



INSTRUCTIONAL LECTURES & PANEL PRESENTATIONS

LOW LUMBAR BURST FRACTURES

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LITERATURE

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ANATOMICAL CHARECTERISTICS OF LOW LUMBAR REGION

- Lordotic segment
- Anterior height of vertebrae and disc more than posterior
- Sagittal position of facets
- Decreased length of posterior elements
- Increased pedicle diameter and medial angulation
- Relative increase of coronal diameter with respect to neural structures
- Neurologic injury as in the form of peripheral nerve injury and increased chance of recovery

• Axial loading and flexion distraction are the main forces in injury

“Low lumbar burst fractures have distinct biomechanical and anatomical features.”

“Treatment and management considerations for low lumbar fractures are somewhat different than for the rest of the axial skeleton.”

Denis F, Spine, 1983

“Burst fractures of the lumbar spine are the result of axial compressive forces with an associated flexion moment creating a kyphotic deformity in a normally lordotic spine.”

Court-Brown CM, Spine, 1987

Axial forces increase kyphosis by compressing anterior elements in vertebrae above L2 in which there is already kyphosis.

However; Axial compressive forces below L3 cause uniform compression instead of kyphosis due to lordosis in this region although vertebrae is flexed.

The iliolumbar ligaments and location below the pelvic rim, are two stabilizing factors that are unique to low lumbar vertebrae when compared to thorocolumbar junction.

“It is important to detect the presense of subluxation and/or presense of thecal sac and posterior nerve roots compression between greenstick laminar fractures in low lumbar fractures.

In such a case, first posterior approach is mandatory.”

Cammisa FP, JBJS, 1989

Denis F, Spine, 1991

SAGITTAL PROFILE

Most of the lordosis (%76) is between L3 and sacrum.

Most lordotic segments are L3-4, L4-5 and L5-S1. One of the goals of treatment of spinal

fractures is to restore the sagittal profile to a nearly normal configuration.

It is more difficult to control the sagittal profile in low lumbar spine than thoracic and upper lumbar spine.

Difficulty of anterior approach.

Difficulty of fixation to sacrum.

In this region, isolated nerve root deficits act similarly to peripheral nerve injury with a good prognosis for spontaneous recovery with conservative treatment.”

Andreychik D, JBJS, 1996

CLASSIFICATION

Boehler	1929
Watson-Jones	1931
Nicoll	1949
Holdworth	1963
Kelly-Whitesides	1968
Louis	1973
Denis	1983
Farcy	1990
Magerl	1994

DENIS CLASSIFICATION

COMPRESSION FRACTURES

BURST FRACTURES

SEAT-BELT FRACTURES

FRACTURE-DISLOCATION

CLASSIFICATION (MAGERL)

TYPE A: COMPRESSION OF VERTEBRAL BODY

- A1 : Impaction Fractures
- A2 : Split fractures
- A3 : Burst fractures

TYPE B: ANTERIOR AND POSTERIOR ELEMENT INJURY TOGETHER WITH DISLOCATION

- B1 : Posterior ligamentous injury
- B2 : Posterior bony injury
- B3 : Anterior injury through disc

TYPE C: ANTERIOR AND POSTERIOR ELEMENT INJURY TOGETHER WITH ROTATION

- C1 : Type A injury with rotation
- C2 : Type B injury with rotation
- C3 : Rotational shearing injury

“Stable vertebrae can withstand the anterior axial forces acting on the vertebral body, posterior tension forces and rotational stresses.”

“By that way, vertebrae can hold the body erect and protect spinal canal contents without producing kyphosis.”

Whitesides

“Clinical instability is defined as that vertebrae can not protect the relations between vertebrae under physiological loading.”

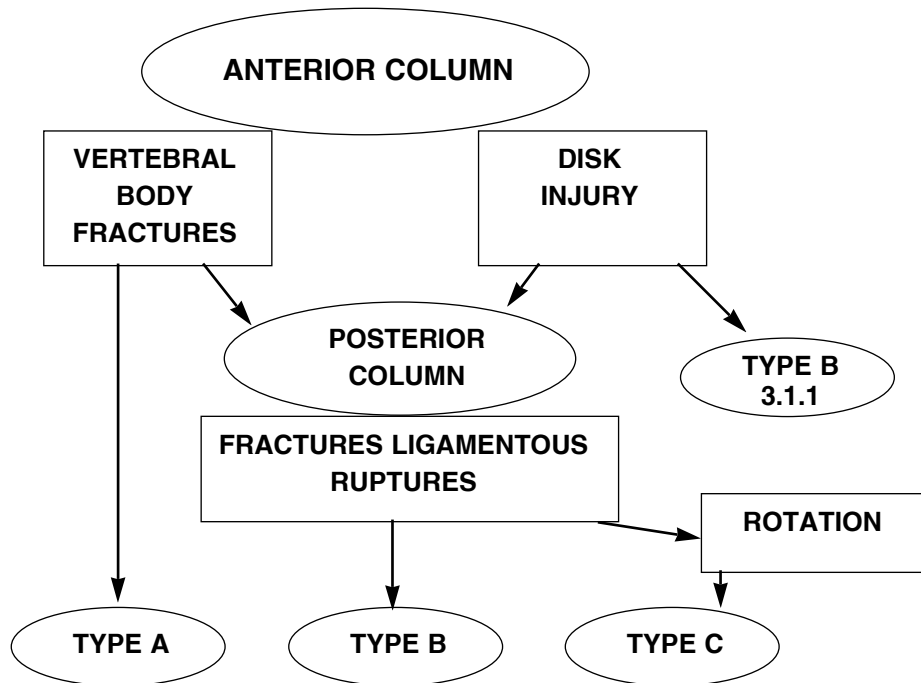
White A.A.

TREATMENT

- Medical treatment of spinal cord injury
- Conservative
 - Anterior
 - Posterior
 - Anterior-Posterior
 - Posterior-Anterior

CONSERVATIVE TREATMENT

- Bed-rest
- Brace
- Cast
- Technical difficulty
- Patient incomppliance



The results of conservative treatment are better than surgical treatment with long instrumentation.

An HS, Spine, 1991

Conservative treatment is successful in neurologically intact patients.

Finn CA, JBJS, 1992

Mick CA, Spine, 1993

The results of conservative treatment are similar to surgical treatment with short transpedicular instrumentation.

Andreychik D, JBJS, 1996

RADIOLOGICAL FINDINGS AFTER CONSERVATIVE TREATMENT

There may be progression of bony deformities like kyphosis, collapse during conservative treatment.

There may be no correlation between severity of deformity and symptoms during follow-up period.

RELATIVE SURGICAL INDICATIONS

Posterior elements injury

Neurological deficit

Multisegment injuries

Problem in brace use

Patients' desire

SURGICAL TREATMENT

The ideal result of surgical treatment of low lumbar fractures;

Complete decompression of neural elements

Fusion as possible as minimum segment

Establishing the physiological coronal and sagittal position of the spine.

SURGICAL TREATMENT

Posterior

Anterior

Anterior+Posterior

Pseudoarthrosis

Implant failure

Flat-back syndrome

AIMS OF DECOMPRESION

To treat incomplete neurological deficit

To prevent progression of neurological lesion

To restore the vertebral alignment

INDICATION OF ANTERIOR SURGERY

Incomplete neurologically deficit.

Burst fractures with Cauda Equina injury.

Occlusion of spinal canal.

Insufficient anterior bony stock.

>25° sagittal index.

Instability after laminectomy.

INDICATION ANTERIOR INSTRUMENTATION

Acute burst fractures with neurological deficit.

Late burst fractures (10 day)

%50 spinal cord compression (without neurological deficit).

KOSTUIK, Spine, 1988

CONTRAINDICTION OF ANTERIOR APPROACH

Dislocation of dorsal bony fragments into spinal canal

Severe osteoporosis

Multiple traumatized patients with thorax trauma

Irreducible dislocation

HAAS, Spine, 1991

INDICATION OF POSTERIOR INSTRUMENTATION

Compression fractures (vertebral body height <50% or 30° local kyphotic angle)

Ligamentous flexion/distraction injury

Fracture-dislocation

Neurologically intact patient with 15-25° sagittal index

UUMF DEPARTMENT OF ORTHOPAEDICS MATERIALS AND METHODS

Twenty-six patients with low lumbar burst fractures were treated from 1995 through 2001.

Medical records, preoperative and last follow-up radiographs were obtained.

Functional results for all patients were based on comparison of the patients occupational and recreational status before the injury and after it.

These results were classified as excellent, good, fair or poor according to Smiley-Ebster Scale.

RESULTS

- Twenty-six patients (twenty-eight low lumbar burst fractures) were treated with an average follow-up of 39.5 months (12-80 months).

- Female to male ratio was 5/21 and mean age was 37 years (17-64).

- The most common etiological factor was fall from height (24/26).

- Five of the patients were treated conservatively by immobilization for averagely 3 months in a thoracolumbar orthosis.

- The remaining cases underwent surgery.

- Indications for surgery were neurologic impairment in 9 patients and/or instability/deformity in 14 patients.

- Of the surgically treated group, 2 patients were treated with anterior, 10 patients with posterior and 9 patients with combined approach.

- Seven patients with low lumbar burst fractures had traumatic dural tears and extravasation of the nerve roots outside the dural sac.

- All patients underwent laminectomy, replacement of the roots within the dural sac and primary dural repair in addition to instrumentation and fusion procedures.

- Six patients showed complete neurological recovery in follow-up and one was neurologically intact prior to surgery and remained same.

- Two patients from the surgically treated group required hardware removal due to deep wound infection and migration of screws into the disc space in the postoperative 24 months and 7 months respectively.

- The functional outcome of the entire study group was assessed using the Smiley-Webster Scale. Good to excellent results were obtained in 24 (92%) of 26 patients (100% for nonoperative group, 90% for operative group).

CONCLUSION

Low lumbar burst fractures occur in a relatively young population affecting the most mobile and highly stressed portion of their spine.

If patients are neurologically impaired in association with low lumbar burst fractures, surgical treatment is effective.

In the case of dural tear, it is not possible to detect the tear and nerve root entrapment in greenstick lamina fracture before the surgery.

So, it must be the rule to expose the dura safely with posterior approach before any reduction maneuver.