

Brown-Séquard Syndrome Due to Firearm Injury in the Upper Cervical Region: Case Report

Üst Servikal Bölgede Ateşli Silah Yaralanmasına Bağlı Gelişen Brown-Séquard Sendromu

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ABSTRACT Brown-Séquard Syndrome (BSS) is damage of the left or right half of the spinal cord along one or a few of segments. Vibration, positional loss of sense, and weakness due to involvement of the upper motor neuron are seen at the side of lesion level, and loss of sense of pain and heat is at the opposite side. Although penetrant spinal injuries due to penetrating stabs are among the most possible causes of BSS, BSS developing due to firearms injuries in the upper cervical region has been encountered only in one case in the literature. In this article, a 35-year-old case, in whom a shrapnel piece entered into the space of C1-C2 laminae due to firearm injury during Syrian civil war and damaged the left side of the spinal cord, who demonstrates characteristic clinical features of BSS and was treated medically, was presented.

Key Words: Brown-Séquard Syndrome; cervical vertebrae; firearms;
spinal injuries

ÖZET Brown-Séquard Sendromu (BSS), omuriliğin sağ veya sol yarısının bir ya da birkaç segment boyunca hasara uğramasıdır. Lezyon seviyesi tarafında vibrasyon, pozisyon duyu kaybı ve üst motor nöron tutulumuna bağlı kuvvetsizlik, karşı tarafta ise ağrı ve ısı duyu kaybı görülür. BSS'nin en olası nedenleri arasında kesici ve delici aletlere bağlı penetran spinal yaralanmalar olmakla birlikte üst servikal bölgede ateşli silah yaralanmasına bağlı olarak gelişen BSS'ye literatürde sadece bir olguda rastlanmıştır. Bu makalede Suriye iç savaşı sırasında ateşli silah yaralanması sonucunda bir şarapnel parçasının C1-C2 laminer aralığından girerek spinal kordun sol yarısında hasara neden olan, BSS'nin karakteristik klinik özelliklerini gösteren ve medikal olarak tedavi edilen 35 yaşında bir olgu sunulmuştur.

Anahtar Kelimeler: Brown-Séquard Sendromu; servikal vertebra; ateşli silahlar;
omurilik yaralanmaları

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The Brown-Séquard Syndrome (BSS) is a rare syndrome and most commonly caused by penetrating trauma such as a firearm injury or stab wound to the spinal cord. BSS probably account for about 2-4% of all traumatic spinal cord injuries.¹ Injuries to the thoracic region of the spine are the most common, followed by the thoracolumbar region and the cervical spine.²⁻⁴ A majority of spinal firearm injuries are caused by attack with handguns. In direct proportional to length of each segment, the dis-

tribution has been reported 19-37% in the cervical region, 48-64% in the thoracic region and 10-29% in the lumbosacral region.⁵ Spinal cord may be damaged because of transection and contusion of the spinal cord or ischemia due to vascular injury.⁶ While spinal cord injury due to civilian gunshot wounds to the spine are primarily due to direct injury from the bullet, military weapons which may create injury from shock waves and cavitation.⁵ In the literature few cases with BSS caused by firearm injury in the craniovertebral region has been reported previously.⁷⁻⁹

CASE REPORT

A 35-year-old man had been injured in the Syria's civil war. The patient has been admitted 3 days after trauma to our clinic in Turkey. The patient was fully conscious and oriented. Muscle tone and deep tendon reflexes were reduced on the left side. Neurological examination revealed 2/5 left arm weakness, 1/5 left leg weakness and numbness in the left side of body. Right sided motor function was normal. On the right side, the patient had a loss of pain and temperature sensation below the level of C2-C3 dermatomas. Physical examination revealed crusted wound on the face and scalp and an entry wound in the left side of neck. There was no cerebrospinal fluid leakage from the wound. Computed Tomography (CT) of the cervical spine revealed one shrapnel fragment in the left side of spinal canal near the lateral mass of C1 (Figure 1). As the ferromagnetic property of the shrapnel fragment was not known, magnetic resonance imaging (MRI) for assessment of the spinal cord injury was not possible. Our case were treated medically with antibiotics and analgesic drugs. Upon admission to rehabilitation, 3 months after the injury, neurological examination revealed 4/5 weakness in the left extremities. However, because the patient is foreign national, he did not respond to correspondences, and his next follow-up was unavailable.

DISCUSSION

BSS was first described as a clinical entity by Charles-Eduard Brown-Séquard in 1849 after a



FIGURE 1: This axial image of CT shows metallic fragment located in the left side of spinal canal near the lateral mass of C1.

traumatic hemisection of the spinal cord as a result of stab injury. The syndrome is comprised of ipsilateral loss of motor function and tactile discrimination, vibratory and position sensation with contralateral loss of pain and temperature sensation below the level of the lesion.¹⁰ BSS is characterized by injury of the spinal cord with disruption of the descending lateral corticospinal tracts resulting in ipsilateral hemiplegia, and damage of the ascending lateral spinothalamic tracts (which cross within one or two levels of the dorsal root entrance) resulting in contralateral loss of pain and temperature. Damage to the dorsal columns results in ipsilateral loss of proprioception and light touch below the level of the lesion.²

Penetrating firearm injuries of the spine are one of the major problems of neurosurgery. This type of injuries is common in war, but may also be seen in civilian life. On the other hand, non-missile injuries are seen in civil life with objects like knives, wooden material, screw drivers and other multitude of materials, and pose similar treatment challenges.¹¹ Cervical and thoracic spine is usually the most commonly affected region. Firearm injuries to atlanto-axial spine are rare. Only few cases have been reported in the literature.⁷⁻⁹

After a firearm injury, spinal cord defect occurs as a result of direct damage by the bullet nucleus or metallic particles or as a result of

compression by the broken bone particles. The bullet causes damage by directly destroying the tissues in the path as well as by creating pressure waves, temporary cavitation and thermal injury.¹¹

Firearm injuries of the cervical spine may cause suddenly death, quadriplegia or cruciate paralysis.^{7,12,13} In the case of our patient, after the firearm injury the shrapnel piece was lodged in the spinal canal in the C1 level. There were no defects of bony tissues.

Surgical treatment is not always required in spinal firearm injuries. The indications for surgical intervention are usually progressive neurological deficits, persistent cerebrospinal (CSF) leaks, incomplete neurological deficits with radiographic evidence of neural compression (especially in the cervical spine and cauda equina).^{5,7,8,14-16}

After spinal firearm injury, occasionally retained bullet is responsible for secondary neurological problems, late infection or lead toxicity and it should be removed.¹⁷ Kupcha et al. advised selective wound management and observation of retained intracanal bullet fragments in patients with complete spinal cord lesion due to firearm

injury. Surgical decompression after this injury is not recommended.¹⁸

In some of retrospective studies, methyl prednisolon has not been suggested because it was not useful in firearm injuries of the spinal cord.^{14,19} Because of conditions such as finding of infection, CSF leakage, instability and neurological deterioration have not been observed in our case, prophylactic antibiotic and analgesic therapy has been applied.

BSS has a good prognosis doing better than other forms of incomplete spinal cord injury. While pathogenesis of spinal cord injury in BSS due to blunt trauma depends upon vascular compromise, compression of bone, disc or epidural hematoma compression or longitudinal strain of the cord, prognosis and healing in patients usually are better than penetrant injuries.^{1,2} Approximately 90% of patients regain anal and urinary sphincter control and motor function with the ability to ambulate.^{1,5,7} In our case, a significant neurological recovery has been determined in the control after physical therapy and rehabilitation program.

The purpose of this case report is to discuss the BSS due to firearm injury with a shrapnel piece in the cervical spinal canal at C1 level.

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