Penetrating spinal injuries, Cases registry in Sohag university hospital

Ahmed Saro[1], Roshdy Elkhayat[2]

Neurosurgery department, faculty of medicine of Sohag[1] and Assuit[2]

Abstract:

Introduction:

Penetrating spinal cord injuries caused by missile or stab wound injuries are uncommon. The harm may be due to the direct injurious effect or the resulting vascular insult either in the form of an intra- or extradural hemorrhage, 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 by the neurosurgeons. Such injuries do not only affect the patient's lifestyle but also influence the whole patient's family.

Aim of the study:

To evaluate the penetrating spinal injuries, report both clinical and radiological characteristics of the patients and assess the course and the prognosis in both complete and incomplete spinal cord injuries.

Patients and methods:

A prospective case series of 28 patients came to the emergency department at Sohag university hospital between March 2012 and January 2016 with a penetrating spinal injury caused by knives, dagger, missile and nail gun injuries. A full history was taken. Complete general and neurological examination including motor power, sensory examination was done using Frankel grading classification.

Results:

The average age was 28.36 ± 5.96 years (range 19-37) with male predominance (78.6%). Our study showed the frequency of the lesions' sites; 12 lumbar, 12 dorsal, and 4 cervical cases. None of the cases showed an infection or cerebrospinal fluid leak. For the degree of spinal cord injury, 16 cases (57.1%) showed no spinal cord injuries, 8 patients (28.6%) showed incomplete spinal cord injuries and 4 patients (14.3%) had complete spinal cord injury with no motor or sensory functions below the level of the injury.

Conclusion:

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.

Keywords: Stab injuries - Penetrating wounds - Neurological deficit - Spinal cord injuries.

Introduction:

Spinal penetrating injuries are scarce. They affect mainly the young and middle-aged males (1). Despite their rarity, they may cause serious complications like motor affection in the form of paraplegia or quadriplegia, 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 the first aid measures and multi-team cooperation as these injuries may be underestimated with hidden serious complications including multi-organ affection. CT and MRI spine are mandatory tools in diagnosing and detecting the level and extent of the injury. Following those patients is mandatory to record any improvement. Physiotherapy plays an influential role in improving the outcome (3).

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

Patients & method:

Patients:

This study included the patients who came to the emergency department at Sohag university hospital between March 2012 and January 2016. A total of 28 cases were included in the study.

Protocol:

Our study is a prospective case series. Patients were evaluated for the two main neurological functions; motor power examination grading from 0 to 5, while the sensory examination was subdivided into two main subtypes, the superficial sensation including pain and temperature while the deep sensation involving sense of vibration and sense of position.

The patients were classified into 3 groups:

- Group A: patients with no spinal cord injuries: 16 patients.
- Group B: patients with partial spinal cord injury: 8 patients.
- Group C: patients with complete spinal cord injuries: 4 patients.

Frankel grading classification system is also used to categorize the extent of function affection.

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

Methods:

All patients underwent advanced trauma life support (ATLS) for ABCDE. Complete general examination was carried out to rule out any associated other injuries. No CSF leak or wound infection was found at the time of presentation. CT spine was done for all the patients in the first 24 hours. MRI on the spinal segment was done for those who had signs of cord injuries. For B & C groups, initial bolus I.V drip injection of methylprednisolone with 30mg/kg followed

after 45 min with 5.4 mg/kg/hour for the next 23 hours. Intravenous analgesia and prophylactic broad spectrum antibiotics that cross the blood brain barrier were given. Patients were 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 January 2016.

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 patients (14 patients) were unemployed. Twelve patients had dorsal injuries (42.9%), 12 patients had lumbar injuries (42.9%) and 4 had cervical injuries (14.2%). Patients with no spinal cord injury (Group A) comprised the largest group with 16 patients (57.1%), while Group B patients were 8 patients (28.6%) (Figure 1)

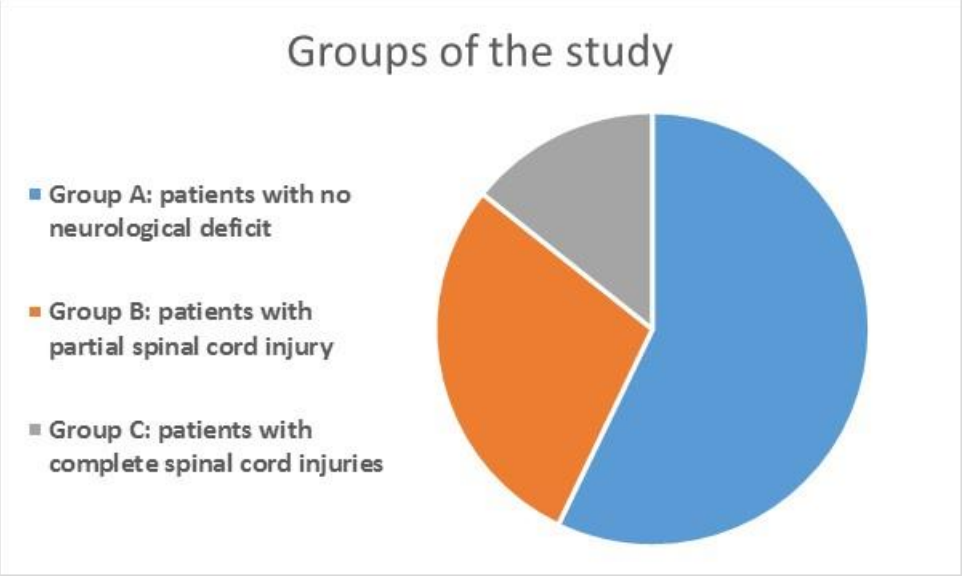


Figure1: Groups of the study

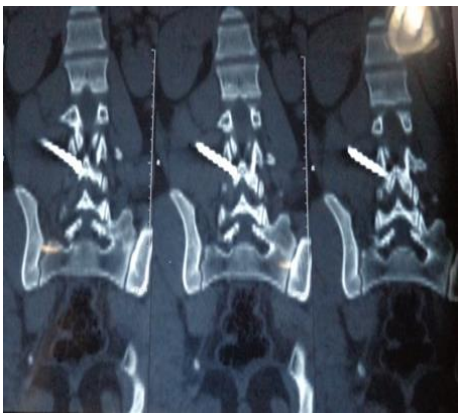
Complete spinal cord injury was reported in 4 patients (14.3%). Out of the 4 cases in group C; two patients died due to respiratory failure with no response to artificial ventilation and medical therapy. In the remaining two cases; no motor or sensory improvement occurred. Patients were still complaining of fecal and urinary incontinence and loss of erectile function. On the other hand, patients with incomplete spinal cord injury (Group B) showed improvement in their Frankel grading. Out of the 8 patients included in group B, five cases moved from Frankel grade B to grade D within 6 months; and three patients showed less amelioration with the change from Frankel grade B to grade C in the same period. Table 2 summarizes epidemiological data of patients.

Table2. Descriptive statistics of the study participants

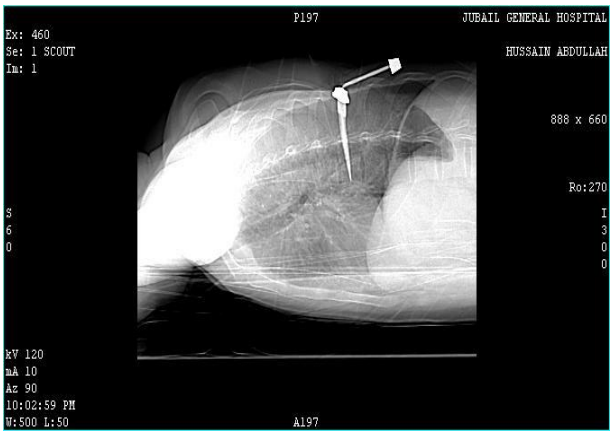
Item			Value
Age (years)	Mean±SD		28.36±5.96
	Median(range)		30(19-37)
Sex	Male n(%)		22(78.6%)
	Female n(%)		6(21.4%)
Marital status	Single		22(78.6%)
	Married		6(21.4%)
Occupation	Unemployed		14(50%)
	Manual worker		9(32.1%)
	Office employee		5(17.9%)
Cause of injury	Assault		24(85.7%)
	Incidental injury		4(14.3%)
Site of injury	Cervical		4(14.3%)
	Dorsal		12(42.9%)
	Lumbar		12(42.9%)
Degree of Injury	A. No spinal cord injury		16(57.1%)
	B. Partial spinal cord injury		8(28.6%)
	C. Complete spinal 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 after 6 months	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%)
Outcome	Improved		24(85.7%)
	Not improved		2(7.1%)
	Died		2(7.1%)

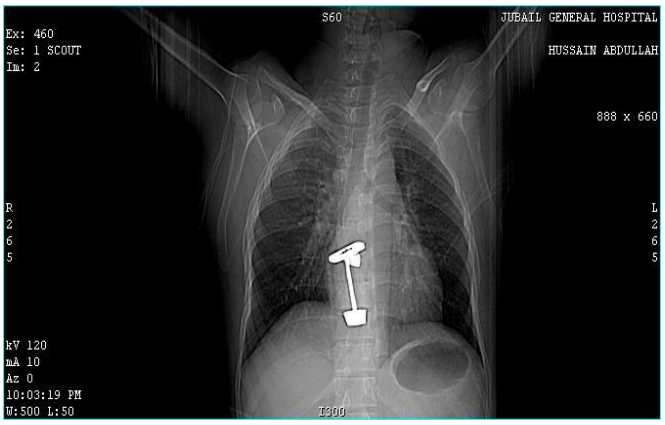
Case1: X ray and CT spine to male patient 28 years, he was neurologically intact (Group A), had history of incidental nail gun injury in the lumbar region opposite transverse process of L4, the patient underwent a surgical exploration and the nail was extracted.

A. **B.** **C.**



Case 2: X ray and CT spine of male patient, 26 years had knife stab wound in the dorsal region with incomplete spinal cord injury (group B) with paraparesis Frankel grade (C), Surgical exploration was done and the knife tip was extracted and the patient improved 3 months postoperatively to Frankel grade (D)





Case 3: A bullet firearm injury opposite D5 to 50 years old male with complete paraplegia and loss of sensation below the level of the lesion (group C), the bullet was extracted and the did not show any improvement.

Discussion:

The results of our study showed that penetrating injuries are more common in young unoccupied males with a mean age (28.36 ± 5.96 years). This correlates to another study in Turkey (1) 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 (2).

Most patients included in this study, showed no neurological deficit, while another study demonstrated a higher incidence of incomplete spinal cord injuries (3). None of the complete spinal cord injuries showed any improvement which is not correspondent to other studies (4, 5). There was no CSF leak or wound infection in all patients which is not in line with other studies (2,6). The mortality rate was approximately 7%, which is similar to the study done by Saeidiborojeni et al (7).

All our patients in groups A and B showed a variable degree of improvement in their Frankel grading which is inconsistent with a study published by Venger et al (5). In this study, a majority of the injuries were in the dorsal and lumbar regions which are similar when compared to other studies (8, 9).

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 (10,11). However, MRI was crucial in groups B and C (12, 13).

To our experience, dealing with nail-gun spinal injuries should be careful with a close exploration at the theater to manage probable complications as a dural tear or neurological injuries. Posterior midline approach is preferred as it allows easy access (8).

Results demonstrated that the prognosis is directly related to the extent and the level of the injury. The higher the level injured, the worse the prognosis would be (14). While incomplete spinal cord injuries showed a favorable prognosis with a predictable course, the complete spinal cord injuries still have unpredictable course and poor prognosis (15). No visceral injuries reported in this series compared to other studies (5,16).

Further research should be carried out on how to improve prognostic factors in patients with complete spinal cord injury.

Conclusion:

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

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الملخص العربي

الاصابات النافذة للعمود الفقري، تسجيل للحالات بمستشفى سوهاج الجامعي

مقدمة البحث:

تعتبر الاصابات النافذة للعمود الفقري من أخطر انواع الاصابات التي تؤثر على حياة المريض ككل وتؤثر أيضا على محيطه الاسري. تلك الاصابات ليست بالكثيرة ولكن قد ينتج عنها شلل بالاطراف أو فقد القدرة على الاحساس او عدم التحكم في وظائف البول والبراز. ان النتائج المترتبة على هذه الاصابات قد تكون من الاصابة نفسها أو نتيجة عدوى في الانسجة المصابة أو ناتجة عن اصابات الاوعية الدموية المحيطة. متابعة المريض بشكل دقيق في العناية المركزة والتدخل الجراحي ان لزم من أهم خطوات العلاج.

الهدف من البحث:

تقييم وسائل العلاج المثلى لحالات الاصابات النافذة بالعمود الفقري واستنباط أفضل العوامل التي ان مورست بشكل صحيح تؤدي لنتيجة افضل والتأكيد على أهمية الادوار المشتركة للتخصصات المختلفة لعلاج مثل تلك الاصابات.

طريقة البحث:

دراسة في قسم الطوارئ بالمستشفى الجامعي بسوهاج في المدة ما بين مارس 2012 و يناير 2016 على 28 مريض مصابون باصابات نافذة في الظهر ناتجة عن طلقات نارية أو طعنات سكاكين أوخناجر. تم أخذ التاريخ المرضي وتم فحص المصاب بشكل كامل كما أنه تم عمل الاختبارات العصبية للمريض التي تشمل درجة الاحساس والحركة.

النتائج:

متوسط السن للمرضى كان 28.3 سنة وكان معظم المصابين من الذكور. الاصابات شملت الفقرات العنقية في أربع حالات والفقرات القطنية في 12 حالة والفقرات الصدرية في 12 حالة. لم تسجل أي حالات عدوى أو تسريب للسائل النخاعي . بالنسبة لدرجة الاصابة فان الاغلبية (16 حالة) كانت لاتشمل على أي صابات بالنخاع الشوكي و8 حالات اصابة جزئية للنخاع الشوكي وأربع حالات اصابة كاملة للنخاع الشوكي.

ملخص البحث:

حالات الاصابات النافذة الناتجة عن طلق ناري تعد أخطر أنواع الاصابات النافذة للعمود الفقري. نسبة التحسن في الاصابات الكاملة للنخاع الشوكي ضئيلة أو منعدمة بالمقارنة بالحالات التي بها اصابات جزئية بالنخاع الشوكي اتي تتحسن بطريقة ملحوظة وبدرجات متفاوتة. تحسن المصاب يعتمد على مستوى الاصابة ودرجة اصابة النخاع الشوكي.