Paraplegia **23** (1985) 207–224

Fractures of the Thoraco-Lumbar Spine

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Summary

A personal prospective study of 98 consecutive patients presenting with neurological impairment and fractures or dislocations between the 9th thoracic and 2nd lumbar vertebrae bodies. Fifty-three patients underwent Harrington instrumentation, and 45 patients were treated recumbently. Neurological improvement was much better following Harrington rods in the complete paraplegia group but there was no difference in neurological recovery between the two groups in those with incomplete paraplegia. Forty-two patients who had been stabilised with Harrington rods underwent post-operative myelography or tomography to assess the adequacy of spinal decompression. The best results were in patients with adequate neural canal decompression. In 21 cases decompression had not been adequate, usually due to a stereotyped pattern in which the postero-superior aspect of the fractured body remained in the neural canal. All 21 underwent anterior decompression at an average of five months post injury. All the incomplete paraplegics (nine patients) regained the ability to walk, three of the 12 complete paraplegics improved and regained the ability to walk with bilateral ankle-foot orthoses. Neurological improvement was dependent upon the adequacy of spinal cord decompression and not upon Harrington rods. per se. *Harrington rods alone were not adequate to decompress the spinal canal in 50 per cent of cases. The best results after anterior decompression occurred where neural compression was caused by a minimally displaced wedge fracture distal to T12.*
Key words: *Thoraco-Lumbar fractures; Harrington rods; Anterior decompression.*

Introduction

The incidence of traumatic spinal cord injury in the United States varies between 12·4 and 53·4 cases per million population per year (Bracken *et al.*, 1981; Kraus *et al.*, 1975; Krause *et al.*, 1980; Kurtze, 1975). Ninety per cent of paraplegics injured between the ages of 20 and 24 will survive at least 10 years after their injury (Ducker *et al.*, 1979; Mesard *et al.*, 1978). Accurate epidemiological information is not available on the incidence of spinal cord injury in Saudi

Arabia, but we assume the incidence of traumatic paraplegia is at least comparable to the United States figures.

Laminectomy was first described in 1762, and since that time the controversy continues as to the place for surgical intervention in fractures of the thoracolumbar spine (Bampfield, 1845; Bedbrook, 1969; Lewis and McKibbon, 1974; Feuer, 1976; Freeman, 1958; Hardy, 1977; Holdsworth, 1963; Jackson, 1975; Kaufer and Hayes, 1966).

Opinion has tended to polarize around extremes: surgical versus non-surgical treatment. (Beatson, 1963; Bedbrook, 1969; Bedbrook, 1975; Bedbrook, 1979; Bedbrook, 1979; Bedbrook, 1980; Luttmann, 1949; Guttmann, 1976; Nicoll, 1949).

Laminectomy alone still has advocates (Freeman, 1958), although experience with this approach over the years has been disappointing (Morgan *et al.*, 1971).

The introduction of Harrington rods led to increasing emphasis on accurate anatomical reduction to accelerate functional recovery and hopefully improve neurological recovery (Dickson *et al.*, 1978). Although it is now accepted that stabilisation by Harrington rods does decrease both the length and cost of hospitalisation (Convery *et al.*, 1978; Flesch *et al.*, 1977; Jacobs *et al.*, 1980; Savastano *et al.*, 1979; Schmidek *et al.*, 1977; Yosipovitch *et al.*, 1977), it has not yet been shown that Harrington rods per se will improve neurological recovery (Dickson *et al.*, 1978; Hannon, 1976). Similarly, it has not yet been proven that Harrington rods by diminishing spinal motion in an unstable fracture have actually prevented further damage to the cord or nerve roots (Roberts and Curtiss, 1970), although experimentally stabilisation may improve neurological recovery (Ducker *et al.*, 1978).

The role of decompression combined with stabilisation is still controversial (Dolan *et al.*, 1980; Karulas and Bedbrook, 1927; Ducker and Byrnes, 1979; Freeman, 1958; Meyer, 1977). In many cases Harrington instrumentation can produce an anatomical restoration of the vertebral column, (Flesch *et al.*, 1977; Roy-Camille *et al.*, 1976; Yosipovitch *et al.*, 1977) but does it adequately decompress the spinal canal? Does decompression alter the prognosis for neurological recovery? If so, should Harrington instrumentation be combined with decompression, whether from the anterior, the anterolateral, the posterolateral or the posterior approach? (Schmidek *et al.*, 1977; Larson *et al.*, 1976; Riska and Myllynen, 1981; Bohlman and Eismont, 1981; Dolan *et al.*, 1980; Paul *et al.*, 1977; Wang *et al.*, 1979; Young *et al.*, 1981). The purpose of this paper is to report the gradual evolution of a philosophy as it applies to spinal injuries at the thoracolumbar junction.

Materials and methods

In June 1979, a Spinal Cord Injuries Unit was established at the Riyadh Central Hospital in Riyadh, Saudi Arabia. During the 3-year period June 1979 to June 1982, 395 patients with fractures of the axial skeleton were treated personally by the authors. One hundred and two consecutive patients presented with fractures between the 9th thoracic and 2nd lumbar vertebral bodies and had suffered severe neurological impairment. Four patients are excluded from

this series, two who died prior to surgery and two who had suffered gunshot injuries as the aetiology of their fractures. All patients were treated personally and followed prospectively. The average follow-up is 19 months following the most recent surgery with a range of from 12 to 48 months from the most recent surgery.

All patients were classified neurologically, utilising Frankels' Classification (Frankel *et al.*, 1969):

A. Complete motor and sensory loss below the fracture level.
B. Some preservation of sensation below the level of fracture but no motor function.
C. Some motor power below fracture level but of no practical use to the patient.
D. Motor power below the level of fracture that was useful to the patient (the minimum for inclusion in our series in Class D was the ability to walk utilising no more than ankle-foot orthoses).
E. Normal motor and sensory function, including normal sphincter function distal to the fracture.

Therefore, CD indicated a patient who upon presentation had no useful motor function distal to his level of injury. At final follow-up he has useful motor control distal to his injury level and is able to walk with at most ankle-foot orthoses. 'Improvement' meant neurological improvement by at least one grade on the above scale.

The fracture patterns were classified as either: 'burst' (comprising burst and anterior wedge compression fractures and involving primarily the anterior column only) or 'displaced' (either dislocation or a fracture dislocation and involving anterior and posterior columns). The classification was a simplification of that of Holdsworth (Holdsworth, 1954; Holdsworth, 1970) and similar to that of Kelly and Whitesides (1968). As a practical point all burst or anterior column injury fractures had vertebral displacement of one body on another of less than 30 per cent while displaced injuries had variable degrees of displacement dependent often upon the posture of the patient when performing the radiographs.

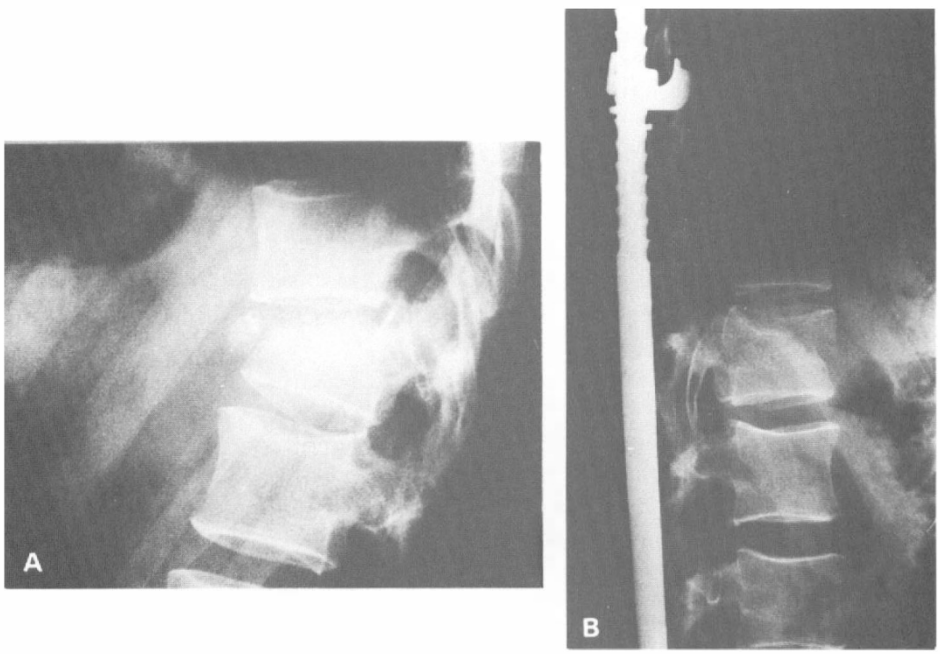
Forty-five patients were treated without surgery because Harrington rods were not initially available. They were treated in a specialized Spinal Cord Injuries Unit with recumbency for an average of 10 weeks and then begun on a period of gradual mobilization with spinal supports.

With the introduction of Harrington rods in early 1980, 53 patients underwent Harrington rod stabilisation at an average of 18 days post injury. The criteria for Harrington rodding versus recumbent treatment was dependent solely on the availability of the Harrington rods. One author (RML) had been using Harrington rods extensively for the treatment of scoliosis and the results of Harrington rodding were consistent throughout the series of patients thus treated.

During this same period of time, the authors had been having increasing experience with anterior spinal decompressions, primarily for tuberculosis. We had been impressed by the rapidity of recovery in patients with spinal tuberculosis following adequate anterior decompression. We also at this period had a clinical impression that the more adequate the spinal canal decompression with

Harrington rods, the better the long-term prognosis in patients with traumatic injuries. We therefore began performing lateral tomography and myelography on patients who had little or no neurological recovery following Harrington rodding. This was initially performed at an average of 5 months post-surgery (range 3 to 9.1 months) but later post-operative myelography was routine in all cases. Forty-two patients underwent post-Harrington myelography and lateral tomography. In this group, 21 cases underwent later anterior decompression (average 5.1 months post-Harrington rodding; range 3 to 9.1 months). Figures 1, 2, 3 and 4 illustrate typical examples.

The three groups were similar but not identical (Table 1) the 'anterior decompression' group was slightly younger (31 years) than the Harrington rod group (39.5 years). Sexual distribution was almost identical. There were more 'burst' fractures in the 'no-surgery' and 'anterior decompression' group, and more 'displaced fractures' in the Harrington rod group. There were more proximal injuries in the no-surgery group and fewer with injuries above T11 in the anterior decompression group. Delay to treatment was 5 days on the average in the no-surgery group, 18 days for the Harrington rod group, and 153 days for the anterior decompression group. The delay to treatment was primarily related to the difficulties in transporting the severely injured patient to the Spinal Cord Injuries unit.



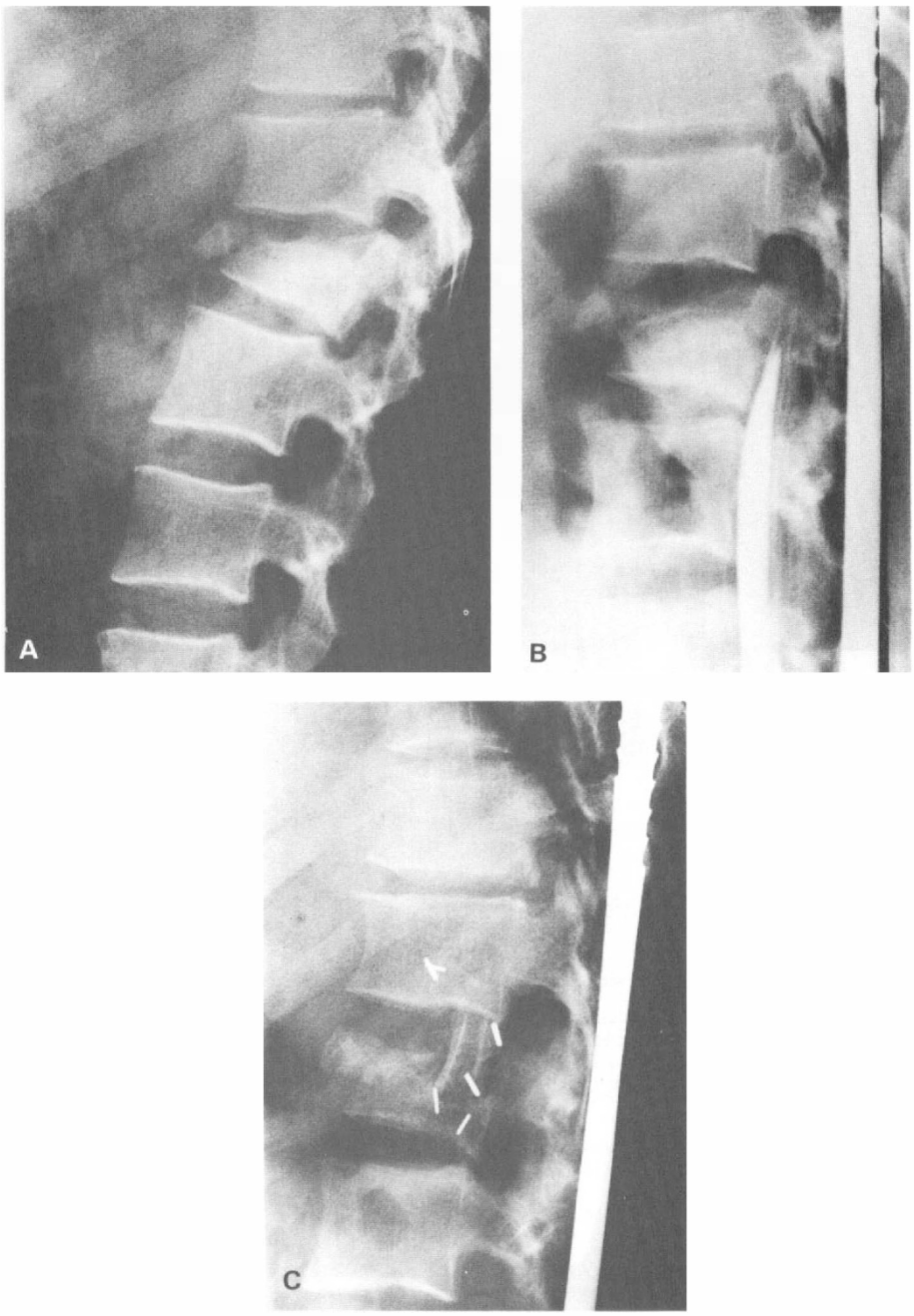


Figure 2. Thirty-one-year-old male involved in a motor vehicle accident 2 months prior to presentation. Suffered an incomplete paraplegia with preservation of non-useful motor distal to the L1 fracture. (A) Wedge shaped fracture with large posterior superior fragment of the body of L1 displaced posteriorly into the neural canal. (B) Prone myelogram performed one week after Harrington rod fixation without laminectomy. Harrington rods were applied at 9 weeks post injury. The posterior superior aspect of the body of L1 is still encroaching upon the vertebral canal. (C) Same patient one week following anterior decompression and strut grafting. The posterior superior aspect of the body of L1 has been removed through a thoracotomy approach. Patient recovered to normal neurological status at seven weeks post anterior decompression with normal bowel and bladder control, normal motor and normal sensation distal to L1.

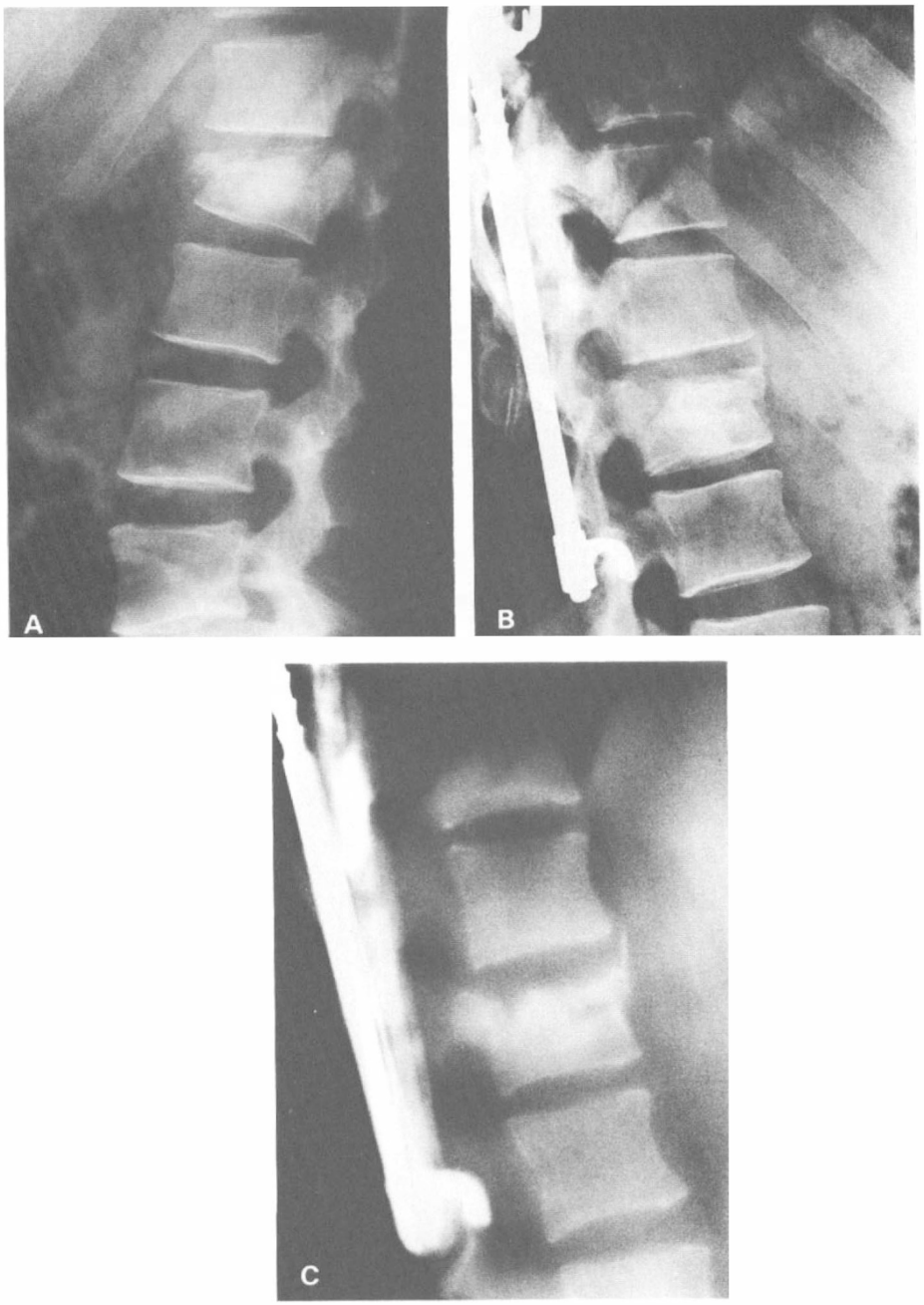


Figure 3(A) Thirty-one-year-old male involved in a motor vehicle accident, with an incomplete paraplegia distal to the L1 level. On presentation he was Frankel classification C with non-useful motor and no bowel or bladder control distal to L1. (B) Harrington rod fixation was performed at 2 weeks post-injury and on this X-ray there was apparent excellent reduction of the posterior superior body of L1. (C) The same patient with tomography, showing the obvious large bone fragment behind the body of L1 impinging on the neural canal. Anterior decompression at 5 months post-injury resulted in recovery of useful motor power down to and including L4 nerve roots bilaterally, but unfortunately no recovery of bowel or bladder control. The distal Harrington rod hooks were placed under the next uninvolved body as opposed to our usual practice of placing them two uninvolved bodies distally, but no untoward events occurred. At one year following-up, he is solidly united.

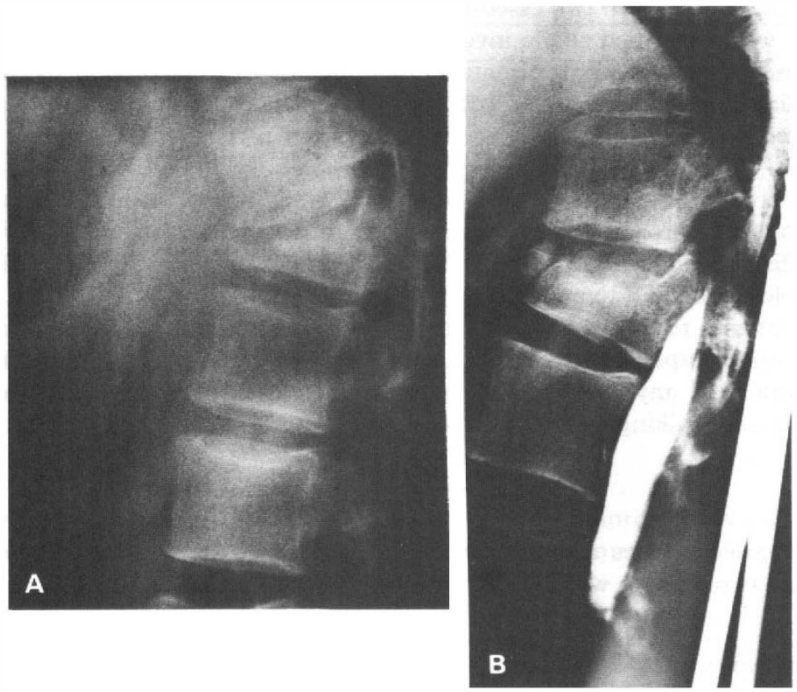


Figure 4. Forty-five-year-old male, industrial injury, suffering a fracture of the body of T12. Presented as a complete paraplegic without sparing. (A) Shows the initial X-ray appearance. (B). Shows the appearance following Harrington rod fixation without laminectomy. Prone myelography shows persistence of the posterior superior aspect of the body of T12 with obliteration of the neural canal. Anterior decompression at 3 months was performed.

Table 1 Age and sex of patients, level and type of vertebral injury, degree of neurological disturbances, and treatment used

	No surgery	Harrington rods	Anterior decompression
Age (Years)	32·0	39·5	31·0
(Range)	(17–55)	(15–59)	(20–50)
Sex	43/M	51/M	20/M
	2/F	2/F	1/F
Fracture pattern			
Burst	28	22	14
Displaced	17	31	7
Level of injury			
T9-11	7	2	1
T11/12-1 1	31	41	17
L1/2-L 2	7	10	3
Delay to treatment	5 days	18 days	153 days
Paraplegia			
Complete	20	31	12
Incomplete	25	22	9

Surgical technique

Surgical technique utilized for the placement of Harrington rods was a standard straight posterior approach with three above and three below fixation

in all but two cases. In two cases three above and two below, rodding was used. Fusion was performed at the involved levels only. Distraction rods were used in all cases. No patient either prior to or in conjunction with Harrington instrumentation underwent laminectomy. Intra-operative plain X-rays were taken to assess the adequacy of reduction, but intra-operative myelography was not performed.

Anterior decompressions were performed on 21 cases through a standard thoracotomy approach, or through a subdiaphragmatic retroperitoneal approach. The site and side of approach was determined by the major block identified by myelography and tomography.

All patients following surgery were mobilised within three to five days of surgery and no patient was treated with an external body cast, body jacket or body brace of any form. All patients were allowed full sitting, transfers, standing and walking as soon as able.

Results

There were 94 males and four females. Two females underwent Harrington rods and two females were in the non-surgical group.

Level of injury

All patients with injuries proximal to T11 presented as complete paraplegics and no patient showed any improvement (Table 2). Fifty-four per cent

Table 2. Level of injury versus clinical improvement

	Level			
Paraplegia	T9–11	T11/12–L1	L1/2–L2	Totals
Complete	0% (0/9)	26% (10/39)	33% (1/3)	22% (11/51)
Incomplete	0/0	76% (25/33)	79% (11/14)	77% (36/47)
Total	0% (0/9)	49% (35/72)	71% (12/17)	48% (47/98)

Improved by at least one grade on neurological assessment.

of patients with injuries between T11 and L1 presented as complete paraplegics and overall 49 per cent of patients injured at this level showed some improvement. Between L1 and L2 only 18 per cent of patients presented with complete paraplegia and overall 71 per cent of this group improved. Twenty-two per cent of the complete paraplegics and 77 per cent of the incomplete paraplegics improved.

Fracture type

The displaced injuries showed the worse prognosis (Table 3). Thirty-seven of the 48 displaced fractures (77%) presented with complete paraplegia, and only 29 per cent showed any significant improvement. In the burst fractures only

Table 3 Fracture type, versus percentage clinical improvement

	Fracture pattern		
Paraplegia	Displaced	Burst	Totals
Complete	14% (5/37)	43% (6/14)	22% (11/51)
Incomplete	82% (9/11)	73% (27/36)	77% (36/47)
Totals	29% (14/48)	66% (33/50)	48% (47/98)

%Improvement—number of patients improved by at least one grade on neurological assessment.

28 per cent (14/50) presented with complete paraplegia and 66 per cent of these patients improved.

Age vs. results

The younger patients had the lowest overall per cent improvement (33%) but there was little significant difference in per cent improvement versus age (Table 4).

Table 4 Age of patient, versus percentage clinical improvement

	Age (years)				
Paraplegia	<20	21–30	31–40	41–60	Totals
Complete	0% (0/4)	21% (4/19)	31% (4/13)	20% (3/15)	22% (11/51)
Incomplete	60% (3/5)	78% (14/18)	75% (12/16)	88% (7/8)	77% (36/47)
Totals	33% (3/9)	49% (18/37)	55% (16/29)	43% (10/23)	48% (47/98)

Improvement by at least one grade on neurological testing.

Results of treatment

Harrington rods alone made little difference to the overall rate of improvement in the incomplete paraplegic (Table 5). Seventy-six per cent of the recumbently treated group improved to some extent, versus 77 per cent of the

Table 5 Result of treatment, versus percentage clinical improvement

	Treatment		
Paraplegia	Recumbent	Harrington Rods	Anterior decompressions
Complete	5% (1/20)	32% (10/31)	33% (4/12)
Incomplete	76% (19/25)	77% (17/22)	88% (8/9)
Totals	44% (20/45)	51% (27/53)	57% (12/21)

Improvement—% of patients who improved by at least one neurological grade.

Harrington rod group. The improvement was most noticed in the complete paraplegic where 32 per cent of the Harrington rod group showed some improvement, versus only 5 per cent for the recumbently treated group. Improvement was almost always related to root recovery. Anterior decompressions were performed at an average of 5 months following injury and were only performed on those patients who had failed to improve following Harrington rodding. In spite of these limitations 33% of complete and 88 per cent of incomplete paraplegics improved following adequate late decompression.

Adequacy of reduction

Adequate reduction was defined as a free unimpeded flow of myelographic dye past the initial area of fracture or dislocation, and a tomographic picture showing no evidence of bone encroachment in the spinal canal.

CT scanning was utilised in five cases but the presence of Harrington rods made it difficult to adequately evaluate the spinal canal and contents.

Patients who had 'adequate decompression' following Harrington instrumentation had the most significant improvement in neurological function with overall 81 per cent improving (Table 6). One hundred per cent of the incomplete paraplegics in this group improved. Those with inadequate decompression following Harrington instrumentation overall only had a 29 per cent improvement, and only 22 per cent of the incomplete paraplegics improved. In the group with inadequate decompressions' when anterior decompressions were performed a further 57 per cent improved. It is the adequacy of decompression that is important as opposed to the actual stabilisation afforded by the Harrington instrumentation.

Forty-two patients achieved adequate decompressions (21 following Harrington rods plus anterior decompression, and 21 following Harrington rodding alone).

Table 6 Adequacy of reduction, versus percentage of clinical improvement

	After Harrington rods			
Paraplegia	Adequate decompression	Inadequate decompression	Anterior decompression	Total adequate decompression (A.D. & ADQ. HR)
Complete	55% (5/9)	33% (4/12)	33% (4/12)	43% (9/21)
Incomplete	100% (12/12)	22% (2/9)	88% (8/9)	95% (20/21)
Totals	81% (17/21)	29% (6/21)	57% (12/21)	69% (29/42)

Table 7 Failure to improve following adequate decompression

Paraplegia	Patients	Aetiology of failure
Complete	12	9 Displacement > 30%
		1 Inadequate anterior decompression
		1 Vascular ascending
		1 Unknown
Incomplete	1	10 Months since injury

Of this group 95 per cent of the incompletes and 43 per cent of the complete paraplegics improved (overall 69 per cent improvement).

Twelve of 21 complete paraplegics did not improve following adequate decompression (Table 7). Nine of these initially had displacement of greater than 30 per cent of one vertebra on another. One patient had an inadequate anterior decompression, one patient had a fracture at T12 with a neurological level of T4 on presentation suggesting a probable vascular aetiology, and the failure to improve of one patient is unknown. Among the incomplete paraplegics only one patient failed to improve and he was operated on at 10 months post-injury. Patients who did best following anterior decompression were those who presented with burst fractures distal to T11/12 where the Harrington rods had restored alignment but had not adequately reduced fracture fragments lying in the spinal canal. In each case where late recovery or improvement occurred, the obstruction was caused by the postero-superior aspect of the body (usually at L1) retropulsed into the spinal canal. This postero-superior aspect of the body was not adequately decompressed by the Harrington rods in 50 per cent of our cases.

Complications

There were two deaths in this series, both in the non-operative group previously mentioned. In the operative group, two Harrington hooks became dislodged distally but in both cases, only one hook disengaged and no change in overall alignment resulted. There was one deep infection in the Harrington rod group occurring 3 years post-operatively, at which time a decubitus ulcer communicated with the lowest hook. Removal of the Harrington rod system plus local wound care resulted in complete clearance of the infection.

Decubiti occurred in eight cases in the postural reduction group and in two cases following Harrington rod fixation. Deep vein thrombosis, pulmonary emboli and urinary tract infections were approximately equal in both groups. Anterior thoracotomies were relatively complication-free.

No patient worsened following thoracotomy, and no patient developed respiratory complications, deep infection or further decubiti. The average operating time for the Harrington rods was 1 h 30 mins; the average operating time for the anterior decompressions was two hours and forty minutes.

Discussion

In discussing fractures of the thorocolumbar spine, it is obvious that fracture pattern, level of injury, severity of neurological injury and adequacy of reduction are all extremely important in determining prognosis. The age of the patient at the time of presentation has little significant effect on neurological recovery. Harrington rods did lead to increased improvement in the complete paraplegic but had little effect on the incomplete.

Both stability and decompression must be achieved in the spinal injured patient. We feel stabilisation is best achieved with Harrington instrumentation. Postural

reduction is a difficult technique to master (Frankel *et al.*, 1969) and requires a well-trained and highly motivated staff. Harrington rod stabilisation has made nursing care easier and has accelerated functional recovery. In a spinal injuries unit with a chronic shortage of beds this has been of enormous benefit. The incidence of complications has been minimal and has certainly been acceptable in terms of rapidity of recovery, maintenance of alignment and the rapid return to the community of most of our patients. However in half of our cases Harrington instrumentation did not adequately decompress the neural canal. Fifteen of these patients exhibited a stereotyped pattern of injury with persistent neural compression by a wedge-shaped segment of the fractured body remaining in the neural canal. Adequacy of reduction is vitally important for neurological recovery with 69 per cent of patients improving following adequate decompression versus only 29 per cent improving following inadequate decompression. This is most marked in the incomplete paraplegics where improvement can almost be guaranteed after adequate reduction. Adequate decompression performed late still yielded excellent results. Although our number of cases is small we feel that the difference in improvement between the inadequately decompressed group and the adequately decompressed group is significant. Our results are in accord with those of Riska and Myllynen who in 1981 described 17 cases of persistent bony fragments remaining after internal fixation. They performed antero-lateral decompression to remove these fragments with generally excellent results.

We feel that the improvement in neurological recovery following Harrington rodding is not due to the Harrington rods *per se* but rather to the adequacy of the decompression of the spinal canal. The contention that the Harrington rods by decreasing further motion at the fracture level may protect underlying cord or root is probably not as significant a factor as the mechanical decompression effected in many cases by the Harrington rods themselves.

In other skeletal fractures the degree of violence producing the injury can often be inferred by the degree of displacement, the comminution, the amount of soft tissue damage, etc. All of these factors have a bearing on the prognosis for fracture healing and none are surgically remediable. Perhaps the same criteria hold true for fractures of the spine and more importantly for possible neurological recovery. In our experience, the level of injury, the type of injury, the degree of displacement, the degree of neurological impairment at presentation, and finally the adequacy of neural decompression, all seem to significantly affect the prognosis. The only factor in prognosis that can be surgically altered is the adequacy of decompression. Holdsworth, discussing wedge fractures in his classic article of 1953 (Holdsworth and Hardy, 1953), said that 'the displacement was essentially one of angulation; the spinal canal was not seriously deformed and paraplegia was rare', but he did add 'it is theoretically possible in such fractures for fragments of the vertebral body to be driven back into the spinal canal with severe damage to the cord though we have not seen such a case'.

In 21 of our cases anatomical reduction of the spinal canal did not occur following Harrington rod fixation alone, and in 15 of these the problem was retropulsed bone fragments following a burst fracture.

Adequate reductions will not guarantee neurological recovery in all cases. No

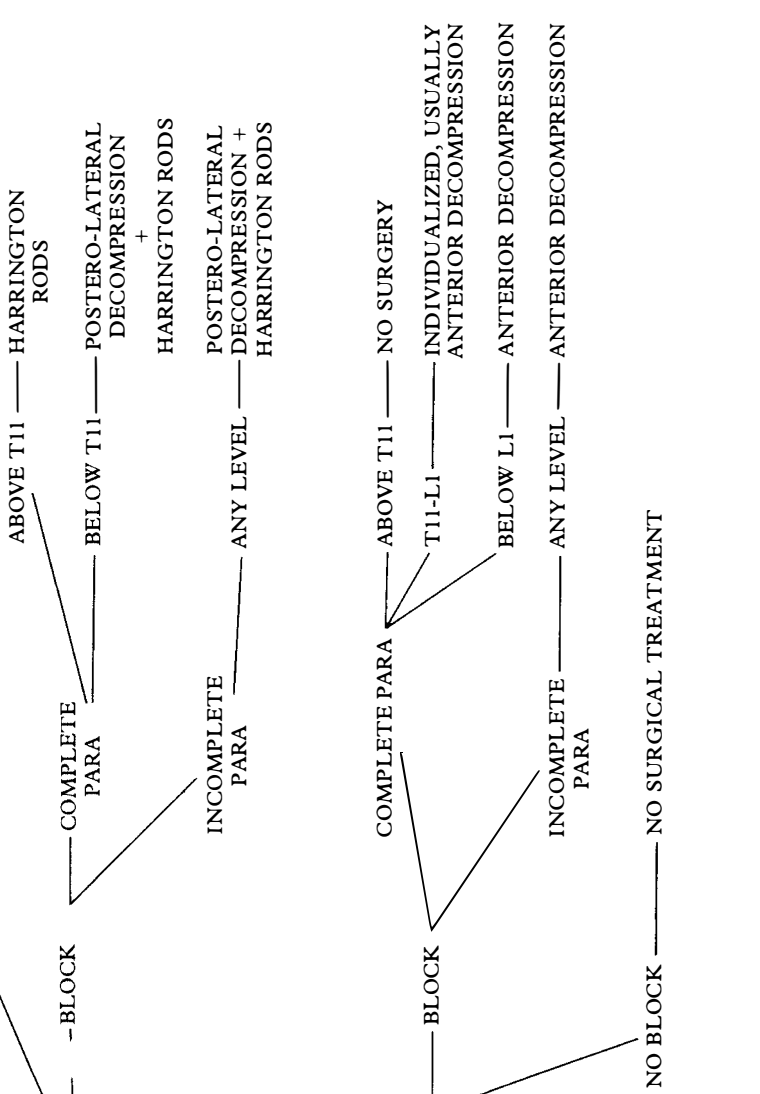


Figure 5. Proposed management for thoraco-lumbar spinal injuries.

patient with an initial fracture displacement of greater than 30 per cent improved following either Harrington rodding or anterior decompression.

Complete paraplegics above T11 did not recover regardless of treatment. Improvement generally connoted root escape and root recovery, but one patient with complete, and four patients with incomplete lesions did recover bowel and bladder control following adequate decompression. Whether these patients actually did experience limited cord recovery or whether there were anatomical variations of the conus in relation to the fracture we are uncertain.

The prognosis is significantly better if the lesion is distal, is minimally displaced, is associated with an incomplete neurological picture and is adequately decompressed. Only the last of these prognostic indicators can be surgically altered.

The proposed management for thoraco-lumbar spinal injuries are set out in Figure 5.

Conclusion

In the patient presenting with a fracture or fracture dislocation of the thoracolumbar spine, prognosis is dependent upon: the type of fracture, the level of the fracture, the degree of initial displacement, and the degree of neurological impairment on presentation. Although the initial injury cannot be altered, the prognosis can be improved in specific cases by adequate surgical decompression.

Harrington instrumentation has not adequately decompressed the neural canal in 50 per cent of our patients with a stable burst type fracture and retropulsion of the fractured body. We have used post-operative myelography and tomography to assess the adequacy of decompression but would recommend intra-operative myelography if available. In the acute case we are now performing routine postero-lateral decompressions plus Harrington rod stabilisation on all incomplete lesions and on all complete lesions distal to T11. Above T11 in the complete paraplegic we perform Harrington rod stabilisation only. If there is 30 per cent or more displacement in the complete paraplegic distal to T11 we still perform postero-lateral decompression prior to Harrington rodding, but our results at this level have been much less gratifying.

In patients presenting late, where spinal stability has already occurred, we recommend no surgical treatment if the patient presents as a complete paraplegic with a lesion above T11. In all incomplete lesions regardless of level we perform amypaque myelography and computer assisted tomography. If a discrete mechanical block is identified we proceed with anterior decompression.

In patients presenting late with a lesion distal to L1 we decompress all obstructive lesions. Our preferred method of decompression is via the retroperitoneal approach.

Between T11 and L1 is a difficult area to categorise and each case must be considered on an individual basis. In a patient presenting with a complete paraplegia of greater than 1 year duration at T12 with displacement of 30 per cent we would probably not recommend anterior decompression. Conversely a patient with a simple burst type stable injury at T12-L1 with minimal displacement

even though a complete paraplegic we would undoubtedly proceed with an anterior decompression.

Good prognostic indicators are distal lesions, incomplete paraplegia, and minimally displaced fractures, soon after injury. Poor prognostic indicators are, the converse: proximal lesions, greater than 30 per cent displacement, complete paraplegia, and a prolonged delay from injury.

Decompression is vital to neurological recovery and in our hands Harrington rods have been inadequate in 50 per cent of cases to decompress the neural canal.

Acknowledgement

The authors would like to thank Nancy Napuunoa for her generous contribution in the typing and revision of this manuscript.

Résumé

Une étude prospective personnelle de 98 malades consécutifs qui se présentaient avec affaiblissement neurologique et avec des fractures ou luxations entre le 9ème corps vertébral thoracique et le 2ème lombaire. Cinquante-trois malades ont subi l'instrumentation Harrington, et on a traité 45 malades en position couchée. L'amélioration neurologique était beaucoup meilleure suivant le traitement avec des bâtons Harrington dans le groupe qui souffrait de paraplégie complète mais il n'y avait pas de différence dans le rétablissement neurologique entre les deux groupes chez ceux qui souffraient de paraplégie incomplète. Quarante-deux malades qu'on avait stabilisés au moyen de bâtons Harrington ont subi une myelographie soit une tomographie post-opérative pour évaluer la suffisance de la décompression vertébrale. Les meilleurs résultats se produisaient chez les malades qui avaient une décompression suffisante du canal neural. Dans 21 cas la décompression n'avait pas été suffisante, généralement à cause d'un schème-stéréotype selon lequel l'aspect postéro-supérieur du corps fracturé restait dans le canal neural. Tous les 21 ont subi la décompression antérieure à une moyenne de cinq mois après la blessure. Tous les paraplégiques incomplets (neuf malades) ont regagné la faculté de marcher, trois d'entre les 12 paraplégiques complets se sont améliorés et ils ont regagné la faculté de marcher avec des orthoses bilatérales cheville-pied. L'amélioration neurologique dépendait de la suffisance de décompression de la moelle épinière, non pas des bâtons Harrington *per se*. Les bâtons Harrington seuls n'étaient pas suffisants pour décomprimer le canal vertébral dans 50 pour cent des cas. Les meilleurs résultats après la décompression antérieure se sont produits là où la compression neurale ëtait causée par une fracture en coin minimalement déplacée, distale vers T12.

Zusammenfassung

Ein persönliches vorausschauendes Studium von 98 aufeinanderfolgenden Patienten, die sich mit neurologischer Beeinträchtigung und Brüchen bzw. Luxationen zwischen dem 9ten Brust- und dem 2ten Lendenwirbelkörper presentierten. Dreiundfünfzig Patienten haben sich Harrington'scher Instrumentation unterzogen, und 45 Patienten sind liegend behandelt worden. Neurologische Verbesserung war viel besser zufolge Harrington'scher Stäbe bei der völlig querschnittsgelähmten Gruppe, aber es gab keinen Unterschied in der neurologischen Wiederherstellung zwischen den zwei Gruppen bei den nicht völlig Querschnittsgelähmten. Zweiundvierzig mit Harrington'schen Stäben stabilisierte Patienten haben sich postoperativer Myelographie bzw. Tomographie unterzogen, um die Zulänglichkeit der Wirbelentlastung zu bewerten. Die besten Ergebnisse zeigten sich bei Patienten mit zulänglicher Neuralrohrentlastung. In 21 Fällen war die Entlastung nicht zulänglich gewesen, meistens durch ein Stereotypmusterverhalten, wonach die Hinterobenseite des gebrochenen Körpers im Neuralrohr blieb. Alle 21 haben sich früherer Entlastung zu einem Durchschnittszeitpunkt von fünf Monaten nach der Verletzung unterzogen. Sämtliche nicht völlig Querschnittsgelähmte (neun Patienten) haben die Fähigkeit, zu Fuss zu gehen, wiedergewonnen, drei von den 12 völlig Querschnittsgelähmten haben sich verbessert und die Fähigkeit, zu Fuss mit zweiseitigen

Fussgelenk-Fuss-Orthosen zu gehen, wiedergewonnen. Neurologische Verbesserung hing von der Zulänglichkeit der Rückenmarkentlastung ab, nicht von den Harrington'schen Stäben *per se*. Harrington'sche Stäbe alleine waren nicht imstande, den Wirbelkanal in 50 prozent der Fälle zu entlasten. Die besten Ergebnisse nach früherer Entlastung sind dort vorgekommen, wo die Neuralentlastung durch einen minimal verlegten Keilbruch, distal zu T12, verursacht wurde.

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