

mortality among the infants was 61.27 per cent. The mothers succumb from bleeding, sepsis, or sometimes as a result of rupture of the uterus caused by the methods used in delivery. The children die from prematurity and from asphyxia due to placental obstruction and placental damage arising during delivery. In every case of placenta praevia we must consider the amount of the bleeding as affecting both mother and child, the length to which pregnancy has gone, and the degree of obstruction offered by the placenta in its bearing on the mother (haemorrhage and sepsis) and on the child (asphyxia). Should labour come on in a case in which the placenta is marginal or lateral and the head is presenting, rupture of the membranes followed by spontaneous or artificial (forceps) delivery is the procedure indicated, but, even in these cases, stillbirth is often the result, and there is to the mother the risk of sepsis. If the child is dead or is not viable (that is, before the thirty-sixth week) then bipolar version (the method of Braxton Hicks), bringing down one foot and leaving the case to Nature, and using traction on the leg only to control any haemorrhage, if done with full aseptic precautions, is the plan usually adopted.

In those cases, however, in which the child is viable—after the thirty-sixth week—two plans have to be considered. The first is what is called metreuryesis—that is, the use of some form of rubber balloon (Champeret de Ribes's is the favourite one employed now), which acts so as to dilate the cervix, tamponade the lower uterine segment, and to induce labour, like the child's thigh and breech in Braxton Hicks's method. It was in 1887 that Mäurer introduced this manoeuvre, which Dührssen, and afterwards the French school, perfected, their idea being that it saved more children than any other then existing plan of treatment. The second and more recent method for managing a case of placenta praevia, when the child is viable, is Caesarean section; and certainly, if the woman is in good condition, the child alive, if the pregnancy has gone beyond the thirty-sixth week, and if there has not been too much bleeding (so as to exhaust the mother), then Caesarean section, in my opinion, gives a better chance for both mother and child, and the case recorded is evidence in support of such a view.

Suture Material.

In both the cases recorded here the wounds—natural and artificial—were sown up with thirty-day standardized Luken's tanned sterile catgut. In the recent discussion before the Royal Society of Medicine on "Rupture of Caesarean section scar,"¹ while attention was drawn to sepsis and faulty suturing, as causative factors in the giving way of a former Caesarean scar during a subsequent pregnancy or labour, special stress was laid upon the use of catgut, Dr. Eardley Holland pointing out that in 279 cases in which a subsequent pregnancy had gone to, or near to, full term, catgut had been employed, and in 91 silk; in the 279 catgut cases there had occurred 15 ruptures, making an incidence of 1 in 18, and in the 91 silk cases there were only two ruptures, making an incidence of 1 in 45. In other words, the liability to rupture after catgut was two and a half times the liability after silk. "Put in another way, if silk had been used instead of catgut throughout the whole series, and rupture had occurred in the same proportion as in the silk cases, the total number of ruptures would have been reduced to half"; and, in replying at the end of the discussion, Dr. Holland said the most important point revealed in his collective investigation was "the danger of catgut, and he hoped that those who used this material would renounce this dangerous practice." In reading an account of this most interesting recent discussion, I find no information supplied as to the precautions that were taken either in the selection or in the mode of preparation of the catgut used. Some of the speakers spoke of employing "ordinary" catgut (whatever that is), others of "chromic" or "chromicized," and still others of "picric" catgut; while again, one of those most experienced in doing Caesarean sections, recommended catgut for the deepest layers and for the peritoneal surface, and linen thread or fine silk for the bulk of the muscle. What one would like to ascertain is, what precautions were taken in the selection of the catgut, and as to its special preparation afterwards, so as to ensure that it was reliably aseptic and without any risk of conveying tetanus, and that it would not absorb too quickly in an organ like the uterus

with such extraordinarily rapid autolysis, or self-digestion, occurring immediately after delivery. The question is, may not failure in the preparation of the catgut (how easy, in contrast, is it to sterilize by boiling, silk, linen thread, or silkworm gut!) in some such points as asepsis and standardization for too short a period of duration before absorption be the cause of the failure of catgut in certain cases of Caesarean section to hold firmly together all the parts—especially the muscle layers—of a wound made in a puerperal uterus?

In a continuous series of thirty-nine Caesarean sections at the Belfast Maternity Hospital with one death (a case septic before admission) the suture material has been (with the exception of a few cases done with Merson's "iod-aseptic thirty-day" catgut) invariably the thirty-day tanned sterile catgut of Luken. Three cases have been twice "Caesareanised," and one three times. Four cases delivered themselves naturally in subsequent pregnancies (the original Caesarean section having been done in two of them for obstruction to delivery by tumours), yet, up to the present date, we have had no ruptures, nor have we in the repeated Caesarean cases seen any indication of the old "scar." Two methods in the suturing of the uterine wound have been employed: (a) Continuous layer suturing by my colleague, Mr. R. J. Johnstone, F.R.C.S. Eng.; and (b) interrupted deep and half deep sutures, placed close together, with a continuous layer bringing over the peritoneum, so as to bury the interrupted sutures, the plan followed by myself. Like Mr. C. Martin of Birmingham, who presided at the recent discussion, I formerly used silk in gynaecological work, but I gave it up for catgut owing to the trouble it sometimes caused in hysterectomy for fibroids; on two occasions I found, some months after operation, that, owing to the silk ulcerating into the bladder from the uterine stump, it formed the nucleus of a secondary calculus, while I also thought that some obscure cases of sepsis under the same circumstances were also due to the use of silk; at all events, neither of these unpleasant occurrences have since followed the substitution of catgut for silk. What we all want to get is clear scientific as well as clinical evidence to guide us as to whether silk, silkworm, linen thread, or properly prepared aseptic catgut is the proper suture material to use in Caesarean section.

P.S.—In reply to a letter of mine, Dr. Holland tells me in a courteous communication, dated June 18th, 1920, "The fact has come out that the catgut which was used in all the eighteen cases in which rupture of the scar subsequently occurred was chromic."

REFERENCE.

¹ Vide reports in *British Medical Journal*, May 22nd, 1920; and *Lancet*, May 15th, 1920.

THE RELATIONS OF DISEASE AND INJURY.*

BY

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ON analysing the last 500 cases referred for examination under the Workmen's Compensation Act I find that in forty (that is 8 per cent.) of these the main question at issue was the relation of disease to the injuries received.

Only if a relation exists is the employer held liable, and it is easier to assert than to disprove a relation. The cases are certainly medico-legal, but the medical examiner must keep as far away from the legal aspect as possible. The lawyer has a duty to his client, but the duty of the medical examiner is to guide the court and not to influence it. This can only be done by a rigid adherence to known medical facts. It is the elasticity of the medical witnesses' imagination which has merited the phrase "doctors differ." It is the forced admission in court of "might possibly" which gives to the shrewd lawyer his chance to win, altogether apart from the actual merits of the case.

I have heard half a dozen different opinions expressed in court on the same case by six different doctors on this question of relation of disease to an injury. All were agreed that the man was suffering from disease, and all were aware of the alleged accident. One maintained that the disease was directly attributable to accident, another

* A paper read before the Edinburgh Pathological Club.

that the disease might not have been caused but had certainly been aggravated by the accident, while a third explained that the accident had acted as a kind of connecting link in the vicious circle. The fourth admitted that the injury "might possibly" have had some bearing on the disease, although he personally did not think so. The fifth said that the effects, if any, of the injury on the disease were negligible, while the sixth maintained that no relation existed between the disease and the injury. What chance had judge or jury, in the face of such conflicting evidence, of coming to a fair and just decision?

Even a little experience of work in court will suffice to convince anyone of the importance of examining the facts critically from all different points of view before expressing an opinion thereupon. The medical witness is expected to be able to answer questions on the finer points of anatomy, physiology, and pathology. I have been cross-questioned on the subject of fluid pressures. This was in a case where a blood vessel in the testicle was said to have been ruptured as a result of bodily strain. How does the pressure vary in different parts of a system of tubes of variable cross sectional area? If increased rate of flow results in a diminution in pressure, how could a strain which causes increased rate of flow, cause at the same time an increase in the pressure? The medical witness must be prepared to answer such questions.

What is wanted is solid fact, or as near an approach to it as possible. It is no use, when asked a direct question, to answer, "Not in my experience," or "That is my experience." Experience is of value only if tempered with judgement. It is the experience of every medical man that his patient has always some suggestion to offer as to how or why he is suffering from any disease. More especially is this the case where there is tuberculous disease of any bone or joint. It is almost invariably attributed by the patient to some trivial injury. So usual is this that the relation suggested by the patient has come to be accepted as fact by the doctor.

I have watched cases during their course in which such a relation was beyond doubt, but in all the injury was of such a nature as to afford the tubercle bacillus the many weeks of absolutely undisturbed rest necessary for its incubation and growth. In the great majority of cases, however, there is no relation between the injury and the disease, the injury having been far too trivial to afford the tubercle bacillus its necessary prolonged period of absolute rest during its incubation.

Sufficient attention has not been paid to the factor of time. When a tissue is injured there is an effusion, usually of blood, perhaps of serum only. If the circulation is rapidly re-established, none but the most virulent organisms have any chance of establishing themselves. Absorption or resolution is by the lymph stream. Take the slightest form of injury, namely, such slight local exposure to cold as may result from paddling in the water. The circulation is temporarily arrested, there is effusion of serum, and probably diapedesis. Any pyogenic organisms in the blood stream may thus become extravascular, and although the circulation is rapidly re-established the organisms remain outside the blood vessels, and may successfully establish themselves before they are carried away in the more slowly moving lymph stream. If the organisms had been tubercle bacilli they would not have had the slightest chance of development.

The period necessary for the establishment of the acute pyogenic organisms has been short, the effusion has not been of sufficient degree appreciably to increase the pressure locally at the time of exposure, hence no pain. The organisms during their rapid multiplication have not even increased the local pressure before giving off their toxins. Here constitutional disturbance ensues before there is any local evidence of injury or disease. It is this time factor which gives to the two types of inflammation their characteristic clinical signs, and further, it is the time factor which will have to be studied in a consideration of aggravation of existing disease as the result of injury.

In acute inflammations the result of injury there may or may not be an initial period of freedom from pain, but once pain starts it becomes progressively worse. The more rapid the effusion the more severe the pain. How different is the picture presented by tuberculous infection! The injury has been of such a nature as to result in an effusion

of such dimensions that its absorption cannot be completed for many weeks. There is bound to be corresponding pain. It may not be very severe, but it is continuous, and after the tuberculous dépôt is fully established and spreading occurs into the neighbouring tissues there is an increase in the severity of the pain. If the lesion be primarily in a joint, there is stiffness, limp, or alteration in the shape of the joint more than actual pain. If, on the other hand, the focus of infection is within the bone near a joint, there is stiffness or limp for a long time, and it is only when the joint cavity is invaded that the characteristic "starting pains at night" are exhibited. The whole process takes months instead of days, or even hours, as may be the case with pyogenic infections. It might be said truly that parents usually seek advice rather because they notice a difference in their offspring than because there has been any complaint of pain or even stiffness.

It might be said that the injuries which predispose to the onset of tuberculous infection are those in which there is either a large effusion or those in which absorption is extremely slow. It is for this reason that tuberculous disease frequently follows sprain of the ankle but seldom follows fracture. In sprain there is a large effusion into the joint cavity, absorption is very slow, and the tubercle bacilli find in the effused material a suitable nidus in which they can grow undisturbed. There is certainly an effusion of blood after fracture at the ankle joint, but this effusion soon becomes permeated by young and vigorous capillaries. Amidst this scene of active reconstruction and repair the slow-growing tubercle bacilli have little if any chance of establishing a dépôt.

A much more difficult problem is presented when we seek to investigate the question of aggravation of existing disease by injury. Here again we must visualize the pathological changes occurring in the tissues and attempt to pair each symptom with its pathological cause.

It is surprising how unobserving most people are with regard to their persons, and how frequently a "lump" which may have existed for years is only discovered by the person after some injury in the neighbourhood; they usually insist that the lump is a result of the accident. In the same way a slight injury may be the means of calling a person's attention to a part which is really the site of disease. This danger of being biased at the outset by the patient's own statement, in however good faith it may be made, is one of the greatest difficulties in the investigation. The facts must be carefully weighed, and the opinion of the patient disregarded. Here again tuberculous disease looms largely. Fortunately the time factor usually gives information which can be relied upon.

It is reasonable to start with the assumption that an already diseased tissue will be more easily hurt than a healthy tissue. It is reasonable also to infer that the pain experienced will be out of proportion to the violence applied. The pain is practically the same as that which would have been caused by a greater degree of violence upon healthy tissue. It is caused by a local increase in pressure due to effusion. Absorption is slower than normal, and accordingly the pain will continue.

The time of onset of symptoms is another difficulty present, in the question of aggravation of disease by injury. A man is at work, he may be lifting no heavier a weight than he is accustomed to, he has sudden pain in the abdomen, is taken to hospital, and immediate operation shows a ruptured appendix or duodenal ulcer. A workman may have a sudden hæmoptysis, fatal or non-fatal, from an aneurysm or from old fibroid phthisis. Whatever he happened to have been doing at the time is most certainly blamed for the occurrence. Such signs or symptoms might easily have made their appearance while the person was at rest in bed. In fact they usually do occur when the patient is doing his daily or nightly routine. To attribute the sign or symptom to strain is quite reasonable from the patient's point of view, but is it right? Is the employer to be held liable for the occurrence, and must he bear the expense of the workman's incapacity or even death? This is a question upon which the medical examiner is called upon to express his opinion.

There are several familiar categories under which the question of relation may be considered.

Disease Caused by Injury.

Cases under this heading are common; the nature of the injury, the time of onset of the symptoms, the course of the disease, and the facts elicited on examination, present a complete clinical picture, which coincide with the known pathological changes which have been taking place in the tissues. The disease in such cases is usually pyogenic in nature and the injury has acted as the predisposing cause.

Disease Aggravated by Injury.

There are many who would say that any disease is certain to be aggravated by any injury, no matter how far removed the site of injury may be from the seat of disease. The argument is only good in so far as it is wellnigh impossible to prove the negative. Cases arising under the Workmen's Compensation Act demand that a more definite relation shall be proved between the injury and existing disease. Sentiment need not enter into the question, because the workman is provided for under the Workmen's Compensation Act in the case of injury, and under the National Insurance Act for disease.

The following is a case of aggravation:

On June 28th, 1912, J. L., a miner aged 50, was lifting a hutch when he slipped and fell on his buttocks; pain was so severe that he could not walk after the accident. He was confined to bed for a fortnight.

On August 4th he said he had never been free from shooting pains in thigh and calf since the accident. X-ray examination showed right sacro-iliac disease. On June 5th, 1913, the x ray showed disease to be more advanced, and commencing on the left side.

The company was advised that this was a case of disease aggravated by injury.

The points to be noted in the above case are as follows: (1) Pain at time of accident out of all proportion to the violence; (2) continuance of pain, so severe as to keep him in bed for fourteen days; (3) neuralgic pain in sciatic distribution severe since accident; (4) the man had a previous history of sciatica, off and on, for the previous eighteen months.

In the next case it was attempted to prove that disease had been aggravated by an injury.

In February, 1913, a car conductor says he knocked his testicles against the hand rail on his car. He worked on for two days and had no inconvenience. Three days after the knock the left testicle swelled. There was no pain, and he remained at work for a week. He was then off work for five weeks. He returned to work and worked for a month, then went to the infirmary, where the testicle was removed and proved gummatous. He had suffered from syphilis seven years previously.

The points in this case are: (1) No pain at time of accident; (2) no discoloration at any time; (3) swelling unaccompanied by pain.

The company was advised in this case that the condition was due to disease and that no aggravation by injury could be proved.

Disease Causing Prolongation of Convalescence.

This is fairly common. In fact, it might be said that, other things being equal, the greater the freedom from disease the shorter the convalescence after injury. The following is an extreme case and one in which the company was advised that the prolonged incapacity was attributable to accident:

W. M. was knocked down by a bread van on December 20th, 1916. He was taken to hospital with the right knee much swollen. There was extensive bruising all over the body. There was bleeding from the bowel. On January 30th, 1917, the knee had gone septic; the patient was transferred to the surgical ward. He was kept in hospital for nine months. On October 4th, 1917, he had almost totally recovered.

This case seems almost quite straightforward—serious injury, long time for recovery; and it is straightforward from the medical point of view. The insurance company, however, always pays the closest attention to the minute details of the accident. In this case the bread van merely brushed against the man, and he fell rather from fright than from violence. The violence was negligible. In fact, it was not until the knee became septic that he suffered any pain. He stated voluntarily that he was a bleeder; and it is interesting to note, in passing, that his father died from haemophilia. He is unaware of any history of bleeding on the mother's side.

No Relationship between Disease and Injury.

The cases falling under this head are so controversial that only a few which have been decided in court will be quoted.

A. P., a miner, was lifting a derailed hutch on April 26th, 1914. He had no pain, but shortly afterwards, during the course of the day, had pain in the left testicle. A doctor was called in, who advised rest in bed for three weeks. The scrotum was lanced in May.

On June 2nd the case was reported to the insurance company by the doctor as an accident under the Workmen's Compensation Act. The diagnosis was rupture of blood vessel in testicle as the result of strain caused by lifting a hutch. On examination on June 12th the left testicle and epididymis were seen to be swollen and nodular; globus minor especially enlarged; cord thickened and nodular. The seminal vesicles on both sides were enlarged and nodular, worse on the left. Discharge from the urethra on direct smear showed no tubercle bacilli; no gonococci, but many staphylococci.

The points in this case were: (1) No pain at time of alleged accident; (2) doctor opened abscess ten days after alleged accident; (3) full blown tuberculous disease of the whole genital tract forty-seven days after alleged accident. In this case the court decided that the accident as a cause of incapacity had not been proved.

Here is another case of tuberculosis, but of the lungs.

T. H., a miner, in December, 1915, received a blow on the back from a pit prop. He worked on till May, 1916, when he lay off work, and was certified by his doctor as suffering from "heart-strain," as the result of his accident of the previous December. He was off work till November, 1916 (five months).

On September 5th, 1918, after levering up a stone, he spat up a mouthful of blood. He stopped work. On September 27th he complained of ill health, and that he had always been liable to colds in the chest. On examination there was marked evidence of fibroid phthisis; waterfall ribs; mottled roots; small pendent heart; left dome of diaphragm stationary; right apex dull +++; left apex ++. Clinical signs of fibroid phthisis.

On May 31st, 1919, both domes were poor but equal; otherwise *in statu quo*.

In this case the court decided that the spitting of blood might possibly have been due to exertion, but that the effects of the loss of blood had passed off, and that the man was not entitled to compensation under the Workmen's Compensation Act for his ill health due to fibroid phthisis.

Here is a case of tuberculous disease of a joint.

J. B., aged 15, bruised his right thigh on June 6th, 1918. It was painful at the time, but this soon passed off. On June 13th he had sudden pain in the hip; a doctor was called in, who sent him to hospital.

July 1st, 1918. Starting pains at night; put on extension. On July 16th x rays showed tuberculous hip.

May 6th, 1919. Disorganization of head of femur; ankylosis; shortening of limb. Marked tuberculosis of chest.

In this case the court decided that no accident as the cause of incapacity had been proved.

The points in the case were: (1) History of the accident indefinite, the boy giving different accounts to different people; witnesses giving different accounts. (2) Total freedom from pain between alleged accident and onset of pain. (3) Forty days after alleged accident, definite bone destruction.

Many more cases could be quoted of herniae, etc., but sufficient, I think, has been said to show the importance of sticking to hard solid facts. The time factor is one on which the court usually places great weight.

THE London County Council, which has a standing order requiring women employees, with certain exceptions, to resign their appointments on marriage, has agreed that it shall be permissible to employ married women doctors for a period expiring not later than October 21st, 1920, and has instructed a committee to report further on the question of the permanent employment of such women doctors before the end of that period.

ACCORDING to the report of the Special Schools After-care Subcommittee, of 2,282 mentally defectives formerly attending the City of Birmingham's special schools 950 are doing remunerative work; of these 839 are earning wages which average 28s. 1d. per week; 519 are males earning from 7s. to £6 a week (average 31s. 7d.), and 320 are females, earning from 6s. to 50s. per week (average 22s. 6d.). At ages over 30 only 14 males and 1 female are earning wages.