COMPLICATIONS OF POSTERIOR SURGICAL STABILISATION IN THE TREATMENT OF THORACOLUMBAR SPINE FRACTURES*

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ABSTRACT:

Posterior reduction and stabilisation is one of the most common alternative in the treatment of unstable spine fractures. The purpose of this study is, to detect the complications of posterior stabilisation.

We evaluated 120 patients (175 fractures) with unstable spine fractures who have been undergone posterior stabilisation with Alıcı Spinal System. Mean follow-up was 25.7 months (not less than 6 months) and mean age was 34 years. Stabilisation has been achieved by means of Alıcı Spinal System and mean time from injury to operation was 4.3 days.

During surgery, as a complication, we had progressive neurodeficits in 2 cases (one was due to poor anaesthesia and the other was due to insertion of transpedicular screw into the spinal canal). Pedicular fracture rate was 2.5% in transpedicular screw applications and was %0.6 in hook applications.

In early postoperative period, 3 patients dead. The rate of surgical and urinary infection were 5% (5 superficial and 1 deep) and 11.5%, respectively. In 2 cases, anterior approach became necessary because of insufficient reduction. Complications concerning instrumentation were dislocation of pedicular hooks (3.2%), dislocation of laminar hooks (2.8%), loosening of transpedicular screws (6.5%), breakage of transpedicular screws (2.6%), bending of transpedicular screws (3.9%), breakage of rods (0.4%) and loosening of telescoppical nuts(2.4%). During follow-up an increase of 5.9 degrees in Cobb Angle was observed.

Finally, when we evaluated the reasons of complications retrospectively, in order to prevent the possible complications, experienced surgical team and anaesthesist, suitable operation room conditions, preoperative preparation and surgical planning, and postoperative management are very important factors.

Key Words: *Thoracolumbar spine fracture, surgical treatment, complications, instrumentation, Alıcı Spinal System.*

INTRODUCTION

Complications in the surgical treatment of spinal fractures may be encountered in any stage (preoperatively, intraoperatively and postoperatively) of treatment. Although spinal injuries are associated with neurological signs, complications are not limited within neurologic ones. Neurologic and instrumental complications should be evaluated together.

The purpose of this study is to detect the complications of Alıcı Spinal System which was introduced in 1990, also to determine the causes of complications and finally to discuss the methods for solution.

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MATERIALS AND METHODS

In this study, 120 patients with thoracolumbar fractures whose mean follow-up was 25.7 months (not less than 6 months) were evaluated prospectively. Seventy-nine of them were male and 41 of them were female and their mean age was 34 (range 13 to 80). Causes were fall from height, traffic accident and crush under heavy material in 67, 45 and 8 cases, respectively. In 27 of 120 patients spinal fracture was associated with additional traumas. Fractures were classified according to Denis (9). Fifty-four of the cases had neurologic deficits preoperatively.

The most common fracture type and fracture level were burst (131 fractures in 87 patients) and L_1, respectively. The mean time from injury to operation

was 4.3 days (range 3 hours to 28 days). In 120 patients with thoracolumbar fractures, stabilisation was performed by means of Alıcı Spinal System which was applied via posterior approach. In 26 patients, fusion with iliac bone grafts was also added. In 9 patients, who had posterior column fracture associated with posterior spinal compression, laminectomy was an additional procedure. Mean duration of the operations was 2.6 hours (range 55 to 275 minutes).

Intraoperative and postoperative amount of blood transfusion were meanly 2,5 unites and 1.4 unites, respectively. In all cases, during intraoperative and postoperative periods infection prophylaxis was performed by 3rd generation cephalosporins (not less than 3 days) Dextran 40 was used (500 ml/day) for prophylaxis against deep vain thrombosis.

RESULTS AND COMPLICATIONS

Complications encountered pre, intra and postoperatively were shown in Table 4.

Late diagnosis of spinal fractures in 2 cases (in one case because of cerebral trauma and insufficient radiologic examination, and in another case traumatic forearm amputation had the priority) was a preoperative complication.

In intraoperative period, in cases of pedicular or laminar fractures due to technical mistakes the next upper or lower laminae or pediculae were choosen for application. Also, postoperative radiograms have shown that 1 screw in 1 case was insufficiently tightened.

In two cases, we observed progression of neurodeficits intraoperatively. Diagnosis was made by means of wake-up method. In one of three cases, intramedullary location of one transpedicular screw was confirmed by CT and instrumentation was repeated, neurodeficit due to postoperative spinal shock became Frankel E in 6th month, in this case. Neurodeficit of the other case was due to sudden movement of patient because of poor anaesthetic application. This patient was lost in 28th day because of pneumonia.

Patients without neurodeficit were mobilised with corset support. Patients associated with neurodeficit were undergone rehabilitation program beginning from the 1st postoperative day.

In the early postoperative period, 3 cases were dead (1 case bronchopneumonia, 28 the day; 2 cases cardiovascular insufficiency 5th and 10th day). Injury level of these two cases were T4-5 and T5-6 fracture-dislocations, respectively.

We had 6 wound infections. Pathogen bacteria were E. Coli in 3 cases, S. aureus in 2 cases and S. epidermidis in 1 case. 5 cases with superficial skin infection were treated successfully with medication. But in 1 case although medication and debridement has performed, extraction of intruments became necessary in order to eradicate the deep infection (9th month). On the other hand, in 2 cases there were draining fistulised wound (sterile sinus syndrome) in 1.5 and 2.5 years postoperatively. Instruments were extracted and also biopsy material didn't show any infection sign other than reaction tissue.

In 5 cases with neurodeficit decubitus ulcers developed, 4 of them were treated by medication, but in one case with cerebral trauma flab surgery became necessary.

In the early postoperative period bronchopneumonia developed in two cases. One case was treated with medication, but the other was lost.

In the postoperative period (1st and 3rd months) culture antibiograms confirmed urinary tract infection in 14 patients and treated medically. Two cases were resistant to medical therapy.

The most common complications related to instrumentation in the postoperative period were, hook dislocation and loosening of transpedicular screws. In such situations (11 patients) instruments were extracted. In the follow-up period there were totally 39 patients whose instruments were extracted.

DISCUSSION

Development of instrumentation methods in the treatment of spinal fractures and fracture-dislocations resulted in complications either technically related or unrelated (7, 15, 16). Purpose of instrumentation in the treatment of spinal fractures, is to stabilise the fracture, to decompress the medullary canal and to shorten the hospitalisation time in order to return daily activity early (7, 16, 18, 19).

The most common intraoperative complication related to instrumentation was transpedicular screw application. Rate of pedicular fracture during transpedicular screw application was 3.7%, malposition of pedicular screw was 2.5%. According to the literature, the most common encountered complications during intraoperative period are the ones related to transpedi-

cular screw (4, 8, 10, 12, 13, 17, 21, 23, 24). In order to minimise such complications, it is important to evaluate the bone density and pedicular location and anatomy preoperatively (20, 21, 25). In addition, surgeon's experience and necessity of fluoroscopy are also important factors (4, 8, 10, 12, 13, 17, 20, 21, 22, 23, 24, 26). Although all requirements are fulfilled malposition rate range 2% to 10% (10). Our malposition rate is 2.5%. On the other hand, rate of pedicular fracture due to poor surgical technique is 2.5%. Although hook has low-risk than transpedicular screw (11), in our series pedicular fracture rate during hook application is 0.6%. It was due to poor technique and we had to choose the next lower or upper level.

The most important complication during intraoperative period is progression of neurodeficit (3, 13, 17, 19, 23). According to the literature, this rate range 0% to 12% (8, 10, 13, 14, 18, 19, 23). Excessive distraction and compression, deterrioration of reduction and insertion of instrument directly into the spinal canal are the possible causes of such complications (3). We had 2 cases (1.6%) in whom progression of neurodeficits occured. One of them was due to insertion of transpedicular screw directly into the medullary canal. The other was not related to instrumentation, it was the result of sudden movement of patient due to poor anaesthesia.

One of the most common (3-10%) complications in the postoperative period is wound infection (7). Our rate is 5% and is similar with the literature. But, in our series Gram (–) pathogens are more common than Gram (+) pathogenes and this opposes with the literature. In addition, we have sterile sinus syndrome in 2 (1.7%) cases. Our urinary tract infection rate is 11.5%. In the early postoperative period we had broncopneumonia in 1.6% cases. In order to prevent such a complication, early mobilisation, prophylaxis and respiratory exercises are very important (7).

Three of our patients (2.5%) were dead in the post operative period. Causes were bronchopneumonia (1 case) and cardiovascular insufficiency (2 cases). Injury levels of 2 cases with cardiovascular insufficiency were T4-5, T5-6, respectively. In injuries of upper thoracic and servical spine there is an activation of parasymphatetic system due to inactivation of symphatetic system (5). In such cases, because of low arterial tension and low pulse rate due to vagal activity close follow-up during postoperative period is very important (5).

Telescopical nut loosening rate was 0.08% and it was due to insufficient tightening. Spontaneous loosening rate in the follow-up period was 0.2%. In order to eliminate this complication it is necessary to tighten the nuts well intraoperatively and to use nuts with interlocking components (2). Our complications of pedicular hook dislocation 3.2% and laminar hook dislocation 2.9% are correlated with the literature (7, 11). In order to prevent this event, it is important to choose suitable sizes of hooks (11).

In the postoperative follow-up period, the most common problem was related to transpedicular screws. Screw bending (3.9%), screw loosening (6.5%) and screw breakage (2.6%) were such complications. Although these complications hadn't deteriorated reduction and correction, extraction of instruments had become necessary in the early postoperative period. Poor bone quality and malalignment between screw and pediculae are the most common causes of pedicular fractures (6, 8, 13, 25, 26). Insufficiency of instruments are inevitable especially in cases of contraindicated posterior applications (2, 6).

In addition, as in hook system, extinction hook application added to short-segment transpedicular screws will decrease complications (2). On the other hand, in cases with poor bone quality transpedicular screws combined with bone cement may be useful (26).

In order to avoid flat-back deformity, it's very important to bend the rods to adapt physiological kyphosis and lordosis. We had 2 cases (1.7%) with flatback and they were painful. In the follow-up (not less than 1 year) increase in Cobb's angle was 5.9°: It was correlated with the literature.

Finally, as we evaluated the complications retrospectively, in order to prevent the possible complications, experienced surgical team and anaesthesist, suitable operation room conditions, preoperative preperation and surgical planning and postoperative management are very important factors.

Table 1. Distribution of Additional Lesions

Cerebral Trauma	2
Intraabdominal haemorhage	1
Haemothrax	1
Pneumothorax	1
Traumatic forearm amputation	1
Fracture	
Metatars	1
Calcaneus	7
Talus	2
Malleol	2
Tibia	4
Trochanter	1
Pelvis	1
Mandibula	1
Clavicle	1
Humerus	1
Double forearm	1
Galeazzi	1
Colles	3
Metacarp	1

Note: Additional lesions were more than one in 5 cases.

Table 2. Distribution of Fracture Types (Denis) (9)

Fracture Type	Number
Compression	4
Burst	87
Fracture-dislocation	27
Seat Belt	2

Table 3. Distribution of Fractures

a) Compression type and burst type fractures

	Compression	Burst
T_1	–	–
T_2	–	–
T_3	–	–
T_4	–	–
T_5	–	1
T_6	–	1
T_7	1	1
T_8	–	1
T_9	1	4
T_{10}	1	4
T_{11}	3	3
T_{12}	3	32
L_1	4	47
L_2	1	25
L_3	1	9
L_4	–	2
L_5	–	1

b) Seat Belt type and Fracture-dislocations

	Seat Belt	Fracture-dislocation
T_{1-2}	–	–
T_{2-3}	–	–
T_{3-4}	–	–
T_{4-5}	–	2
T_{5-6}	–	1
T_{6-7}	–	–
T_{7-8}	–	1
T_{8-9}	–	–
T_{9-10}	–	2
T_{10-11}	–	2
T_{11-12}	1	7
T_{12}-L_1	1	6
L_{1-2}	–	4
L_{2-3}	–	1
L_{3-4}	–	1
L_{4-5}	–	–
L_5-S_1	–	–

Table 4. Complications

Period	Relation with instrument	Complications	No	No of patient	%
INTRAOPERATIVE	Related to instrumentation	Progressive neurodeficit	1	1	0.8%
		Pedicular fracture (During hook applications)	2/288[a]	2	0.6%
		Pedicular fracture (During transpedicular screw applications)	2/80[b]	1	2.5%
		Mallocation of transpedicular screw	2/80[b]	2	2.5%
		Laminar fracture (During hook application)	0/252[c]	0	0%
		Insufficient tightening of telescopical nut	1/1240[d]	1	0.08%
		Flat back	2	2	1.7%
		Dura injury (During removal of interspinous inf.)	1	1	0.8%
		Haemorrhage of vertebral vain (During screw application)	1	1	0.8%
POSTOPERATIVE	Unrelated to instrumentation	Death	3	3*	2.5%
		Wound infection (Superficial)	5	5	4.2%
		Wound infection (Deep)	1	1	0.8%
		Sterile sinus syndrome	2	2	1.7%
		Bronchopneumonia	2*	2*	1.6%
		Urinary tract infection	14	14	11.5%
		Deep vein thrombosis	0	0	0%
		Gastrointestinal bleeding	1	1	0.8%
		Heterotopic ossification	0	0	0%
		Transfusion reaction	3	3	2.5%
		Hepatitis (Secondary to transfusion)	1	1	0.8%
	Related to instrumentation	Nonunion	1	1	0.8%
		Pedicular hook dislocation	9/278[f]	3	3.2%
		Laminar hook dislocation	7/246[g]	2	2.8%
		Hook breakage	0	0	0%
		Loosening of transpedicular screw	5/76[h]	2	6.5%
		Bending of transpedicular screw	2/76[h]	3	3.9%
		Breakage of transpedicular screw	2/76[h]	2	2.6%
		Brekage rod	1/234[j]	1	0.4%
		Bending rod	0/234[j]	0	0%
		Loosening of telescopical rut	3/1200[k]	2	0.2%
		Anterior approach due to unsuccesful reduction	2	2	1.7%
		Increase of Cobb's Angle (in the follow-up)		5.9°	

Note: Table 4

a) Total pedicular hooks
b) Total transpedicular screws
c) Total laminar hooks
d) Total telescopical nuts
e) May be related to instrument
f) Total pedicular hooks in follow-up
g) Total laminar hooks in follow-up
h) Total transpedicular screws in follow-up
j) Total rods in follow-up
k) Total telescopical nuts in follow-up
*) Bronchopneumonia, progressive neurodeficit, death (in one case).

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