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Tlics Score & Denis Scale and Their Association with Various Variables among Patients Undergoing Operative Treatment for the Thoraco-Lumbar Fracture at Tertiary Care Hospital

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Abstract: ***Background:*** Present study to evaluate the TLICS score & Denis scale and their association with various variables among patients undergoing operative treatment for the thoraco-lumbar fracture with short segment stabilization of thoraco-lumbar spine with or without one screw fixation in fracture vertebrae. ***Methodology:*** The present study included both prospective and retrospective patients of thoraco-lumbar injury admitted, operated or came for follow up in Department of Orthopaedic Surgery at Indira Gandhi Medical College, Shimla between May2019 to May 2020. They were divided in 2 groups; Group A included the patients with 4 screws while group B included the patients with 5 screws. Socio-demographic history was assessed and a thorough clinical & neurological examination was done for classification and other parameters. ***Results:*** A total of 108 patients with TLISS score of more than 4 were recruited in the study which include 44 retrospective patients while 64 patients were prospective. 28 patient's fracture (Group A) were stabilized with 4 screw and 80 (Group B) were stabilized with 5 screws. There were 57 males and 51 females. Mean age was higher in group A (48.14 ± 4.35) as compare to group B (44.88±12.89). Group A had a mean TLICS of 5.03±0.51 and Group B with 5.26±0.71. Our study observed a significant association between TLICS score and pre-operative kyphotic angle. According to Denis scale, majority had occasional minimal pain with no need of medication & Returned to sedentary work, without weight restriction at 9 months of follow up. There was no significant association between age and Denis scale & between TLICS score and Denis scale. ***Conclusion:*** Present study concluded that majority of patients were males and aged above 50 years. There was no statistically difference according to TLICS & Denis scale in both groups. There was significant association between TLICS score and pre-operative kyphotic angle but not between age and Denis scale & between TLICS score and Denis scale.

Keywords: TLICS score, Denis scale, Association, Variables, Thoraco-lumbar fracture.

INTRODUCTION

Thoracolumbar injuries in trauma are concentrated at the thoracolumbar junction, with 60% occurring between T11 and L2vertebral level, and 10-14% involved the lower lumbar spine. About 20% patients with fracture atthoracolumbar level have associated neurological injury. Thoracolumbar injuries account for 30-50% of all injuries in spine. It is also the 2nd most common region after cervical spine injury.[1,2]

The Thorco-lumbar spine injuries are classified by various classification system like Denis system which classify it on the basis of stability and mechanism and thoraco-lumbar injury classification severity score (TLICS) which focussed on 3 key parameters to reflect the stability of disrupted spinal column namely the morphology of the injury; the integrity of the posterior ligamentous complex; and the neurologic status of the patient.[3-7]

The aim of surgery in these fracture include decompression of the neural components, fracture reduction, and providing a rigid fixation, and rehabilitation of the patient. Short-segment spinal instrumentation has been beneficial in the management of thoraco-lumbar spinal fractures for better correction of kyphotic deformity with greater initial stability, early painless mobilization, and indirect decompression of the spinal canal. Despite the advantages of this approach, it is also associated with loss of reduction and instrumentation failure.[8,9]

Pedicle screw instrumentation provides less surgical exposure, correction of deformity and better stabilization of one motion segment above and below fracture. The combined screw fixation technique requires insertion of 1 screws into the fractured vertebrae, which can produce a forward driving force to enhance the reduction and reshaping and can be used to directly raise the end plate to assist in the restoration of the compressed vertebral height.[8,9]

The present study was designed to evaluate the TLICS score & Denis scale and their association with various variables among patients undergoing operative treatment for the thoraco-lumbar fracture with short segment stabilization of thoraco-lumbar spine with or without one screw fixation in fracture vertebrae.

AIMS & OBJECTIVES

To evaluate the TLICS score & Denis scale and their association with various variables among patients undergoing operative treatment for the thoraco-lumbar fracture with short segment stabilization of thoraco-lumbar spine with or without one screw fixation in fracture vertebrae.

PATIENTS AND METHODS

Study Design- It was a Cross-sectional hospital based study.

Study Area:

The study was carried out in the Department of Orthopaedic Surgery at Indira Gandhi Medical College, Shimla.

Study Duration- Between May 2019 to May 2020.

Study Population:

A total of 108 patients with TLISS score of more than 4 were recruited in the study which include 44 retrospective patients who were operated for thoraco-lumbar fracture within 2 years before May 2019 & came for the follow-up of in the OPD and 64 patients who were operated between May 2019 to May 2020. All the patients with stable thoracolumbar fracture, comorbidities, and multiple level fracture were not included in the study.

Data Collection:

Detailed socio-demographic history was assessed and clinical examination & neurological charting of all patients was done.

Operating Procedure:

A posterior midline incision was given cantering the affected vertebrae. Posterior elements were exposed subperiosteally by reflecting the erector spinae muscle laterally to the facet joint and just base of transverse processes distal to proximal, one level above and one level below the level of decompression. Point of insertion of screws was identified and cortical bone nibbled with a bone nibbler. A blunt awl was inserted into the pedicle and advanced through the pedicle. All the entry point were made where pedicular screws insertion were identified with probe. All the entry point checked with pedicular feeler for all four intact walls of pedicle (medial, lateral, superior & inferior).Adequate length and diameter screws are inserted as per direction and position of pedicular awl. Adequate length of rod selected and bend according to the curvature of spine. Rod was stabilised over the pedicular screw and blocker in top loading screw. Laminectomy was done in case where canal diameter is decreased more than one third and patient had neural deficit. Dural tear if found was repaired with 3-0 silk with continuous stitches. Gauge count was done before initiation of closure. Negative suction drain of 16 G was placed in the wound over the gel foam. Erector spinae muscle and overlying fascia was sutured. Superficial and thoracolumbar fascia closed meticulously. Injection vancomycin 1gm infiltrated locally in to wound. Subcutaneous sutures were applied. Negative suction secured with skin with No 1 silk cutting body. Skin staplers were applied. Post-operative routine lateral and anteroposterior radiograph were obtained to access the placement of pedicle screws and rods.

Operation Definition:

A) Denis Classification

a) Functional pain scale according to Denis. Score Criteria of the pain scale
   1: No pain
   2: Minimal pain, without using medication
   3: Moderate pain, with occasional use of medication
   4: Moderate to severe pain, with constant use of medication
   5: Severe pain, with chronic use of medication

b) Functional work scale according to Denis. Score Criteria of the functional work scale
   1: Returned to heavy work
   2: Returned to sedentary work, without weight restriction
   3: Returned to work, but changed activity
   4: Returned to work, but only part-time
   5: Incapable of working

B) **Thoracolumbar injury classification and severity score (TLICS)**:Parameter were

a) **Morphology: Morphology of the injury is divided into three patterns:**

- Compression
  - Wedge Compression Fracture: 1 Point
  - Burst Fracture: 2 Points
- Translation/Rotation: 3 Points
- Distraction: 4 Points

b) **Posterior Ligamentous Complex**

- Intact: 0 Points
- Suspected Injury Or Indeterminate: 2 Points
- Injured: 3 Points

c) **Neurologic Involvement**

- Intact: 0 Points
- Nerve Root: 2 Points
- Cord/Conus Medullaris (Incomplete): 3 Points
- Cord/Conus Medullaris (Complete): 2 Points
- Cauda Equina: 3 Points

Statistical Analysis:

Data was collected and entered in Microsoft excel spread sheet, cleaned for errors and analyzed with Epi Info V7 Software with appropriate statistical test in terms of frequencies, percentage, mean standard deviation etc. The comparison of continuous variables between the groups will be performed using student's t test while categorical data between the groups were compared using chi square test. For all statistical tests, p value less than 0.05 was taken to indicate a significant difference.

RESULTS

A total of 108 patients were recruited in the study. Group A included the patients with 4 screws while group B included the patients with 5 screws. Group A consisted of 28 patients while group B had 80 patients.. 10 patients (35.7 %) in group A and 54 (67.5%) patients in group B were prospective cases. In retrospective group, 18 cases were in group A and 26 (32.5 %) were in group B. The age range of the participants was from 16 to 78 years. 12 (42.8%) patients in group A and 30 (37.5%) in group B were aged above 50 years. In our study mean age was higher in group A (48.14 ± 4.35) as compare to group B (44.88±12.89), with range (22-78) in group A and (18-65) in group B. In our study there were total 57 males and 51 females. Males were higher in group A (n=19; 67.8%) while females were higher in group B (n=42; 52.5 %) (Table-1).

Table 1: Distribution of patients according to groups & Socio-demographic Variables

	Group A : 4 screws		**Group B : 5 screws (one intermediate screw)**	
	No.	**%**	**No.**	**%**
Type of patients				
Prospective	10	35.7	54	67.5
Retrospective	18	64.3	26	32.5
Age group				
16-30 years	5	17.8	16	20
31-50 years	11	39.2	34	42.5
51-70 years	12	42.8	30	37.5
Mean Age	48.14±4.35		44.88±12.89	
Gender				
Male	19	67.8	38	47.5
Female	9	32.2	42	52.5
Total	28	100	80	108

Our study observed that mean TLICS score was comparable between group A (5.03±0.51) and group B (5.26±0.71) (p - 0.122). There was no difference in pain and work scale at 9-months between both groups according to Denis scale, However in this study group A 11 (39.3 %) and in group B 22 (27.5%) of patients had no pain, 50% in group A and 67.5 % in group B had occasional minimal pain with no need of medication, 10.7% in group A and 5.0% in group B had moderate pain with occasional need for medication. In group A 12 (42.8%) patients in group A and 27 (33.7%) in group B were returned to heavy work, 11 (39.2%) patients in group A and 42(52.5%) in group B Returned to sedentary work, without weight restriction, 3 (10.7%) patients in group A and 9(11.2%) in group B Returned to work, but changed activity while 2 (7.3%) patients in group A and 2 (2.5%) in group B Returned to work, but only part-time at 9 months of follow up (Table-2).

Table 2: Comparison of TLICS score & Denis scale between both groups

Grading System	**Group A (n=28)**		**Group B (n=80)**		**P value**
	No.	**%**	**No.**	**%**	
TLICS score	5.04±0.51		5.26±0.71		0.122
Denis scale (9-months)					
Denis Pain scale					
P1	11	39.3	22	27.5	0.24
P2	14	50.0	54	67.5	0.09

P3	3	10.7	4	5.0	0.29
Denis Work scale					
W1	12	42.8	27	33.7	0.38
W2	11	39.2	42	52.5	0.22
W3	3	10.7	9	11.2	1.0
W4	2	7.3	2	2.5	0.26

Our study observed a significant association between TLICS score and pre-operative kyphotic angle. In our study 64 patient presented with score of 5 and 31 patient had TLICS score of 6 while 12 patient had score of 4 & 1 patient had score of 8 (Table-3).

Table-3: Association between TLICS score and kyphotic angle in patients

TLICS score	11-20 degree (n=40)	21-30 degree (n=50)	>30 degree (n=18)	Total	P value
4	5 (41.7%)	7 58.3%)	0	12	0.045
5	20 (31.2%)	27 (42.2%)	17 (26.6%)	64	
6	14 (45.2%)	16 (51.6%)	1 (3.2%)	31	
8	1 (100.0%)	0	0	1	
Grand Total	**40**	**50**	**18**	**108**	

In our study there was no significant association between age and Denis scale (Table-4).

Table-4: Association of Age with Denis scale.

Denis scale (at follow-up)	16-30 years (n=21)		31-50 years (n=45)		51-70 years (n=42)		P value
	No.	%	No.	%	No.	%	
Denis Pain scale							
P1	7	33.3	11	24.4	15	35.7	0.49
P2	13	61.9	31	68.9	24	57.1	0.90
P3	1	4.8	3	6.7	3	7.1	0.70
Denis Work scale							
W1	4	19.0	18	40.0	17	40.5	0.19
W2	12	57.1	21	46.7	20	47.6	0.70
W3	4	19.0	4	8.9	4	9.5	0.43
W4	1	4.8	2	4.4	1	2.4	0.84

In our study there was no significant association between TLICS score and Denis scale (Table-5).

Table-5: Association of TLICS score with Denis scale.

Denis scale (9-months follow up)	TLICS score				p value
	4 (n=12)	5 (n=64)	6 (n=31)	8 (n=1)	
Denis Pain scale					
P1	9 (75.0%)	21 (32.8%)	3 (9.7%)	0	<0.01
P2	3 (25.0%)	40 (62.5%)	24 (77.4%)	1 (100.0%)	<0.01
P3	0	3 (4.7%)	4 (12.9%)	0	0.78
Denis Work scale					
W1	7 (58.3%)	26 (40.6%)	6 (19.4%)	0	0.05
W2	5 (41.7%)	33 (51.6%)	14 (45.2%)	1 (100.0%)	0.64
W3	0	5 (7.8%)	7 (22.6%)	0	0.09
W4	0	0	4 (19.9%)	0	0.01

DISCUSSION

Present study included patients undergoing operative treatment for the thoracolumbar fracture in the Orthopaedics Department of Indra Gandhi Medical College, Shimla. Recruited patients had TLICS score of 4 or more and were operated with Pedicle Screw fixation which should be done as early as possible to help in good nursing care and mobilization of the patient and to prevent deterioration of the neurological status. Pedicle screw fixation via posterior approach which was the technique employed in the present study has been widely used for most thoracolumbar fractures owing to its three-column fixation and satisfactory clinical outcome as it provides adequate exposure and direct visualization.[10-12]

The mean age of the participants in the present study was (48.14±4.35) in group A and (44.88±12.89) in group B, in the studies in the past this has been seen that the age range of these kind of injuries is present in the range of 30 to 50 years, studies by Jei wei Tian et al[13], Guven et al[14], Farrokhi et al[15], Butt M et al[16], and have all findings similar to our study where the age is in the similar range. The reason of the age range can be

attributed to the risk of accident involving RTA[17] or impact injuries which is generally present in this age group. Similar assumption can be made about the sex distribution of the study group which shows a male pre-ponderance.

In our study of 108 patients, total 57 were males in both group A and Group B and 51 were females in both groups. Male were higher in group A (N=19) 67.8% while female were higher in group B (N= 42) 52.5%. The observation in the study are comparable to numerous studies established in literature, they include male preponderance & this reflect the fact that most outdoor activities are performed by male, so they are more prone for injuries.[15-17]

Our study observed that mean TLICS score was comparable between group A (5.03±0.51) and group B (5.26±0.71) (p - 0.122). TLICS Scale is a guideline for the management of thoracolumbar injuries. A composite injury severity score stratifying patients into operative and non-operative treatment. It is used to assess integrity of the posterior ligamentous complex, injury morphology, and neurological status of the patient. TILCS facilitates the communication between physicians, and guides to treatment decision with better outcome.[18,19] Our study also observed a significant association between TLICS score and pre-operative kyphotic angle.

Denis scale was used to assess the pain and functionality of the patients after operation, there was no significant difference in the reduction of pain in the two groups, however, the functionality showed a marked regain in the post-operative period with majority of patients returning to their old job, few of the patients who were involved in heavy work were ergonomically relocated to the new job with less physical labour, such patients were 3 in the group A and 9 in group B. Previous study using the Denis scale also found that the pain reduction was not significantly different in the groups[20,21]. In our study there was no significant association between TLICS score and Denis scale.

CONCLUSION

Present study concluded that majority of patients were males and aged above 50 years. There was no statistically difference according to TLICS & Denis scale in both groups. There was significant association between TLICS score and pre-operative kyphotic angle but no significant association between age and Denis scale & between TLICS score and Denis scale

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