Surgical Anatomy of the Cervical Pedicles: Landmarks for Posterior Cervical Pedicle Entrance Localization


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Summary: The posterior entrance to the cervical pedicle is described using quantitative and descriptive parameters. Fifty-three spines (C2-C7) were evaluated using a digital caliper and by visual inspection using four bony landmarks: the lateral vertebral notch and inferior articular process (C2-C7), the medial pedicle cortex at C2, and the transverse process at C7. Three distances were defined. (1) At C2, the average medial pedicle cortex–pedicle distance was 7.2 mm. (2) The lateral vertebral notch–pedicle distances showed that the entrances were located close to the notch at C2, almost at the notch at C3 and C4, and gradually moved medially away from the notch from C5 to C7. The pedicles were rarely located lateral to the lateral vertebral notch. (3) The inferior articular process–pedicle distance was large at C2, the shortest at C3, and gradually increased toward C7. Three relations were defined. (1) The pedicles were located mostly in the intermediate third of the inferior facet at C2; in the lateral third at C3, C4, and C7; or in the lateral or intermediate thirds at C5 and C6. Only C2 and C6 pedicles were located in its medial third. (2) The pedicles were located mostly below the lateral vertebral notch at C2, at C3–C6, or almost equally above and at the notch at C7. (3) Most of the C7 pedicles were located below the midline of the transverse process. The location of the pedicle entrance was unique at each cervical level. Their distribution followed the cervical spinal cord enlargement. These landmarks should assist with safe placement of pedicle screws. Key Words: Cervical spine—Cervical pedicle—Posterior cervical spine instrumentation.

Several previously published clinical studies (2–5, 10, 20, 21) have suggested that cervical pedicle screws can be used successfully in the surgical treatment of diseases and disorders of the cervical spine. This type of posterior fixation has been proved to provide the greatest stability in the middle and lower cervical spine (14). Pedicle screws also provide an alternative to lateral mass fixation of C7, where the lateral mass is usually thin (5). However, injury to the spinal cord, nerve root, or vertebral artery during pedicle screw placement remains an important concern.

Anatomic variations in the size of cervical pedicles limit the application of pedicle screws (6, 9, 13, 18, 22). Our previously published anatomic study showed that the inner and outer diameters of the cervical pedicles at C3, C4, and C5 were small. We suggested caution when pedicle screws are placed at those levels. At C2, C6, and C7, the pedicles were almost always large enough to accommodate a screw (13).

Broad guidelines for successful localization of cervical pedicles on the lateral mass were given in some clinical reports (2, 3, 10), but reports of unsuccessful screw placement have been up to 87.5% in the anatomic studies (4, 5, 8, 9, 15). The lack of more accurate landmarks to the cervical pedicle entrance (9, 15) lead to suggestions for foraminolaminotomies (9, 15, 20) or use of expensive stereotactic image-guided systems (15) or computed tomog-