HYDATIDS OF THE SPINAL CANAL.

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THE spinal canal is one of the rarest of localities for the development of hydatids. Therefore, while reporting a case of this kind which occurred at St. Mary's Hospital, I have collected for comparison the whole of the cases on record, twenty in number, together with two instances in which cysticerci were present in the spinal cord, in order that the symptoms and pathological signs may be compared, and in this way the natural history of the disease made evident. The new case I have to report was under the care of my colleague, Dr. Lees, who has kindly placed it at my disposal, and the records of the case were furnished by P. A. Lloyd, F.R.C.S., the house-physician in charge of the case, who carefully observed it throughout.

F. L., aged 16, was admitted into St. Mary's Hospital, on the 5th of July, 1886, complaining of weakness in his legs, and inability to walk. For the last nine months the patient had worked in a bakehouse, and six weeks previous to admission had frequently bathed when perspiring freely, sometimes remaining in the water for an hour and a half. He attributed his illness to a chill obtained in this way.

Four years ago the patient had scarlet fever, and three years ago he attended as an out-patient for paresis of the left forearm. He then had sharp pains in the arm, chiefly at night, but these passed off when at his work. The loss of power in the forearm disappeared under the influence of galvanism. Nothing of importance was elicited as to the family history.

The present illness began about two months before admission with a sharp pain across the upper part of the back extending from shoulder to shoulder. The pain increased, and on the 24th of June, he first noticed weakness in the legs; about a week before admission he was treated by a medical man for rheumatism.

On admission, the patient had pain in the region of the upper dorsal vertebræ; he could walk alone without dragging either foot, but his gait was unsteady and awkward. The feet were thrown forward and brought down suddenly, the heels striking

the ground first. There was no tottering when he stood with his feet together and his eyes shut. There was no muscular atrophy. The electrical reactions of the arms were normal; in the legs there was excessive irritability to the faradic current. The limbs were not generally rigid, but marked tension and rigidity of the ham-string muscles was observed when the patient sat up. The knee-jerks were excessive, and ankle-clonus could be obtained on the right, but not on the left side. Plantar reflex was marked, abdominal and cremasteric reflex could not be obtained, and the epigastric reflex was slight on the left side, absent on the right. There was perfect control of the sphincters, but a history was obtained of incontinence of urine during the previous week. The pupils were equal, and nothing abnormal was seen in the fundus of either eye. Sensation was normal, there was no tenderness over the spine and no external evidence of caries of the vertebrae. There were no cerebral symptoms.

The thoracic and abdominal organs appeared healthy. The urine was very feebly acid, almost neutral, sp. gr. 1028, and deposited triple phosphates, but no casts or renal epithelium. The temperature was normal.

Three days later (July 8th) the patient could not walk without assistance, and the gait was of a shuffling character. He now fell, on attempting to stand, with his eyes shut and feet together. Flexion and extension of the legs and thighs could be performed fairly well when the patient lay in bed; he could turn on his face or get out of bed without help, but all the movements were done slowly and with effort. The arms were not affected. The pupils at times appeared unequal, the left being contracted and the right of ordinary size, but both responded well to light and to accommodation.

On the 14th of July, the patient had less power in his legs, and for the first time since admission passed urine and faeces involuntarily. The pupils were now normal in size and reaction. The patient could not stand alone. Ankle-clonus was on this day marked on the left side, and could just be obtained on the right. The knee-jerks were somewhat more powerful than on admission.

On the 20th of July the patient could not move his legs without assistance, but on tickling the feet partial flexion of the knee was obtained. Ankle-clonus was marked on the left side and was also present on the right. The sensation of the legs appeared to be defective, but the patient's statements were inconsistent. The pain in the back had ceased, and complaint was made of numbness below the knees. About this time severe pain was experienced in both elbows, although no swelling, redness, or tenderness could be there discovered. The urine was now alkaline and was passed involuntarily. The bowels were constipated. The power in both arms became less, the right hand gauging 25 and the left 20 degrees of the dynamometer.

On the 30th of July, the pupils were very contracted, and only slight dilatation was produced by shading them from the light. There was great tension of the muscles of the neck and retraction

of the head. Severe pain in the head was complained of. The pain in the elbows disappeared, but the arms became almost totally paralysed. The patient could not now move the legs at all, and had no control over micturition or defecation. There was no bed-sore. On the 29th, the temperature, which had remained normal throughout the illness, rose to 102.6° F., but fell next day to normal, and in the further progress of the case never rose above 100° F.

On the 3rd of August, the patient had two severe attacks of dyspnoea, the lungs showed signs of congestion and oedema, and slight epistaxis occurred during the night. Death took place on the 5th of August from asphyxia, the patient remaining conscious to the last.

The treatment during the patient's stay in hospital consisted of counter-irritation by flying blisters applied to the spine, and the internal administration of bromide of potassium and ergot.

The autopsy was made twelve hours after death. The membranes of the brain were congested and the cerebral fluid was excessive in amount. The brain itself was normal. On removing the vertebral arches to expose the spinal cord, a large number of cysts were found lying between the dura-mater and the last cervical and upper six dorsal vertebræ. The cysts varied in size from that of a pin's head to that of a small chestnut. Some were shrivelled and contained an opalescent fluid. The fluid from most of the cysts was clearer, and showed under the microscope hooklets and echinococci. Some of the cysts were imbedded in the bone of the vertebral arches, others pressed upon the spinal cord. The latter was so extremely soft and congested in the region of the cysts and immediately above and below this part, that no further examination could be made. No cysts were found in any other part of the spinal canal or in any other organ of the body. The lungs were oedematous, and pleuritic adhesions were found on the right side. The liver and kidneys were congested, but otherwise normal.

The cases similar to this which I have been able to find on record are the following:

1. CHAUSSIER.¹—A woman, aged 22 years, suffered from paralysis and loss of sensation in the lower limbs. She was pregnant, and spontaneous accouchement occurred without pain. Four days afterwards, fever and suppression of lochia set in, and death ensued upon the tenth day, five or six months after the first spinal symptoms. A large hydatid cyst was found in the thorax, and the third and fourth dorsal vertebræ were eroded in many places. Within the vertebral canal were found about a dozen acephalocysts

¹ 'Jour. de Méd. de Corvisart,' vol. xiv. p. 231. 1807.

compressing the spinal cord, in the region of the first four dorsal vertebræ.

2. **ESQUIROL**.¹—A woman, aged 53, began to suffer from convulsions. The attacks became more frequent, and the patient died in status epilepticus, after five days of coma, at the age of 56. Acephalocysts were found in the arachnoid cavity, extending from the medulla to the end of the lumbar region. The cord was softened in the lower part. A cyst containing brown fluid was found in the pituitary body.

3. **REYDELLET**.²—A woman, aged 22 years, suffered from pain in the shoulders and right arm, with weakness of the arm. In three years' time there was no pain, but only weakness. Still later, pain in the spine was experienced. Then appeared anæsthesia of the legs, and paralysis of the right leg. A tumour was now found in the lumbar region, and pressure upon the tumour increased the pain in the arm. The tumour was opened, and a large number of hydatids removed from it, and from the vertebral canal, with which the interior of the tumour communicated. The patient improved for a time, but abundant suppuration set in and complete paraplegia appeared. Death, however, did not occur until more than a year after the opening of the tumour.

4. **MORGAGNI**³ describes a case in which hydatids perforated from the outside into the spinal canal. A woman, aged 26, was confined during the last six months of 1814. Ten months later she began to complain of pain in the lumbar region, lancinating in character, but not sufficiently intense to greatly incommode her. As the disease progressed, formication, cramps and numbness in the lower extremities were complained of, and soon sensation and motion became affected. The patient finally became completely paraplegic, urine and fæces being passed involuntarily. The patient died nine months after the first onset of symptoms. At the autopsy there was found beneath the peritoneum, near the left kidney, an elastic tumour, round, and about the size of a fist, which had eroded the bodies of the first and second lumbar vertebræ. It contained a large number of hydatid cysts. The intervertebral foramina were greatly enlarged, and through them the acephalocysts gained access to the spinal canal. The dura-mater of the cord was surrounded by hydatid cysts of all sizes, and the lumbar nerves were compressed.

5. **MÉLIER**.⁴—A woman, 29 years of age, complained of pains, spasms, paralysis and loss of motion in the legs for three years. After death a small cyst was found in the soft parts of the dorsal

¹ 'Bulletin de la Faculté et de la Société de Médecine de Paris, t. v. p. 426. Obs. vii. 1817.

² 'Dict. des Sciences Médicales,' art. Moelle, t. xxxiii. p. 564. 1819.

³ 'De Sedibus et Causis Morborum,' vol. v. p. 168. 1822.

⁴ 'Journ. gen. de méd.' Sédillot, 1825, p. 33.

region filled with acephalocysts. On tracing this it was found that it had eroded the laminæ of the fifth and sixth dorsal vertebræ, and in the vertebral canal, between the dura-mater and the bone, numerous cysts were seen. The vertebral canal was enlarged at this spot from erosion of the bones, and the spinal cord compressed and softened.

6. MONTANSEY¹ reports the case of an idiotic and epileptic woman. At the autopsy there was found a large number of hydatids on the surface, and in the thickness of the brain and cerebellum, and "a score in the thickness of the spinal cord."

7. MAZET.²—A man presented himself at the Hôpital St. Antoine at Paris, with an abscess situated over the posterior superior spine of the ileum. The abscess was punctured and a quantity of excessively fetid pus liberated. The patient died, and the end of the vertebral canal was found filled with acephalocysts. The sacrum was carious, and its canal communicated with the abscess by an opening situated in the posterior median line. There was no paralysis during life.

8. DUMOULIN.³—A man, aged 25 years, eighteen months before his death, suffered from pain in the back after a blow. The pain increased in severity. The legs became weak, the movements difficult, and the power of sensation diminished in the lower limbs. The bladder and rectum were paralysed. One month before death, complete paraplegia set in. At the autopsy a cyst was found between the muscles of the back and the vertebræ, and the vertebral laminæ were much thinned. Twelve hydatid cysts were found free in the vertebral canal, lying between the dura-mater and the second and fifth dorsal vertebræ.

9. DUBOIS.⁴—A girl, aged 20, suffered from pain in the lumbar region for one year before death. There was also weakness of the limbs. Pinching the legs caused pain in the soles. Signs of caries of the second dorsal vertebra were seen, but there was no tumour and no abscess. Bed-sores formed, the urine and fæces were discharged involuntarily, and death occurred. Hydatid cysts were found in the eleventh and twelfth dorsal vertebræ, which had penetrated the vertebral canal and compressed and softened the cord. No other hydatids were found.

10. CRUVEILHIER⁵ records the case of a woman, aged 38, who was seized with complete paralysis of the lower extremities. There were sharp continuous pains in the lower extremities, and there was a burning feeling in the same parts. The slightest

¹ 'Bulletin de la Soc. Anatom.' 1827, p. 188.

² Ibid. 1837, p. 226.

³ Ibid. 1847, p. 321.

⁴ Ibid. 1848, p. 95.

⁵ Ibid. 1850, p. 63; and 'Anat. Pathol.' xxxv., pl. vi.

passive movement of the lower limbs caused pain. Simple touch caused pain which ran from the point touched throughout the length of the limb. There was no plantar reflex. At the level of the twelfth dorsal, or first lumbar vertebra, there was discovered a soft point easily depressed, becoming prominent on coughing, which was believed to be an uncured spina-bifida. At the autopsy, in the situation of this soft spot was found a pouch filled with acephalocysts. The spines and laminae of the vertebrae were eroded and the cord pressed upon, although the dura-mater was unchanged. The spinal cord beneath the cyst was much softened, and changed into a purulent sac, so that at the point of compression scarcely a trace of spinal cord remained.

Cruveilhier states that he has seen several cases of the kind, but gives no further details.

11. Goupil.¹—A man, aged 40, had suffered for some time from weakness of the legs. On the 15th of May he had walked from Montmartre to the Hôpital Beaujon, but on the 17th could not walk at all. Sensation disappeared from the legs. A bed-sore formed on the sacrum, and the patient died twenty-one days after entering the hospital. At the autopsy, an acephalocyst was found in the lumbar region of the spinal canal at the posterior part of the cord outside the dura-mater. The spinal cord was softened at the point in contact with the cyst, and the bones were not affected.

12. Ogle.²—A case occurred at St. George's Hospital, in which a cyst containing a vast number of small ones was found within the substance of the spinous process of the seventh cervical vertebra, projecting upon the spinal cord and producing symptoms not unlike those of cancer. No details are given of the clinical history.

13. Foerster³ mentions a case in which echinococci had produced caries of the vertebrae, abscess between the muscles of the back, perforation of the dura-mater, and purulent inflammation of spinal cord and its membrane.

14. Bartels.⁴—Man, aged 25, complained of pain in the left arm, four months before admission into hospital. Afterwards, pain in right arm and neck came on, with gradually developing symptoms of compression paraplegia, which proved fatal some three months after admission. At the autopsy, the dura-mater spinalis was very congested. On section, clear fluid flowed away. There were no changes in the vertebrae. Immediately below the cervical enlargement of the cord was a cyst, lying between the dura-mater and the cord, compressing the latter from behind forwards, and towards the right side. The length of the depression in the cord was 3.5 cm.,

¹ 'Bulletin de la Soc. Anatom.' 1852, p. 211.

² 'Pathol. Trans.' xi. p. 299.

³ 'Handb. d. Pathol. Anat.' vol. ii. p. 639.

⁴ 'Deutsches Archiv f. Klinische Medizin,' vol. v. 1869, p. 108.

while the cyst itself, after being opened, measured 5 cm. in length. At a distance $7\frac{1}{2}$ cm. below the first was another similar cyst, also on the left side of the cord, and within the dura-mater, measuring 3.8 cm. in length. Above the first cyst, the spinal cord was normal; where compressed by the cyst, it was pale and soft. Between the two cysts again the cord was fairly normal, but, below the second cyst it was much softened, and the pia-mater congested. No other cysts were found in the body.

15. ROSENTHAL.¹—A patient, aged 15 years, began to suffer, without any apparent cause, from pain and weakness, in both lower extremities. In three months he could not leave his bed. There was observed cramp of the flexors, followed by that of the extensors, with twitches and formications, and afterwards total paralysis. Total anæsthesia was found in the lower extremities as high as the nipples, and backwards to a line through the scapulæ. Later on, incontinence of urine and fæces appeared, with bed-sore; and death occurred from pyæmia. At the autopsy, the brain was pale, the right pleural cavity contained turbid fluid, and the right lung was compressed. Between the pleura and the bodies of the third to the fifth dorsal vertebræ, there was a sac the size of a goose egg; this had eroded the bodies of the vertebræ, and entered the spinal canal on the right side. It lay outside the dura-mater, and compressed the cord between the third and fourth dorsal nerves, until only a thin layer of nerve-substance was left.

16. MURCHISON² describes a specimen existing in the Middlesex Hospital Museum, in which two hydatid cysts, one on each side, separated the pleura from the ribs and the sides of the bodies of the vertebræ. The hydatids were opened in sawing through the laminæ of the vertebræ, and the spinal cord at this spot was considerably smaller than elsewhere. The patient was a woman, aged 40, who had been admitted into the hospital with paraplegia, and retention of urine. She died with a large slough on the sacrum, and the bladder was found to be inflamed. There was a large hydatid cyst in the liver.

17. LIOUVILLE AND STRAUSS.³—A man, aged 42, had paralytic symptoms in the lower limbs for six months before death. A hydatid cyst was found in the back communicating with débris under the scapula, and running down under the muscles of the back. The cyst entered the spinal canal between the ninth and tenth ribs, disorganising the laminæ of the vertebræ. In the spinal canal, hydatid cysts were found, ranging in size from that of a pea to that of a nut, lying outside the dura-mater, and compressing the cord. The dura-mater was adherent at several points to the hollowed vertebral bodies. Sudden paraplegia was the first

¹ 'Handb. d. Nervenkrankh.,' pp. 192-193.

² 'Diseases of the Liver,' 2nd ed. p. 129.

³ 'Bulletin de la Soc. Anat.' 1875, p. 93.

symptom. Beyond the point where the cord was affected by the cyst, descending and ascending changes were seen.

18. LLEWELIN.¹—A patient under the care of Dr. Annand, of Australia, had a hydatid cyst, which occupied the whole length of the vertebral canal. The cyst was tapped during life, and fluid containing echinococcus hooklets was removed.

19. WOOD, H. S.²—A woman, aged 54, was seized on the 11th of February with darting pains in the limbs, and on the following day had incontinence of urine. On February 20th these symptoms had disappeared, but on March 28th she was re-admitted to hospital, suffering from incontinence of urine, a feeling of numbness of the left arm and leg—the movement of the leg being impaired, but sensation perfect. On the 6th of April the right arm and leg became powerless, and the patient died comatose on the 7th of April. On post-mortem examination, there was found opposite the last lumbar and upper sacral vertebræ a hydatid cyst within the dura-mater of the cord, filling the spinal canal, and extending through the second left anterior sacral foramen, so as to form a small bilocular cyst on the posterior wall of the pelvis, covering the points of exit of the second and third sacral nerves. The cyst also extended through the first and second sacral foramina, which were partially thrown into one. The whole cyst and its prolongations were full of small daughter cysts. At the upper end the cyst was open, and some daughter cysts were lying free. There was an immense quantity of fluid effused beneath the membranes of the cord and brain. The liver also contained a hydatid cyst.

20. MOXON.³—A woman, aged 58, had suffered for eleven months from pain in the side, and had been paraplegic for six weeks. A multi-locular hydatid was found budding externally; it formed a large elastic swelling on the left side of the spine, and made its way into the canal through the second and third lumbar vertebræ. It compressed the cord, but did not penetrate the dura-mater.

DIXON records a hydatid cyst of the neck, which had eroded the bodies of the fifth, sixth and seventh, cervical, and of the second dorsal vertebræ. It was opened, and the patient died of hæmorrhage, but it is not clear from the record whether the cyst entered the spinal canal or not.

In the following two cases cysticerci were found in the spinal cord.

21. WESTPHAL⁴ describes a case in which the symptoms were mainly those of epilepsy. Cysticerci were found in the brain.

¹ Quoted by Cobbold, 'On Parasites,' p. 140.

² 'Austral. Med. Journ.' 1879, p. 222.

³ Quoted in Fagge's 'Medicine,' vol. i. p. 413.

⁴ 'Med. Chir. Trans.' vol. xxxiv. p. 315.

⁵ 'Berlin Klin. Wochenschr.' 1865, p. 425.

At the lower part of the spinal canal, in the region of the cauda equina, was found a large number of small cysts containing fluid and no special solid elements. Some of the cysts were attached to one another. The spinal cord was somewhat softened to the naked eye, but otherwise unchanged.

22. WALTON¹ describes a case which occurred in Leipsic, under Wagner. A butcher's widow, aged 56, was admitted to hospital with complete anæsthesia and almost complete paralysis of the legs. There was also observed a loose condition of the knee and ankle joints. There was no reflex action in the legs, and the urine and fæces were passed involuntarily. The spine was normal. There was muttering delirium and fever, the temperature ranging between 37° C. and 41° C. At the autopsy, the brain showed opacity of the arachnoid and several cysticercus cysts on the surface and in the anterior part of the right corpus striatum. In the cord was found sclerosis of the posterior columns, as in *tabes*. The grey matter of the posterior horns was affected, but the anterior horns were normal. The left side of the cord at the level of the third and fourth spinal nerves was larger than the right, and here a cyst was found in the grey matter of the left side. The cyst was 6 mm. × 5 mm. in size, and had caused atrophy of the ganglion cells in its neighbourhood. It was surrounded by firm connective tissue. Inside the cyst was found a cysticercus head with hooklets.

Rokitansky gives no case, but states that cysticerci sometimes appear in the spinal cord.

The new case I have reported requires but little comment. The paresis of the left arm which occurred some time before the symptoms of the last illness set in, was probably unconnected in any way with the hydatid tumour. The actual symptoms of the disease were clearly those of pressure upon the spinal cord below the origin of the arm nerves, causing the paralysis and irritative phenomena of the lower limbs. Consequent upon the pressure, myelitis resulted which produced the arm symptoms and probably caused the death. The retraction of the head and tension of the muscles of the neck may be noted, although I consider them to be merely accidental symptoms. Nevertheless, Ollivier,² in commenting upon Chaussier's case mentioned above, lays special stress upon the rigidity of the neck; he remarks that it is due to a permanent irritation by the parasites.

In only four cases, namely, No. 2 (Esquirol), No. 6 (Montansey), No. 14 (Bartels), and No. 19 (Wood), had the hydatids developed inside the dura-mater, whereas, in both

¹ 'Bost. Med. & Surg. Journ.' 1881, p. 511.

² 'Traité de la Moelle Epinière,' vol. ii. p. 527.

the cases of cysticercus reported, the parasite was found in the substance of the spinal cord or its prolongation. In some of the other cases, in which the cysts were found between the dura-mater and the bones, it is clear that the growth had commenced within the vertebral canal, or at least in the bones which bound the canal. The records of two of these cases, namely, No. 11 (Goupil) and No. 18 (Llewellyn), show that the bones were not affected by the growth, proving that it is possible for the parasite to develop in the soft tissues of the canal. In the other cases, however, definite affection of the bones is described. They may have been eroded by the growth of the cyst, but bearing in mind the frequency with which hydatids are found in the bones of other parts, it would appear probable that here also their primary seat was the vertebral column. In the original case described in this paper, the cysts were actually imbedded in the spinous processes. In seven of the cases described it will be seen that the vertebral canal was only secondarily invaded; while in three: No. 1 (Chaussier), No. 3 (Reydellet), and No. 5 (Méliér), the record leaves the exact origin of the cyst in doubt. It will be noted in several of the cases quoted, and also in the new case described, that numerous cysts were found. It is most likely that these were really daughter cysts, the wall of the mother cyst having disappeared under the pressure. Such is the comment made by Foerster,¹ with reference to his own case.

The symptoms of the affection are those of compression paraplegia, and, unfortunately, in the absence of some external sign of hydatid tumour, there appears no means of diagnosing the cause of such compression. This is the more to be regretted, as a consideration of the cases given shows that, in by far the majority of cases, the cyst is situated at the posterior surface of the cord, and therefore would lend itself readily to operative interference. In one case, No. 18 (Llewellyn), the position of the cyst is not fully described, and in four cases, as already mentioned, the cyst was in the substance of the cord; but of the remaining sixteen cases, there are only four, Nos. 1, 4, 15 and 16, in which the cord was affected from the anterior part of the canal. Finally, it will be observed that in Reydellet's case an operation was performed, and even at this early date (1819), the vertebral canal was opened and cleared of its hydatid tumours. The operation was so far successful that the patient lived for twelve months and then died of suppuration. Modern surgery would probably avoid such a termination.

¹ *Loc. cit.*