Thoracolumbar Burst Fractures. Treatment in Extension Cast of Those with Minimal or No Neurological Deficit

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ABSTRACT: The study assessed the results of the conservative treatment of thoracolumbar burst fractures in extension cast in terms of deformity, neurological deficit, pain and work status. Thirteen patients were treated and evaluated after a mean follow up of 11 months. The results showed that the kyphus angle increased in 9 patients, remained the same in 2, and decreased in 2 patients. The mean increase in the kyphus angle for all patients was 4.2°. Neurologically, 11 remained the same while 2 worsened one Frankel's grade. There was no correlation between the kyphus angle and the neurological deficit. Twenty-one point five percent were pain free while 43% had minimal pain not requiring medication. There was no difinite correlation between kyphus angle and pain found. Seventy-five percent patients could hold a permanent job and returned to work after a mean of 3.9 months. These results compared favourably with those treated operatively.

INTRODUCTION

The treatment of thoracolumbar burst fractures remains controversial. Burst fractures are potentially, mechanically, and neurologically unstable[1,2]. If so, should it then be surgically stabilised ? Dewald[3] recommends that all burst fractures should be operatively fixed. Yet no studies have conclusively shown a clear superiority of operative over non-operative treatment.

Furthermore,as many as one half to two thirds of these fractures have no neurological deficit[4]. As such, most surgeons are reluctant to operate on them for fear of making them worse. The surgical fixation carries with the attendant risks of inadvertent injury to the cord, blood loss, post operative infection, pulmonary embolism and thrombophlebitis. There is also no guarantee that full reduction can be obtained and retained[2]. The implant itself limits spinal mobility[5] and may require the second operation to remove it. A dislocated implant necessitates a troublesome removal[6]. If not properly inserted, it may worsen the fracture[7] or overdistract the spine[5]. Recently, Woolsey[8] reported a case of aortic laceration by a metallic implant 6 weeks after anterior fusion for a burst fracture of the L2 vertebra. Besides, Kahanovitz[7] et al reported that symptomatic arthritis of the spine may arise from internal fixation.

Faced with this myriad of possible complications and a neurologically intact patient, conservative management is an attractive alternative and has been championed by Frankel[9] et al.

This study aimed to assess the results of conservative treatment in an extension cast of thoracolumbar burst fractures with no or minimal neurological deficits in terms of deformity as measured by the kyphus angle, neurological deficits, pain status and work status.

MATERIALS AND METHODS

Fourteen patients were treated from October 1988 to July 1990 solely in extension casts. This study looked at all burst fractures from T11 to L3. Diagnosis was made on plain radiographs of the lumbosacral spine using both antero-posterior and lateral views.

The plaster cast was applied at a mean of 11 days (range 8-16 days) after the accident. In the interval between admission and the application of cast, the patient was treated with postural reduction using a pillow placed below the spine at the level of the fracture.

Patients were hospitalised for a mean of 14 days (range 8-24 days). The patients were interviewed by one of the authors regarding pain and working status examined for neurological deficits and lumbosacral radiographs were taken on follow-up. The mean duration of follow-up was 11 months (range 6-17 months). One patient was subsequently lost to follow-up and excluded from the study. The average age of patients was 34.2 years (range 16-54 years).

There were 12 males and 2 females. The major cause of injury was a fall at work (9 out of 14 cases). Four others fell, one fell from a suicide attempt, one fell during an epileptic attack, and another from a tree, while the last was a motorcyclist who skidded. Another one was hit by a falling metal at work. Ten had no associated injuries; 2 had fractures of the distal radius, one was a fractured calcaneum and one was a fractured mandible with avulsion fractures of L2 and L3 transverse processes. L2 was the most common site of injury (7 patients) followed by L1 (3 patients) and T12 and L3 (2 patients). Most were Denis Type B[10] (Table 1). There were 4 Type E, 2 Type A and 1 Type D fractures.

The parameter studied were:

1. Kyphus angle, initial and on follow-up
2. Neurological status, initial and on follow-up
3. Pain status
4. Work status

Pain and work status were graded according to a scale proposed by Denis[6] et al.

TABLE 1
DISTRIBUTION OF FRACTURES BY DENIS' TYPE

Denis type	NO. of Patients	Percentage (%)
A	2	14.3
B	7	50
C	0	0
D	1	7.1
E	4	28.6

RESULTS

Mean initial kyphus angle was 16° (range 5°-34°) and on follow-up 22° (range 10°-40°). The kyphus angle increased in 9 patients;in 2 it remained unchanged and decreased in another 2. The mean increase angle for all patients was 4.2°.

Neurological status of all of patients were graded Frankel E except one patient who was graded Frankel D because he had paraesthesia over the L5-S1 region and mild weakness of his right lower limb.

As for the follow-up, 11 remained the same,and two worsened one Frankel's Grading. One had paraesthesia over his right lower leg while the other developed mild weakness of his extensor hallucis longus power grade 4+/5 which was picked up during the follow-up and unnoticed by the patient. These deficits did not worsen after 6 months of the follow-up. The patient with Frankel D improved in muscle power and sensation but not totally without residual deficit to be classified as Frankel E.

We looked at the magnitude of the kyphus angle on the follow-up and the change in neurological status to see if progressive deformity led to neurological deficits (Fig. 1). Almost all the patients remained the same neurologically whatever the kyphus angle. The patient who improved neurologically had a kyphus angle of 30° while that of those who worsened were 4° and 26°.

The pain assessed was that due to the back and not from the associated injuries and measured on Denis' pain scale[6].

Up to 64.5% (9 out of 13) of patients had minimal or no pain on the follow-up. Nobody had severe incapacitating pain.

We also looked at the magnitude of the kyphus angle with regard to pain (Fig.2). Those with large kyphus angle were as likely to be painfree as those with kyphus angle smaller than the mean for the study population. There appears to be no correlation between kyphus angle and pain at this point in follow-up.

The most of our patients had returned to work after an average of 3.9 months. According to Denis' work scale[6], 75% of patients could hold a permanent, full-time job, either sedentary or labouring with lifting restrictions. Nobody could return to heavy labour.

Three had not returned to work despite a mean follow-up period of 9.7 months (range 8-10 months). All scored P4 on the pain scale. Their average kyphus angle was 17°.

The first was a lorry driver (LST) who had also a fracture of the distal left radius. He complained of weakness of his left hand and did not want to return to work as yet.

The other two were construction workers. One had residual neurological deficit and was apprehensive about straining his back but had intention of returning to work later. The other had not returned to work because of backache. Two others were not assessed on the work scale. One was an epileptic who was not working prior to the accident. The other had started normal duties but changed job, the nature of which could not be determined.

Looking at the magnitude of the kyphus angle on the follow-up and the work status of patients (Fig. 3) to determine if deformity impaired work status, we found that patients with a big kyphus angle could hold a permanent job as well as those with small kyphus angle. There appeared to be no correlation between the kyphus angle and the work status. There were as many patients with the above average kyphus angle who could return to work as there were those who could not.

DISCUSSION

Most studies have treated all burst fractures alike and included patients of different neurological status. Only Denis[6] et al had put forward a study treating burst fractures with no neurological deficits as a special group by itself. In Denis' study[6], 13 were treated operatively and 29 non-operatively. Their study will form the basis of comparison with our study.

One of the main objections to conservative treatment is the possibility of progressive deformity. Our nine patients showed the increased kyphus angle. In 2 patients, the kyphus

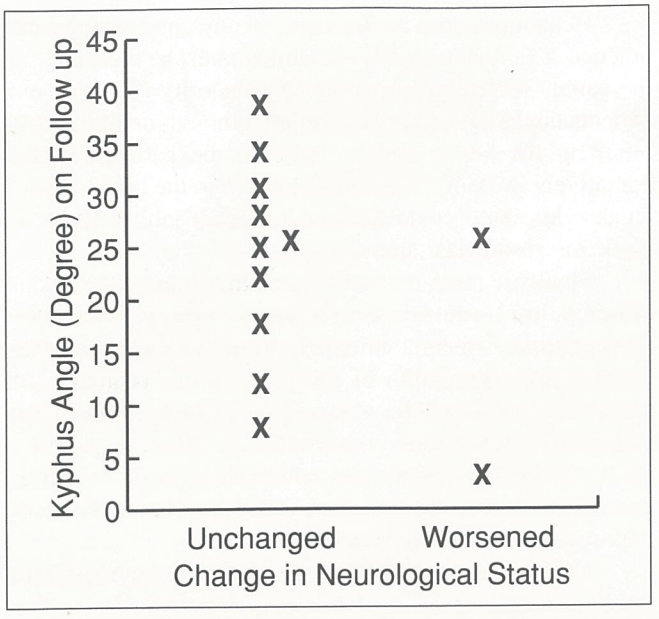

Figure 1 : Distribution of kyphus angle against change in neurological status

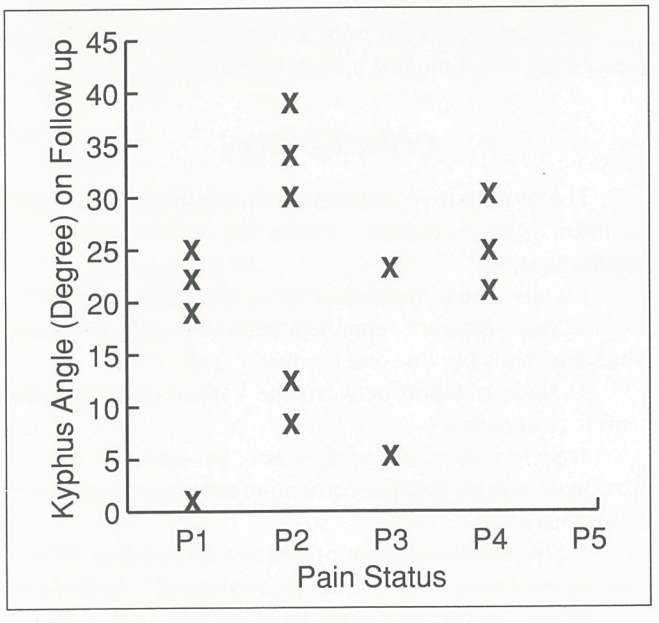

Figure 2 : Distribution of patients kyphus angle on follow up against pain status

angle remained the same and in 2 others it decreased. The mean increase for the while group was 4.2°. Reid[11] et al reported a change of only 4.6° in his study. These findings may be explained by bony bridges seen in the healing fracture on the follow-up (Fig.4) which may form a natural stabilisation of the fracture. The operative treatment can reduce the kyphus angle to almost normal provided the internal fixation is not removed. Myllynen[12] et al found that the initially well reduced the anterior height and the kyphus angle often had returned to values close to that seen on admission after the

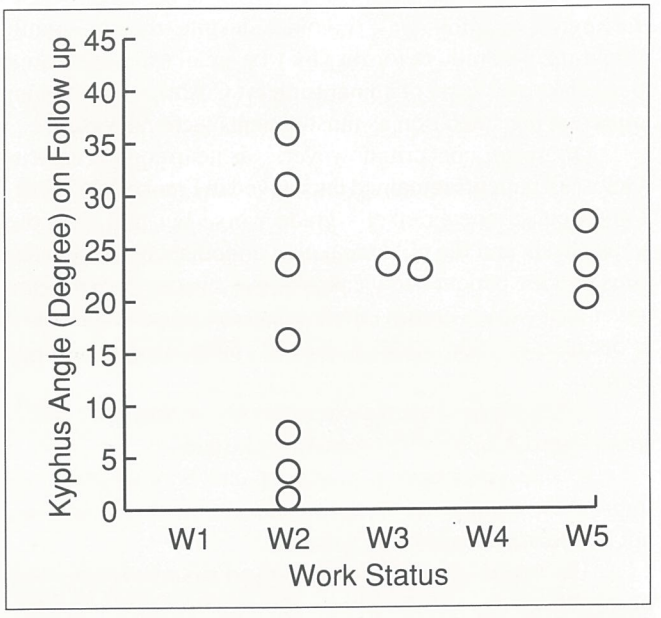

Figure 3 : Distribution of patients kyphus angle on follow up against work status

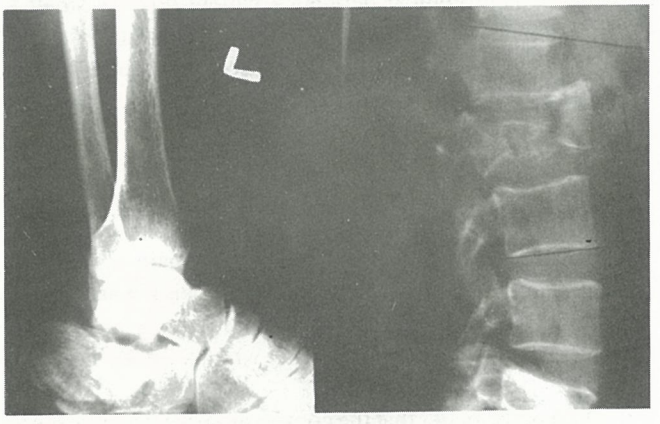

Figure 4 A : Radiographs of a patient (NYK) with a severely comminuted fracture Denis' Type E of the L2 vertebra and associated fracture calcaneum.

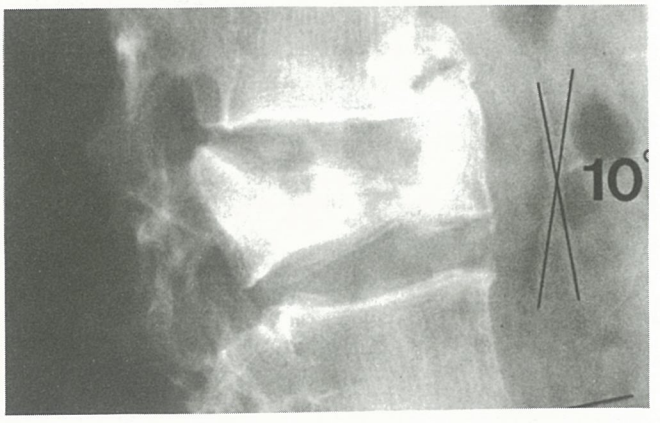

Figure 4 B : Follow-up radiograph of the same patient showed bony buttress forming between the fracture and the vertebra above. This may act as a natural stabilisation for the fracture.

Harrington fixation was removed despite the 29 month follow-up. The mild deformity may be small price compared to the risks and costs of spinal surgery. Cosmesis was not an important consideration as most patients were labourers.

Of greater concern; however, was neurological deficit. Almost all patients remained unchanged in Frankel's grading. Two because one Frankel's grade worse but had only the paraesthesia and the mild weakness unnoticed by the patient himself. One patient had weakness and sensory deficit of his lower limb which improved but could not be graded Frankel E because of mild residual deficits. This brought up two points:-

1. The Frankel's scale was not sensitive enough to detect some improvement in the neurological status.

2. The conservative treatment can be a result in an improvement in the neurological status clinically which may not be recorded on Frankel's scale.

The improvement with the conservative treatment may be explained by recent reports that retropulsed fragments could be resorbed with time[13,14].

There appeared to be no correlation between the deformity and the neurological deficit. A patient with as small a kyphus angle as 4° became worse on the follow-up.

It has been reported that the conservative treatment led to the incapacitating pain[15]. McEvoy[16] et al; however, found that the back pain was common in patients treated surgically. Denis' study[6] showed more of the patients treated operatively were painfree; 61.5% had minimal pain not requiring medication and the rest had moderate pain requiring occasional medication but not interrupting work. Our pain score compared favourably with 3 patients (21.5%) being painfree and 5 patients (43%) with minimal pain not requiring medication making a total of 64.5% of patients who had minimal or no pain.

Part of the belief that the conservative treatment leads to more pain arises from the assumption that the progressive deformity will lead to more pain.

Indeed Soreff[17] et al found a positive correlation between the kyphus angle and the pain after the follow-up of 8 years. Weinstein[18] et al; however, has shown recently that the kyphosis was not related to the pain in non-operatively treated patients.

Our study did not show the correlation between the kyphus angle and the pain at this period of follow-up. A longer follow-up will be needed to clarify the situation.

Rehabilitation is the keystone of any good orthopaedic practice. The final test of any treatment must be the ability of the patient to go back to work. The majority (75%) of our patients could hold a permanent job although nobody could return to the heavy labour. None of the patients treated operatively in Denis' series could return to the heavy labour either while 84% could hold a permanent job. In terms of work, our result was satisfactory.

Finally,it must be pointed out that return to work is affected by a multitude of factors, among which are compensation[19], mental attitude to work, associated injuries and patient's perception of the severity of his injury. As anyone can see, it will be a herculean task to determine what proportion each factor contributed towards the patient's absence from work. Hence,any comment about the effectiveness of treatment based on work status necessarily be made with these confounding factors in mind.

One drawback of the conservative treatment has been the long period of bed rest required. The surgical fixation usually requires some forms of orthosis, e.g.light plaster jacket for 4 months after surgery unless the patient is very cooperative and intelligent[2,16].

Our patients stayed only 2 weeks in hospital with an average lapse of 4 months before returning to work.

CONCLUSION

The conservative treatment of the thoracolumbar burst fractures in the extension cast on the follow-up over 10 months showed:

1. Only a mild increase in the kyphus angle of 4.2°

2. Most patients remained neurologically the same while 2 patients became one Frankel's grade worse.

3. No correlation between the kyphus angle and the neurological deficit.

4. Sixty-four point five percent of patients had minimal or no pain with no definite correlation between the pain and the kyphus angle.

5. Seventy-five percent of patients could hold a permanent job, returning to work after an average of 3.9 months.

Hence, the thoracolumbar burst fractures with minimal or no neurological deficits can be treated in the extension cast with favourable results in terms of the deformity, neurological pain and work status.

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