ASSESSMENT OF SINGLE C-ARM FLUOROSCOPY TECHNIQUE IN PERCUTANEOUS TRANSPEDICULAR SPINE FIXATION

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Introduction

Percutaneous fixation was introduced by Magerl et al. in 1977 for the external fixation of the spine in patients, who required transitory stability for traumatic and infectious causes. Percutaneous targeting techniques have gradually improved and have led to the expanded use of these fixation methods. Instrumentation is now available that can be used to perform lumbar and thoracic fixation by placing rods that are curved freehand to the desired shape, without limitation on the number of levels instrumented. The advantages of percutaneous pedicle screw fixation relative to open surgery are: less blood loss, shorter operative time, lower infection risk, less postoperative pain, shorter rehabilitation time as well as shorter hospital stay. Percutaneous lumbosacral pedicle screw placement using intraoperative dual-planar fluoroscopy is a safe technique with low rates of complication and revision. This could pose an obstacle in the way of practicing this technique in developing countries due to limited resources as providing two fluoroscopy devices in a single operating theatre is rarely possible.

Aim of the work

The aim of this study was to assess the safety and accuracy of the single c-arm technique in percutaneous spine fixation of thoracolumbar fractures at El-Hadra University Hospital.

Subjects and Methods

The study included thirty patients with unstable fractures of dorsal or lumbar spine planned for percutaneous transpedicular fixation prospectively. All patients were treated in the spine unit at El-Hadra University Hospital.

Inclusion criteria: Dorsal or lumbar spine fractures with no need to perform posterior decompression.

Exclusion criteria: Dorsal or lumbar spine fractures that need to be managed with decompression of the spinal canal posteriorly.

Methods of evaluation: The following data is collected from each individual patient.

Preoperatively: 1- Present history: Age, comorbidities and date of injury.
2- Clinical examination: Neurological status.
3- Radiological investigations: Xray, CT scan, (AO classification of fracture) with or without MRI images.

Intraoperatively: **1.** Amount of blood loss **2.**Operative time **3.** Time of radiation exposure.

Postoperatively:
1. Postoperative pain (per VAS on 1st day) 2. Ability to ambulate (1st day)
3. Wound complications (as of 2 weeks postoperatively)
4.Postoperative plain x ray and CT scan images to assess accuracy of screw placement using Learch and Wiesner classification.

Results

Table 1: Degree of malposition of screws according to direction

Type of malposition	Degree of malposition							
	Encroachment		Minor penetration		Moderate penetration		Severe penetration	
Axial	No.	%	No.	%	No.	%	No.	%
Medial	9	4%	4	1.8%	3	1.3%	0	0%
Lateral	5	2.2%	0	0%	2	0.9%	0	0%
Anterior	7	3.1%	1	0.4%	0	0%	0	0%
Sagittal								
Cranial	1	0.4%	0	0%	0	0%	0	0%
Caudal	4	1.8%	0	0%	1	0.4%	0	0%
Total	26	11.5%	5	2.2%	6	2.6%	0	0%

Table 2: Degree of malposition of screws according to fixed levels

Screw level	Degree of malposition				Screws per level
	Encroachment	Minor penetration	Moderate penetration	Severe penetration	
T5	0	0	0	0	2
T6	1 Lateral	0	0	0	4
T7	0	0	0	0	4
T8	1 anterior	1 Anterior	0	0	4
T9	0	0	1 Medial	0	2
T10	0	0	0	0	6
T11	4 Medial	0	1 Medial	0	22
T12	1 Medial 2 Anterior	1 Medial	0	0	34
L1	2 Medial 1 Anterior 1 Caudal	0	0	0	32
L2	1 Medial 1 Lateral 1 Cranial	2 Medial	1 Caudal	0	44
L3	2 Caudal 2 Lateral	1 Medial	1 Lateral	0	36
L4	1 Medial 1 Lateral 2 Anterior	0	1 Lateral	0	22
L5	1 Caudal 1 Anterior	0	1 Medial	0	10
Total	26	5	6	0	222

Out of a total of 222 screws: 26 screws (11.5%) showed encroachment. 5 screws (2.2%) showed minor penetration (< 3 mm). 6 screws (2.6%) showed moderate penetration (3-6 mm). No screws showed major penetration (> 6 mm). The screws that showed moderate penetration whether in the caudal direction (1 screw), in the medial direction (3 screws) or in the lateral direction (2 screws) required no revision as they showed adequate biomechanical stability and purchase in addition to no pertinent neurological deficits.

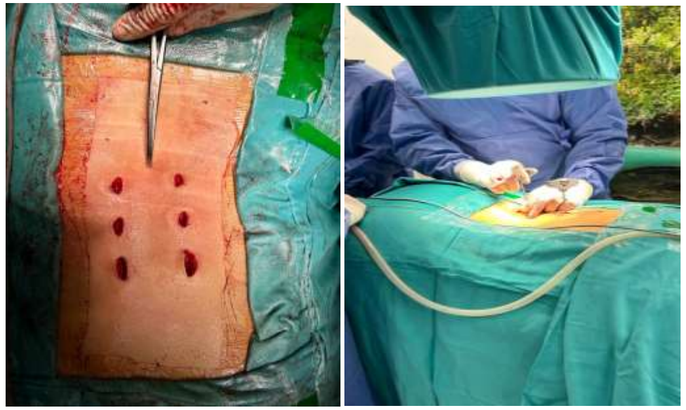

Figure : Intraoperative setup

Conclusion

In this study, we concluded that single c arm percutaneous transpedicular spine fixation technique proved to be a safe and effective technique for managing thoracolumbar fractures that do not necessitate vertebral canal decompression.
Advantages include less intraoperative and postoperative complications with results comparable to those of priorly published studies in which more expensive fluoroscopic imaging techniques were used.