

Management of Penetrating Spinal Cord Injuries in a Non Spinal Centre: Experience at Enugu, Nigeria

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Abstract

Background: Penetrating injuries of the spinal cord are among the most dangerous of injuries. They are often associated with injuries to other vital organs of the body, which may demand priority attention. The objectives of this study were to determine the pattern of the penetrating spinal cord injuries and to evaluate outcome of treatment in our setting.

Methods: This is a retrospective study of all penetrating spinal cord injuries seen at the National Orthopaedic Hospital, Enugu over a fifteen-year period (April 1990 March 2005). Information about the demographics aetiology, level of injury, associated injuries, time of presentation, duration of hospitalization and outcome of treatment were retrieved from patients case notes. Data were analyzed using SPSS for windows version 11.

Result: There were 22 patients, 13 males and 9 females, giving a M:F ratio of 1.7:1. Gunshot injury was the most common aetiological factor. The thoracic spine {9(41%)} was most often involved. Chest and abdominal injuries were common associated injuries in 5 cases. The circumstances of the injury were mostly armed robbery attack {13(59%)}. On admission the neurological status was Frankel grade A in 20(91%) cases. Period of hospitalization ranged from 1 week to 36 weeks with a mean of 11 weeks. Pressure sore was the most common complication that delayed rehabilitation. Five (23%) patients with injury at cervical level died from respiratory failure.

Conclusion: Penetrating spinal cord injuries are relatively rare and demand extra care. Early recognition of associated injuries, minimal wound excision and antibiotic therapy give good result.

Key Words: Penetrating spinal cord injuries, pattern, outcome of treatment, Enugu, Nigeria.

Date accepted for publication 11th March 2008

Nig J Med 2008; 206 - 210

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INTRODUCTION

Penetrating spinal cord injury is often associated with injuries to other vital organs of the body, which may demand priority attention. The management of spinal cord injured patients have been considered the most

depressing and neglected aspect of clinical medicine in our environment¹. Open spinal cord injury is a subset with special considerations; its management is demanding both in terms of specialized manpower and facilities. Inappropriate handling of this delicate injury has grave threat to comfort and survival of the patient². The aetiology of penetrating spinal injury varies from country to country and from culture to culture. Reports from North America indicate that gunshot injury is the commonest aetiological factor. Stabbing is less common except in certain areas of South Africa³. Stab wounds produce greater proportion of incomplete lesion.

The mechanism of injury to the spinal cord following gunshot may be direct or indirect. The direct injury transects the cord and often produces complete lesion, while an indirect injury is frequently as a result of bone fragment driven into the spinal canal. Gunshot injuries of the spinal cord can be classified according to the intraspinal location or trajectory of the missile as follows:

- Missile penetrating the cord,
- Missile lodged intramedullary,
- Missile lodged extramedullary but intradurally,
- Missile lodged extradurally,
- Indirect cord damage⁴.

Experience in the treatment of penetrating spinal injury has evolved from the two world wars. The results of both conservative and operative treatment during the First World War revealed a picture of extreme hopelessness⁴. Only patients with partial lesions survived. This poor outlook continued in the early periods of the Second World War mainly due to the traditional defeatist attitude of clinicians to these victims. However, during the course of the war a fundamental change in the early mortality rate of these patients took place. This turning point was due to a number of factors, among them are⁴: improvement in treatment of haemorrhagic shock, introduction of antibiotic to combat infection, and early admission to Spinal Injury Centres.

There is general agreement that circulatory collapse and any associated life threatening injuries should be given priority attention⁵. As soon as possible an

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adequate wound debridement should be done coupled with systemic antibiotics. Early spinal decompressive laminectomy appears controversial⁶⁻¹⁰. This is based on the philosophy that the greater part of physiological loss is due to damage produced at the moment of injury rather than by subsequent compression. There is however consensus of opinion on the need for decompression if there is progressive neurological deficit.¹¹

Experience has shown that with gathering of spinal patients in spinal units, where experts and facilities exist for comprehensive care, the associated mortality and morbidity can be reduced drastically⁴. Unfortunately, these centres do not exist in Nigeria. Patients with spinal cord injuries are admitted and treated like any other trauma case. The patients are scattered in various wards. Under this scenario patients do not get the specialized attention they require. Therefore the need for specialized teams and establishment of regional spinal cord injury centres cannot be overemphasized.¹

The objectives of this study were to determine the pattern and outcome of the penetrating spinal cord injuries in our setting.

PATIENTS AND METHODS

We reviewed the medical records of all patients with penetrating spinal cord injuries managed at the National Orthopaedic Hospital, Enugu between April 1990 and March 2005. Spinal injured patients with incomplete records were excluded. Information about the demographics, aetiology, level of injury, neurological assessment /status on admission and discharge using Frankel grading, associated injuries, where initial treatment was received, interval between injury and presentation, duration of hospitalization, and outcome of treatment were retrieved. Within the period under review, neither Computerize axial Tomography scan nor Magnetic Resonance Image was readily available. Plain radiographs were the only imaging employed. The management protocol consisted of resuscitation, copious irrigation of the penetrating tract, delayed or secondary wound closure; skeletal stabilization with skull traction for cervical spine and hyperextension jacket for thoracolumbar segment. Antibiotic therapy was instituted in each case. Thoracotomy or laparotomy was done for those with associated thoracic or abdominal injuries. Graded physiotherapy was started from admission. The outcome of treatment was defined as mobility status at discharge and can either be walking, walking with aid, wheelchair bound or dead.

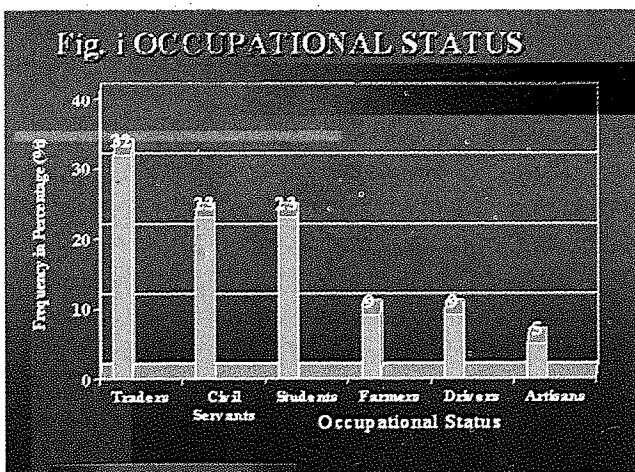
Data were analyzed using SPSS for windows version 11. The result is presented in form of tables and figures.

RESULTS

Over a fifteen year period, 450 spinal cord injured patients were managed and twenty-two were penetrating spinal cord injuries- an incidence of 0.7 per 30 patients per annum or 4.9%. Thirteen were males and nine were females giving a ratio of 1.7:1 .The mean age was 35.0±4.7 years with a range of 18-65years (Table 1). They were mostly traders (retailers) (Figure 1). Most patients (17) were received from private hospitals after a mean duration of 7 days. Three other patients were referred from Federal Medical Centres. Only two came to our centre straight from the scene of accident. Most patients were transferred from the accident scene to primary care centres and subsequently to our centre without any form of spinal support. Two patients were conveyed by motorbike.

Table I: Age distribution

Range (years)	Frequency(n)	Percentage (%)
0-10	0	0
11-20	1	4.5
21-30	8	36.4
31-40	7	31.8
41-50	3	13.6
51-60	1	4.5
61-70	2	9.1
Total	22	100



Low velocity gunshot injury (double barrel) was the most common type of injury (Table II). The circumstances of their injury were mostly armed robbery related (Table III). The thoracic spine was involved in 9 cases, lumbar

spine in 7 cases, and the cervical spine in 6 cases. Twenty patients had complete injury (Frankel A) on admission (Table IV). Five patients had associated injuries- 3 abdominal and 2 thoracic injuries that required immediate surgical intervention.

The primary wounds were closed by either delayed primary closure or secondary wound closure. The period of hospitalization ranged from 1 week to 36 weeks with a mean of 11 ± 3.6 weeks.

Seventeen patients developed complications while on treatment. Urinary tract infection was the most common complication but pressure sores was more significant in delaying rehabilitation and eventual discharge (Table V). None of our patients developed Cerebrospinal fluid fistula, meningitis or vertebral abscesses. Five of our patients with injury above C5 requiring ventilatory support died, giving a mortality rate of 23%. On discharge, ten of the cases were wheelchair bound while 5 walked with an aid (Table VI). Twelve patients are still on follow up for a variable duration of 2-6 years.

Table II: AETIOLOGICAL AGENTS

Type	Total	Frequency(N)	Percentage(%)
Gunshot injuries		20	91
1. Double barrel =	14		
2. Rifle =	6		
Matchet cut		1	4.5
Stab wound		1	4.5
Total		22	100

Table III: Circumstances of injury

	Frequency (n)	Percentage
Armed robbery attack	13	59.1
Police accidental discharge	2	9.1
Stray bullet(unidentified source)	4	18.2
Chieftaincy tussle	1	4.5
Communal clash	2	9.1
Total	22	100

Table IV: Neurological status on admission.(Frankel grading)

Type	Frequency (n)	Percentage
Grade A	20	90.9
Grade B	1	4.5
Grade E	1	4.5
Total	22	100

Table V. COMPLICATIONS

Range	Frequency	Percentage
Urinary tract infection	11	50.0
Pressure sores	7	31.8
Depression	3	13.6
Pneumonia	1	4.5
Total	22	100

Table VI. OUTCOME OF TREATMENT

Outcome	Frequency	Percentage
Walk without support	2	9.1
Walk with aid	5	22.7
Wheelchair bound	10	45.4
Dead	5	22.7
Total	22	100

DISCUSSION

In civil setting, gunshot injury is the third most common cause of spinal cord injuries.^{12,13} However when penetrating injuries to the spine are pooled together, gunshot injury ranks highest except in certain parts of South Africa where stab wounds are the commonest cause of penetrating cord injuries^{3,14}. Civilian gunshot wound of the spine, in contrast to military wounds, are usually as a result of low-velocity missiles^{12,13,15}.

In our study, low velocity missiles (double barrel) were the commonest aetiological factor. This is in agreement with the work done in New York USA^{12,15}. However, in our setting, the circumstances surrounding these gunshot wounds were armed banditry, urban violence, student cultism, communal and boundary disputes. Of interest is the fact that six of our cases were due to high caliber guns. This reflects the state of insecurity in the land.

There are a number of legislations on arm control in our setting but enforcement has always been the problem.

Stab wounds often produce incomplete injury.¹⁶ Stab wound producing spinal cord injury may be as a result of generalized stabbing but in some cases they are deliberately inflicted to produce paralysis. The two cases in this study were intentional injuries. The first case was an undergraduate who was assaulted by a cult group. He received a cut at back of his neck which left him partially paralyzed. The second patient was stabbed in the anterior triangle of the neck by a street urchin. He developed the Brown-Sequard like syndrome. These types of cord injuries are commoner in South Africa, often inflicted by the gang of young Bantus called "zossies"^{3,4} the equivalent of our "Odua Peoples Congress (OPC)", "Egbesu boys", "Bakassi boys" and the "Hisbah".

Most of our patients were under forty years of age. This group is most commonly affected in trauma. Most of them were business people. It is quite common in our environment for people to carry huge sums of money on business trip. This predisposes to armed robbery attack. The affected students were either secret cult members or innocent student caught in crossfire between rival cult groups, a situation which is very rampant in our institutions of higher learning.

Nigeria is a country with great land mass. The health facilities are poorly developed and far in between. Pre hospital care does not exist. Accident victims are scooped from the scene by either relatives or passer-by to the nearest health facility by any means of transportation. This accounted for the delay in presentation. For spinal injury of whatever cause the mode of transportation have significant bearing on the outcome of these patients. It is interesting to report that two of our patients were transferred to our centre as pillion passengers on motor bike.

Most of the patients (20) received first aid treatment in peripheral hospitals and subsequently transferred to our centre over a variable time period without any form of spinal support. All those who were so transferred had the worst neurological status both on admission and half of them remained so on discharge. It has been shown that survival and eventual neurological recovery depend upon the skills of health professionals who delivered the initial care¹⁷. A misadventure will convert incomplete to a complete lesion. Major trauma outcome study shows that the education and training of the general practitioner is a key success factor in improving outcome from rural trauma¹⁷.

The predominance of thoracic spine as the most common level is consistent with similar studies in North America^{12,15,18} and India¹⁹. Associated injuries to the neck, chest, or abdomen are found in approximately one-quarter of all civilians with penetrating spinal cord or cauda equina injuries⁸. This was similarly observed in this study.

While the value of and indications for general surgical exploration and repair of these associated injuries are fairly self-evident, the value of neurosurgical intervention

in terms of neurological outcome and infection prophylaxis remains the subject of debate⁸. The treatment principles from wartime experience with gunshot wounds (GSWs) of the spine consisted of complete debridement of the missile tract, dural grafting to prevent cerebrospinal fluid fistulas; visual assessment of gross cord injury to determine subsequent prognosis and surgical decompression of the spinal cord¹¹. This protocol was subsequently challenged by reports dealing with civilian GSWs of the spine^{11,20-23}. Heiden et al noted that neurologic outcome was unaffected by surgical therapy in complete and incomplete neurologic lesions¹¹. In our study, the treatment protocol was conservative and the outcome of treatment was good, and similar to other studies from organized spinal centres^{11,24}. The associated injuries to the chest and abdomen were the only indications for surgical intervention in our setting.

The management of penetrating SCI requires a multidisciplinary approach, which must be properly coordinated and supervised⁴. Seventeen of these patients developed complications. Pressure sore and urinary tract infection were the most common complications. Pressure sore is measure of the inadequacy of nursing care²⁵; its development creates a big problem for the patient as it delays rehabilitation and prolongs hospitalization.¹ None of the patients developed CSF fistula, uncontrolled fulminant meningitis and septicaemia, or disc space infection. These complications have been shown to occur more in operated patients^{20,23,24}. We recorded five deaths; resulting from respiratory failure in patients with cervical spine injuries. Some of the deaths may have been prevented in a proper setting with facilities for ventilatory support.

CONCLUSION

Penetrating spinal cord injuries demands extra care. Early recognition of associated injuries is very important for patient's survival. The conservative approach consisting of minimal wound excision, copious irrigation of the missile track and antibiotic therapy and early skeletal stabilization give good results. However, a prospective study is proposed that would allow better control of the variables affecting outcome.

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