DEFECTS OF THE PEDICLE AND SPONDYLOLISTHESIS OF THE SECOND CERVICAL VERTEBRA

DAVID F. FARDON, J. WILLIAM FIELDING

From St Mary's Medical Center, Knoxville, Tennessee, and St Luke's Hospital, New York

Bilateral defects of the pedicles with spondylolisthesis of the second cervical vertebra were observed in a five-year-old boy, and produced "clicking" in the neck. This lesion had not previously been reported and was thought to be of congenital origin. Although an attempt at anterior fusion of the second to the third cervical vertebra was unsuccessful, the clinical result of the operation was good and function was fully preserved.

Spondyloysis, or absence of the pars or pedicles, is uncommon in the cervical spine. Among the 26 cases found in a search of the literature (see Bibliography), there was one patient with such a lesion of the second cervical vertebra. Our patient is only the second reported case of a defect of the pars in the second cervical vertebra, and the first reported case of spondylolisthesis of the second on the third cervical vertebra; our patient is also the youngest reported to have the defect in the cervical spine.

CASE REPORT

A five-year-old boy was referred to Knoxville Orthopedic Clinic for "clicking of the neck". His mother had had a normal pregnancy and delivery, and the family history was negative. At the age of two years, the child had an occasional mild pain in the neck which developed insidiously but never limited his activity. There had been no history of injury to the head or neck and no physical abnormality had been found. By the age of three, he had a "clicking" in his neck which had been noticed by his mother but had not been found on examination. The "clicking" which had become more frequent and bothersome, was then noted by his examining paediatrician and orthopaedic referral was made.

He was found to be a healthy, five-year-old child, normal in appearance, who moved his neck freely. However, when he fully flexed his neck, there was a consistent palpable and audible "clunking" sensation from the upper neck. This was associated with mild discomfort and he preferred not to do it but would demonstrate it upon demand. There were no other abnormal findings. Radiographs (Figs 1 and 2) revealed bilateral defects of the pars of the axis. The spinous process and laminae appeared adherent to the dorsal elements of the third cervical vertebra and moved with them on flexion and extension. The body of the axis moved forward on the body of the third cervical vertebra by four millimetres in flexion and posterior to it by two millimetres in extension, exceeding the limits of normal for this age (Bailey 1952, Cautilli, Joyce and Lin 1972). The angles between the end-plates of the second and third cervical vertebrae were 16 degrees of flexion and 16 degrees of extension.

An anterior fusion of C2 to C3 was attempted. The entire disc was not removed. A trough was made through the adjacent end-plates into the cancellous bone of the vertebral bodies of C2 and C3 and a rectangular autogenous iliac bone plug was inserted. A Minerva cast was fitted after three days of bedrest. His course was uncomplicated except for signs of Horner's syndrome which spontaneously resolved. The Minerva jacket was removed after three months. A plaster collar was worn for an additional six months, and a soft collar while playing for three months after that.

Fusion did not occur across the vertebral bodies (Figs 3 and 4). Anterior beaks formed on the bodies, especially of the third cervical vertebra. Anteroposterior shift with flexion and extension was reduced from six millimetres before operation to two millimetres afterwards. The angulation between the bodies of C2 and C3 was reduced from 16 to 12 degrees in flexion and from 16 to 0 degrees in extension. When last examined three years after the operation, the child had no symptoms, movement of his neck was full, painless, and free from any abnormal sounds or sensations. He was permitted full activity except for sports with a high likelihood of injury to the head.

DISCUSSION

An accurate description of this abnormality is difficult because of inconsistencies in terminology in the literature. Spondyloysis is the most commonly used term for such defects in the cervical spine. Because of the unique anatomy of the second cervical vertebra, with an anterior superior articulation and a posterior inferior articulation, the application of the terms "pars interarticularis" and "spondylolysis" are awkward. "Pedicle defects" would perhaps be a more precise term with reference to the axis. Köhler and Zimmer (1961) called it a "congenital hiatus" in the neural arch.

The absence of a history of injury and of radiographic evidence of reactive bone changes, and the presence of symptoms from the age of two years and of coalition of the posterior elements of C2 and C3, suggest that our patient's problem was congenital rather than traumatic in origin. Because of the uncertainties of history-taking in this age group, however, we cannot exclude the possibility that this lesion was caused by injury.

D. F. Fardon, MD, Knoxville Orthopedic Clinic, 630 Concord Street SW, Knoxville, Tennessee 37919, USA.
J. W. Fielding, MD, Professor and Director of Orthopedic Surgery, St Luke's Hospital Center, New York, New York 10025, USA.
Requests for reprints should be sent to Dr D. F. Fardon.

526 THE JOURNAL OF BONE AND JOINT SURGERY
Flexion and extension at the age of five years, before operative treatment. Figure 1 — Radiograph with the neck flexed showing defects in the axis with forward displacement of four millimetres of the body of the axis on the body of C3 and adherence of the posterior elements of C2–3. Figure 2 — Radiograph with the neck extended showing that the body of the axis moves through 32 degrees and shifts into a position two millimetres posterior to the body of C3.

Flexion and extension at the age of six, one year after operative treatment. Figure 3 — Radiograph with the neck flexed showing anterior projection of the body of C3 resulting from the bone grafting procedure. The angle between the bodies of C2 and C3 measures 12 degrees of flexion. Figure 4 — Radiograph with the neck extended showing the angle between the bodies of C2 and C3 to be zero. The body of the axis does not shift posteriorly over the body of C3 as it did before operation.
Eighteen of the 26 similar cases reported in the literature had defects in the sixth cervical vertebra. Of the 20 that had spondylolisthesis in addition to a defect, 17 were of C6 on C7, one of C5 on C6, and two of C4 on C5. Twenty of the 26 with defects and 16 of the 20 with slippage were male. Ours is the youngest patient ever reported, the age range of the previous 26 patients being 8 to 27 years.

There are three reports of successful treatment by anterior cervical fusion (Lissner 1956; Dawley 1971; Prioleau and Wilson 1975). This seemed particularly suitable for our patient because, as suggested by Francis and Fielding (1978) in a discussion of late results of traumatic spondylolisthesis of the axis, rotary movement is preserved by not including the atlas as one would have to do if a posterior approach were used.

We cannot explain the failure of fusion. Previous experience, mostly with a posterior approach, led us to expect that the cervical spine of such a young child would fuse readily. Perhaps more extensive periosteal stripping, excision of disc and cartilage, decortication and grafting are necessary for anterior fusion to be successful in very young children. Though we failed to achieve a solid fusion, our patient had a good clinical result with total disappearance of symptoms and of the radiological signs of instability and his function was fully preserved.

REFERENCES


BIBLIOGRAPHY OF PREVIOUS CASES