

during normal activity or by the death spasm, either directly or through the intermediary formation of glucose.

Colasanti and Moscatelli have found paralactic acid in the urine of soldiers after long marches.

As a chemical ingredient of the thyroid gland Bubnow found no mucin in the watery extract, but it gave the reaction of albumen, besides which were also present cretinin, hypoxanthin, guanine, and lactic acid, all of which were qualitatively determined. The lactic acid has been repeatedly found in the form of paralactic acid.

Horsley has, on the ground of the increased amount of mucin in the tissues of cases of thyreopriva, regarded the thyroid as the seat of the metamorphosis of mucinoid substances; and Rogowitsch has drawn a parallel between myxœdema and amyloid degeneration, which is caused by the formation in the blood of some unknown poisonous substance which finds its way into the blood as a result of chronic suppuration.

In his elaborate treatise, Lanz has thus summed up the thyroid question. There is much material for speculation in the analogy between the function of this gland and that of many other organs of the body, the accurate determination of which rest largely with physiological chemistry. It is certain that the surgery of the thyroid has witnessed marked changes in the last two decades; and the vast amount of material in this line which has been accessible to Kocher has made his name especially prominent in this particular field of surgery.

JAMES P. WARBASSE.

#### THORBURN ON THE SURGERY OF THE SPINAL CORD AND ITS APPENDAGES.<sup>1</sup>

THE author begins by discussing the propriety of the use of the term "laminectomy." Though acknowledging its bastard derivation,

<sup>1</sup> Abstract of lectures delivered before the Royal College of Surgeons of England, by William Thorburn, M.D., F.R.C.S., of Manchester, *British Medical Journal*, June 23 and 30, 1894.

nevertheless, since he finds it explicit, convenient, and already in general use, he proposes to use it himself.

As to the statistics of the operation of laminectomy which have been published, he finds them difficult of interpretation in detail, owing to the impossibility of differentiating between results due to the operation and to the conditions for which the operation was done. It is evident, however, that they show an improvement in results, attributable partly to improvements in surgical methods, and partly to a more judicious selection of cases. In operations for tuberculosis the mortality has been about 20 per cent.

The cause of death in these selected cases is important, and in the very great majority we find it to have been shock. Septic troubles are practically absent, and hæmorrhage, formerly so much feared, is rarely serious. This fact is again an encouraging one, as it is by no means impossible that an increasing experience and perhaps an improved *technique* may lessen the one serious risk,—that of shock.

*Penetrating Wounds of the Spinal Cord.*—He has collected and analyzed 40 published records of mostly stabs with the sword, bayonet, knife, or chisel.

In all these cases the meninges were certainly wounded by an instrument which was probably septic, and in spite of this, in 38 cases in which the result is stated there were only 15 deaths, of which 9 only were due to septic infection. The usual form of septic disease has been a rapidly-spreading meningitis, which in 2 of the cases extended to the cranial meninges, whereas in 1 case only was death due to a localized meningo-myelitis. Under these circumstances we can hardly regard the spinal meninges as peculiarly liable to septic inflammation. Again, there are 9 of the 40 cases in which there is a clear account of the discharge from the wound of cerebro-spinal fluid, which discharge was often profuse and prolonged, but this result gave no trouble save in one case, reported by Walshe, in which there ensued severe retching, readily arrested by closure of the wound, the patient making a good recovery. This being the case, it would appear to be good practice, in case of injury, or suspected injury, of

the meninges, which is likely to be septic, to leave the wound open, and thus to allow of the escape of such discharges as may form.

The most important point, however, with regard to these penetrating wounds of the spinal cord is the question of recovery of function after such a lesion, indicating as it would the power of repair of the human spinal cord. Of the 40 cases collected, 5 may be neglected, as there was evidence of injury of the meninges only, and 1, that recorded by Parmentier, appears to be an example of section of the cauda equina. This leaves 34 cases in which either the cord or the lower end of the medulla oblongata was wholly or partially divided. Many of these cases showed at first paraplegic symptoms, which rapidly cleared up to some extent, leaving as the more permanent or typical condition a spinal hemiplegia. Thus they are not only excellent examples of the so-called Brown-Séquard's paralysis, but they illustrate the readiness with which the minor compression lesion of the uncut side of the cord clears up, the one side being subject, no doubt, to the destroying lesion of section, the other to the mere pressure of hæmorrhage.

Of the 34 cases comparatively few died, there being 21 non-fatal examples in which the ultimate result is recorded. In these 21 cases the opportunities for recovery of structure and of function were the best possible. It is obvious that there can have been no great separation of the cut surfaces,—nothing, probably, beyond a slight layer of clot,—no persistent compression of any kind, and no septic infection. Despite these most favorable conditions, complete recovery of function occurred in but 3 cases; 16 had certainly persistent paralysis or anæsthesia, or both; and 2 were said to be improving when lost sight of. Further, of the numerous cases with permanent symptoms, very few showed any amelioration of the earliest condition. These facts appear to point strongly to there being little power of recovery of function after a destroying lesion of the human spinal cord, and although in a few cases such recovery was certainly satisfactory, these are so few and so opposed to the general rule that we can hardly suppose that the original injury was of any serious extent.

In man we cannot hope for anatomical recovery. Vicarious conduction may allow of restoration of function to some extent, but in the case of complete transverse lesions, in which vicarious conduction is manifestly impossible, no recovery whatever will take place.

These remarks apply to the spinal cord only. It is quite otherwise with its nerve-roots after they have left its structure. These roots are now simply peripheral nerves, and nothing is more certain than that such nerves are capable of repair after section. Hence we may anticipate recovery of the nerve-roots when divided within the vertebral canal. The importance of this distinction between the cord itself and its nerve-roots arises only in the cauda equina, where we have only roots to deal with, and here we may expect a natural recovery if the ends be not too far separated, or if no mechanical obstacle intervene; and, failing this, we may hopefully cut down upon and suture these roots, as we should do in the case of any peripheral nerve.

*Fractures and Dislocations.*—In compound fractures, which are chiefly gunshot wounds, and are, therefore, rare in civil life, there can be no question of the advisability of removing all splinters and foreign bodies. No new danger of any kind is introduced by such an operation, which is merely of the nature of "wound toilet," and numerous cases illustrate the benefits which may be derived therefrom. Fractures of the transverse and articular processes are also of little interest from the present point of view. They are very rare, being due only to direct injuries, such as gunshot wounds, and they do not involve the contents of the vertebral canal.

Fractures of the spinous processes alone are also rare. In such a case the removal of the depressed spinous process would be a simple operation, and one which should certainly be adopted, but as yet no operation of this nature has been recorded.

Fractures of the laminae are more important, and have always been regarded as suitable cases for surgical operation, although they also are by no means common. Thorburn analyzed 10 published

cases, in which the diagnosis was not open to question, and they lead to the following conclusions :

(1) The cause of this injury has generally been stated to be direct violence to the spine, but in 4 of these 10 cases there was certainly no direct violence, and in only 3 is such distinctly described. Further, the frequency of this injury in conjunction with a fracture of the bodies indicates a similarity in the mechanism of their production.

(2) The symptoms of fracture of the laminae are by no means definite, and the only case in which we can be satisfied that the diagnosis was made before death owed its detection to the distinct lateral mobility of a spinous process.

(3) The diagnosis is therefore difficult, and probably we can rely only on the following points : (*a*) The cause, if there be a clear history of direct violence ; (*b*) the abnormal contour of the spine, and the presence of lateral mobility of one or more of the spinous processes, in conjunction with an obvious lesion of the spinal cord.

The treatment of these cases is very clearly indicated. We can hardly hesitate to perform laminectomy in such a case if there be any symptoms of pressure upon the cord. There is here no reason to anticipate a rebound of the bony fragment, such as that which we find in the case of fracture-dislocation of the bodies of the vertebrae. Then, again, the fragment is liable to be driven further inward upon the cord, and to be moved about so as to plough up the soft structures beneath it. There is also at least a reasonable probability that the medullary lesion is not a complete crush, but merely a more or less severe pressure. Lastly, the operation itself is in such a case of the simplest. In spite of this clear indication, which is generally accepted, Thorburn has found but 3 recorded operations in cases of this nature. The first, that of Péan, is briefly recorded, but appears to have been highly successful. The second, that of Mr. Allingham, was less satisfactory. The third case, reported by Schede, was one of complete paraplegia and anæsthesia with paralysis of the bladder and rectum. Sixteen hours after the accident the sixth dorsal arch was removed, and was found to have been broken off and depressed so as

to press upon the theca. The patient made a steady recovery, and eighteen months after the operation he could walk for long distances without even requiring the assistance of a stick.

Of the far more common and more serious lesions of the bodies of the vertebræ, fractures and dislocations may be spoken of together as fracture-dislocations; the commonest injury being a distinct luxation with but slight injury to bone.

It is only in unilateral dislocations that these injuries present any special peculiarities, but the latter undoubtedly form a distinct class of injuries. Their essential peculiarity is that, owing to the fact that but one articular process is displaced, there is often either no injury to the cord whatever, or such injury, if present, is but slight; and again, reduction is frequently possible and successful.

The true dislocations are almost always forward and downward. Indeed, the direction of this displacement is so common that all other forms may be regarded as pathological curiosities. In association with this lesion we may, however, note that it is probably not very rare to meet with diastases,—that is to say, with dislocation in which the displaced bones have recoiled, so as to leave no permanent disturbance of their relations. In cases of this nature, despite the temporary displacement, the cord may be seriously injured.

Fractures, on the other hand, may be oblique, transverse, or vertical; but they are by far most commonly oblique, from behind and above downward and forward, and, even if the broken vertebra be comminuted, the tendency to this obliquity of direction still remains.

Analogous to the distinction between a true dislocation and a diastasis is the distinction between those fractures in which the bony displacement remains and those in which it is succeeded by the recoil of the vertebræ, due either to the falling back of the head or to the elasticity of muscles and ligaments, and the question as to the relative frequency of such recoil has been much discussed.

Of specimens in the author's possession, in the cervical region there are 12 cases in which there is no permanent displacement and

6 in which there is such displacement, thus giving a two to one majority in favor of temporary compression of the cord. In the lumbar region, on the other hand, in the whole of 10 cases there is more or less permanent displacement of the injured vertebræ, but it is by no means certain that the amount of this displacement was sufficient to cause serious pressure upon the spinal cord.

It is, however, to be remembered that the cases of permanent displacement or of permanent pressure upon the cord, are naturally more serious than those of temporary crushing, and that, therefore, they will appear in greater number among pathological preparations. This is probably the reason for the universal presence of permanent compression in lumbar cases, inasmuch as only the worst of these cases come under the hands of the pathologist.

*Nature of Injury to the Cord.*—(1) By far most commonly there is approximation of the laminæ of the vertebræ above to the body of that below, causing crushing of the cord. Such crushing may be associated on the one hand with permanent pressure, as in true dislocation and in fractures which do not recoil; or, on the other, with temporary compression, as in diastases and in fractures which do recoil.

(2) A fragment of bone may be driven back upon the spinal cord, but such a condition is exceedingly rare.

(3) Equally rare, if not more so, is a condition in which an intervertebral disk is, as it were, squeezed out from between the adjacent bones, so as to form a projecting shelf which compresses the theca.

(4) And, lastly, the medullary symptoms may be mainly due to the pressure of hæmorrhage.

In trying to distinguish these varied lesions the one from the other, in the first place, the strong presumption is that the injury is a crush by approximation of the affected bones; but whether such be associated with permanent or with temporary compression, we can as a rule judge only by our somewhat unreliable statistics, although the presence of a marked angular curvature would indicate the persistency of displacement.

Pressure by a displaced fragment of bone we cannot recognize, although asymmetry in the level of the nerve symptoms would be suggestive of such a condition. With regard to hæmorrhage, we might expect that the onset of symptoms after accident would be less immediate than in the case of true crushing of the cord.

In two recorded instances there have been excellent results from operation for hæmorrhage into the spinal canal. The first of these is recorded by Church and Eisendrath, there being a fracture-dislocation of the tenth dorsal vertebra with complete paraplegia and laminectomy, revealing the fact that the spinal canal was filled with a firm extradural blood-clot, which was easily broken down, and which had arisen from tearing of the anterior and posterior longitudinal spinal veins. The clot having been removed by the finger and by irrigation, and all hæmorrhage having been controlled, the displaced vertebræ were reduced, and the patient recovered almost completely. The second case, published by Wagner, was one of hæmorrhage at the level of the ninth dorsal vertebra, due to a bullet wound, and causing paraplegia. Three months after the accident there was removed a firm fibrous tissue which had formed in the clot, there being again an excellent recovery.

There is, however, one unusual lesion which can be recognized, and which may be called "gravitating hæmorrhage." In such cases the diagnosis is comparatively obvious, and, although we have as yet no facts upon which to build, we are surely justified in hoping for benefit from operation.

As to what operation is most likely to be successful there may be some difference of opinion; but the author advises laminectomy at the seat of injury and endeavor to arrest the hæmorrhage, or at least to give exit to the blood, combining this procedure in the first instance with paracentesis of the meninges in the lumbar region after Quincke's method, or, if the result were not satisfactory, a secondary laminectomy at the lower part of the spine.

For all practical purposes, we have, however, three varieties of injury which call for treatment,—namely, permanent pressure upon



the cord, temporary crushing of the cord, and hæmorrhage. The latter is so rare and so little likely to be diagnosed that we are almost justified in neglecting it. As regards the two former, it is clear that in cases of temporary compression—which constitute the majority—laminectomy is necessarily useless. The crush is over; the cord has already sustained its maximum of injury, and it lies in the best possible position for recovery, if such be possible. In cases of permanent compression, on the other hand, we may certainly restore the normal lumen of the vertebral canal, but we can hardly hope to do much, if any, good to our patient; in the first place, because, as we have already seen, the injured cord will not be capable of regeneration, and in the second place because the extreme mortality—or at least persistency of symptoms—in the cases of temporary compression is such that we can hardly hope for benefit in the more severe cases in which the compression has been permanent.

Of 7 cases under the author's observation in 3 there was no permanent pressure, and the operation met no indication whatever. In two there was pressure upon the cord, but this was not removed by laminectomy, and even had it been removed by chiselling away the bony prominence on the anterior aspect of the theca, the injury done to the cord was such that the operation would probably have been useless. In the remaining two cases the extent of the dissection does not allow him to say with absolute certainty what the pathological condition really was. In none of the cases did any real benefit result; all those in which the injury was in the cervical region died; all those in which it was below the cervical lived, but did not recover from paralysis. And, lastly, in all those cases in which death did not cut short its progress the wound healed readily.

The published cases, of which there are about 200, show no better results, if we exclude injuries of the laminae, hæmorrhage, and operations upon the cauda equina. It does not appear beyond question that there have been any successes as regards recovery of function, save such as may be attributed to the regeneration of nerve-roots only, or to the natural recovery of a cord which was but very slightly injured.

The only question, therefore, which remains to us is, Are we justified in expecting in future any better results than those which we have met with in the past? There appear but two directions in which we may hope to improve the operation. The first is by operating at an earlier period,—immediately after the accident; the second is by extending our laminectomy to the chiselling away of the bony projection on the anterior aspect of the theca, as is so strongly urged by Urban and Chipault. On the *à priori* grounds which have been already mentioned, it is to be feared, however, that we have little to hope for in either direction, and that we are not yet able to treat with success the common injuries of the spinal cord.

In intractable injuries of the cauda equina operations may be advocated mainly upon two grounds,—namely: (1) that we may here expect a regeneration of the nerve-roots, the physiological evidence being strongly in favor of such regeneration and not against it, as in the case of the cord; (2) that the absence of spontaneous recovery in such cases in itself indicates the presence of a mechanical obstacle, such as permanent compression by bone, blood-clot, or cicatrix; otherwise we should expect the roots of the cauda equina to recover as other peripheral nerves after severe bruises.

The only point now needing discussion is that of the most suitable time for operation. It is to be remembered that some cases will recover spontaneously,—cases probably in which there has been no extensive tearing of the roots or intervention of tissue between their ends. Hence, then, we must not operate too early. On the other hand, should we delay too long, secondary degenerations will render the ultimate prognosis bad. Between these two difficulties we can hardly dogmatize as to the most suitable time for interference. Personally, the author has taken as a rough rule that we should operate at the end of six weeks if there has been little or no recovery, or if recovery has ceased to progress.

*Pathology of Paraplegia in Vertebral Caries.*—Caries of the spine may produce paraplegia in one or other of the following different ways:

(1) In a few rare cases angular curvature has been found to cause compression of the cord.

(2) Sudden paraplegia may result from fracture of carious vertebræ, but this is not a common condition. Kraske estimated cases of this nature to form but 2 per cent. of the total number of paraplegias depending upon vertebral caries. These cases also stand apart in their pathology, the essential lesion being here a fracture-dislocation; laminectomy can here only do harm, in so far as it further weakens the already fragile spine, whereas, the cord lesion is not due to simple pressure but to an irreparable crush. Probably, therefore, the most suitable treatment of cases of this nature will be by extension and fixation of the spine.

(3) Rare causes of paraplegia are the bursting of abscesses into the spinal canal, hæmorrhage into the canal, and the displacement of bony sequestra, which press upon the cord.

(4) The most usual cause of paraplegia is pressure by granulation tissue, which may or may not be caseous; this pressure being accompanied by irritative non-tuberculous pachymeningitis.

(5) Lastly, in a few cases true tuberculous periarteritis is found within the cord, generally in association with tuberculous leptomeningitis, due to the perforation of the theca by the diseased process.

The condition usually found, both after death and during operation, is, however, certainly that of pressure by granulation tissue or abscess (that is, granulation tissue which has softened) accompanied by non-tuberculous pachymeningitis and with either a small firm cord or a swollen œdematous cord. Local degeneration with secondary degenerative changes in the ascending and descending tracts follow. The pressure may be either directly backward or lateralized, or, in cases of posterior caries, from behind forward. Further, in a few cases, no anatomical changes have been found, and in one of the author's operations the condition revealed appeared hardly sufficient to have given rise to the symptoms which were present, although the latter rapidly recovered after laminectomy.

*Prognosis.*—It is common clinical experience that recovery will

usually occur after prolonged rest with fixation of the spine, but the limitations of ordinary hospital experience render it difficult to estimate in figures the frequency of this result. The author's experience is that nearly all cases will recover if kept fixed in the recumbent position for a sufficiently long time, but the time required may be very prolonged. Of all the cases which he has met with, other than those submitted to operation, he knows of only one in which the patient did not recover, or was not manifestly recovering when lost sight of. On the other hand, relapses are unquestionably common, and recovery is rarely, if ever, absolutely perfect, there being at least some exaggeration of the deep reflexes which, persisting through life, indicates the previous existence of the paralysis.

Cases in which the paraplegia is due to intramedullary tuberculous periarthritis can hardly be expected to get well, and those in which pressure has arisen from fracture of the carious bones are not likely to improve to any great extent. So also in some of the other rare varieties of paraplegia we have little to hope for, but, unfortunately, these are just the cases in which we can hardly expect any benefit from operative treatment.

*Indications for Operation.*—Assuming the prognosis to be thus favorable, we are never called upon to perform laminectomy save under certain special conditions. It will not be argued that the recovery after laminectomy is more complete than that produced by Nature, and experience shows that relapses also are only too common after operation. The indications which appear to him to point to the necessity for operation are as follows :

(1) A steady increase in symptoms in spite of favorable conditions and treatment.

(2) The presence of symptoms which directly threaten life, such as secondary chest-troubles and intractable cystitis.

(3) The persistence of symptoms in spite of complete rest is the indication which has been most commonly adopted, but such symptoms may persist for very long periods and then yield to absolute rest. It is, however, not improbable that, in a few cases, cicatricial pachy-

meningitis or, rather, peripachymeningitis may remain after the original pressure lesion has ceased to act, and may thus keep up paraplegia until the constricting tissue is removed.

(4) In posterior caries (that is, in caries of the arches of the vertebræ) operation is clearly indicated, as here we can readily both treat the paraplegia and remove the whole of the tuberculous tissue.

(5) The existence of severe pain, which is rapidly exhausting the patient, may be regarded as an indication for surgical interference.

(6) Lastly, children, as a rule, yield better results than do adults, so that, other things being equal, childhood may also be regarded as an indication for operation.

*Contraindications.*—On the other hand, there are certain definite contraindications, such as the presence of active tuberculous changes in other organs. Macewen holds that we should not operate when there is pyrexia, which is almost tantamount to saying that we should not operate in presence of active tuberculosis. If, however, the pyrexia were clearly due to cystitis, then we might regard it as an indication for, rather than against, interference. Again, general meningitis (although fortunately very rare) will, at times, obviously be present, and will probably prove fatal whether we operate or not. Cases of fracture following upon caries have already been mentioned as unsuitable for laminectomy, and most paraplegias of sudden onset will fall into this category.

*Results in Recorded Cases.*—It is difficult to estimate the mortality of these cases,—that is to say, how far the mortality is due to the operation itself,—but from 17 to 20 per cent. of deaths is not far from an accurate estimate. By far the most common cause of death has been shock or syncope; in a few cases myelitis or meningitis has proved fatal; in one the result was due to hæmorrhage into the cord; and in one to hæmorrhage from the vertebral artery at the time of operation.

As regards cure of the paraplegia, the immediate result has often been good, the symptoms improving even if they do not entirely disappear; but, unfortunately, recurrence is not uncommon, and in not

a few cases a tuberculous sinus forms in the healed wound. This simply means that we have not fully cleared out the tuberculous tissue, and hence we are met by the usual difficulty in the surgery of tuberculosis, the difficulty of removing the disease by any conservative operation.

In the earlier cases no attempt was made at complete elimination of the tuberculous tissue, but in the modern and bolder operation, so strongly urged by Urban and Chipault, we may hope occasionally to succeed, although the probabilities of failure must remain considerable. The most satisfactory results have been those obtained in cases of peripachymeningitis in which the original tuberculous disease has ceased.

Lastly, it is to be remembered that, in some, at least, of the apparently successful operations, it is probable that the associated rest and fixation of the spine would alone have sufficed to produce the fortunate result.

The other diseases which may cause pressure lesions of the spinal cord he tabulates as follows :

*Diseases arising externally to the spine :*

- Hydatids.
- Aneurisms.
- Sarcoma and other growths.

*Diseases of the vertebræ :*

- |            |                      |
|------------|----------------------|
| Carcinoma. | Syphilitic deposits. |
| Sarcoma.   | Osteo-arthritis.     |
| Osteoma.   | Spondylolisthesis.   |

*Diseases of meninges or perimeningeal tissue :*

- |                  |                       |
|------------------|-----------------------|
| Tumors.          | Meningitis.           |
| Pachymeningitis. | Spina bifida.         |
| Hæmorrhage.      | Spina bifida occulta. |

*Diseases of the spinal cord :*

- Tumors.
- Syringomyelia.

A few cases of hydatids have been submitted to operation, which has uniformly proved fatal, but the mortality has generally been due

to sepsis, and there is no reason why in such cases we should abandon surgical treatment.

Aneurisms penetrating the vertebral canal are obviously utterly unsuited for operation.

Several cases are reported of tumors arising externally to the spine and penetrating to the vertebral canal. Thus, in 1889 was recorded a case of Mr. Wright's in which great relief was given by scraping out the intraspinal prolongation of a fibro-sarcoma of the neck. Five years later recurrence had occurred with return of paralysis, and laminectomy revealed a general infiltration of the vertebral arches, no benefit being derived. In 1856, Athol Johnstone successfully removed a lipoma situated over the sacrum, which had penetrated into the vertebral canal. Possibly, however, this may have been a case of spina bifida occulta.

Growths of the spine itself have also been submitted to operation, there being several such cases in which the primary lesion was a sarcoma of the laminae. Of these Mr. Davies-Colley's case resulted in recovery from the cord symptoms, but in all the growths have recurred.

The only rule, then, that we can adopt in cases of this class—that is, in cases of pressure lesions arising externally to the spine, or arising in the vertebrae themselves—is that pressure on the cord does not *per se* contraindicate operation, and we must be guided in our practice by the general rules of surgery.

With respect to tumors of the meninges operated upon there are now eight recorded cases, with four deaths, three complete recoveries, and one in which no benefit resulted, the latter, however, being a case in which symptoms had existed for twelve years at the time of operation. These figures indicate that laminectomy has saved from certain death more than one-third of these cases.

As regards meningitis, although the author knows of no operation in the form known as hypertrophic cervical pachymeningitis, it seems to him not improbable that good results may be here obtained. White and Dercum operated in the cervical region in a case of

complete paraplegia of rapid onset, finding only adhesions between the dura and pia mater. These being separated, complete recovery followed, but the true nature of the case is somewhat doubtful.

In two cases only do we find the records of operative interference for disease situated within the spinal cord. Church and Eisendrath report a case of removal of a sarcoma, which was situated in the posterior fibres, the patient dying from septicæmia. The growth was readily enucleated, but *post-mortem* examination revealed a blood-clot extending almost transversely across the cord. It is unfortunate that in this case the septic accident did not allow us to judge of the ultimate possible result. Abbe has punctured a syringomyelia without benefit.

*Spina Bifida and Spina Bifida Occulta.*—The author concludes his lectures by calling attention to the results of pressure on the cord occurring as the result of cicatricial or hypertrophic changes in certain cases of bifid spine. Paralytic and trophic degenerations, such as motor and sensory paralysis of varying extent, perforating ulcer of the foot, chronic osteitis of the metatarsus, talipes, dislocation of the hip, pain, have been observed in the published cases of this kind. Cases of this nature he recommends to be subjected to surgical treatment.