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A study on traumatic injuries involving CVJ: Radiological study

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Abstract

As with other transitional regions of the spine, CVJ is highly susceptible to injury. This region's vulnerability to injury is particularly high because of the large lever-arm induced rostrally by the cranium and the relative freedom of movement of the craniocervical junction, which relies disproportionately on ligamentous structures rather than on intrinsic bony stability. Patients with a clinical suspicion of CVJ ABNORMALITIES were evaluated by CT and Magnetic Resonance Imaging during the course of the study. No selection bias was exercised in terms of patients' age, sex and pathology. Imaging characteristics of radiological modalities like CT and MRI were recorded. Final diagnosis was also noted. The results was analyzed and studied. In our study the most common injury was odontoid fracture(90%) which is followed by fracture of Atlas with an incidence of 20%. In our study the most common odontoid fracture was Type II with 55.55% followed by type III (22.2%).

Keywords: Traumatic injuries, CVJ, odontoid fracture

Introduction

Injuries to the craniocervical junction are common, and they are among the few skeletal injuries that carry a high likelihood of death. They are often difficult to diagnose on initial imaging studies[1, 2].Successful management of these injuries depends on familiarity with the normal anatomic relationships of this region of the spine and recognition of the critical consequences of injured structures. The craniocervical articulation is a very mobile transitional region of the vertebral column. As with other transitional regions of the spine, it is highly susceptible to injury. This region's vulnerability to injury is particularly high because of the large lever-arm induced rostrally by the cranium and the relative freedom of movement of the craniocervical junction, which relies disproportionately on ligamentous structures rather than on intrinsic bony stability. Due to the vital functions of the nearby neurovascular structures, injuries to the upper cervical spine that disrupt its structural integrity carry a high likelihood of death. Improved trauma care, and perhaps the availability of airbags and enforcement of seat-belt laws, however, has increased the likelihood of

survival in patients with these injuries, raising the burden of responsibility to promptly identify and appropriately treat these life-threatening injuries[3, 4].

Methodology

A sample of 10 patients referred from OPD and Emergency department wereincluded in this study.
Patients with a clinical suspicion of CVJ ABNORMALITIES were evaluated by CT and Magnetic Resonance Imaging during the course of the study. No selection bias was exercised in terms of patients' age, sex and pathology.
Imaging characteristics of radiological modalities like CT and MRI were recorded. Final diagnosis was also noted. The results was analyzed and studied.
The following technique were adapted for the examination:

- The CT scan wasperformed on a 16 slice Philips MX16 CT machine.
- The MRI scan was performed on a 1.5T SIEMENS Avanto Machine with Axial, coronal and sagittal planes obtained using multiple sequences in various imaging planes.

Scanning parameters

Spin Echo Sequences	TR (msec)	TE (msec)
T1	400-500	10-12
T2	2500-3500	100-150

MRI cervical spine was performed using TI and T2 axial and sagittal, TI and T2 coronal and MR myelogram sequences with T2 axial screening of brain. T1W and T2W spin echo sagittal, coronal and axial scans of region of interest were done using spine coil. The quality of the Magnetic Resonance Images would suffer if the patients moved during the examination. Consequently sedation was essential in occasional restless patient. Final diagnosis was made after MRI findings with clinical correlation and in some patients confirmed on surgery.

Results

In our study all patients came with a history of trauma with suspected upper cervical spine injury. Ct was done in cases with suspected fracture of spine to confirm the bony injury.

Table 1: Age Incidence

Age group (years)	No of Patient			Percentage
	Male	Female	Total	
0-10	0	0	0	0%
11-20	0	0	0	0%
21-30	5	0	5	50%
31-40	0	0	0	0%
41-50	1	1	2	20%
>50	3	0	3	30%
	9	1	10	100%

Youngest patient in this study was 21 years old while oldest was 76yrs old. The maximum number of patients, 5, werein 3rd decade followed by 3 patients in the age group of >50.

Table 2: Sex Incidence

Sex	No. of Patients	Percentage
Males	09	90%
Females	01	10%

Predominance of males with a ratio of 9:1 was obtained, which may be attributed to the either More prone to trauma as males are more outgoing and used for heavy work.

Table 3: Incidence of Various CVJ injuries

MRI findings	Number	Percentage
Odontoid Fractures	9	90%
Fracture of Atlas	2	20%
Fracture of Axis	1	10%
Occipital Condyle Fracture	0	0%

In our study the most common injury was odontoid fracture(90%) which is followed by fracture of Atlas with an incidence of 20%.

Table 4: MRI findings analysis

MRI findings	Number	Percentage
Odontoid Fractures	9	90%
Fracture of atlas	2	20%
Fracture of axis	2	20%
Atlanto-occipital dislocation	1	10%
AtlantoAxial Dislocation (AAD)	1	10%
Cord compression	2	20%
Cord edema	3	30%
Absent Flow void in vertebral artery	01	10%

In our study the most MR finding was odontoid fracture(90%) in the form osseous injury which is followed by cord edema(30%) in the form of neural injury.

Table 5: CT Findings Analysis

CT findings	Number	Percentage
Odontoid Fractures	9	90%
Fracture of atlas	2	20%
Fracture of axis	1	10%
Atlanto-occipital dislocation	1	10%
AtlantoAxial Dislocation (AAD)	1	10%
Other spine injuries	3	30%

In our study the most common injury was odontoid fracture(90%) which is followed by fracture involving lower cervical spine(30%).

Table 6: Incidence of different types of odontoid Fractures

Odontoid Fractures	Number	Percentage
Type I	2	22.2%
Type II	5	55.55%
Type III	2	22.2%

In our study the most common odontoid fracture was Type II with 55.55%followed by type III(22.2%)

Discussion

Table 7: Comparison of CT and MR findings

Findings	Lee *et al.* [5]	Present Study
Odontoid Fractures	32.5%	90%
Fracture of Atlas	47.5	20%
Fracture of Axis	32.5%	10%

In the study mentioned above, the most common injury is fracture of atlas followed by odontoid fracture. In our study the most common finding was odontoid fracture followed by fracture of atlas.

Table 8: Combination of injuries

Findings	LEE *et al.* [5]	Dickman *et al.* [6]	Present study
C1+Odontoid Fractures	32.5%	37.5%	20%
C1+Miscelleaneous C2 fractures	15%	28%	0
C1+hangmans #	10%	12%	0

All the above studies show C1+ odontoid Fracture as themost common combination of injury.

Table 9: Odontoid Fractures

Findings	CR Clark *et al.* [7]	Anderson *et al.* [8]	Present study
Type I	0.6%	5%	22.2%
Type II	64.6%	60%	55.55%
Type III	30.4%	30%	22.2%

All the above studies show type II odontoid fracture as the most common type of odontoid fracture.

Conclusion

The commonest injuries involving the CVJ were odontoid fracture predominantly type II and the commonest combination of injury was C1 with odontoid fracture. The common age group to be involved was 3rd decade with male predominance.

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