

Penetrating Spinal Injuries, Cases Registry in Sohag University Hospital

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Abstract

Background Data: Penetrating spinal cord injuries caused by missile or stab wound injuries are uncommon. The harm may be due to the direct injurious effect or may be due to the resulting vascular insult either in the form of an intra- or extradural hemorrhage or spinal infarction or a late infection at the site of injury. Penetrating injuries may cause a neurological motor, sensory or an autonomic deficits or a combination of them. Both the conservative and the surgical treatments are widely practiced among the neurosurgeons. Such injuries not only affect the patient's lifestyle but also influence the whole patient's family.

Purpose: To Evaluate the penetrating spinal injuries and describe the multi-team management and report both clinical and radiological characteristics of the patients. Also, we would assess the course and the prognosis in both complete and incomplete spinal cord injuries.

Study Design: A cohort study conducted to patients with penetrating injuries

Patients and Methods: A case series retrospective study of 28 patients presented to the emergency department at Sohag university hospital between March 2012 and March 2015 with penetrating spinal injuries caused by knives, dagger, and missile and nail gun injuries. A full history was taken. Complete general and neurological examination including motor power, sensory examination using Frankel grading classification.

Results: The average age was 28.36 ± 5.96 (range 19-37) years. Twelve injuries were in lumbar spine, 12 in the dorsal spine, and 4 in the cervical spine. None of the cases shows an infection or a cerebrospinal fluid leak. Spinal cord injuries were as follow; 16 cases (57.1%) showed no spinal cord injuries, 8 patients (28.6%) showed incomplete spinal cord injuries and 4

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patients (14.3%) had complete spinal cord injury with no motor or sensory functions below the level of the injury. The incomplete spinal injuries due to firearm improved markedly according to Frankel grading system.

Conclusion: Missile injuries have the most detrimental effect among the penetrating spinal injuries. Complete spinal cord injuries have the worst prognosis. Most of the incomplete spinal cord injuries had improved with varying degrees. The prognosis of the penetrating spinal injury is proportional to the extent and to the level of the injury. (2016ESJ110)

Keywords: Stab injuries, penetrating wounds, neurological deficit, spinal cord injuries

Introduction

Most spinal injuries are caused by road traffic accidents. Spinal penetrating injuries are scarce. It affects mainly the young and middle-aged males.¹ Although its rarity, it may cause serious complications like a motor affection in the form of paraplegia or quadriplegia, a sensory affection or genitourinary manifestations.² Those hazardous complications influence the whole patient's family and confront them with a new situation they have to adapt.³ The optimal management to the patients is early intervention after stabilization of hemodynamics (Golden Hour). The management should involve first aid measures and multi-team cooperation as these injuries may be underestimated with a hidden serious complications including multi-organ affection. CT spine is a cornerstone tool in diagnosing and detection the level and extent of the injury. Follow up of those patients is mandatory to record any improvement and physiotherapy plays an influential role in improving the outcome.

Our aim in the study was to predict the prognosis of the penetrating spinal cord injury and assess the management steps were done for those patients.

Patients and Method

This study included the patients presented to the emergency department at Sohag university

hospital between March 2012 and March 2015. A total of 28 cases were included in the study.

Our study is a case series retrospective study. Patients were evaluated for the two main physiological functions. Motor examination with grades from 0 to 5, while the sensory examination was subdivided into two main types, the superficial sensation including pain and temperature and the deep sensation involving a sense of vibration and sense of position.

The patients were classified into 3 groups (Figure 1): Group I: patients with no neurological deficit: 16 patients, Group II: patients with partial spinal cord injury: 8 patients, Group III: patients with complete spinal cord injuries: 4 patients.

Franked grading classification system is also used to categorize the level of function affection (Table 1). All of the patients underwent advanced trauma life support (ATLS) for ABCDE. The complete general examination was carried out to rule out any associated other injuries. Vascular and abdominal injuries were excluded. No CSF leak or wound infection were found at the time of presentation. CT spine was done for all the patients in the first 24 hours. MRI on the affected spinal segment was done for groups II & III. For II & III groups, initial bolus intravenous drip injection of methylprednisolone in a dose of 30 mg/kg followed after 45 min with 5.4 mg/kg/hour for 23 hours. Intravenous analgesia and prophylactic broad spectrum antibiotic

that cross the blood brain barrier were given. Patients immediately transferred to the ICU for monitoring their vital signs.

Results

Twenty-eight Patients came to the emergency department at Sohag university hospital with penetrating spinal injuries with different tools including the knives, bullets and nail gun injuries between March 2012 and March 2015. Firearm injuries were the predominant injuries with 50% (N=14), while the knives' injuries occurred in 8 cases, daggers in 6 patients and nail gun injuries in two patients. No reported injuries to the great vessels.

Most of the patients were males (22 patients; 78.6%) while only 6 were females (21.4%). Their age ranged from 19-37 years, with a mean of 28.36 ± 5.96 years. Twenty-four patients were assaulted while four were incidentally injured. Twenty-two of the patients were single (18 males and 4 females). Half of the group (14 patients) was unemployed. Twelve patients had lumbar injuries (42.9%) (Figure 3), 12 patients

had dorsal injuries (42.9%) (Figure 4), and 4 had cervical injuries (14.2%). Patients with no spinal cord injury (Group I) comprise the biggest group of 16 patients (57.1%), while Group II patients were 8 patients (28.6%). Complete spinal cord injury reported in 4 patients (14.3%) (Figure 1). Out of the 4 cases in group III; two patients in the level of C4 and C5 consequently died due to respiratory failure with no response to artificial ventilation and medical therapy. In the remaining two cases; no motor or sensory improvement occurred. At the end of follow up, patients were complaining of fecal and urinary incontinence. Impotence also was a major complaint in those patients. On the other hand, patients with incomplete spinal cord injury (Group II) showed improvement in their Frankel grading. Out of the 8 patients included in Frankel grade B, five cases improved from Frankel grade B to grade D within 6 months; and three showed less amelioration with the change from Frankel grade B to grade C after 6 months (Figure 2). Table 2 summarizes epidemiological data of patients.

Table1. Frankel Classification

Frankel	Neurological Deficit
A	Full sensory and motor palsy below the level of the lesion
B	Full motor palsy, but some residual sensory spared
C	Sensation is present with some residual motor function
D	Presence of motor and sensation but below the normal
E	No neurological changes

Table 2. Descriptive Statistics of the Study Patients

Item		Value
Age (years)	Mean±SD	28.36±5.96
	Median(range)	30(19-37)
Sex	Male	22(78.6%)
	Female	6(21.4%)
Marital status	Single	22(78.6%)
	Married	6(21.4%)
Occupation	Unemployed	14(50%)
	Manual worker	9(32.1%)
	Office employee	5(17.9%)
Cause of injury	Assault	24(85.7%)
	Incidental injury	4(14.3%)
Level of injury	Cervical	4(14.3%)
	Dorsal	12(42.9%)
	Lumbar	12(42.9%)
Degree of Injury	G-I. No cord injury	16(57.1%)
	G-II. Partial cord injury	8(28.6%)
	G-III. Complete cord injury	4(14.3%)
Frankel before	A	4(14.3 %)
	B	8(28.6%)
	C	0(0.0%)
	D	0(0.0%)
	E	16(57.1%)
Frankel 6 months after	A	2(7.1%)
	B	0(0.0%)
	C	3(10.7%)
	D	5(17.9%)
	E	16(57.1%)
	Not done (patients died)	2(7.1%)
Fate	Improved	24(85.7%)
	Not improved	2(7.1%)
	Died	2(7.1%)

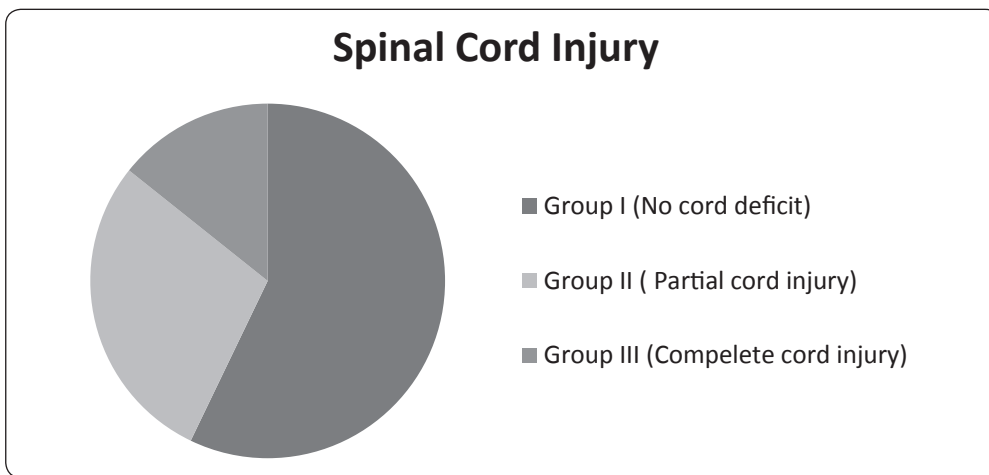


Figure 1. Study Patients According to Degree of Spinal Cord Injury.

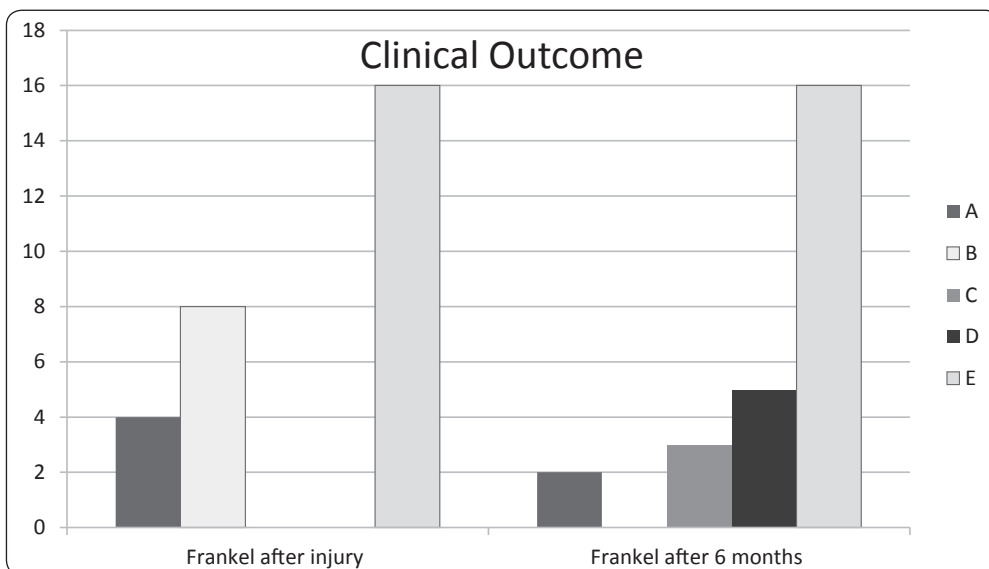


Figure 2. Clinical Outcome According to Frankel Scale.



Figure 3. Showing A: X-ray AP view, B,C: MS CT-scan different formats of the lumbar spine with nail gun injury. He was male patient 28 years, he was neurologically intact (Group A), had history of incidental nail gun injury in the lumbar region opposite transverse process of L4, the patient underwent a surgical exploration and the nail was extracted.

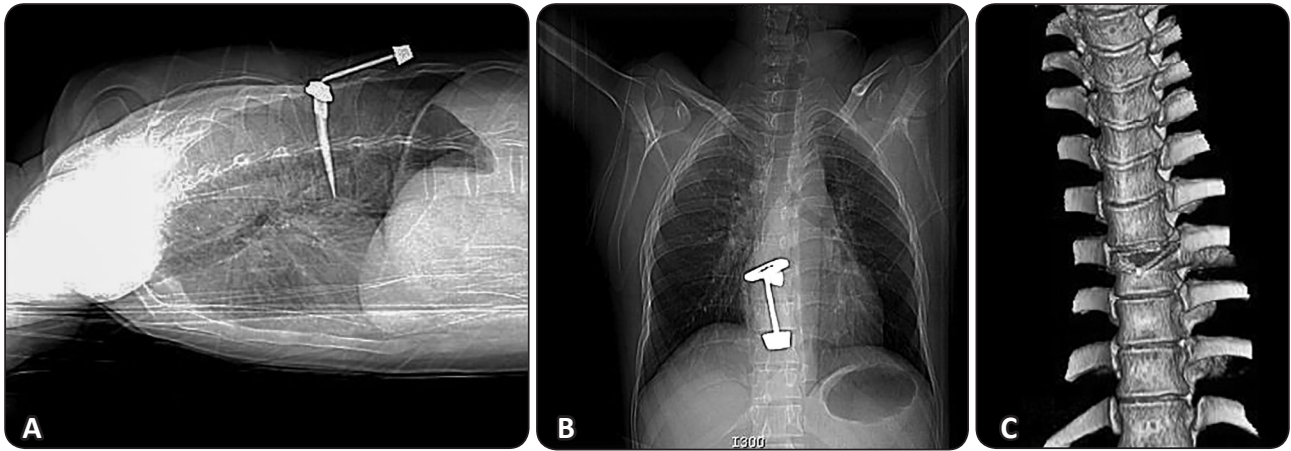


Figure 4. Showing A: lateral, B: X-ray and C: 3D CT-scan dorsal spine stabbed with knife. He was male patient, 26 years had knife stab wound in the dorsal region with incomplete spinal cord injury with paraparesis Frankel (C), Surgical exploration was done and the knife tip was extracted and the patient improved 3 months postoperatively to Frankel (D).

Discussion

The results of our study show that penetrating injuries are more common in young unoccupied males with a mean age of 28.4 years. This correlates to another study in Turkey.¹ The mean age in this study remains lower than other studies and this may be attributed to higher activity in this age group. Gunshot injuries were the most common type of penetrating spinal injuries. The injury to thoracic region carries the risk of injuring the great vessels.

Most of the patients included in this study show no neurological deficit, while another study demonstrated a higher incidence of incomplete spinal cord injury group. None of the complete spinal cord injuries show any improvement which is not correspondent to other studies. There was no CSF leak as the causative tool does not penetrate dura or it may act as a local compressor on the dural opening or wound infection in all patients which is not in line with other studies. The mortality rate was approximately 7%, which is similar to the study done by Saeidiborojeni et al,¹⁰

All our patients in groups II and II showed a varied degree of improvement in their Frankel grading which is inconsistent with a study published by Venger et al,¹⁵ In this study, a majority of the patients were dorsal and lumbar injuries which are similar when compared to other studies. Computed tomography (CT) was the option of choice in diagnosing these cases in contrast to Magnetic Resonance (MR) which was the used imaging modality in other studies. However, MRI was done in groups B and C to evaluate associated cord injuries.

To our experience dealing with nail-gun spinal injuries should be careful with a close exploration at the theater to manage probable complication as a dural tear or neurologic injuries. In our cases we did posterior midline incision, paravertebral muscle dissection, then using the dissector to separate it from the transverse process and extraction with rongeurs.

Results demonstrated that the prognosis is directly related to extent and level of the injury. The higher the level injured, the poorer prognosis would be. While incomplete spinal cord injuries show a favorable prognosis with a predictable course, the complete spinal cord

injuries still have unpredictable course and poor prognosis. No visceral injuries reported in this series comparing to other studies. Further research should be carried out on how to improve prognostic factors in patients with complete spinal cord injury.

Conclusion

The complete and the cervical injuries have the worst prognosis. The dorsal and incomplete spinal injuries have better prognosis. Monitoring and follow up these cases are mandatory to provide the optimum management and to improve the outcome.

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الملخص العربي

الإصابات النافذة للعمود الفقري: سجل الحالات بجامعة سوهاج

البيانات الخلفية: تعد الإصابات النافذة للعمود الفقري من طعنات أو طلقات نارية إصابات - لحسن الحظ - غير منتشرة. قد تكون الإصابة ناتجة عن التأثير المباشر للإصابة أو ناتج ن النزيف الحادث بعد الإصابة أو حدوث قصور في الدورة الدموية للنخاع الشوكي المترتب عن الإصابة أو قد يكون ناتج عن العدوى البكتيرية بعد حدوث الإصابة. تلك الإصابات النافذة قد ينتج عنها حدوث شلل بالأطراف أو فقدان بالإحساس أو عدم تحكم في البول والبراز. طرق العلاج تشمل العلاج التحفظي والتدخل الجراحي على حسب كل حالة. تلك الإصابات لا تؤثر فقط على المريض ولكنها تؤثر بشكل أو باخر على عائلة المريض.

الغرض: تقييم الإصابات النافذة للعمود الفقري وتسجيل البيانات الخاصة لكل المرضى المصابين ومعرفة الحالة الأكلينيكية والأشعات المصاحبة. توقع النتائج للمرضى المصابين بتلك الإصابات على حسب مكان ودرجة الإصابة.

المرضى و الطرق: شملت الدراسة ٢٨ مريضاً مصابون بإصابات نافذة في العمود الفقري ناتجة عن طعنات بآلات حادة أو طلقات نارية في الفترة ما بين مارس ٢٠١٢ و مارس ٢٠١٥ بقسم الطوارئ بمستشفى سوهاج الجامعي. تم أخذ التاريخ المرضي لكل مصاب وتم فحصه بشكل كامل وفحص الجهاز العصبي شاملاً درجة قوة الحركة والإحساس.

النتائج: كان المتوسط العمري للمصابين ٢٨ سنة. اثنا عشر إصابة بالفقرات الصدرية و ١٢ إصابة بالفقرات القطنية وأربع إصابات بالفقرات العنقية. لا توجد حالات عدوى أو التهابات ما بعد الإصابة. ستة عشر إصابة لم يوجد بها إصابة مباشرة للنخاع الشوكي، ٨ مرضى بهم إصابات جزئية للنخاع الشوكي وأربع مرضى بهم قطع كامل للنخاع الشوكي مع عدم القدرة على الحركة أو الإحساس تحت مستوى الإصابة. تم تحسن المرضى المصابون بإصابات جزئية للنخاع الشوكي بصورة كبيرة حسب كل مريض على حدة.

الاستنتاج: تعد الإصابات النافذة للعمود الفقري الناتجة عن طلقات نارية من أخطر تلك الإصابات. القطع الكامل للنخاع الشوكي يحمل نتائج سيئة ولا تحمل تلك الحالات أي تحسن. مكان ودرجة إصابة النخاع الشوكي تحدد بشكل كبير درجة التحسن.