The Use of 3D Navigation in Subaxial Cervical Spine Lateral Mass Screw Insertion

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Learning Objectives

1) Describe the importance of reducing complications with LMS insertion
2) Identify an effective method to reduce possible operative complications

Introduction

Stabilization of posterior c-spine typically achieved by lateral mass screws (LMS). The use of 3D navigation may help in identifying the ideal trajectory. the use of navigation for LMS has not been fully investigated. The purpose of this study to show if there is any difference observed in terms of screws postioning and complications whether using the 3D navigation system or using the freehand technique

Methods

a prospective cohort study was performed for a total of 40 consecutive patients. in Twenty patients the 3D navigation system was uesd while the other twenty had their LMS inserted by the traditional technique. Ethics approval was obtained for this study. demographic data were compared between the two groups. intraoprative events (spinal cord injury, vertebral artery injury, root injury etc) were captured and all patients had post -operative CT scan for assessment of screws positions, lateral mass fractures, rod breakage and screws lessening.

Table 1: Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
>18 years	less than 18 years old
>1 level of lateral mass screw fixation, C3-C7	4mm or more screws
First time posterior cervical intervention	Previous posterior cervical surgical intervention.
Follow up for 1 year	Less than 1 year follow up

Means and SD were calculated . Analysis controlled for all covariants. Blanced events proportions were calculated and outcomes were compared between the two groups using Z test. all statistical test were calculated at alpha level of 5%.

Results

A total of 284 LMS inserted in 40 patients.The mean age for patients who underwent navigation was 62.4 (CI 5.6) while for the other group it was 64.6 (CI3.7) (Table 2). There was no statistical difference between the two groups in regard to their demographic data. Screws malposition was statistically different between the two groups (Table 3) p 0.006 (17.1% within the standard group and was only 6.25% within the navigation group).there was no statistical differences in regard to the incidence of vertebral artery injury, SC injury ,nerve root injury or hospital stay. Intraoprative LM fractures were higher in the standard group.

Table 2: Demographic data

	3D Neuro Nav	Freehand	*p* value
Age	62.4	64.6	0.45
Sex M:F	55:45	65:35	0.52
Fracture	40%	40%	1
Degenerative	60%	60%	1
Neurological Deficit	85%	95%	0.28

Table 3: Results

	3D Neuro Nav	Freehand	*p* value
Total number of inserted screws	140	144	
Screw malposition	6.25%	17.1%	0.006
Intra-op LM fracture	0.7%	2.8%	0.2
Mean operative time in hrs	5.1	4.35	0.1
Mean blood loss in ml	615	575	0.83
Mean hospital stay in days	8.05	6.45	0.21

We found using 3D navigation for placement of LMS was asociated with singnificant diffrence in reducing malpositining of LMS which would reduce risk of vascular or neurological injuries

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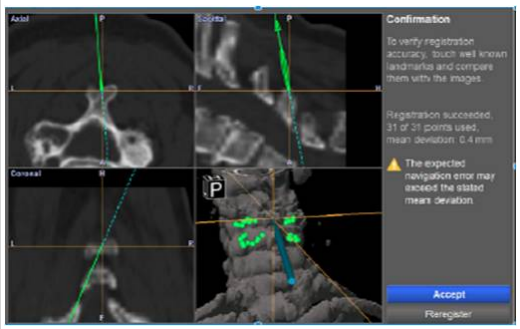
Figure 1: 3D Navigation acureacy



we found using 3D navigation based on pre-opratice CT can be very acureate

Conclusions

The use of 3D navigation in LMS insertion will decrease the rate of screw malposition (facet, foramen transversarium).This may reduce the surgical complications and improve the patients outcome