Thesis—

on

albuminuria.—

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Introduction.

Much controversy, has, within the last few years arisen, in regard to the pathological importance to be attributed to the appearance of albumen in the urine; that a coagulable principle exists in that secretion, in many diseases, is beyond doubt, as proven by the researches of numberless observers, both Continental, & British, & it is a subject of the greatest surprise, that a condition so frequent, & so easily detected, should have escaped the observation of the older Physicians, who appear, to have placed

greater reliance on the state of the urine, both during, & at the crisis of diseases ~~than~~ as a means of prognosis; than on any other agent.

It has, however, been asserted, that Hippocrates[1] was cognizant of the occasional appearance of coagulable urine; be that as it may; if it were known to him the subject lay dormant & however ably the conditions of the urine, both morbid & healthy, may have been commented on by succeeding authors) it (this state of the urine) was not again introduced until the beginning of the present century. when Dr Blackhall[2] in his work on Dropsies, called the attention of the Profession, to the appearance of coagulable urine in connection with that disease. thus he remarks - "Writers have spoken of the colour of that secretion, (the urine) its quantity, its sediment. & it is a circumstance hardly credible, that amidst so much minute labour, bestowed on these topics, the effect produced on it by heat, should have been so greatly overlooked."

1 Hippocrates. Vol 1 page 98. Sydenham edition.
2 Blackhall on Dropsies.

It was not, however, until the year 1827, that this important fact, received the attention it merited, when Dr. Bright in his Medical Reports, announced that dropsy, & albuminuria, were frequently associated with a peculiar degeneration of the structure of the kidneys - in the year 1829 - the statements of Dr. Bright were corroborated by Dr. Christison; & in 1831 confirmed by Dr. James Gregory (Drs. Alison, Wells, Christison, & Professor Andral, it was afterwards found, had made observations, which if carried out, would have led to the same conclusions at which Dr. Bright arrived). it was at this time only that the subject of coagulable urine, as well as the morbid appearances of the kidney, in connection with it, began to be studied, with a zeal, & interest, due to their importance, & they have since been treated of, by the most eminent Physicians of the present time.

By continental writers the names of M. Martin Solon. Rayer, Becquerel, Franz Simon, Romberg, & Phillips, &c stand prominent

observ in this country, Dr Bright - Alison Christison - Todd - Johnson - &c have contributed considerably; some considering albuminuria, as an invariable sign of Bright's disease, or Granular degeneration of the kidney; others looking on it, as sometimes, a consequence of organic lesion of the kidney, but also, as occasionally occurring, for a limited period only, as a concomitant to certain febrile & other diseases, & independently of any structural change, the object of the following pages will be be to discuss the probable causes, & consequences of the morbid state under consideration.

On Albuminuria.

Albuminuria, is the term applied by M. Martin Solon, to that abnormal state of the urine, in which coagulable matter presents itself, on the addition of heat, & certain Chemical reagents.

Before discussing the subject however, it will be well to describe,

1st. The means of detecting Albuminuria,

2dly. The general characters of the secretion in Albuminuria.

3rdly. The Microscopic characters of the urine in that disease.

4thly. The general characters of the blood in the advanced stage or persistent Albuminuria.

1st Obj. Tests for the detection of Albumen.

The tests usually employed for the detection of albumen, in the urine, are, heat, & nitric acid; other agents have been used, as - Bichloride of mercury, Tannin, Ferro-cyanate of Potassium &c, but are more or less fallacious, acting on other constituents of the urine, besides the albumen, & presenting appearances analagous to it. The albumen begins to coagulate at a temperature of 160° Fahren. & coagulation becomes complete at the boiling point. Heat, & Nitric Acid, are not free from fallacy - however, if used alone, as a test for albumen, they must be used conjointly - as for instance Heat, if used alone, may throw down a white precipitate, (which may be mistaken for albumen), when the urine contains an excess of the earthy Phosphates; - Nitric acid

however, added to this precipitate, immediately dissolves it, renders the suspected liquid clear, whereas coagulated albumen would remain unchanged on the addition of nitric acid.
On the other hand, nitric acid, alone, will sometimes produce a white amorphous precipitate, (when the urates are in abundance) of uric acid, it may be distinguished from albumen, by not appearing on the application of heat, alone.

According to Dr. Bunson,[1] heat, will not coagulate albumen, when the urine which contains it alkaline.

& Dr. Bence Jones[2] has shown that a minute quantity of nitric acid added to urine containing albumen will prevents its coagulation, on the application of heat.

Albuminous urine, when acted on by these agents, may become merely turbid, flaky, gelatinous or readily solid

1 Medical Gazette Vol XIV.
2 Medical Gazette Vol XXVIII page 228.

according to the quantity of coagulable matter contained.

I have seen the albuminous urine occurring in the resolution of a Pneumonia present very peculiar phenomena. coagulating slightly on the application of a gentle heat, gradually on raising the temperature assuming a perfectly transparent pinkish aspect redissolidifying on raising the temperature to the boiling point.

Nitric acid according to Dr Johnson will produce a white turbid appearance, in the urine of patients taking Copaiba. Cubebs. & substances containing resins of a certain kind. it may be known from albumen by not falling to the bottom of the test-tube. & by not appearing, when heat alone is applied.

2ndly Of the general character & appearance of the urine in Albuminuria.

The character & appearance of the urinary secretion, will be modified by the cause, or causes, which may have excited the disease, & also by its duration; the essential characters, are, however, in the generality of cases, the peculiar pale straw coloured secretion, its diminished quantity, low specific gravity, coagulability by heat, & nitric acid, & deficiency in urea, & the salts. It sometimes however varies in colour, it may be voided merely turbid, or it may present a milky or chylous appearance. Chylous albuminuria as denominated by Dr. Prout[1] according to Dr. Christison, it occasionally presents a cherry red (obviously from blood) reddish brown, or pale smoke brown co-

[1] Prout on the Urinary organs. Page XL.

lour, sometimes a peculiar lemon, or orange tint, each dis-appearing on coagulation of the albumen.

The Specific Gravity, varies, according to Dr. Christison, between 1020, & 1012. but in one case, where the urine was not in excess, was so low as 1004. M. Martin Solon, estimates the density at average 1015. but ~~in~~ once observed it so low as 1003, in this case, however, the quantity of the secretion was large being 144 ounces, Dr. Watson considers the mean density of the urine in this disease, not to exceed 1013.

Now in albuminuria, the essential peculiarity is, deficiency, or diminution in the quantity of urea, & an addition of albumen, & notwithstanding the addition of the denser principle albumen, the urine is found to have its Specific gravity diminished, instead of increased: it follows therefore, as a matter of inference, that the denser constituents, proper to healthy urine, must, be deficient to such an extent, as to more than counterbalance the

weight derived from the new principle albumen, Which has been shown to be the case - Dr Christison[1] found the solids decrease, as the disease advanced, thus.

In health.

Quantity	Density -	Solid parts
34 Ounces	1029	67 in 1000
	In diseased kidney (with albumenuria)	
12 Ounces	1009.5	24 in 1000
36 Ounces.	1006.9	15 in 1000

The urine, then, in a state of health, contain 67, or 58, parts, in 1000, of solids whilst in diseased kidney, the amount has been ascertained to have diminished to 12, or 14. parts, & in some cases according to Dr Watson[2] so low even as 6 parts in 1000. at the same time, a remarkable change takes place, in the economy, viz. urea disappears, or diminishes in quantity, in the urine, & appears in the blood, whilst albumen, (at the commencement of the disease) becomes, diminished in quantity in the

1 Christison on the Kidnies - page 54.
2 Watson. Practice of Physic. Albuminuria.

blood, & demonstrates itself in the urine. M. Martin Solon. on this account conjectured, that the albumen might be formed at the expense of the urea, by a slight alteration in the ratio of their elements but Dr. Christison has satisfactorily shown that such is not the case. as in instances where the amount of urea has been small, the proportion of albumen has been small also, & in cases in which a large amount of albumen has occurred, a large amount of urea, has also presented itself, therefore the albumen is not vicarious of the urea; the deficiency in urea then will not always account for the low density, other solids must be wanting. M Martin Solon found that the calcareous salts, were peculiarly deficient, in the advanced stages, no precipitate having been occasioned by oxalic acid when added to the urine; Lithic acid, & various salts, have been found deficient. it seems but rational, therefore to infer that the quantity of the lithates, phosphates, & other solids, the produce of secondary digestion, must, necessarily, in albuminuria,

become more or less diminished in quantity, on account of the continual drainage of albumen from the blood, so lowering the vital action of the tissues, retarding secondary digestion, as to furnish those solids, the result of secondary digestion, in less quantity, than when that vital power is unimpaired, & of the natural healthy standard. Hence one source of deficiency of solids in the urine.

3rdly Of the Microscopic Characters of the urine in albuminuria.

The appearances presented under the microscope, will be influenced by the exciting cause & stage of the disease, whether acute or chronic, inflammatory, or passive. In acute desquamative Nephritis, according to Dr. Johnson,[1] the urine will present coagulated fibrin, blood corpuscles, cells having the appearance of renal epithelium, casts of the tubes, & occasionally, crystals of uric acid,

[1] Dr. Johnson on the Kidneys.

casts of the uriniferous tubes, composed of fibrin, having blood corpuscles, & epithelial cells entangled in their walls, which Dr. Johnson calls epithelium casts. average diameter $\frac{1}{700}$ of an inch. occasionally there are corpuscles smaller than epithelial cells, apparently intermediate in structure between epithelium, & pus corpuscles = true pus corpuscles. The "epithelial casts", with scattered epithelium & blood corpuscles are indicative of a recent attack of acute desquamative nephritis. the granular casts appearing day after day denote a chronic stage of the disease. When the acute stage, has continued a few days, some of the scattered epithelial cells, or those entangled in the casts, may be seen to contain globules of oil, some cells containing two or three globules, others being filled, & perfectly black with them, free oil globules are also seen, having escaped by rupturing the cell wall.-

I have seen free oil globules, in 2 cases, appear in less than 12 hours after having ligatured the renal vein, in a rabbit. If the albumin-

uria, be the consequence of hæmaturia, the result of rupture of some the vessels in the kidney, ureter, or bladder. a quantity of blood corpuscles, with coagulated fibrin, will present. if the blood should come from the Malpigian bodies, blood corpuscles, globulin fibrinous moulds of the Malpigian capsule, & fibrinous casts of the tubuli uriniferi, will be found.

In acute nephritis, occurring in children, according to Dr Johnson,[1] oil globules very rarely show themselves either in the cells or in the casts.

If albuminuria be the result of a healthy eliminative process, as that occurring at the resolution of a Pneumonia; amorphous lithate of ammonia & particles having the appearance of broken down tissue, may be seen.

Spermatazoa may occasionally appear, & in one instance recorded by M. M. Solon[2] gave rise to temporary albuminuria.

if the urine be left for some time before examination, vegetable fungi will general by occur.

1 Dr. Johnson on the Kidney.
2 M. Solon. de l'albuminurie.

4th Of The general characters of the blood, in persistent albuminuria. ———

The appearance of the Patient, & the character of the blood, both undergo remarkable changes, as the disease advances, thus, the blood becomes charged with urea, its proportion of fibrin varies, its hæmatosin diminishes, & the density of its serum, by loss of albumen, becomes lowered. According to M. Martin Solon, the quantity of albumen in this disease is always reduced. Dr. Christison however considers it an invariable character at the commencement of the disease, but, has found it much increased during the latter stages.

The proportion of albumen, in healthy blood, averages from 65, to 69, parts in 1000, Dr. Babington has found it reduced to 16 parts in 1000.— The Specific gravity of

healthy serum, ranges between 1029, & 1031, in this disease, being (in the first stages) seldom above 1022, often so low as 1020, & occasionally 1019- according to Dr. Christison. Dr. Watson considers 1024, 1020 & even so low as 1013 as the average density.

Dr. Christison, has pointed out the interesting fact, that the density of the serum, bears a definite inverse ratio, to the coagulability of the urine. The more albumen existing in the urine, the less in the blood, & vice versâ.

In the early stage, the blood drawn from the arm, generally presents the inflammatory character, it coagulates with a thick firm, cupped, buffy coat, the serum is somewhat lactescent, yields a small quantity of concrete oily matter, when agitated with sulphuric ether.

The solid contents of serum, are reduced from 100 or 102 parts in 1000, to 58, 54, or even 52 parts in 1000. The reduction, Dr. Christison believes, ~~detracting~~ affecting equally the albuminous, & saline constituents.

Another remarkable deviation from the

the normal state, is the appearance of urea in the serum. Dr. Christison in 1829 established the fact, which has since been confirmed by many, that, whenever the discharge of urea by the kidneys, is diminished, materially, it may, in every case, be detected in the serum. If the urine, however, approach the healthy standard in point of quantity, as in the early stage of the disease, or from any incidental cause exceed the natural amount, the urea cannot be satisfactorily detected, ~~either~~ under these circumstances, although traces, of its existence may be elicited.

The Fibrin, in the early stage, is generally increased, especially when any inflammation of the serous membranes happens to coexist. Dr. Christison found the fibrin in healthy human blood to vary from 25, to 52, parts 10,000, in the early stage of diseased kidney, to range between 82 & 30 parts, in 10.000.

The Hæmatosin during the early stage is not at all or very slightly affected.

The Serum in the advanced stage regains

its density, even, occasionally, when it increased, as Dr. Christison mentions having seen ~~a~~ cases, in which the proportion of salts, & albumen, to the entire blood, ~~was~~ has been so high as 973 in 10.000 parts. the natural standard being, according to Lecanu, between 780, & 800,, according to Dr. Christeson's experiments, 816, & 853, parts in 10.000. in the advanced stage, the urea often disappears, but manifests itself in larger proportion than ever, in the latter stage.-

The fibrin in the advanced stage varies between 85, & 43 parts in 10.000.

Lastly, the rapid reduction of colouring matter, or hoematosin, in this disease, is a remarkable feature, becoming reduced to less than $\frac{1}{3}$ its natural quantity, Dr. Christeson adopts 1335 parts in 10.000, as the average proportion of hoematosin in the male sex. She found, that in the first week of the disease, it was 1339 in a stout man not previously bled.— 1111 in another powerful man one month ill but once or twice previously bled; in another strong

man, 5 weeks ill, & once before bled, it was 1046, in 10,000 — in a stout porter ill probably for 2 months, & once before moderately bled, it was 4 55 — in a lad 2 months ill, recently bled, largely, it was 564 — & in a young man, ill for 3 months, & a half, subsequent to Scarlatina, & who had never been bled before, it was only 427, parts in 10,000.

Thus, we see the blood impoverished, and the colouring matter reduced, in proportion to the amount of albumen eliminated. Dr. Christison remarks, "I am acquainted with no natural disease, at least of a chronic nature, which so nearly approaches haemorrhage, in its power of impoverishing the red particles of the blood; hence the peculiar, pallid, or dingy hue, of the Patient's skin, the leucophlegmatic, or even waxy aspect, which invariably, stamps the victims, of this complaint, —

And it is easy to conceive that it should be so. When it is considered, that the principle, necessary for the growth of the corpuscles, (& that the health & colour of the blood

are influenced by those corpuscles) is continually being eliminated from the system, instead of administering to their nutrition. In that stage of the disease, in which the serum regains its density, the non return of the colouring matter, will, I presume, depend on ~~one of two causes, either~~ the diminished assimilative, or elective power, of the cells concerned in its formation; induced, by the presence of urea, or other morbid substances circulating in the blood - the urea, & other abnormal principles being retained in the blood, in consequence of a diminished, or lost, elective, or eliminative power, on the part of the cells, in the kidney, proper for their elimination, being insufficient for that purpose; so, that either the kidney, or the blood, may induce the diseased state, but the kidney, by its impaired eliminative function, not only keeps up the disease, which it may have caused, itself, primarily; but by leaving irident matters, in greater or less quantity, in the circulation, poisons the blood, & effects lesions in other parts of the body, predisposed to disease.

On adverting to the preceding remarks, on the principal changes taking place in the blood, urine, in albuminuria, several questions will naturally arise; we see that certain principles, peculiar to the blood, & urine, individually, in a state of health, under some morbid influence become common to both, or that a transposition of certain of their component parts takes place, thus, blood corpuscles, & albumen, proper to the blood only, when in a normal state, have, in this disease, their natural proportion reduced, in that fluid, & appear in the urine; whilst, on the other hand, urea, & certain salts peculiar to the urine, when in a normal state, are reduced in quantity or nearly wanting to that secretion, & become manifest in the blood- at the same time, the kidney, the medium of communication between the two abnormal fluids, presents characters differing in a greater or less degree from the natural healthy condition-

Now under these circumstances, the

pathological appearances seen in ~~each~~, the blood urine & kidney - would seem to depend each more or less on the other for its abnormal state, how far then are we entitled to attribute the cause of the morbid condition to either one or other exclusively? Is albuminuria a consequence of a morbid state of the blood, or of an impaired function, or altered structure of the kidney? That the exciting cause may originate in either the blood, or the kidney; or be independent of both, will be the object of the following pages ~~to endeavour to~~ to determine

And firstly, Does albumen in the urine, always imply organic lesion of the kidney?

We have abundant proof to the contrary, the urine may become albuminous from various causes, as certain articles of diet, any impediment to the circulation, causing mechanical congestion, by impeding the return of blood to the heart, certain poisons, effete matters, thrown on the kidney in consequence of

suppressed function of the other emunc-
tories, fever poisons, blood ~~in~~ ~~th~~ becoming
exhausted into some part of the urina-
ry apparatus, &c. from many other causes
in explanation of which, many theories
& opinions, have been advanced.

M. Martin Solon, conceives it is
not contrary to the laws of Physiology
to attribute the appearance of albumen
in some instances to nervous influence,
for says he," do we not see the urine
formed from lime water (serum) under
nervous influence, why, then, by the
same nervous power should it not
load itself with a new principle albumen con-
-tained in the serum - from which
its watery elements are derived.
In ~~th~~ disproof of its being an invari-
able sign of organic lesion M. Solon'
mentions two cases of temporary albu-
minuria, one of rheumatic origin, the
other, caused by a large quantity of com-
mon salt having been swallowed.
in both cases the albumen disappeared on
M. Martin Solon. Dict. albuminurie.

the second day.

Dr. Graves[1] of Dublin thinks the kidnies are not attacked in structure in many cases of albuminuria in connection with dropsy, but that the abnormal state may depend on functional derangement of the system, he has found it occur after the administration of opium. Dr. Christison. M. Solon. Voget. Blackhall. Johnson & many others, have mentioned cases of temporary albuminuria in connection with valvular disease of the heart & anaraeca, M. Solon attributing the cessation of the albuminious urine, to the removal, by some causes or others of the impediment to the return of blood to the heart, Dr. Christison[2] considering its cessation, to be generally due to an arrestment of the progress of disorganization of the kidney. Dr. Blackhall[3] & many others have found

1 Graves. Archives. 2nd series. vol 6. page 559.

2 Christison on Kidnies, case XXIV.

3 Dr. Blackhall. on dropsies.

it follow the exhibition of mercury.

Heave found the urine form a dense coagulum after the administration of mercury to a rabbit.

according to Dr. Johnson! Copaiba cubebs many diuretic medicines will induce it.

Albuminuria occuring from any of these causes, may, after having continued for a limited period; disappear entirely, without any detriment to the kidney- or it may continue, its persistence being influenced by many circumstances, which will be afterwards discussed.

Thus we see albuminuria may be either either "Temporary" or "Persistent." the one verging intor the other, & both, in many cases, owing their origin to the same cause- under these circumstances Albuminuria. may, I think be advantageously considered under four different heads named according to the exciting cause of the disease. thus.

Johnson on the Kidney, p. 163.

I. Mal-Digestive. or that resulting from an imperfect formation from sanguification of Chyle (?)

II. Eliminative, or Critical. or that occurring at ~~the~~ the resolution of certain febrile or inflammatory diseases.

III. Congestive albuminuria. the result of mechanical impediment to the return of blood from the Kidney.

IV. Inflammatory albuminuria

Firstly Of Mal-Digestive Albumminuria.

I. In a state of health the various constituents of the blood bear a pretty definite proportion one to the other, this proportion being kept to its natural standard by an assimilation & melting down of certain elements derived from the Chyle, & an elimination of the redundant products. in other words by Digestion, assimilation, & secretion any of these elements being superabundant being thrown from the circulation, either

in the form of deposits in the tissues, or as Carbonic acid sweat &c by the various emunctories, the skin, lungs, liver, kidneys &c. it follows, therefore, that digestion becoming impaired either by an improper diet, by a vitiated state of the different juices, Pancreatic, Gastric, &c concerned in the formation of the chyle, that the various elements constituting that chyle, the product, of that digestion, will be, to a greater or less extent vitiated also, & appear in abnormal proportion in the blood.

Now in albuminuria, dyspepsia, is generally a leading feature amongst the ~~other~~ complications; but, as in most other cases in which it occurs, symptoms are necessarily so numerous, that the dyspepsia, is almost invariably lost down, as common with the other complications as a symptom, or secondary affection, without any consideration as to its being a cause of the disease.

Judging from analogy, Why should not the blood at times contain a superabundance of albumen, as a result of

mal-digestion, as well as a contain supernabundance of sugar in Diabetes- or any other product, in abnormal quantity, & throw each, in like manner from the system, as matters foreign to the economy.

In support of the theory of its mal-digestive origin- How is it that the urine ~~of~~ in the commencement of Diabetes is found albuminous?

Dr Blackhall[1] speaks of albumen in connection with diabetes.

Dr Prout[2], says. "Sometimes diabetic urine contains a little blood, & not unfrequently albuminous matter analogous to ~~chyle~~ that of the chyle, I have seen it also contain a white milky fluid precisely similar to chyle which slowly subsided to the bottom of the vessel.

An albuminous condition of the urine with more or less of structural change in the kidney, has as Dr Christison[3] remarks been observed to occur so frequently in

1 Blackhall on Dropsies p. 67
2 Prout on urinary organs p. 61.
3 Library of Practical medicine Vol IV p. 253

connection with diabetes, that their occurrence can scarcely be looked upon as altogether accidental.

Now according to Dr Watson, in diabetes, even after the enormously increased duty the kidneys has had to perform, the pathological appearances presented by that organ after death, have been comparatively trifling - amounting in many cases to merely a slight increase of vascularity, but no change of structure

Andral & others, tell us that, the kidneys are hypertrophied in diabetes, which is not to be wondered, at when we reflect on the vastly increased amount of duty required of those glands in this disease,

but if albumen is found in the urine, in diabetes, & after diabetes has continued for many months, no change is found in the structure of the kidney two facts are proven, namely, that a congested state of the kidney is not always the cause of albuminuria, & that increased functional duty, may be continued for a long time without the same

phenomena being induced, as are generally attributed to that cause in albuminuria—

Dr. Prout mentions a case of what he has called "chylous albuminuria it occured in a woman at 30. it made its appearance 12 months previously & the patient had symptoms of diabetes. she also had great difficulty in passing water in consequence of the coagula which formed in the bladder, blocking up the urethra. the specimen voided in the evening after an early dinner, so closely resembled chyle, ~~that~~ (says Dr. Prout) if it had been brought to me as a specimen of that fluid I am doubtful whether I should have detected the imposition. It consisted of a solid coagulum of a white colour, & assumed the shape of the vessel like "blanc-mange." on being submitted to pressure & allowed to drain, the residual solid portion, was small in quantity & presented a whitish appearance, intermixed with strings of a fibrous consistence. Iced colour the

serous part was a whitish opaque, like milk, & on being heated & allowed to stand some time, threw a substance on its surface very like the cream of milk- & which like that substance, was found to contain a considerable amount of a butyraceous principle. Sp. Gravity of the fluid 1.0175. smell not unmous ~~still~~ could after ~~coagulation~~ concentration by heat. when it yielded distinct traces of urea.

The chylous urine in this case was evidently due either to imperfect formation, or imperfect assimilation of chyle. & probably independent of any change of structure in the kidney Dr. Prout saw this woman 4 years subsequently & the urine continued in the same condition, in the mean time she had borne a healthy living child.

-But to reason theoretically,

In what ~~of~~ way might mal-digestion be presumed to influence the proportion of albumen in the blood, or urine, & under what circumstances

might it be anticipated?

the food of man must contain saccharine oleagenous & albuminous principles, which are acted on by the mucus, saliva, pancreatic, & gastric juices & the Brunnerian & biliary fluids.

the saliva acts by converting boiled starch &c into dextine & sugar & finally into lactic acid; & gastric juice reduces all albuminous, & gelatinous principles; & the pancreatic juice, is supposed by Bernard, Bidder, to dissolve the oil & fat; as it has been found that in certain diseases of the pancreas, the oil & fat, have passed from the bowels in an undigested state. now if from organic disease, or a vitiated state of the pancreatic, or other secretion, the oleagenous particles are not dissolved, so as to form a proper emulsion with the other principles entering into the formation of the chyle, & if that it requires both oil & albumen to form cells, it follows that from an incapacity of the albumen to form cells of

itself that in superabundance of albumen must necessarily be thrown into the circulation in proportion to the other constituents of the chyle & the surplus be eliminated as matter foreign to the economy.

conceiving that the pancreatic juice might be concerned at times in the production of albumen in the urine by not exerting its solvent properties on the oil & fat in the duodenum,

I succeeded in tying the pancreatico duodenal duct together with the artery & vein communicating with the pancreas, in a dog, having previously given the animal a plentiful meal containing oily & albuminous principles. the dog died in about 12 hours & the bladder contained about 3 drachms of urine slightly coagulable by heat & nitric acid

Whether the production of albuminuria is to be attributed to the absence of the pancreatic juice, or to what extent nervous influence excited by the perito-

nitis or other sources of fallacy may have been concerned in its production I am not prepared to say; it most undoubtedly was in the urine from some cause or other, I shall however repeat the experiment & hope to come to a more definite conclusion -

According to many Authors albuminuria has occurred in a greater number of phthisical cases than any other but in these instances marked lesion of the kidney & other organs are usually found to coexist, now in Phthisis according to Dr Bennett who tried the experiment in a great number of cases, the greater part of the alimentary canal presents an acid reaction, instead of an alkaline one, now the reaction of pancreatic juice when healthy is alkaline, & if it requires an alkali to dissolve oil & allow it to form an emulsion with the other elements of the chyle, then the emaciation of the Patients, & the albuminuria might be accounted for, by the absence of that alkaline principle & the superabundance of vitiated

acid secretions in the first instance, although a diseased state of the kidneys might be induced by the morbid state of the blood caused by that matter & the means of a continuance of the albuminuria, again, if nervous influence can cause diabetes why should not that same influence cause albuminuria? we see the two diseases commence simultaneously - & the kidney little altered in structure after a long continuance of the disease, if then albuminuria occurs, as some say, only, as a consequence of a deposit or degeneration of the kidney, why should there be no degeneration of the kidney, or deposit in it, after the albuminous stage of diabetes? - are we not rather to infer that it may be result of diseased blood & independent of organic lesion of the kidney, & look to a process which influences so much the quality of the secretions, namely ~~digestion~~ nutrition, for its cause? I shall consider that coagulable condition of the urine induced by irritation of the kidney, caused by products of mal digestion under the head of eliminative al-

buminuria,.- Bernard & others have found on injecting the veins of dogs with a solution of albumen, that the urine has become albumen-ous

II of Eliminative or Critical albuminuria

Under this head I shall consider, that coagulable condition, occuring at the crisis of certain inflammatory diseases, as on the resolution of a Pneumonia, dropsy &c, or occuring as a result of certain poisons or effete matters, (inducing "sub acute inflammation of the kidney" so called by Mr. Simon') circulating in the blood; as the products of faulty digestion; the lithates, the oxalates, sometimes of matter cast on the kidneys in consequence of suppressed function, in other organs, as the skin, or the liver, or from the mysterious ferment of a fever poison, as happening, occassionally at the crisis of certain febrile diseases, cases have been enumerated by many Physicians of albuminuria demonstrating itself at the crisis of Scarlatina, Erysipelas, Small-Pox, Measles, Typhus, &c; certain articles of Lond. Medical & Chirurgical transactions Vol XXII. Virkes Physiology.

diet, & various medicaments, have been found to occasion it, as Mercury, Canthurides, Copaiba Cubebs, &c. on the absorption of a pneumonic collection or dropsical effusion from either of which causes the kidney if predisposed to disease may take on a sub. acute, or acute inflammatory action, & in consequence of its increased effort to eliminate the morbid matter.

This holds good so far as the elimination of fever poisons & medicaments, are concerned, but can we attribute the appearance of coagulable matter in the urine or the resolution of a pneumonic, or other collection, containing albumen, to the same irritation; & inflammation. I believe in many instances it is independent of all such inflammatory action, ~~because the kidney the~~ because it may be looked upon as a healthy process, & if the effused matter when diluted in the blood, ~~it~~ would exert an inflammatory action on the kidney; so much the greater would the inflammation ~~be~~ or irritation be in the absorbents conveying it, in a more concentrated state to the blood.

which, if such were the case, would aggravate in a great degree the constitutional symptoms; now at the resolution of pneumonia the symptoms gradually disappear as the albumen shows itself. & again if it is the quality of the blood, not the quantity, carried to the kidney, that irritates it & causes the effusion of serum (if it were quantity, albumen would be invariably associated with diabetic urine) why should not these same morbid matters existing in the blood circulating in other parts of the body, equally delicate, irritate & induce the same phenomena in ~~other~~ organs predisposed to disease, rather than the kidneys? such I presume is the true cause of inflammatory dropsy occurring in connection with scarlatina - which will be considered presently. in which dropsy there is frequently no coexisting albuminuria

another circumstance favouring the view of occasional inflammatory origin of coagulable urine, during the eliminative process attending the resolution of albuminous collections, is the fact, that certain animal & vegetable productions, as various salts

odorous, & coloured principles, & introduced into the circulation, are eliminated without exercising any injurious effect on the secreting cells of the kidney, & with the same facility as though they were normal elements of the secretion.

In regard to the albuminuria concomitant to certain febrile & other acute diseases, many conflicting statements have been adduced, especially in reference to that condition of the urine occasionally happening in connection with Sciatica & the analogous skin diseases. I shall therefore take sciatica to illustrate this albuminuria occurring in these febrile diseases.

& first. In regard to the frequency of the appearance of albumen in the urine in this disease, many opinions are prevalent, as also in regard to the cause of its appearance. some affording evidence of its frequent coagulability during the desquamative stage, others from careful experiments & observation opposing it.

Dr Anthony Todd Thompson[1] says. that the urine is always albuminous, when dropsical symptoms appear.

Dr J. W. Begbie[2] thinks that if careful experiments were made, albumen in small amount would be found to exist in every case of scarlatina.

Dr Begbie ~~tried~~ examined the urine in 21 cases of scarlatina & found the urine in some stage of the disease to be in every case albuminous

Dr Gillespie has recently published an article on Scarlatina, in the "Monthly Journal of Medical Science" in which he states that albumen was not found in a single instance during the desquamative or other stage in a great number of cases, & accounts for the antagonistic opinions on this subject, by conceiving, that some peculiarity must have existed in the disease, during the epidemic in which Dr Begbie &

1 Dr Anthony Todd Thompson on the Skin (diseases of)
2 Dr J. W. Begbie. Monthly Journal of Med science. Oct. 1852.
3 Dr Gillespie. Monthly Journal of Med Science. March. 1853.

others made their observations.

Anasarca & chemical effusions were very numerous during that epidemic.

In the Monthly Journal of medical Science Octr 1852. Dr Bennett records four cases of scarlatina are recorded, which occurred in the Royal Infirmary, under Dr Bennett. in which, particular attention was paid to the examination of the urine daily & in neither case did albumen demonstrate itself.

In the course of my dispensary practice I have had 13 cases of scarlatina - 18 children in two families, having had it more or less severely in the course of 3 weeks.) & in 3 cases out of the 13, only; did I detect albumen - in one case where the symptoms had been very mild. & the desquamation amounting merely, to a few bran like scales - but where the child had been exposed to cold, I found the urine slightly coagulable & the feet slightly swollen, on the ninth day from the commencement of the rash. This occurred ~~in the boy 3 years of age~~. in James Mason. residing, at 13. Potter Row. aged 3 years

In the second case, ~~the~~ Robert Young. aged 12

residing in Weirs Close, Canongate. the was seized with rigors on the 18th of January this three sisters were just convalescing from the scarlatina,) on the 20th a slight rash appeared on the chest but soon passed away & the affection was principally of the throat the glands being much swollen & the tonsils ulcerated. the discharge of saliva was also great, the tonsils were touched with a strong solution of nitrate of silver. & small doses of Dovers powder given, with a draught containing chlorate of Potass, the throat became less painful, & the glands diminished in size, & discharge of saliva abated, albumen appeared in the urine which was on the 27th on the 31st albumen had disappeared & the boy was convalescent. The third case was one of Cynanche Maligna, & occurred to James Cameron. St Marys Wynd - aged 18 months, this was entirely a throat affection but much more severe than the last, albumen appeared on the 14th day of the disease. & from that time the child seemed to improve, symptoms of effusion on the brain, having preceeded the

appearance of albumen in the urine — owing however, to the difficulty of procuring the urine, on account of the youth of the child (being only 18 months,) I cannot say how long the albuminous condition lasted — it was not present on the 26th day of the disease on the 30th the child was convalescent but had a troublesome discharge from the left ear & a corresponding soreness of the left eye.

Now what is the origin, & or rather what is the cause of albuminuria, in connection with this disease? it is generally attributed to ~~it~~ ~~suppressed~~ an accumulation of morbid matter in the blood, in consequence of a cessation of the secretory function of the skin, these morbid matters being thrown upon the kidney, & by their irritating it, causing an acute dequamative nephritis. the usual exciting cause of the suppressed function of the skin being, cold, or damp, or exposure too soon to the open air.

Dr. J. N. Begbie, considers it to be as essential a symptom of the disease as is desquamation of the cuticle, to be associated

to a certain extent with that desquamation, to be, in fact the results of a desquamative process which the mucous membranes in this disease, equally with the skin are subject to.

If it were the result of a sympathetic process - in every case in which desquamation occurs, we should have epithelium cast from the tubuli uriniferi, which is probably the case, but ~~the~~ increase of epithelium in the urine will not constitute albuminuria. in one of the cases mentioned by Dr. Bennett, the critical discharge of epithelial cells & casts was great, but no albumen whatever appeared.

Cold by suppressing the function of the skin, is the other generally supposed cause. Can the suppression of albuminuria be always attributed to irritation caused by the passage of an increased amount of effete matter or poisons through the kidney?

1st. I think it is evident that albumen occurs in the urine in this disease, by no means as an invariable rule, that when it

Monthly Journal Med. science page 405. case IV.

does occur, the kidney has been predisposed to disease, & that the same matter circulating in the blood, which, in one person, produces an acute nephritis, will produce in another person - a pleurisy, & another ~~an ascites~~, if the parts are so predisposed. & leave the kidney intact if previously healthy - I have heard of several men having been exposed for some time at sea, in an open boat, during a violent thunder storm; the exciting cause, was the same, ~~but~~ & all were in good health before its ~~application~~ occurrence, but the consequences in each case were different, in one instance it induced a pleurisy, in another an acute rheumatism & in another an affection of the kidneys, the next was seized with an attack of gout & the last one caught a Bronchitis - the remainder escaped any bad effects.

From the fact of albuminuria having occurred in cases, where the affection has been entirely glandular. & no desquamation of cuticle having taken place, I presume it has, in these cases been owing to the action

of the peculiar poison on the kidney ~~acted~~
irritating the gland in the same way as it
did the parotid, & salivary glands, & necessarily causing an increased discharge
of epithelium & albumen, as it did from
the salivary glands, in fact acting on
the secreting cells of all the glands, in the
same manner as Mercury, Iodide of Potash
& certain other chemicals, do, when they exert
their specific action; & that therefore albuminuria
may occur independently of any sympathetic action existing between the
skin & secreting cells of the kidney.

but as in scarlatina the cutaneous capillaries are undoubtedly greatly
concerned, as indicated by the peculiar
colour of the surface; & as dropsy, acarus,
& albuminuria, are frequent sequelæ
to this disease, might not each, whether occurring singly, or simultaneously, be looked upon, as the result of impaired vital power, or action, of the local capillaries, occurring sympathetically with the altered state of the cutaneous capillaries, & the albuminuria
be considered a passive dropsical effu-

sion, finding vent by the meter, whilst a similar effusion occuring in closed sacs in other parts of the ~~body~~ body predisposed, by previous inflammation or otherwise, would form an ascites, a hydrothorax, or in the areola tissue, an anasarca. ———

III. Of Congestive Albuminuria, or that resulting from an impediment to the return of blood from the kidney—

The function of the kidney is to separate certain watery, saline & other matters from the blood, which if left in the circulation would act injuriously on the system, for this purpose it is furnished with an artery to bring the materials, & cells, tubes, to convey the separated matters away— the artery, after having entered the substance of the gland, divides into branches, corresponding in number to the dilated ends of the uniferous tubes, which when occupied by the ramifications or subdivisions of one of these primary branches— constitutes (according to Mr Bowman—) the Malpighian corpuscles. the artery then, when it arrives at one of these dilatations or Malpighian capsules, pierces it.

& divides into 2. 3. 4 or even 8. twigs which run in a tortuous manner & subdivide once or twice in their course. becoming very thin, & of a fine homogenious structure. they then turn inwards (so forming a ball) & unite to form a single vessel, which leaves the capsule by perforating it, at the artery entrance, & nearly close to the artery. the efferent vessels from these Malpigian corpuscles enter a plexus of capillaries lying between the uniferous tubes (& in contact with their walls,) they anastomose freely & form a continuous net work throughout the whole organ, having arrived at the outer surface of the convoluted tubes, they form themselves into small venous radicles, which unite & form the renal or emulgent vein Thus, we see, the circulation in the kidney, being furnished with two sets of capillaries, is rather complicated, indeed in considering it in relation to absorption, we may look upon it, as made up of a number of independent circulations, each Malpighian corpuscle, being capable of becoming congested & effusing serum without interfer

ing (under certain circumstances) with the functions of the rest. Therefore the amount of congestion, (as any obstruction to the return of blood from the kidney, or single Malpighian body, will cause it.) will be modified, as also will the amount of serum, or albuminuria, & the severity of the symptoms, by the amount & proximity of the impediment; to the Malpighian corpuscles; the congestion may be partial or complete, & the exciting cause originate either in the gland, or at a distance from it.

That a congested state of the bloodvessels of the kidney may cause albuminuria has been shown by Dr. Geo. Robinson[1] who caused it artificially by tying the renal vein in rabbits.

I performed the same experiment some time since in 3 rabbits (being unaware of its having been previously done) & found the urine presenting in each instance a bloody appearance - coagulable by heat & nitric acid, & presenting under the micro-

[1] Medico Chirurgical Transaction Vol XXVI.

some casts of the uniferous tubes. blood corpuscles. & great number of free oil ~~corpu~~ globules.

Now, what are the causes of renal obstruction?

It may arise from many causes, but the cause modifies the effect only, & not the mechanism of the action,

The congestion may arise from valvular disease of the heart, as by in capacity of the mitral valves to empty the right ventricle, causing retardation of the flow of blood in the vena cava ascendens, so by its retrograde action on the renal capillaries, inducing their plethora, this together with a certain amount of pressure derived from the arterial impetus, causing an effusion of serum, the only means ~~by~~ which (if the obstruction were great) the vessels could unburden themselves. When this is the cause the congestions will necessarily be of the whole organ.

Many consider that the Heart disease occurring in connection with albuminuria is a secondary affection in-

duced by the albuminuria - or kidney disease - but if albuminuria causes heart disease, why should not an anasarca or other dropsical effusion be the cause of it? perhaps as one objection it might be said that effusions caused by heart disease occur at the extremities, where the circulation is weakest, first; as in anasarca, at the ancles; but when we consider the delicate structure of the capillaries in the Malpighian corpuscles & ~~their lying~~ & the fact of their lying free in the capsule - having no support to their walls, might we not infer that a less degree of obstruction might at times congest these unsupported capillaries than would be required to congest, capillaries situated more favourably for the process - but having their walls supported - heart disease may, doubtless, be caused or induced ~~by the~~ by albuminuria in some instances by impoverishing the blood, but any other drain on the system will induce the disease as well. & although many cases of heart disease coexist with albuminuria &

deposits in the kidney - still many cases of diseased kidney & albuminuria of long continued duration occur without any lesion of the heart.

Tumours of any description by pressing on the vena cava, or renal vein may cause the obstruction.

It may arise as a consequence of inflammation or other deposits in kidney itself. and this leads me to say a few words in regard to the nature of these deposits

uric acid, oxalate of lime - & other calculi, may by pressing on the efferent vessel emerging from the Malpighian body or bodies, cause it; an inflammatory action may be set up in consequence of a blow, exposure to cold, &c. or any other cause, exciting an effusion of coagulable lymph. As a natural consequence a greater or less mechanical congestion of the gland. deposits of fat as in the "Fatty kidney" may cause it - & in the albuminuria occurring in connection with puerperal Convulsions - might not the cause be attributed to a sympathetic nervous

influence existing between the uterus & kidney, which by stimulating the latter organ, (as sympathetic influence will stimulate lymphatic & other glands in other parts of the body) causes an effusion of serum, & by interfering with the function of its secretory cells, prevents the due separation of urea & other effete products from the blood, thereby ~~caus-~~ ing inducing convulsions, as a result of the morbid substances circulating through the nervous centres.*

Does the deposit of fat in the kidney precede, or is it a consequence of consequence of congestion.

Dr Robinson Bright & others think that a congested condition of the kidney precedes all the other stages of the disease

Mr Toynbee' considers the congestive condition of the organ to necessarily precede the deposition of fat. the enlargement of the organ itself or any of it tubes, vessels, or any other change

Dr Johnson differs from these for

* Medico Chirurgical Journal. Vol XXIX.

he says, "There is no reason for believing in the existence of any congestive stage as necessarily preceding any morbid change & he considers the primary obstruction to arise from a morbid deposition of fat in tubuli uriniferi.

but as my ~~the~~ object is not to treat of diseased, fatty, or "Bright's kidney so called, not to treat of the origin of morbid matters deposited in the kidney, but of the causes of Albuminuria & the effect of these morbid matters in inducing it. I shall pass by the subject merely making one observation, which is that, taking into consideration the facility with which, under certain circumstances, the urine from a congested kidney, will coagulate when out of the body, would there be any thing irrational in concluding that, ~~th~~ from some chemical change, or action, on the fluid, in the tubuli uriniferi, the same coagulation might take place, & by the tortuosity of the tube impeding the ~~#~~ elimination of the deposit, causing mechanical obstruction? This would

account for the appearance of the tubes in cases where fat cannot be detected.

IV Of Inflammatory Albuminuria or that occurring as a consequence of inflammatory products, being thrown from some part of the urinary apparatus

Few words need be said in regard to the coagulable urine arising from this cause, as inflammation of a minor grade, is concerned in the production of most cases of albuminuria arising from the kidney & has been spoken of under each of the former heads,

but as it may arise independently of any change in the kidney from the ureters, the bladder, the prostate gland, or ~~from~~ from the urethra, as a result of an inflammatory process, taking place through some part of their mucous coats, & on that account affect diagnosis in

in a great degree. I have thought it ~~better~~ better to speak of, under a different head, what might seem more properly to belong to Congestive Albuminuria.

Albuminuria may occur independently of the kidney, as a result of haematuria; from vesical haemorrhage; in the first place arising from morbid conditions of the urine & in the second from diseased prostate, & or disease of the bladder. it may arise in consequence of a stone or any irritating matter in the bladder or from extravasation of blood into the ureters in the passage of a calculus. malignant tumours of the bladder during ulceration (according to Professor Miller) must furnish blood. pus has been found in the urine in consequence of a lumbar abscess opening into the bladder. gonorrhoeal matter, & the leucorrhoeal discharge from the vagina by becoming admixed have occasioned ~~albu~~ coagulable urine as also has abscess of the kidney. in diagnosticating ~~between~~ the different causes

1 Johnson on the Kidney. p. 503

of albuminuria, the microscope together with the general symptoms of the Patient, will be the only sure means of ascertaining where those causes probably originate, the extent of the disease & whether in an acute or chronic stage.

Albuminuria is undoubtedly of more frequent occurrence than is generally imagined, & owes its origin to many different causes - some causes being evident & others obscure - or transient ~~&~~ deposit - whatever it may be, or whatever its cause - being evident on dissection in a great number of cases in the kidney, its origin is generally attributed to that deposit. but as albuminuria frequently occurs where there is no deposit presented on dissection - are we not to infer, that the albuminuria is dependent on other causes, than those originating in the kidney? That it may arise from the ureter, or bladder, by escape of blood, is self-evident, that it may occur as a result of congestion caused by pres

on the veins, issuing from the kidney impedicts the return of blood may be presumed, when we see the analogous effusion or anasarca produced by pressure on a vein - as the femoral, by an aneurism or tumour. & by its having been produced artificially by ligature of the renal vein;

That its appearance at the crisis of certain febrile diseases is due in many cases to a reaction in the capillaries caused by nervous influence, & that nervous influence may be the origin or cause, of that albuminuria occurring in "puerperal convulsions," although theoretical, is I think a rational explanation -

That its mal-digestive origin judging from analogy, in any thing rather than improbable -

The knowledge of the cause of a disease is evidently a great step towards its cure - When the primary cause, of a morbid state of any secretion is ascertained, treatment may be timely applied, & prevent the injurious effects, on

on other secretions, or organs, which will be sure to accrue from a continuance of any morbid condition however simple. Chemistry Physiology & Pathology go hand in hand, together, & ere long, no doubt, will explain phenomina in connection with Nutrition & secretion, at present complex; & show them to be comparatively simple, in the mean time, practice must be theoretical, & as theory often leads to fact, we may, perhaps, by its means arrive at the true causes of albuminuria - and other morbid ~~d~~secretions

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