**International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)**
**IJAMSCR |Vol.12 | Issue 1 | Jan - Mar -2024**
**www.ijamscr.com**
**ISSN: 2347-6567**
DOI : https://doi.org/10.61096/ijamscr.v12.iss1.2024.47-51

**Case study**

# Surgical Treatment of Post Traumatic Spinal Instability with Anterior Components

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Published on: 22 Feb 2024

Published by:
DrSriram Publications

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## Abstract

Our study focuses on unstable lumbar spine trauma. There were 16 cases: 8 cases had neurological lesions evaluated according to Frankel's classification From an anatomical point of view, these fractures associated serious bodily lesions and lesions of the posterior bone elements making them highly unstable. A neurotoxic fragment is often found. Canal stenosis was present in 6 cases. In 2 cases neurological lesions appear to be related to vascular disorders related to spontaneous displacement and reduction. Surgically, the first step has always been posterior stabilization associated with reduction and / or laminectomy. The previous approach was performed within two weeks 1. Overall, the clinical results were satisfactory with a consolidation and improvement of the Fränkel score with the exception of 2 cases seen at day 5 with Fränkel A lesions. In all cases kyphosis was reduced.

**Keywords:** Fracture, Spine, Instability, Anterior.

## INTRODUCTION

Fractures of the lumbar spine are becoming more frequent as a result of the considerable increase in road traffic accidents and accidents at work.
The severity of these fractures is related to the initial or secondary instability that threatens the neurological axis, and may be permanent, sometimes resulting in severe disability.
The therapeutic approach must include [2,3]:

1. Release spinal cord compression
2. Ensure primary stability
3. Allow consolidation of bone and disco-ligament injuries by anterior arthrodesis.

Surgical abstention, as was once accepted, is no longer accepted today. Surgery allows spinal decompression and stabilization of the lesions [4].

The aim of this study is to report on the therapeutic methods, results and evolution of 16 unstable traumatic lesions of the lumbar spine, 8 of which had neurological signs, treated by a 2-stage double approach.
Two questions arise during the initial treatment [5]:
- Is posterior stabilization of these injuries by osteosynthesis sufficient?
- Is the addition of an anterior cortico-cancellous graft necessary in all types of fracture?

**CASE STUDY**

From January 2015 to January 2022, 16 trauma patients were operated on using this technique. There were 12 men and 4 women with an average age of 27 years, ranging from 22 to 52 years. 4 cases were polytrauma. The mechanism most frequently found was telescoping of the spine by:

**Fall from a high place**

- 10 construction workers.
- 2 fall from a tree.

**4 traffic accidents**

From a neurological point of view, 8 trauma patients had nerve injuries classified according to Frankel as follows:

- Group A: 2
- Group B: 1
- Group C: 5

In all cases, a full clinical work-up was carried out, and recorded on a chart used as a reference and to monitor the patients.

A standard radiological examination combining:
- Full frontal and lateral spine
- Face, profile and ¾ centered on the lesions

A CT scan with 3D reconstruction was used to specify the lesions more precisely. MRI was performed systematically in the case of neurological lesions. The lesions were located preferentially in L2 and L3 (7 cases) and L1 (5 cases). In 3 cases, the lesion was located at L4, and in 1 case it was a combination of bi-articular dislocation and anterior lesions of the vertebral body. The CT scan showed:

**Posterior wall recession in 6 cases (fig 1)**

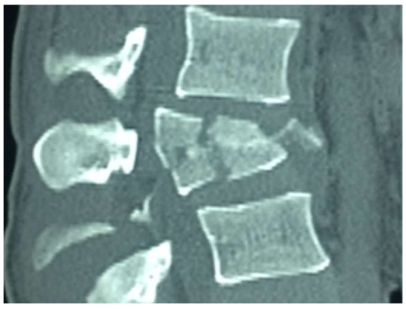


**Fig 1: Posterior wall recession**

**Burst fracture in all 16 cases (Fig 2)**



**Fig 2: Burst fracture with neurotoxic fragment**

Injury to the middle vertebral segment in 12 cases.

**TREATMENT**

This is carried out in 2 stages. Reduction and stabilization by posterior surgery combining CD osteosynthesis or, in the past, ROY-CAMILLE plates. In the 8 cases of associated neurological lesions, laminectomy was performed. Whenever possible, this posterior surgery was performed before the 12th hour. In 5 cases seen late, the delay exceeded 72 hours.

The 2nd anterior operation was performed between the 2nd and 3rd week. It always involves an anterior graft, sometimes combined with plate osteosynthesis. This anterior surgery is a crucial stage; it will prevent secondary kyphosis once the height of the vertebral body has been re-established and bone consolidation achieved.

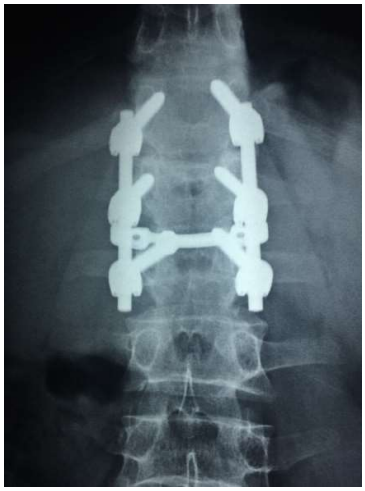


**Fig 3: CD mounting with frontal X-ray**



**Fig 4: CD mounting with lateral X-ray**

## RESULTS

Clinically, there were no septic complications. In one case we noted the expulsion of a screw with dismantling of the synthetic material in 1 case, which led to its removal at 18 months. Angular kyphosis was re-established in all cases. Neurological problems persisted in 4 cases:
2 did not recover at all; these cases were seen late

- 1 case classified as Frankel A
- 1 case classified as Frankel C

- The remaining 14 cases have progressed well and have returned to work, sometimes at the cost of being downgraded.

5 cases had residual pain, considered intense in 2 patients.
Mobility of the spine was constantly reduced, and 8 patients had a hand-to-ground distance of 20 cm or more.
Morphology: The extent of fracture displacement was assessed by calculating 2 angles:

- Vertebral kyphosis (VC), or pure bony deformity measured by the angle between the upper and lower plates of the fractured vertebra.
- Regional kyphosis (RC), which combines vertebral kyphosis with the disc ligament factor of adjacent mobile segments.
- Measurement of vertebral height before and after surgery is a reliable indicator of reduction.

In the 16 cases, the average initial CV value was 26 degrees, with extremes ranging from 18 degrees to 42 degrees. Postoperatively, after reduction, the average was only 12 degrees, with extremes ranging from 5 degrees to 30 degrees (Table 1).

**Table 1 : CV value**

| | Initial CV | Average post-operative Gain |
|---|---|---|
| 4 | 18 – 25° | 18° |
| 4 | 25 – 30° | 5° |

| | | |
|---|---|---|
| 2 | 30 – 35° | 25° |
| 3 | 35 – 40° | 30° |
| 3 | > 40° | 30° |

In one case, the vertebral kyphosis was 10 degrees, associated with major disco-ligament lesions and significant posterior wall recession. Postoperatively, the residual kyphosis was estimated at 5 degrees (Table 2). In absolute terms, the correction of regional kyphosis is greater than that of vertebral kyphosis. Finally, in the case where material was removed, we noted a worsening of the residual kyphosis compared with the initial kyphosis of 6 degrees on average, without any clinical repercussions.

**Table 2 : CV height**

| | initial kyphosis | (deficit correction) |
|---|---|---|
| 4 | > 50% | 1 cas : 30%<br>1 cas : 20%<br>2 cas : 15% |
| 7 | 30 – 50% | 1 cas : 30%<br>3 cas : 20%<br>3 cas : < 20% |
| 5 | < 30% | 5 cas : < 15% |

## DISCUSSION

The double approach to unstable traumatic lesions of the lumbar spine is indicated [6]. Although difficult, anterior surgery is mechanically more interesting. It must be able to prevent progression to kyphosis that is poorly controlled by osteosynthesis. The graft must maintain the height of the reduction and create a bone block with the overlying and underlying vertebrae to prevent progression to pseudarthrosis. However, the use of this additional anterior graft is somewhat disappointing in our series, as correction is rarely total, although the stabilization obtained after consolidation seems definitive. In addition to the graft, the use of anterior fixation techniques seems to give good results [7]. We are beginning to have some experience of this. From a clinical point of view, there does not seem to be any correlation between residual pain and the degree of kyphosis, and the notion of an accident at work is an important subjective element in determining the result. At the end of this study, the indications for the double approach can be summarised as follows:

- Canal stenosis of corporal or disc origin.
- Unstable fractures with disco-ligamentary damage involving the vertebral body.
- Any anterior corporal lesion that may lead to instability.

**Conflicts of Interest**

The authors declare no conflicts of interest.

## CONCLUSION

This type of technique is of interest for the treatment of unstable fractures of the lumbar spine. The posterior approach, with or without laminectomy, allows reduction, stabilization and decompression. Decompression is essential in cases of neurological injury. The anterior approach is more interesting from a mechanical point of view, as it allows vertebral height to be restored by an anterior graft and possibly spinal cord decompression [8]. It is, however, a major operation and is indicated in cases where posterior surgery alone is not sufficient.

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