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ASSESSMENT OF CLINICAL PROFILE AND OUTCOME OF CERVICAL SPINAL CORD INJURIES WITH OR WITHOUT BONY INJURIES

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ABSTRACT

Objective: The present study was design to investigate the clinical profile and outcome in patients of cervical spinal cord injury with or without bony injury.

Material and Method: All patients of cervical spinal cord injury with or without evidence of bony injury on X-ray were included in this study. In addition to X-ray finding, patient age, sex and MRI cervical spine were also recorded at the time of admission. Clinical profile and outcome was assess with *Benzel-Larson Grade* included one to seven grades.

Results: Total 87 patients of cervical spine injury were included in study, 25 patients were included in SCIWORA group while 62 patients were having associated with bony injuries. Both SCIWORA and SCI with bony injury ware more commonly due to fall from height and more common in males. Neurological recovery was more in SCIWORA than bony injury patients.

Conclusion: cervical spine cord injury is commonly seen in children, while associated bony injury is common in adult population. Early diagnosis and proper management for SCIWORA can improve neurological outcome in selected group of patients.

KEYWORDS : Spinal cord injury without bony injury(SCIWORA)

INTRODUCTION:

SCIWORA (Spinal cord injury without radiological abnormality) was defined by Pang[1] & Wilberger in 1982 as the "objective signs of myelopathy as a result of trauma" in which no evidence of fracture, subluxation or instability on plain radiographs or computed tomography (CT) is demonstrated.

The SCIWORA is documented in children [2,3], probably due to increased elasticity of the paediatric spine. It is not described very well in adults with normal spinal canals. The mechanism for such injuries in adults was initially postulated to be either hyperflexion dislocation with immediate reduction by muscular action or temporary prolapse of the cervical disc after forcible flexion. However, Taylor and Blackwood (1947) and other authors have convincingly demonstrated that the most likely injury mechanism in adult is hyperextension superimposed on pre-existing cervical spondylosis. The present study was planned to evaluate the clinical profile and outcome in patients of cervical spine injury with or without bony injury.

MATERIAL AND METHOD:

The present study was conducted at department of neurosurgery, GR Medical College and group of hospitals (GRMC) over a period of 5 year from December 2001 to April 2006. GRMC is a tertiary care super specialty treatment Centre. Being the largest medical institute in the region of Gwalior, it caters the health needs of entire region as well as neighboring states. All patients of cervical spine injury with or without evidence of bony injury on X-ray were included in this study. In addition to X-ray finding, patient age, sex and MRI cervical spine were also recorded at the time of admission. Initial X-ray cervical spine was looked for -1) type of bony injury 2) height of inter-body space. Initial neurological assessment were done with *Benzel-Larson Grade*[4] *included one to seven grades. Grade 1 represents complete cord transection with no sensory and motor function while grade VII represents normal neurological status.* Patients were looked for any respiratory difficulties and deep vein thrombosis daily. Complication were noted and treated accordingly. Patient neurological recovery was noted according to *Benzel-Larson Grade* at the time of discharge. Thus, withal above considerations we had a cohort of 87 patients with cervical spine injury. The data was compiled, summarized and analyzed using frequency distribution and percentage proportion.

RESULT:

Total 87 patients of cervical spine injury were included in study, 25 patients were included in SCIWORA group while 62 patients were having associated with bony injuries. Highest incidence of SCIWORA were reported in age group of 0-20 years while SCI with bony injury were present in 21-40 years of age (Table 1).

TABLE: 1 Assessment of Age in study groups

Age	SCIWORA No. Of Patients	SCI with Bony injury No. Of patients
0-20	13(52%)	7(11%)
21-40	9(36%)	**25(40%)**
41-60	**3(12%)**	22(36%)
>60	0(0%)	8(13%)

Table 2 revealed males were more likely to have SCIWORA compared to females. Spinal cord injury usually associated with bony injury in females. Both SCIWORA and SCI with bony injury ware more commonly due to fall from a height, though RTA also constitutes a major bulk in patients with bony injuries. SCIWORA was much less common with other modes of injury (Table 3).

TABLE 2: Assessment of Sex Factor in cervical SCI

Type of injury	Sex	
	Male	Female
SCIWORA	24	1
SCI with bony injury	45	17

TABLE 3: Assessment of Mode of Injury

Mode of Injury	SCIWORA	SCI with Bony injury
RTI	6	22
Fall from height	13	26
Penetrating injury	2	2
Hit by animal	2	8
Assault	2	4

Myelopathy was seen in every patient of SCI whether with or without bony injuries, while central cord syndrome was seen in 7 patients with bony injury and 4 patients of SCIWORA (Table 4). These were 2 cases of Brown-Sequard Syndrome in patients with SCIWORA and 4 cases in patients with a bony injury with SCI. **(Table 4).** On MR, the signal of cord correlated with the type of cord injury. While cord edema was seen in 12 patients, cord contusion was either seen in association with cord edema (2 patients) or with associated disk herniation (8 patients). 3 patients had normal MR and were suspected to have cord concussion (Table 5).

TABLE: 4: Pattern of the Neurological deficit at Presentation

Deficit	SCIWORA	SC with bony injury
Myelopathy	25	62
Central Cord Syndrome	4	7
Anterior Cord Syndrome	1	1
Brown-Sequard Syndrome	2	4
Horner's Syndrome	0	0

TABLE 5: MRI Appearance of injured Spinal Cord (SCIWORA)

MRI Finding	No. Of Patients	Percentage
Cord edema	12	48%
Cord contusion	0	0%
Cord edema with a contusion	2	8%
Disc Herniation with or without edema and contusion	8	32%
Normal	3	12%

22 patients presented with grade I in the group SCI with bony injury while 5 patients were in grade I at the time of admission in the group SCIWORA (Table 6).

TABLE 6: Neurological status at the time of admission and discharge

Benzel & Larson's grade	At Admission		At Discharge	
	SCIWORA	SCI with Bony injury	SCIWORA	SCI with Bony injury
Grade I	5	22	2	9
Grade II	12	21	1	8
Grade III	7	16	4	10
Grade IV	1	2	2	3
Grade V	0	1	7	11
Grade VI	0	0	6	7
Grade VII	0	0	1	1
Expire	0	0	2	13

DISCUSSION

Our study population was implicitly closed to the age and sex distribution of cervical spine injury in general population. The age range was 0-70 years with a mean of 31.1 years and sex distribution was roughly 4:1, similar to the general population with cervical spine injury as has been reported in earlier studies as well.

Approximately 25.7% of the patients have spinal cord injury without bony injury in the present study. The highest incidence of SCIWORA was reported in the age group of 0-20 years. This finding was similar to other studies, as SCIWORA is a disease of the pediatric spine. The common pathogenesis is the inherent elasticity of the soft tissues, which ensures immediate spontaneous reduction after considerable intersegmental displacement. SCIWORA in adults is not well documented. Chen et al[5] described five cases with traumatic central cord syndrome and an abnormal cord signal on MRI but without definitive compression of the cord. Pathogenesis for SCIWORA in adult group affirms that degenerative changes or calcification of the posterior common vertebral ligament produce excessive traction of the spinal cord during the accident and can influence the development of SCIWORA[6]; while others deny this relationship, and believe these changes have no direct influence on the presence of neurological impairment following low-energy trauma[7].

MRI cervical spine is a useful tool to evaluate SCIWORA and the investigation of choice[8]. Our study revealed cord edema was seen in 12 patients, cord contusion was either seen in association with cord edema (2 patients) or with associated disk herniation (8 patients). 3 patients had normal MR and were suspected to have cord concussion but when this is not conclusive; diffusion MRI or proton emission tomography (PET) may be useful in those patients with negative MRI and with myelopathy neurological syndrome. Another option to be considered is the use of somatosensory evoked potentials.[9]

Our study revealed maximum patients with SCIWORA presented at *Benzel-Larson Grade* II as compared to those with a bony injury who mostly presented in *Benzel-Larson Grade* I. In SCIWORA patients, at the time of discharge, mostly the patients had improved to a higher grade at Benzel and Larson grade V and Grade VI. 7 patients were discharged at grade V, 6 patients in grade VI while 2 patients expired in the present study. While in patients with bony injuries usually the Benzel and Larson grade at the time of discharge was poor. 9 patients did not improve and were discharged in grade I. 8 patient in grade II, 10 patients grade III, 13 patients died in SCI with a bony injury in the present study. Above finding indicates spinal cord injury without bony injury had good prognosis compared to spinal cord injury with a bony injury. Although there are several factors that influence the likelihood of neurological recovery [10] in these patients, and these are primarily related to the initial injury, [11] the diameter of the canal,[12] the patient's age, the extent of the injury, the presence of disc-ligament lesions and the severity of the neurological syndrome.1

CONCLUSION:

SCIWORA is a syndrome that defines posttraumatic SCI in patients with neurological findings without any evidence of fractures or mal-alignment in plain X-rays and CT. cervical spine cord injury is commonly seen in children, while the associated bony injury is common in the adult population. With its superior ability to reveal so tissue pathologies and prognostic value, MRI is accepted as the imaging modality early diagnosis and proper management for SCIWORA can improve neurological outcome in a selected group of patients.

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