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Rheumatoid Spondylitis

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Summary. *(1) Two out of ten necropsy cases with rheumatoid arthritis had multiple erosive and destructive changes in the thoracic and lumbar vertebrae, in addition to the cervical vertebrae. (2) Apophyseal joints of the thoracic and lumbar vertebrae are often involved in rheumatoid arthritis. (3) The area of the enthesis and peridiscal connective tissue is most likely to be involved in rheumatoid arthritis and seems to be the site of the initial changes. (4) Early operative fusion may be useful in preventing the progression of the rheumatoid spondylitis.*

Résumé. *(1) Deux autopsies sur dix, chez des malades présentant une arthrite rhumatoïde, ont montré des lésions multiples à type d'érosion et de destruction au niveau des vertèbres dorsales et lombaires, en plus de l'atteinte des vertèbres cervicales. (2) Les articulations interapophysaires des vertèbres dorsales et lombaires sont souvent lésées au cours de l'arthrite rhumatoïde. (3) Le tissu conjonctif péridiscal est le plus vraisemblablement atteint dans l'arthrite rhumatoïde et paraît être le lieu des modifications initiales. (4) La fusion chirurgicale précoce peut être utile pour arrêter la progression de la spondylite rhumatoïde.*

Key words: *Spine, Rheumatoid spondylitis*

Spinal involvement in rheumatoid arthritis has often been discussed but mainly in connection with the cervical spine where the X-ray changes are well known. Descriptions of the histological findings are less common, especially those to be found in thoracic and lumbar lesions. Ball [2] describes numerous autopsy findings in rheumatoid arthritis, but spinal lesions were only reported in the cervical spine. In the literature only two patients, one with destruction of the twelth thoracic vertebra and a nodule in the third lumbar vertebra (Baggenstoss et al. [1]) and the other with destruction of several vertebral bodies in the thoracic and lumbar spine (Lorber et al. [4]) have been reported with histological evidence.

Rheumatoid changes in the apophyseal joints of the thoracic and lumbar spine are only rarely reported [3]. We believe they are not uncommon although occurring less frequently than in the cervical spine.

Study Performed

Ten cases of rheumatoid arthritis were examined at post mortem and the spinal column including the uncovertebral, apophyseal, costovertebral and sacroiliac joints was studied histologically. In two cases X-ray and necropsy findings revealed marked destructive lesions in several thoracic and lumbar vertebrae.

In one other case material obtained from the disc and surrounding tissue at operation on the level C_{3-4} was compared with necropsy material from the same level and the findings gave a guide to the site of the original pathological changes.

Case 1

61-year-old male died in May 1970 with a 24 year history of progressive seropositive rheumatoid arthritis. At age 50 severe narrowing of intervertebral disc spaces $C_{3-4-5-6}$ was noted but an X-ray of the lumbar spine was almost normal.

At age 57 pulmonary tuberculosis with sputum culture yielding tubercle bacilli, Gafky V, was successfully treated. The same year he developed low back pain and two years later intense intercostal neuralgia and marked kyphosis of the thoracolumbar region. This was rapidly followed by sensory disturbance and muscle weakness of all four limbs.

At this stage he was barely able to walk even with crutches. One year later he developed impotence and difficulty with micturition and defecation. He died shortly after the onset of haematemesis and melaena.

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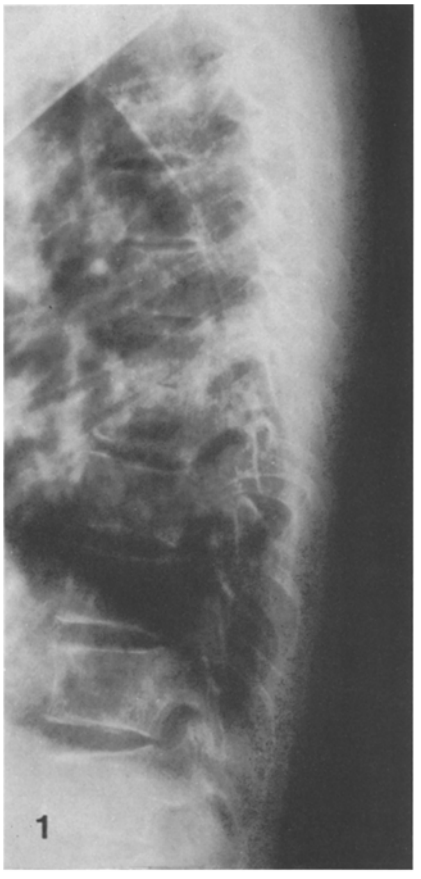
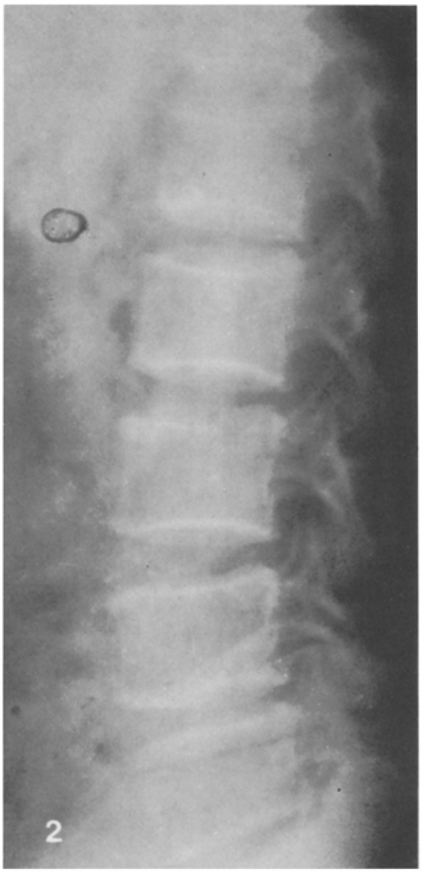




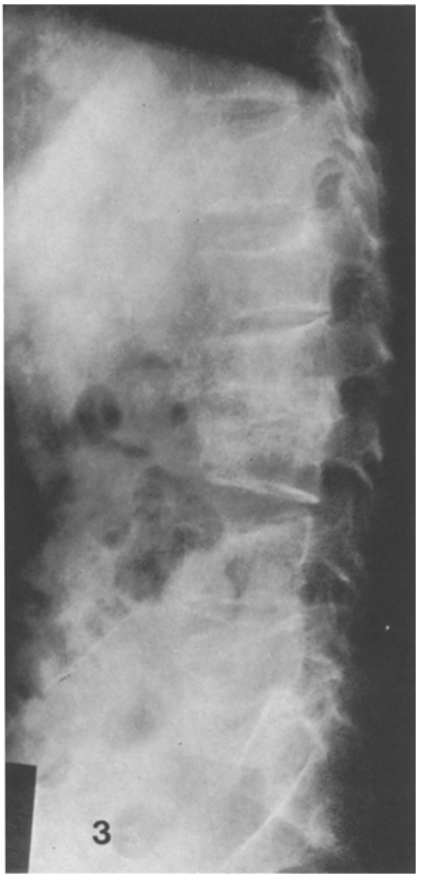


Fig. 1. Thoracic spine, Case 1. Narrowing of the intervertebral spaces and marked erosive changes of T5 to T8. Complete loss of the intervertebral disc without osteophyte formation of T5–6 is characteristic

Fig. 2. Lumbar spine, Case 1. There is moderate narrowing of the intervertebral space of L4–5 and some "squaring" of the antero-inferior corner of the vertebral body of L1

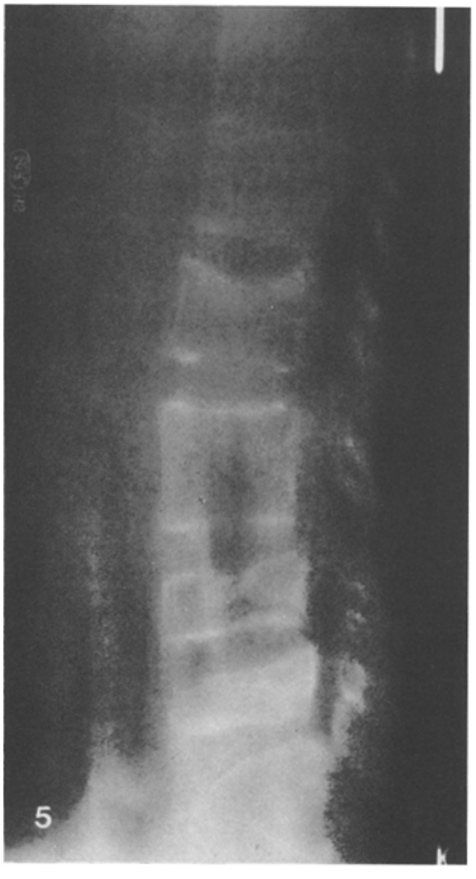
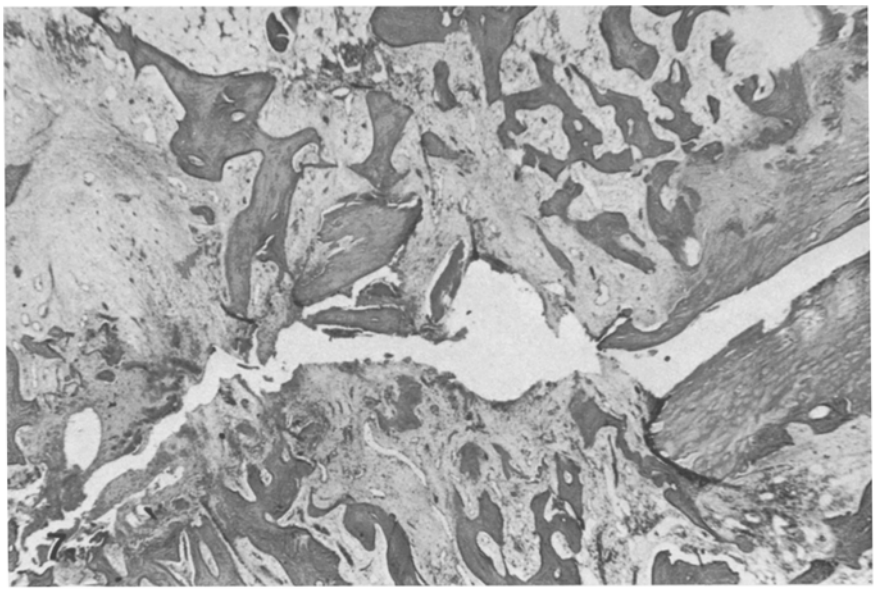


Fig. 3. Lumbar spine, Case 1 taken seven years after Figure 2. Erosive changes have progressed. Marked destructive lesion of L2 and L3, anterior wedging of L4, and bone loss of the antero-inferior corner of L1 are prominent findings

Fig. 4. Lumbar spine, Case 1, necropsy specimen, three years after Figure 3. Destructive lesions of L1, L2, and L3 have advanced further, resulting in kyphotic deformity

Fig. 5. Lumbar spine tomography of Case 2. There is marked collapse of the vertebral bodies of L4 and L5 and concave deformity of L2



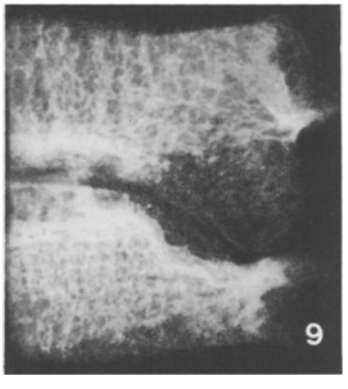


Fig 6. Thoracic and lumbar spine X-ray of Case 2, necropsy specimen, one year later than Figur 5. There is generalized osteoporosis and extensive collapse of the plates of almost all vertebrae, especially severe in T4, L1, L4, and L5

Fig. 7. Loss of the intervertebral disc, destruction of vertebral plates and fairly dense fibrous connective tissue with a moderate degree of vascularity, replacing the marrow of the opposing vertebral surfaces. Posterior portion of the intervertebral space of T5–6, Case 1. H and E x 18,6

Fig. 8. Osteolysis by ingrowth of granulation tissue. There is an area of central fibrinoid necrosis surrounded by proliferated connective tissue with cell infiltration, resembling a rheumatoid nodule. Vertebra L4. Case 1. H and E x 93

Fig. 9. Case 2. X-ray film of uncovertebral joint of C3–4, obtained at necropsy. There is narrowing of the joint space with eroded bony surfaces

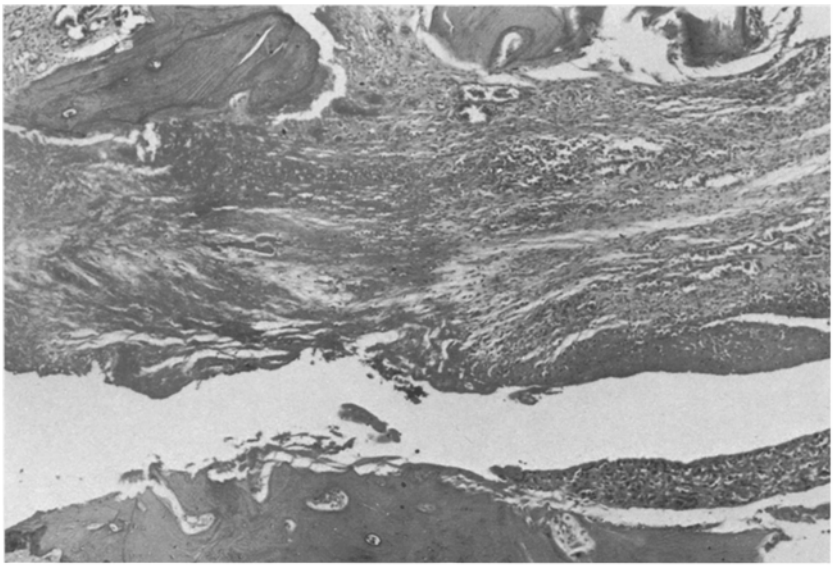


Fig. 10. Histological view of Figure 9. Inflammatory and very proliferative fibrosing granulation tissue covers the bony surface of the joint, replacing the destroyed cartilage and subchondral bone. H and E x 35,6

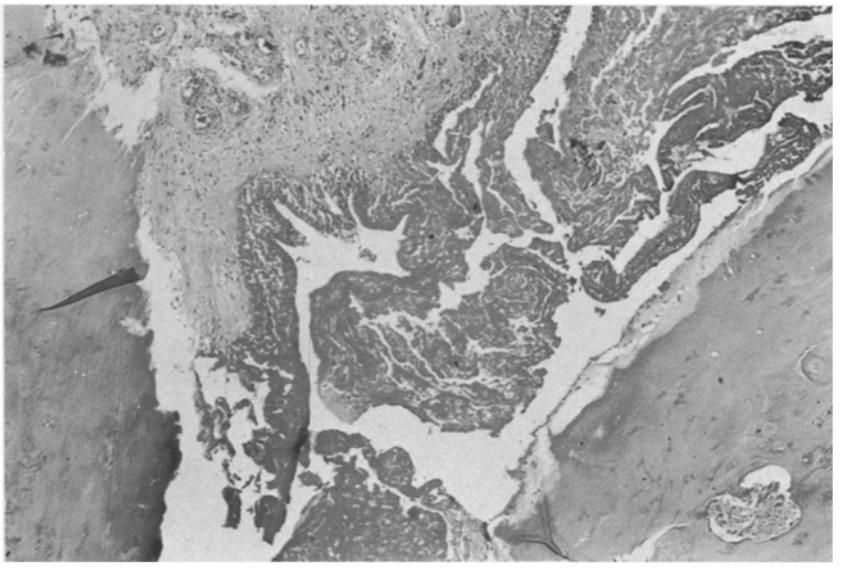


Fig. 11. Apophyseal joint of L4–5, Case 2. Marked fibrin deposit, proliferative, vascular synovial tissue, cartilage loss, and pannus formation. H and E x 35,6

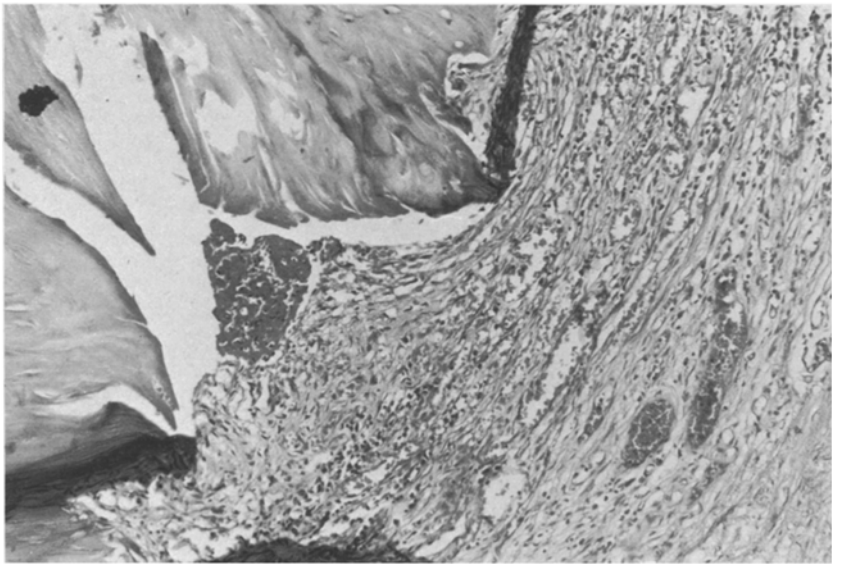
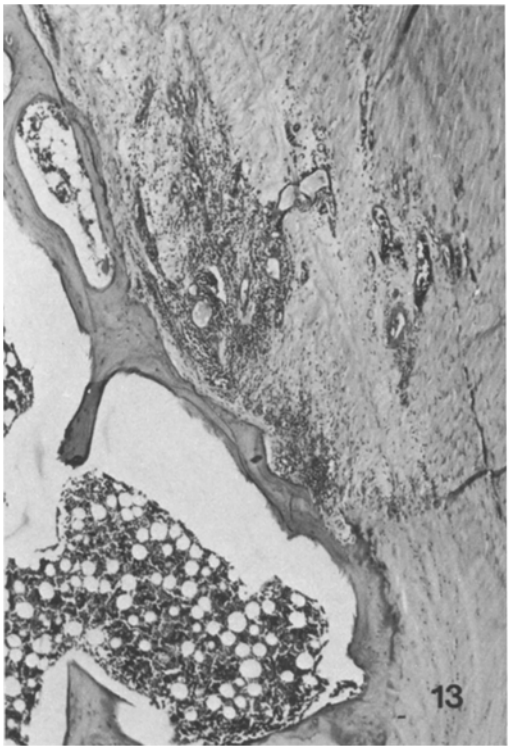


Fig. 12. Posterior portion of the intervertebral disc of T4–5, Case 2. Granulation tissue with a high degree of vascularity present in the peridiscal area. H and E x 89



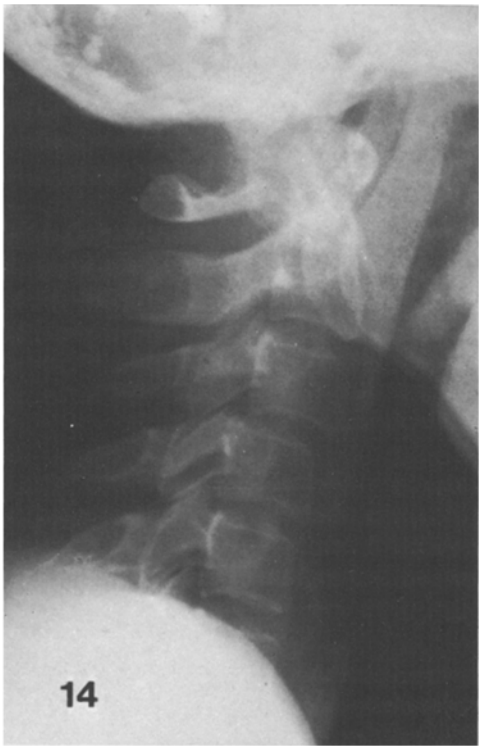


Fig. 13. Lymphocyte accumulation in an area of ligamentous attachment on the antero-inferior vertebral border of T5 which showed normal appearance on the X-ray H and E x 32

Fig. 14. Case 3. Cervical spine film before operation. Subluxation at the level of C3–4 is noted

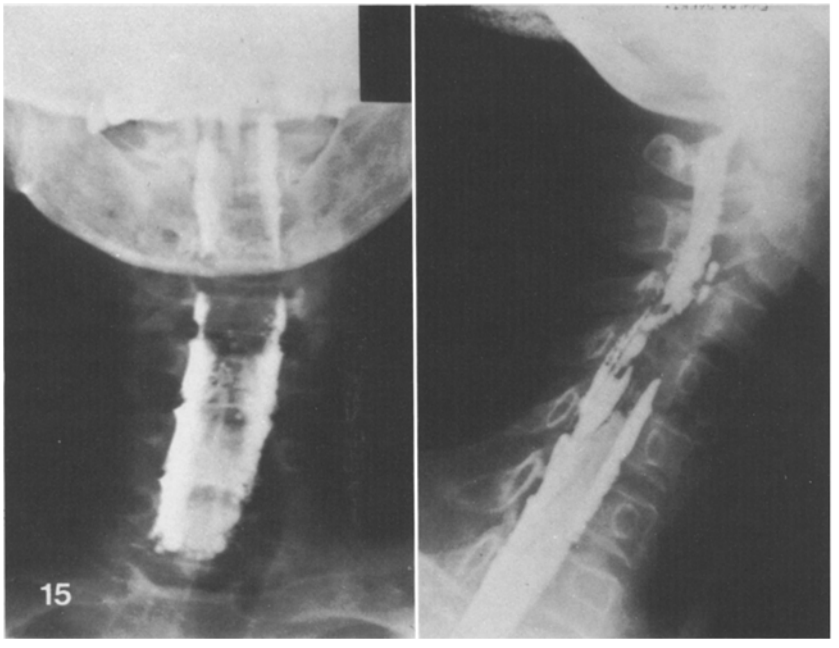
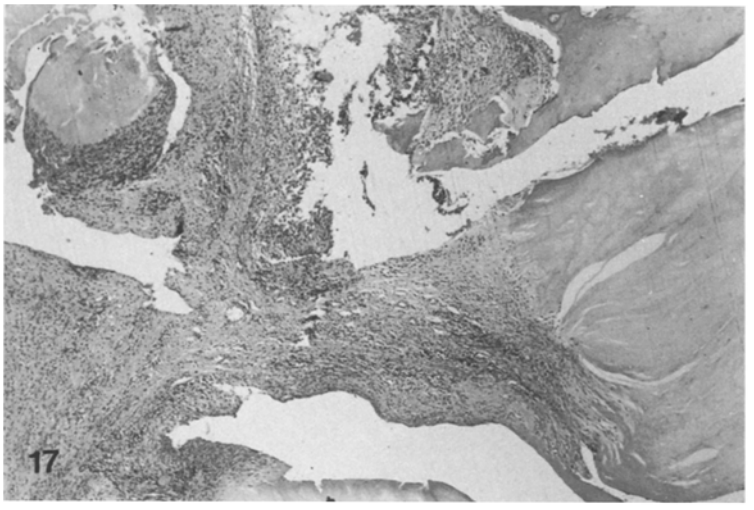
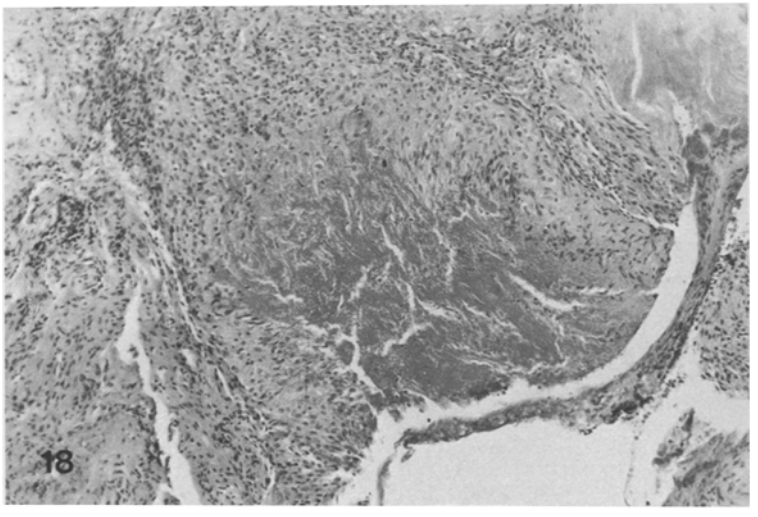
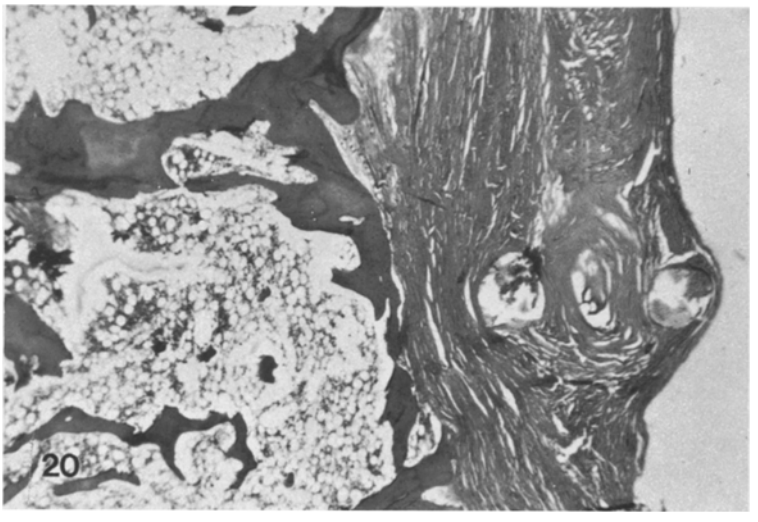


Fig. 15. Case 3. Myelography showed a filling defect at the level of C3–4 in the A-P as well as lateral views

Fig. 16. Case 3. Cervical spine X-ray after operation. Anterior fusion with bone graft was performed at the level of C3–4







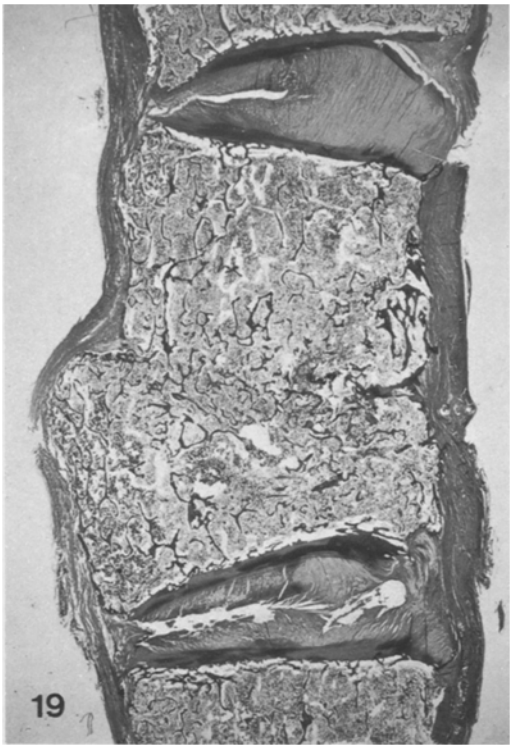


Fig. 17. Anterior portion of the intervertebral disc resected at operation, Case 3. Very proliferative and chronic inflammatory granulation tissue, invading the bone marrow and the disc is present. H and E x 32

Fig. 18. Chronic inflammatory connective tissue including rheumatoid nodule. Histological view of the granulation tissue resected at operation from the posterior peridiscal area, Case 3. H and E x 93

Fig. 19. Histological section of cervical spine at the level of C2 to C5. Fusion of C3–4 is well demonstrated. There is a posterior bony projection at the level of fused C3–4, which is thought to be a reason why the cervical cord compression signs were not much improved postoperatively. Case 3. H and E x 16

Fig. 20. More detailed view of Figure 19. Only suture material in the anterior longitudinal ligament is found. There is no inflammatory reaction. Compare with Figure 18 which shows the histology of the same area three years previously. H and E x 80

During his lifetime he received two courses of gold therapy without benefit and corticosteroids from 1956 until 1970. The total dose received was estimated to be equivalent to 2550 mg of prednisolone.

X-ray in 1965 revealed a destructive lesion at T_{7-8} in addition to narrowing and erosion of the disc spaces at several levels (Fig. 1). X-ray of the lumbar spine in 1960 was almost normal showing "squaring" of the anteroinferior corner of the vertebral body of L_1 and a suspected erosion of the upper surface of L_3 (Fig. 2). Several years later marked destruction developed at multiple levels of the lumbar spine (Fig. 3). Figure 4 shows an X-ray of the necropsy specimen obtained three years after the previous film, and shows further progression of the deformity.

Case 2

A housewife died in 1969 at the age of 55 years with a nine year history of seropositive rheumatoid arthritis with nodule formation. Oral administration of corticosteroids continued, with only a one year interruption, from 1962 until 1969. Four years before her death she developed persistent neck pain and stiffness as well as low back pain. Loss of neck movement and occipital neuralgia became more marked and in 1968 pain in the buttock was so intense that she was unable to sit. Signs of scleritis and cardiac hypertrophy with right bundle branch block developed which progressed until she died of cardiac insuficiency. X-ray examination prior to death revealed generalized osteoporosis, multiple erosive changes and marked flattening of the fifth lumbar vertebra (Fig. 5)

Post Mortem and Histological Findings of Cases 1 and 2

Fibrosing granulomatous changes were found in the intervertebral space T_{5-6} of Case 1 (Fig. 7). In the vertebral bodies of L_4 and L_5 of Case 2 a necrotic area surrounded by granulation tissue resembling rheumatoid nodules was seen (Fig. 8). The sites of the lesions corresponded with the position of marked vertebral destruction or collapse seen on the X-rays.

Although only the uncovertebral joints of the cervical spine are easily visualized on X-ray, the apophyseal joints of the spine at any level may be involved and Figure 11 shows inflammatory synovial tissue filling the apophyseal joint spaces of L_{4-5}.

In Figure 12 inflammatory and proliferative tissue resembling synovial tissue is visible along the outer edge of the intervertebral disc at the level T_{3-4} (Case 1). Figure 13 shows the anteroinferior surface of T_5 with its ligamentous attachment obtained at necropsy from a rheumatoid patient who died of cardiac insufficiency. The vertebra appeared quite normal on X-ray but small foci of small round cell infiltration in the area of the ligamentous attachment were seen in histological preparations.

Case 3

A 62-year-old housewife had a 13 year history of seropositive rheumatoid arthritis.

Three years prior to her death from cardiac causes and amyloidosis, she fell and developed subluxation of C_{3-4} with a myelographic block. Anterior interbody fusion of C_{3-4} provided tissue for histological examination. The anterior part of the intervertebral disc with ligamentous attachment showed marked inflammatory changes (Fig. 17). In the posterior part of the same disc granulation tissue with a rheumatoid nodule was present (Fig. 18). The histological section of the cervical spine obtained at necropsy two years after operation is shown in Figure 19. Bone grafting had been successful and there was no evidence of active inflammation in the paravertebral ligaments. In Figure 20 where the operated area is magnified, only a few pieces of suture material are visible in the anterior longitudinal ligament.

Discussion

In the vertebrae, the enthesis, that is the area of ligamentous attachment to the bone and peridiscal connective tissue, is most likely to be involved and is thought to be the site of the initial vertebral lesion in rheumatoid arthritis.

The pathological changes in ankylosing spondylitis are thought to arise at the same sites also. The squaring of the vertebrae that is a characteristic radiological feature of ankylosing spondylitis is interpreted as due to an extension of the inflammation from the surrounding areolar connective tissue which lies between the longitudinal ligament and the anterior vertebral border and the disc. The anterior longitudinal ligament is attached at the middle portion of the border of the vertebral body, hence the areolar tissue exists only in the surrounding area of the anterior corner of the vertebral body and the outer surface of the disc.

Our studies show that a similar spread of the inflammatory process from the areolar tissue to the

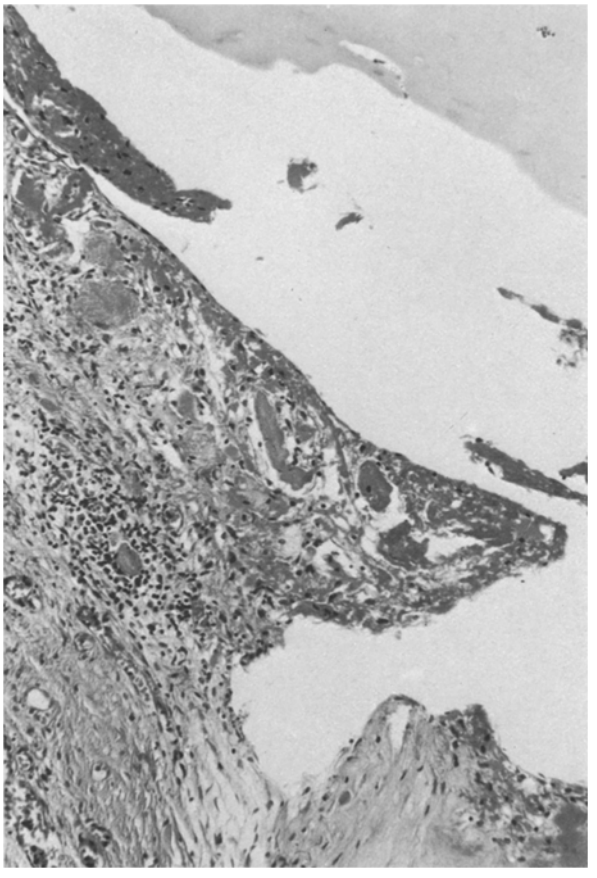


Fig. 21. Tongue-like extension of the proliferative, chronic inflammatory connective tissue into the empty clefts produced in the intervertebral disc. L2–3, Case 1. H and E x 95

adjacent vertebral body and disc can occur in rheumatoid arthritis. In addition the posterior corner of the vertebral body can also be involved in the same pathological process. In Case 1 the X-ray revealed that an indication of "squaring" of the anteroinferior corner of the vertebral body, seven years later became a gross erosive defect at the same site.

Lorber et al. [4] from study of gross sections are of the opinion that in rheumatoid arthritis granulomatous nodular lesions may occasionally develop in the marrow of the vertebral bodies which then spread to cause osteolysis and weakening followed by collapse of the vertebral plates. The progressive radiological changes and especially the histological findings in our Cases 1 and 2 do not support this view and we believe the extension of the rheumatoid process occurs in an entirely different manner.

It is also possible that prolapse of the nucleus pulposus provokes inflammation in surrounding tissue and the proliferative granulation tissue that occurs in the area of the enthesis and peridiscal areolar tissue invades clefts in the damaged annulus fibrosus or in the plane between bone and ligament. The empty disc appears as a joint space occupied by granulation tissue (Case 1) (Fig. 21).

Vertebral bodies appear to be eroded and destroyed by rheumatoid granulation tissue which probably occurs in the peridiscal part of the vertebrae irrespective of the presence or absence of any synovial tissue in the vicinity.

As shown by Case 3, the inflammatory changes in the vertebrae in rheumatoid arthritis are reversible as is rheumatoid inflammation in other parts of the body.

The necropsy findings confirm that the thoracic or lumbar spine may be involved in rheumatoid arthritis and that bone fusion was effective in one case in preventing progression of the inflammatory process in the enthesis and peridiscal areas.

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