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# Comparison the efficacy of short segment, compared to long segment instrumentation in thoracolumbar vertebral fractures

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**ABSTRACT:**

**Background:** Spinal trauma may result in spinal cord injury (TSCI), an injury to the spinal column resulting in severe compromise to neurologic structures, resulting in possible paralysis, sensory loss, bladder or bowel dysfunction, and mortality. Short-segment pedicle screw fixation (SSPF) is one of the most standard surgical approaches in treatment of TBFs. Long posterior fixation with pedicle screws and rods two-levels above and below the fracture level provide better fixation; however, it results in potentially extraneous instrumentation and increased load on the lower discs. Hence; under the light of above mentioned data, the present study was undertaken for assessing and comparing the efficacy of short segment, compared to long segment instrumentation in thoracolumbar vertebral fractures.

**Materials & methods:** A total of 20 patients were enrolled which who were scheduled to undergo spinal instrumentation in pathological and traumatic vertebral fractures. Patients were randomly divided into 2 groups of 10 each as follow: Short segment treatment group and Long segment treatment group. Follow-up was done and assessment was based on following variables: Visual Analogue Scale and Oswestry Disability Index. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software.

**Results:** Mean ODI index was significantly lower among patients of the short segment group at 12$^{th}$ month postoperative follow-up in comparison to long segment group. Mean VAS was significantly lower among patients of the short segment group at 12$^{th}$ month postoperative follow-up in comparison to long segment group. Non-significant results were obtained while comparing complications among patients of the two study group.

**Conclusion:** The patients in this study showed better results for short segment instrumentation.

**Key words:** Short, Segment, Long segment

## INTRODUCTION

Spinal trauma may result in spinal cord injury (TSCI), an injury to the spinal column resulting in severe compromise to neurologic structures, resulting in possible paralysis, sensory loss, bladder or bowel dysfunction, and mortality. The treatment of thoracolumbar fractures aims at restoration of the anatomical integrity and structural stability of the injured spine, thus providing a biologically and biomechanically ideal environment for facilitating functional recovery. Thoracolumbar fractures used to be treated conservatively. The surgical approaches include anterior surgery, posterior surgery, and a combination of anterior and posterior surgery.In the last three decades, traditional four-screw short-segment posterior instrumentation has been popular, but the early implant failure rate and loss of correction rate are high.[1-3]

Short-segment pedicle screw fixation (SSPF) is one of the most standard surgical approaches in treatment of TBFs. This technique has many advantages of preserving segment motion, providing superior correction of kyphosis, and reducing blood loss. However, some reports suggest the high failure rate of the traditional SSPF, which is not satisfactory as predicted. Long posterior fixation with pedicle screws and rods two-levels above and below the fracture

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level provide better fixation; however, it results in potentially extraneous instrumentation and increased load on the lower discs.[4- 7]Hence; under the light of above mentioned data, the present study was undertaken for assessing and comparing the efficacy of short segment, compared to long segment instrumentation in thoracolumbar vertebral fractures.

## MATERIALS & METHODS

The present study was undertaken for assessing and comparing the efficacy of short segment, compared to long segment instrumentation in thoracolumbar vertebral fractures. A total of 20 patients were enrolled which who were scheduled to undergo spinal instrumentation in pathological and traumatic vertebral fractures. A detailed history was taken and relevant physical examination and investigations required was done. Patients and relatives were thoroughly explained regarding the nature of study.Detailed pre-anesthetic check-up of all the patients posted for surgery was done a day prior to the surgery. All the patients were kept nil per oral for more than 8 hours prior to the surgery. Patients were randomly divided into 2 groups of 10 each as follow:

- Short segment treatment group
- Long segment treatment group

Follow-up was done and assessment was based on following variables:

- Visual Analogue Scale: On a scale of 0 to 10 with 0 indicating no pain and 10 indicating severe unbearable pain.
- Oswestry Disability Index
    - 0% to 20%: minimal disability
    - 21%-40%: moderate disability
    - 41%-60%: severe disability
    - 61%-80%: crippled
    - 81%-100%: These patients were either bed-bound or exaggerating their symptoms

All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Chi-square test and student t test were used for evaluation of level of significance.

## RESULTS

Mean age of the patients of the short segment group and long segment group was 149.36 minutes and 174.62 minutes respectively. Mean operative time was significantly lower among short segment group. Mean ODI at preoperative, postoperative $7^{th}$ day and postoperative 12 months among the patients of the short segment group was 52.36, 31.47 and 7.69 respectively. Mean ODI at preoperative, postoperative $7^{th}$ day and postoperative 12 months among the patients of the long segment group was 52.18, 33.69 and 13.41 respectively. Mean ODI index was significantly lower among patients of the short segment group at $12^{th}$ month postoperative follow-up in comparison to long segment group. Mean VAS at preoperative, postoperative $7^{th}$ day and postoperative 12 months among the patients of the short segment group was 7.9, 3.5 and 1.8 respectively. Mean VAS at preoperative, postoperative $7^{th}$ day and postoperative 12 months among the patients of the long segment group was 7.7, 3.3 and 1.3 respectively. Mean VAS was significantly lower among patients of the short segment group at $12^{th}$ month postoperative follow-up in comparison to long segment group. Non-significant results were obtained while comparing complications among patients of the two study group.

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**Table 1:** Comparison of operative time

| Operative time (minutes) | Short segment group | Long segment group |
|---|---|---|
| Mean | 149.36 | 174.62 |
| SD | 15.6 | 16.2 |
| p- value | 0.000 (Significant) | |

**Table 2:** Comparison of Oswestry disability index

| Oswestry disability index | Short segment group | Long segment group | p- value |
|---|---|---|---|
| Pre-operative | 52.36 | 52.18 | 0.66 (Non-significant) |
| Postoperative 7$^{th}$ day | 31.47 | 33.69 | 0.74 (Non-significant) |
| Postoperative 12 months | 7.69 | 13.41 | 0.000 (Significant) |

**Table 3:** VAS score at different time intervals

| VAS | Short segment group | Long segment group | p- value |
|---|---|---|---|
| Pre-operative | 7.9 | 7.7 | 0.74 (Non-significant) |
| Postoperative 7$^{th}$ day | 3.5 | 3.3 | 0.46 (Non-significant) |
| Postoperative 12 months | 1.8 | 1.3 | 0.22 (Non-significant) |

**Table 4:** Complications

| Complications | Short segment group | | Long segment group | |
|---|---|---|---|---|
| | Number | Percentage | Number | Percentage |
| Implant failure | 3 | 30 | 2 | 20 |
| Deep wound infection | 1 | 10 | 1 | 10 |
| p- value | 0.45 | | | |

## DISCUSSION

The advantages of operative treatment of thoracolumbar fractures over the nonoperative approach include avoiding an orthosis in the presence of multiple injuries, skin injuries, and obesity, immediate mobilization and earlier rehabilitation and better restoration of sagittal alignment. Surgical decompression of compressing bone fragments over the spinal cord also reliably provides a better environment for restoration of neurologic function. On the other hand, the benefits of surgical treatment must be carefully weighed against the potential surgical morbidity. Conventional open surgical techniques can be associated with morbidity because of approach-related muscle injury, increased infection rates and higher blood loss.[6-9]Hence; under the light of above mentioned data, the present study was undertaken for assessing and comparing the efficacy of short segment, compared to long segment instrumentation in thoracolumbar vertebral fractures.

In the present study, mean age of the patients of the short segment group and long segment group was 149.36 minutes and 174.62 minutes respectively. Mean operative time was significantly lower among short segment group. Mean ODI at preoperative, postoperative 7$^{th}$ day and postoperative 12 months among the patients of the short segment group was 52.36, 31.47 and 7.69 respectively. Mean ODI at preoperative, postoperative 7$^{th}$ day and postoperative 12 months among the patients of the long segment group was 52.18, 33.69 and 13.41 respectively. Mean ODI index was significantly lower among patients of the short

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segment group at 12th month postoperative follow-up in comparison to long segment group. Our results were in concordance with the results obtained by previous authors who also reported similar findings.Girardo M et al compared clinical and radiological data and rate of mechanical complications in elderly patients treated with short segment (SSS) or long segment stabilization (LSS) for thoracolumbar junction osteoporotic vertebral fractures (OVFs). Patients over 65 years old with a T-score of <-2.5, affected by (T10-L2) vertebral fracture treated with LSS or SSS pedicle screw fixation, with at least 24 months of follow-up were evaluated. For both groups, ODI and VAS significantly decreased over time with good results. At the final follow-up, no significant differences were found in terms of ODI and VAS. There was no difference in correction of BKA between groups; however, a significant difference was found in LSS group between pre- and postoperative BKA (p=0.046), whereas no difference was found in SSS group. A significant difference in the rate of mechanical complications was found between groups. They concluded that both treatments showed good clinical and radiological results; however, LSS group showed better BKA correction and lower mechanical complications than SSS group.[10]

In the present study, mean VAS at preoperative, postoperative 7th day and postoperative 12 months among the patients of the short segment group was 7.9, 3.5 and 1.8 respectively. Mean VAS at preoperative, postoperative 7th day and postoperative 12 months among the patients of the long segment group was 7.7, 3.3 and 1.3 respectively. Mean VAS was significantly lower among patients of the short segment group at 12th month postoperative follow-up in comparison to long segment group. Non-significant results were obtained while comparing complications among patients of the two study group. Hu X et al evaluated the clinical and radiographic results of posterior short segment fixation including the fractured vertebra (PSFFV) combined with kyphoplasty (KP) for unstable thoracolumbar osteoporotic burst fracture. Forty-three patients with unstable thoracolumbar osteoporotic burst fracture underwent PSFFV combined with KP from January 2015 to December 2017 were analyzed retrospectively. They concluded that PSFFV combined with KP is a reliable and safe procedure with satisfactory clinical and radiological results for the treatment of unstable thoracolumbar osteoporotic burst fracture.[11] Singh A et al in 2020 compared outcome of the Short-Segment Posterior Fixation (SSPF) versus Long-Segment Posterior Fixation (LSPF) for treatment of thoracolumbar burst fracture in term of surgical, radiological, neurological and functional outcome. They concluded that short-Segment Posterior Fixation (SSPF) is a significantly decreased duration of surgery and blood loss compare with Long-Segment Posterior Fixation (LSPF).[12]

## CONCLUSION

The patients in this study showed better results for short segment instrumentation.

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