

# Spinal cord injuries due to close combat weapons

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## ABSTRACT

تم الهجوم على مريض يبلغ من العمر 17 عاماً بقوة وطعن في المنطقة الظهرية من ظهره بواسطة سكين. وقد أدخل إلى غرفة الطوارئ في مستشفى حمود المركز الطبي الجامعي وهو يرقد في وضعية الانبطاح. أظهر الفحص العصبي أن السكين كانت ثابتة على مستوى العمود الفقري الظهرى T-7، حيث تم إدراجها داخل الجسم الفقري. لحسن الحظ، كان النصل من السكين موازي للمسالك العصبية في النخاع الشوكي وبالتالي لم يظهر أي عجز عصبي. يستعرض هذا التقرير لمحة عامة عن كيفية تطبيق مبادئ جراحة الأعصاب و العمود الفقري لمرضى يعانون من إصابات العمود الفقري جراء الصدمة بسبب الأسلحة البيضاء.

A 17-year-old patient was aggressively attacked and stabbed in the dorsal region of his back by a knife. He was admitted to the emergency room of the Hammoud Hospital University Medical Center, Saida, Lebanon lying in the prone position. The neurological examination revealed that the stabbing object was fixed at the dorsal spine level at the T-7 level, where it was inserted inside the vertebral body. Luckily, the blade of the knife was parallel to the nervous tracts of the spinal cord; thus, he showed no neurological deficits. This case provides an overview of how neurosurgical principles can be applied to trauma patients with spine injuries due to close combat weapons.

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Spinal cord injuries may result in devastating medical and social consequences for patients and their families.<sup>1</sup> Open spine injuries resulting from penetrating traumatic armor such as knives, targets the spinal canal or spinal cord. Delayed or inappropriate treatment of these severe injuries may lead to serious CNS infections. Penetrating injuries such as stab wounds may affect the integrity of the spine and spinal cord and also involve other organs or important structures. Primary aims in the management of penetrating spine injuries are the optimal management of the spine and spinal cord injury, and the management of associated vascular and musculoskeletal injuries, which may themselves be life-threatening.<sup>2</sup> Knives, ice-picks, bicycle spokes, glass fragments, and screw drivers are the common weapons used. The attacker may withdraw the weapon, but occasionally it is left in or near the spinal canal and acts as a foreign body and a stimulus for infection. These patients are usually young males involved in robbery, violence, or revenge.<sup>3</sup> Our objective in presenting this particular case is to provide an overview of how neurosurgical principles can be applied to trauma patients with spine injuries due to close combat weapons.

**Case Report.** A 17-year-old patient was aggressively attacked and stabbed in the dorsal region of his back by a knife. He was admitted to the emergency room of the Hammoud Hospital University Medical Center, Saida, Lebanon lying in the prone position. Initially, when still exploring his injury, he could still move his legs. This prompted caution in treating, moving, and performing anesthesia. In addition, the neuro-radiological studies were performed inside the emergency room and not at the hospital's radiology center. The neurological examination revealed that the stabbing blade was fixed at the dorsal spine level at the T-7 level, where it was inserted inside the vertebral body. Luckily, the

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blade of the knife was parallel to the nervous tracts of the spinal cord (**Figure 1**). Blood and CSF were observed coming out of the wounded area (**Figure 2**). He was then transferred to the operating room. The optimal administration of anesthesia was discussed, and intubation in the supine position was rejected. Also, the suggestion of directly removing the knife from the patient's back was also rejected. We decided to place the patient in the prone position and not to remove the knife. At the beginning of the procedure we applied Ceftriaxone (Rocephin; Roche, Nutley, New Jersey, USA) to avoid infections. We started the surgery with an incision in the dorsal region. We separated the muscular layers by stretching at the T6-T7 level

with the knife kept intact. We continued incising and separating, until we found that the knife had penetrated the thoracic canal and had cut the lateral part of the dura. The tip of the knife was also inserted in the 7th vertebral body and touching the spinal cord. During the operation, we decided against using a monopolar for coagulation as it may cause burns and lesions in the spinal cord. Hence, we used a bipolar, which is less aggressive in the process. When we were sure that we had reached the tip of the knife, we removed it completely (**Figure 3**). Finally, the hemorrhage stopped and the dura was reconstructed. Post-surgery, he underwent treatment with antibiotics (Ceftriaxone) for a period of 10 days as an inpatient. After discharge, he continued



**Figure 1** - A sequence of the patient's CT scans showing the penetrating foreign body (knife) in the posterior subcutaneous thoracic soft tissues crossing the posterior elements of T6 and T7 vertebrae as well as crossing the thoracic canal and abutting the posterior one third of the T7 vertebral body. The arrows point to the penetrating blade.



**Figure 2** - Cerebrospinal fluid, blood, and other bodily fluids coming out of the wound made by the stabbing knife, while the patient is placed in the prone position.



**Figure 3** - The knife after removal from the patient's back.

his treatment for a further 2 weeks using Clindamycin (Dalacin C 300 mg; Pharmacia, Stockholm, Sweden) and a second-generation fluoroquinolone antibacterial (Cipro; Bayer HealthCare Pharmaceuticals, Montville, New Jersey, USA). His condition improved, and he made a full recovery.

**Discussion.** The World Health Organization (WHO) defines spinal cord injuries as any damage to the spinal cord that results in a partial or complete impairment of the spinal performance including sensory, motor, autonomic, and reflex functions completely or incompletely.<sup>4</sup> Penetrating spinal cord injuries cause sensory, motor, and genitourinary system problems or a combination of sensorimotor dysfunctions. These injuries are among the most debilitating conditions and negatively affect quality of life; not only for the patient but also for their family members.<sup>5,6</sup> This type of injury is observed mostly in young people and has an important role in diminishing life expectancy.<sup>7,8</sup>

Attacks with close combat weaponry are repetitive incidents in unemployed and poor socioeconomic areas. We notice that most medical mistakes take place in small rural hospitals or local health units. The possibility of healthcare professionals in such institutions making fast decisions and directly removing the knife or any other sharp instrument without analysis and interpretation of the possible consequences can be costly. Very few similar cases have been reported in the medical literature. Penetrating spinal injury with CSF leakage without neurological deficit is extremely rare.<sup>9</sup> They are usually an uncommon injury and not reported very frequently.<sup>10</sup> Recently, one case was reported in Turkey whereby lumbar CSF leakage caused by knife injury was treated with surgery without neurological deficit.<sup>9</sup> We recommend that each case is studied on its own. In our case, directly removing the knife from the patient's dorsal region would have led to a hemorrhage inside the thoracic canal. This resulting hemorrhage would have pressurized the dorsal region of the spinal cord and caused edema. This could result in an irreversible

motor-sensory lesion. Therefore, we decided to perform general anesthesia in the prone position and to carry out the surgery after washing and purifying both the place of the cut and the intact knife itself using Betadine as a disinfectant.

In conclusion, it is not always advisable to remove the agent pre-surgery in penetrating spinal cord injuries. We recommend that injuries are studied separately to avoid hemorrhage, edema, or any irreversible lesions. In the absence of neurological deficits, caution should be maintained to avoid complications and using antibiotics pre and post-surgery is necessary to avoid infections.

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