

COTREL-DUBOUSSET INSTRUMENTATION IN SURGICAL MANAGEMENT OF THORACOLUMBAR AND LUMBAR BURST FRACTURES

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Twelve patients who had burst fractures in thoracolumbar junction and lumbar region, had been managed with Cotrel-Dubousset instrumentation between August 92-December 93, at the department of Orthopaedics and Traumatology, in Haydarpaşa State Hospital, İstanbul.

Six of our patients were female and the average age was 29.2. According to the level of the lesion, one of the patients had burst fracture at T 12, eight of the patients at L1, one of the patients at L2, one of the patients at L3, and one of the patients both at L3 and L4.

Our average follow up time was 10.5 months. Though, preoperative average local fracture angle was 20°, it became 8.7° postoperatively. Average local kyphosis angle was 15.6° preoperatively and 4° postoperatively. Average preoperative compression of anterior vertebral body percentage was 41.6% and in the last follow up it was 16.9%. On CAT scan, preoperative average vertebral canal obstruction was 51.9% and postoperatively it was 31.3%.

Four patients who had incomplete neurologic deficits had improvement, and fell in to one grade higher category according to Frankel and et al.'s classification system.

As complication, one patient had peroperative laminar fracture and the other one whom short segment was performed had upper pedicular screws broken postoperatively 8 and 12th months.

Key Words: Cotrel-Dubousset Instrumentation, Surgical Management, Thoracolumbar and Lumbar Burst Fractures.

Overall, burst fractures account for approximately %15 of all thoracolumbar spinal injuries (8). Disagreement exist as to the optimal treatment for burst fractures both with and without neurologic deficit. All authors surgically treat burst fractures with neurologic deficit (5, 14, 19, 20). But some authors treated conservatively the burst fractures with potential neurologic deficit (21, 28). Although, Denis (8) and other some authors treat them surgically (9, 15, 22, 25).

Since the use of the rods and the hooks by Harrington in 1958 (11), Roy-Camille pedicle screw plates (27), Luque rods (23), Edwards' rods and sleeves (15), Jacobs' locking hook spinal rods (18), sublaminar wiring of Harrington rods (9, 22, 28), Dick's fixatuer interne (10), and Alici spinal instru-

ments (2) have been used from posterior for reduction and stabilization of the spinal fractures, and decompression of the spinal canal and early mobilization. Beside these methods, Dunn (14), Kaneda (19) and Kostuik (20) have been developed anterior decompression and instrumentation methods.

In recent times, Cotrel-Dubousset instrumentation method has been popularized (1, 4, 6, 7, 12, 13, 26, 30). In this study, we analyzed our results of C-D method in the treatment of thoracolumbar junction and lumbar region burst fractures.

MATERIALS AND METHODS

Twelve patients who had burst fractures in thoracolumbar junction and lumbar region, had been treated with Cotrel-Dubousset instrumentation method between August 92-December 93, at the department of Orthopaedics and Traumatology, in Haydarpaşa State Hospital, İstanbul.

The study included 6 male and 6 female patients. The age of the subjects ranged from 18 to 42 years (average, 29.2 years).

9 of these injuries were secondary to falling from height, and 3 due to motor vehicle accidents.

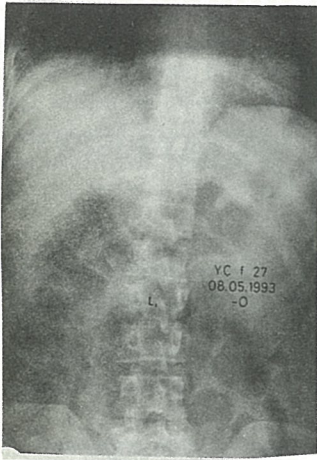
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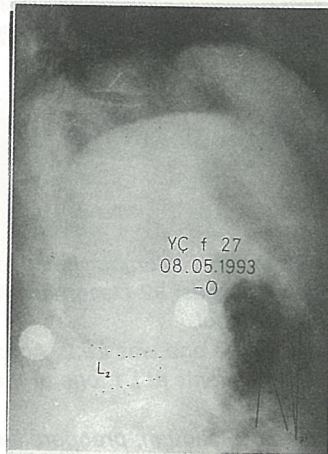
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A. preop, plain LAT radiograph



B. preop, plain AP radiograph

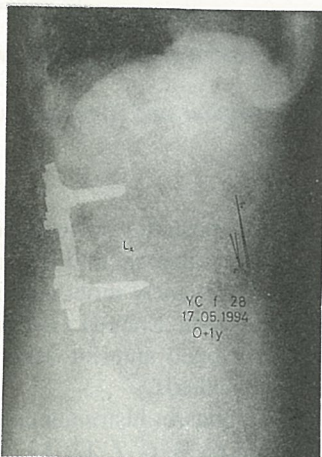
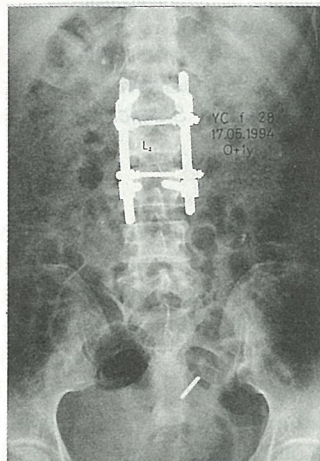
C. postop 1 year,
plain LAT radiographD. postop 1 year,
plain AP radiograph

Figure 1. Patient 1 is a 27-year-old woman with a burst fracture at L2, with short-segment pedicle instrumentation.

We classified burst fractures according to three-column concept of Denis (8).

According to the level of the lesion; one of the patients had burst fracture at T₁₂, eight of the patients at L₁, one of the patients at L₂, one of the patients at L₃, and one of the patients both at L₃ and L₄.

Additionally; three patients had calcaneus fractures, two patients had radius and ulna fractures, and one patient had tibia and fibula fractures.

Average time between trauma and operation was 13.8 day (2-20 days).

We operated two patients with L₂ and L₃ burst fractures with (Figure 1) short - segment pedicle - instrumentation. In one patient who has both L₃ and L₄ burst fractures, we used two vertebra up and one vertebra down from the lesion levels which the lower screws were supported laminar hook at L₅ level (Figure 2). In other patients, we made long segment osteosynthesis with pedicle screws and suitable hooks.

Fusion was made by osseous graft taken from spinous processes in four patients, and from iliac crest in eight patients. During the operation, approximately average 4.5 Ü (3-6 ü) blood were transfused.

All patients were managed with immobilization in a thoracolumbosacral brace for average 2.5 months (2-4 months) postoperatively.

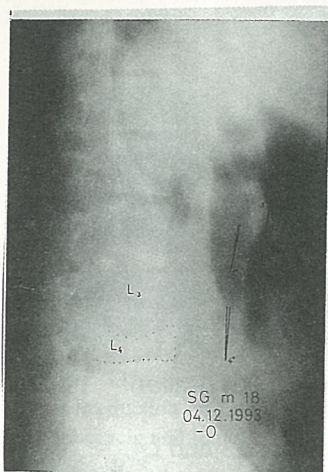
RESULTS

Our average follow-up time was 10.5 months (5-21 months). The preoperative average local fracture angle was 20° (8°-29°), the postoperative local fracture angle was 8.7° (0°-22°), and in the last follow-up the average local fracture angle was 8.9° (0°-25°).

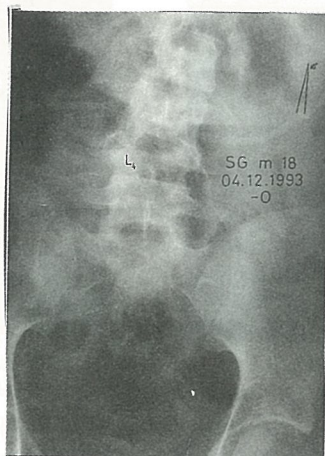
The preoperative average local kyphosis angle was 15.6° (7°-25°), postoperative average angle was 4° (0°-12°), and in the last follow-up average angle was 6.7° (0°-18°).

The preoperative average anterior vertebral body compression percentage was %41.6 (%5.5-%60.7), postoperatively it was %15.5 (%0-%40), and in the last follow up it was %16.9 (%0-%42).

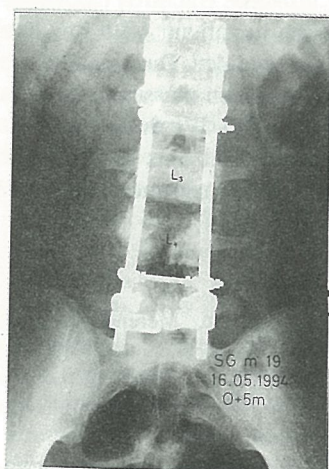
On CAT scan, vertebral canal obstruction percentage was preoperatively average %51.9 (%22.3-%100), postoperatively it was %31.3 (%12.5-%50).



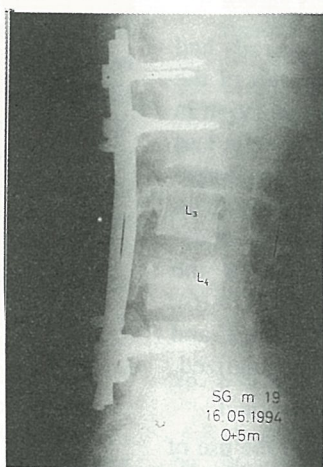
A. preop, plain LA radiograph



B. preop, plain AP radiograph



C. postop 5 th months,
plain LAT radiograph



D. postop 5 th months,
plain AP radiograph

Neurologic status of the patients was classified according to Frankel, et al.'s grade scoring system (17). One patient who was categorized as grade B was later categorized as grade D, one patient who was categorized as grade C was later categorized as grade E, two patients who were categorized as grade D were later categorized as grade E, and eight patients who were categorized as group E were later categorized as group E again.

As complication, one patient had peroperatuar laminar fracture, and the other one whom short-

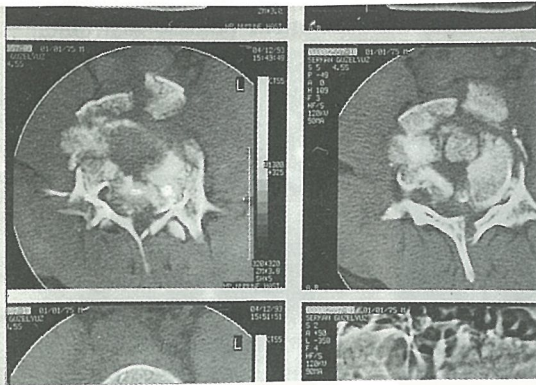
segment pedicle instrumentation was performed had upper pedicular screws were broken at 8 th and 12 th months, after the operation.

DISCUSSION

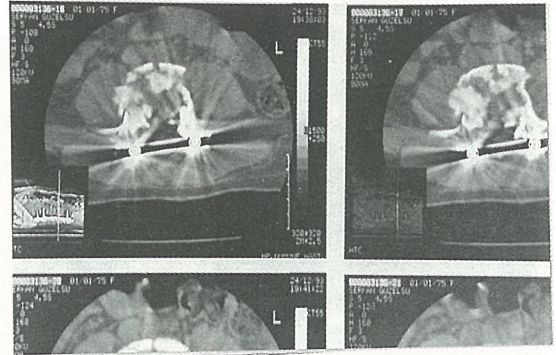
There are different ideas about the treatment of burst fractures according to the neurologic status of the patients and stability of the fractures. Burst fractures with neurologic deficits or with anterior cord compression are treated surgically by most of the authors (5, 14, 16, 19, 20, 25). However, there is disagreement about the treatment of burst fractures with potential neurologic deficits. Denis states that in his 59 cases, 31 patients (%52.6) have neurologic intact at the first examination. 29 patients were treated conservatively and 6 (%20.6) of 29 patients developed neurologic deficits later in the follow up (8). Some of the authors treat burst fractures without neurologic deficits conservatively (21, 28, 29). Denis and some of the authors believe that they must be treated surgically (8, 9, 15, 22, 25). Because, in axial loading middle column is broken. External fixation of vertebral column which made in extension can prevent flexion, extension and rotational forces but has no effect on axial loading. So, anterior and middle columns are fractured and osseous fragments obstructs the medullary

canal. If axial loading continues, risk of neurologic deficits increases (8).

Some authors like Dunn (14), Kaneda (19), and Kostuik (20) use anterior instrumentation systems in the presence of neurologic deficits that result from the fragments anteriorly compressing the cord. However, some authors believe that decompression is necessary in patients with neurologic deficits but they also think anterior surgical intervention have risks and are complicated (16, 25). Thus, some authors advised decompression by posterolateral approach (16, 25). We per-



E. preop CAT scan



F. postop CAT scan

Figure 2. Patient 2 is a 18-year-old man with burst fractures at L3 and L4, with the lower pedicle screws were supported with special laminar hooks. Posterolateral decompression was performed to this patient.

formed posterolateral decompression with CD instrumentation in two of our cases (Figure 2).

Till the beginning of 1980, Harrington rods had been used widely in the treatment of injuries of the vertebral column. But there are some complication in this system; inadequate correction peroperatively, loss of correction postoperatively, inadequate decompression of medullar canal, inadequate rotational stabilization (14, 15, 18, 20, 22, 24). Cotrel and Dubousset developed a new instrumentation method in the treatment of scoliosis at the beginning of 1980's (6). Later, it was also used in the unstable thoracic and lumbar vertebral fractures and has been popularized (1, 4, 6, 7, 12, 13, 26, 30).

McBride reported excellent results after the use of C-D instrumentation for thoracolumbar fractures, but the constructs in his study spanned at least three normal vertebrae cephalad and two caudad to the fracture site, according to traditional principles established for the use of Harrington rods (26). Devito and Tshakis, Gillet and et al. reported that short C-D instrumentation produced favorable results (26). But, McKinley et al. and McLain et al. reported that breakage of the screws and loss of correction in the short-segment instrumentation (26). We also used short-segment pedicle instrumentation in two of our cases with L2 and L3 burst fractures. We managed both of them in a thoracolumbosacral brace for 4 months postoperatively. One of them, upper pedicular screws were broken at 8 th and 12 th months after the operation. We used long segment instrumentation in the other cases.

Fractures of the low lumbar spine (L3-L5) constitute less than %4 of all spine fractures (3). Long instrumentation and fusion in patients with low lumbar burst fractures should be avoided. Back pain is probably associated with long fusion masses in the lumbar spine with loss of lordosis (3). We think that if surgical stabilization is necessary in this region fracture, short-segment pedicle screws instrumentation must be supported special laminar hooks.

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