PERCUTANEOUS VERTEBROPLASTY

Thesis

Submitted for the partial fulfillment of the MD degree in Orthopaedic Surgery

BY

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ABSTRACT

Percutaneous vertebroplasty is an emerging interventional technique in which surgical PMMA is injected via a large bore needle into a vertebral body under imaging guidance. This technique provides increased strength and pain relief in vertebrae weakened by a variety of bone diseases.

The current indication for vertebroplasty is intractable non-radicular pain caused by compression fractures due to osteoporosis, myeloma, metastases and aggressive vertebral haemangioma. Contraindications include bleeding disorder, unstable fracture and lack of definable vertebral collapse.

KEY WORDS

Percutaneous

Vertebroplasty

orthopaedic

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List Of Abbreviations

PV: - Percutaneous Verebroplasty.

PMMA: - PolyMethylMethAcrylate.

MMA: - MethylMethAcrylate.

VAS: - Visual Analogue Scale

VCF: - Vertebral Compression Fracture.

ADLs: - Activities of Daily Living.

ODI: - Oswestray Disability Index.

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INTRODUCTION:

The first percutaneous vertebroplasty of which we are aware was performed in Europe by Deramond and colleagues in France in the late 1980s and reported in the literature in 1987 ***(Deramond. et al, 1987)***, and the first vertebroplasty in North America was performed in 1993 and reported in 1997 ***(Jensen et al, 1999~~7~~).*** Percutaneous vertebroplasty entails injection of polymethyl methacrylate (PMMA) cement into the collapsed vertebra. The injected bone cement acts as an internal splint to reinforce and stabilize the fracture for pain alleviation. Re-expansion of collapsed vertebrae or height restoration may be achieved during the process of vertebroplasty.

Radiologic imaging has been a critical part of percutaneous vertebroplasty from its inception. Most procedures are performed utilizing fluoroscopic guidance for needle placement and to monitor cement injection. The use of computed tomography (CT) has also been described for these purposes ***(Gangi et al, 2002)***.

Percutaneous vertebroplasty is an established, safe, and effective procedure for selected patients. Extensive experience documents safety and efficacy of this procedure ***(Barr et al, 2000)***. As with any invasive procedure, the patient is most likely to benefit when the procedure is performed in an appropriate environment by qualified physicians.

Anatomy of Thoracic & Lumbar pedicle

The vertebra is composed of a ventral heavy part, the body, and a posterior part, the neural arch enclosing the spinal canal where the spinal cord or cauda lies.

The neural arch consists of:

- 2 roots (the pedicle), form the sides and unite the arch to the body.
- Transverse process projecting laterally from the pedicle at each side.
- The laminae slope downwards and backwards from the pedicles to unite in the midline and complete the neural arch and it is provided with a number of projections that serve for attachments of the muscles.
- The spinous process projects from the midline, dorsally and inferiorly and it serves for attachment of muscles and ligaments.
- The superior articular facet project laterally from the junction with the pedicle and the transverse process at each side.
- The inferior articular facet from the lower border of the laminae at each side.
- The pars interarticularis is bony ridge that connects the superior and inferior facets **(Hollinshead, 1969).**

The pedicles are short and heavy and arise from the upper third of the body, so that they have a shallow superior notch and a deep inferior one. The intervertebral foramen is bounded superiorly and inferiorly by the pedicle of two adjacent vertebrae. The posterior boundries of these foraminae are formed by the superior and inferior articular process (facet joint) and anterior by the bodies of the vertebra and the intervertebral disc ***(Roger , 2000).***

Thoracic Pedicle

The pedicles of the thoracic vertebrae are directed dorsally starting at the vertebral body and ending at the lamina. They are oval and directed slightly laterally and upward (Figure 1-1) ***(Robertson et al, 2000).***

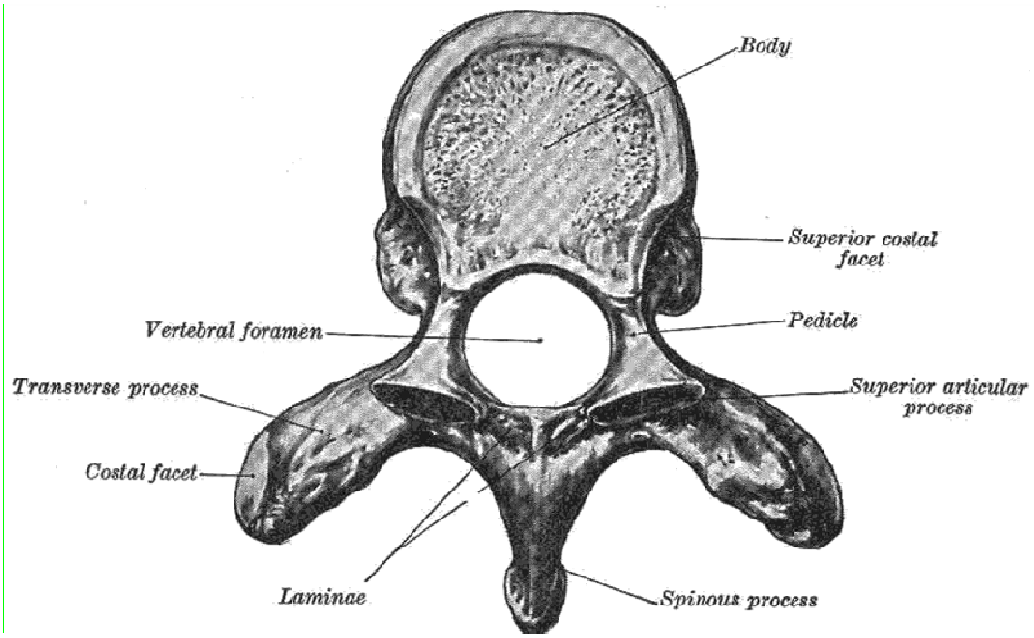

Fig.1-1 Typical thoracic vertebra.

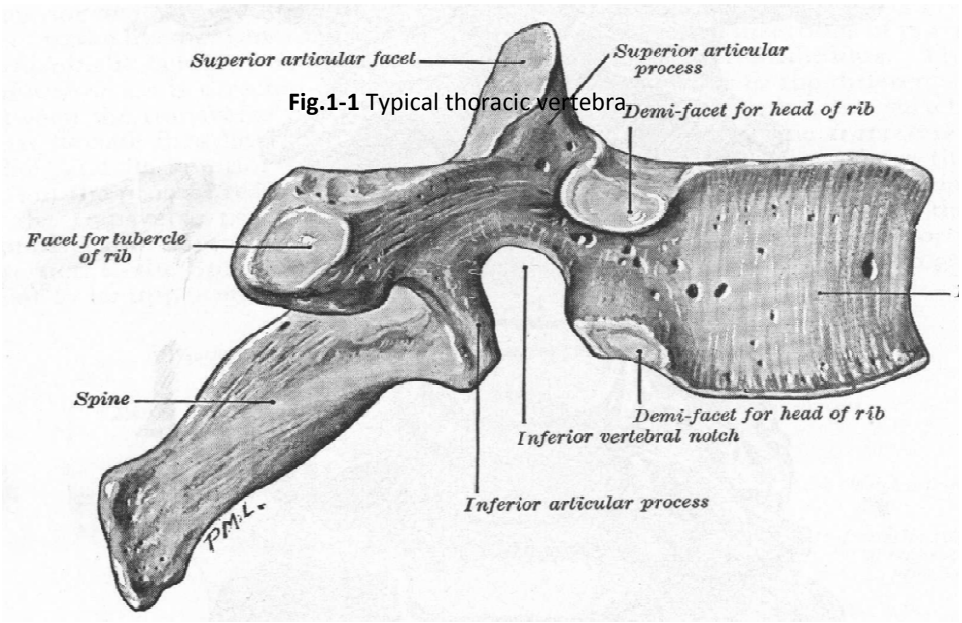

Fig.1-1 Typical thoracic vertebra.

Pedicle Width:

The linear measurement was done in all cases by taking the shortest point of the pedicle width. Pedicle width was the shortest in the mid-thoracic region. Significant variation was found among this measurement in several studies. The results shown by ***Vaccaro (1995)*** and ***Scoles (1998)*** were consistently smaller than those reported by ***Panjab (1991)***, ***McCormack (1995)***, ***Zindrick (1987)***, and ***Ebraheim (1997)*** (Table 1-1).

On average, ***McCormack (1995)*** showed sizes 2.4 mm larger than reports by ***Panjabi, Ebraheim & Zindrick***, but with no significant statistic difference. In all studies no significant difference was found between both sides. Gender also showed no significant difference. Although these authors used different measurement techniques, the results were similar. The tendency is for the pedicle width of the thoracic spine to have a smaller diameter at the mid-thoracic region from T4 to T8-T9. Largest linear values are usually found at the ends of thoracic spine (T1-T2 and T11-T12) (Table 1-1).

	Vaccaro	Zindrick	McCormick	Scoles	Panjabi	Ebraheim
T1		7.9	8.3	7.3	8.2	8.8
T2		7.0	9.2		8.4	6.0
T3		5.6	9.5	3.9	7.0	4.1
T4	4.5	4.7	9.1		5.5	3.9
T5	4.4	4.5	9.7		6.2	4.6
T6	4.6	5.2	9.3	3.5	6.0	3.6
T7	4.9	5.3	8.8		6.5	4.5
T8	5.1	5.9	9.4		6.7	5.0
T9	5.8	6.1	10.8	3.9	7.6	5.3
T10	6.7	6.3	11.0		8.3	5.6
T11	8.0	7.8	10.7		8.8	8.3
T12	7.8	7.1	11.1	7.4	8.8	8.0

TABLE 1-1 Thoracic Anatomy: Pedicle Width.