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KEY WORDS: TLTV thoracolumbar transition vertebra, MRI- Magnetic resonance imaging, CT – computed tomography, AP projection- anteroposterior projection .

A RARE CASE OF THORACOLUMBAR TRANSITION VERTEBRAE

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ABSTRACT

The literature states that transitional vertebrae at any junction are characterized by features retained from two adjacent regions in the vertebral column. Currently, there is no published literature available that describes the prevalence or morphology of thoracolumbar transitional vertebrae (TLTV). We present to you a case of thoracolumbar transitional vertebrae with compression fracture.

INTRODUCTION

The vertebral column originates from the pre.somatic mesoderm under regulation of the notochord (Greene & Copp, 2009). The number of vertebrae in a region may vary congenitally. Variability in the vertebral column may arise from cranial–caudal border shifts. Border shifts take place when there is a somatic shift from the typical distribution of vertebral segments in a region. This may cause an anomalous total number of vertebrae in the vertebral column.

In the typical method of spinal enumeration, the last thoracic vertebra is defined by counting down from the second cervical vertebra (C2) or the first thoracic vertebra (T1) under the assumption that there are 12 thoracic vertebra. However, this method may be prone to error because the number and distribution of thoracic and lumbar segments exhibit considerable variation, even though the cervical spine has a relatively stable morphology and a fixed vertebral count of seven. In addition, acquisition of whole-body spine radiographs, MR scans or CT scans are needed for this method. Nonetheless, this method remains widely used. Wigh et al suggested that the true nature of lower vertebral segmentation can be established by using images that include the thoracolumbar junction. In such images, hypoplastic true ribs can be differentiated from large transverse processes, thereby allowing correct identification of the L1 vertebral body. Farshad-Amacker et al also proposed that ribs or rib equivalents are more reliable for numbering the lumbar vertebra. Several studies have labelled the rib-bearing vertebra as the thoracic vertebra. However, these studies did not establish definite criteria by which ribs can be differentiated from rib equivalents (table 1).

Without classifying bones as either ribs or rib equivalents, any vertebra showing an attached bone is considered to be a thoracic vertebra.

We are presenting a rare case of thoracolumbar transition vertebra with a compression fracture.

CASE REPORT

A 61 year old male patient had presented with complains of lower back pain for a period of one month. He had history of road traffic accident one month back, for which he was evaluated and treated in a local hospital. Now patient complains of excruciating pain in his lower back and restriction of movements associated with it.

CLINICAL EXAMINATION

On palpation, the point of maximum tenderness was over the thoracolumbar region corresponding to L1 vertebral body, with no associated bruising or swelling . There was no complains of loss of consciousness, seizures or vomiting at the time of trauma. Patient is a known case of systemic hypertension on medication for the past 2 years. The results of the hematological investigations were within normal limits.

RADIOGRAPH

FIGURE-I

The AP projection of thoracolumbar spine shows a linear radiolucent streak with reduction in height of the T 13 vertebral body. Mild scoliosis to the right is also noted.

The T13 vertebral body shows attachment of an extra rib arising from the right costovertebral joint.

FIGURE-II

A lateral projection of thoracolumbar spine showing a reduction in height of T13 vertebral body- suggestive of Anterior wedge compression fracture of T13 with vacuum phenomenon

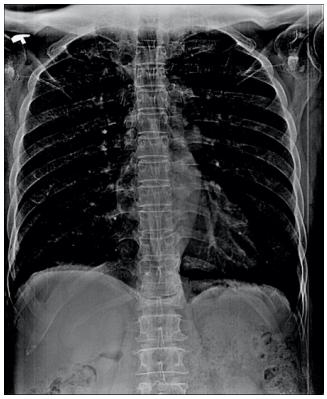
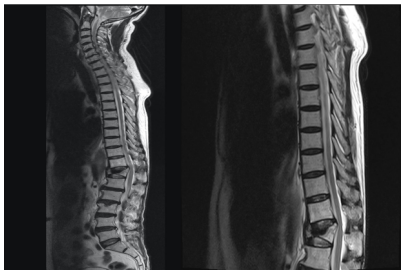


FIGURE-III

- Anterior wedge compression fracture of T13 vertebral body with 70-80 % reduction in the vertebral body height.
- Chest radiograph , AP projection taken in adequate inspiration showing normal lung fields and airways. Mediastinal structures are within normal limits.
- No apparent cardiomegaly, costophrenic and cardio phrenic angles are within normal l limts, extra thoracic soft tissues appear normal.

MRI

- Thoracolumbar transition vertebra (BETWEEN D12 AND L1) – vertebral body shows a compression fracture – osteoporotic
- There is 70-80% reduction in height. No obvious marrow edema . No recent compression, pedicles and neural arches are nomal. ALL and PLL are intact.
- No retro pulsed bone fragment . No paravertebral soft tissue components. Moderate impression on thecal sac noted.
- Mild kyphosis at the level of D12 lower end plate is also noted.
- Posterior annular tear of L4-L5 disc. No significant disc herniation.
- Accessory unilateral right lumbar rib arising from the transverse process of thoracolumbar transition vertebra.



WHOLE SPINE SCREEING

- Diffuse degenerative changes of cervical and lumbar spine with disc desiccation and disc bulge.
- Posterior annular tear of L4-L5 disc. No significant disc herniation.
- Cord shows normal signal morphology.
- Anteroposterior spinal canal diameters are within normal limits.

Table-1

System of enumeration	Advantages	Disadvantages
Counting down from the second cervical vertebra (C2) or the first thoracic vertebra (T1) under the assumption that there are 12 thoracic vertebra1–6	• Counting the number of presacral segments	• Prone to error because the number and distribution of thoracic and lumbar segments exhibit significant variation (e.g. 22, 23 or 25 presacral segments, 13 rib-bearing thoracic vertebra with 4 lumbar-type vertebra, 11 rib-bearing thoracic vertebra with 6 lumbar-type vertebra) • Acquisition of whole-body spine radiographs, MR scans or CT scans are needed. If no such images have been acquired, the patient must be recontacted
Labelling the rib-bearing vertebra as the thoracic vertebra8,13,14	• Possible without whole spine images • Allows segmentation of the lumbar and thoracic vertebra	• Lack of definite criteria by which ribs can be differentiated from rib equivalents (until the current study)
Differentiation of vertebral segments at the thoracolumbar junction as the TLTV or non-TLTV (thoracic or lumbar) segments through definitive criteria for differentiating the most caudal ribs	• Possible without whole spine images, by using the axial spine CT image with a CPR image. The patient's axial chest, abdomen CT or spine MR image can also be used for morphologic evaluation, except for the length of bone • Allows segmentation of the lumbar and thoracic vertebra	Requires an axial image that shows the relationship between the vertebra and most caudal ribs

DISCUSSION

Accurate spinal enumeration is necessary to establish the correct level in spinal surgery. In some cases, spine surgeries are performed on unintended levels because of various spinal variants. In contrast to the lumbosacral transitional vertebra, very little is known about the thoracolumbar transitional vertebra (TLTV). Indeed, the precise definition of the vertebra is still debated.

Transitional vertebrae are abnormal vertebrae that resulted from the overlap of developing somites during a cranial–caudal border shift. The affected vertebra has combined anatomical morphology of the two adjacent vertebral regions. Thoracolumbar transitional vertebrae (TLTV) are vertebrae that result from the overlap or shift of thoracic and lumbar somites at the thoracolumbar junction.

This may alter the number of vertebrae present in the thoracic region (T_1–T_{11} or T_1–T_{13}) or lumbar region (L_1–L_4or L_1–L_6). In addition, cranial–caudal border shifts alter the morphology of

either the thoracic or lumbar vertebrae at the thoracolumbar junction.

CONCLUSION

Deviation from typical vertebral anatomy can result in confusion by clinicians, specifically orthopedic surgeons and radiologists while reporting. It is clinically relevant to study natomical variations at the thoracolumbar junction, such as TLTV. Any deviation from typical morphology can result in significant clinical errors during medical procedures.

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