ORIGINAL ARTICLE

Outcome of spine fixation for unstable fractures at dorsolumbar junction including fractured vertebrae in pedicular screw fixation

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Abstract

Objective: To evaluate the clinical and Radiological outcome of spine fixation for unstable fractures at dorsolumbar junction including fractured vertebrae in Pedicular screw fixation.

Study Design: Quasi experimental study.

Place and Duration of Study: Department of Orthopaedics and Spine surgery Ghurki Trust Teaching hospital Lahore Pakistan, Department of Orthopedics and Traumatology, Khyber Teaching Hospital Peshawar, Pakistan from January 2010 to December 2014.

Material and Methods: All patients with unstablesingle level fracture from D11 to L2 were fixed with transpedicular screws and rods. The fracture vertebra was included in the fixation by putting transpedicular screws in it. Patients were evaluated both radiologically by measuring anterior and posterior vertebral heights, Cobb angle and sagittal index and clinical assessment of back pain was done by using Visual Analogue Score (VAS) and disability using Oswestry disability index (ODI). All these parameters were measured before surgery immediately after surgery and at 6 months post-operatively.

Results: A total of 143 patients including 93 males and 50 females with mean age 30.34 years (range 20 to 52 years) were included in the study. Majority of fractures were of L1(51) and D12(47). The mean Cobb angle was improved from preoperative 7.35±4.57 to 2.18±1.71 post-operatively. The pre-operative mean anterior vertebral height and posterior vertebral height were improved from 17.45±3.8 mm and 26.81±5.291 to 27.02±3.83 mm and 39.63±3.59 mm respectively. The pre-operative average sagittal index of 17.42° was reduced to 6.83° post-operatively. The Oswestry disability index was improved from pre-operative score of 67.14±17.68% to 39.81±20.56%. Visual analogue score was improved from pre-operative 7.3±1.3 to 2.4±0.9 post-operatively. No major complications were reported.

Conclusion: Trans-pedicular screw fixation including the fractured vertebrae gave excellent radiological and clinical outcome results in majority of our patients. We there-fore strongly recommend fixation of the fractured vertebra in transpedicular screw fixation of dorso-lumbar spine fractures.

Keywords: vertebral fracture, transpedicular screw, Cobb angle, Sagittal index, anterior vertebral height, Posterior vertebral height

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Introduction:

Injury of the spinal cord with loss of neurological function is the most devastating life-changing injury.[1-3]

In the United States, spinal cord injuries occur at an annual rate of 30 cases per million inhabitants, which translates into 8,000 new cases per year.[4-6]

Each year a large number of Pakistani population sustain spinal injuries.[7] Studies on spinal injuries have been published in Pakistan but the exact incidence of spinal injuries in Pakistan is still unknown.[8-10] Unstable vertebral burst fractures are two or three column fractures accord-

ing to the Three Column Concept of Denis[11] and all vertebral fractures with more than 50% loss of vertebral height, more than 20 degrees angulation or more than 50% spinal canal compromise need surgical intervention.[12] A uniform consensus has not yet been developed for the standard treatment of unstable burst fractures or fracture dislocation.[13]

With surgical spine fixation patients could expect to become mobile early, perform rehabilitative remedies, overcome anatomic fractures, and improve, in most cases, nervous functions by using decompression and fixation.[14,15]

Different procedures of posterior fixation of thoraco-lumbar spine fractures e.g. hooks and Harrington rods have undergone tremendous improvement over the last couple of decades. Moreover, pedicle screw fixation has revolutionized spinal surgeries all over the world.[16] Short-segment posterior fixation is the most common and simple treatment. It offers the advantage of incorporating fewer motion segments in the fusion.[17,18]

There are biomechanical advantages of posterior fixation including the fractured vertebra (PFFV) over conventional short-segment fixation. It will be biomechanically stronger by inserting screws at the fracture level which in turn may omit the need for further anterior reconstruction. Studies have shown the inclusion of the fracture level in short segment fixation.[19,20]

This study was designed to evaluate the radiological and clinical results of transpedicular screw fixation of spine fractures including the fractured vertebra.

Material and Methods:

This study was conducted at Department of Orthopaedics and Spine surgery Ghurki Trust Teaching hospital Lahore Pakistan, from January 2010 to December 2014. The study protocol was approved by the ethical review board of respective Hospitals. Informed written consent was taken from the patients. 143 patients were included in this study with single level fracture from D11 to L2. Complete history and physical examination was done in each case. Xrays of the whole spine and MRI of dorso-lumbar region was done in all cases.Pathological spine fractures, osteoporotic spine fractures and poly trauma patients requiring immediate fixation of other long bones or other operative interventions were excluded from the study. All patients with unstable dorso lumbar fractures were fixed from posterior with transpedicular screws and rods. We included fracture vertebrae in the fixation by putting trans-pedicular screws in fractured vertebrae. Patients were evaluated both radiologically and clinically. Radiological parameters were anterior and posterior vertebral heights, Cobb angle and sagittal index and clinical parameters were back pain using Visual Analogue Score (VAS) and disability using Oswestry disability index (ODI). All these parameters were measured before surgery immediately after surgery and at 6 months post-operatively. The data was analyzed using SPSS software version17.

Results:

We included 143 patients in our study. Out of them 93 were males and 50 were females. Mean age was 30.34 years ranging from 20 to 52 years of age. In majority of our cases cause for spine trauma was fall from height, followed by road traffic accidents. Levels of spine fractures were 23, 47, 51, and 22 at D11, D12, L1 and L2 respectively. The mean Cobb angle was 7.35 ±4.57 pre-operatively which improved to 2.18±1.71 at final follow up. The mean anterior vertebral height was 17.45±3.8mm, which increased to 27.02 ± 3.83mm at 6 month visit. The posterior vertebral body height was 26.81±5.291mm before surgery which increased to 39.63±3.59mm at 6 months post-operative visit. The pre-operative average sagittal index was 17.42°, which was reduced to an average 6.83° post-operatively. According to Oswestry disability index for pain and mobility, the mean pre-operative score was 67.14±17.68% which changed to 39.81± 20.56% at 6 months post-operative follow-up. Visual analogue score was 7.3±1.3 pre-operatively and it improved to 2.4±0.9 at six months. No major

complications occurred in our study like neurological deterioration, screw pull out, breakage of implant and deep vein thrombosis or mortality was reported.

Discussion:

Acute spinal injury is a devastating and disabling life event. According to figures from the United States, there are around 11,000 acute spinal injuries each year, and more than 250,000 individuals are living with the consequences of these injuries.[21] The 50% patients of spinal trauma are quadriplegic.[22]

The average age at which these injuries occur is 38 years, although the most severe injuries occur in adolescents and young adults in motor vehicle accidents involving high-powered cars, presumably as a result of a bad combination of inexperience, recklessness, alcohol and/or drugs, affecting the victims at the most productive stage of their lives.[23] In our study the mean age was 30.34 years and fall from height was the main cause of spinal trauma followed by road traffic accidents.

There is no implant failure or ≥ 10° correction loss when fractured vertebrae are incorporated in the implant assembly. Unilateral pedicle screw fixation through the pedicle of fractured vertebra combined with the short segment of pedicle screw is effective for thoraco-lumbar fracture with mild to moderate instability.[24] In our study no implant failure was noted.

The mean anterior vertebral body height increased from 57.0%± 6.3% before the surgery to 93.1%±1.7% at the last follow-up.[25] In another study the mean anterior and posterior vertebral height also showed significant improvements post-operatively, which were maintained at the final follow-up.[24] In a study conducted in Bangladesh, the mean pre- and post-operative anterior and posterior vertebral height was 0.6±0.1, 0.9±0.2 and at final follow-up was 0.9±0.2, which showed significant improvements post-operatively and were maintained at the final follow-up.[26] In our study the mean anterior vertebral height was 17.45±3.8mm, which increased to 27.02±3.83mm at 6 month visit. The posterior vertebral body height was 26.81±5.291mm before surgery which increased to 39.63±3.59mm at 6 months post-operative visit.

The sagittal Cobb angle decreased from 15.6°±4.7° before the surgery to 2.6°±5.2° at the last follow-up.[25]

In another study the mean pre-operative kyphosis angle was 22.9°±7.6°. This improved significantly to 9.2°±6.6° after surgery.[24] In our study the mean Cobb angle was 7.35±4.57 pre-operatively which improved to 2.18±1.71 at final follow up.

VAS and ODI were 1.0±0.7 and 17.0±5.9 at the last follow-up in a study.[25] In another study The mean pre-operative VAS and ODI scores were 5.2±01.1 (range, 6–9), 54.8±7.7 (35-70) and at the end of 1 year were 1.7±0.5 (range, 0–3), 17.4±12.4 (10-42) respectively.[26] In our study the Oswestry disability index for pain and mobility, the mean pre-operative score was 67.14±17.68% which changed to 39.81±20.56% at 6 months post-operative follow-up. Visual analogue score was 7.3±1.3 preoperatively and it improved to 2.4±0.9 at six months.

Conclusion:

Trans-pedicular screw fixation including the fractured vertebrae gave excellent radiological and clinical outcome results in majority of our patients. It improved the biomechanical stability by giving extra pedicle for fixation which shorten the fixation segment and also helped in reduction and deformity correction. We therefore strongly recommend fixation of the fractured vertebra in trans-pedicular screw fixation of dorso-lumbar spine fractures.

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Role and contribution of authors:

Dr Waqar Alam, collected the data, references and worte the initial wite up.

Dr Faaiz Ali Shah,helped in collecting the data,

references and helped in introduciton writing.

Dr Roohullah Jan, helped in collecting the data, references and also helped in interpretation of data and methodolgy writing

Prof Muhammad Ayaz Khan, critically review the article and did several changes

Dr Abdullah Shah, helped in collected the data and references and discussion and conclusion writing

Prof Amer Aziz critically review the article and made the final changes.

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