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Article

Short same segment fixation versus short segment fixation in postoperative correction of kyphosis and pain reduction in thoracolumbar spine fractures

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Short same segment fixation versus short segment fixation in postoperative correction of kyphosis and pain reduction in thoracolumbar spine fractures

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Abstract: *Introduction*: Posterior short segment pedicle screw fixation is considered the most common way for management of unstable thoracolumbar spine fracture. This study is aiming to evaluate the efficacy of both posterior short same segment and posterior short segment pedicle screw fixation on postoperative kyphotic angle and pain dense score in thoracolumbar fractures. *Methods*: This is a Prospective study of 32 patients with single level thoracolumbar spine fracture between June 2011 and May 2014. Patients were divided randomly into 2 groups, one of them was submitted to short same segment posterior pedicle screw fixation with mean age 31.25+9.25ys, while the other group submitted to short segment posterior pedicle screw fixation with mean age 29.18+9.65ys. Cobb method and Denis work scale were used to assess kyphotic angle and pain score respectively on admission, during follow up period and after one year postoperatively. *Results*: The short same segment type of operation showed improvement in correction in kyphotic angle deformity at the end of follow up period although this improvement was not statistically significant compared to short segment type. The short same segment patients showed statistically significant improvement as regard pain Denis score among those patients treated by short segment fixation. *Conclusion*: In this study short same segment posterior pedicle screw fixation is more efficient in postoperative pain reduction than short segment posterior pedicle screw fixation.

Key word: fracture, kyphotic angle, Spine

Introduction

The aim of surgical management of any spine fracture is early ambulation, healing without deformity and minimizing pain (8).

Spine considered unstable if two or more spinal columns are affected (2).Restoring vertebral columns stability and early patient's mobilization are the goals of treatment of thoracolumbar spine fracture (3). Posterior short segment pedicle screw fixation is

considered the most common way for management of unstable thoracolumbar spine fracture (5).

Most of burst fractures of spine occurred in thoracolumbar junction because it represents a transitional zone between stiff kyphotic thoracic spine and mobile lordotic lumbar spine (7).

Progressive kyphosis remain a concern in posterior short segment pedicle screw fixation and lack of anterior column support is the main cause (6).

Aim of the work

Evaluation of the efficacy of both posterior short same segment pedicle screw fixation and the posterior short segment pedicle screw fixation on postoperative kyphotic angle and pain dense score in thoracolumbar fractures.

Patients and methods

This is a prospective study including 32 patients with single level thoracolumbar spine fracture. The study was conducted between June 2011 and May 2014 in Mansoura Emergency Hospital. Patients were divided randomly into two groups; one of them was submitted to short same segment posterior transpedicular screw fixation with the mean age of 31.25+9.25ys, and the other group was submitted short segment posterior transpedicular screw fixation with mean age of 29.18+9.65ys.

Radiological examinations were done for all patients and they included lateral view plain x-ray, computed tomography scan (CT) and magnetic resonance imaging (MRI) to assess the level of the fracture, admission kyphotic angle, and the neural tissue status. Patients with neurological deficits, multiple spine fractures and polytraumatized patients were excluded.

Cobb method was used to assess the kyphotic angle by drawing two lines perpendicular to other two lines representing superior end plate of the vertebra above and inferior end plate of the vertebra below. The kyphotic angle was classified to minimal form (0-5 degrees) deformity, mild from (6-15 degrees), moderate from (16-20 degrees) and severe (greater than 20 degrees (1)).

One half of the patients with fracture spine were fixed surgically by posterior short segment pedicle screw fixation (SS) by fixation of one level above and one level below the fractured level, the other half of the patients were fixed by posterior short same segment pedicle screw fixation (SSS) by using additional screws in the fractured level. Polyaxial top loading screws were used for all patients.

Patients were followed up regularly at 3 months intervals. Last follow up for final assessment of kyphotic angle and pain dense score was at one year postoperatively. All patients were followed up with plain x-rays and CT scans of dorsolumbar region.

Denis work scale was used to assess patient's pain status and his ability to return to work Denis work scale was classified to five categories (5):

- W1: patients back to his previous job.
- W2: patient back to previous job but not full time work.
- W3: patient unable to return to previous job but can work full time in other job.
- W4: patient unable to return to full time job.
- W5: patient unable to work (complete disability).

Table I

Demographic characters of the patients

Characters	Type of operation				Test of significance	P-value
	SSS n=16		SS n=16			
Age ± SD	31.25±9.85		29.18±9.65		0.62	0.5
Gender:	No.	%	No.	%	Chi-square	
Male	12	75	9	56.25	1.25	0.26
Female	4	25	7	43.25		
Mode of trauma:						
Falls	7	43.75	5	31.25	0.62	0.5
Motor car accident	2	12.5	3	18.75		
Motor bicycle accident	7	43.75	8	50		

There is no statistically significant difference as regard demographic characters of age, gender and mode of trauma between patients who underwent short same segment and short segment fixation.

Table II

Outcome of kyphotic angle correction and pain dense score following short same segment and short segment posterior transpedicular interbody screw fixation

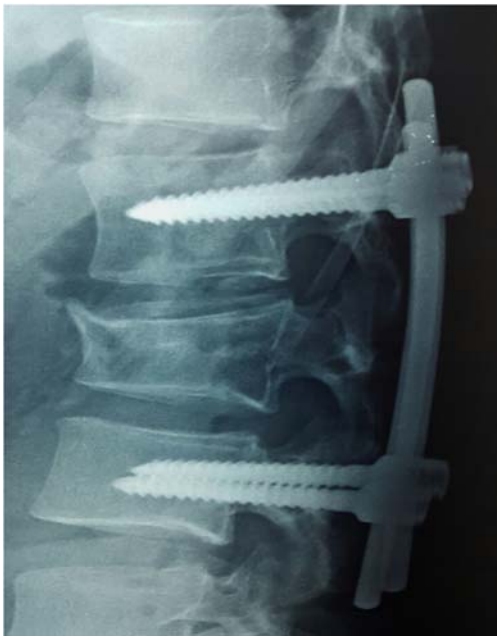
Variables	Type of operation				Test of significance	P-value
	Short same segment fixation n=16		Short segment fixation n=16			
Kyphotic angel at end of follow-up:	No.	%	No.	%		
Mild	11	68.75	4	25	4.438	0.085
Moderate	4	25	8	50		
Severe	1	6.25	4	25		
Pain dense score:						
W1	3	18.75	0	0	15.813	0.03
W2	9	56.25	5	31.25		
W3	2	12.5	4	25		
W4	2	12.5	6	37.5		
W5	0	0	1	6.25		

The short same segment type of operation showed improvement in correction of kyphotic angle deformity at the end of follow up period although this improvement is not statistically significance compared to short segment type.

The short same segment patients showed statistically significant improvement in pain dense score than patients treated by short segment fixation.

P value is considered statistically significant at $p \geq 0.0$

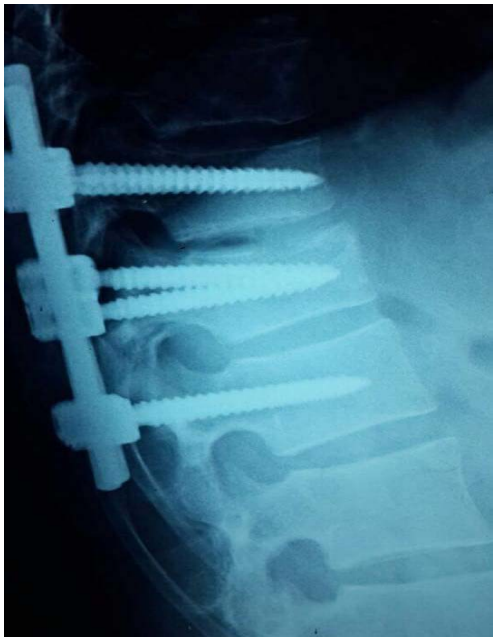
A



B

Figure 1 - A) preoperative case with lumbar 3 vertebral fracture , B) post-operative short segment fixation at the end of follow up period

A



B

Figure 2 - A) preoperative case with lumbar 2 vertebral fracture, B) post-operative short same segment fixation at the end of follow up period

Discussion

The goal of treatment of thoracolumbar spine fractures are restoring spine stability and pain improvement (3).

In this study there was no statistically significant difference between patients with short segment and short same segment posterior fixation as regard to age, gender and mode of trauma. These results are in agreement with Tezeren and Kuru (3).

In this study the short same segment operation showed correction of kyphotic angle deformity at end of follow up period, but this improvement was not statistically significant compared to short segment fixation.

These results are in agreement with Allanay et al. (1) who demonstrated long-term loss of kyphotic correction occurred with short same segment posterior fixation.

However, Jonathan et al. (4) in their study showed that short same segment fixation provide successful kyphotic correction.

Our results showed statistically significant improvement of the pain dense score among patients treated by short same segment posterior fixation than those treated by short segment posterior fixation; these results are in agreement with Jonathan et al. (4) who reported clinical improvement in pain and disability with short same segment posterior fixation. The improvement of the pain dense score and kyphotic angle correction with short same segment posterior fixation is probably due to increased biomechanical stability and reduction of implantation failure.

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