Case Report

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Pure Posterior Cord Injury Management: Case Report Study

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ABSTRACT

Brachial plexus injuries are common; however, pure posterior cord injuries are rare and present with exclusive clinical manifestations that require specialized surgical approaches to achieve acceptable outcomes. Here, we present our experience with these unique cases.

Four patients with lacerated pure posterior cord injuries were included in the study. All cases underwent brachial plexus exploration, and nerve grafts were used for reconstruction. After completing physiotherapy, demographic, medical, and surgical data were collected and evaluated.

All four patients were referred due to brachial plexus injury. One patient had sustained a gunshot wound and had undergone arterial reconstruction with a vein graft one week prior. The remaining patients had penetrating injuries. Surgical exploration confirmed pure posterior cord injury in all cases. Sural nerve grafts were used to repair the nerve injuries and bridge the gaps. Patients participated in intensive physiotherapy programs for approximately 12 months, followed by motor and sensory evaluations. Three patients achieved excellent outcomes, while the patient with the gunshot wound had a poor result.

There are numerous approaches to managing brachial plexus injuries, including non-surgical treatments, nerve repair, nerve grafting, nerve transfer, and muscle neurotization, depending on the condition and surgeon preference. In cases with clearly defined proximal and distal nerve ends, nerve grafting is preferred. Posterior cord injuries have recognizable clinical manifestations, and appropriate surgical techniques may yield good to excellent outcomes. Although pure posterior cord injuries are rare, meticulous exploration and effective nerve grafting can improve final results.

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Introduction

Brachial plexus injuries are among the most complex and catastrophic traumatic events, often resulting in varied outcomes and long-term sequelae. The unique arrangement of nerve fibers within the plexus has long intrigued surgeons and researchers, prompting efforts to classify injury patterns and management strategies. Accordingly, different levels of nerves are defined, with the cords forming a key component of this system. These include the lateral, medial, and posterior cords, named according to their anatomical position relative to the subclavian artery. The posterior cord is formed by the posterior divisions of the upper, middle, and lower trunks, receiving contributions from C5 to T1. It gives rise to the upper subscapular nerve, thoracodorsal nerve, and lower subscapular nerve, and ultimately the radial and axillary nerves [1–3].

Because the posterior cord is located in the infraclavicular region, its anatomical position presents specific challenges—one of which is the difficulty of dissection, particularly in patients with prior vascular repairs [4]. Conversely, the clavicle offers some protection from external trauma, creating a different injury profile compared to more proximal lesions. We aim to present our experience managing patients with pure posterior cord injuries treated at our referral center.

Case Presentation

In this study, 4 patients who were referred to our ward underwent preoperative evaluation. All the patients were victims of penetrating injuries to their shoulder (one gunshot injury vs. three penetrating injuries). At the operation scene, there was pure posterior cord injury. All patients were treated by nerve graft between two ends and then scheduled for hand physiotherapy programs during 2022–2024. The demographic data and functional improvements were gathered.

Four patients entered the study. All patients were men. The mean age was 24.75 years. One patient with a gunshot injury had arterial injury, which was repaired with a vein graft, and a week later was explored for brachial plexus reconstruction (patient 2). During exploration, there was only posterior cord injury, so this patient's data were added to the three patients who had only posterior cord injury. All the primary data of patients are demonstrated in Table 1. Following wound healing and recovery, the patients were referred to a physiotherapy center, and the motor and sensory improvements were assessed and illustrated in Tables 2 and 3. These evaluations were recorded 12 months after physiotherapy completion.

These data focused on muscle movements and demonstrated that the proximal muscles of the upper limb showed more improvement in comparison to the distal muscles innervated by the radial nerve. Shoulder muscles, which are innervated by the axillary nerve, had better outcomes, too. This may be related to the distance to the motor endings of the muscles. Patients 2 and 3 had the worst outcomes in distal muscle movements. Patient 2 had a severe gunshot injury; though surgical exploration showed intact nerve continuity of the other cords, they may have received thermal injury that appeared months later.

Sensory recovery of treated nerves demonstrated excellent recovery in the proximal upper limb in the territory of posterior cord branches (axillary and radial nerves). However, patient 2 had poor results after recovery and treatments. His sensory defects in other sensory territories may be related to gunshot thermal injury.

Discussion

The posterior cord, as a part of the brachial plexus, lies in the infra-clavicular area before terminating into the axillary and radial branches. The extensor and abductor muscles of the upper limb are mostly innervated by these nerves, and any nerve deficiencies

Table 1. Demographic data of patients

	Age	Sex	Trauma mechanism	Cord of injury	Surgery type	Level of injury	Months between injury and surgery
Patient 1	36	M	Penetrating	Posterior Cord	Nerve Graft	Post. Gasnglionic	< 3
Patient 2	26	M	Penetrating	Posterior Cord	Nerve Graft	Post. Gasnglionic	< 3
Patient 3	18	M	Penetrating	Posterior Cord	Nerve Graft	Post. Gasnglionic	< 3
Patient 4	19	M	Penetrating	Posterior Cord	Nerve Graft	Post. Gasnglionic	< 3

Table 2. Manual muscle testing (MMT) according to each evaluated muscle.

Cases	MMT Deltoid	MMT Infraspinatus	MMT pectoralis	MMT Biceps brachii	MMT Triceps	MMT Wrist movements	MMT Fds	MMT Fdp	MMT Fdm	MMT Fp	MMT ED	MMT Ei	MMT Epb	MMT Epl
Patient 1	4	4	4	5	3	4	4	4	4	2	1	2	2	2
Patient 2	5	4	4	5	4	2	3	4	2	4	0	0	0	0
Patient 3	3	3	3	4	3	3	3	4	3	5	0	0	0	0
Patient 4	5	5	4	5	4	4	5	5	5	5	2	2	2	2

Fds flexor digitrom superficialis, fdp flexor digitrom profundo, fdm flexor digiti minimi, fp flexor policis, ED extensor digitrom, EI extensor indicis, epb extensor policis brevoious

Table 3. Sensory evaluation of patients

	Sensory Point Median	Sensory Point Radial	Sensory Point Ulnar	Sensory Point Axillary	Sensory Point Musculocutaneous	Sensory Point Medial Antebrachial cutaneous
Patient 1	6	5	2	4	5	5
Patient 2	1	0	2	6	5	1
Patient 3	6	6	7	5	5	6
Patient 4	6	4	6	4	4	4

present with weakness in vital functions [1]. Therefore, it is important to be familiar with its anatomy and the proper management of nerve injuries to enhance ultimate functions.

The three cords are located caudal to the clavicle and medial to the lateral border of the pectoralis minor muscle as a landmark for identification. Another point of reference for the cords in the sagittal plane is the subclavian artery, which can be used to identify the medial, lateral, and posterior cords [5,14]. This can be a clue to consider probable arterial injury in penetrating injuries in patients who suffer from cord injury symptoms.

The posterior cord of the brachial plexus is formed by the union of the posterior divisions of the upper, middle, and lower trunks of the brachial plexus, posterior to the second part of the axillary artery, giving off the upper subscapular, thoracodorsal, lower subscapular, and axillary nerves in the axilla, and continues distally as the radial nerve. In this way, we can define the clinical manifestations of posterior cord injury. However, there are embryological variations depending on the position and width of the limb bud, which determine its innervations; these may affect the manifestations [6].

We went to surgery as soon as possible upon diagnosis, as all our patients had indications for acute exploration: concomitant vascular injury, open injury with sharp laceration, or contaminated open wound (the last indication may need debridement and delayed repair) [7,9,13]. Although Vasileios et al. (2014) emphasized nerve reconstruction before nine months of injury [8], there are some cases treated later with acceptable outcomes. However, we know that exceptions cannot stand instead of rules.

There are various reconstruction techniques, i.e.,

conservative non-surgical treatments, neurolysis, nerve grafts, nerve transfers, nerve repair, neurotization, and even free muscle transfer, depending on the condition and type of injury [8,10,11,15]. We decided to use a nerve graft from the sural nerve between the proximal and distal ends of the posterior cord in cables to achieve coaptation. This policy was due to the location and type of injury, which helped us to find both ends and have fresh nerve endings with limited defects.

Oberlin et al. (2013) described their experience with 9 patients with posterior cord injury. They waited at least 6 months and then performed reconstructions. Their patients had car accidents or closed injuries [12], but all our clients were victims of penetrating injury and had to undergo surgery as soon as possible. They mostly performed nerve transfers, but we thought nerve graft would be a better option for our patients. At the end of the evaluation, we found nerve graft to be a good option in posterior cord injury reconstruction. The weak response of patient 2 was mostly related to the type of injury; gunshot wounds may cause thermal injury beyond the resected ends.

Kim et al. (2004) evaluated mechanisms, surgical treatments, and outcomes in brachial plexus injuries in 1,019 patients during 30 years of surgery. According to their reports, among their cases, brachial plexus GSWs (12%) and lacerations (7%) were included. They performed nerve grafts in 77% of lacerated cases [16]. We appreciate the use of nerve graft in such lacerated nerve injuries.

Conclusion

Posterior cord injuries are rare, and even more rare in pure injuries. It seems that surgical exploration, nerve dissection, and reconstruction by nerve graft may be a good choice in cases with penetrated pure posterior cord injury.

Ethical Considerations

Informed consents

All patients provided informed consent.

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Conflict of Interests

The authors declare no competing interests.

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