of the 10th dorsal area, but above this area lay a band of intense hyperalgesia, corresponding to the 7th, 8th and 9th Dorsal areas on both sides. Six days before death a small patch of herpetic eruption appeared over the tip of the 9th and 10th costal cartilage. Post-mortem, besides other changes, the 9th dorsal ganglion alone showed a small focus of inflammatory small round cells. This explains small patch of Herpes Zoster which appeared over the 9th space shortly before death. Also a Symptomatic Herpes Zoster.

They further say that cases have been reported where Caries of Spine or Tuberculous Spine have caused Herpes/

Herpes Zoster.

Tabes Dorsalis may cause Herpes Zoster, due to thickening of pia-arachnoid over dorsal surface of cord, extension of this process to sheath of ganglion and so extension to structure of ganglion or secondly changes in vessels present in Tabes may render ganglion more vulnerable to an attack of Zoster. Above also according to Head and Campbell. In the first case it would be a Secondary Zoster, and in the second case a Primary infection. This shows the difficulty if not the impossibility of distinguishing in every case between a Secondary or a Primary Herpes Zoster.

They examined the unbroken vesicles in five cases of Herpes Zoster and found the contents sterile bacteriologically in all five cases, thus corroborating what I have already said about the fluid being the result of blood vessels dilated due to a nervous reflex. Also they say "The microscopic examination of the fluid and careful staining of the sections of the skin, failed to reveal any signs of microorganisms".

H.H. Williams¹⁵ describes two cases of Herpes Zoster with associated nerve symptoms of Vertigo, Aphasia and loss of coordination in one case, and an Epileptic attack in the other. These symptoms showed themselves just before the Herpes Zoster appeared. Immediately after the Herpes attack they disappeared and/



and did not recur.

F. Parkes Weber¹⁰² quotes Evans, "Meningitic Herpes", British Journal of Dermatology, London, 1900, vol. XII, page 83, who says that it should be noted that Herpes Zoster is one of the more common cutaneous manifestations of Epidemic Cerebrospinal Meningitis, and also that it occurs in Tuberculous Meningitis, but more rarely.

Arnstein¹²⁵ evidently a strong believer in the association of Herpes Zoster with disease of internal organs urges a careful examination of all cases of Herpes Zoster for affections especially of the Liver and Lung, which in his experience are the commoner associations. He says that in most of the cases there was no other symptom pointing to visceral disease until careful examination was made.

I here wish to point out that in cases where diseases of the internal organs are associated, it would be difficult to say whether the Herpes Zoster is the result of a deferred nervous action, and so secondary or whether primary, especially if the associated disease is one which is running a temperature. Also the patient through the associated internal disease might be predisposed to infection with the Idiopathic type of Herpes Zoster, again showing that it will sometimes be impossible to place the Herpes Zoster in any definite category. However comparing the sensory nerve/

nerve supply of the affected area of skin to that of the affected internal organ would help in diagnosis. For Sensory nerve supply of internal organs see Head's table already mentioned.

Arnstein mentions a case of a generalised Herpes Zoster following six days after a typical Herpes Zoster involving the 4th and 5th left dorsal segment. This patient had his left lung affected with basal Pneumonia. This case I would put down as an Idiopathic Herpes Zoster, infection being predisposed to by low vitality as a result of the Pneumococcal infection. The Herpes Zoster here developed into a general systemic infection, according to a group of cases which will be described later.

In an Editorial note ¹³⁸ the writer quotes Brown and Dugardin (Ref. Brain, 42, part 1, 1919), as regards the relationship between Herpes Zoster and Syphilis. The writers say that it was noticed that Herpes Zoster was distinctly more prevalent among a group of soldiers under observation for Syphilis than it was amongst an unselected group of patients from the civilian population of the district. Among the syphilitics Herpes Zoster occurred in proportion of 4 cases per 1000, while in general population only in proportion of 1 case per 1000. They also noted that in Syphilitics Herpes Zoster had a predilection for the lumbar and sacral ganglions corresponding to the well known observation/

observation that Spinal Syphilis is more likely to attack the lower segments. In these cases the authors studied the changes of the Cerebro Spinal fluid and frequently found a lymphocytosis, occasionally accompanied by an increase in globulin, and in the case of the Syphilitics sometimes accompanied by a positive Wassermann reaction. Here again the Syphilis might produce local conditions which predispose the ganglions of the spinal cord to infection, or on the other hand the Syphilis itself might cause irritation of the Spinal Ganglia and so produce a Secondary Herpes Zoster. The above authors further continue by saying that Syphilis is frequently latent in the spinal meninges without clinical manifestations of spinal disease. Is it not possible then that the unusual frequency of Herpes Zoster among Syphilitics is due simply to the frequency of inflammatory conditions of the spinal meninges in this disease, and so irritation of the posterior ganglia?

The spinal lymphocytosis so often found in cases of Herpes Zoster may have been in some cases due to underlying Syphilis and not to Herpes Zoster.

Also it is a well recognised fact, that if Wassermann tests were done on every hospital patient, as has already been practised in certain hospitals, that a much larger percentage of patients would have a positive/

positive Wassermann reaction, than would be expected.

Dopter¹²³ had three cases of Zona in same room, occurring after complete cure of gastro-intestinal symptoms, accompanied in two cases by simple Angina. He thinks that epidemics of Herpes Zoster are epidemics of the common seasonal infections, in which Herpes Zoster is merely a manifestation or symptom.

Budde¹¹⁶ records a case of a soldier in good health. He had an injection in the right Subclavian region against Typhoid Fever. Two days after the second injection of the vaccine, he began to have radiating pain from the site of injection, up to the angle of the jaw and to the ear. The next day a typical Zoster eruption appeared with the most severe lesions in the distribution of the supraclavicular nerves. The author reasons that the Zoster was the result of injection of the vaccine directly into one of the branches of the Supraclavicular nerves, and ascending along it to the Plexus, thus involving the other nerves.

Instances of a similar nature are quoted in the Medical Review.⁹⁸ The Review quotes Ch. Archard. Ref. Bulletins de la Soc. Méd. des Hospitaux. Nov. 29th, page 1330. Archard has observed three cases of Herpes Zoster of the face after intraspinous injections. In two cases the substance injected was Cocaine, while in the third it was Eucaine. The eruption was preceded/

preceded by symptoms of meningeal irritation, headache and vomiting and was bilateral. He quotes another case where Herpes Zoster followed a simple lumbar puncture without anything being injected, as patient was suspected of being a Syphilitic. Five days later the patient had pains in the Lumbar region, and Herpes Zoster vesicles appeared on right buttock. The writer further says that Herpes Zoster cases have been observed after injection of anaesthetics into the Spinal Canal.

G.E. Roberts¹³ records a case of Herpes Zoster in an old patient who previously had an accident to his head. The man got a Herpes of scalp. Fourteen days later a child in same house developed Chicken Pox. The accident no doubt being of the head, lowered the resistance of Central Nervous System and predisposed to infection with the virus of Herpes Zoster, the type associated with Chicken Pox, as will be shown later.

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Targowla confirms the presence of inconsistent and slight changes in the cerebro-spinal fluid. They consist in increased pressure, lymphocytosis and increase in albumin, not in globulin. The Benzoin reaction is negative. He says that he has recently observed 5 cases at the Villejuif Asylum consisting of 3 cases of General Paralysis, one of Dementia Praecox, and one of mental enfeeblement due to a circumscribed/

circumscribed lesion of the brain, in which Herpes Zoster developed and Lumbar Puncture was performed. The Cerebro Spinal fluid did not appear to be affected by the occurrence of the Herpes Zoster. In two cases of General Paralysis, however, the tension of the fluid was raised.

According to Hugh Barber¹³³ the Cerebro Spinal fluid in Herpes Zoster shows a marked excess of lymphocytes. Several times he has found more than 100 per cmm. (more than 5 may be taken as abnormal). He says that the fluid must be examined early as the lymphocytes soon subside.

W.P. Le Feuvre¹²⁸ says that in some cases of Herpes Zoster, Kernig's sign has been elicited.

According to Hugh Barber a certain degree of Lymphocytosis is constantly associated with Herpes Zoster only, as it subsides early, that however does not rule out the fact that Spinal lymphocytosis so often found in Herpes Zoster may not in some cases be the result of some underlying or latent Syphilis or Tuberculosis. Also the frequent lymphocytosis taken in conjunction with the fact that in some cases Kernig's sign has been elicited, shows that the pathological process is not always just limited to the posterior ganglia, but may be part of a more widely distributed meningeal irritation.

From/

From what has been said it will be apparent that many cases of Herpes Zoster resembling in all respects that arising spontaneously may be produced by implication of a Posterior Root Ganglion or Nerve in an inflammatory process, secondary to malignant disease, Syphilis, Tuberculosis, injury and other diseases which might be latent.

Further it will be obvious that in many cases of Herpes Zoster it will be a matter of the greatest difficulty if not an impossibility to definitely decide whether such a Herpes Zoster is primary or secondary. I have quoted a few cases of Herpes Zoster due to injury, which one would expect to be of the Symptomatic variety, yet these cases were followed by Chicken Pox, so that the probability is that the injury predisposed to an attack of the Idiopathic variety, followed by Chicken Pox, a class of case which will be discussed later.

Lastly we must note that Symptomatic Herpes Zoster may be more frequent than is generally expected.

ASSOCIATION OF IDIOPATHIC HERPES ZOSTER
AND CHICKEN POX.

Considerable evidence has lately been accumulated, which tends to show that certain cases of Herpes Zoster and Chicken Pox are closely associated, and that there may be some common cause for Chicken Pox and some cases of Herpes Zoster. Up till now unfortunately all this evidence has been clinical, and not bacteriological or experimental.

We have always been accustomed to regard Chicken Pox as a type of Fever found especially in children and have regarded Herpes Zoster as a type of Skin disease due to a nerve lesion of the Posterior Ganglia of the Spinal Cord. This rigid differentiation of the two diseases, the one a fever and the other a nerve skin disease has automatically put a wide gap between the diseases in question, and no doubt is one of the main reasons why the association and close relationship of the two diseases had not been suspected years before this question began to occupy the attention of in comparison a few of our Medical men.

Now having differentiated between Idiopathic and Symptomatic Herpes Zoster and having shown the various possible causes of the Symptomatic variety and the way/

way in which they can produce this disease, it will be obvious that those cases of Herpes Zoster which are accompanied by fever, grant immunity, are infectious and occur in epidemics, belong to a class by themselves, that is, they form the Idiopathic variety, and in all probability are due to some infecting agent.

Further in view of the large number of cases quoted, where certain cases of Herpes Zoster and Chicken Pox have been associated, it will be apparent that if the two diseases are associated, Chicken Pox must be associated with the Idiopathic variety, and this is the object of this part of my thesis.

In future when using the term Herpes Zoster, I refer to the Idiopathic variety, unless otherwise stated.

Herpes Zoster should not be regarded simply as a disease of the skin due to the affection of the Posterior Ganglia, but as such a disease which commences with a sudden onset, accompanied by a temperature, running a definite course, of an infectious nature with an epidemic prevalence, and a disease granting immunity to second attacks, and our conception of it as a Fever is complete, no matter what its etiology or pathology may be. It is at once brought into line with the group of diseases generally named Fevers, and already we are a step nearer to its association with Chicken Pox, which also belongs to the/
the/

the Fever group of diseases.

If every case of Herpes Zoster were regarded with suspicion and with the above mentioned statements kept in mind, then by proper questioning, and the elimination of other factors which might cause Herpes Zoster, the average medical man as contrasted with the few, will soon convince himself of the infectiousness of Herpes Zoster and its association with Chicken Pox, and will be able to produce a mass of evidence in this connection, which would never be questioned.

PREDISPOSING CAUSES OF IDIOPATHIC HERPES ZOSTER AND
CHICKEN POX.

In considering Herpes Zoster as of the nature of a Fever we would expect its predisposing causes to be similar to those say of a Pneumonia and that the specific virus producing the condition is able to infect us, given a favourable opportunity.

Also these infectious fevers are more prevalent at certain times of the year. This has also been shown to be true of Herpes Zoster.

H.W. Stellwagon¹⁴⁸ mentions as predisposing causes the following:- More frequent during damp changeable weather, atmospheric changes, and exposure to cold and wet.

It is interesting to note that Le Feuvre¹²⁸ thinks that/

that on more than one occasion he could trace an attack of Herpes Zoster or Chicken Pox to, "Handling Sick Chickens".

Any diseases which especially weaken the resistance of the Central Nervous System would predispose to an attack of Herpes Zoster, such as peripheral nerve irritation, and head injuries.

Also the patient having a weak resistance would naturally be more susceptible to an attack, should the organisms be especially introduced into the system, as would be possible in traumatism with an open surface, vaccination, or skin diseases, where the protective covering layers of the skin have been destroyed, making it easier for any organisms in the vicinity to infiltrate say into the lymphatics of the exposed nerve endings, and so travel up to the corresponding posterior ganglia. This however brings us to the mode of infection, which will be considered under a separate heading.

The main point however is a lowered resistance, such as would invite an attack of an infectious fever, as for instance Chicken Pox, so that the predisposing causes may be considered the same for both diseases.

Chicken Pox although it has no particular season, is known to be more frequent in Autumn, also a favourite season for Herpes Zoster.

So/

So far then, both diseases are of the nature of an infectious fever, and so have the same predisposing causes, and both tend to occur mostly at the same time of the year, both occur sporadically and in epidemics, only the one is more prevalent in adults, and the other in children.

Arsenic also predisposes to an attack of Herpes Zoster. Le Feuvre¹²⁹ mentions that Ludwig Nielson, (Ref. New Sydenham Society 1893) searched the records of the General Hospital, Copenhagen and found that during twenty-five years more than three hundred patients suffering from Psoriasis were being treated with Arsenic, either in pill form or mixture; out of this number 3% suffered from Herpes Zoster. Le Feuvre also quotes Welander (Ref. Medical Annual 1903), who some years later treated a certain number of cases of Psoriasis by hypodermic injections of Arsenic, with Herpes Zoster appearing in 12% of these. Le Feuvre concludes by saying that the difference between 3% following oral administration and 12% following hypodermic injections is instructive.

As regards this drug there is great controversy as to whether it produces an Arsenical Neuritis and so a Secondary Herpes Zoster, or a Zoster of the Primary variety, the Arsenic diminishing the resistance of the Central Nervous System and so making it more susceptible/

susceptible to infection with the specific unknown microorganism.

The following case recorded by Parkes Weber¹⁰² is in favour of Herpes Zoster following Arsenic administration being of the Primary variety. He records the case of a patient, who suffering with Lymphatic Leukaemia, was being treated with Arsenic. Two weeks after commencement of Arsenical treatment, she developed a typical Herpes Zoster, which five days later was followed by a generalised Varicella like eruption over her whole body. A little boy aged four years was in the same ward, and ten days after his discharge from hospital, he developed Varicella.

BACTERIOLOGY.

No organism has as yet been discovered which can be proved to be the cause both of Herpes Zoster and Chicken Pox.

That Herpes Zoster is probably due to a specific virus is substantiated by its typical and characteristic features of temperature, infectious nature, epidemic tendency, and immunity conferred. Further the enlargement of the neighbouring lymphatic glands is strongly suggestive of the action of some virus or its toxin.

Second attacks of Herpes Zoster are said to be rarer/

rarer than second attacks of Measles.

The mode of onset of Herpes Zoster also favours its being due to a virus. It starts with a prodromal period of varying length, during which the temperature is raised, patient feels ill, but diagnosis is impossible and patient is usually suspected of developing one of the ordinary acute specific diseases. The rash appears and disease is diagnosed. This description of mode of onset is according to Head.

As regards the Primary Adenitis of Herpes Zoster, Ramond and R. Lebel¹⁴⁵ say that the adenitis can be detected every time by palpation, and is a sign of much diagnostic importance, in that it serves to differentiate true Herpes Zoster.

They found that there was constantly a primary Adenitis of the glands into which the lymphatics of the affected area drained. Like the eruption the Adenitis is unilateral. It appears quite early, even in the mildest cases, is seldom painful and is thus easily overlooked. The adenitis according to these authors is at its height when the vesicles appear, and disappears about the seventh day. The Adenitis due to secondary infection can thus be excluded. This Adenitis one would naturally consider to be the direct work of the still unknown virus.

Head and Campbell¹⁰⁰ confirm these associated enlarged lymphatic glands, but could obtain no evidence of/
of/

of bacterial invasion, sections of the glands revealing no microorganisms, although such sections showed the glands to be in a profound condition of inflammation with masses of small round cells.

Dr Cranston Low in a personal communication informed me that he stained the Posterior Ganglia of people who during their life time had an attack of Herpes Zoster, but failed to find any organisms. The only chance of discovering organisms in the Posterior Ganglia seems to be in a patient who has an attack of Herpes Zoster and then two or three days later dies with some intercurrent disease. The freshly infected Posterior Ganglia might then contain microorganisms. If too long a time has elapsed the glands would naturally have gone sterile again, and only the traces of the inflammation would be left.

As regards Chicken Pox, Claud B. Ker¹³¹ says it is possible that the microorganisms may be found to be a protozoon, and mentions Korte as having described unicellular organisms with amaeboid movement occurring in the clear fluid of the vesicles.

Protective inoculation for Chicken Pox also favours the bacterial origin of this disease. This was successfully performed by Kling, quoted by Claud B. Ker. Kling used the contents of a clear Chicken Pox vesicle, and of thirty-one children treated, only one took the disease, /

disease, although all were exposed to Chicken Pox. Steinert¹⁴⁴ similarly applied a preventative vaccine to stamp out a ward Epidemic of Chicken Pox and was successful.

As regards Herpes Zoster the most convincing experiments were performed by E.C. Rosenow and Oftedal^{108 & 110}.

They showed that the probable infection atriia, tonsils, pyorrhoeal pockets and suppurating sinuses in cases of Herpes Zoster harbour Streptococci and other organisms, which show an elective localisation and affinity for the posterior ganglia when injected intravenously into rabbits. Emulsions were made from such foci in people with typical Herpes Zoster and when injected intravenously into rabbits, produced typical Herpes Zoster, while the Posterior Ganglia corresponding to the areas of Herpes Zoster showed haemorrhages and round cell infiltration. In these affected ganglia, Gram staining Diplococci and Short Chains were found, but not in the normal ganglia. The peripheral lesions however just as in man, contained no organisms. Cultures from the spinal fluid and affected haemorrhagic ganglia gave pure cultures of Streptococci, while those from the blood, joint fluid and opposite ganglia were sterile. While suggesting that Herpes Zoster is due to a streptococcus having/

having elective affinity for the ganglia and the posterior roots, they admit that the disease in some instances may be due to other bacteria having a similar affinity.

A number of animals, usually those showing marked Herpes of the skin, showed also herpetiform lesions of the viscera, and in these the ganglia of the Vagus or Sympathetic nerves were found to be haemorrhagic.

The tendency of these organisms to localise electivity in the ganglia is shown by the fact that Herpes developed in six guinea pigs following intra-peritoneal injection.

Rosenow and Oftedal quote Sunde (Ref. Deutsch. Med. Wchnschr. 1913, 39, 849) who demonstrated gram staining Diplococci in a haemorrhagic Gasserian ganglion in a case of Ophthalmic Herpes in an old man who died of a Broncho Pneumonia three and a half days after the appearance of the Herpes.

Head and Campbell¹⁰⁰ did not manage to find any organisms in the Posterior Ganglia microscopically. The making of cultures was not attempted.

From a possible etiological point of view, it will be interesting to consider the analogy between Acute Anterior Poliomyelitis and Herpes Zoster.

Both diseases occur sporadically and occasionally in Epidemics.

Both/

Both diseases commence suddenly without any obvious cause, the first symptoms being malaise, temperature and pain. Up till now no diagnosis can be made, and especially in children one anticipates an acute febrile disease. The temperature is usually raised for about three days to a week, and during or just after this febrile period the paralysis occurs in the one case, and the vesicles in the other, and the diagnosis of both is complete.

Both diseases grant immunity to further attacks. Pathologically this similarity is still closer. The pathological findings are the same, but on the one hand an inflammation of the motor cells of the Anterior Horns, with a secondary degeneration and Sclerosis of the motor nerve trunks, and on the other hand an inflammation of the posterior root ganglia, also with an acute degeneration of the posterior nerve roots, and a secondary degeneration of the peripheral sensory nerves, due to destruction of the ganglion cells of the posterior roots.

Head¹⁰¹ who pointed out this analogy, says on this question, "The cells of the posterior root ganglion are the morphological equivalents of the large cells of the Anterior Horn, and thus the parallel between the two diseases is complete. The reason that Zoster is of commoner occurrence than Anterior Poliomyelitis probably lies in the fact that one who has suffered/

suffered from Zoster is not hampered in the struggle for existence, whilst Anterior Poliomyelitis materially diminishes the likelihood of the patient's survival in the struggle."

It is the similarity of the two diseases both clinically and pathologically that has induced Head and Campbell to consider Herpes Zoster as an acute Posterior Poliomyelitis in contra distinction to Acute Anterior Poliomyelitis.

Cases have been recorded where Herpes Zoster was accompanied by muscular paralysis and muscular atrophy, and it has been suggested that in a severe case this paralysis may be a result of an overflow of the inflammation from the posterior ganglion along the Sensory roots into the grey substance of the posterior horns, and then to the grey matter of the anterior horns.

Taking this analogy in connection with the observations of Flexner³ who in his Huxley Lecture mentions a list of diseases due to filter passing ultra microscopic viruses. Amongst others he mentions Acute Anterior Poliomyelitis and Vaccinia. The former we have seen resembles Herpes Zoster very closely, while the lesions of the latter in their early stages are similar to those of Chicken Pox, and Cranston Low³¹ thinks it possible that the virus of Herpes Zoster and of Chicken Pox belong to the same group of organisms.

It/

It therefore seems possible that both Herpes Zoster and Chicken Pox are due to filterable viruses, and as will be shown by an abundance of clinical material, probably due to the same virus. On the other hand we must not forget the very convincing experiments of Rosenow and Oftedal, although they admit that the disease may in some instances be due to other bacteria.

Interesting and important as the above mentioned experiments and analogies may be, we have as yet nothing definite, and no common organism for both Herpes Zoster and Chicken Pox.

Probably the most important observation for the establishment of the connection between Herpes Zoster and Chicken Pox was made by Cornelia de Lange, quoted in the British Medical Journal ⁷⁴, the original article having appeared in the Nederlandsch Tydschrift voor Geneeskunde, April 21st 1923, page 1634. She records the case of a child aged 20 months who developed an attack of Herpes Zoster. In the course of the next eighteen days three other children in the same house developed Chicken Pox. On examination, the blood of all four children showed a more or less strongly positive reaction to Varicella antigen. As a control she also in the same way examined the blood of two other children who had never had Chicken Pox before, with a negative result. The Varicella antigen was made/

made from the Varicella crusts in a physiological salt solution. This was ground in a mortar and used as the antigen.

She concludes by saying that as this reaction is very specific, we may assume that Herpes Zoster and Chicken Pox are caused by the same organism.

An examination was also done with lapine antigen, obtained from rabbit pox, with in all four cases a negative result.

This experiment by Cornelia de Lange gives promise of great possibilities.

PATHOLOGY.

Herpes Zoster being a manifestation of a local disease and Chicken Pox being a general systemic disease, a lengthy discussion of the pathology of the two diseases will bring us no nearer as regards their association.

In Chicken Pox the virus probably attacks the nerve endings or minute nerve twigs in the skin. The grouping of vesicles sometimes seen in this disease suggests that the seat of a focus of infection is probably in a small branch of a peripheral nerve.

As regards Herpes Zoster, the work of Head and Campbell¹⁰⁰ on twenty-one cases, has shown that the affected posterior ganglia showed pathological changes such as might be caused by a virulent virus or its toxin.

Rare though they may be, there are cases on record, showing that Chicken Pox has an affinity for the Nervous System, this also tending to bring this disease in line with Herpes Zoster.

In this connection Cornelia de Lange⁷⁴ quotes Miller and Davidson (Ref. British Journal Children's Diseases 1914, XL, p.15) who record a case of Chicken Pox complicated by Encephalitis, and collected three other examples published by Marfan, Caccia and Osler, as well as examples of Chorea following Chicken Pox.

MODE OF INFECTION.

Although a consideration of mode of infection has perhaps little in common with the association of Herpes Zoster and Chicken Pox, it might not be out of place to consider it here, since we have just discussed the bacteriology of these diseases.

As regards Chicken Pox, the general consensus of opinion seems to be that the virus is inhaled.

Cranston Low³¹ suggests that the mode of infection in Herpes Zoster is similar to that of Anterior Poliomyelitis, that is, that the infection is probably local, through the nose, along the lymphatics, round the Olfactory Nerves to the Meninges and Cerebro Spinal fluid, from where it is easy for it to reach the ganglia/

ganglia on the Sensory Nerves. In Chicken Pox he says there is probably a blood infection with the virus.

E.S. Lain¹¹⁷ an exponent of Herpes Zoster being a focal infection, suggests as the origin or focus infected tonsils, decayed teeth and pyorrhoeal pockets. Their observation of several hundred cases over a period of three years confirm this. It will be remembered that Rosenow and Oftedal also got the material for their experiments from the above sources.

Cranston Low's theory no doubt is very true for Herpes Zoster which affects the upper cervical segments; but it would be difficult to understand why a virus which enters by the above named route should skip say all the Cervical and Dorsal Posterior Ganglia, travel down the Spinal Cord, and then fix itself to a definite ganglion, say in the Lumbar or Sacral region. It also would be difficult to understand why, in a system which is generally run down and predisposed to infection, one particular ganglion, say in the Lumbar region, should be more vulnerable to attack than all the Cervical and Thoracic ganglia, which the virus entering through the nose must have passed on its way, while going to the Lumbar region.

It also is characteristic that only one ganglion and at most two together, should be affected and that the affection should always be unilateral. These two characteristics/

characteristics practically rule out a blood infection which could affect any number of ganglia at once, and on both sides.

We have already seen that with Herpes Zoster, according to Ramond and Lebel, there is always an associated enlargement of the lymphatic glands draining the affected area of skin, and that before any secondary infection of the vesicles has taken place, as the enlarged lymphatic glands appear early, the Adenitis being at its height, when the vesicles make their appearance, and disappearing about the seventh day.

D.W. Montgomery¹²¹ regards Herpes Zoster as a primary ascending neuritis and says that it would be quite logical to assume that the virus gains entrance to the lymphatics of the nerve terminals of the affected area, say on the skin, cause the glandular enlargement, and then travel up along the lymphatic spaces of the nerve sheath, to the posterior ganglion of that nerve. This explains why only one or at most two ganglia are usually affected, and why the eruption is always unilateral.

The toxin of the Tetanus bacillus reaches the central nervous system through a local injury along the nerves, so also does the virus of Cerebro Spinal Meningitis, so that one could expect the same for Herpes/

Herpes Zoster along the sensory nerves, provided the virus had a mode of entrance to the lymph spaces of these nerves.

According to Ramond and Lebel the Adenitis is at its height when the vesicles make their appearance. This is what one would expect, as it allows time for the virus to travel from the enlarged lymphatic glands, say which drain a particular area of the skin, to the posterior ganglia, cause inflammation there, and then only the vesicles of the Herpes Zoster would appear.

On this question D.W. Montgomery draws an analogy with the Spirochaeta Pallida, which enters by way of the skin, and travels up the lymphatics, causing the Bubo of the Primary sore. Here again there must be an abrasion as a means of entry for the Spirochaete.

The same writer says that this characteristic adenitis is still another proof that the virus in Herpes Zoster enters on the surface of the skin of the region attacked. He believes that these enlarged glands during their primitive enlargement afford the site in which to search for the specific organism.

A few days before the eruption, the writer continues, there is a temperature, which however falls when the eruption appears, due to the fact that by the time the eruption has appeared the highly immunizing virus of Herpes Zoster has already immunized the/
the/

the patient to such an extent, that the temperature becomes normal. The longer the nerve the longer the virus takes to reach the ganglion, and all this time the patient is being immunised. On this theory he explains the frequent severity of Herpes Zoster of the Fifth nerve, especially of the very short Ophthalmic branch.

So in Herpes Zoster as in Syphilis one may need a local abrasion for entrance of organisms, and patient being predisposed to an attack, Herpes Zoster develops.

In this connection the association of the various skin conditions with Herpes Zoster, as found in my analysis of 270 cases of this disease, must be kept in mind, as providing the abrasion in the skin surface, possibly necessary for the entrance of organisms to the lymphatics of the Sensory nerves, supplying that area of skin.

In the mentioned analysis I found that in almost one half of those cases of Herpes Zoster associated with other skin diseases, the distribution of the Herpes Zoster corresponded to the distribution of those skin diseases.

As mentioned before, the number of cases is not sufficient for definite conclusions to be drawn; however it suggests one possible mode of infection.

In my discussion of the distributional tendencies of/
of/

of Herpes Zoster, attention was drawn to the fact, that the posterior ganglia mostly affected, were those which also received afferent impulses from the viscera. This is a significant fact.

In the physiological discussion as to the mode of production of Herpes Zoster vesicles, it was mentioned that in many cases inflammation affecting one branch of a nerve may have associated with it definite inflammatory disturbance in the areas, supplied by other branches of the same nerve, and that when inflammation affects one organ, inflammatory phenomena may be sympathetically developed in regions innervated from the same area in the brain or spinal cord.

As a result many cases of Herpes Zoster may be of a Symptomatic variety. On the other hand, is there not a possibility that the virus of Herpes Zoster may also frequent the intestinal system, local conditions as an Enteritis allowing the virus to enter the lymph spaces of the afferent sensory nerves supplying that area? Having reached the posterior ganglion Herpes Zoster could develop in the usual way, with the stimulus causing the vesicles, passing down the branch of the ganglion, which supplies the skin. In these cases the enlarged glands would be associated with the intestinal system, and not be found connected with the skin.

The/

The distributional tendencies of Herpes Zoster suggest such a mode of infection in some cases.

So it seems probable that the virus of Herpes Zoster may reach the ganglion along three routes (1) Back of nose. (2) Skin. (3) Intestinal system, some local predisposing cause deciding in any particular case, which is to be the mode of infection.

DISTRIBUTIONAL SIMILARITIES OF HERPES ZOSTER
AND CHICKEN POX.

Although bacteriologically we have discussed experiments such as Cornelia de Lange's, which suggest the association of Herpes Zoster and Chicken Pox, it is to the clinical aspect of these diseases that we must look for our most convincing proofs.

I will begin with a discussion of the similarity of the rashes as regards their distribution for both diseases.

Totally different as these diseases are in many respects, there are similarities in their distribution which are very striking, and which tend to point to Herpes Zoster being a local manifestation of Chicken Pox. If such be the case we will observe (1) rarely though it may be, that there will be occasions, when the/

the disease is not quite true to type, but tends to take on the characteristics say of its modified type or vice versa.

(2) Inspecting the distributions very closely we will see a similarity between the two diseases as regards the positions of the body usually affected.

As regards No.2. On referring back to the distributional preferences of localisation for Herpes Zoster as analysed, we see that the dorsal spinal segments are by far the most often affected, with the eruption then mostly on the trunk. Of the cervical segments the third and fourth are more often affected than the fifth and sixth, and the latter more often than the seventh and eighth. In other words the neck and shoulders are more often affected than the proximal ends of the upper limbs, and the proximal ends more often than the distal ends.

As regards the Lumbar region, we find that the first and second Lumbar segments are far more often affected than the third, fourth and fifth, that is, the proximal ends of the lower limbs are more often affected than the distal ends.

The palms of the hands and the soles of the feet are hardly ever affected in Herpes Zoster.

In Chicken Pox we find the eruption exactly the same, most profuse on the trunk, and scanty upon the extremities, the forearm and wrist especially being only/

only slightly affected.

The Chicken Pox eruption tends to be centripetal, an important point in its diagnosis from Small Pox. Also in Chicken Pox the palms and soles are hardly ever the seats of vesicles.

Herpes Zoster then, although its eruption is on a much smaller scale, tends to be similar to Chicken Pox as regards the localisation of its rash.

Now considering No.1, that is that the two diseases are not always true to type, but tend to simulate each other. We know that the essential lesion in the case of Chicken Pox is a discrete vesicle, and in the case of Herpes Zoster a group of vesicles. Yet some slight local irritation may prevent the Chicken Pox vesicles appearing true to type and determine them to take on a grouped formation very similar to that of Herpes Zoster. Such irritation may be due to pressure say of a mustard leaf, garter, collar stud or badly fitting corsets. A number of such instances are recorded as follows:- Dr C.B. Ker⁷⁸ says that occasionally infants with Chicken Pox are seen, where the eruption is particularly profuse in the region covered by the napkin, due to the irritation of the excretions. He mentions a patient of his, who broke his clavicle during the incubation period of Chicken Pox, and on account of the bandages the spotting was three or four times more profuse on the chest, affected shoulder and/

and arm, than on any other part of the body. Dr Ker also records another case of a lady with Chicken Pox, who had the eruption extremely profuse on the face. She had been in the country for a week-end, when she spent her time sitting in the sun.

Dr Ker quotes Gautier (Ref. Arch. de Médecine des Enfants, Dec. 1919) who quotes similar cases in children who were being treated by heliotherapy. Dr Ker mentions a case of his where a patient, 4 days after a severe Scarlet Fever rash, developed Chicken Pox. The Scarlet Fever determined the distribution of the Chicken Pox vesicles due to the skin hyperaemia. Dr Ker says that he cannot say however that in any of these cases the eruption was grouped in a herpetic manner, but that cases might occur which might suggest Herpes to a not very careful observer and so lead to a mistaken diagnosis.

Cranston Low says that the lesions in Chicken Pox often occur in groups, suggesting that the focus of infection may be in a small branch of a peripheral nerve.

J. van Bokay¹²⁴ advanced the theory that under certain unknown conditions the virus of Chicken Pox may produce a local Zosteriform eruption instead of a generalised eruption. The Zoster is thus an expression of Chicken Pox, and others are readily infected. He/

He mentions the case of a 3 year old boy who during the course of an attack of Chicken Pox, displayed a distinct line of vesicles, simulating Herpes Zoster, following the line of the 6th and 7th intercostal spaces.

Henoch¹⁰⁴ similarly observed Zoster like groupings of the vesicles in varicella.

Swoboda¹⁰⁵ says that the eruption in varicella often occurs in bands, where there is pressure of clothes.

C.I. Jennings¹⁰⁶ quotes Thomas who says that the vesicles sometimes are congregated in Varicella into small groups, making the eruption resemble Herpes Zoster.

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Paul Heim quotes a case of Herpes Zoster in a mother, followed by Chicken Pox in her two children, one of the children in addition to the Chicken Pox eruption, had an eruption like Herpes Zoster in the right axilla. He says that Varicella often shows grouping of lesions like Herpes and Herpes often show Varicella lesions.

W.L. Le Feuvre¹²⁸ says he observed a case in a native during a recent epidemic of Chicken Pox in Bulawayo, where the vesicles of Chicken Pox showed a more or less Zoster like grouping.

W.G. Nash⁴⁸ records a case of a boy aged 14 years who got Varicella from his brother, and infected his/

his sister. He had a few vesicles scattered over his body, but between the fourth and tenth left ribs posteriorly was a copious eruption, resembling an extensive eruption of Herpes Zoster. There was nothing to explain the localisation of the rash in this neighbourhood.

These cases show the tendency of Chicken Pox to simulate the grouped eruption of Herpes Zoster.

The reverse also often happens, and Herpes Zoster on occasions tends to develop into a generalised rash, which cannot be diagnosed from that of Chicken Pox. Cases of this nature fall under a definite heading, which will be referred to later. Along with another doctor I saw a patient aged forty years, suffering from a typical attack of Herpes Zoster corresponding to the left sixth and seventh Thoracic segments. The day before the appearance of the eruption he had severe pains in the left chest. On the day following the eruption, one vesicle exactly like a Chicken Pox vesicle was noticed near the left Anterior, Superior Spine, and another near the outer Canthus of the left eye. About five days later two more such vesicles appeared, one behind the right ear in the scalp, and one on the right thigh. The appearance of these vesicles in crops on different dates is also characteristic of the manner in which the Chicken Pox rash appears. One dermatologist who will be referred to later, goes so far as to say that if one examined /

examined every case of Herpes Zoster carefully and daily, one would in every case find outlying or aberrant vesicles, indistinguishable from Chicken Pox vesicles.

Thus Herpes Zoster and Chicken Pox on occasions threaten to develop into or simulate each other.

From the above it will be evident that mistaken diagnoses can be made in cases which are not typical, and which are not properly observed. A few words on diagnosis would therefore be justifiable. We know that in Herpes Zoster the skin manifestation appears as groups of vesicles on inflammatory patches, practically always unilateral, and if more than one group, that they assume a linear distribution.

Pain is another important point in Herpes Zoster. Although pain preceding the appearance of the eruption is said to be absent sometimes in children, it is nevertheless a constant symptom, even if only in the form of tingling or a burning sensation in the area affected. If a case of Herpes Zoster is described as a typical case, all the above mentioned symptoms including the pain will be present. In the list of cases which will be quoted we will see how many cases of Herpes Zoster are described as typical, allowing no mistake to be made, and obviously signifying that appreciable pain must have been present too, and in many/

many cases special reference is made to such pain.

The Primary Adenitis already referred to and said to be present every time in Herpes Zoster if sought for by palpation, is also of much diagnostic importance to differentiate from Chicken Pox, which has no such primary Adenitis.

As regards diagnosis, Hugh Barber¹³³ says, "Two points should be diagnosed. First from a clinical point of view is the question of pain. It is a very constant symptom in Herpes Zoster, and of real practical importance in justifying the diagnosis of Herpes Zoster, if an unusual distribution of Chicken Pox were under discussion. The second much more important is that the Cerebro Spinal fluid in Herpes Zoster shows a marked excess of lymphocytes. Several times I have found more than 100 per cmm. (more than five may be taken as abnormal). The fluid must be examined early as the lymphocytosis soon subsides." This last statement excludes in some cases at least, the lymphocytosis being due to latent Syphilis or Tuberculosis.

Some observers draw attention to a clinical observation which in doubtful cases might be helpful in diagnosis, namely that often there is a hyperaesthesia on the area of skin on which the Herpes Zoster vesicles are going to make their appearance.

Any of the above mentioned points, with the exception/

exception of a lymphocytosis of the Cerebro Spinal fluid, would justify a diagnosis of Herpes Zoster as opposed to Chicken pox. The lymphocytosis of the Cerebro Spinal fluid is excluded, as Herpes Zoster may appear in patients who are Tubercular, or who suffer with Syphilis, the central nervous system being affected. These two conditions, as well as others, would also produce a lymphocytosis of the Spinal fluid.

CLINICAL EVIDENCE SHOWING THE CONNECTION BETWEEN
THE TWO DISEASES.

We now come to the most important and convincing evidence of the association of Herpes Zoster and Chicken Pox, namely the observation of a number of medical men over a period of many years, that the one disease clinically is found to be associated with the other in a variety of ways.

On reviewing the literature on this subject one cannot help being impressed with the strength of the evidence advanced, in the form of the number of cases quoted, which tend to show that there may be a common cause for Chicken Pox and some cases of Herpes Zoster.

Although bacteriologically and experimentally we really have very little to convince us of this association, yet clinically we have a volume of evidence so abundant as to convince even the most sceptical.

Many/

Many people are already convinced that this connection is established, many still however believe that these cases are a mere coincidence, and no doubt will not be persuaded till they have had a case or cases of their own, where Herpes Zoster produces Chicken Pox in another person, and where no source of infection for the Chicken Pox could be found.

However laborious reading it may make, I think it necessary to describe or give the references of all the cases that I could find, showing the connection between the two diseases, in order to rule out the argument of coincidence, and also in order to draw from such cases a number of conclusions. The published cases fall under a variety of groups. In each group I intend describing a number of cases which are characteristic, and which bring out any special points which are of importance.

HISTORICAL REMARKS OF THE ASSOCIATION.

Bokay¹²⁴ of Budapest was the first to draw attention to the possible association of Chicken Pox and Herpes Zoster. In July 1888 he noticed this connection between the two diseases for the first time. He visited a child with Thoracic Herpes Zoster and ten days later in the same family another child developed Chicken Pox.

A few weeks later he for the second time again had occasion to see an example of this association, and this led him to consider whether there was not a possible connection between the two diseases.

In 1891 he saw three more such examples, and in 1892 he suggested that the virus of Varicella might under certain circumstances cause a Zoster eruption, instead of the generalised Chicken Pox eruption. By 1909 he had seen nine such cases, which were published in the Wiener. (Klinische Wochenschrift, September 30th 1909.)

In 1888 M. Boullard, quoted in the Lancet,⁷⁵ published a case from the practice of M. Brissaud, of a man with Herpes Zoster. Examination of the patient showed a large number of isolated vesicles quite similar to those of the Zoster eruption, but disseminated over the entire cutaneous surface.

In 1893 Tennyson (Ref. Traite Clinique de Dermatologie, Paris, 1893, p.116 and 117, quoted in the Lancet⁷⁵) stated that if the entire cutaneous surface of patients affected with typical Herpes Zoster were examined daily, aberrant or outlying vesicles would be found nine out of ten times, distributed irregularly at great distances from each other, on all parts of the body. He says that although these aberrant vesicles are described as similar to the ordinary Zona vesicles, /

vesicles, they do not appear to be usually accompanied by pain, as they remain unnoticed if not looked for. This statement by the well known dermatologist of the St Louis Hospital was startling at the time, but was soon confirmed.

The cases of Herpes Zoster with outlying vesicles or a generalised vesicular eruption refer to the type of case called Herpes Zoster Generalisatus or Herpes Zoster and Chicken Pox in the same person.

By now a large number of cases suggesting the connection between Herpes Zoster and Chicken Pox have been recorded in all parts of the world.

The cases will be described or mentioned under the following headings:-

- (1) Cases of Herpes Zoster in one patient, followed by Chicken Pox in others who were exposed.
- (2) Chicken Pox in one patient followed by Herpes Zoster in others who were exposed.
- (3) Herpes Zoster and Chicken Pox occurring simultaneously in the same individual.
- (4) Herpes Zoster and Chicken Pox occurring simultaneously in the same individual, and then Chicken Pox transmitted to others who were exposed.
- (5) Herpes Zoster and Chicken Pox occurring simultaneously in different individuals closely associated.
- (6) Epidemic of Herpes Zoster and Chicken Pox occurring at the same time.

If/

If a sufficient number of cases can be quoted for each group, so as to rule out coincidence, then it must be admitted, that the fact that the two diseases are so closely associated with each other in such a variety of ways, points to their being different manifestations of the same disease.

HERPES ZOSTER IN ONE PATIENT FOLLOWED BY CHICKEN POX
IN OTHERS EXPOSED.

The main points to which special attention must be drawn in connection with the cases of this group are:- (1) A patient develops a typical attack of Herpes Zoster. (2) A susceptible contact who has been exposed to this case of Herpes Zoster, develops a typical attack of Varicella. (3) A uniform interval of 14 to 21 days exists between the two diseases, this interval corresponding to the agreed incubation period of Chicken Pox. (4) One writer points out that there is probably a close contact between the giver and the taker of the infection. (5) In each case of Varicella following Herpes Zoster, no source of infection other than the case of Herpes Zoster could be found; and in some cases which will be quoted, surroundings and conditions make it impossible that any other source of infection or Chicken Pox could have existed, without the medical man being aware of its existence.

J. Van Bokay¹²⁴ being the first to have noticed the association between the two diseases, his nine cases will be described first.

1. In July 1888 he noticed this association for the first time, and in his private practice. A child developed an attack of Thoracic Herpes Zoster, 10 days later in the same family, another child developed a typical attack of Chicken Pox.
2. A few weeks later again in his private practice a young girl developed Abdominal Herpes Zoster, 10 days later another girl in same family developed typical Chicken Pox.

He thought these cases very interesting, but was inclined to consider them as coincidences. He did not think that similar observations would be made in the future

3. In 1891 the wife of a colleague of his developed a Thoracic Herpes Zoster on April 10th. Attack was not too severe. On April 22nd, that is 12 days later, the youngest member of the family, a boy of 8 yrs. of age developed Chicken Pox. A year previously his sister had an attack of Chicken Pox, and in spite of insufficient isolation, he did not develop the disease, but now after the Herpes Zoster in his mother he developed Varicella.

4. On May 21st 1891 he was asked to see the sister of a professor colleague of his, who lived in Buda Pest. Her 15 year old son was suffering with a Zoster frontalis. 15 days after the onset of the Herpes the sister of the patient aged 13 years developed Chicken Pox.
5. This peculiar observation was brought to the notice of his colleague Baron Freiherr v. Korányi on November 2nd 1891 and as soon as six days later, that is on Nov. 8th he was informed by Professor v. Korányi that on October 29th a patient with Herpes Zoster was treated in one of his wards. In the same ward on Nov. 6th, or 8 days after the Zoster eruption, an adult with a chronic splenic tumour got Chicken Pox.
6. In 1904 he had occasion to see a similar series of cases, in his private practice. The nurse of Professor v. Korányi's children developed a Zoster Frontalis. On April 11th the professor's boy and on April 13th his daughter developed typical Chicken Pox. The interval between the occurrence of the Zoster and the Chicken Pox infection was more than two weeks.
7. On December 10th 1907 a boy aged 6 years who was being treated for spinal trouble in the internal department/

department of the Stephanie Children's Hospital developed a Pectoral Herpes Zoster. On December 25th in the same department a boy 4 years of age, suffering with Chronic Laryngeal Stenosis, developed Chicken Pox. On December 26th a boy 4 years old, also suffering with Laryngeal Stenosis, was similarly affected, as also a boy 3 years of age who was being treated for a laryngeal papilloma. The intervals between the Herpes Zoster and Chicken Pox in these cases were 15, 16, and 18 days respectively. The boy of 6 years of age was stated to have had Chicken Pox 3 years ago, but the statement of parents, Bokay says, is not to be relied upon. Bokay says that it is remarkable that for several months no Chicken Pox had appeared in this department of the hospital and the visiting of Children to this hospital had always been strictly forbidden, and that it was hardly possible that Chicken Pox could have been brought in by adults. He came to the conclusion that the Chicken Pox in all 3 cases had been derived from a common source, which was only to be found in the diseased patients of that department. The boy with the Zoster had been removed on several occasions to the Surgical department to be bandaged, and he was the only patient who came in/

in contact with other children.

8. His eighth observation he owed to a friend who informed him of a case in the Blind Asylum. A 10 year old boy was brought to the hospital on Sept. 3rd 1908. Two days later he developed a Pectoral Zoster. On September 21st, or 15 days after the occurrence of the Herpes, a boy aged 13 years developed a typical Chicken Pox. This last boy was in the same ward, and his bed was in the neighbourhood of the Zoster patient, also the boy had not been in contact with the outside world for weeks. In the same ward Chicken Pox also developed in two boys aged 9 and 7 years on Oct. 6th and 8th respectively, and in the neighbouring ward a 6 year old boy was affected with Chicken Pox on October 12th.

So here we have a Chicken Pox epidemic in an asylum following a case of Herpes Zoster, and one of the boys affected with Chicken Pox had not been in contact with the outside world for some weeks, which strongly suggests, that the source of infection was the case of Herpes Zoster.

9. The following instance he saw in the eye department of the Stephanie Children's Hospital. J.F. an 8 year old boy, was brought to the department on March 3rd 1909 suffering with a Keratitis. On/

On March 7th this child developed an Occipital Herpes Zoster with a slight rise of temperature. In the same department 4 children suffering from eye diseases got typical Chicken Pox, on March 21st a 6 year old girl, on March 22nd a 3 year old girl and a 6 year old boy, and on March 24th an 8 year old boy. First interval then was 14 days. He emphasises the point that the eye department had for months been completely free from Chicken Pox infection.

Nine cases observed by one medical man can hardly be coincidence, and that only after he had his attention drawn to the connection.

Bokay concludes that the unknown virus of Varicella may under certain circumstances, instead of giving rise to a generalised eruption, produce a localised Zoster eruption, which may infect other children with Chicken Pox.

The following four cases have not appeared in any of the medical journals. The doctors mentioned have given me permission to make use of the cases.

10. In 1921 Dr Aitken's grandmother stayed at their house on a visit, and while there developed a typical Herpes Zoster. Two weeks later both grandchildren/

grandchildren got Chicken Pox. The children had not had Chicken Pox before. They stayed in the country far away from anybody else, and there was no Chicken Pox in the neighbourhood at that time. The grandmother stayed with them while they had Varicella, but did not herself develop the latter disease.

The following three cases were in the first instance communicated to Dr Cranston Low, who along with the doctors named, gave me permission to make use of them.

11. Dr W.B. Winckworth of Taunton wrote that on Jan. 16th 1919 his children's nurse developed a typical Facial Herpes Zoster. On January 29th or 13 days later one of his children got varicella. On January 30th two more developed Chicken Pox. He could trace no source of infection.
12. Dr Horace C. Colman of Broughty Ferry, Forfarshire, had a case where one member of a family aged 16 years, developed a severe attack of Herpes Frontalis. The brother and sister of above, aged 8 and 3 years respectively, developed typical Chicken Pox two weeks later. They live in an isolated block of houses a quarter of a mile from other houses. There was no case of Chicken Pox in these houses.

13. Mr C.M. aged 44 years, says that he developed Herpes Zoster. Twelve days later his son developed Chicken Pox, and also immediately afterwards his youngest daughter. In a fortnight his other two girls also developed Varicella. He says that the children came in contact with him while he was in bed. He had never had Chicken Pox before.

The following include instances of Chicken Pox epidemics occurring in hospitals, as a result of Herpes Zoster. In some cases as will be seen, there was almost perfect isolation.

Dr Claud B. Ker⁷⁸ records the following four instances.-

14. A child suffering from whooping cough developed a typical Herpes Zoster with no outlying vesicles on December 23rd 1918. On January 7th a child in the same ward was discharged from hospital and developed Chicken Pox within a week of her return home. The onset of the eruption was within 21 days of the appearance of the Herpes in the other patient. A few presumably unprotected children who remained in the same ward escaped infection.
15. A girl aged 8 years, suffering from Scarlet Fever, developed a typical Herpes Zoster. Eighteen days later two children aged five and six years, whose beds adjoined that of the Herpes patient, developed/

developed typical Chicken Pox, the following day a child, occupying the bed exactly opposite also developed Chicken Pox.

16. A Scarlet Fever patient in one of the wards had a typical attack of Herpes Zoster, 25 days later this was followed by an outbreak of Chicken Pox affecting several children. Dr Ker says that as the Herpes case was not removed from the ward, the long interval does not exclude a possible incubation period, for if the infection had been derived from the Herpes patient it need not necessarily have been contracted during the first 3 or 4 days of that condition.

17. A child was admitted with Chicken Pox from Dr J.S. Fowler's wards in the Royal Hospital for Sick Children. A case of Herpes Zoster had occurred in the ward 19 days previously. Dr Ker concludes that as regards two of his cases, it must be noted that they occurred in convalescent Scarlet fever wards. With a view to keeping these wards quite free from secondary infections, no patient is transferred to them, unless he has at least been three weeks in hospital, so that he has passed the incubation period of any infection which he might have been exposed to before admission. Dr Ker says that with the exception of post Scarlatinal/

Scarlatinal diphtheria, which is due to undetected carriers, it is most unusual for secondary infections to occur in convalescent wards, so that it is very remarkable that on two of the rare occasions, on which Chicken Pox has made its appearance there, Herpes Zoster should have preceded it. It would be difficult to get a more complete isolation.

Dr R. Cranston Low³¹ mentions the following three observations.

18. He was asked to see a gentleman, age 43, in October 1915, suffering with a very severe attack of Herpes Zoster affecting the skin area supplied by the first division of the 5th nerve on the right side. A very severe attack with much pain. He had never had Chicken Pox before. 13 days after the appearance of the first signs of Herpes Zoster, two of his children developed typical Chicken Pox, and 2 weeks after that other two also developed Varicella. The Children were at school when attacked, but as far as was known had not been in contact with any case of Chicken Pox.
19. A child suffering from typical Herpes Zoster on right side of body was admitted to Deaconess hospital on October 24th 1918. 19 days later, e.g./

e.g. on Nov. 12th, another child in the same ward developed typical Chicken Pox. This child had been in the ward since October 21st.

20. G. Richardson⁷⁶ describes another very suggestive case where outside infection can be almost entirely excluded. He reports that one of the patients developed a profuse Herpes Zoster of lower dorsal and upper lumbar distribution, in a convalescent Scarlet Fever ward. The patient was not isolated, but was nursed in the main ward. Exactly two weeks later Chicken Pox broke out in the ward, three patients being affected, and all three had been in the hospital longer than three weeks, the times being 30, 32 and 40 days respectively.

This case falls under the same category as Dr Ker's case which also occurred in a convalescent Scarlet Fever ward. Richardson says the only other source of infection apart from the Herpes Zoster patient might have been infection introduced on clothes sent in to convalescent patients from outside.

W.M. Elliott⁸⁴ Physician Superintendent, Ruchill Fever Hospital, Glasgow, records an interesting series of epidemics of Chicken Pox following/

following cases of Herpes Zoster in the wards. The cases were seen and diagnosed as Herpes Zoster by the writer.

He records nine cases of Herpes Zoster in Wards, with outbreaks of Chicken Pox following five of them, all within acknowledged incubation period of latter disease. In none of the cases was any source of infection to be discovered. All the patients attacked had been in the ward for a period much over the incubation period of Chicken Pox. So out of nine cases of Herpes Zoster, Chicken Pox epidemics followed in five. Of the other four, one had a doubtful diagnosis of Herpes Zoster, more likely a septic condition or an Impetigo, and in one the ward was practically empty and contained only three susceptible people, so facilities for spreading were not great. Therefore if these two cases be discarded, the striking fact remains that there were five epidemics of Chicken Pox out of seven cases of Herpes Zoster which occurred in wards. As regards the remaining two cases, the writer says there is no reason why Chicken Pox did not follow, as in each instance a considerable number of susceptibles were exposed.

The writer says that in every case except No.6, the patient developing Herpes was susceptible/

susceptible to Chicken Pox, where as none of them subsequently developed the disease, though they remained in the wards and became contacts of the succeeding cases of Chicken Pox. This was particularly noticeable in one outbreak where ten out of seventeen susceptibles became infected before the epidemic ceased. I would like to point out that No.6, case of Herpes Zoster, was one of the cases where an epidemic did not follow, he, according to the writers had had Chicken Pox before, and this suggests symptomatic Herpes Zoster. Elliott also draws attention to the fact that one of the patients with Herpes Zoster was not a patient, but a nurse in the ward. She had preherpetic pain and so went off duty a day before the eruption appeared, so that she was not in contact with any of the patients while the eruption was present, yet other patients in her ward developed Chicken Pox. Elliott further observed that with the exception of one outbreak, the number of susceptible contacts attacked primarily, is distinctly small. This is different to the usual experience when individuals in a ward become cross infected with Chicken Pox.

The cases were as follows:-

21. G.A. $1\frac{1}{2}$ yrs. Interval 15 days. Did not have
Chicken Pox before.
22. J.F. $5\frac{8}{12}$ " " 20 days. " " "
23. /

23. A.D. ⁸21² yrs. Interval 16 days. Did not have
Chicken Pox before
24. Nurse A. Interval 16 days. " " "
25. E.D. 5 yrs. Interval 17 days. " " "

George Gunn³⁰ mentions another case which practically excludes any other source of infection except the primary Herpes Zoster case. He says that the Royal Liverpool County hospital for Children has one closed indoor ward; the rest of

26. the hospital being open air. A child developed Herpes Zoster well marked on October 20th, 16 days later, or on November 5th, four patients in that ward developed Chicken Pox. The following day another case of Chicken Pox appeared. No new cases were admitted between October 12th and 27th, except one who had had Chicken Pox three months previously. There was no case of Chicken Pox in any other ward, and none of the staff were affected. No visitors had been admitted to the hospital since October 12th owing to the influenza epidemic, so no infection could have come from outside.

27. Dr Milne²⁰ mentions a case of a lad, J.K. aged 20 years, who was admitted to Her Majesty's hospital (in connection with Dr Barnardo's Homes) with severe Herpes Zoster of face and neck. 16 days later a boy aged 5 years, in an adjoining bed, /

bed, developed typical Chicken Pox. He had been in the ward for 6 weeks, and there had been no other case of either disease.

In shortly reviewing the cases mentioned, it must be admitted that the isolation in some of the cases was fairly thorough, and in those cases where an epidemic of Chicken Pox followed Herpes Zoster in a convalescent Scarlet Fever ward, as in Dr Ker's case, or where the hospital had been closed to visitors, the focus of infection strongly points to the original Herpes Zoster case, especially if we take into consideration all the other instances in which Herpes Zoster was followed by Chicken Pox.

Elliott's cases show that there is a tendency for Herpes Zoster to give at least a temporary immunity to Chicken Pox infection, which as will be shown later, is one of the chief and strongest arguments against the identity of the two diseases.

However it is admitted that infection can be carried for a short distance on a healthy third person, and with nurses and members of the staff constantly going in and out of the wards, infection might be carried in that way. However the constancy with which - in the above cases - Chicken Pox appeared after a case of Herpes Zoster and the/

the fact that the interval between the two diseases always corresponded to the Incubation period of Varicella, strongly points to the association of the two diseases.

Granted that infection might be carried into the wards by a healthy third person, say by nurses or staff, I will now quote amongst others, cases where the isolation would be still more rigid, distance separating the people from the outside world, and yet we have the same sequence of events, a person develops Herpes Zoster and within the same definite period Chicken Pox develops in others exposed.

28. Le Feuvre¹²⁸ in the Medical Journal of South Africa writes that he received a telegram from a farmer in Rhodesia to see his wife. The farmer's wife, aged 30 years, had typical Herpes Zoster extending from left shoulder to wrist, preceded by severe neuralgia. Temperature on day of rash was 99° in morning and 100° in the evening. Left axillary glands were enlarged and tender. There were three children in the house, aged 10, 7 and 5 years, and a grandmother. A fortnight later the husband wrote that all three children had contracted Chicken Pox. Mother had had Chicken Pox at age of 16. They lived on an isolated farm 70 miles from a Medical man, and ten/

ten miles from a railway station. Le Feuvre made careful inquiries but could find no other source of infection.

Here was a typical attack of Herpes Zoster with a temperature, preceded by intense Neuralgia and accompanied by enlarged axillary glands, so that the possibility of a wrong diagnosis can be ruled out. This case with those characteristic and diagnostic symptoms could not possibly have belonged to that type of Chicken Pox case, where grouping of the vesicles resembles Herpes Zoster and so might have been wrongly diagnosed as such. The isolation speaks for itself. Anybody who is acquainted with isolated colonial farms, where only a few people are found over a wide stretch of country, knows that every person in that area can be examined, and any other source of infection can be excluded, and Le Feuvre says that he made careful inquiries. In a crowded city with a large population it is almost impossible to be certain that there was no other source of infection. On an isolated farm where every native, at the farmer's command, has to appear for examination if wanted, outside infection can practically be excluded.

The following is a similar case described by the same writer.-

29. A missionary's wife developed left Intercostal Herpes/

Herpes Zoster. Her infant, aged $5\frac{1}{2}$ months, got Chicken Pox 15 days later. Mother had had Chicken Pox when 7 years of age. They were living sixty miles from the nearest town and the mother assured him that neither she nor the child could possibly have come in contact with any case either of Herpes Zoster or Chicken Pox. The case occurred in March 1913. The mother never previously had Herpes Zoster. Here in addition I draw attention to the fact that the infant was a baby in arms, and so came in close contact with the mother.

Le Feuvre altogether experienced nine cases showing this connection. I may add that he is a very strong supporter of the view that the two diseases are related and consequently was always on the look out for such cases. He found nine cases; the others of his series being as follows:-

30. The wife of a plumber developed Herpes Zoster; 22 days later the younger of the two children aged four years, and the one most likely to be in close contact with the mother, developed an ordinary Chicken Pox rash. Her brother, aged 8 years, developed Chicken Pox 15 days later.
31. Le Feuvre says that the following was a case where the mother was very anxious to discover the source of infection, which gave her son Chicken Pox, as she was most careful during the holidays to keep /

keep his away from other children. On investigation he discovered a small patch of what she had taken to be Eczema, on right side of her throat. This was nothing else than a small patch of Herpes Zoster. The use of an ointment had obliterated the vesicles, but the excessive pain and her description of the course of the eruption was enough to clinch the diagnosis. The boy developed Chicken Pox 13 days after the Herpes Zoster in his mother.

32. Le Feuvre one day met a friend who had his arm in a sling, and who was complaining of a severe attack of Neuritis. He said that there had been some talk of "Shingles". His eldest son, aged 14 years, rubbed his father's arm with a powder and developed Chicken Pox. The second son, aged 12 years, also developed Chicken Pox. Le Feuvre was not his medical attendant, but warned him of infection with Chicken Pox. His wife was not overpleased with her medical adviser for omitting to mention the fact of the possibility of Chicken Pox infection, as she had been obliged in consequence to give up her music pupils owing to the fear of further spread of the disease. Le Feuvre says that his doctor no doubt did not feel justified to act on a theory not yet accepted by the profession in general. The case brings out the/

the close contact and also that patients with Herpes Zoster should be warned of the possibility of Chicken Pox following after Herpes Zoster.

33. T.G. developed severe neuralgia of left side of face; two days later a rash appeared over the painful parts. Thinking his teeth to blame he had several extractions with no relief in pain. Eighteen days after appearance of symptoms his little daughter, aged two and a half years, developed Chicken Pox. This was on September 26th. Early in October her elder brother got Chicken Pox, and later still the third and last member of the family. The fact that the youngest first developed Chicken Pox is explained by the proximity of the little girl to her father, entailed by his taking his turn with his wife in bathing the child.

Other four cases of Le Feuvre's were as follows:-

34. Two weeks interval between Herpes and Chicken Pox. Herpes patient did not have Chicken Pox before.
35. Interval 13 days.
36. Interval 19 days. Herpes patient was aged 10 years, and had Chicken Pox eight years ago.
37. Interval 18 days. Patient with the Herpes Zoster does not know whether he had Chicken Pox before or not.

The following cases illustrate the important part that close contact might play for infection to be spread in these cases. Perhaps in some cases it was the absence of such close contact that prevented a patient with Herpes Zoster infecting others with Chicken Pox.

It will be noticed that anyone acting as a nurse and developing Herpes Zoster is very apt to spread the disease to the Children.

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38. A. Charpentier records a case where he saw a nurse maid suffering with Herpes Zoster. 14 days later he was called to see a little girl in the same house, who undoubtedly had Chicken Pox. She had not been exposed to infection elsewhere.
39. G. Bruce⁸ saw a lady with a profuse crop of Herpes Zoster over right temple. She was nursed by her sister who was with her almost without intermission. 16 days later the sister complained of feeling poorly, and during the next day or two, or 18 days after the Herpes Zoster, she developed Chicken Pox. There were no other cases of Chicken Pox in the town as far as he knew.
40. G.C. Walker⁹ mentions another instance. On Jan. 30th 1913, nurse had Herpes Zoster of left side of body. 14 days later two of the children developed/

developed Chicken Pox, and subsequently four others.
No known source of infection.

41. Dr E. Harrison¹⁴ had the opportunity to observe a similar case. Mother had Herpes Zoster, 2 weeks later baby aged 3 months developed Chicken Pox. He failed to find any source of infection, although he looked for it. A baby of 3 months would naturally be in very close contact with its mother.
42. S. Hartill⁴² mentions another case which can be put under the heading of Close Contact, e.g. A woman aged 35 developed Herpes Zoster on left leg on December 17th 1920. 14 days later her child who slept with her developed Chicken Pox.
43. He mentions another important case which should be noted. A boy aged $11\frac{1}{2}$ years developed Herpes Zoster round left side of chest on Jan. 6th 1921. On Jan. 20th, e.g. 14 days later, a brother and sister started Chicken Pox and on February 3rd the three remaining members of the family also developed Chicken Pox. The only member of the family to escape the Chicken Pox was the original patient suffering from Herpes. He infected 5 cases with Chicken Pox. Evidently there must be some temporary immunity granted by the Herpes Zoster to infection with Chicken Pox.

44. Other cases showing close contact, quoted by P.W. Black⁶⁴, also a nursing case, A lady nursed her friend who had Herpes Zoster, she developed Chicken Pox.
45. Travers⁸⁹ quotes a similar instance due to nursing. Interval between two diseases was 14 days.
46. Wainwright⁹⁰ quotes two cases: (1) A nurse of a doctor's children had typical Herpes Zoster. 14 days later his two sons who slept in the same room as the nurse developed Chicken Pox. His three daughters who frequently came into the room during the day developed Chicken Pox a few days later. (2) Just before the confinement of a certain lady, her servant developed Herpes Zoster. They were much together as the servant suffered great pain. Ten days after her confinement she developed Chicken Pox, which she passed on to her baby. The lady had been absolutely away from anyone suffering from Chicken Pox.
47. G.F.P. Gibbons⁵² mentions the case of a girl aged 25 who developed a typical Herpes Zoster over right buttock, groin, vulva, and inner side of thigh. There were no vesicles elsewhere on the body. Three weeks later the small brother aged/

aged 4 years developed typical Varicella. During the whole intervening period he had been in and out of his sister's room daily. Both patients were inmates of the same house, standing by itself right out in the country; moreover during the possible incubation period of the Varicella, no visitors came to the house, nor had any cases occurred in the neighbouring farms and villages.

There are many more cases showing the part played by close contact, but the above examples are sufficient to illustrate this fact.

Herpes Zoster to all appearances can act as a link between two cases of Chicken Pox, the following case illustrates this fact.

49. T.S. Evans⁵¹ says he saw a girl aged 9 years who had a typical Varicella rash. One week later a younger sister had a typical attack of Herpes Zoster in the 5th right intercostal space, accompanied by pain. Both children soon got well, but during their convalescence, a third child in the same house had an attack of Varicella. There were no cases of Varicella which Evans attended at that time.

I will now mention some cases showing that Herpes Zoster can result in an outbreak of Chicken Pox in schools, this being an important point/

point as regards the question of isolation of Herpes Zoster cases.

Dr Aikman⁸⁷ writes: Mrs M. and her daughter kept a school. A child returned to school on September 22nd with some Chicken Pox crusts on it. On September 29th Miss H.M., aged 30 years, who had never had Chicken Pox before, developed Herpes Zoster over right side of chest and breast. On October 10th, or eleven days later, her sister aged twenty-five years, and two children attending the school developed Chicken Pox. Here the epidemic might be due to the child with the Chicken Pox crusts or due to the Herpes, both are within the incubation period of that disease.

50. G.B.D. Gray,⁶⁹ Medical Officer, British Hospital, Oporto, quotes two cases and says that he was consulted by the head of a school, who had a severe attack of Herpes; 14 days later there was an outbreak of Varicella at the school, amongst the boarders at his house.

51. Towards the beginning of an epidemic of Varicella in Oporto, Gray was called to see a little girl who had typical Varicella. On making inquiries the mother volunteered the statement that about 14 days before she had had similar spots on one side of the body, which the mother thought was shingles./

shingles. Dr Gray thought that her diagnosis was correct. The other two children had Varicella in due course. Here of course the diagnosis cannot be absolutely relied upon.

52. Dr E.L. Elliott⁴⁴ gives another similar experience. Just before Christmas he saw a school child suffering from Herpes on the thigh and buttock. On January 10th and following days several cases of Varicella occurred in a village amongst school children. The interval was about 17 days.

53. He further says, "I saw a man with Supra Orbital Herpes on January 17th; fourteen days later several children took Chicken Pox.

It will perhaps be interesting to quote a few cases of this connection between the two diseases, which occurred in different countries.

A Netter¹⁴⁰ states in a French Medical Journal, that he had seen three cases showing this connection between Herpes Zoster and Chicken Pox. Abstracted in Journal American Medical Association.

Several similar cases have also appeared in American literature. A.G. Hough¹¹² writes in the Journal American Medical Association that he saw a lady with typical Herpes Zoster following the/

the course of the superficial nerves of the Cervical Plexus. 16 days later he saw the

54. patient's younger brother and found a well marked case of Chicken Pox. During February there were only fourteen cases of Chicken Pox reported in the city, Madison Wis., thirteen of them were in the extreme other end of the town, and one was about four blocks distant from his patient, and that child went to a different school. He could find no history of the child being exposed to Chicken Pox.

Cornelia de Lange⁷⁴ in a Netherlands Medical

55. Journal records the case of a child aged 20 months who developed Herpes Zoster. In the course of the next 18 days, three other children in the same house developed Chicken Pox.

This case has been mentioned before, as here the blood of the four children all showed a more or less strongly positive reaction to Varicella antigen. (Abstracted in British Medical Journal).

¹³⁰

56. Kraus in the New York Medical Journal quotes (Herderschee quoted by Bruijning in Nederlandsch Tyd. v. Geneeskunde, Amsterdam, Sept. 20, 1919, vol. II, No.12) a case of a nursing woman with Herpes Zoster. Her nursing child developed Chicken Pox ten days later.

57. Paul Heim⁴ in the Berliner Klin. Woch. Dec. 9th 1912, mentions the case of a doctor's wife who had an attack of Herpes Zoster, 10 days later her six year old daughter developed Chicken Pox. The mother had not had Varicella in childhood. (Abstracted in British Medical Journal).
58. Magda Frei¹⁴³ in the Jahrbuck für Kinderheilkunde, Berlin, describes a case of Herpes Zoster followed two weeks later by Chicken Pox in other children in the same ward of a hospital (Abstracted in Journal American Medical Association).
59. E. Feer¹³⁹ in the Schweizerische Med. Wochenschr. describes a case of Herpes Zoster in a boy, 17 and 20 days later respectively two children who had been in contact with the Herpes Zoster case developed Chicken Pox. No other cases were known in the environment. (Abstracted in J.A.M.A.)
60. A. Gismondi¹¹³ in an Italian paper, Pediatria, Naples, records the case of Varicella in an infant 14 days after an attack of Herpes Zoster in the child's aunt. There was no case of Chicken Pox in the surroundings at the time. (Epitome in J.A.M.A.).
61. M. Pincherle¹⁴² in the Rivista di Clinica Pediatrica, Florence, describes a ward epidemic of Chicken/

Chicken Pox which followed development of Herpes Zoster in one child and then Chicken Pox in another. (Abstracted J.A.M.A.)

To obviate monotony, but at the same time to give as full a bibliography as I could get, I will quote the following cases with their references, without describing the cases. If there are any important points I will mention them shortly, should they be different to the points and principles which we have already considered. The following cases are all still examples of cases of Herpes Zoster followed by Chicken Pox, with the same constant interval as before, e.g. A.Z.C. Cressy¹⁰ interval 14 days, E.J. Bruce¹¹ interval 13 days, G.E. Roberts¹³ interval 14 days, H.S. Wilson¹⁸ 2 cases, intervals 13 and 15 days, W.H. Coates¹⁷ interval 14 days, J. Orr²¹ interval 2 weeks, J. Bushfield²² Had Chicken Pox before. Interval 14 days, Bartlett²³ interval 10 days, H. Distin²⁶ interval 22 days, Hepworth²⁹ interval 19 days, J. Taylor³⁴ 4 cases, intervals 2, 2, 2, and 3 weeks, A.I. Cooke³⁵ interval 2 weeks, J. Taylor³⁸ 2 cases, intervals 7 days and 2 weeks, A Carver⁴⁰ made an analysis of 51 cases which he got from the literature. He found that after Herpes Zoster, Chicken Pox developed in 8 adults, rather a high percentage, /

percentage, considering the infantile nature of the complaint. The analysis of the intervals in the 51 cases were as follows:-

10 days in 5 cases	
12 " " 1 "	18 days in 1 case
13 " " 6 "	19 " 5 "
14 " " 13 "	20 " 1 "
15 " " 2 "	21 " 3 "
16 " " 4 "	22 " 1 "
17 " " 1 "	

From 8 to 20 days in 8 cases.

He records a similar case of Herpes Zoster infecting 3 other children with Chicken Pox at intervals of 17, 19 and 20 days from the first appearance of the Herpetic eruption.

W.M. Robson³⁹ interval 15 days, W.G. Nash⁴⁸ 2 cases, intervals 2 weeks and 10 days, J. Gordon Mc Dougall⁴⁷ interval 14 days, G.Y. Eales⁴⁹ interval 16 days, A.S. Hendrie⁵⁵ 2 cases, intervals 18 and 16 days, Dr O. Hilton⁵⁶ interval 17 days, A. Somers⁵⁷ interval 11 days, H. Lawrie⁶⁰ interval 16 days. Patient with Herpes had Chicken Pox when 5 years old, she is now 12 years of age. Whitcombe Brown⁶³ interval 15 days, K. Anderson⁶⁵ interval 14 days, H.B.W. Smith⁶⁸ /

H.B.W. Smith⁶⁸ interval 21 days, F.G. Gardener⁷⁰ interval 15 days, A.C. Roxburgh⁹⁶ interval 16 days. Patient with Herpes had Chicken Pox in childhood. He described another case, interval 16 days. Allan⁹⁰ interval 3 weeks. A Dingwall Fordyce⁸² interval 14 days, Le Feuvre¹²⁷ quotes Aikman Guernsey, interval 3 weeks. C. Wilson³⁷ interval 18 days. E.H.R. Harries and E. Dunderdale⁵⁴ interval 13 days. No history of previous Varicella in the Herpes Zoster patient.

In all I have managed to quote 102 instances of cases of Chicken Pox following an attack of Herpes Zoster in another person, and there was in every case a constant interval between the two diseases, corresponding to the incubation period of Chicken Pox.

CHICKEN POX IN ONE PATIENT FOLLOWED BY HERPES ZOSTER
IN OTHERS EXPOSED.

If Herpes Zoster can infect others with Chicken Pox, and if the two diseases are due to the same virus, one would naturally expect the reverse to hold too, namely that Chicken Pox can be infectious to produce Herpes Zoster.

If the two diseases can cross infect each other, it would be still a further strong proof of their being due to the same causal organism.

Such/

Such cases have been reported, but in comparison with the first group they are rare. Chicken Pox does not appear to be so infectious to produce Herpes Zoster, whereas as we have seen Herpes Zoster is able to infect quite a number of people at once with Chicken Pox. Herpes Zoster seems to be more infectious and more virulent to produce Chicken Pox, than Chicken Pox is to produce Herpes Zoster.

A number of cases illustrative of this group will be quoted. In these cases one member of a household develops Chicken Pox; after some time another member will follow suit with Herpes Zoster, usually one to five weeks, average two to three weeks after the appearance of Chicken Pox in the first patient. We should especially note here the long incubation period in some cases.

The following are two unpublished cases which have been brought to my notice.

1. Miss R. informed me that her sister on April 20th 1923 developed Herpes Zoster over an area corresponding to the right eighth dorsal segment. The attack was fairly severe with severe preherpetic pain. Three weeks before the attack, and also afterwards, she had played with Chicken Pox children. Here the incubation period could be three weeks or less, according to when she last played with the Chicken Pox children. There were

no/

no aberrant vesicles, and she had not had Chicken Pox before.

The details of the following case were in the first instance given to Dr Cranston Low. I have his permission to make use of the case.

2. Dr George Bruce writes that in a village near Melbourne near Derby he attended a child with Varicella. The mother later developed Herpes Zoster. Incubation period not mentioned. He met with no other Chicken Pox in the village.
3. Dr Aikman ⁸⁷ quotes a case of a Mrs M. and her daughter who kept a school. A child returned to school on September 22nd with some Chicken Pox crusts on it. On September 29th Miss H.M. aged 30 years, developed Herpes Zoster over right side of chest and breast. Interval here 7 days. She had never had Chicken Pox before. 11 days later her sister and two children in the school developed Chicken Pox. Here the Herpes Zoster might have acted as a link between the cases of Chicken Pox, or the later Chicken Pox cases might have been due to infection from the first child who came to school with the Varicella crusts, as both possibilities are within the incubation period of varicella.

4. Another case, quoted anonymously⁸⁸ in the Guy's Hospital Gazette, of a boy aged 13 years who was exposed to infection with Chicken Pox at school. He spent his Easter holidays at home and was considered more or less in quarantine. 2½ weeks after he was last exposed to infection he developed Herpes Zoster. He has not previously had Chicken Pox.
5. Dr Heatherly⁹¹ was asked to see a boy aged 7 years, on April 8th.; he had developed spots the previous day. He had typical Chicken Pox. On April 21st he was called to see the only other child, aged 2 years, who had Herpes Zoster of right buttock down to knee. Interval from first appearance of Chicken Pox here is 14 days.
6. Dr Dando²⁴ quotes two such cases. (1) He says that he was called to see a patient suffering with Herpes Zoster; 4 weeks earlier he had been attending the son of this patient who was suffering with Chicken Pox. Interval here about 4 weeks.
7. In the same house some years previously he attended the mother in the house. She was suffering with Herpes Zoster; 5 weeks preceding this he attended the daughter suffering with Chicken Pox. Of course one cannot say with certainty at which stage /

stage of the Chicken Pox the other patient became infected with Herpes Zoster. Then also the intervals in Dr Dando's cases refer to his visits, and not necessarily to the incubation period. So here the incubation periods are only approximate, as it may not be till the scabs have appeared, as in Dr Aikman's case, that infection takes place, resulting in an attack of Herpes Zoster in another.

8. W.M. Kraus¹³⁰ quotes Garé who reports two cases of Chicken Pox in a family of 3 children, followed 2 weeks later by Herpes Zoster in the third.
9. Feer¹³⁹ reports the case of a child who had contracted Chicken Pox. Two weeks later Herpes developed in a boy aged 9 years who had been in contact with the Chicken Pox case. 17 to 20 days later respectively, 2 children who had been in contact with this case of Herpes Zoster developed Varicella. No other cases were known in the environment. This case brings out the association and close connection between the two diseases very well, for not only does Chicken Pox produce Herpes Zoster in another person, but this Herpes Zoster again infected others with Chicken Pox, that is, the Herpes case acted as a link between the two attacks of Chicken Pox.

10. R.L. Heard⁴⁶ mentions the case of a child with Chicken Pox. 22 days later the grandfather who lives in the same house developed a small Herpetic eruption over the second costal cartilage on the left side.
11. W.P. Le Feuvre⁶¹ gives us another such instance. A rather small and nervous boy, J.H., sat next to a friend at a bioscope. This friend of his still had Chicken Pox scabs on him. 14 days later J.H. broke out with a very painful attack of Herpes Zoster.
12. J.P. Martin⁵⁰ says that a little boy was brought to hospital for circumcision and on removing his clothes, a typical group of Herpes Zoster was found on left side of Thorax, about 6th intercostal space. Rest of body carefully examined for spots, but none were found. Inquiry from the mother revealed the fact that a younger brother had Chicken Pox 3 weeks before.
13. T.S. Evans⁵¹ quotes a similar case where the interval between the two diseases was 1 week; in this case also the Herpes infected others with Chicken Pox, acting as a link between the two diseases. Here also pain with the case of Herpes Zoster.

14. Le Feuvre¹²⁹ quotes a case of a Mr J. who arrived in Durban on July 16th having had a severe attack of Chicken Pox whilst in Cape Town. He stayed with his sister, Mrs H., aged 60. He left Durban on July 28th. His sister developed a left sided intercostal Herpes Zoster beginning with a preliminary neuralgia on August 3rd and the usual eruption on August 10th. She does not remember having had Herpes Zoster or Chicken Pox before. This gives 18 days of an incubation period, counting from the day of her brother's arrival. Seventeen days after the Herpes she infected her daughter with Chicken Pox, again demonstrating the Herpes acting as a link between the two diseases.
15. Le Feuvre¹²⁸ mentions a similar occurrence with an interval of 20 days between the two diseases.
- 16 & 17. Similar cases are quoted by J. Taylor³⁸, and A. Abrahamson⁶⁷. Intervals in both not mentioned.
18. Wm. McCallin⁷² says that a boy aged 6 years had Chicken Pox. 16 days after its first appearance he saw his sister aged one year and 9 months, who was supposed to have the same disease. The eruption consisted of numerous vesicles with the distribution of Chicken Pox and Herpetic patches on/
on/

on left side of chest. It has taken the ordinary course of Herpes and there have been no fresh crops. This case might be a case of Herpes Zoster subsequently developing into a Chicken Pox, as will be considered in the next group, or it might be a case of Chicken Pox showing the Herpes Zoster like grouping of vesicles as has been described previously.

In all then we have got 17 cases, not counting the last case.

An analysis of the intervals between the two diseases in this group.-

2 cases 7 days	1 case 21 days
4 cases 14 days	1 case 22 days
2 cases 18 days	1 case 28 days
1 case 20 days	1 case 35 days
1 case 21 days or less	

So out of fourteen cases there were only two cases where the intervals were less than a fortnight, while in the majority, namely eight cases, the interval was longer than a fortnight, in two of them 28 and 35 days. As previously mentioned, the actual interval is not always accurately stated.

HERPES ZOSTER AND CHICKEN POX OCCURRING SIMULTANEOUSLY
IN THE SAME INDIVIDUAL.

Quite a number of cases have been recorded in the Medical Journals where a patient has an attack of Herpes Zoster, followed soon by a Varicella like eruption. The vesicles of this latter eruption are indistinguishable from those of Varicella, may be either isolated or diffuse, and are found in remote parts of the body. In addition to the usual Herpes Zoster eruption, these aberrant vesicles have been found in large numbers on the trunk, face, limbs and scalp, or occasionally only a few outlying vesicles have been found.

Such cases have been reported from time to time under the titles "Herpes Zoster Generalisatus", "Aberrant Vesicles", and "Varicella like Eruption". This class of case will, I think, show the connection between the two diseases better than anything else could do.

At a meeting of the Societé Médicale des Hôspitaux M. Jeanselme and M. Leredde, quoted in Lancet⁷⁵, in a contributed paper stated that in a number of cases of Herpes Zoster, careful examination showed disseminated over the entire cutaneous surface, isolated vesicles quite similar to those of the Zoster eruption.

Tennyson⁷⁵ is reported to have stated that if the entire/

entire skin of a patient affected with typical Herpes Zoster be very carefully examined, Aberrant Vesicles would be found nine out of ten times, distributed irregularly at great distances from one another, and on all parts of the body. These Aberrant vesicles are not accompanied by pain, so patient does not complain of them, hence they are easily overlooked or pass unnoticed, if patient is not especially examined for them. Patient then should be stripped and carefully examined.

The Aberrant vesicles are described as resembling closely those of Varicella. According to Dr Claude Kern they seem to be less deeply seated than those of the ordinary Herpes, and heal more quickly and with less cicatrization.

The term "Aberrant Vesicles" as compared to the general Chicken Pox eruption, is one I think just of degree, and under "Aberrant Vesicles" I will refer to cases with just a few outlying vesicles, as compared to the large number of vesicles usually associated with a Chicken Pox eruption.

It is important to note that these extra or Aberrant Vesicles are not associated with pain, patients do not complain of them, hence they are easily and usually overlooked.

The main points to be noted as regards these cases are:-

(1)/

- (1) That they always have a definite sequence or follow a certain rule, namely
- (2) The Herpetic eruption is always the precursor or first to appear.
- (3) Then after a constant and definite interval usually of 2 to 8 days, a general vesicular eruption appears on the body. Interval dated from appearance of Herpes Zoster rash. Sometimes both Herpes Zoster and Chicken Pox like eruption are described as appearing together, but the pain of the Herpes Zoster usually appears first and then both rashes appear together.
- (4) This second eruption is never associated with pain.
- (5) This vesicular eruption is indistinguishable from the Chicken Pox eruption, and resembles it, not only in appearance, but also in its after infectivity being capable as will be shown in next group IV of infecting others exposed with Chicken Pox.

Le Feuvre^{61& 129} says "The disease in this form may therefore be looked upon as a Varicella with a prodromal rash" such as we find in many other infectious diseases. Quite a large number of cases of this nature have been quoted in the literature. I will however only fully describe a few typical ones, as the principles underlying all are the same. The rest will be mentioned with their references.

The/

The earliest recorded case of this double eruption was according to Le Feuvre¹²⁹ recorded by Pundschu: New Sydenham Society, 1867. Parounagian and Goodman¹¹⁹ say that the earliest case of what they call Herpes Zoster Generalisatus was reported by Haslund in 1897.

I will first mention two cases where besides the Herpes Zoster eruption there were only a few outlying vesicles, allowing these cases to be recorded under the heading of "Aberrant Vesicles". This case I saw along with another doctor. The patient was a man aged about 40 years. In February 1923 he had an operation for Appendicitis and made a slow recovery. Previous to the operation he had been a chronic dyspeptic for a long time. He is not strong and looks thin and pale. On Saturday, May 26th 1923, he had severe pain in left chest. The following day he got a crop of Herpes Zoster vesicles on an area of skin corresponding to the 6th and 7th Thoracic segments, extending from median line in back to almost median line in front. On Monday he noticed one vesicle near Anterior Superior Spine, and one near outer Canthus of left eye. These two vesicles exactly resembled those of Chicken Pox, had red areolae round them, and later tended to become pustular. About five days later two more vesicles appeared, one behind right ear on the scalp and another on right thigh. The vesicles few as they were, tended to appear in crops like a typical Chicken Pox eruption./

eruption. He had no pain with these aberrant vesicles. He does not know whether he had Chicken Pox before. There was Chicken Pox in the vicinity, but he had not been in contact. This case has been mentioned before.

2. J. Taylor³⁸ writes that during his attack of Herpes Zoster he also had some isolated vesicles scattered over various parts of his body. He gives no more details.

A few examples of a generalised Chicken Pox like eruption following a typical attack of Herpes Zoster after an interval of a day or more.

3. The first is an unpublished case which Dr Kenneth Rogers of Bromley, Kent, has given me permission to make use of. The details of this case were originally given to Dr Cranston Low. G.W. a girl aged 10 years, on May 20th 1910 developed a well marked and severe Herpes Zoster over right seventh Intercostal space. Temperature 98.6. She had great pain in her side for several days previously. The Herpes vesicles were well marked in a band 2 to 3 inches wide from spine to midline in front. By May 21st the temperature had risen to 103, when she had a number of papules on forehead and arms. Interval here one day. By May 23rd the papules/

papules were on the face, chest and arms, while later vesicles developed. He consulted another doctor who agreed that it was a severe Varicella. Later the vesicles became almost confluent.

Dr Rogers says that the article of Dr Cranston Low's made him look up his notes, and that it was the merest chance that he had kept this 1910 case book. The letter was written in 1919. If Dr Low's article had not drawn his attention, this case would never have been recorded.

94 & 102

Dr Parkes Weber records two cases:-

4. A widow aged 60 years, after usual preherpetic pain developed typical Herpes Zoster of left forehead, scalp, left eyelids and left half of nose. The glands draining the affected area were much enlarged and tender. After one week a generalised vesicular Varicella like eruption was noticed scattered over trunk and extremities. The vesicles were distributed as follows, 2 on outer margin of right orbit, 6 on lower extremities, 20 on chest. These vesicles disappeared in two weeks, while the true Herpes Zoster took two months to dry up. The generalised eruption was not accompanied by any subjective symptoms. The Herpes Zoster attack was severe, with severe pain, while the Herpetic eruption became confluent and haemorrhagic. There was/

was much oedema of the whole face. Six weeks after the Herpes Zoster she developed Diplopia due to paralysis of the Oculomotor muscles.

5. A boy aged 8 years had Hodgkins disease, and was being treated with arsenic. He developed a right Intercostal Herpes Zoster, and later showed a generalised vesicular eruption on trunk.
6. Parkes Weber quotes Fischl. Ref. Archives f. Derm. u. Syph., Vienna 1913, vol 118, p.553, who recorded a similar case in a patient suffering with Lymphatic Leukaemia and aged 61 years. Herpes affected right side of neck.
7. Parkes Weber also quotes A. Tryb of Prague, Ref. Dermat Wochenschr, Leipzig 1914, vol.59, p.983, who records a similar case in a man aged 60 years with a dorsal Herpes. This patient was cachetic and had Tuberculosis. Interval between the eruptions was one week.
8. Parkes Weber further quotes Frederick Steuer in Wiener. Med. Wochenschr. A similar case in a woman aged 76 years, with an Ophthalmic Zoster. Interval between eruptions was seven days.
9. Goldberg and Francis¹¹¹ describe three typical cases of this nature.

A man aged 53 had Herpes Zoster on chest with some burning sensation. Three days later he noticed a series of small pimples and blisters appearing over face and body. They were not accompanied by any subjective symptoms. The Herpes corresponded to left 8th and 9th Dorsal segments. Over face and trunk were discrete, vesicular pustules and crusted lesions in various stages. An occasional lesion on legs and arms. Fauces, Pharynx and Palate also showed a discrete distribution of vesicles and papules.

I would like to point out here, as in other cases, the similarity to the Chicken Pox distribution, which also affects mostly the trunk and least the limbs.

10. A man aged 38 years developed a severe Herpes Zoster over right forehead and eye, with severe pain. Two days following the onset he noticed a small eruption of pimples on his body, preceded by no subjective symptoms. Examination showed a discrete sprinkling of macules and papules, vesicles and pustules. Very few of these lesions were seen on the extremities and none on the face.
11. Their third case was of a similar nature, in a man aged 27 years. Herpes Zoster over right eyebrow/

eyebrow and forehead, with severe pain. The neck, chest, abdomen and back showed a sprinkling of papules and vesicles. Interval not noted.

12. Dr Hugh Barber⁹² writes in the Guy's Hospital Gazette in 1916. "A few weeks ago I saw a man aged 45 years, with Herpes Zoster and a rash indistinguishable from Chicken Pox, both out at the same time. Illness began with severe pain round the side, and an extensive rash of Herpes Zoster came out next day, with the usual distribution along the course of an intercostal nerve. On the 4th day a crop of typical Chicken Pox spots had come out, some papules, but many already in the vesicular stage. They were distributed over trunk and limbs, and also in the mouth, and over the face and scalp. Both diseases ran a normal course. I could not trace where the Chicken Pox infection had come from. Patient had no children, and his wife who had suffered from Chicken Pox as a child, remained quite well. He himself had not had Chicken Pox before".

13. Another typical case of this nature is described by R. Hill⁴³. A Medical student aged 22 years developed a severe Herpes Zoster over area of skin supplied by the Ophthalmic division of the right/

right 5th Cranial Nerve. Pain very severe, prevented him from sleeping. 6 days after the initial Herpetic eruption a generalised varicellar eruption came out on the trunk, upper and lower limbs. There was no pain from the new eruption, and it disappeared in about 6 days, leaving no scars, while the initial vesicles took a further 14 days to heal, leaving extensive scarring on the right side of forehead.

14. John Orr²¹ gives another instance of Herpes Inter-costalis in a man aged 45, followed three days later by a well defined varicella eruption typical in character and distribution.

The above are typical examples.

I will now quote a few cases where, in addition to the Herpes Zoster, you get the secondary Chicken Pox like eruption following the original eruption in a matter of 24 hours or less, as opposed to some days.

15. Head¹⁰¹ describes such a case in a boy who was obviously ill, with pain in side and a temperature of 101°F. He developed a typical Herpetic eruption on 5th Dorsal area, and 24 hours afterwards typical Chicken Pox spots came out over arms, face and chin. Yet the Herpetic rash was in no way altered by this complication.

16. Dr W.L. Ffrench² had a case of a gentleman over 60 years of age, who had a severe attack of intercostal Herpes Zoster of left side. The next day patient had a temperature of 100^oF. and in addition to the Herpes, he had a crop of vesicles scattered over various parts of his body, few on face, several on chest, few on arms and abdomen. Ffrench consulted the Medical Officer of Health who said it was Varicella complicated by Herpes Zoster. This case was described in the British Medical Journal in 1899.
17. Bruijnigen¹³⁷ reports the case of a man who seemed to have Erysipelas of the face; this diagnosis was however speedily corrected to Herpes Zoster. The next day typical Chicken Pox appeared and the two ran their usual course together.

The two following cases do not definitely state interval between the two eruptions. This interval at best can only be approximately stated, for not being painful, the second rash may only be accidentally discovered, or on examination.

18. Hildred Carlill²⁸ reports the case of a Naval Officer aged 54, admitted to hospital on February 25th 1916, with enlarged and tender lymphatic glands in cervical, preauricular, axillary and inguinal/

inguinal regions. On March 23rd he began taking 15 drops of Fowler's solution daily and on July 10th an eruption of Herpes Zoster appeared on right side of abdomen in D8, 9 and 10, occupying a considerable area. The eruption rapidly became generalised and vesicles appeared over the face, body and limbs.

19. Another case probably with a short interval reported by Dr Giraudeau⁷⁵, quoted in the Lancet. A man with well marked lumbo-femoral Zona and fever. As soon as Zona eruption was completing its development, there appeared about 30 lesions over the whole body, papules and vesicles, either isolated or in groups of twos or threes. 3 or 4 on scalp, 3 or 4 on face, 10 on back and 2 or 3 on each upper limb. Here again note tendency of second eruption to follow the typical Chicken Pox eruption, although on a small scale.
20. Same reference says that in 1888 M. Boullard published a case of this nature.

The following cases illustrate the type where the two eruptions probably appeared simultaneously.

21. A case described by G. de Bec Turtle⁷⁹ in the Lancet. A man aged 71 had pain in the back and a/

a skin eruption which had only been noticed a few hours. He had a well marked Herpes Zoster patch on right buttock, and in addition a few vesicles were distributed over the body generally.

The following day there were four patches of Herpes extending from the right buttock to the ankle, down the back of thigh and knee. He was also covered with a vesicular eruption very closely resembling Chicken Pox, several of the vesicles being umbilicated.

The vesicles numbered 266 and were distributed as follows, 12 over face and scalp, 108 on trunk anteriorly, 90 on trunk posteriorly, 14 on right arm, 11 on left arm, 12 on right leg and 19 on left leg. Apparently the mucous membrane was not affected. The condition cleared up in a few days, simultaneously with the original patch of Herpes Zoster. There was no evidence of a case of Chicken Pox either before or after in patient's house.

22. A similar case is described in the Lancet by W.G. Verniquet ¹³⁶ E.L., male, aged 31 years, complained of pain in left buttock and extending down to the knee. Two days later he noticed a rash on the buttock which proved to be Herpes Zoster. He felt ill and giddy, and noticed a few/

few spots on his mouth and chest. The next day there were more spots on his chest and some on his face. The generalised rash was diagnosed as Chicken Pox. According to the description it seems as if the two rashes appeared together, but here however we have a definite history of the pain being the precursor by two days.

23. The first case of this nature that I could find reported in the British Journals was by MacKay⁸³ in the Glasgow Medical Journal in 1897. Here again the case is not fully enough described, and no definite conclusion can be arrived at as to whether both rashes appeared simultaneously or not. No interval is mentioned. Case was in a man aged 57, who had well marked Herpes Zoster of left side of scalp, face and neck, and numerous papules like those of Varicella. The discrete rash passed through the stages of papules and vesicles. There followed in addition a paralysis of left side of face.

Previously we had discussed the analogy between Herpes Zoster and Acute Anterior Poliomyelitis, when it was mentioned that in a severe case the inflammation of the Herpes Zoster might overflow into the Anterior horns, producing paralysis, /

paralysis, as in this case of MacKay's which also was a severe case. MacKay says of the patient that he felt out of sorts on January 9th. On January 12th he had well marked Herpes Zoster of left side of face and neck; the lower and inner limit being near the Sternum at the 2nd intercostal space, while the side of the scalp was also affected. The ear was markedly swollen and the Manubrium Sterni pitted deeply on pressure. Later much sloughing took place. The temperature in the beginning was 103.2^o F.

In connection with the 23 cases which I have fully described, I would like to emphasise the following points.

- (1) Case 3 shows that if an article on this subject had not drawn his attention, this case would not have been recorded.
- (2) Quite a number of cases show the similarity in distribution of the secondary eruption to Chicken Pox, and also the appearance of the vesicles in crops, as in Chicken Pox.
- (3) Most doctors diagnosed this secondary rash as Chicken Pox. Dr Claude B. Ker⁷⁸, Medical Superintendent of the Edinburgh City Hospital for infectious fevers had two such cases of which he said as regards this secondary rash, "In both the Chicken Pox was undoubted, and in/

in both it followed within two days a condition originally diagnosed as Herpes".

- (4) In 9 out of the 23 cases the patient was older than 50 years of age.
- (5) Twelve out of the 23 cases were definitely described as being a severe attack of Herpes Zoster.
- (6) In eight out of the twenty-three cases the primary Herpes Zoster was Ophthalmic or situated about the head and neck.
- (7) Out of the 8 cases of Herpes Zoster affecting the head and neck, 6 were severe or very severe cases of Herpes.
- (8) Five out of the twenty-three cases of Herpes Zoster were not in good health. No 1 had an operation for Appendicitis, No.5 had Hodgkin's disease, No.6 had Lymphatic Leukaemia, No.7 was cachetic looking and was suffering with Tuberculosis, while No.18 had some lymphatic condition, for which he was taking Arsenic.

Claude B. Ker⁷⁸ reported two cases with this double eruption.-

24. One case in a little girl who had Diphtheria at the same time. She had a very copious Herpes Zoster above the elbows.

25. The other was a patient aged 55 years, with a profuse Herpes Zoster round the Anus.

Similar cases were described by W.P. Le Feuvre⁶¹, Agnes Saville,¹⁹ H. Downes³², J.P. Martin⁵⁰, Fred Tresilian⁴⁵, M.O.H. in the British Medical Journal⁵³, G.E. Elkington⁵⁸, Donald Hall⁵⁹, R.E. Scholfield⁷¹, Wm. McCallin⁷², S. McNaughton¹³⁴.

McNaughton's case is a very peculiar and interesting one. A man aged 80 years had taken half a drachm of Liquor Arsenical since June 14th, in two minim doses three times a day. On June 27th he had acute pain over outer side of left leg, with definite tenderness along the course of the External Popliteal Nerve. On June 29th McNaughton noticed several small papules evenly distributed over the trunk, and reaching to the shoulders, arms and backs of both thighs. No rash on face, forearms or legs. Next day rash was mostly vesicular and indistinguishable from Chicken Pox. On July 1st an intense Herpetic eruption appeared on left buttock and leg in two well marked lines, and over the sole of the left foot. The whole of the left leg was now painful, undoubtedly an attack of Herpes Zoster. Here however the Chicken Pox rash appeared before that of the Herpes Zoster, but the neuralgic pain of the Zoster preceded the Chicken Pox rash by two days.

J. Watt⁸⁰ /

J. Watt⁸⁰, Arkwright⁸⁵ 2 cases, Coleman⁸⁶, Watson^{85A},
 G. Pernet⁹³, Anonymous case in Medical Review⁹⁷,
 another anonymous case in Medical Review⁹⁹, Shamberg¹⁰⁹,
 W.T. Corlett¹¹⁴, Ormsby¹¹⁵, G. Noble¹¹⁸, W.M. Kraus¹³⁰
 quotes Bruijning, who had a similar case.

M.B. Parounagian and H. Goodman¹¹⁹ record one case
 and quote the following men, who have had similar
 cases:-

1. Haslung, Ref. Nord. Med. Ark 8, Festschrift No.6,
1897.
2. Jeanselme and Leredde, "Sur les vesicules Aber-
 rantes du Zona", Bull et Mém. Soc. Méd. d. Hôp.
 de Paris, 15: 6, 19, 1898.
3. Beyer, Ref. Archiv. f. Dermat. u. Syph. 78:233, 1906.
4. Fasal, Ref. Archiv. f. Dermat. u. Syph. 95:27, 1909.
5. Lipschutz, Archiv. f. Dermat. u. Syph. 108: 533, 1911.
6. Zumbusch, Archiv. f. Derm. u. Syph. 118: 823, 1913.
7. Lipp, Waselenski (Leyden Clinic) and Pennetti
 and Pogliési.

Altogether I have managed to find in the litera-
 ture 62 references of cases in which Herpes Zoster was
 followed within a short period of time by a rash in-
 distinguishable from that of Chicken Pox.

An analysis of these cases shows the following:-

1. Age was mentioned in 55 cases and of these 25
 patients were over the age of fifty years of age.

2./

2. Thirty-four of the cases were severe cases of Herpes Zoster, described as profuse and usually with severe preherpetic pain.
3. The distribution of the original Herpes Zoster was given in 54 cases, and out of these 14 had either the scalp, face or neck affected. Out of the 14 cases affecting face, scalp or neck, 10 or 71.4% were described as severe or very severe cases of Herpes Zoster.

28 cases had the Dorsal Ganglia affected, of which 18 or 64.3% were severe.

9 cases affected in vicinity of Lumbar Ganglia, 4 or 44.4% were severe.

2 cases affected shoulder, 1 was severe.

4. In fourteen instances mention was made that the patient was not in good condition at the time, the following being some of the mentioned cases of low resistance: "Three weeks after child birth", "Tuberculosis of both lungs and Chronic Bronchitis", "Just had Bronchitis", "Weak", "Run Down", "Hodgkin's Disease", "Diphtheria at same time" and so on.

Unfortunately only in ten instances was the question of previous attacks of Chicken Pox referred to. This is an important point as Chicken Pox usually grants immunity to second attacks for life, although second attacks of Chicken Pox have been reported.

Out/

Out of the ten instances, seven did not have Chicken Pox before, two were not certain, and one is said to have had it before. Further, in many cases the interval between the two diseases was not mentioned, perhaps when doctor examined the case, both eruptions were already present, and patient did not note the interval.

The conclusions we come to as regards this type of case are:-

1. Patient is often very old and feeble.
2. Patient often debilitated by some other disease.
3. The attack of Herpes Zoster in a high percentage of cases is severe or very severe.
4. In many cases mention was made of the fact that the temperature rose higher with the formation of Aberrant Vesicles, or just before the appearance of the generalised rash, which points to a general infection taking place.
5. Distribution and mode of onset of this second generalised rash corresponds to the usual Chicken Pox eruption. The Vesicles are not so profuse on the limbs as on the body, there is no pain, and the vesicles tend to come out in crops.
6. Herpes Zoster is always the precursor, then after a definite period the Chicken Pox like eruption appears.

7. Interval mentioned in 35 cases.

Interval of 7 days	5 cases
" " 6 days	2 cases
" " 5 days	0 cases
" " 4 days	3 cases
" " 3 days	8 cases
1 to 2 days	12 cases

Secondary rash appeared at same time or a few hours after the original Herpes Zoster in 5 cases.

HERPES ZOSTER AND CHICKEN POX OCCURRING SIMULTANEOUSLY
IN THE SAME INDIVIDUAL AND CHICKEN POX THEN TRANSMITTED
TO OTHERS EXPOSED.

There are only a few cases recorded in the literature where such a double eruption infects others exposed with Chicken Pox. I could find only six such instances.

1. Dr McM. informed Sir Norman Walker of the following case, the details of which Sir Norman has very kindly given me.

A man aged 71 years had Herpes Zoster on the posterior surface of Pinna of ear and towards angle of jaw. The vesicles developed on August 22nd, preceded for a few days by pain for which aspirin/

aspirin was prescribed. On the evening of August 28th, that is six days later, the doctor again saw him, when he also complained of a rash on forehead and body. Next morning the rash was abundant on forehead, chest and body, back and front, with a few spots on legs and arms. The rash was papular and vesicular. The spots came out in crops for a few days. The pain was still present in original area, but was not so severe. A fortnight later a niece developed Varicella. Here also note how similar the secondary rash was to Chicken Pox, appearing in crops and being more abundant on the body than on the limbs, and in addition infecting a second person with Chicken Pox.

2. Another such example is recorded by Dr Claude B. Ker⁷⁸ in a small girl who developed an absolutely typical Herpetic patch over the left Scapula. Next day a few outlying vesicles appeared near the Herpes patch and one or two on the back. One of the vesicles, Dr Ker says, was "Apparently typical of Varicella". There was nothing at any time below the waist line, and the face, scalp and limbs were free. She was sent to the Chicken Pox ward, where she did not contract the disease. Seventeen days after her removal, one of the children who had been exposed to her developed Chicken Pox.

Of this and another case Dr Ker⁷⁸ says,
 "I have on the other hand seen two cases of un-
 doubted Chicken Pox in which the eruption, at
 first indistinguishable from Herpes, became after-
 wards generally distributed over the body."

It is noteworthy that although patient was
 sent to the Chicken Pox ward, she did not develop
 that disease, but however managed to infect another
 with Chicken Pox.

3. McEwan¹²⁰ records another example. A patient de-
 veloped Herpes Zoster of left side of face, pre-
 ceded for 24 hours by very severe pain in left
 temple. The Anterior Auricular and upper Anterior
 Cervical glands were enlarged and painful, while
 oedema of the lid closed left eye. He had a severe
 Herpes Zoster of upper and middle branch of 5th
 Cranial Nerve. Five days after commencement of
 this attack, there appeared on other parts of face,
 scalp, trunk, arms and legs, papules which were not
 associated with pain. From their centre vesicles
 emerged, some of which were umbilicated. The
 second eruption was recognised as Varicella, and
 patient was placed in the usual quarantine. Ten
 days after the beginning of the Varicella lesions,
 the patient's 3 year old daughter, who had been in
 contact with him before and during the quarantine,
 developed/

developed a typical Chicken Pox. The father had never had Varicella before, and no source of infection of that disease could be traced in his case. The daughter was only exposed to Chicken Pox through her father.

4. W.M. Gray³³ described a case where on January 15th three brothers were admitted to hospital all suffering from Scarlet Fever. The eldest who had never had Chicken Pox before had a well marked right sided Herpes Zoster. In addition to Impetiginous spots on face and ears, there were 2 or 3 spots on left side of chest, which left scars on healing, suggestive of Chicken Pox. Four days after admission one of the brothers developed a typical Chicken Pox, followed within 15 days by a similar attack in the youngest child.

5. J.F. McClean⁸¹ reports a case in a male aged 46, who was sent to the London Fever Hospital as a case of Facial Erysipelas. On admission he was found to have a well marked attack of left fronto-nasal Herpes, which had subsequently become infected. There was a definite area of erysipel- atous inflammation surrounding the patch of Herpes. Scattered over the trunk were a considerable number of vesicles. All eventually dried up with scab formation. Eighteen days after the/

the commencement of patient's illness his wife wrote and informed him that their three children had that day developed Chicken Pox.

6. F. Parkes Weber ^{94 & 102} quotes the case of a Jewish female patient aged 59 years, who had Chronic Lymphatic Leukaemia for 6 years. She had enlarged glands, liver and spleen. Reds 3,200,000, Whites 53,600 and Haemoglobin 60%. She was put on Arsenic, and two weeks after commencing this treatment, she developed a typical Herpes Zoster of right shoulder with much pain. Five days later a generalised eruption of Varicella like spots occurred over body. A little boy aged 4 years was in the same ward, and ten days after his discharge from hospital he developed Chicken Pox.

It is remarkable that there should be so few cases of this group recorded in the literature, considering the large number of cases that we have in which Herpes Zoster and Chicken Pox are closely associated in other ways.

HERPES/

HERPES ZOSTER AND CHICKEN POX OCCURRING SIMULTANEOUSLY
IN DIFFERENT INDIVIDUALS CLOSELY ASSOCIATED.

Cases of this nature would naturally also tend to show the association of Herpes Zoster and Chicken Pox. I have been able to find six such instances. In the first three cases the two diseases affected different individuals on the same day.

1. The first is an unpublished case communicated to me directly by Dr J. Young of Edinburgh, and I have his permission to mention this case.

Dr Young's four children aged respectively 8 months, five years, seven years and nine years, all took ill at the same time in Newfoundland in the Summer of 1922. The eight months baby developed Herpes Zoster, and the other three Chicken Pox. Another doctor's opinion was asked and he agreed with the diagnosis. None of the children had had either Chicken Pox or Herpes Zoster before. It is peculiar that the youngest child should have developed Herpes Zoster, and the older children Chicken Pox.

2. Dr H. Oakes¹⁶ quotes a similar case. He saw two children in one household on the same day. The one had typical Herpes Zoster, and the other typical Chicken Pox. He could not find any source of Chicken Pox infection in the neighbourhood.

3. J.B. Miller⁶⁶ reports an instance where a child aged 5 years developed Chicken Pox. On the same day her little sister aged one year got Herpes Zoster. Again the peculiar observation that the Herpes attacks the younger of the two children.

In the following two cases the Chicken Pox developed two to four days after the Herpes Zoster.

4. R. Cranston Low³¹ records an instance which occurred in the Skin wards, under Sir Norman Walker's charge, at the Royal Infirmary, Edinburgh.

A patient suffering from Lupus Vulgaris developed a typical right sided Herpes Zoster. Two days later a child in the same ward suffering from Seborrhoeic Dermatitis developed Chicken Pox. Both these patients had been in the ward for some days previously, so Dr Low suggests that the infection had probably been brought into the ward from outside by visitors.

5. Gray³³ records an instance of three brothers who were admitted to hospital with Scarlet Fever. The eldest who had no previous history of Chicken Pox had a well marked right sided Herpes Zoster, and had one or two spots on left side of chest, suggestive of Chicken Pox. Four days later one of the brothers developed Chicken Pox which after the/

the usual Incubation period infected the younger brother.

Unfortunately it is not mentioned how long the eldest brother had the Herpes Zoster; if disease had just appeared it would fall under this class of case, if not it would belong to the previous group under which this case has also been mentioned.

6. Chicken Pox occurring two days before the Herpes Zoster.

Bruijnigen¹³⁷ quotes Gara who has reported a case in which two children in one family had Chicken Pox, two days later, the third developed Herpes Zoster.

So we have cases of this group where the Chicken Pox &

(1) Herpes Zoster occur in different individuals

(1) On the same day.

(2) Chicken Pox occurring 2 and 4 days after the Herpes Zoster.

(3) Chicken Pox occurring 2 days before the Herpes Zoster.

(2) The short interval - 2 and 4 days - make it impossible to be an incubation period, so that none of these cases can be classed under any of the other headings or groups.

(3) Taking this group by itself, the cases might just be a coincidence as only five certain cases/

cases could be found, but taken in conjunction with the large number of cases quoted under the various other groups, these five instances are of value, and still add further proof to the association of the two diseases, and also show an additional way in which the two diseases can be associated.

(4) This group presents three possibilities.

(1) If the viruses of the two diseases are entirely different, then in these five cases they were present at the same time, infected the patients and produced the two different diseases.

(2) The one virus may be a modified virus of the other. (3) If the virus for both diseases is identically the same, we have the same virus producing Herpes Zoster in the one patient and Chicken Pox in the other, something in the patient itself forming a media for the virus, which influences the virus to change its characteristics to produce either the one or the other disease. Having already observed the large number of cases in which the two diseases are closely associated, one tends to favour the last two possibilities.

EPIDEMICS OF HERPES ZOSTER AND CHICKEN POX
OCCURRING SIMULTANEOUSLY.

We have seen that both diseases can occur in epidemic form, so if the two diseases should be due to the same virus, we would expect such epidemics of the two diseases to occur at the same time. Here we are faced with the difficulty that neither of the two diseases is notifiable, so that we can quote no accurate statistics, showing simultaneous epidemics. We have already seen however that both diseases tend to be more prevalent at certain and the same times of the year, thus showing a slight connection. Furthermore Claude B. Ker⁷⁸ and R. Cranston Low³¹ quote P. Heim, Ref. Berl. Klin. Woch. December 9th 1912, p.2349, who recorded simultaneous epidemics of Herpes Zoster and Chicken Pox at Buda Pest in April and May 1912. During the period of that epidemic of Chicken Pox, Heim saw in his hospital and private practice more cases of Herpes Zoster than he had ever observed before.

The fact that Heim's report is the only one that can be found is no proof that such simultaneous epidemics do not occur more frequently. If both diseases were made notifiable, this question would at once be settled.

D I S C U S S I O N .

When dealing with two diseases like Herpes Zoster and Chicken Pox, in both of which the etiology or causal organisms are not known, we cannot draw our conclusions as to the similarity of the two diseases on bacteriological grounds, but have to resort to clinical facts and observations to prove the identity of the two diseases.

Let us take any disease caused by a specific organism and with diagnostic clinical symptoms. At first perhaps a diagnosis could only have been made by finding and staining for the causal organism, but as a large and sufficient number of cases are found, all having the same characteristic clinical symptoms, bacteriological examination becomes unnecessary, as the similarity of the often observed clinical manifestations points to the nature of the disease. A case of Pneumonia of the lungs is now diagnosed as such by its well known and recognised symptoms and clinical signs characteristic of that disease, and one need not stain the sputum for Pneumococci to make a diagnosis. Chicken Pox is recognised as such every time by its clinical symptoms, although a definite virus causing this disease has never yet been discovered.

The/

The constant repetition of a characteristic group of symptoms and clinical signs for any disease, warrants a diagnosis to be made, and permits that disease to be classed by itself with a special name.

The same applies to Herpes Zoster and Chicken Pox. So many cases have been recorded in which the two diseases have been associated with each other in every conceivable way, and in such a variety of ways, that one may assume that the two diseases are identical without having to resort to a bacteriological examination, which in this case is unfortunately impossible.

As we know the same poison acting on different structures produces an entirely different combination of symptoms. There no doubt was a time when the suggestion if made, that Pneumonia of the lungs and a variety of Meningitis were due to an identical virus, would have been ridiculed, so entirely different are the symptoms in the two diseases; who at that time would have believed that Tuberculosis of lungs, Meninges, Joints and other organs with their entirely different clinical manifestations could have been due to the same virus? Yet the advance in Pathology and Bacteriology has proved this to be the case.

Is it not possible that in our case the virus attacks the Posterior Ganglia of the Nervous System in one individual producing Herpes Zoster, and in another individual/

individual the same virus circulating in the blood stream could produce the generalised eruption of Chicken Pox? Only at present we cannot prove this bacteriologically.

No doubt medical men are sceptical when any new theory is advanced, and until positive proof can be given, the argument of Coincidence is the one that is most commonly brought up. With the facts that have been given and described, coincidence can surely be ruled out, as too many cases showing this association have been recorded under different headings, and in practically every group the cases had a definite sequence of events.

One hundred and two cases have been recorded where Herpes Zoster in one patient was followed by Chicken Pox in others exposed, and in every case a susceptible exposed patient developed the Chicken Pox within a uniform period of 14 to 21 days, this corresponding to the agreed incubation period of Chicken Pox.

In every case no source of infection other than the cases of Herpes Zoster could be found, and in some cases that have been quoted the surroundings and conditions make it impossible that any other source of infection or Chicken Pox could have existed, without the medical attendant being aware of its existence. We have noticed such cases occurring in convalescent Scarlet/

Scarlet Fever wards, where the patients have been in hospital longer than the incubation period of Chicken Pox, and yet they developed Chicken Pox after a case of Herpes Zoster, although here any outside infection of Chicken Pox can be practically excluded.

We have noticed the cases of Le Feuivre with the same sequence of events, although the people were isolated on lonely farms miles from the nearest village. Le Feuivre drew attention to the fact that in the colonies with a scattered population, the medical men have a much better control of the cases and circumstances than in a crowded town, so that a case of Chicken Pox as a likely source of infection is not easily missed.

Noteworthy is it that in all these instances the Herpes Zoster was the first disease and that practically every case of Herpes Zoster was typical with marked preherpetic pain and other symptoms as discussed under diagnosis, so that a mis-diagnosis can be ruled out. Also many of the cases of Herpes Zoster were diagnosed as such by eminent authorities, superintendents in charge of fever hospitals and skin specialists, so that it is extremely unlikely that these cases of Herpes Zoster could have been wrongly diagnosed cases of Chicken Pox.

Enough instances of the association of these two diseases have occurred to make it more than likely that/

that they have a common cause.

The occurrence of Herpes Zoster without any definite associated Chicken Pox cases is no argument against the identity of the two diseases, as Herpes Zoster often, as explained, is only symptomatic of some other disease, and here no connection with Chicken pox could be expected.

In the second group Chicken Pox in one patient followed by Herpes Zoster in others exposed, I have found seventeen cases. Chicken Pox does not appear to be so infectious to produce Herpes Zoster. Of the third class of case Herpes Zoster and Chicken pox occurring simultaneously in the same individual, I have collected sixty-two cases, and here also we have a definite sequence of events which goes against coincidence (1) Herpes Zoster is always the first to appear. (2) After a constant and definite interval of one to eight days a general vesicular eruption appears on the body. This secondary eruption is never associated with pain, and is indistinguishable from Chicken Pox; this secondary eruption, like Chicken Pox vesicles, tends to come out in crops, is plentiful on the body and slight on the limbs.

Of the fourth group Herpes Zoster and Chicken Pox occurring simultaneously in the same individual and Chicken Pox then transmitted to others exposed, I have found six cases, while in the last group Herpes Zoster and/

and Chicken Pox occurring simultaneously in different individuals closely associated, I have also found six instances, a sum total of one hundred and ninety-three cases, surely sufficient to exclude coincidence, especially if we consider the definite sequence of events which occurred in most of them.

Although I have been able to get 193 cases, there must be a large number of cases showing the association between the two diseases which have never been recorded. A large number of Medical men in the past have probably not been aware of the possibility of the identity of the two diseases, and so have not been on the look out for such an association, nor made the necessary inquiries. Also as already mentioned, the rigid differentiation between the two diseases in text books has probably resulted in many cases showing this association having been missed. Lastly, there is also probably a section of medical men who are acquainted with the large number of these cases published in the medical journals, and consequently have not thought it worth while publishing any further instances, so that the number 193 does not nearly represent the total examples that have occurred.

J. Van Bokay¹²⁴, who was the first to notice this association between the two diseases, saw his first example of the connection in July 1888. A few weeks later he saw a similar occurrence. He thought these cases/

cases interesting, but was inclined to consider them as coincidences and did not think that similar observations would be made in the future. However once his attention had been drawn to this fact by close observation, he by 1909 had observed nine such cases.

Nine cases observed by one medical man can hardly be coincidence, and that only after he had his attention drawn to this connection. One wonders how many cases he must have missed previous to the year 1888.

We also noted that in 1891 six days after he had informed his colleague Baron v. Koranyi, the latter observed a case showing this connection. Le Feuvre who is a strong supporter of the association of the two diseases, was constantly on the look out for such examples, and in the South African Medical Record of 1921¹²⁹ he says. "The number of cases which have fallen to the lot of one practitioner only is, I think, a strong point in the argument that such cases are by no means rare, and only require a little careful search by those who may be in a similar favourable position, and by that I mean practising not in a large town where the origins of epidemics must be almost impossible of discovery, but in out of the way districts or small towns. During six years I have come across 12 cases of the following, of Shingles in one individual, by Chicken Pox in Another."

Anybody who has studied the literature on this subject/

subject cannot help being struck by the fact that one case is reported in one of the Medical Journals, and then for months afterwards a large number of similar cases appear in the Medical Journals. Then for a long time no cases are found, a year or two later the interest in this subject is revived by the appearance of another case in one of the journals, followed immediately or in that same year by a large number of similar cases. The appearance of a published case, stimulates interest, practitioners temporarily are warned and a large number of cases are published.

Le Feuvre¹²⁷ says two cases which occurred in Rhodesia during 1913 were reported in the Guy's Hospital Gazette for April 26th and June 21st respectively with the result that further examples were reported from five different quarters. These cases were shortly alluded to in the British Medical Journal for May 10th 1913, with the result that similar cases were reported by twenty practitioners scattered over the British Isles. Le Feuvre wrote to a Guernsey practitioner on this subject, and almost by return this practitioner furnished him with two cases, which had occurred quite recently in his practice. Le Feuvre continues by saying that he has little doubt that there is scarcely a medical man who keeps a case book, who if he applied himself to it, could not add one or more/

more examples, in proportion to the care with which such case book is kept.

Le Feuvre¹²⁹ read a paper on this subject at the Durban Congress; the following day one of the Secretaries informed him that a similar case had lately occurred in the practice of their president Dr S.G. Campbell.

Reviewing the literature on this subject as it appeared in the British Medical Journals, we will see how that when once attention is drawn to the association, the journal is flooded with similar examples, then a temporary lapse, till interest is again stimulated.

Previous to 1913, only one reference is found in the British Medical Journal and that was in 1899 by W.L. Ffrench, an article on Herpes Zoster with aberrant vesicles. In 1913 I found 21 references on this subject, seventeen cases having been recorded between May and October 1913. In 1914 there were no references, in 1915 two, one of which dealt with the epidemicity of Herpes Zoster, and not with its association with Chicken Pox. In 1916 I found no references on this subject. In 1917 one reference in connection with what is also called Generalised Herpes Zoster. In 1918 there were two references, in 1919 three, in 1920 five, in 1921 twenty-seven, and in 1922 six.

Dr/

Dr R. Cranston Low's³¹ article also was the means of stimulating a great deal of interest. Dr Low received six letters from various practitioners describing cases showing this association, after his article had been published. One letter was written five days and another six days after Dr Low's article appeared in the British Medical Journal.

One practitioner wrote to Dr Low saying that his interesting article recalled a case of his which made a considerable impression on his mind, although the possible connection of the two eruptions did not occur to him at the time. He had seen this case nine years previously, so he looked up his notes, and indeed he says it was by the merest chance that he had kept his notebook for that year. The case was one of Herpes Zoster and Chicken Pox occurring simultaneously in the same individual. One wonders how many more cases of this nature are hidden away or have been lost in case books.

In six months time I have been able to collect four cases, three of which were given me by other doctors, and one I saw along with another doctor.

Evidently then the total of 193 cases does not nearly represent all the cases of this nature that have occurred.

ERRORS/

ERRORS OF DIAGNOSIS.

Dr Claude B. Ker⁷⁸ while admitting that the coincidences of the association of the two diseases are getting sufficiently numerous to be somewhat puzzling, brings up the question as to whether there is not the possibility of errors of diagnosis accounting for the frequency with which one of these diseases follows the other.

The 193 cases have been reported by over a hundred doctors from all parts of the world, and it is hardly possible that so many doctors should all have made a wrong diagnosis, and that especially on this subject. Many of the cases, as has been already mentioned, have been seen, diagnosed and described by authorities.

Dr Ker himself quotes several cases of which he says that typical Herpes Zoster was followed by undoubted Chicken Pox in others exposed or in the same person. Also on reviewing the large number of fully described cases, we see that practically all the cases were typical cases of Herpes Zoster with preherpetic pain, many with enlarged glands, and other characteristics as described under the heading of diagnosis, and also that the cases of Chicken Pox were typical.

Dr Ker makes mention of the fact that there are abnormalities in the distribution of the eruption of certain cases of Chicken Pox, so much so that they resemble/

resemble Herpes Zoster; for instance the Chicken Pox eruption may be more profuse in areas affected by pressure, sun etc. Dr Ker however admits that in the cases of this nature, which he saw, the Chicken Pox vesicles were not grouped in a herpetic manner.

Further Dr Ker quotes Hamburger, Ref. Nothnagel's *Spezielle Pathologie und Therapie*, p.32, who suggests that some of the alleged cases of Herpes Zoster which have been followed by Chicken Pox may have been in reality cases of Chicken Pox itself, where the eruption was influenced by such a cause as the pressure and friction of badly fitting corsets.

A diagnosis of Herpes Zoster is usually not made by the distribution of the vesicles alone. There are cases of Herpes Zoster with very little or no pre-herpetic pain, but one just needs to glance over the recorded cases of Herpes Zoster as mentioned, to see how many of them are described as typical Herpes Zoster with severe preherpetic pain, while mention of enlarged lymphatic glands is made in some of the cases. These characteristics of Herpes Zoster are not found in any case of Chicken Pox, however closely its eruption may resemble that of Herpes Zoster.

Dr Ker however says, "I have on the other hand seen two cases of undoubted Chicken Pox in which the eruption, at first indistinguishable from herpes, became/

became afterwards generally distributed over the Body", also, "In both, the Chicken Pox was undoubted and in both it followed within two days, a condition originally diagnosed as Herpes".

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In an editorial note in the Lancet an argument is brought up that the cutaneous manifestation of Chicken Pox may be reduced to a very few spots, even to one single vesicle, while the clinical phenomena are so slight as to easily escape notice. This type of case it is argued, provides an overlooked source of infection, which cannot be eliminated. The writer even goes further and says that if the rash may be reduced to one vesicle, it seems probable that cases exhibiting no eruption at all, may from time to time occur, and indeed this was described about a century ago by Eichhorn¹⁵¹. It however seems strange why such an obscure case should in so many instances be the cause of an outbreak of Chicken Pox which is always associated with a typical case of Herpes Zoster in someone in close contact, and that the outbreak should always in these cases occur at a definite period after the attack of Herpes Zoster, this period in every case corresponding to the incubation period of Chicken Pox.

Should the two diseases be different forms or expressions of the same disease, one would be entitled to ask, and expect satisfactory replies to the following questions.

I./

I. Why does one not have Chicken Pox associated in some form or other with every case of Herpes Zoster?

In order to give a satisfactory answer to this question, the mode of production of Herpes Zoster vesicles and the concurrent pain has been described at length, and emphasis was laid on the fact that Herpes Zoster could be divided into Idiopathic and Symptomatic; the latter being due to injuries, pressure of tumours etc. could not be expected to be associated with Chicken Pox. While one would not perhaps expect say one half of the Herpes Zoster cases to be due to pressure of tumours, Spinal Meningitis, latent Syphilis etc., no doubt a larger percentage of cases are due to such causes than we expect. Also how many cases of Herpes Zoster are questioned suitably with a view to their relationship with Chicken Pox.

II. Why has this relationship been recognised only a comparatively short time ago? Le Leuvre¹²⁸ on this point says (a) Because it is only comparatively recently that Chicken Pox has been entirely differentiated from Smallpox and not regarded as a modified Small Pox. Le Feuvre quotes Professor Kaposi, a translation of whose lectures was published in England in 1895 and who said on this point, "With Hebra I regard it as practicable to recognise/

recognise three classes of Variola, according to their degree of severity, viz. Variola Vera, Varioloid and Varicella". (b) The rigid differentiation in text books between the two diseases, Herpes Zoster a nerve skin disease, and Chicken Pox a specific infectious fever, no doubt helped to delay the theory of the identity of the two diseases, as it helped doctors to be unsuspecting, and has thrown them off the scent for a long while, until the first case was published by Bokay, when many others appeared in rapid succession.

III. Le Feuvre¹²⁸ says that if the theory were correct one would expect during an epidemic of Varicella often to meet with children suffering from Herpes Zoster. Such cases he says have been found and reported, but Herpes Zoster is comparatively rare in children, who are more susceptible to Chicken Pox.

Herpes Zoster and a simultaneous Chicken Pox like eruption in same person.

We now come to the important variety of case in which an attack of Herpes Zoster is followed within a few days in the same person by an eruption indistinguishable from Chicken Pox, either in the form of a few outlying aberrant vesicles, or as a diffuse rash all over the body, the difference/

difference probably only being one of degree.

In view of the variety of ways in which Herpes Zoster and Chicken Pox have been found to be associated, there is reason to believe that this secondary rash is nothing else but an attack of Chicken Pox, occurring simultaneously with the Herpes Zoster in the same person, and that the two diseases are related to each other.

Cranston Low³¹ on this subject has advanced the theory that the virus probably first attacks the posterior ganglia, with the production of Herpes Zoster, and then a few days later the same virus gets into the general circulation, producing the generalised Chicken Pox eruption. In other words Herpes Zoster is a localised form of the generalised Chicken Pox.

It is quite possible that the virus of Herpes Zoster may become disseminated in the blood, due to the vascular damage that it causes in the posterior ganglion, and so allowing the virus to enter the blood stream.

The following observations of the recorded cases of this nature will substantiate Dr Low's theory, and will tend to encourage a localised disease to become generalised.

1. The patient was often very old and feeble.
2. The patient was often debilitated by some other disease.

3. The attack of Herpes Zoster in a high percentage of cases was severe or very severe.
4. In many cases mention was made of the fact that the temperature rose some degrees with the formation of aberrant vesicles or the appearance of the generalised rash, pointing to a general infection taking place.

In favour of this secondary eruption being associated with the original attack of Herpes Zoster, is the following sequence of events noticed in every case.

1. All the cases follow a certain rule.
2. The Herpes Zoster is always the first to appear.
3. Then an interval varying from some hours to eight days.
4. Then the secondary Chicken Pox like eruption appears.

In some of the described cases the rashes of the Herpes Zoster and Chicken Pox apparently appeared at the same time, but in these cases the pain of the Herpes Zoster was always the first symptom, and then after a varying interval both rashes apparently appeared together. In these cases there is probably a very weak resistance, allowing the virus of Herpes Zoster to become rapidly generalised. Also the secondary rash, having absolutely no pain associated with it, the actual time of its onset is not always noted, and when the doctor examines the patient, both rashes are found/

found together.

In favour of this secondary rash being Chicken Pox are:-

- (1) The large number of cases and the variety of ways in which Herpes Zoster and Chicken Pox have already been found to be associated.
- (2) This secondary eruption has been described by many authorities to be absolutely indistinguishable from Chicken Pox, and has been diagnosed by many specialists as such.
- (3) Its distribution and mode of onset correspond to that of Chicken Pox. The vesicles as in Chicken Pox are not so profuse on the limbs as on the body, there is absolutely no pain associated with them, and the vesicles as in Chicken Pox tend to come out in crops.
- (4) A few instances have been reported where these cases have transmitted Chicken Pox to others exposed.

We have seen the large number of cases in which Herpes Zoster has given rise to epidemics of Chicken Pox in others exposed, yet here the Zoster is followed by an eruption indistinguishable from Chicken Pox in same person, and yet only a few cases, six in number, could be found where others exposed to this class of case developed Chicken Pox. This seems to go against this secondary eruption actually being Chicken Pox, yet/

yet why then does the original Herpes Zoster in this type of case not affect others exposed with Chicken Pox, as it does in so many other cases as quoted. Now we have already noted the cases of Elliott⁸⁴ and Hartill⁴² where patients, who were susceptible to Chicken Pox, developed Herpes Zoster and caused an epidemic of Chicken Pox in a ward, and although these cases with the Herpes Zoster remained in the wards and became contacts of the succeeding cases of Chicken pox, none of them developed this disease. This shows that Herpes Zoster can grant immunity, be it only temporary, to infection with Chicken Pox. Now coming back to the class of case of Herpes Zoster and Chicken Pox in the same person. Here the Herpes Zoster seems to have lost much of its infective nature for producing Chicken Pox in others, but instead has become a generalised disease, developing Chicken Pox in the same person. This secondary Chicken Pox in coming through a patient's system, which as shown above has already been partly immunised to Chicken Pox by the original Herpes Zoster, has perhaps lost much of its virulence, and so may account for the reason why so few other individuals exposed were infected with Chicken Pox. Why then can Chicken Pox develop in a system which is already immunised to this disease? Because Herpes Zoster being a localised lesion, the patient probably takes some time to become properly immunised, and the time/

time - one to eight days - may not be sufficient to produce a complete immunity to Chicken Pox infection, whereas in two to three weeks, the intervals between the two diseases in Elliott's and Hartill's cases, complete immunity against Chicken Pox could perhaps have been developed in the Herpes Zoster patients.

Some writers try to account for the secondary generalised eruption by assuming that the Herpes Zoster has overflowed as it were the original posterior ganglion, and affected a large number of posterior ganglia. We know that a slight attack of Herpes Zoster may exceptionally be associated with hardly any pain, but that a severe attack is accompanied by much pain. Now if a Herpes Zoster is so severe as to become generalised, affecting many ganglia at once, one would expect at least a fairly severe degree of pain, not only in the area supplied by the ganglia first infected, but also in the areas supplied by the secondary infected ganglia, yet this generalised rash is not accompanied by any pain whatsoever, so much so that often the patient is not aware of any aberrant vesicles or secondary rash on body, until he is examined. This goes against a generalised affection of the Posterior Ganglia.

Also the possibility of patient having a double infection with Herpes Zoster and Chicken Pox has to be/

be excluded. The definite sequence of events as mentioned however goes against this coincidence and points to the Chicken Pox having a connection with the original attack of Herpes Zoster.

In conclusion then this type of case suggests that the two diseases are merely different symptoms of one and the same disease. The connecting link as Le Feuvre suggests being the so called Aberrant Vesicle, substantiated by the fact that the Herpes Zoster appears first, and then after a short interval the Chicken Pox makes its appearance, if slight as aberrant vesicles, if severe as a fully developed Chicken Pox eruption, so that Chicken Pox may be present in every case of Idiopathic Herpes Zoster, either latent, or as one or more Chicken Pox vesicles, the so called aberrant vesicles, or as a profuse Chicken Pox eruption. This taken in connection with the large number of cases of Herpes Zoster followed by Chicken Pox in other individuals within the incubation period of the latter disease, makes it more than likely that the two diseases are due to one and the same cause. Le Feuvre⁶¹ suggests that the disease in this form should be looked upon as a Varicella with a prodromal rash, and that contacts will be affected with one or both eruptions, according to age and temperament, adults and neurotic children generally exhibiting the herpetic eruption, and the majority of young children the Varicella eruption.

VIRUSES.

In a discussion as regards the viruses of the two diseases, we can only come to an approximate idea as regards their relation to each other, and that opinion will have to be derived from clinical observations, as the causal organisms for both diseases are as yet unknown.

According to Rosenow and Oftedal, Herpes Zoster is caused by a streptococcus, and considering the nature of the vesicle contents we would expect both diseases to be of streptococcal origin, staphylococci being more associated with the formation of pus.

If however both diseases are due to the same virus, identical in every respect, it would be difficult to account for the facts why (1) in one case the virus should show preference for the blood stream, as opposed to the Posterior Ganglia and (2) why an attack of the one disease while granting permanent immunity to second attacks of the same disease, does not grant the same immunity to an attack of the other.

A consideration of the incubation period of a disease may be of value. The effect of the duration of the incubation period on the severity of a disease is well shown in a disease like Tetanus, which disease is an excellent one from which to draw an inference. Here the interval between the date of entrance of organisms into the system, corresponding with the date of/

of injury, and the commencement of symptoms, gives us a definite incubation period. As regards Tetanus it is well known, that the shorter the incubation period, the more virulent the organism, the more severe the attack, and so consequently the more unfavourable the prognosis. The same rule holds for other infections as well, and so could be applied to Herpes Zoster and Chicken Pox. In considering the incubation periods of these two diseases as got from the recorded cases, we find that the dates of actual onset of the disease have not always been accurately stated, dates often being given when doctor was consulted, no mention being made of the actual onset of symptoms.

(1) We have found 102 cases of Herpes Zoster followed by Chicken Pox in others exposed, often resulting in epidemics of the latter disease, and only 17 cases of the group Chicken Pox followed by Herpes Zoster in others exposed, so Chicken Pox does not appear to be as infectious to produce Herpes Zoster, as the latter disease is to produce Chicken Pox.

Of the two diseases then the virus of Herpes Zoster seems to be more infectious and more virulent to produce Chicken Pox.

(2)/

- (2) We know the incubation period of Chicken Pox to be 14 to 21 days, while where Herpes Zoster infected another patient with Herpes Zoster, the incubation period as could be got from the quoted cases, was four days or less in four out of eight cases, the actual intervals in the quoted cases being 14, 2 or 3, 13, 4 or 5, 3 and 3 days. According to this the incubation period of Herpes Zoster tends to be much shorter than that of Chicken Pox, consequently the virus of Herpes Zoster can be expected to be much more virulent.
- (3) Now comparing this to the Herpes Zoster developed after exposure to a Chicken Pox case. Here we find the incubation period to vary from one to five weeks. Out of the 14 cases quoted in which the intervals were mentioned, we find only two cases in which the interval was less than two weeks, four cases with 14 days interval, and eight cases with an interval or incubation period of more than two weeks.

Evidently then Chicken Pox takes a much longer time to infect others with Herpes Zoster, than Herpes Zoster does to infect others with Herpes Zoster.

From the above it might be suggested, that the virus of Herpes Zoster is more virulent than that of Chicken Pox, so that if both diseases have the same causal origin, /

origin, as shown by clinical observations, the viruses of the two diseases are not exactly identical in virulence. It might be that Chicken Pox is caused by a modified and attenuated Herpes Zoster virus with a special affinity for the blood stream, as opposed to the more virulent Herpes Zoster virus with a special affinity for the Posterior Ganglia of the Central Nervous System.

As the one disease can produce the other in different individuals and vice versa, we would have to accept that the virus can change from the more virulent to the attenuated and vice versa. Either the virus is in the virulent or attenuated form, before it infects the patient, or the inherent characteristics or medium of patient on which the organism grows, determine it to be of either the one or other variety. In general children tend to influence the virus to be attenuated, and adults virulent, Chicken Pox being more common in children and Herpes Zoster in adults.

Such a theory would not be impossible, for bacteriologists by making cultures of the same organism on different media, can change the characteristics of the same virus, producing different cultures of the same organism, and with different characteristics, depending on the medium on which they grow.

Le Feuvre in answer to the question, what are the differences determining the nature of the eruption, Chicken/

Chicken Pox in one case and Herpes Zoster in the other, suggests as the most likely explanation, the existence of a lessened resistance in the nerve area involved in the case of Herpes Zoster, but as regards the question why does Herpes Zoster sometimes manifest itself as a Chicken Pox, he says can only be answered in the future when we know the cause of Chicken Pox, and when we can produce a Zoster eruption experimentally. In the future it may conceivably be proved that Chicken Pox is due to an attenuated and modified Herpes Zoster virus.

IMMUNITY.

It is a recognised fact that Chicken Pox grants immunity for life to second attacks of the same disease. Second attacks have occurred, but they are very rare. An instance of a second attack is quoted by
 F.H. Thomson ¹³⁵ .

The same applies to second attacks of Herpes Zoster, and Cranston Low attributes second attacks of this disease to the irritation of recurrent attacks of peripheral neuritis, e.g. Symptomatic Herpes Zoster. Now if Herpes Zoster and Chicken Pox are due to the same virus, one would expect an attack of the one disease to grant immunity against infection with the other./

other. Further, should Chicken Pox be due to a modified and attenuated Herpes Zoster virus, one would not expect Chicken Pox to grant such a perfect immunity against infection with Herpes Zoster, as this disease would grant against an attack of Chicken Pox. We will first discuss the immunity granted by Chicken Pox against Herpes Zoster infection.

Claude Ker¹³¹ says that many adult patients with Herpes Zoster can give a definite history of Chicken Pox in childhood, while he⁷⁸ quotes Savill, Ref. Brit. Medical Journal, October 4th 1913, who mentions a case of a boy, who developed Herpes Zoster five months after an attack of Chicken Pox.

Le Feuvre⁹⁵ suggests that Herpes Zoster is a manifestation of Chicken Pox in a person, who has already had Chicken Pox in childhood.

- A. On reviewing my record of 270 cases of Herpes Zoster got from the Royal Infirmary, I found only 14 cases in which a history of previous Chicken Pox was inquired for, and result mentioned. Four had Chicken Pox before and ten not. The details of the four patients are as follows.-
- (1) Patient had Herpes Zoster at 10 years of age, and Chicken Pox at 4 months.
 - (2) Patient had Herpes Zoster at 14 years of age. Thinks he had Chicken Pox, but is not very sure.
 - (3) Patient had Herpes Zoster at 13 years of age, and Chicken Pox at 3 years.
 - (4) Patient had Herpes Zoster at 33 years of age, and Chicken Pox when a child.
- B. Now reviewing the recorded cases showing the association between Herpes Zoster and Chicken Pox. Of the class of case Herpes Zoster followed by Chicken Pox in others exposed I have recorded 102 cases, and only in 21 instances was such a history inquired after. Eight out of the 21 instances had Chicken Pox before, and thirteen not, the eight cases being as follows.-
- (1) Patient had Herpes Zoster at 6 years of age, and Chicken Pox at 3 years. Bokay says parents/

parents statement is not to be relied upon.

- (2) No details mentioned.
- (3) Herpes Zoster at 30 years, Chicken Pox at 16 years.
- (4) Herpes Zoster when a mother, Chicken Pox at 7 years.
- (5) Herpes Zoster at 10 years, Chicken Pox at 2 years.
- (6) Herpes Zoster at 12 years, Chicken Pox at 5 years.
- (7) Herpes Zoster when a grown up man, Chicken Pox in Childhood.
- (8) No details mentioned.

- C. Herpes Zoster and Chicken Pox occurring simultaneously in different individuals closely associated. Here I have recorded six cases, and in two a history of Chicken Pox was inquired for. Negative in both.
- D. Chicken Pox followed by Herpes Zoster in others exposed; 17 cases recorded, and in five Chicken Pox history inquired after. Negative in all.
- E. Herpes Zoster and Chicken Pox occurring simultaneously in the same individual; 68 cases recorded, and/

and in nine history of Chicken Pox inquired after. Negative in seven and doubtful in two cases.

Out of a total of 463 cases of Herpes Zoster, Chicken Pox history was inquired after or mentioned in only 51 cases, of which 39 had a negative history, and 12 patients with Herpes Zoster had Chicken Pox before. So we see that not enough attention has been given to this subject; however Chicken Pox does not in every case grant immunity to an attack of Herpes Zoster. This might be explained in two ways.-

- (1) The attacks of Herpes Zoster following in patients who have already had Chicken Pox, might have been of the Symptomatic variety, to which Chicken Pox obviously can grant no immunity.
- (2) We note that with the exception of Savill's case, the interval between the two diseases was some years, the shortest being three years. If then Chicken Pox is due to a modified or attenuated Herpes Zoster virus, one would not expect its immunity against Herpes Zoster to be permanent.

So evidently it is of the utmost importance as to whether the Herpes Zoster is Symptomatic or Idiopathic.

The type of Herpes Zoster which has simultaneously associated with it in the same individual an eruption indistinguishable from Chicken Pox is evidently an Idiopathic Herpes Zoster, and here I could find no certain/

certain previous history of Chicken Pox.

Now as regards the immunity which Herpes Zoster grants to Chicken Pox infection.-

Cranston Low³¹ says that he could find no record of a case of Herpes Zoster, developing Chicken Pox later on. I have however managed to find such an instance recorded by J.B. Miller⁶⁶, of a girl who developed Chicken Pox thirteen days after an attack of Herpes Zoster. Dr C.E. Ker⁷⁸ quotes Dr Scotland's case showing that Chicken Pox can follow closely upon Herpes Zoster. These are the only two references that I could find, in which Chicken Pox followed Herpes Zoster.

Cranston Low could find no such references, so it seems as if these cases are extremely rare. Again these two cases of Herpes Zoster might have been of the Symptomatic variety, and unless it can be proved that Herpes Zoster, which is not symptomatic, can be followed soon after by an attack of Chicken Pox, the two mentioned cases cannot be taken as a basis for argument against the association of the two diseases, on the grounds that the two diseases do not grant immunity to each other.

Further we have valuable evidence that Herpes Zoster of the type associated with Chicken Pox, and therefore of the Idiopathic variety, does grant immunity against an attack of Chicken Pox. In this connection/

connection the cases of Elliott⁸⁴ and Hartill⁴² have already been mentioned and described.

In Elliott's one case the patient with Herpes Zoster infected ten out of seventeen susceptible patients with Chicken Pox, and although the Herpes patient had not had Chicken Pox before, and remained in the ward, he did not develop this disease. Elliott records five such instances, some of these patients with Herpes Zoster being at the age when they were liable to Chicken Pox. The ages of the patients in Elliott's cases were $1\frac{1}{2}$ years, $5\frac{8}{12}$ years, $2\frac{8}{12}$ years, a nurse, age not mentioned, and 5 years.

One of Dr Ker's⁷⁸ cases already mentioned also showed this same immunity granted by Herpes Zoster to an attack of Chicken Pox, e.g. a little girl developed typical Herpes Zoster, followed next day by outlying vesicles, apparently typical of Varicella. She was sent to a Chicken Pox ward, where she did not contract the disease, but seventeen days after her removal, one of the children who had been exposed to her developed Chicken Pox.

So we might conclude that.-

- (1) Herpes Zoster being due to the more virulent virus, grants immunity to an attack of Chicken Pox, provided that such Herpes Zoster is not of the Symptomatic variety.
- (2)/

- (2) Chicken Pox being due to an attenuated or modified Herpes Zoster virus would not grant such a permanent immunity to an attack of Idiopathic Herpes Zoster.

It is obvious that as yet we have not sufficient knowledge on this question of immunity. As both Varicella and Herpes Zoster are seen more frequently by the general practitioner than by the dermatologist, much light would be thrown on this subject if members would adopt a scheme of note-taking and inquiries, and forward it to the medical journals.

The following would be the important points in such a scheme.-

- (1) In all cases of Herpes Zoster and Chicken Pox inquire as to previous attacks of either disease, and the interval that has elapsed between the attacks.
- (2) In cases of Herpes Zoster, try as far as possible to determine whether the disease is symptomatic or idiopathic.
- (3) Period which elapses between an attack of Herpes Zoster, and an outbreak of Chicken Pox in others exposed, to determine whether the Chicken Pox always follows the Herpes Zoster after an interval, corresponding to the incubation period of Chicken Pox. The recorded cases however have practically established this fact.

(4)/

- (4) A patient with Herpes Zoster (idiopathic), who is susceptible to Chicken Pox, and who has infected others with Chicken Pox, does he develop this disease, if left in contact with them, or does the attack of Herpes Zoster give him immunity to Chicken Pox infection.
- (5) Note cases of Herpes Zoster occurring in a family, where there are children susceptible to Chicken Pox, and whether such children develop this disease or not.
- (6) Every Herpes Zoster patient should be examined daily for aberrant vesicles or a generalised rash, and if found, interval between original Herpes Zoster and secondary rash should be noted.

The association between the two diseases having been observed in so many instances, it should be seriously considered, whether both diseases should not be made notifiable. Such a procedure would at once give us valuable knowledge as regards the epidemicity of Herpes Zoster, and also as to whether epidemics of Herpes Zoster and Chicken Pox occur simultaneously or not.

The necessity of warning patients of the association of the two diseases should not be forgotten, otherwise unpleasant results may ensue, as have already been mentioned in one case.

C O N C L U S I O N S .

1. Herpes Zoster should be divided into Idiopathic and Symptomatic.
2. The Idiopathic variety can occur in epidemics and is infectious.
3. Mode of infection in Idiopathic Herpes Zoster probably through three channels (1) Back of nose. (2) Skin. (3) Intestinal System.
4. Clinically there is a definite association between Idiopathic Herpes Zoster and Chicken Pox, the former evidently being a local manifestation of the generalised disease Chicken Pox.
5. Herpes Zoster is probably due to a more virulent virus than Chicken Pox, with a special attraction for the Posterior Ganglia.
6. Chicken Pox is probably due to a modified and attenuated Herpes Zoster virus.
7. As yet there is not sufficient evidence on the question of immunity, and symptomatic Herpes Zoster should in every case be excluded.

8./

8. If Herpes Zoster is due to a more virulent organism than Chicken Pox, it would be expected to give a more lasting immunity to Chicken Pox infection, than this disease would to Herpes Zoster. The information we have in this connection, points to this being the case.

 9. It is necessary to warn patients of the association of the two diseases, and to take measures to prevent Chicken Pox epidemics breaking out in schools, hospitals etc., following a Herpes Zoster case.
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