in the absence of microfilariae in the peripheral circulation, but none was found.

It is evident that after a single dose MSb can act as a prophylactic against the development of filariasis in the cotton-rat by preventing the establishment of adults in the pleural cavity after the exposure of the animal to the infective larval form in the mite, so far as these experiments show, at a minimum dose of 250 mg. per kg. of body weight and with a maximum prophylactic interval of three weeks. Stilbamidine and antrypol are both inactive at doses of 50 mg. and 500 mg. per kg. respectively at shorter intervals.

We are indebted to Dr. E. A. H. Friedheim for supplying the MSb.

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INFECTED INTERVERTEBRAL DISK AFTER LUMBAR PUNCTURE

BY

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The use of lumbar puncture as a diagnostic and therapeutic measure is so common that any complication which results from it merits attention. In a review of the literature we found reports of 44 cases of injuries to intervertebral disks, clinically and radiologically established, following lumbar puncture. Only two of these, however, were complicated by infection of the disk or adjoining vertebral bodies.

The majority of cases occurred in children on whom lumbar puncture had been performed for meningitis; those in adults followed a spinal analgesic or some procedure such as encephalography. One of the two infective lesions reported, that by Findlay and Kemp (1943), describes osteomyelitis of the second and third lumbar vertebrae, with destruction of the intervening disk, in a 1-month-old child following an unsuccessful attempt at lumbar puncture in the presence of pyogenic skin infection. The second case (James, 1946), that of a 4½-year-old boy, has some features in common with our own. One week after a difficult lumbar puncture he developed a temperature of 104° F. (40° C.) and flattening and rigidity of the lumbar spine. Shortly afterwards a radiograph showed loss of L3-L4 disk space and later of L4-L5 space with sclerosis of the adjoining vertebral bodies. The illness was complicated by the

development of chicken-pox, but recovery followed plaster immobilization and penicillin therapy.

The clinical picture in all the reported cases—whether accompanied by infection or not—is remarkably constant. At a varying interval after lumbar puncture low backache occurs, accompanied by rigidity of the lumbar spine and diminution of the normal lumbar lordosis. Radiological examination subsequently reveals some loss of intervertebral joint space and, later, sclerosis of the adjacent cortex of the related vertebral bodies. Frequently lumbar puncture has either been repeated or been accomplished with difficulty.

In addition to the two infective complications already quoted, one case of spinal epidural abscess after lumbar puncture had been reported up to the end of 1945 (Rangell and Glassman, 1945).

Case Report

A girl had an attack of meningococcal meningitis in 1943, at the age of 12 years, for which she was treated first at a fever hospital and then at a general hospital elsewhere. Exact details are not known, but she remembers that at least one lumbar puncture was performed under an analgesic. She made a good recovery from her meningitis, but experienced backache and severe stiffness during convalescence. The backache has been present on and off ever since; it has never been severe, nor has it radiated from the lumbar region.

Two years after her illness she developed a tender mass above the middle of her left groin and was treated by sulphonamides and local heat. The mass persisted and she became ill, being admitted to hospital with an irregular pyrexia. A provisional diagnosis of actinomycosis was made at this time and she was given 5,500,000 units of penicillin. The mass softened centrally and discharged pus, from which, however, no streptothrix filaments were isolated. After a further course of 7,500,000 units of penicillin the skin over the sinus healed and she was discharged in good general condition.

In October, 1947, she was admitted to St. Mary's Hospital for the first time with a recurrence of the swelling above the left groin. There had been no exacerbation or alteration in the intensity or character of her backache. A radiograph of the pelvis showed no abnormality. Examination under an anaesthetic revealed no palpable intra-abdominal mass. The swelling was subsequently explored and a specimen of tissue sent for histological examination. This revealed chronic inflammatory changes only, and showed that the deep part had not been completely excised. The wound healed, however, and the patient was discharged.

She was readmitted in January, 1948, because a sinus had formed at the site of the operation. Culture yielded *Staphylococcus aureus*. Lipiodol injection and x-ray examination of the sinus showed a track 16 cm. long going across the midline to just above the right anterior-superior iliac spine. A lateral radiograph revealed that the sinus lay in the anterior abdominal wall. No connexion with bone or viscus could be demonstrated.

It was decided to explore the sinus track, and this was done by Mr. A. E. Porritt on Feb. 11. The track lay in its proximal 8 cm. entirely superficial to the aponeurosis and, immediately to the right of the midline, passed deeply, lying on the anterior aspect of the rectus muscle and then between the aponeurosis of the external and internal oblique muscles. It was traced to just above the anterior-superior spine, where no further extension could be found. The wound was then closed, and it healed by first intention.

Further radiological examination was carried out by Dr. T. Richard Riley, who reported on the lumbar spine as follows (see Fig.):

"There is a mild scoliosis convex to the right. The body of L3 shows evidence of irregular bone destruction on its lower surface. The affected margins are sclerosed and there is no sign of present activity. The upper surface of the body of L4 shows irregular shallow bone destruction and appearances otherwise as in L3. The intervertebral disk space between L3 and L4 is still present, but considerably reduced in depth. Comment:

The appearance of the contiguous surfaces of the bodies of L3 and L4 and that of the intervening disk space is consistent with an old localized infective process at this level. The appearance is not that of tuberculous infection. The retention of some degree of disk space, the absence of paravertebral shadow,

and the limited involvement of the upper surface of the body of L4 are not consistent with tuberculous destruction. I would say that the appearances are consistent with a pyogenic infection secondary to lumbar puncture."

Radiograph showing antero-posterior view of lumbar spine.

The patient was put into a plaster jacket and discharged in good condition on March 1. When seen in May, 1948, she was in excellent health and had been comfortable and free from backache in her jacket. The operation wound had remained healed and there was no evidence of any recurrence of the abscess. Her E.S.R. at this time was 3 mm. per hour (Westergren). She

was fitted with a lumbar support to be worn in the daytime only.

Discussion

The manner in which the infection in this case presented is interesting. No doubt intensive sulphonamide and penicillin therapy altered the course of the infection, but this cannot explain how an L3-L4 intervertebral abscess tracking laterally round the right side of the abdominal wall should present itself in the left mid-lateral line 5 cm. above the inguinal ligament. At first thought it is tempting to postulate that the pus followed the course of the anterior primary ramus of a lumbar nerve or of a lumbar branch of the abdominal aorta, but simple anatomical considerations show this to be unlikely.

In the majority of reported cases, as in this one, there was no history of sciatic or other root pain, or any related deep segmental pain, in spite of the obvious intervertebral joint disorder. A more detailed study of these patients may throw some added light on the mechanism of pain in intervertebral disk injuries.

The fact that the majority of reported cases have been in children could be accounted for because of the greater frequency of meningitis in children. It is, however, likely that, overall, at least as many lumbar punctures are performed on adults as on children, and the relative frequency of complications among children is therefore probably significant. The danger of intervertebral disk damage is clearly related to the fact that in children the depth of the disk from the skin is much less than in adults, which therefore allows for a smaller margin of error. The annulus fibrosus in young children is no more than 2-3 mm. in depth, and is considerably stretched and thinned in acute flexion of the spine, the standard position for lumbar puncture. Further, the nucleus pulposus is known to be under considerable tension, bulging backwards in acute flexion, and this makes for its easy escape along the needle puncture or its infection by the same means.

Consideration of all these factors might help to minimize the danger of intervertebral disk damage following lumbar puncture, particularly in children.

We are indebted to Mr. A. E. Porritt, under whose care this patient was admitted, for permission to publish this report, and to Mr. V. H. Ellis for helpful advice.

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COUGH FRACTURE OF RIBS

BY

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The purpose of this paper is to call attention to an infrequent but possibly often unrecognized cause of pain in the chest of sudden onset and resembling dry pleurisy in its symptoms. I have observed a number of cases of "spontaneous" fracture of ribs occurring in tuberculous subjects, in some of which there was a clear history of pain following violent expiratory effort as in coughing or sneezing. These cases happen to have been discovered in women aged between 18 and 35, but other authors have recorded it occasionally also in men.

This condition, which I will describe as cough fracture of ribs, is not widely recognized, and the literature on the subject is scanty.

Halliwell (1929) reported fracture of the sixth, seventh, and eighth ribs after a bout of coughing in a doctor aged 40, of good physique and convalescent from pleurisy and "pseudo-asthma." About a month later, on getting out of a bus, he had another attack of coughing, and x-ray examination revealed a fracture of the ninth rib on the same side as before and in line with the other three. Recovery was uneventful. Howson (1934) was able to trace, in all, 58 reported cases, and added a further case of his own. This occurred in a woman of 26 with bilateral pulmonary tuberculosis who had had a thoracoplasty on the left side, and several months later was found to have a recent fracture of the ninth right rib, older fractures of the tenth and eleventh right ribs, and a fracture of the left tenth rib "with considerable callus formation." Sakka (1938) also described three cases of spontaneous rib fracture occurring in North African natives which he thought were due to tuberculous osteitis. The subjects were all men between 24 and 27, two of whom were suffering from pulmonary tuberculosis. Cramer (1943) described four cases—three in women aged 26, 65, and 72, and one in a man of 72. He thought the fractures were due to muscular action on areas of rarefaction in the ribs, and suggested that the upper five ribs are unlikely to fracture from cough because they are shorter and are supported posteriorly by the scapular musculature.

Case Reports

Case 1.—A woman aged 23 was admitted to Black Notley Hospital on April 8, 1937, for tuberculosis of the left lower lobe. X-ray examination on admission revealed, in addition to the tuberculous disease, a recent fracture of the seventh left rib about 1½ in. (3.75 cm.) from its junction with the costal