

Original Article

Bertolotti's syndrome; an important etiology of low back pain on x-ray lumbo-sacral spine among young population

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ABSTRACT

Objective: To find out frequency of Bertolotti's syndrome on X-ray lumbosacral spine in young adults having low backache.

Methodology: This is a retrospective descriptive cross sectional study done in Radiology Department POF hospital Wah Cantt, from Nov 2017 to Oct 2019. The sample size was 600 X-ray lumbosacral spine of patients with low back pain between 15-40 years of age. 200 cases with a history of trauma were excluded. Data analysis of 400 included cases was done by SPSS-22. Percentage of etiologies of low backache, lumbosacral transitional vertebra (LSTV), Bertolotti's syndrome, and Castellvi types of LSTV was calculated. Mean age with SD and percentage of gender distribution among cases of Bertolotti's syndrome was calculated.

Results: Among 400 patients, 120 (30%) had LSTV, 264 (66%) had muscle spasm, 6(1.5%) had Pott's disease and 10 (2.5%) had spinal metastasis. 120 patients with LSTV, 32 (26.6%) had Bertolotti's syndrome and 88(73.3%) had normal transverse processes. The mean age with Bertolotti syndrome was 29.96±0.417 years. 20 patients (62%, n=32) were female and 12 (37.5%, n=32) were male. Among 32 patients with Bertolotti's syndrome, 4 (12.5%) were Castellvi type-I, 10 (31.25%) were Castellvi type-II, 12 (37.5%) were Castellvi type-III and 6 (18.7%) were Castellvi type-IV.

Conclusion: Bertolotti's syndrome is a frequently observed etiology of backache in young patients. The importance of imaging is not only in the diagnosis but also in the identification and exact enumeration of LSTV, to avoid unintended level treatment.

Keywords: Bertolotti's syndrome, Castellvi classification, Lumbosacral transitional vertebra.

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Introduction

The prevalence of LSTV is 4- 35% of the population in different studies and it is a frequently occurring congenital variant. LSTV may have normal or dysplastic transverse processes. Association of LSTV with Bertolotti's syndrome is known since 1917 when Mario Bertolotti first described this syndrome.¹ It refers to the presence of Lumbosacral transitional vertebra (LSTV) with dysplastic transverse process unilateral or

bilateral with abnormal articulation with sacrum or iliac blade. This abnormal articulation triggers inflammatory changes and generate stress on the intervertebral disc above the level of LSTV. This leads to early degenerative disc changes and low back pain or sciatica in young patients.^{2,3}

Bertolotti's syndrome overall affects 4% to 8% of the population with low back pain and usually presents in 2nd or 3rd decade of life. In this syndrome LSTV may be

lumbarized S1 or sacralized L5 and enlarged, spatulated transverse process of LSTV measures 19 mm in height. It may be having partial /complete, pseudoarthrosis/ fusion with sacrum or iliac bone, or sometimes with both. These results in the limited movement at the lumbosacral junction.^{4,5,6} Limited movement and stress related to altered mechanics which leads to degenerative changes in the disc above the LSTV most commonly at L4-5 level.^{7,8} Also there is bilateral facet joints arthropathy due to increased stress and neural foramen narrowing at this level. Due to combination of discogenic disease and neural foramen narrowing these patients have compression of L5 nerve root and usually present with sciatica.^{7,8,9} LSTV may have enlarged spatulous transverse process on one side and hypoplastic transverse process on contralateral side which increases stress on iliopsoas and quadrates lumborum muscles resulting in scoliotic curvature of the lumbar spine.

LSTV can be identified on X ray, CT, and MRI, but X ray L/S spine AP and Lateral view is the first modality that is easily available, cost effective, and has less radiation burden.^{10,11} Furthermore, the enumeration of vertebrae and identification of LSTV is much easier with X-ray. This can be done by taking x ray whole spine and counting vertebrae below C2, so LSTV is identified and can be labeled as sacralization of L5 or lumbarization of S1.^{10, 11} X-ray L/S spine lateral view further confirms LSTV which shows squaring (Figure 1)



Figure 1. X-ray l/s, showing LSTV type iii-b on ap view and squaring of LSTV on lateral view.

It is important to do the correct identification of LSTV as inaccurate identification may result in poor correlation with clinical symptoms and can lead to surgical and procedural errors. Castellvi et al in 1984 described a

radiological classification system. On the basis of morphologic characteristics, 4 types of LSTV are identified.^{12, 13}

Type I LSTV: Dysplastic transverse processes. It is further divided in to type IA (unilateral) and type IB (bilateral). The dysplastic transverse process is elongated and spatulous measuring 19mm in height.

Type II LSTV: has pseudoarthrosis between enlarged transverse process and sacrum or iliac bone, if unilaterally it is called type II-A and if bilaterally it is called type IIB. There is incomplete lumbarization or sacralization.

Type III LSTV: There is a complete fusion of elongated transverse process to the sacrum or iliac bone with complete lumbarization or sacralization. If unilateral fusion it is called type III-A and if bilateral fusion it is called type IIIB.

Type IV: LSTV having incomplete fusion that is type II on one side while having complete fusion that is type III on the contralateral side.(Figure 2, 3)

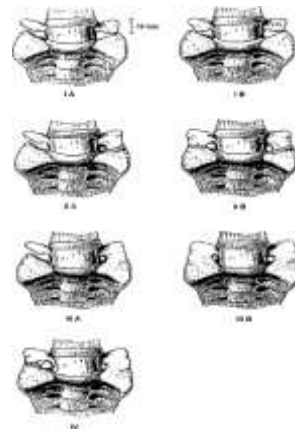


Figure 2. Castellvi LSTV types.



Figure 3. LSTV Castellvi type. II

CT scan is also a better modality for evaluation of bony pathologies but enumeration of vertebrae can be problematic. Moreover, increased radiation dose and high cost make it a less frequently used modality to rule out LSTV and BS. However, its role in evaluation of bony trauma cannot be denied.¹⁴

MRI has better role in evaluation of discogenic disease associated with BS, but enumeration of vertebrae and identification of LSTV is also problematic with MRI. Moreover, it is time a consuming and costly modality. It becomes cumbersome on MRI, to differentiate between

DV12 having hypoplastic lowest rib and LVI having a spatulated enlarged lumbar transverse process.^{12,13,14} Most patients with BS may have unilateral low back pain, MRI confirms the cause by showing abnormal signal, hypointense on T1W, and hyperintense on T2W and STIR, suggestive of marrow edema in ipsilateral pseudoarthritic joint.

Different non-surgical or surgical procedures can be opted for in the treatment of Bertolotti's syndrome. Pain relieving treatment includes local anesthetics and steroid injections within a partially or completely fused transverse process and sacrum or iliac bone.¹⁵ Symptomatic relief can also be achieved by injecting steroid injection in facet joint contralateral to pseudoarthrosis.¹⁵ Other palliative option includes radiofrequency ablation. Surgical treatments are partial resection of dysplastic transverse process or spinal fusion.^{16, 17} Associated degenerative disc disease may need discectomy with or without laminectomy.^{18, 19} X ray is a cheap and widely available radiological modality which can help in early identification of Bertolotti's syndrome in young patients and further assist in providing timely treatment and symptomatic relief to the patient.

Methodology

The retrospective, descriptive cross-sectional study was conducted in the Department of Radiology POF hospital Wah Cantt, Pakistan. The data is acquired from PACS storage, X rays were done using Shimadzu Digital Xray Machine from Nov 2017 to Oct 2019.

600 x-rays lumbosacral spine of patients with low back pain in the age between 15-40 years were viewed on DICOM VIEWER. 200 cases with old or recent trauma were excluded. The rest of 400 x rays were included in the study.

Statistical analysis was done by using SPSS-22. The percentage of various etiologies causing low back pain was calculated. Cases with lumbosacral transitional vertebra (LSTV) with and without Bertolotti's syndrome were identified and percentages were calculated. The percentages of different types of LSTV according to Castellvi classification were also found out. The mean age with SD and percentage of gender distribution in cases of Bertolotti's syndrome was also calculated.

Results

Out of 400 patients included in the study 120 patients (30%), n= 400 had LSTV and among these, 32(26.6%) n=120 patients who had dysplastic transverse processes with degenerative disc disease above the LSTV, were labeled as Bertolotti's syndrome. Mean age of patients with Bertolotti syndrome was 29.96 ± 0.417 years and there was female preponderance over males. Out of 32 patients with Bertolotti's syndrome, 20 (62%)n=32 were female and 12(37.5%) n=32 were male patients.

Further categorization of LSTV in patients with Bertolotti's syndrome was done according to the Castellvi classification. 4(12.5%) n=32 patients only having elongated unilateral or bilateral transverse processes with no arthrosis or fusion with sacrum or iliac bone were labeled as Castellvi type-I. 10 (31.25%) n=32, patients were Castellvi type -II having unilateral or bilateral pseudoarthrosis of transverse processes with sacrum or iliac bone. 12 (37.5%) n=32 patients were Castellvi type-III having a unilateral or bilateral fusion of transverse processes with sacral or iliac bone. 6 (18.7%) n=32 patients were labeled as Castellvi type- IV having a type II transverse process on one side and type III on the other side. Out of 120 patients with LSTV, 88(73.3%) n=120 were having normal transverse processes. The most common type of LSTV among the patients with Bertolotti's syndrome in our study was Castellvi type-III.

Table I: Xray findings of studied patients(n=400)

Findings	No. of patients	Percentage
Straightening of lumbar curvature (muscle spasm)	264	66%
LSTV	120	30%
Pott's disease	6	1.5%
Metastatic spine disease	10	2.5%
Total patients	400	100%

Table II: Crosstabulation of Gender distribution and Bertolotti's type (n=32)

	Type-I	Type-II	Type-III	Type-IV	Total
Female	2	3	12	3	20
Male	2	7	0	3	12
Total	4	10	12	6	32

Discussion

X ray Lumbosacral spine is one of the commonest radiological examinations in any diagnostic imaging center. The most frequent clinical history of these patients is low backache. In older patients' degenerative changes in the spine is the most common cause but it is young adults may also have low back pain and seek medical advice.²⁰

X-ray lumbosacral spine antero-posterior and the lateral view is done in such patients. Among the young population, the most common finding is, only straightening of lumbar curvature spine due to muscle spasm.²¹ Other common etiologies in younger age groups include trauma, congenital, infection, seropositive/seronegative spondyloarthropathies, and less commonly primary and metastatic neoplastic disease. LSTV is a frequently observed congenital finding on X-ray lumbosacral spine in such patients.²² In many cases it is just an incidental finding along with another etiology of low back pain, having no dysplasia of transverse processes. But in cases, with dysplastic transverse processes, pseudoarthrosis/fusion with the sacrum and iliac bone it may lead to curvature abnormalities, inflammation, and nerve root compression, hence lead to low back pain at a young age.³ Associated degenerative disc disease at L4-5 and sciatica, warrants evaluation by MRI lumbo-sacral spine in such patients.⁸

Bertolotti's syndrome is not an uncommon etiology of low back pain in young adults.^{20,21} The percentage of Bertolotti's syndrome found in our study supports this hypothesis.

Our study is different from the other studies which report the transitional vertebrae in asymptomatic patients as an incidental finding. We did not include asymptomatic patients with LSTV. All 120 patients with LSTV were symptomatic and among these, the incidence of BS is 1 in 4. In our study patients with BS having the LSTV Castellvi type III, type II, type IV, and type I are found in descending order of frequency. In comparison to the study by Apazidis et al, the most common Castellvi type was type-IA with a prevalence of 14.7%.³ Likewise in another study by Nardo et al, type-I and type-II were the commonest varieties with 40% occurrence of total LSTV. As type-I is not significant so most of their patients were asymptomatic.⁴

Degenerative disc disease manifested by decreased disc space and degenerative endplates changes was frequently

seen above LSTV at L4-5 disc in our study. It is comparable with studies by Luoma et al and Bron et al who described degenerative disc disease in such cases by using MRI lumbosacral spine. In those studies, also, L4-5 disc level is the most common level having degenerative changes due to dynamic changes occurring the most at this level. The disc below the level of LSTV remains protected from these effects.^{7,8} In another study by Aihara et al the same findings were described and the cause of degenerative disc disease above LSTV at L4-5 was attributed to hypermobility and abnormal torque at this disc level.⁸

There is a relatively high incidence of BS in females as compared to males in our study, 20 patients were females and 12 were males but Bertolotti's syndrome and gender distribution showed no significant association with p value =0.55 and chi square= 0.341. As far as the type of

Bertolotti's syndrome is concerned, type III showed significant association in females with p value =0.006 and chi square= 12.373 The mean age in our study was 29.96±0.417 years. The mean age in another study conducted in India by Reddy Ravikanth and Pooja Majumdar mean age 39 ± 15 years. Gender distribution in this study also showed female preponderance with 70 women and 59 men.¹²

Conclusion

Among the many etiologies of low back pain in young adults, Bertolotti's syndrome is frequently observed. While reporting x ray lumbosacral spine radiologists should pay special attention to look for LSTV and transverse processes of the lowest lumbar vertebra. The importance of imaging is not only in the diagnosis but also in identification and an exact enumeration of LSTV, so that unintended level injection for pain relief or surgery can be avoided.

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