Computed tomographic demonstration of calcification of the ligamenta flava of the lumbosacral spine in ankylosing spondylitis

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SUMMARY An axial computed tomographic (CT) scan of the lumbosacral regions was performed in 65 patients. The patient population was divided into two groups. The first (control) group included 40 elderly patients without calcification of the ligamenta flava. The second group included 25 patients with ankylosing spondylitis. More than 90% of those in the second group showed calcified lumbosacral ligamenta flava. In two patients these calcifications produced spinal stenosis. The diagnostic and practical importance of these findings are discussed.

Calcification of the ligamentum flavum was first recognised in 1929.¹ Only recently, however, was it found that such calcifications induced myelopathy.²⁻³ Since then similar reports have been presented, most of which referred to the location of this condition in the thoracic spine, producing myelopathy.⁴⁻⁷ Some of the reported cases, included mainly in the morphological studies, were associated with calcification and ossification of other spinal ligaments and enlargement of the vertebral pedicles.⁸ In his study on spinal column specimens, Hiraoka reported ossification of the ligamentum flavum in 44 out of 128 (34%) spinal columns of cadavers of aged persons.⁹ Calcification and ossification of the ligamenta flava in the cervical spine, associated or not with myelopathy and radiculopathy, have also been reported. In several of the patients operations resulted in significant improvement. Cervical ligamenta flava calcifications have been found not rarely in elderly women as an incidental finding.¹⁰⁻¹⁷

Calcifications of the ligamenta flava in the lumbosacral spine have been reported as part of the spectrum of ligamentous calcifications of the entire spine. The condition seems poorly understood and has not been reported separately.

Patients and methods

Sixty five patients underwent axial CT scan of the

lumbosacral region (L3-S1). The patients were divided into two groups. Group 1 included 40 patients, 20 female and 20 male, aged between 40 and 65 years, who underwent CT examination of the lumbosacral spine after complaints of low back pain. Group 2 included 25 male patients, aged 20-55 years, with ankylosing spondylitis, without CT findings of prolapsed disc. An Elscint EXEL 2400 CT scanner was used. All patients had a preliminary 250 mm long surview scan of the lumbosacral area with a viewing angle of 90°. In each intervertebral space the tilt of the gantry was planned parallel to the disc space. The width of the slices was 5 mm with 4 mm increment. A circle diameter of 140 mm was used with matrix 340/340 pixels.

Results

All patients in group 1 had normal CT scans, and no calcifications of the ligamenta flava were found. The mild spondylarthritic changes found in some of the patients were consistent with their age. Patients with senile vertebral ankylosing hyperostosis were not included in this group.

All the patients in group 2 had findings of sacroiliitis and 'squaring' of the lumbar vertebrae on conventional radiographs. The older patients had syndesmophytes and ossifications of the spinal ligaments, producing 'bamboo spine'. All the patients in this group had juxta-articular osteoporosis around the sacroiliac joints. In 23 patients (92%) calcifications of the ligamenta flava were demonstrated

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various levels, from L3 to S1. In the younger patients (below the age of 25 years), suffering from the disease for a considerably shorter duration of time, these calcifications were fine and not associated with calcifications of other spinal ligaments. In older patients, with a longer duration of the disease, the calcifications of the ligamenta flava were coarse and not necessarily associated with calcifications and ossifications of other spinal ligaments. In two patients coarse calcifications of ligamenta flava resulted in clinical symptoms of spinal stenosis (Fig. 1). Ligamenta flava calcifications or ossifications at more than one level (Fig. 2) were found in 12 patients. Eleven patients in this group also underwent axial CT scan of the cervical spine, which showed ligamenta flava calcifications in five of them (Fig. 1). These five patients had calcified or ossified spinal ligaments in the cervical spine, demonstrated on conventional radiographs.

Fig. 1 A 53 year old patient with ankylosing spondylitis and neurogenic intermittent claudication. Calcifications of the ligamenta flava (upper image). Coarse ossification of the ligamenta flava at the level of L3, causing narrowing, predominantly of the transverse diameter of the spinal canal (lower image).

Fig. 2 A 42 year old man with ankylosing spondylitis. Right anterior syndesmophyte and calcified ligamenta flava at the level of L3-4 (upper image). Calcified ligamenta flava at the level of S1 and juxta-articular sacral osteoporosis near the sacroiliac joints (lower image).

Discussion

Calcification of the ligamenta flava in the lumbosacral region is not sex dependent. Age probably plays a part when calcifications are already present. These calcifications may become coarser and more ossified with age. The lack of ligamenta flava calcifications in otherwise normal CT examinations is obvious in group 1, in which patients older than 40 years were selected. Also obvious is the high percentage of calcifications in group 2. They are seen at an early stage of the disease and are not associated with calcifications in other spinal ligaments. At this stage they can be of diagnostic significance when other symptoms are insufficient for the diagnosis. In older patients, with a longer duration of the disease, these calcifications become coarser, more ossified, and can result in spinal stenosis. Usually, in such patients with ankylosing spondylitis, calcifications

and ossifications of other spinal ligaments are also seen in the remainder of the spine. The calcifications demonstrated in the cervical ligamenta flava in this group are probably an expression of the general process of spinal ligament calcifications and can be useful in the early diagnosis of ankylosing spondylitis.

Spinal soft tissue calcifications and spinal stenosis in ankylosing spondylitis are reported, but there has been no separate study of the ligamenta flava.¹⁸⁻²¹

The aetiology of calcification remains unclear. In inflamed joints, calcium pyrophosphate dihydrate has been found, and the phenomenon has been called 'pseudogout syndrome'.²² Chondrocalcinosis also seems to arise in various conditions, such as hereditary haemochromatosis, hyperparathyroidism, diabetes mellitus, and gout.^{13, 23} Ligamenta flava calcification, which is a non-specific phenomenon, could well result from other conditions, as in the cases discussed in this study.

Today there is no doubt that CT scanning is the best procedure for the demonstration of ligamenta flava calcifications. This demonstration could be of greater importance in the diagnosis of spinal conditions. It provides important information to the physicians performing surgery for decompression of the spinal canal. This information can also warn the anaesthesiologist before the insertion of the needle for epidural anaesthesia.

We are convinced that, if demonstrated, ligamenta flava calcifications should be noted in the radiologist's report.

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