

Bone single-photon emission computed tomography and three-dimensional computed tomography in the diagnosis of low costal variation and pathologies

Güler Silov, Zeynep Erdoğan, Ayşegül Özdal, Aysel Özaşlamacı¹

Departments of Nuclear Medicine and ¹Radiology, Kayseri Training and Research Hospital, Kayseri, Turkey

ABSTRACT

In general, there are five lumbar vertebrae in normal human subjects. But occasionally there are six. In such a situation, a radiologist needs to discern between lumbarization of S1 (S1 vertebra becomes segmented and mimics L5) or due to hypoplastic 12th ribs, hence the T12 vertebra is wrongly assumed to be L1. These interesting images serve a multimodality approach to right aplasia/left hypoplasia of 12th rib, injury of left 11th rib and subluxation of left 11th Costovertebral joint in a patient with lumbar back pain.

Keywords: Bone single-photon emission computed tomography, costal variation/pathologies, three-dimensional computed tomography

A 37-year-old woman with left low back pain for 3 months was admitted to the department of orthopedic surgery and traumatology. Patient was not described any major trauma. Her laboratory finding was compatible with iron deficiency anemia. Other serologic and hematologic results are within normal limits. On anteroposterior and lateral radiography at first glance, there was six lumbar vertebrae [Figure 1a]. This distinction matters little to the health of the patient him/herself but can have a terrible effect if the surgeon decides to operate on him/her and there is a misconception of the level.^[1-3] There are typically no anatomic complications using the anterior approach from beneath the costal margin. The posterior approach requires an incision at the level of the spinous process of the first lumbar vertebra to avoid entering the pleura.^[4-6] On the thoracolumbar computed tomography (CT), there was only five lumbar vertebrae and right 12th rib aplasia and left 12th rib hypoplasia [Figure 1b]. But there was no pathological finding to explain the pain.

The patient with intense low back pain was also further investigated with three phase bone scintigraphy (TPBS), whole

body bone scintigraphy (WBBS) and thoracolumbar bone single-photon emission computed tomography (SPECT). There were no abnormal findings on the first two phases of TPBS. On the WBBS, there were not seen the ribs of 12th and moderate diffuse activity involvement was observed on the left 11th rib [Figure 2a]. In the coronal SPECT images, there was diffuse increased uptake in the left 11th rib [Figure 2b]. On the three-dimensional-CT imaging, left 12th hypoplastic rib was observed while right one was not. Also left 11th Costovertebral joint was subluxated [Figure 3]. Ribs 11 and 12 do not attach to an anterior costal cartilage or transverse process, but rather invest into the fascia and musculature of the lateral and posterior abdominal wall. Ribs 11 and 12 are described as having caliper motion, primarily influenced by their relationship to their muscular

Access this article online	
Quick Response Code: 	Website: www.ijnm.in
	DOI: 10.4103/0972-3919.152990



Figure 1: (a) At first glance, there were six lumbar vertebrae on the anteroposterior radiography (b) There were only five lumbar vertebrae and right 12th rib aplasia and left 12th rib hypoplasia (arrow) on the thoracolumbar computed tomography

Address for correspondence:

Dr. Güler Silov, Department of Nuclear Medicine, Kayseri Training and Research Hospital, Kayseri 38010, Turkey.
E-mail: gulersilov@yahoo.com

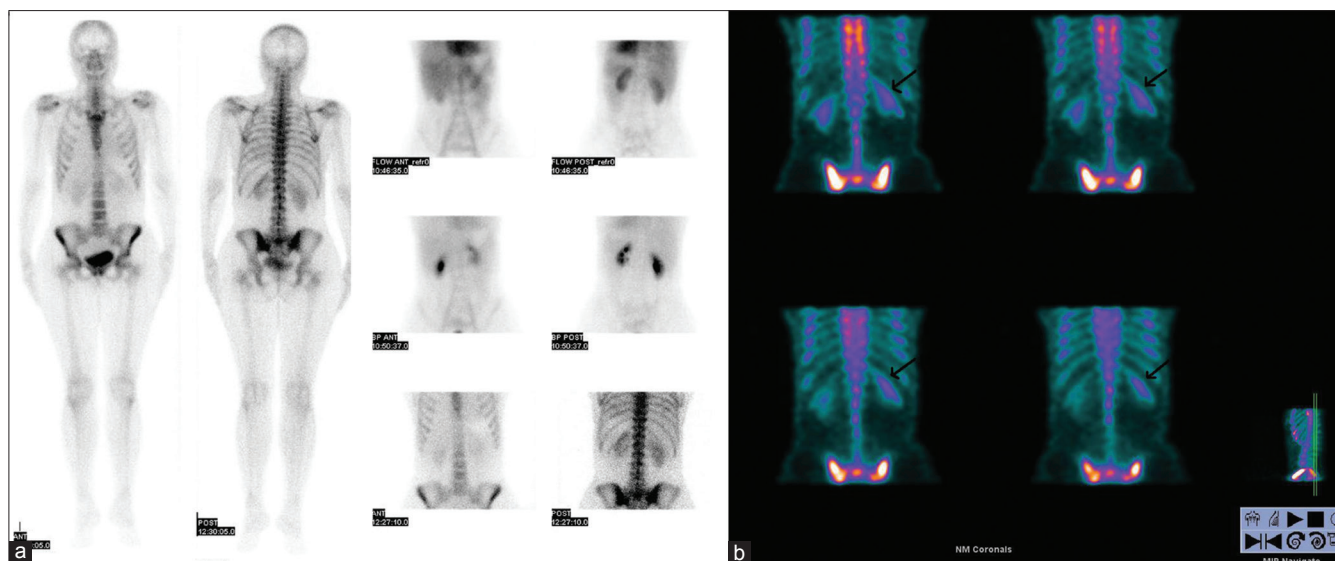


Figure 2: (a) There were not seen the ribs of 12th and moderate diffuse activity involvement was observed on the left 11th rib on the whole body bone scintigraphy (b) There was diffuse increased uptake in the left 11th rib (arrow) on the coronal single-photon emission computed tomography images

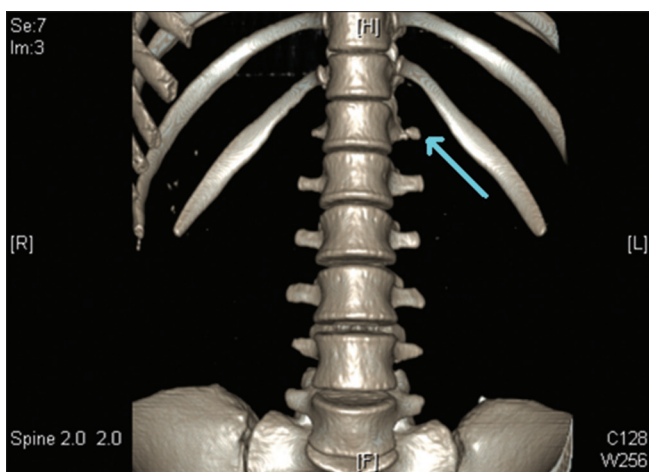


Figure 3: On the three-dimensional computed tomography imaging, left 12th hypoplastic rib (arrow) was observed while right one was not. Also left 11th costovertebral joint was subluxated

attachments. The caliper motion of ribs eleven and twelve can be seen to be related to the near-vertical orientation of the small transverse processes of T11 and T12 as well as the way the ribs invest into the abdominal musculature, thoracolumbar fascia, and diaphragm. Another important lower extremity muscle affecting rib cage motion is the quadratus lumborum, which originates from the iliolumbar ligament and the posterior part of the iliac crest, runs along the posterior lateral aspect of the vertebral column, and inserts on the transverse processes of the upper four

lumbar vertebra and the inferior aspect of the 12th rib on each side.^[7] According to all of these findings, repetitive daily minor posttraumatic subluxation of the left 11th rib and injury was diagnosed in this patient.

REFERENCES

1. Merks JH, Smets AM, Van Rijn RR, Kobes J, Caron HN, Maas M, *et al.* Prevalence of rib anomalies in normal Caucasian children and childhood cancer patients. *Eur J Med Genet* 2005;48:113-29.
2. Edwards DK 3rd, Berry CC, Hilton SW. Trisomy 21 in newborn infants: Chest radiographic diagnosis. *Radiology* 1988;167:317-8.
3. Grangé G, Tantau J, Acuna N, Viot G, Narcy F, Cabrol D. Autopsy findings related to Down's syndrome: 101 cases. *J Gynecol Obstet Biol Reprod (Paris)* 2006;35:477-82.
4. Spain DA, Martin RC, Carrillo EH, Polk HC Jr. Twelfth rib resection. Preferred therapy for subphrenic abscess in selected surgical patients. *Arch Surg* 1997;132:1203-6.
5. Kato H, Kiyokawa H, Inoue H, Kobayashi S, Nishizawa O. Anatomical reconsideration to renal area: Lessons learned from radical nephrectomy or adrenalectomy through a minimal incision over the 12th rib. *Int J Urol* 2004;11:709-13.
6. Kato H, Nishizawa O. Supracostal approach – An excellent exposure for renal and adrenal surgery. *Hinyokika Kyo* 2001;47:449-52.
7. De Stefano I.A. *Greenman's Principles of Manual Medicine*. Philadelphia: Lippincott; 2011. p. 265-6.

How to cite this article: Silov G, Erdoğan Z, Özdal A, Özaşlamacı A. Bone single-photon emission computed tomography and three-dimensional computed tomography in the diagnosis of low costal variation and pathologies. *Indian J Nucl Med* 2015;30:183-4.

Source of Support: Nil. **Conflict of Interest:** None declared.