Congenital absence and hypoplasia of pedicles in the thoracic spine

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Abstract. A case of thoracic pedicle aplasia of T12 coincident with pedicle hypoplasia at T11 is reported. The authors review the literature on thoracic pedicle deficiency and discuss the computed tomography (CT) findings in the thoracic pedicle aplasia/hypoplasia spectrum.

Key words: Thoracic pedicle aplasia – Thoracic pedicle hypoplasia – Pedicle deficiency

Concordance of pedicle aplasia and/or hypoplasia at more than one level in the thoracic spine has not been encountered previously. Such anomalies have been reported in the cervical and lumbar spine [1, 6, 8, 15], and the occurrence of a multilevel pedicle deficiency affecting the thoracic spine seems a logical extension of this rare abnormality. We report a child with pedicle aplasia and hypoplasia of T12 and T11, respectively.

The case demonstrates a unique lesion, each component of which is, in and of itself, extremely rare. A study of this lesion by computed tomography has allowed good correlation with findings previously reported in cases of solitary pedicle deficiency in the vertebra column.

Case report

A 12-year-old boy presented to the Radiology department for imaging work-up (barium enema and upper gastrointestinal examinations) of chronic, nonspecific abdominal pain without weight loss or any abnormal findings on physical examination. Incidentally noted on the radiographic examinations was the absence or hypoplasia of the left T11 pedicle and the absence of the right T12 pedicle (Fig. 1). Because these findings were recognized prospectively as a congenital anomaly, computed tomography (CT) was performed. CT examination of this region shows that the T11 vertebral body is malformed, with a posterolateral extension to the left (Fig. 2A) which anomalously articulates with the left eleventh rib (Fig. 2B), just anterior to a hypoplastic, vertically cleft pedicle (Fig. 2B). The left T11 superior articular facet is hypoplastic (Fig. 2A). There is minimal sclerosis but not definite enlargement of the contralateral pedicle. The spinous process tilts away from the side of the deficient pedicle, and the spinal canal is enlarged on the side of the deficient pedicle.

At the T12 level, the right pedicle is absent (Fig. 3B). Again, the contour of the right posterolateral vertebral margin is slightly expanded (Fig. 3A) in order to articulate anomalously with the right twelfth rib (Fig. 3B). The contralateral pedicle is thickened, moderately sclerotic, and larger than normal. The right superior articular facet of T12 is hypoplastic (Fig. 3A). The spinous process tends to tilt away from the deficiency on the plain radiograph (Fig. 1). The spinal canal is widened to the right and there is extra fat in the extradural space (Fig. 3B). Because the patient is entirely asymptomatic, no further work-up or therapy is planned.

Discussion

Congenital absence of a thoracic pedicle is an extremely rare anomaly. Of nine previously reported cases [4, 7, 10–13], only two have been studied by computed tomography. Pedicle deficiencies occur more commonly in the lumbar vertebral column, next in the cervical spine where their occurrence is uncommon, but by no means rare [14]. We suspect that thoracic pedicle deficiencies are slightly more common than the small number of reported cases leads one to believe, and that they may be underreported as are absent lumbar [15] and, perhaps, cervical pedicles.

Only recently has attention been paid to the differences between “aplasia” and “hypoplasia” of a pedicle, largely due to the advent of CT scanning for the careful analysis of such anomalies.
Fig. 1. Abdominal radiograph from upper GI study shows pedicle deficiencies at T11 on left and at T12 on right. Note spinous process tilts away from deficiency at each level.

Fig. 2 A, B. Pedicle hypoplasia at T11. A Malformed vertebra anomalously articulates with rib. Contralateral pedicle shows minimal sclerosis without enlargement. B Hypoplastic, vertically cleft left pedicle. Left transverse process larger than normal. Spinal canal enlarged on side of deficiency.

Fig. 3 A, B. Pedicle aplasia at T12. A Malformed vertebra with hypoplastic right superior facet. B Contralateral pedicle shows enlargement and sclerosis. The right pedicle is absent, and the transverse process is hypoplastic (not shown). Note anomalous articulation of the right twelfth rib, and widening of the spinal canal to include extra-epidural fat.

As such, Wortzman and Steinhardt [14] believe that many of the previously reported cases of lumbar "absent" pedicle may, in retrospect, represent hypoplasia of a pedicle, especially in the lumbar spine. We have reviewed the nine previously reported cases of "absent" thoracic pedicle including the two cases in which computed tomography was performed, in order to carefully analyze the findings and clinical setting of this congenital anomaly (Tables 1 and 2).

Review of the literature

Of the nine cases of thoracic pedicle deficiency recorded in the literature, six reports have sufficiently detailed information for analysis, and three are mentioned merely briefly [6, 12] in reports addressing other issues. The patients ranged in age from 9 to 64 years, and three were male and three female. No patient had symptoms clearly referable to the pedicle deficiency, although two of the adults had low back pain at the time of presentation. One child presented with non-painful scoliosis, the apex of which was six vertebral levels above the absent thoracic pedicle. No laboratory data were reportedly abnormal in any case. The deficient thoracic pedicles were more commonly found at T12 (three cases) than at any other level, with two cases occurring at T11, and the highest level being T4. Five were right-sided and two were left-sided in the seven cases in which data were available. In only one case [10] were congenital anomalies at other vertebral levels associated with a pedicle deficiency.

These data and our case support the thesis that the deficient pedicle is an asymptomatic condition which is usually discovered incidentally and probably random as to age distribution. Yousefzadeh et al. [15] have shown that congenital aplastic-hypoplastic lumbar pedicles can be recognized in their series of nine patients in infants and children between one day and 10 years of age, absent cervical pedicles have also been reported in children [8].