

Bertolotti's syndrome

A CAUSE OF BACK PAIN IN YOUNG PEOPLE

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Bertolotti's syndrome is characterised by anomalous enlargement of the transverse process(es) of the most caudal lumbar vertebra which may articulate or fuse with the sacrum or ilium and cause isolated L4/5 disc disease.

We analysed the elective MR scans of the lumbosacral spine of 769 consecutive patients with low back pain taken between July 2003 and November 2004. Of these 568 showed disc degeneration. Bertolotti's syndrome was present in 35 patients with a mean age of 32.7 years (15 to 60). This was a younger age than that of patients with multiple disc degeneration, single-level disease and isolated disc degeneration at the L4/5 level ($p \leq 0.05$). The overall incidence of Bertolotti's syndrome in our study was 4.6% (35 of 769). It was present in 11.4% (20 patients) of the under-30 age group.

Our findings suggest that Bertolotti's syndrome must form part of a list of differential diagnoses in the investigation of low back pain in young people.

In 1917 Bertolotti¹ described unilateral or bilateral enlargement of the transverse process of the most caudal lumbar vertebra which may articulate or fuse with the sacrum or ilium.² He associated these changes with low back pain which he subsequently attributed to arthritic change on the basis of clinical and radiological examination. The syndrome is said to affect 4% to 8% of the population.³ Since then, the nature of the link between lumbosacral transitional vertebrae, low back pain and disc degeneration has remained uncertain.⁴ It has been claimed that the disc above the transitional vertebra is subject to increased stress which renders the vertebral motion segment hypermobile and prone to early degeneration.^{5,6} Similar changes may be seen around block vertebrae.¹ The asymmetry of movement between the transitional vertebrae and the sacrum may accelerate these changes.

We have reviewed a series of consecutive elective MR scans of the lumbosacral spine performed over a period of 17 months to quantify the incidence of Bertolotti's syndrome in the population at large, and especially among younger patients.

Patients and Methods

A total of 769 consecutive patients with low back pain underwent elective MRI of the lumbosacral spine between July 2003 and November 2004. There were 398 males (51.8%)

and 371 females (48.2%) with a mean age of 44.8 years (9 to 90). All were scanned in a Philips new-generation Gyroscan Intera Tesla (T) scanner (Koninklijke Philips Electronics N.V., Eindhoven, The Netherlands) and had T1-weighted sagittal, T2-weighted sagittal and axial and coronal Short T1 Inversion Recovery (STIR) images performed.

Statistical analysis. This was performed by univariate analysis of variance (ANOVA) using the Microsoft Excel programme (Microsoft Corporation, Seattle, Washington). Statistical significance was set at $p \leq 0.05$.

Results

The MR findings showed multilevel disc degeneration in 383 patients (49.8%) (Fig. 1), single-level disc degeneration in 150 (19.5%) (Fig. 2), a normal scan in 131 (17%) and Bertolotti's syndrome in 35 (4.6%). The levels involved in the single-level group are summarised in Table I and the overall findings in Table II. Other spinal anomalies accounted for the remaining 70 patients (9.1%).

There were 22 males (63%) and 13 females (37%) in the Bertolotti group with a mean age of 32.7 years (15 to 60). Of these, 27 had bilateral radiological involvement (Fig. 3). Five had unilateral changes on the left and three unilateral on the right (Fig. 4). A broad-based disc bulge was seen in 23 patients, a central disc protrusion in ten and no significant abnormal-

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Fig. 1

MR T2-weighted sagittal image showing multilevel disc degeneration.



Fig. 2

MR T2-weighted sagittal image showing single-level disc degeneration at the L4/5 level.

Table I. Levels involved in patients with single-level disc degeneration

Level	Number
L1/2	5
L2/3	1
L3/4	4
L4/5	40
L5/S1	100
Total	150

Table II. MRI findings of the total group of patients

	Number	Percentage
Multi-level disc degeneration	383	49.8
Single-level disc degeneration	150	19.5
Normal	131	17.0
Bertolotti's syndrome	35	4.6
Spondylolisthesis/lysis	26	3.4
Post-operative changes	18	2.3
Scoliosis	9	1.2
Discitis/infection	6	0.8
Metastatic disease	5	0.7
Ankylosis	2	0.3
Arachnoiditis	1	0.1
Burst fracture	1	0.1
Pathological fracture	1	0.1
Scheurmann's variant	1	0.1
Total	769	100

ity in two. According to the classification of Castellvi, Goldstein and Chan,⁷ all had type-2 lumbosacral transitional vertebrae, eight type-2a and 27 type-2b.

The mean age of the patients with multilevel disc degeneration was 51.6 years (17 to 90). These patients were older

than those in the Bertolotti group ($p < 0.001$). Similarly, the mean age of the single-level group was 37.5 years (17 to 75), also significantly older than the Bertolotti group ($p = 0.05$). When patients with isolated L4/5 disc degeneration were separated from the single-level group, the mean age was 42.6 years (15 to 75). Again, this was significantly higher ($p < 0.001$) than the mean age of the Bertolotti group. Six patients in the Bertolotti group had disc degeneration at L3/4 which is the level above the transitional level. Their mean age was 41.5 years (29 to 60) which is older than the mean age of the group as a whole. Minor degenerative changes were also noted in the disc level below the transitional vertebra in five patients. The mean age of these patients was 38.8 years (27 to 49).

The incidence of Bertolotti's syndrome in the whole series was 4.6%. However, when the normal scans were removed from the total group, the incidence rose to 5.5%. There were no normal MR scans in the Bertolotti group. We then examined the 176 patients under the age of 30 years from the group as a whole. Of these, 20 were shown to have radiological evidence of Bertolotti's syndrome. This gave an incidence of 11.4% in the under-30 age group. However, when the normal scans were removed from this group, the incidence rose to 18.5%.

Discussion

Low back pain is one of the most common reasons for taking medical advice and 80% of adults seek help at some stage.^{8,9} In any one-year period 15% to 20% of the population are affected.⁸ In 1991 the annual cost of diagnosing and treating low back pain in the USA was estimated to be \$50 billion.⁹



Fig. 3

Coronal Short T1 Inversion Recovery (STIR) MR image showing bilateral Bertolotti's syndrome.

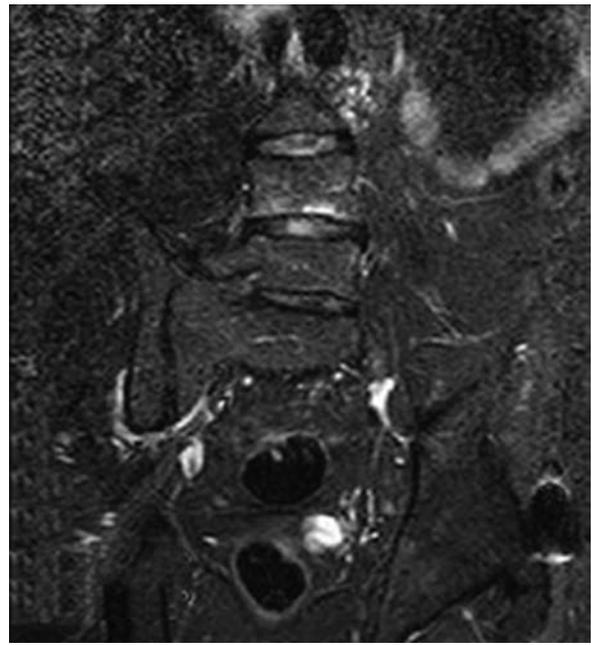


Fig. 4

Coronal Short T1 Inversion Recovery (STIR) MR image showing unilateral Bertolotti's syndrome on the right.

For patients over the age of 50 years with low back pain, plain anteroposterior and lateral lumbar radiographs are often the first examination performed, but they seldom give a clear diagnosis.¹⁰ In general, MRI is the investigation of choice for patients with low back pain.^{11,12}

Our study has attempted to quantify the overall incidence of Bertolotti's syndrome in the population and in particular in young patients. It differs from series which report the asymptomatic radiological findings of transitional vertebrae^{13,14} in that all the patients studied presented with low back pain. Consequently, this incidence of Bertolotti's syndrome is more realistic than the mere presence of a transitional lumbosacral vertebra, many of which are seen as incidental radiological findings in asymptomatic patients. When normal MR scans in the under-30 age group were excluded, Bertolotti's syndrome was seen to be present in nearly one in five patients, a much higher incidence than previously identified.

The exact aetiology of Bertolotti's syndrome remains unclear. Both Luoma et al⁵ and Brown et al¹⁵ have published MRI-based studies describing degenerative changes of the intervertebral disc in relation to lumbosacral transitional vertebrae. Specifically, they make reference to the fact that the disc above a transitional vertebra appears at risk of increased degenerative change while the disc below appears protected. Aihara et al⁶ suggested that this phenomenon was due to hypermobility and abnormal torque of the intervertebral space above the transitional vertebra

and that there was less degenerative change at the level below because the anomalous articulations allow less movement between the L5 and S1 vertebrae. In this study the possible role of the iliolumbar ligament in this phenomenon was examined but its exact role was unclear.

To date, there is no agreement as to how to treat these patients. Marks and Thulbourne¹⁶ studied ten patients who received a steroid and local anaesthetic infiltration in their anomalous lumbosacral articulations for severe chronic low back pain. Immediate relief was registered in eight, but only one patient remained free from pain two years later.¹⁶

Jonsson, Stromqvist and Egund¹⁷ also reported symptomatic relief in nine of 11 patients who had an injection of local anaesthetic into the anomalous articulation. However, these patients all subsequently underwent resection of the accessory joint, and at a mean follow-up of 17 months, nine reported relief from pain.

Similarly, Santavirta et al¹⁸ studied a series of 16 patients with low back pain and radiological evidence of an anomalous articulation. Eight underwent posterolateral fusion of the transitional segment and eight had a unilateral anomaly resected. After a mean follow-up of nine years, ten reported an improvement in their pain. The outcome was the same in each group. Consequently, the management of these patients remains uncertain.

The absence of a consensus is of greater significance given the incidence of Bertolotti's syndrome shown in our study. In light of the economic and social impact^{9,19} of low

back pain in young people, our findings illustrate the importance of including Bertolotti's syndrome in the list of differential diagnosis when investigating young people with low back pain.

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