Comparative Study for Percutaneous Posterior Pedicle Screw Fixation of the Lumbar Spine and Conventional Open Technique

Thesis

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By

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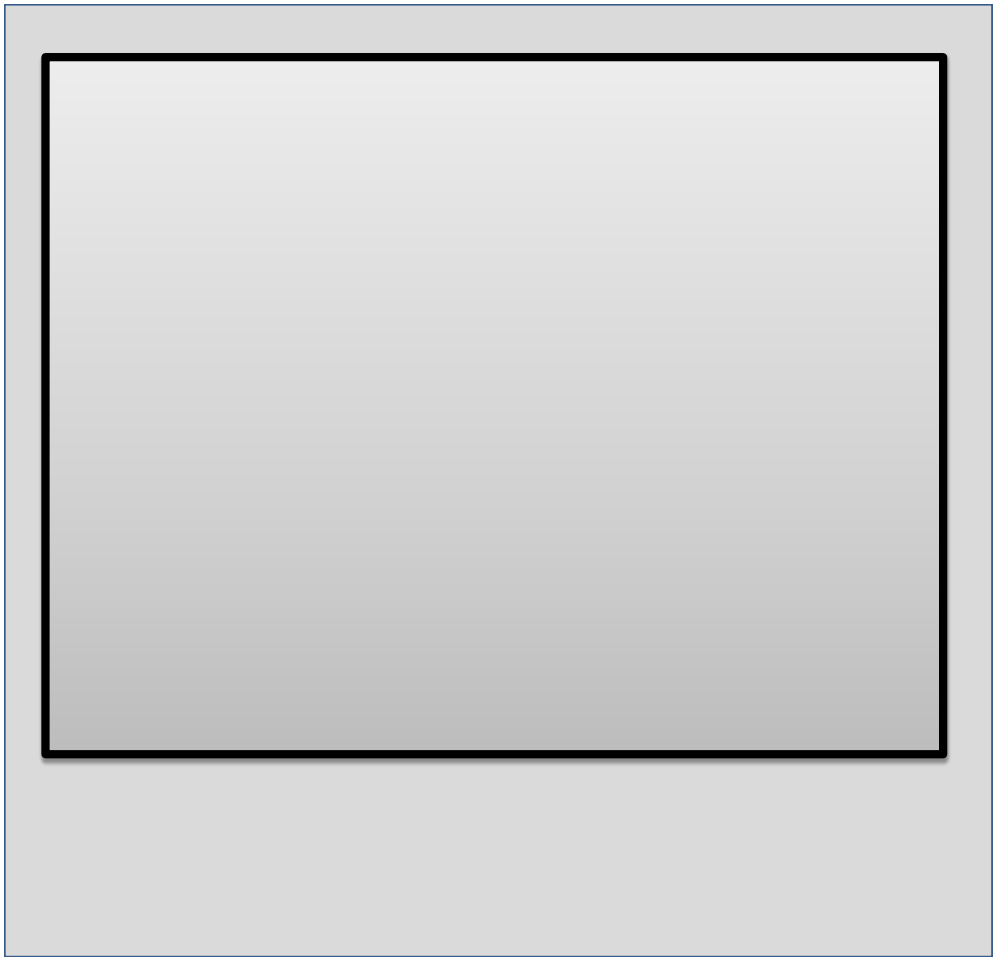

	Pedicular angle in our study	
	Pedicular angle	

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ASD	Adjacent Segment Degeneration
ALIF	Anterior lumbar interbody fusion
BMPs	Bone morphogenetic proteins
CSF	Cerebrospinal fluid
COT	Conventional open technique
CT scan	Computed tomography scan
FSU	Functional spinal unit
IL	Interleukin
LBP	Low back pain
LSS	Lumbosacral spine
MMPs	Matrix metalloproteinases
MRI	Magnetic resonance image
NO	Nitric oxide
OA	Osteoarthritis
PERC	Percutaneous fixation
PL	Phospholipase
PLIF	Posterior lumbar interbody fusion
PXR	Plain X rays
TLIF	Transforaminal lumbar interbody fusion
TNF	Tumor necrosis factor
VAS	Visual analogue scale

Introduction

The use of pedicular screw-assisted spinal stabilization has become increasingly popular worldwide. Pedicular screw systems engage all three columns of the spine and can resist motion in all planes. **(32)**

Standard technique for pedicular screw placement, however require extensive tissue dissection to expose entry points and to provide for lateral to medial orientation for optimal screw trajectory. Open pedicle fixation and spinal fusion have been associated with extensive blood loss, lengthy periods of hospitalization and significant cost. Percutaneous fixation of the lumbar spine was first described by Magerl, who used an external fixator in 2001. **(32)**

Mathews and Long first described and performed a wholly percutaneous lumber pedicle fixation procedure in which they used plates as the longitudinal connectors. Lowery and Kulkarni subsequently described a similar procedure in which rods were placed. **(44)**

Percutaneous pedicle screw fixation for lumber posterior instrumental fusion is an attractive alternative can be challenging and even frustrating when first learning the technique. However, once these techniques have been mastered, they offer a safe, less invasive, less traumatic. **(44)**

The percutaneous posterior lumber fixation system allows for the straight forward placement of lumber pedicle screws and rods. Through stab wounds, the screws and rods are placed in an anatomical position similar to that achieved by an analogous open surgical approach. Paraspinous tissue trauma is greatly minimized without sacrificing the quality of the spinal fixation. **(73)**

Aim of the work

The aim of this work is to compare the clinical and radiological outcome of percutaneous posterior pedicle screw fixation of the lumber spine and conventional open posterior lumber pedicular screw fixation in cases of instability, spondylolisthesis grade I and II.

We excluded trauma cases from our study, as we found that cases suitable for percutaneous fixation could be treated effectively conservatively (no compression on spinal canal and wedging <50%). Also trauma cases that underwent open fixation had posterolateral fusion and PERC group had not.

Anatomy Of the spine

Four curvatures are present: cervical lordosis (C1-T2) which is convex forward (15-35°), thoracic kyphosis (T2-T12) which is concave forward (20-40°), lumbar lordosis (L1- LS) which is convex forward and sacral kyphosis which is concave forward [(29)]. (Figure 1)

Primary curves refers to the curves present at birth (thoracic kyphosis and laegycocorcas kyphosis), while the secondary curves are those developed after birth which include the cervical lordosis that develops when baby head is held up and the lumbar lordosis which develops when child walk [(29)]. (Figure 1)

A vertebra at birth consists of three bony parts united by hyaline cartilage (two halves of the neural arch and the centrum). By the age 2, the two halves of each neural arch begin to fuse and then at age 7, the arches begin to fuse to the centrum [(29)]. (Figure 2)

Typical vertebra consist of vertebral body anteriorly for weight support, vertebral (neural) arch posteriorly (pedicles/ laminae) that protects spinal cord and three processes, two transverse and one spinous for muscle , ligaments attachment and levers for movement, four articular processes: 2 superior , 2 inferior (from the junction of pedicles & laminae), each with an articular facet and lined by hyaline cartilage [(29)]. (Figure 3)

Typical lumbar vertebra characterized by its body that is large and kidney shaped, pedicles are strong, laminae are thick, triangular vertebral foramina, long and slender transverse processes, the spinous processes are short, flat,

quadrangular and project backward, the articular surfaces of the superior articular processes face medially, and the inferior articular processes face laterally [29]. (Figure 3, 4)

5th Lumbar Vertebra characterized by smaller size of spinous process, thick transverse processes springing from the body as well as from the pedicles (attachment of iliolumbar ligaments) [29]. (Figure 5)

Intervertebral foramen formed by the inferior vertebral notch on the pedicle of the vertebra above and the superior vertebral notch on the pedicle of the vertebra below. Intervertebral Foramen is bordered posteriorly by the zygapophyseal joint and anteriorly by the intervertebral disc and adjacent vertebral bodies [29]. (Figure 5)

Figure 1: spine Curvatures [29]

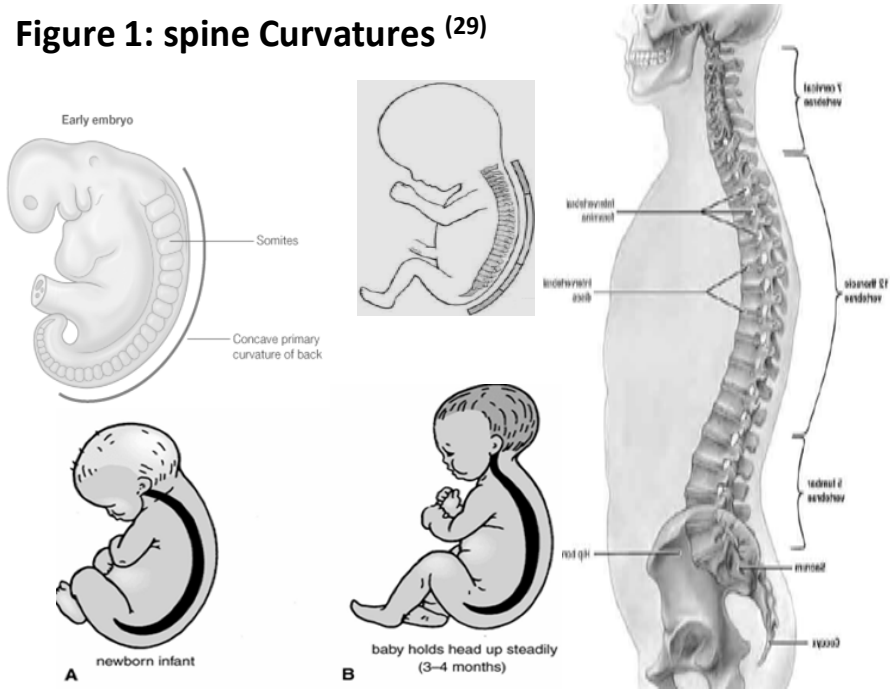

Figure 2: Development of Vertebrae [29]

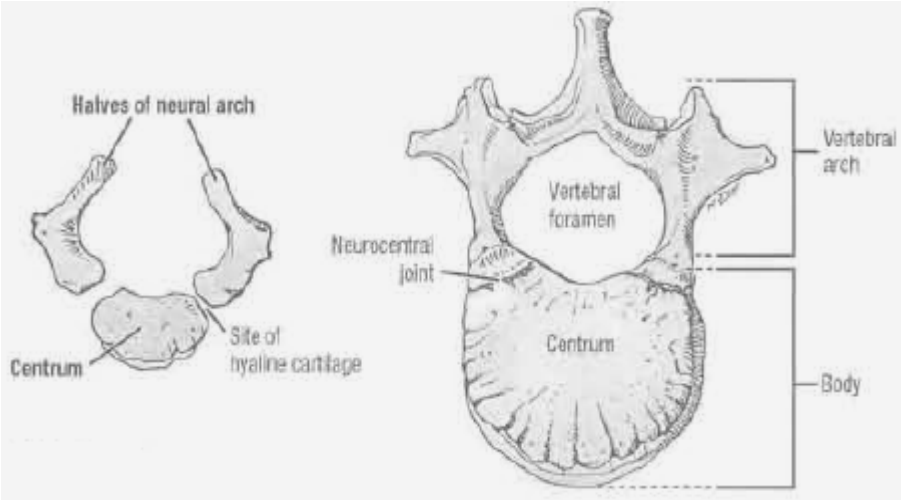

Figure 3: anatomy of lumbar vertebra(L3) [29]

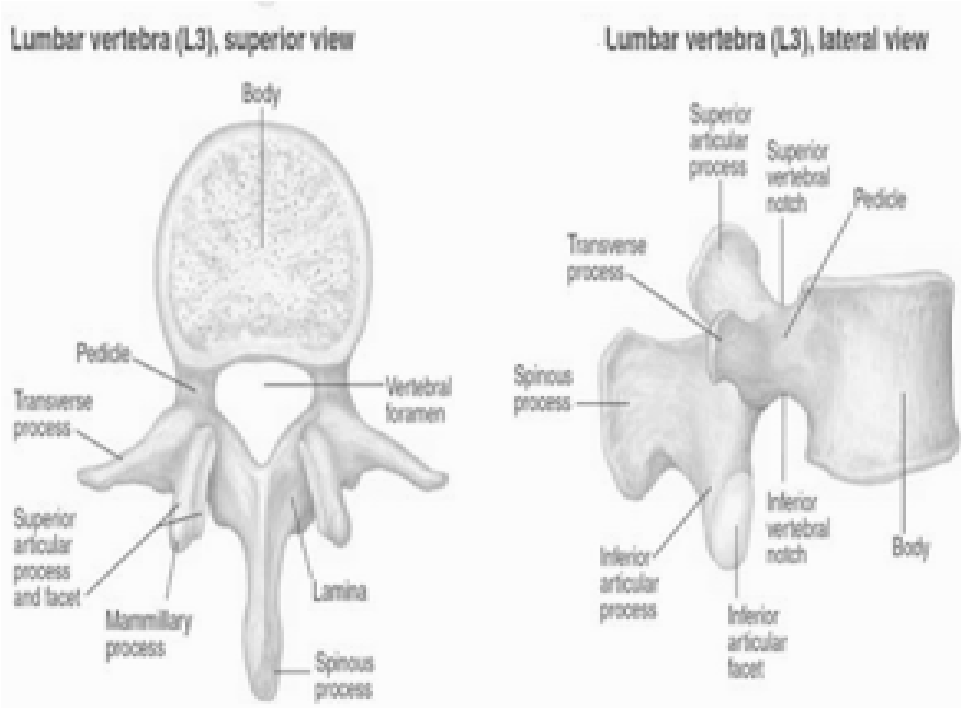

Figure 4:Typical Lumbar Vertebra [29]

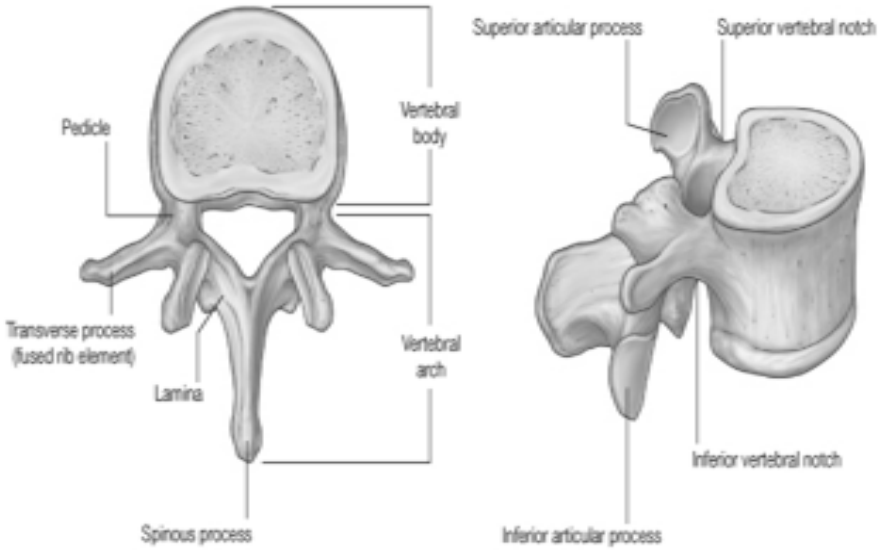

Figure 5: ***Intervertebral Foramen*** [29]