Traumatic dorso lumbar spine fractures and its management

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الخلاصة

تعد إصابات العمود الفقري بمستوى الفقرات الصدرية القطنية من الإصابات الشائعة والخطرة في أن واحد بسبب الانتقال من مستوى الفقرات الصدرية الثابتة إلى مستوى الفقرات القطنية المتحركة والتي بدورها تكون سهلة الانكسار أو الخلع تم دراسة ثمانية وأربعون حالة أدخلت جميعها خلال الأسبوع الأول من الإصابة . كانت أعمار المرضى بين (18-55) سنة وسبب الإصابات أما السقوط من علو أو حوادث السيارات .

كان هناك ستة عشرة مريض إصاباتهم مستقرة عولجوا تحفظيا بيما كان هناك اثنان وثلاثون مريضا عولجوا جراحيا بواسطة تثبيت العمود الفقري باستعمال براغي وقضبان من مادة التيتانيوم بعد إن أجريت عملية فتح الفقرات وتحرير النخاع ألشوكي من الضغط الحاصل بسبب انكسار جسم الفقرة ورجوعه إلى الخلف وضغطة على النخاع ألشوكي . تحسنت حالة المرضى الذين كانوا يعانون من ضرر عصبي جزئي بينما لم نلاحظ أي تحسن على المرضى الذين يعانون من شلل الإطراف السفلى الكامل .تحسن حالة تقوس العمود الفقري ما بعد العملية بالإضافة إلى تراجع حدة الألم المصاحبة للكسر .

Abstract

The dorsolumbar segment is an unstable zone between fixed dorsal and mobile spine. The posterior approach with interpedicular screws and rods for segment stabilization was found appropriate method.

Forty eight consecutive patients of dorso-lumbar spine injuries with or without neurological deficit ranged from 18-55 years were included in this study. LI vertebra was fractured in 32 cases, D12 in 12 cases l 1 in 3 cases and D10 in one case.21 patients presented with unstable fractures, 12 of them presented with complete paraplegia while 9 presented with incomplete neurological deficit. 16 patients with stable fractures treated conservatively while 32 patients treated surgically by decompression of the cord (Laminectomy) at the site of injury with stabilization by interpedicular screws and rods.

All sixteen patients without neurological deficit and stable fractures treated conservatively and return to the work within 3 weeks of injury, 9 patients presented with partial neurological deficit showed significant improvement after surgery, while those 12 patients who presented with complete paraplegia showed no any significant improvement.

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The anterior wedge compression angle decreased postoperatively and there is improvement in kyphosis and decrease in severity of the pain.

Transpedicular screws fixation with rods is the method of choice in treatment of dorsolumbar spine injury for stabilization and decompression to allow improvement of neurological deficit and early rehabilitation.

Keywords: Pedicular screws, Dorsolumbar spine fractures, posterior fixation, Neurological deficit.

Introduction

The dorso lumbar junction is a zone of structural and functional transition, which makes it vulnerable to injury, this transition zone between the rigid thoracic vertebral column and the relatively mobile lumbar column creates a fulcrum at the thoraco lumbar junction.(l) for this reason the 75% of fractures occurring between T12 and L2(2). And this fractures associated with neurological injury in up to 48% of cases(3,4). 19% of them presented with complete neurological deficit, 26% have incomplete deficit, and 55% are neurologically intact.(5). Treatment of dorso lumbar fractures constitute a most controversial subject, these are strong proponents in surgical management (6,7,8,9,10).The surgical treatment of the thoraco lumbar spine has undergone profound change in the past decade with an emphasis on preservation of the intact segment(short segment fixation) (1 l).Good result have been reported in flexion distraction injuries (12).

The majority of thoraco lumber spine fractures and fracture dislocation may be considered acute sagittal plane deformities, unstable thoraco lumbar injury required stabilization (13),allow mobilization of the patient to prevent pulmonary and venous complication (14), to relive pain (15),to realign the spine and spinal canal and to decompress directly or indirectly the neural elements (16).

Materials and meyhods

Fourty eight patients with closed dorso lumbar spine injury were admitted with in the first week of injury and followed up by regular outpatient visit.

The information obtained from patients and their records include: age, time of injury and time of admission, the cause of injury, level and type of spinal injury, history of illness, pain, tenderness, parasthesia, paresis , paraplegia and incontinent of urine and bowel.

There were 40 male and 8 female, age ranged from 18-55 years. LI vertebra was fractured in 32 cases , D12 in 12 cases , Dl 1 in 3 cases and D10 in one case table 1,

Table 1:Level of vertebral fractures

Level of fracture	No .	%
L1	32	66
D12	12	25
D11	3	6
D10	1	4

All the patient admitted within one week of injury , 75% of the patient admitted to the hospital within 72 hours, while 25% admitted after 3 days The type of fracture variable from partial to burst fractures depending on CT scan with bone windows and by used 3 column classification of Denis [17]. 21 patients presented with unstable fracture, 12 of them presented with compete neurological deficit (motor and sensory) and incontinent of urine and bowel, while 9 of them presented with incomplete neurological deficit, 5 of 9 patients presented with complete motor paralysis arid incomplete sensory loss(C2), and the other 4 patients presented with incomplete motor paralysis and complete sensory loss (C3).We used following criteria to call a burst fracture unstable:

(1) Sever persistent pain with slightest movement
(2) Kyphosis deformity
(3) More than 50% anterior vertebral body Compression
(4) Canal compression 40% from (T 11 to LI) associated injury to posterior column
(5) Associated neurological deficit [18, 19, 20].The patients were subjected to X-rays, investigation, CT scan with 3 D bone windows and MRI (to know the cord status),and associated injuries to be managed simultaneously. 16 patients with stable spine 'fractures 'without neurological deficit were treated conservatively with adequate bed rest,bracing analgesia and early mobilization with physiotherapy.

32 patients were operated with in two weeks, table 2.

Table 2;Type of injury

Type of injury	No	%	Type of treatment
Stable	16	33.6%	Conservative
unstable	32	66.4%	surgical

Decompression of the cord at the site of injury was carried out with stabilization done one vertebra above and one vertebra below using 4.5 mm x36 mm pedicle screws with two rods. Routine post-operative management of dressing , antibiotics , analgesics and other was followed in all patients with care was taken to prevent bed sores by using air beds , frequent change of posture and back car[21].The follow up of the patients along one year, the clinical evaluation include, neurological improvement, spinal deformity, associated symptom like pain, parasthesia, weakness,

Radiological evaluation and complication

The fracture were classified according to the three column of Denis (1983) [17] and included 25 unstable burst fracture and 7 fracture-dislocation according to it, burst fracture are classified In to:

-Type A: Fracture of both end plates.
-Type B: Fracture of the superior end plate.
-Type C: Fracture of the inferior end plate.
-Type D: Burst rotation.
-Type E: Burst lateral flexion.

In our study we had 3 patients type A, 17 with type B, 2 with type C, and 3 with type E .Table 3

Table 3;Type of unstable fracture according to tree column of Denis

Type	No.	%
Type A	3	12%
Type B	17	68%
Type O	0	0%
Type E	2	8%
Type G	3	12%

The neural function was determined by classification suggested by Frankel et al (1969) [22, 23] the initial neural state was;

A- (Complete): The lesion causes complete motor and sensory loss below the fracture level.

B- (sensory only) some sensory presentation below the fracture level but no motor function.

C- (Motor useless) some motor power below the fracture level

D- (Motor useful) motor power below the fracture level that is useful to the patient.

E- Normally: Free motor and sensory function.

Surgical technique

All patients were operated under general anesthesia in prone position, amid line posterior approach was used. The injured site was defined ,posterior decompression was performed whenever indicated to ensure that the disrupted soft tissue or bone fragments did not compress neural elements during final reduction[21]. Decompression also included undercutting the disrupted lamina and evacuation of any Epidural hematoma, by using the fluoroscopy control to identify the proper site. The fracture was stabilized by bilateral pedicle screws with short segment fixation, distraction was used to reduce the posterior displacement of vertebral body toward the neural canal and maintain a good alignment of the spine and fracture site. No bone grafting was done in any patient.

Post operative care

All the patients were mobilized on third or fourth days with thoraco-lumbar spinal brace (Rigid type), the spinal was worn for the three months Postoperatively in all patients.

Results

General condition:

All sixteen patients without neurological deficit and stabile and stable fracture return to work within 3 weeks of injury and there was no deterioration of the neurological status of any patients either at the time of discharge from the hospital or at the final examination.

Neurological status

All nine patients with partial neurological deficit in this series, showed significant improvement, only 2 patients with Frankel grade A improved to Frankel grade B .All patients with Frankel grade B, C, and D improved at least one grade, while all 12 patients with Frankel grade A showed no any significant improvement, most patients were happy with surgery as far as relief of pain was concerned. Most patients did not require medication for pain and it was found that there was no significant effect of kyphosis deformity on pain status of these patients.

In this series neurological recovery occurred in all patients with partial paralysis, neurological recovery appeared to be depend on initial kyphosis and vertebral fractures with maximum canal compromise, impacting the neural elements against posterior bony arch, caused greatest neurological damage with less favorable recovery pattern in our cases .The overall rate of recovery varied from 50-85%.

Radiological evaluation

Anterior wedge compression angle:

It is the angle formed between lines parallel to the superior end Plate and a line parallel to the inferior end plate of the vertebra on the lateral film.

- The average anterior wedge compression angle preoperatively was16.4 (5-28) degree.
- The average anterior wedge compression angle postoperatively was 6 (0-2D)' degree.
- Average anterior wedge compression angle at follow up was 9.8 (0-23) degree.

Complication

One patient died due to Deep venous thrombosis and pulmonary embolism under rehabilitation two months after injury. Bed sore in paraplegic patients is an accepted reality and plastic surgery was required to do a rotation flap.

The infection either superficial wound infection seen in two patients they were treated by local and systemic antibiotics, daily dressing of the wound and turning of the patient every two hours, all these infection subsided completely, or deep wound infection was recorded in this

study. There is one patient experienced screw displacement and pullout, he need another surgery to reimplantation of the screw.

Discussion

The management of dorsolumbar spine injury has remained controversial and it became a common lesion of last two decades, falling from height and high speed driving are the main causes.

The goals of treatment of any spinal injury include [23]

1- Effective decompression of the spinal canal and achieved adequate reduction.

2- Healing of the spine without deformity, limitation of movement, instability or pain.

3- Early mobilization and simplified nursing care.

Methyl prednisolone was administrated to all patients of spinal cord injury with neurological deficit to decrease the cord edema [24,25]. Short segment fixation results in less spinal stiffness, forces applied to the spine are not strong and fatigue failure is uncommon [26,27,28].

The pedicular fixation systems have the advantage that they are able to fix the three spinal column and provide segmental stabilization for few spinal motion segments. There is usually a controversy about the role of fusion in treating spinal fractures, because good long-term stability may be obtained in many conditions through conservative treatment alone.

Advocates of surgery believe in obtaining early and solid spinal fusion and good stability. Excellent results with operative treatment have been reported by several authors through the methodology has varied [29, 30, 31, 32]. Conventional pedicle screw instrumentation use distraction forces to indirectly reduce kyphosis and restore vertebral body height [33,34], and following posterior distraction, canal decompression is limited and often incomplete, while when distraction is applied in the lumbar spine it can result in flattening of the lumbar lordosis [35,36,37].

In our study, the spinal canal encroachment of at least 50% was invariably associated with neurological deficit [38, 39], so both clinical and experimental finding suggest that decompression is very beneficial in patients with incomplete neurological deficit, we found that there was no significant correlation between the delay of the decompression and neural recovery [40].

Transfelat *et al* [41] found 68% improvement in neurological deficit when operated with in period of two years. The late onset neurological deficit in thus a reality in these patients and that decompression dose help to relieve pain and improve neurological deficit, patients who treated conservatively and returned back with progressive kyphosis with pain and or neurological deficit. These patients required stabilization of dorso lumbar junction.
Whitesides [42] reported relief of pain and improvement in neurological deficit following correction of kyphosis even after two years.

The anterior wedge compression angle in our series was 38 . Aebi *et al* (1987) [40] using AO internal fixation without fusion found that average loss of this angle 2.2 ?. Daniaux et al (1991) [43] using transpedicular fixation accompanied with inter corporal and intra corporal bone graft, found also that the loss was 3 ?. Lindsey et al (1991) [44] using AO internal fixation found that the average loss of this angle was 8.5.

Liuetal (1991) [45] found 3.3 degree.Review of literature shows recovery rate in routine circumstance vary from 50-90 % [46,47,48,49] which is nearly the same result of our series As regards implant failure in our series one patient experienced screw pull out after healing of their fractures which did not affect the condition of the patient. The complication in the series of Liu et al (1991) [45] using also the AO internal fixation, were one patient experienced screw breakage, One patient had screw pull out and one patient experienced breakage of the connecting rod.

Conclusion

Transpedicular fixation with rod system is the method of choice in the treatment of thoraco lumbar spinal injury for stabilization, indirect decompression for clearance of spinal canal with satisfactory decompression of the spinal cord and allows early rehabilitation with shorter hospital stay and early return to work.

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