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Subject. "Sudden Death."

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Sudden Death.

finitions. Sudden Death may be defined as that form of death which occurs in an individual previously in apparently sound health within an hour of the onset of the symptoms.
If death occur within a few minutes it may be described as immediate.

quency. The frequency of the occurrence of sudden death, as opposed to lingering ordinary deaths, is guaged more or less accurately by the number of Coroner's inquests held in any given year; thus in 1888 the percentage of deaths requiring an inquest was, of those certified in the ordinary way, in Liverpool 4·76, in Birkenhead 7·1. But this is too high a percentage for our purpose as it includes all deaths which result from violence or accident, however slowly they may occur; and hence a more correct notion of the frequency of sudden deaths will be gained from certain tables of cases of sudden death, e.g. those drawn from the Manchester Workhouse and published in the Guy's Hospital Reports for 1845. During 2½ years in that institution the percentage of sudden to all other deaths was 2·59, and these figures may be taken as

79% of
e deaths

a fair indication of the frequency of the occurrence.

portance. But the importance of sudden deaths is much greater than their percentage amongst all deaths would indicate, for every sudden death shoned, and most do, form the subject of a judicial Enquiry before the Coroner or the Procurator Fiscal as the case may be. Formerly, in more superstitious times all such deaths were ascribed to the influence of witches; more lately, some 30 or 40 years ago, every sudden death was popularly attributed to apoplexy; now, in the absence of any medical proof to the contrary, the ordinary belief of the laity is that every sudden death is due to heart disease. But the object of the

esico-legally. judicial enquiry being to determine the vital question of whether or not blame be attributable to any individual or individuals, and the determination of the cause of death lying with the medical man who performs the autopsy, it is evident that it behoves the medical jurist to be ever on the alert in such cases, lest he fall into the error, on the one hand of causing the conviction of the innocent, or on the other of

uthorities

That the subject is one of no small interest and importance is proved by the number of the writers on the subject, more especially amongst the French; and though of our own nation we have the names of Allen, Mills, More Madden, Ogston, Nott, and others too numerous to mention; and amongst the Americans Brinton and others; yet it is amongst the French that we find the greatest and most numerous authorities, preeminent amongst whom stand Devergie, Bichat, & Foville. To this list must be added the name of McWilliam of Aberdeen who has lately propounded a new and most intricate theory to the effect that in certain deaths from so-called Syncope the cessation of life is not due, as usually believed, to sudden standstill of the ventricle in diastole but to a condition of so-called "delirium cordis", a condition of very rapid and irregular contractions of the heart wall, of which I shall have to speak later. (British Medical Journal, Jan. 5. 1889).

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-William on

elirium Cordis.

Now the opinion of all modern writers on Medical Jurisprudence, backed by the opinion of Taylor the classical English authority on that subject, is that death takes place by the cessation of the functions of the heart, Brain or Lungs — any one of

arieties or

des of death—

hrough Heart.

hrough Brain.

hrough Lungs.

these organs being primarily at fault, the functions of the other two are secondarily destroyed; and hence according to which of these vital organs is the seat of the fatal lesion, death is said to take place by Syncope, Coma or Asphyxia.

uivalent to death
y Syncope.
By Coma.
By Asphyxia.

Let us consider first of all sudden death as it is most commonly found in medico-legal cases. Such cases come under the head of

Violent Deaths.

lent deaths

and are classified by Taylor into

1. Poisoning.
2. Wounds and Personal injuries.
3. Drowning, hanging &c. [Suffocations]

isoning.

1. Poisoning. In any such case the recognition of the cause of death at the post. mortem examination will depend upon certain changes in the mucous membrane of the alimentary tract or often on negative evidence, i.e. on the absence of any organic lesion sufficient to account for death. In any case it will be necessary to establish the diagnosis by submitting the contents of the stomach to analytical examination. By this means suspicion may be converted into proof. The two poisons that, in small doses, produce immediate death are Nicotine and Hydrocyanic Acid. With

other poisons, to produce immediate death, require to be swallowed in large doses, and as a rule they take too long a time to produce the fatal result to allow them to fall under our definition of sudden death. True that the mineral poisons may produce immediate death by the shock due to their intensely corrosive action, or by causing reflex spasm of the glottis; but deaths due to such causes, even though induced by mineral acids, will come under consideration later on in my paper. In all cases of death by poison the previous history of the patient and the history of any symptoms or signs immediately preceding death, becomes of course of the first importance.

Wounds and personal injuries.

2. Wounds and personal injuries, such as burns, scalds &c. make themselves sufficiently evident at the autopsy. Their results, shock, haemorrhage &c. — the immediate causes of death — will receive attention later on.

Drowning, hanging &c.

3. Deaths by drowning, hanging &c. come under the head of deaths from asphyxia and in most cases the position in which the body was found is sufficient to give the pathologist his cue. But suffocation

when, on opening the chest, the lungs are found gorged with dark obscure blood, which also distends the Right side of the heart and the pulmonary arteries; whilst the left side of the heart and the pulmonary veins are entirely or comparatively empty of blood. The brain too, and the abdominal organs, but more especially the kidneys and spleen, will be similarly congested. This condition contrasts with that in death by syncope in which an equal amount of blood is found in either side of the heart, the lungs are not remarkably congested, and the blood vessels of the brain are not distended to the point of bursting as in death by coma.

. appearances
ases of Syncope.

Devergie gives the post-mortem appearances of death by syncope under four heads:

a absence of congestion of organs.

b normal state of organs.

c existence of a relatively equal amount of blood in both heart cavities.

d (Perhaps) fibrinous coagulation of the blood.

But whilst what may be called the violent causes of sudden death most concern the medical jurist, he must need know and be able to recognise the other causes of sudden death which in contradistinction are called

The Natural Causes of Sudden Deaths.

Of these perhaps the best classification is that
ural Causes. of Hilles, published in 1847. He divides them thus:
rough lungs. A. Death through the lungs.
(a) with [contributing] lesions of the lungs.
(b) without [contributing] lesions of the lungs.
(c) from violence.
B. Death through the heart.
(a) Produced by disease of the circulatory system.
(b) Produced by derangement, without disease,
of the circulatory system.
C. Death through the brain.
(a) Produced by some lesion of the nervous system.
(b) Produced by some impression on the nervous
system, without obvious lesion.

Let us consider these causes in the above order.

A. Death through the lungs.

Of death through the lungs, as indeed of all sudden deaths, both Devergie (Annal. d'Hygiene, vol 19.) and Payne agree that a low temper. atur is an important predisposing cause. The latter states that a low temperature is one of the determining causes of sudden death in old people; the former states that the commonest cause of sudden death is pulmonary edema and that such deaths are commoner in the winter. But of the 19 cases of sudden death in the Manchester Workhouse (note above) only four

or about 21 per cent were due to pulmonary disease; and of 580 cases given by Opdon in the British & Foreign Medico-Chirurgical Review for 1859, only 82 or 14·14 per cent. are returned as due to pulmonary lesions. Devergie further lays great stress on drunkenness as a most potent predisposing cause of sudden death by the lungs, by the Congestion it causes. Opdon (loco cit.) in his 580 cases returns 49 as due to Pneumonia, 23 to Pulmonary Apoplexy, and 70 to Oedema of the lungs, whilst as other causes of sudden death through the lungs we have in his tables Drowning, Suffocation, Laryngismus, Strangulation, Bronchitis, Haemoptysis and Phthisis. But from want of space he does not quote Cases. Stiles in his first subdivision

(a) death due to lesions of the lungs, includes

(1) Phthisis (2) Pulmonary apoplexy.

(3) Pulmonary oedema. (4) Asthenia.

Opdon gives the percentage of sudden deaths due to the former as ·17 and 3·96 respectively; the last cause he does not mention and what Stiles means by it is not very clear, because in general asthenia death takes place rather by syncope than asphyxia. The common cause of sudden death in Phthisis is haemoptysis, sudden and profuse; the autopsy will easily establish the

on lung lesions
Phthisis.
Apoplexy.
Oedema.
Asthenia.

diagnosis by proving the presence of the phthisis and demonstrating the ruptured vessel. The death in such cases is directly due to the loss of blood and as a consequence to cardiac syncope from an inefficient stimulus to contraction, from the nutrition of the heart being interfered with, and from defective nutrition alike of the cardiac centres in the medulla, and of the intra-cardiac ganglia and nerves. Sudden death has also been recorded from haemoptysis occurring in a case of miliary congestion of the base of the lung [Guy's Hospital Reports 1848]. Death by oedema pulmonum and apoplexy of the lung is due to a general poisoning by Carbonic Acid gas of all the tissues, e.g. of the nucleus of the vagus in the medulla, causing slowing of the heart's action: of the vaso-motor centre in the medulla causing general rise of blood-pressure and so still further interfering with the heart's action: and of the cardiac musculature itself, as well as of the muscular walls of the coronary arteries.

Sudden death from oedema glottidis has also been recorded (Guy's Hospital Reports) and is due to asphyxia from prevention of

the entrance of air into the lungs.

Case. Death from Anthrax.

A most interesting case of sudden death from oedema glottidis occurred in May 1887 during my term of residence in the Liverpool Royal Infirmary. A male adult was brought into the out-patient room at the ordinary out-patient hour, suffering from dyspnoea. The surgeon who first saw him ordered his immediate removal to the ward and shortly after followed himself. Arriving in the ward he found the patient's dyspnoea so much worse that he ordered his immediate removal to the operating theatre for tracheotomy. But when brought into the theatre he was found to be dead. At the post-mortem examination a very widely spread oedema of the glottis was found resulting from a diffused cellulitis, which had become purulent, in the anterior and middle mediastina of the thorax. The pus of this cellulitis, microscopically examined (Professor T. Barron) was found to contain abundant anthrax bacilli. The patient's history was further investigated and it was found that some weeks before he had been employed in unloading hides from a

vessel in the docks. His illness had only recently set in, the dyspnoea had existed a few hours only and death, finally sudden, ensued very quickly after the first onset of symptoms.

without lung lesion
drowning
strangulation
irrespirable gases.

(b) Death through the lungs without contrib. utive lesion. Under this head Tilles includes (1) Drowning. (2) Strangulation. (3) Death from the mephitic gases Eg. CO_2 &c. All of these operate on the heart as above. But Tilles thinks that shock to the nervous system may have a contributing influence; thus he holds that the CO_2, if very concentrated, may irritate the sensory nerve endings in the air passages and so cause reflex inhibition of the heart; in drowning and hanging the reflex shock comes from the sensory nerve endings in the skin. His theory is certainly plausible but has not received the support of more modern physiologists.

om violence.

(c) Death from violence applied to the lungs Eg. stabs - the 3rd head in Tilles classification - cause death by shock reflected through the vagus, by haemorrhage, or by asphyxia from plugging of the air passages with blood. Fracture of the spine high up in the cervical region,

survive any length of time, will cause death by asphyxia by paralysing the nerves of respiration. So too morsels of food, foreign bodies &c. impacted in the larynx will induce asphyxia. In connection with the last mentioned cause, Tobille, in the Archives Generale de Medicine for 1869 gives three most interesting cases of sudden death from asphyxia, in all of which the patient was found dead in bed and post-mortem the cause of death was found to be a morsel of food impacted in the larynx; and he quotes one theory to explain this to the effect that, supposing the patient drunk he may vomit — and during the act of vomiting by an inspiration draw the morsel into the larynx. This theory however he considers less probable than his own which is that the patient was seized with an epileptic attack, and during the seizure, vomited. He compares the condition of the fauceal muscles during an epileptic attack to their condition during swallowing when the isthmus faucium becomes much narrowed. This contraction is a tonic one of the same nature as the contractions that occur in the skeletal muscles in epilepsy.

The

the palate too being tonically contracted & the sensibility of the larynx in abeyance, the morsel of food takes the only path left for it. and enters the larynx whence it is not ejected as in the normal condition of the individual but remains to cause fatal asphyxia.

B. Death through the Heart.

through heart.

(a) Death produced by disease of the circulatory System.

th. disease of circulatory organs

Stilles gives a very imperfect classification of these deaths including only

(1) Rupture of the heart.

(2) Rupture of an aneurism.

(3) Rupture of a vein.

These we will first consider and then add what is wanting in Stilles' class.

rupture of heart.

(1) Rupture of the heart. is a rare accident, though one of the undoubted causes of sudden death. It is however an accident of historic interest inasmuch as King George the 2nd died of it., the Right-ventricle rupturing and in his as in all such cases causing death mechanically by the pressure of the blood effused in the pericardium on the heart, as well as perhaps by the shock communicated through the vagus. An undoubted instance of literally broken heart from grief occurred in the Liverpool workhouse in 1886; an old woman dropped

down

drown dead on hearing some very distressing family news and the autopsy revealed the fact that her heart, in a state of fatty degeneration, had ruptured and so caused her death. The percentage of deaths due to this cause in Osler's tables is only .68 (4 cases) shewing the extreme rarity of the accident. Diverse fractions it.

Ruptured Aneurism.

(2) Rupture of an aneurism is a common cause, Osler giving 12 cases or 2.06%. It has occurred more than once in my own experience for when I was Clinical Clerk in Professor Grainger Stewart's Wards in the Edinburgh Royal Infirmary I had myself charge of a case of Thoracic aneurism bulging through the sternum which proved suddenly fatal on the patient's getting out of bed one morning to micturate. The rupture here took place into the oesophagus and the blood was discharged as usual through the mouth. Again, when House-Surgeon in the Liverpool Royal Infirmary I had to perform an autopsy for the Coroner on a case of sudden death, like the last case a male adult, just about the prime of life. The man was seen to drop in the street and was dead by the time he was brought

brought into the Infirmary. He had never complained of being ill. The cause of his death was found to be the rupture of an aneurism of the Thoracic Aorta. Rupture of the sac followed by immediate death is one of the recognised forms of termination of that Disease, & one of the most commonly recognised causes of sudden death. It may take place without any apparent exciting cause but usually, as in the first of the cases I have cited, follows the application of some strain.

Rupture of heart.

(3) Rupture of heart is a still less common accident and Opie does not make no mention of it.; a case of sudden death from rupture of the Portal Vein has however been recorded.

But we must amplify Hilles' shortlist, and of the most important causes of sudden death which he has omitted to mention in his "Heart" class, the most deserving of attention is

Organic heart disease.

(4) Organic disease of the heart. In Opie's tables this cause is accountable for 2·75% of the deaths; and of organic diseases, the 3 most commonly fatal are

i Fatty degeneration of muscular wall

ii Fibroid degeneration of muscular wall.

iii Aortic incompetence.

The first of these is usually answerable for the deaths of those who die under Chloroform. Bristowe states that valvular disease is not a common cause of sudden death but that aortic regurgitant disease is the least common and causes death either by Syncope, or Cardiac anaemia from non-filling of the Coronary arteries. But any organic disease of the heart may prove suddenly fatal. In Quain's Dictionary of Medicine, in addition to Fibroid degeneration, acute interstitial myocarditis is given as one of the causes of sudden death; and great stress is laid on death caused reflexly by inhibition of the heart from irritation applied to some other part or organ of the body.

Rupture of diseased Coronary Artery.

(b) Rupture of a diseased coronary artery is also a cause of sudden death, whether the disease be atheroma, calcification or sclerosis. The cause of death in such a case is the mechanical pressure of the effused blood on the heart as in cases of cardiac rupture.

Dr. F.W. Mott.

On the importance of disease of the Coronary Arteries in causing sudden death, F.W. Mott contributed a paper to the "Practitioner" of Sept. 1888 in which, after citing the usually suddenly fatal organic changes in the heart, fatty and fibroid degeneration, he gives numerous cases of sudden death from

from these causes and from rupture of the aorta. The latter he contends, and with great show of reason, occurs in cases in which a sudden strain is put upon vessels already weakened by calcareous or atheromatous change; and he contends further that such degenerative changes are due to disease of the vasa vasorum - disease of the nature either of peri- or endarteritis or of general sclerosis. That the vasa vasorum are so changed in such cases he has established by microscopical evidence. This pathological condition of these minute arteries occurs as the result of excessive strain, syphilis, alcoholism, or the cirrhotic form of Bright's disease. The same change takes place in the coronary arteries, which may be regarded as the vasa vasorum of the heart, in the same diseases, and leads to fibroid and fatty changes in the heart-wall which they supply. The association of disease of these vessels with the fibroid and fatty forms of cardiac degeneration he has also established by microscopical evidence. Embolism may also occur, or thrombosis though less commonly, in these coronary arteries and by causing infarction lead

lead to the fibroid and fatty changes. In such weakened hearts, fatal depression in the form of syncope is easily excited by some additional or excessive strain. The cases I have quoted, 21 in number, in illustration of this paper, all occurred in middle aged persons, the youngest being 28. Only 7 or 33 per cent occurred in females. A history of syphilis or alcoholism was obtained in most of the cases and the kidneys in many were in a more or less advanced state of chronic granular contraction.

As bearing on this subject, a case is given in the Edinburgh Medical & Surgical Journal for 1835 in which at the autopsy one coronary artery was found to have almost disappeared & must have been obliterated for a long while, whilst the other was studded with patches of cartilaginous and ossific deposition.

(6) Certain poisons act on the heart and may cause sudden death. Amongst such, chloroform is conspicuous. When inhaled in excessive doses it paralyses first the respiratory centre in the medulla, and then the heart through its cardiac ganglia. Hydrocyanic Acid is another which, by paralysing the intracardiac automatic

automatic motor ganglia, causes sudden stoppage of the heart's action, and death.

Angina

(7) Angina Pectoris is a cause of sudden death but when suddenly fatal the post. mortem condition seems to be less one of typical angina than of partial rupture of the heart with subpericardial haemorrhages.

Flatulence

(8) Gastric flatulence, in great excess, may be the determining cause of sudden death by pressure through the diaphragm on an already weakened heart. Such a death would unmasked by a post-mortem examination be ascribed to uncomplicated syncope.

Gastritis

(9) Acute gastritis has been given as a cause in one case related by Bobby in the Lancet for 1874 (p. 156). The patient, a male adult, was an habitual drunkard and on the post-mortem examination in Guy's Hospital the only lesion discoverable was an acute inflammation of the lining membrane of the stomach.

Chron. disease circulatory syst.

(b) Death through the heart without associated and contributing disease is due to shock and falls for consideration rather under the next heading of death through the nervous system.

eath through
ervous System
roduced by some
ion.

C. Death through the Nervous System.

(a) Death produced by some lesion of the nervous system. Hilton includes under this head

upt. of Basilar
tery.

(1) Rupture of Basilar Artery. This is an accident that is almost immediately fatal, through the pressure on the medulla of the blood effused at the base of the brain and the interference with the action of the cardiac, respiratory and vaso-motor centres in that portion of the brain. This accident has been reported as happening during coitus.

low on
strium.

(2) A blow on the epigastrium is sometimes immediately fatal and is due to an impression made on the Solar plexus and transmitted reflexly through the vagus, inhibiting the heart's action. The death is too rapid to be due to Syncope from want of blood in the heart from determination and accumulation of almost all the blood in the body in the abdominal vessels; though no doubt, were the abdominal vessels to be allowed time to dilate, the vaso-motor nerves coming from the Solar plexus through the splanchnics being paralysed, death from syncope would follow. Experiment indeed has proved the enormous dilatation of

these abdominal vessels which follows section of the splanchnic nerves – such an amount of blood accumulating in them as to leave the rest of the body almost bloodless. I do not see some small lesion of the solar plexus, most probably a haemorrhage, is the direct cause of the nervous effects produced.

Apoplexy. (3) Apoplexy is the third cause of sudden death through the nervous system in Hills classification. Of the 79 cases in 2 years in the Manchester Workhouse, 3 or nearly 15 per cent were due to this cause. All three were males and all were over 50 years of age. In Opton's table 43 or 7·41 per cent were recorded from apoplexy, and of these 3 were in new-born children.

Powers classifies the causes of apoplexy as

i Apoplexies due to the influence upon the brain of poisons circulating in the blood, Eg. urea in uraemia.

ii Apoplexies due to a sudden cerebral lesion such as haemorrhage or vascular obstruction.

iii Apoplexies due to a sudden shock or other impression, arresting the cerebral functions but causing no visible alteration

in the brain.

The second class of causes more particularly demands our attention. The fatal haemorrhage may occur as the result of direct violence acting on vessels previously healthy, or as the result of an extra strain applied to vessels already the seat of disease. The effused blood causes death by pressure on the surrounding nerve structures, and again cardiac inhibition. According to Powers however, shock as in the next class of cases, has a powerful accelerating influence. This next class of cases, to which I have just referred, is according to Wilks

Mental impressions acting on nervous system.

(b) Deaths produced by impressions made on the nervous system without discoverable lesion post-mortem - Eg. sudden death from fear, anger, lightning &c. The modus operandi of such cases is evidently from inhibition of the heart communicated via the vagus from the nervous system. In this connection I would draw attention to a paper by Brinton [American Journal of Medical Sciences, 1870] in which he discusses a phenomenon in connection with sudden death

accompanied

accompanied by great shock, more familiar to military than to civil surgeons. This phenomenon consists in the immediate onset of Rigor mortis, instantaneously, in cases of death from bullet wound. He quotes many cases in his paper all illustrating the same circumstance — that so very instantaneous is the rigor mortis in supervening that even as late as 60 hours after death the dead soldier has been found in exactly the same position he occupied at the moment of death; in some cases Eg erect, the rifle levelled from the shoulder, in others in the very act of stooping, in yet others with the last expression whether of hate, hope, joy or what not, in ghastly fixed outline countenance.

In this connection to wound nothing those cases of sudden death which follow blows on or behind the ears, as in a case reported in the daily papers for Nov. 17. 1858 in which a boy at Chatham whilst playing football was accidentally hit behind the ear by a companion. He fell down insensible and expired immediately, the death no doubt being due to inhibition of the heart's action reflected through the Auricular branch of the Vagus.

Theory of McWilliam of Delirium Cordis.

This too is a favourable place to bring into notice the theory propounded by McWilliam of Aberdeen in the British Medical Journal for Jan. 5th of this year. He there states that many of the deaths in the human subject usually attributed to cardiac Syncope are in reality due to a condition of irregular fibrillar contractions of the cardiac musculature, the so-called delirium cordis. In support of this most enticing theory he gives the results of many experiments which he has made upon mammalian hearts, Eg. those of the rat, guinea-pig &c. In them, given certain depressing conditions (of fatty or fibroid degeneration Eg.) a feeble stimulus easily excites this condition of delirium. And as in the human heart we have such depressing conditions so frequently present it is not difficult to believe that as the result of shock, overstrain or other irritant, the same result may follow as in other mammalian hearts. McWilliam discredits the usually accepted theory that in cases of fatal Syncope without discoverable lesion, be the exciting cause what it may — overdistension due to sudden exertion or overstrain, inhibitory influences trans-

mitted by the vagus, or a failure of the intrinsic
mechanism – the ventricle comes to a
sudden standstill in diastole. And in support
of the improbability of such a contingency
occurring he quotes Taiwan: "It is plainly
out of the question to suppose that a chronic
and in its very nature advancing
lesion like fatty degeneration or disease
of the coronary vessels, is the direct and
immediate cause of a death which occurs
in a moment." And if this be true
of discoverable lesions, how much more
is it likely to be true when no lesion
is discoverable? Is it not much more
likely that the balance is upset, that
the musculature goes off into these irreg-
ular contractions? And the author of the
paper argues that it is incomprehensible
that a heart which up to a given moment
had been beating with sufficient force
to sustain at least a considerable amount
of vital energy should all of a sudden
undergo irretrievable collapse, in the
absence of any sudden and material
increase in the amount of work to
be done by the organ; Whilst he shews
that in the heart of other mammals,
from a condition of heightened ventric-
ular sensibility, a condition produced
by

by various interferences with the nutrition of the organ, a very slight stimulus is sufficient to produce the condition of delirium. Mc William suggests too that this condition of the heart as the determining cause of death in Angina Pectoris.

Unusual causes of sudden death.

Let us now consider some remarkable cases of sudden death, and exceptional in their nature and occurrence. Such was one of the cases reported from the Manchester Workhouse, viz. that of an old woman, 67 years of age, who fell down dead; at the autopsy the bronchial glands were found enlarged and calcified. Probably they had acted like any tumour in the thorax may act, but more especially as aneurisms acts, i.e. by irritating the recurrent laryngeal nerves and causing spasm of the glottis and death by asphyxia.

Calcified bronchial glands.

Another case was that of a boy of 10, an idiot, who died suddenly and post-mortem was found to have great congestion of and haemorrhages into the thymus and thyroid glands. Death in such a case would be due to reflex inhibition of the heart through the laryngeal and sympathetic nerves.

Haemorrhages into thymus and thyroid.

Another case given in the same reports (Guy's Hosp. 1845) is that of a boy of 12

who died suddenly without premonitory symptoms. Post-mortem no lesion was discovered but the small intestines were full of ascarides. Death may have been, and probably was, caused by irritation of the mesenteric nerves, carried to the solar plexus, and acting through that just as in the case of a blow directly on the plexus itself.

ascarides.

The conclusions drawn from this series of cases in the Manchester Workhouse are very interesting and instructive.

1 Of sudden deaths occurring above the average age, which is 49.42 years, 3 were due to apoplexy, 2 to haemorrhage into the pericardium, 4 to Asphyxia, and 1 each to anemia and syncope. Below the average age 3 resulted from haemoptysis, 2 from epilepsy and 1 each from anemia, asphyxia and ascarides.

2 14 were male patients, 5 females.

3 as regards the time of day, 11 occurred during the day, 8 at night when the patients were in bed.

4 4 occurred in February, 3 in August, and the rest were evenly distributed through the months.

5 Muscular exertion was as usual noticed to be an important predisposing cause.

more of the patients were above than below the average height.

Views of Devergie.

Devergie & Lalle (Annal: d'Hyg. Vol. 19) that sudden death is commonest between the ages of 40 and 50, and says he has never seen it below 20 nor over 77. But sudden death is known to occur even in infants. It also agrees with the commonly received opinion that sudden death is infinitely commoner in men than in women. This no doubt depends upon their greater liability to strain & accident from the nature of their occupations, and perhaps to the larger amount of alcohol consumed by them.

Ogston's tables.

Ogston's tables in the British and Foreign Medico-Chirurgical Reviews for 1869 must be now considered. He includes many causes which we have not mentioned such as convulsions, exposure to cold, peritonitis, meningitis, hydrocephalus, starvation, erysipelas, scarlatina, albuminuria, cholera, liver disease, pericarditis, abortion, enteric ulceration and finally loss of blood. A case of sudden death from liver disease is given in the British Medical Journal for Nov. 17. 1888. But the individual instances of sudden death from each of the above

causes are few and they are not recognised as the common causes.

There remain to be considered those cases of sudden death which occur in children and those which occur in puerperal women.

Sudden death in children.

D. Sudden death in Children.

In children the commonest cause of sudden death according to Eustace Smith [on disease in children] is laryngismus. The death of course in such cases is due to asphyxia. The other causes operating suddenly and fatally in children are, according to the same authority

Due to laryngismus syncope pulmonary collapse.

1. Syncope and
2. Collapse of the lung.

The latter also causes death by asphyxia and may be a congenital atelectasis or the result of an organic disease acquired after birth. West in the Medical Times for 1859 gives a more extended list and whilst agreeing that stoppage of the respiration is the commonest cause, resulting from laryngismus consequent on organic disease of the air passages or on some exciting cause acting reflexly and without any lesion discoverable at the autopsy, includes bronchitis and pneumonia with atelectasis, and mentions as other causes

acute effusion into the pleura, diarrhoea and asthenia. He states too that whilst sudden death is very common in infants under one year old, it is much less frequent in children between one and five.

Sudden death in Puerperal women.

I. Sudden death in Puerperal women.

This has formed a fruitful subject for discussion amongst obstetricians and much has been written on the subject by e.g. Winckel, More Madden, W. J. Playfair, Cordwent and others too numerous to mention. Winckel in his "Pathology of Childbed" has classified the causes of such deaths very well and as follows:

Pulmonary embolism.

(1) Most common is embolism of the pulmonary artery, due to a clot carried from a thrombosed pelvic vein and loosened by some strain. More Madden opines that this is the most frequent cause of such deaths and suggests by way of explanation that it is predisposed by the condition of the puerperal blood which, as is well known, is one of hyperinosis; therefore thrombi more readily form on small provocation. Playfair in the Obstetrical Transactions for 1872 gives a typical case of sudden death from this cause in which the

exciting cause seemed to be a little pleurisy acting on the already hyperinosed blood and intensifying the condition. He holds [Science and Practice of Midwifery], in opposition to some other authorities, that pneumonic clotting in the right side of the heart and pulmonary vessels is not only possible but actually occurs. And in this opinion he seems to have right on his side; a clot therefore found in the pulmonary artery need not necessarily be always an embolus; it may be and sometimes is thrombotic in nature.

(2) <u>The entrance of air into the uterine sinus</u> is Winckel's second class but is a much disputed cause. More Madden believes in the possibility of such a catastrophe and gives a case to prove it; and another case is given by Cordwent in St. George's Hospital Reports for 1871. Playfair [loco cit.] unhesitatingly gives entrance of air into the uterine sinus post-partum as a cause of sudden death; and the weight of evidence seems certainly on this side. The pathology of this condition is disputed but Virchow attributes the fatal result to coagulation of the air globules in the minute divisions of

the pulmonary artery, where they act as emboli. The entrance of air into the veins at that particular time is predisposed to by the patent condition of the mouths of the uterine vessels and the alternate relaxations and contractions of the uterus after the placenta has been expelled.

(3) Syncope is a not uncommon cause of sudden death during the puerperium, especially after great haemorrhage.

(4) Violent emotions and pain which cause cardiac paralysis according to Winckel, due to a reflex effect through the Sympathetic, sometimes determine the fatal result. Other authorities however say the reflex effect is obtained through the Vagus.

(5) Apoplexy is Winckel's 5th cause, which Playfair says may be either cerebral or pulmonary.

Playfair classes his causes of sudden death into organic and functional. Under the former come deaths from pulmonary embolism or thrombosis and those from entrance of air into the veins; and as resulting from the straining efforts of the 2nd stage, rupture of the heart, of the diaphragm or of an aneurism (a case of each of which

is recorded); also he records a case in which with pre-existing pericardial effusion, the embarrassment became so great during the straining that sudden death resulted. Spiegelberg gives a case of acute myocarditis; partial cardiac aneurism had formed in the left ventricle and opened into the pericardium, causing the fatal result.

Playfair's functional causes are all classed under syncope, shock or exhaustion.

Such are the causes of sudden death as they are found in the human subject. How they are modified by age, sex, and previous health of the individual we have seen. The variety of the causes is sufficient to prove our premiss - were any proof needed - of the importance of the study of the subject of sudden death. I shall hope at some later time to lay before the profession the results of my own experience.

C. L. Williams on
Sudden Death
There is nothing
original in this thesis
but it may be acceptable
as the result of good study
of the subject

A. D. M.