RADIOLOGICAL EVALUATION OF BERTOLOTTI SYNDROME – CASE REPORT

RADIOLOŠKA EVALUACIJA BERTOLOTI SINDROMA – PRIKAZ SLUČAJA

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Abstract
Introduction. Bertolotti syndrome is an anatomical variation characterized by the presence of a lumbosacral transitional vertebra, typically involving an enlarged transverse process of the L5 vertebra (>19 mm). It most commonly presents with lower back pain and is classified into four types according to the Castellvi classification, with further subclassification based on the degree of pseudoarticulation. The estimated prevalence in the general population ranges from 4% to 35%. Standard pelvic or lumbosacral spine X-rays are usually sufficient for initial diagnosis, while Magnetic Resonance Imaging and/or computerized tomography imaging is required for definitive diagnosis and classification. Treatment options range from conservative management to surgical intervention, depending on the extent of pseudoarticulation and presence of nerve compression. **Case Report.** We present the case of an elderly female patient with lower back pain and discomfort in the hip region. Following clinical examination, a standard pelvic X-ray was performed, revealing a bony oval formation approximately 30 mm in size in the left paravertebral and suprasacral region. This finding likely correspond to a hypertrophic transverse process of the L5 vertebra or a cranial extension of the S1 lateral mass. Based on radiographic findings and clinical presentation, the primary diagnosis was Bertolotti syndrome. **Conclusion.** This case underscores the clinical utility of plain of radiography as a rapid, cost-effective diagnostic tool in the evaluation of lower back pain, particularly for identifying structural anomalies such as Bertolotti syndrome.
Key words: Low Back Pain; Sacrum; Spine; Radiography; Anatomy; Lumbosacral Region; Diagnosis, Differential

Sažetak
Uvod. Bertoloti sindrom predstavlja anatomsku varijaciju postojanja lumbosakralnog premošćavajućeg pršljena, u vidu uvećanog procesus transverzusa L5 pršljena (> 19 mm). Najčešće se javlja u vidu bola u donjem delu leđa. Bertoloti sindrom se prema stepenu pseudoartikulacije klasifikuje u četiri grupe prema *Castellvi* klasifikaciji i u dve podgrupe. Prevalencija se kreće 4–35% u opštoj populaciji. Za postavljanje dijagnoze najčešće je dovoljan RTG snimak karlice ili lumbosakralnog dela kičme u standardnim položajima. Radi postavljanja definitivne dijagnoze i klasifikacije Bertoloti sindroma koriste se dijagnostika magnetnom rezonancijom i/ili kompjuterizovanom tomografijom. Lečenje Bertoloti sindroma svodi se na konzervativni tretman, pa sve do hirurškog lečenja, u zavisnosti od stepena pseudoartikulacije i kompromitacije nerava. **Prikaz slučaja.** Pacijentkinja starije životne dobi, sa bolom u donjem delu leđa i u predelu kukova. Nakon fizikalnog pregleda, načinjen je standardni rendgenski snimak karlice. Uočava se koštana ovalna formacija levo paravertebralno i suprasakralno visine oko 30 mm. Može odgovarati voluminoznom procesus transversusu L5 pršljena ili kranijalnoj ekstenziji voluminozne bočne mase S1 pršljena. U prvom redu diferencijalno-dijagnostički dolazi u obzir Bertoloti sindrom. **Zaključak.** U ovom prikazu slučaja želeli smo da naglasimo važnost rendgenske dijagnostike u svakodnevnom radu, kao brzu i relativno jednostavnu dijagnostičku proceduru u diferencijalnoj dijagnostici hroničnog lumbalnog sindroma, sa osvrtom na Bertoloti sindrom.
Ključne reči: lumbalni sindrom; krsna kost; kičma; radiografija; anatomija; lumbosakralna regija; diferencijalna dijagnoza

Introduction

Bertolotti syndrome (BS) is a clinical entity characterized by localized lower back pain with altered sagittal mobility of the lumbosacral spine. It arises due to an anatomical variation involving a lumbosacral transitional vertebra (LSTV), most commonly presenting as an enlarged transverse process of the L5 vertebra (>19 mm) that may pseudoarticulate or fuse with the sacrum – with or without associated nerve root involvement. This condition is most frequently observed in older individuals, with a predilection for the left side, and occurs more commonly in males [1–3]. The condition was first described in 1917 by Mario Bertolotti [4].

The condition is classified according to Castellvi classification, which divides LSTV into four main types based on the fusion at the L5/S1 level, with additional two subgroups based on the extent of pseudoarticulation.

– Type I – transverse process >19 mm
– Type II – presence of a false joint
– Type III – complete fusion of processes
– Type IV – A combination of type II on one side and type III on the contralateral side. Each type is further subdivided into A (unilateral) and B (bilateral) (**Figure 1**).

The reported prevalence of BS in the general population ranges from 4% to 35%, although up to 13% of

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Abbreviations

BS	– Bertolotti syndrome
MRI	– Magnetic Resonance Imaging
CT	– computerized tomography
LSTV	– lumbosacral transitional vertebra

individuals with LSTV remain asymptomatic [2,3,5]. Pain associated with BS is attributed to the enlarged transverse process, osteoarthritic changes between the affected bones, associated disc degeneration, spinal canal stenosis, or varying degrees of nerve compression [1,3,4].

Radiographic evaluation using a standard pelvic or lumbosacral spine X-ray is often sufficient for an initial diagnosis. For a definitive classification and assessment of BS, Magnetic Resonance Imaging (MRI) and/or computerized tomography (CT) imaging is recommended. However, advanced imaging techniques come with certain limitations: CT involves a high radiation dose approximately 4-10 times greater than that of standard X-rays, and MRI may be uncomfortable for some patients, and more costly, thus posing an economic challenge to healthcare systems [6].

Treatment options for Bertolotti syndrome range from conservative management to surgical interventions, depending on the severity of pseudoarticulation and nerve involvement [2,3].

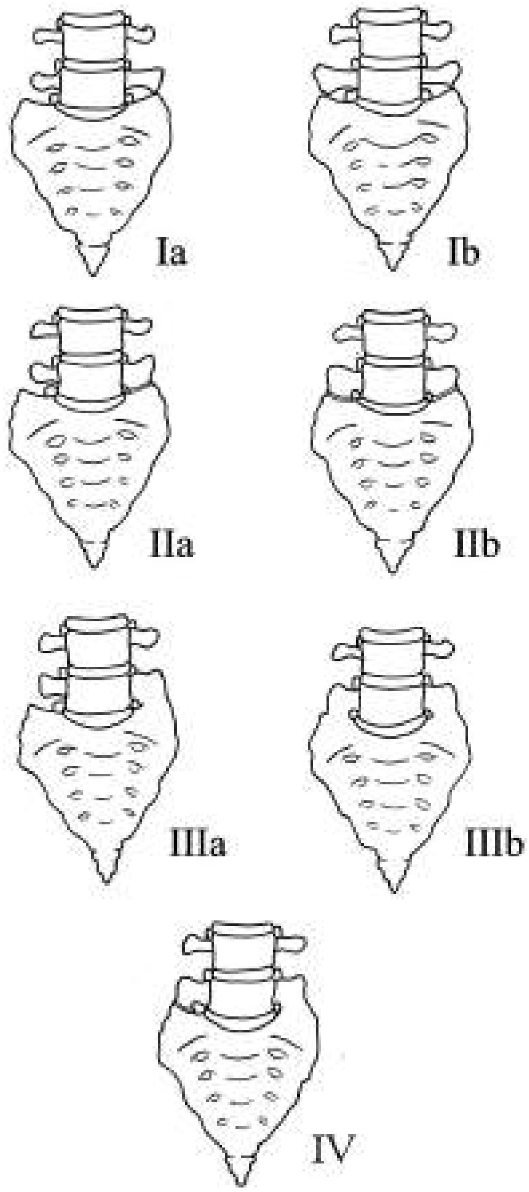

Figure 1. Castellvi's classification (URL: https://www.ajnr.org/content/31/10/1778)

Case Report

A 76-year-old female patient (Visual Analogue Scale (VAS) > 5, body mass index (BMI) 24.46 kg/m^2) presented with chronic pain localized in lower back and hip region. The pain was described as persistent with fluctuating intensity, aggravated by specific movements. Her medical history included anemia, osteoporosis, type 2 diabetes mellitus, hemorrhoidal disease, and the use of a pessary for uterine prolapse. She had previously undergone coronary artery bypass grafting twice. On physical examination, the patient exhibits an anterior trunk inclination and restricted range of motion in both hip joints. The Lasegue test was negative. There were no clinical signs of synovitis in the peripheral joints. Neurological and circulatory function in the lower extremities was preserved, with no evidence of muscle weakness. Ethical approval for the case was obtained from the Ethics Committee of the Special Hospital for Rheumatic Diseases in Novi Sad, Serbia (Approval No. 14/03-1/1-25), and the patient provided written informed consent.

A standard anteroposterior X-ray of the pelvis in the supine position (**Figure 2**), performed using a Philips DuraDiagnost F30 system, revealed an oval-shaped bony structure measuring approximately 30

Figure 2. Arrow points on enlarged processus transversus

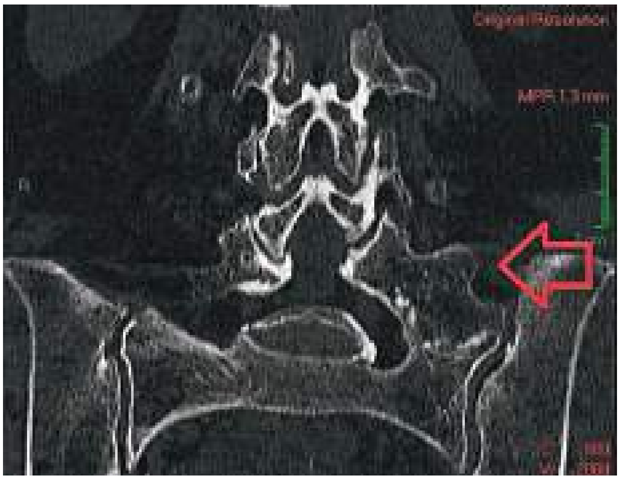

Figure 3. Arrow points on enlarged processus transversus

mm in height, located in the left paravertebral and suprasacral region. This finding was suggestive of either a prominent transverse process of the L5 vertebra or a cranial extension of a voluminous lateral mass of the S1 vertebra. Based on the absence of pseudoarticulation, the primary differential diagnosis was BS, Castellvi type IIIa. Laboratory investigations showed mildly elevated acute-phase reactants: C-reactive protein at 11.2 mg/L (reference range: 0–6 mg/L) and erythrocyte sedimentation rate at 45 mm/h (reference range: 0–15 mm/h).

To confirm the diagnosis, a CT scan of lumbosacral spine was performed. Imaging confirmed the presence of a transitional L5 vertebra with a prominent left transverse process that was fused to the sacral bone, consistent with Castellvi type IIIa (**Figure 3**). Additionally, degenerative changes were noted in the intervertebral disc, most prominent at the L4/L5 level, where disc bulging into the spinal canal and intervertebral foramina was observed, accompanied by mild to moderate spinal canal stenosis.

Based on clinical and radiological findings, the BS was confirmed.

Conservative treatment was initiated, consisting of oral analgesics and physical therapy, along with ergonomic education and counseling on protective movement strategies. The patient was referred to her primary care physician for continued follow-up.

Discussion

Bertolotti syndrome is an anatomical variation at the lumbosacral spine level. This anomaly results in a reduced interspace between the L5 transverse processes and the lateral mass of the S1 vertebra, which normally measures between 2 and 3 cm [1].

When L5 is fused with the sacrum, only four lumbar vertebrae remain, while in cases of S1 lumbarization, six lumbar vertebrae are present, contributing to postural changes and hyperlordosis [4]. The BS often presents with pain localized in the sacral region, hips, lower back, and along the L5 dermatome [1–3]. A genetic predisposition is suspected to play a role in its development [3,4].

Several studies have associated BS with adjacent segment disc degeneration. This may be partially due to a thinner iliolumbar ligament and altered positioning of the conus medullaris - lower in cases of lumbarized S1 and higher in sacralized L5 – possibly contributing to the onset of neurological symptoms [4]. Nonetheless, the precise mechanisms underlying symptom development remain unclear and warrant further research involving larger cohorts.

Standard pelvic or lumbosacral spine radiographs are typically sufficient to raise clinical suspicion of BS. However, advanced imaging such as CT or MRI is required for definite diagnosis and classification based on Castellvi criteria, especially to assess the degree of pseudoarticulation or bony fusion [4]. Literature suggests that diagnostic confirmation can be aided by fluoroscopically guided corticosteroid and local anesthetic injection into the articulation site between the L5 vertebra and iliac wing area, which often results in immediate pain relief. However, due to lack of standardized diagnostic and treatment protocols, BS often goes unrecognized [1–3,5].

Interestingly, some reported cases of lower back pain in younger individuals fall outside the established Castellvi classification but were nevertheless managed as BS [1].

Initial treatment is conservative and includes nonsteroidal analgesic therapy and physical therapy. Depending on the extent of structural involvement and the presence of radiculopathy, surgical intervention may be considered [3,7]. Prognosis is generally favorable, with most patients – especially younger ones - returning to normal activities with substantial symptom relief [1,8].

Conclusion

This case highlights the clinical significance of X-ray imaging as a rapid, accessible, and cost-effective tool for diagnosing Bertolotti syndrome when applied appropriately and interpreted in the context of clinical findings. While advanced imaging modalities such as computerized tomography and Magnetic Resonance Imaging remain indispensable for definitive diagnosis and classification, pose also an economic challenge, causing patient discomfort, and requiring longer result interpretation times, standard X-ray imaging retains considerable diagnostic value.

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