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Case Report

Acute traumatic brachial plexus injury: A case report

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Abstract

While open injuries affecting the brachial plexus are relatively rare, they can result in lasting disability and, if accompanied by vascular damage, pose a potential life-threatening situation. This case report highlights an instance of acute traumatic brachial plexus injury where the urgency of the situation necessitated immediate surgery without the opportunity for diagnostic examinations. A case involving a male aged thirty-three-year-old, who experienced a stabbing injury to the right shoulder, resulting in an inability to move his right upper limb, was documented. On physical examination a stab wound of 4 x 6 cm below the mid of right clavicle without active bleeding at the wound site. We observed that Tinel's sign, Horner's sign was absent whereas distal pulses were present. The muscle power in the elbow, wrist and fingers was zero and no sensation in C6 / C7 / C8 / T1. We performed direct repair of the lateral/medial and the posterior cords with 7-0 optilene, augmented with fibrin glue and matriderm. The clavicle was stabilized with a 6-holed plate and the patient's shoulder was immobilized with a cervical collar for 3 weeks. As the patient was an expatriate, the prompt intervention that resulted in direct repair proved to be beneficial. The patient exhibited a favourable functional outcome, without encountering complications of scarring or grafting in late surgeries.

This case report serves to emphasize the significance of having a thorough understanding of the anatomical aspects of the brachial plexus in emergency situations.

Keywords: Stab wound, Brachial plexus, Trauma, Acute.

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1. Introduction

The brachial plexus is a complex network of nerves responsible for controlling movement and sensation in the arms and hands. BPI (Brachial plexus injury) is considered one of the most severe injuries from the patient's perspective.[1] A brachial plexus injury effectively incapacitates the function in one, and rarely both, upper limbs, resulting in a substantial loss of functionality as well as the capability to perform daily tasks. This impairment can impact one's professional life, potentially leading to unemployment, emotional challenges such as depression and economic hardship. In rare cases, it may even give rise to suicidal urges. A traumatic brachial plexus injury occurs due to sudden damage to the nerves in this network and can result in weakness, loss of sensation, or loss of movement in the arm, shoulder, or hand. The majority of these injuries happen when there is a forceful pulling or stretching of the arm.[2] Injuries to the brachial plexus can be caused by various events, involving motor vehicle collisions, falls, gunshot and knife wounds, with motorcycle collisions being the most common cause.[3] Brachial plexus injuries exhibit a wide range of severity, contingent on the injury type and the extent of force applied. In avulsion, the most severe brachial plexus injury form, the nerve root is torn away from the spinal cord. Such injuries may be challenging to repair through surgery. Neuropraxia, involving mild nerve stretching, might heal on its own or with simple nonsurgical treatments to return to normal functioning. Rupture occurs with a more forceful stretch, causing partial or complete tearing of the nerve. Surgery is sometimes a viable option for repairing these types of injuries.[3,4] Usually BPI is notified in a chronic situation, although its occurrence can be also seen in the acute stage due to the displacement of bony fragments.

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The primary indicators of brachial plexus injury often involve weakened or numbed sensations, a reduction in feeling, impaired mobility (paralysis), and the presence of pain. Moreover, certain patients exhibit distinct indications aiding in pinpointing the nerve injury location. Constricted eye pupils, eyelid drooping, and the inability of facial sweating (Horner's syndrome) signal proximity to the spinal cord. Meanwhile, experiencing shooting nerve-like pain upon the doctor's tapping along the affected nerves (Tinel sign) indicates and damage further away from the spinal cord. Over time, if the Tinel sign progresses down the arm toward the hand, it signifies a positive indication that the injury is undergoing the process of repair.[5]

Commonly employed imaging tests include x-rays, which provide clear images of dense structures such as bones. x-rays of the chest, neck, arm and shoulder are conducted to eliminate the possibility of associated fractures. Additionally, a CT (Computed Tomography) scan is deemed to be the most dependable method to detect injuries relating to spinal nerve avulsion. An Electrodiagnostic study holds significance as well. These tests gauge muscle signals and nerve conduction, serving as crucial assessment tools. They play a vital role in confirming the diagnosis, pinpointing the location of the nerve injury, determining its severity, and evaluating the nerve recovery rate.[6] Numerous brachial plexus injuries exhibit spontaneous recovery without the need for surgery, particularly in mild cases, occurring over weeks to months. Naturally healing nerve injuries often result in more favorable functional outcomes. However, surgical intervention is generally advised when spontaneous recovery is insufficient or fails to restore essential function to the hand and arm it is crucial to recognize that, depending on the severity of the damage, surgery might not fully restore the hand or arm to its pre-injury capabilities.[3,7] It is therefore vital that this very valuable segment of our population is functionally restored as early as possible to the best of our ability. Given advancements in hand and microsurgery techniques, achieving significant restoration is indeed feasible, especially when patients receive timely treatment. There are techniques available for late referrals too, but early commencement of treatment makes a huge difference to the eventual outcome. Due to the scarcity of documented cases, this research study describes an instance of traumatic brachial plexus injury in the right upper extremity of an adult, leading to flail limb.

2. Case Report

A male aged thirty-three-year-old experienced an inability to move his right upper extremity; he had an alleged history of an assault sustaining a stab injury at the right shoulder region. During the examination, it was observed that there was a stab wound measuring 4 x 6 cm below the midpoint of the right clavicle bone, and no active bleeding was noted. Tinel's sign and Horner's sign were absent and distal pulses were felt. Supraspinatus function was evident, and there were slight flicker movements observed in the deltoid, accompanied by mild shoulder shrugging. However, there was complete muscle power loss in the wrist, elbow, and fingers i.e., and the sensory examination also showed C5 dermatome with mild sensation and absent sensation in C6 / C7 / C8 / T1. Intraoperative findings showed the distal cut end of the plexus noted in the infraclavicular region. Clavicle osteotomy is not routinely performed. However, it was needed as the injury was exactly at the cord behind the clavicle.[8] On further exploration, it was found that complete cut in the lateral/medial and posterior cords. Later we performed direct repair of the lateral/medial and the posterior cords with 7-0 optilene, augmented with fibrin glue and matriderm. The clavicle was stabilized with a 6-holed plate. The patient's shoulder was immobilized with a cervical collar for 3 weeks. The operation was performed without complication. (**Table 1** and **Figure 1**)

Table 1: Physical examination indicating absence of muscle power in the right extremity, described as zero (flail limb)

Nerve	Movement	Right	Left
C5	Shoulder Abduction	0	5
C6	Elbow Flexion Wrist Extension	0	5
C7	Elbow Flexion Wrist extension	0	5
C8	Finger Flexion	0	5
T1	Finger Abduction	0	5

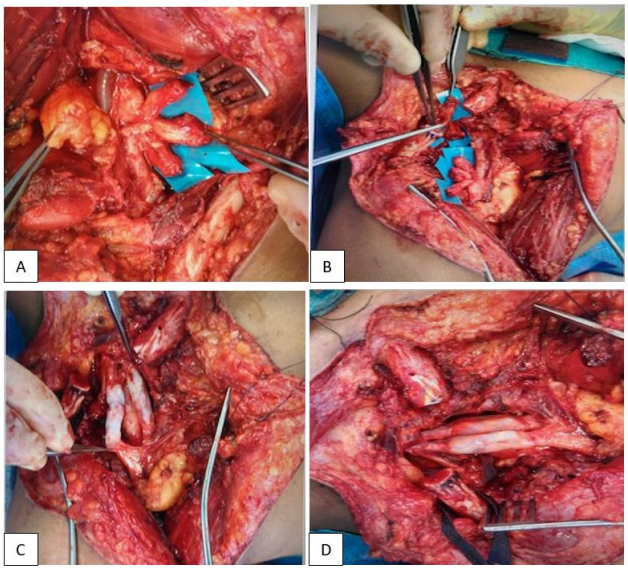

Figure 1: **a):** Proximal cut ends of the cords; **b)**: Distal cut ends of the cords; **c)**: Repair and augmentation with fibrin glue, lateral and the medial cords; **d)**: Final repair of the cords with fibrin glue augmentation

The immediate exploration and direct repair of the patient resulted in a better prognosis compared to late exploration that often requires grafting. This highlights the benefits of prompt intervention and direct repair.

3. Discussion

The severity of brachial plexus injuries varies significantly, influenced by factors such as the injury type and the force applied to the avulsed plexus; in this most severe brachial plexus injury, the nerve root has been torn from the spinal cord. The most common symptoms of brachial plexus injury include weakness or numbness, loss of sensation, loss of movement (paralysis), and pain. Neurologic symptoms are mainly described after trauma with high kinetic energy, as it causes important displacement of the bony fragments, but can also occur due to the high force of impact.[9] In our case involving a thirty-three-year-old individual, the patient exhibited an inability to move the upper right extremity, signifying paralysis, as corroborated by the physical examination, which revealed a motor power of zero. Further direct repair of the lateral/medial and posterior cords with 7-0 optilene, augmented with fibrin glue and matriderm. The patient's shoulder was immobilized for 3 weeks with a cervical collar. According to the observations made in our case, early surgical treatment was very effective. It allowed our patient to obtain immediate control of his preoperative pain and an excellent neurologic recovery. Due to the direct repair which provide an optimal outcome and good prognosis in cases of acute traumatic brachial plexus injury.

The time of onset of symptoms in the acute phase has sparsely been described.[1,11] In 1965, Howard and Shafer[12] reported 4 cases of immediate or progressive acute numbness, paresthesia, and/or weakness due to compression by a middle-third clavicle fracture. Surgical findings and radiographs indicated that the downward and posteriorly displaced lateral fragment led to compression on the brachial plexus. However, during that period, radiologic and medical capabilities were less advanced. Two instances underwent treatment involving open reduction as well as a Steinmann pin, resulting in complete neurologic recovery at six months. Another case, which involved clavicle excision at two months, exhibited motor regeneration over a twelve-month period. The final case was managed conservatively due to a six-week delay in presentation, achieving complete neurologic recovery at six months; however, because of shoulder-hand syndrome the case became complicated. Diagnosing brachial plexus injuries resulting from clavicle fractures can be challenging in the acute stage, primarily due to the pain induced by the fractures. A meticulous initial clinical assessment is needed to obtain the patient’s baseline neurologic state. Prompt identification of neurological deficits, or any deterioration in their condition, is crucial. This is essential to facilitate early surgical intervention, as it enhances the likelihood of achieving improved neurological recovery.[13,14]

Recent advancements offer hope for the restoration of elbow and shoulder movement, especially in cases of partial injuries. However, outcomes are less favourable for nerves that control forearm and hand muscles. In instances of partial hand paralysis, function may be enhanced through tendon transfer procedures.[15] Regrettably, there is a rising incidence of traumatic brachial plexus injuries, resulting in substantial challenges to the affected patients' quality of life. Conservative treatment can assist in managing pain and the preservation of some motion or functionality. Recent technical and scientific progress has markedly heightened the significance of direct surgical interventions like nerve grafting, neurolysis, and nerve transfer. These procedures, when combined with methods such as arthrodesis, functioning-free muscle transplantation, or tendon transfer, hold the potential to enhance functionality of muscle to varying degrees.[16]

4. Conclusion

A comprehensive clinical assessment, encompassing both neurologic and orthopaedic aspects, is imperative for patients suffering from brachial plexus injury. Regular reassessment is crucial to monitor the progression of neurologic deficits, allowing for the timely initiation of appropriate treatment. In cases where acute neurologic symptoms arise from open brachial plexus injury, prompt surgical intervention is recommended to enhance the likelihood of achieving a complete neurologic recovery. In our perspective, acute plexus injury is often related to a complete disruption in the medial/lateral, and posterior cords. Timely referral of all brachial plexus injury patients to specialists is essential, as early intervention typically yields more favourable outcomes.

5. Source of Funding

None.

6. Conflict of Interest

None.

References

1. Biswal OP, Nayak S, Das RK. Orthotic and Prosthetic Management in Brachial Plexus Injury: Recent Trends. In: Wang JJ, Wang G, Lv X, Sun Z, Mahapure KS, editors. Frontiers in Spinal Neurosurgery. Rijeka: IntechOpen; 2023.
2. Gutkowska O, Martynkiewicz J, Urban M, Gosk J. Brachial plexus injury after shoulder dislocation: a literature review. *Neurosurg Rev.* 2020;43(2):407–23.
3. Lieberman JR. AAOS Comprehensive Orthopaedic Review. Rosemont (IL): American Academy of Orthopaedic Surgeons; 2014.
4. Miller MD, Thompson SR. Miller’s review of orthopaedics. 7th ed. Philadelphia: Elsevier; 2016.
5. Solomon L, Warwick D, Nayagam S, editors. Apley's system of orthopaedics and fractures. London: CRC Press; 2010.
6. Sureka J, Cherian RA, Alexander M, Thomas BP. MRI of brachial plexopathies. *Clin Radiol.* 2009;64(2):208–18.
7. Moran SL, Steinmann SP, Shin AY. Adult brachial plexus injuries: mechanism, patterns of injury, and physical diagnosis. *Hand Clin*. 2005;21(1):13–24
8. Bentley TP, Hosseinzadeh S. Clavicle Fractures. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025. [Updated 2023 Jul 31].
9. Della Santa D, Narakas A, Bonnard C. Late lesions of the brachial plexus after fracture of the clavicle. *Ann Chir Main Memb Super.* 1991;10(6):531–40.

10. Virtanen KJ, Malmivaara AOV, Remes VM, Paavola MP. Operative and nonoperative treatment of clavicle fractures in adults. *Acta Orthop.* 2012;83(1):65–73.
11. McKee RC, Whelan DB, Schemitsch EH, McKee MD. Operative versus nonoperative care of displaced midshaft clavicular fractures: a meta-analysis of randomized clinical trials. *J Bone Joint Surg Am*. 2012;94(8):675–84.
12. Howard RM, Shafer SJ. Injuries of the clavicle with neurovascular complications. A study of fourteen cases. *J Bone Joint Surg Am*. 1965;47:1335–46.
13. Barbier O, Malghem J, Delaere O, Vande Berg B, Rombouts JJ. Injury to the brachial plexus by a fragment of bone after fracture of the clavicle. *J Bone Joint Surg Br.* 1997;79(4):534–6.
14. Miller DS, Boswick JA, Jr. Lesions of the brachial plexus associated with fractures of the clavicle. *Clin Orthop Relat Res*. 1969;64:144–9.
15. Hems T. Brachial Plexus Injuries. In: Tubbs RS, Rizk E, Shoja MM, Loukas M, Barbaro N, Spinner RJ, editors. Nerves and Nerve Injuries. Academic Press; 2015. p. 681–706.
16. Niederhuber JE. Totally Implantable Venous Access Devices: Management in Mid-and Long-Term Clinical Setting. Carlo I, Biffi R, editors. Milano: Springer; 2012.

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