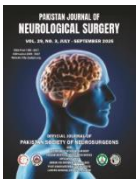

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Case Report

Rare Brachial Plexus Tumor: Case Report and Surgical Management Insights from Pakistan

Mumtaz Ali[1], Akram Ullah[2], Ramzan Hussain[1], Hanif Ur Rahman[1], Jabir Shah[1], Mansoor[1], Muhammad Aneeq[1], Amjid Ali[1], Yasir Ashraf[1,3]

[1]Ali Institute of Neurosciences, Irfan General Hospital, Peshawar. [2]Neurosurgery Prime Teaching Hospital, Peshawar. [3]Khyber Medical University, Peshawar – Pakistan

ABSTRACT

A 40-year-old male presented with a six-month history of numbness, paresthesia, and progressive flaccid weakness that was localized to the right C5 dermatome. A large, lobulated, and encapsulated mass in the medial aspect of the right axilla was identified via imaging studies. The mass was associated with the superior and middle trunk of the brachial plexus and extended to the supra and infraclavicular fossa. The imaging studies were supported by the nerve conduction studies (NCS), significantly highlighting the involvement of the right upper trunk with signs of denervation. The transclavicular neurosurgical approach was effective in the removal of the tumor while preserving the normal neurological functions. Brachial plexus tumors are rare and often underdiagnosed due to nonspecific symptoms and overlapping features with other neuromuscular conditions. This case highlights the diagnostic value of MRI and nerve conduction studies in identifying tumor characteristics and planning surgery. A transclavicular approach enabled safe excision with preservation of neural function. Postoperative recovery was favorable, with improved motor and sensory function and no recurrence at two months. This case emphasizes the importance of early diagnosis, appropriate surgical technique, and multidisciplinary management in achieving optimal outcomes. This case report highlights the diagnostic and therapeutic challenges associated with brachial plexus tumors due to their complex anatomical location. However, Imaging studies, a multidisciplinary approach, and nerve conduction studies were important in achieving favorable outcomes. The transclavicular neurosurgical approach was meaningful in tumor excision while preserving normal neurological function.

Keywords: Brachial Plexus Tumor, Transclavicular Approach, Nerve Conduction Studies (NCS), Magnetic Resonance Imaging (MRI), Surgical Excision.

Corresponding Author: Yasir Ashraf
Ali Institute of Neurosciences, Irfan General Hospital, Peshawar, Pakistan
Email: (Yasirkhattak099@gmail.com

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Introduction and Background

Brachial plexus tumors are such rare neoplasms that cause significant challenges in diagnosis and management, with limited cases reported in the literature.[1] Their location behind the clavicle and strap muscles of the neck makes clinical detection difficult; therefore, these tumors often remain concealed.[2] Swelling is a hallmark of many tumors, which is either absent or minimally apparent in such cases, contributing to underreporting and misdiagnosis.[3] The clinical symptoms of patients with brachial plexus tumors are typically paresthesia, numbness, and progressive weakness, which can mimic other common peripheral carpal tunnel syndrome, pronator teers syndrome, and thoracic outlet syndrome. Accurate differentiation of the condition is crucial because the overlapping symptomatology often leads to delayed diagnosis or inappropriate initial treatment. The rarity of these brachial plexus tumors further complicates their identification.[4] Imaging modalities such as MRI in most cases play a pivotal role in determining the extent and nature of the lesion.[5] The MRI findings often reveal a well-defined, lobulated, and encapsulated mass with variable enhancement patterns depending on the type of tumor.[6] The identification of affected nerve segments that often correlate with clinical symptoms is provided as evidence by nerve conduction study.[7] This multimodal approach is essential for preoperative planning and determining the surgical approach.[8] In this present case report, our patient presented with a unique constellation of symptoms, including paresthesia, right arm numbness, and progressive flaccid weakness, which primarily affected the C5 dermatome. As shown in Figure 1, the MRI imaging confirmed the presence of a large, lobulated, necrotic mass located in the anterior compartment of the axilla and extending supraclavicularly and infraclavicularly. Despite extensive neurosurgical experience spanning over 27 years, this was the first encounter of such a case at Ali Institute of Neurosciences, Irfan General Hospital, Peshawar, Pakistan, where it was successfully managed by the author, underscoring its rarity in Khyber Pakhtunkhwa, Pakistan. This case report highlights the successful diagnosis and management of a brachial plexus tumor using a transclavicular neurosurgical approach while preserving normal neurological function. This study aimed to add to the limited amount of knowledge on brachial plexus tumors, their diagnosis, surgical management, and postoperative outcomes.

Case Presentation

A 40-year-old male presented to us with a six-month history of paresthesia, numbness, and progressive weakness in the right arm. His symptoms were localized to the C5 dermatome with evident wasting of the deltoid muscles. Clinical examination revealed no signs of spasticity and flaccid weakness in the affected limb. The neurological tests performed were negative, including Phalen's test and Spurling's maneuver, therefore ruling out carpal tunnel and cervical radiculopathy, respectively. The Adson's test for thoracic outlet syndrome was performed and was negative. The cervical spine MRI (Figure 1) showed a large, lobulated and encapsulated mass situated in the medial aspect of the right axilla extending into the supra and infraclavicular fossa, while the cervical spine X-ray showed no abnormalities. The tumor was approximately 9cm in length, 4.5cm in transverse diameter, and 6.1cm in anteroposterior diameter (Figure 1). The lesion was closely associated with the brachial plexus, causing stretching of its lower and middle trunks. No lymphadenopathy or bony destruction was observed. The tumor was compressing the C5 and C6 nerve roots, and edema was evident in the surrounding tissues. The findings of the MRI were supported by the nerve conduction studies (NCS) showing involvement of the right upper trunk with signs of denervation.

This case report is a single observational study at our institution highlighting diagnosis, surgical

Figure 1A: *Coronal Pre-op MRI cut showing the extent and medial displacement of the brachial plexus mass. (Written informed consent was obtained from the patient for publication of this image).*

Figure 1B: *Sagittal Pre-op MRI cut showing the superior and posterior relation of the tumor to surrounding structures. (Written informed consent was obtained from the patient for publication of this image).*

management, and postoperative outcomes of a rare tumor of the brachial plexus. Clinical evaluation of the patient was performed, and imaging studies were used to determine the extent and location of the tumor. The patient underwent a transclavicular neurosurgical approach to remove the tumor while preserving normal neurological function. Informed consent from the patient and ethical approval from the hospital were obtained for publication of this case report, including clinical data and images. The surgical approach for the brachial plexus tumor consists of 5P's. Preoperatively, the patient's MRI and X-ray were reviewed, the patient's medical history was assessed as well, and necessary blood work was performed. The patient was positioned supine under general anesthesia. The procedure began with a transclavicular neurosurgical approach (Figure 2) where an incision was made from the lateral border of the sternocleidomastoid muscle extending above the clavicle toward the deltopectoral groove and axilla. The clavicle was osteotomized at its midpoint using a Gigli saw to provide access to the mass. The subclavian artery was identified and carefully dissected away from the tumor. The tumor, located in the superior and middle trunks of the brachial plexus, was lobulated and adherent to surrounding structures (Figure 2). Internal debulking was performed, followed by an extracapsular excision of the tumor, which was successfully removed without damaging the brachial plexus. A drain was placed, and the clavicle was fixed using orthopedic wires, and the incision was closed in layers. Postoperative care included recovery monitoring, arm immobilization with a sling, and plans for follow-up imaging.

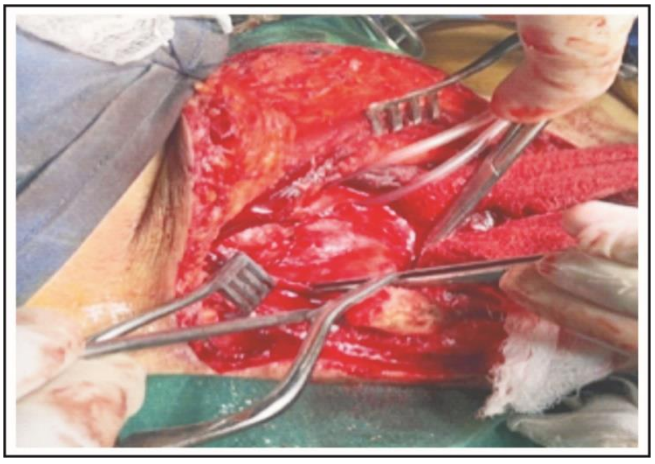

Figure 2: *Intraoperative view showing surgical exposure and dissection of the tumor adjacent to the brachial plexus (Written informed consent was obtained from the patient for publication of this image).*

Postoperative Course

The patient tolerated the surgery well and was monitored in the recovery unit for 24 hours. His postoperative course was uncomplicated, and he was discharged after 4 days of hospitalization with a follow-up plan. Postoperative MRI (Figure 3) was performed to confirm complete resection of the tumor.

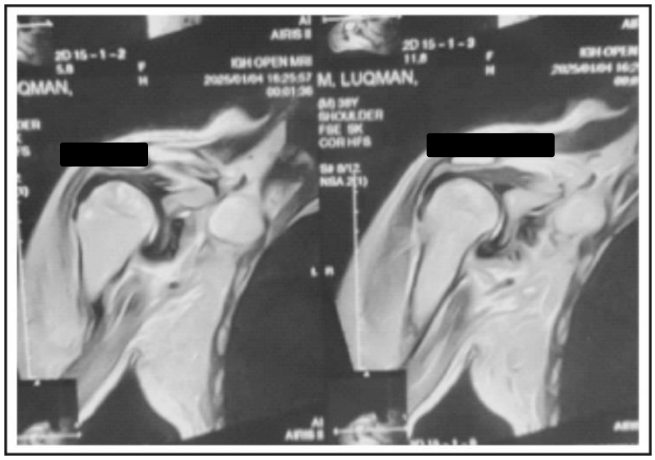

Figure 3: *Showing Postoperative MRI demonstrating complete tumor excision with preserved neural anatomy. (Written informed consent was obtained from the patient for publication of this image).*

At follow-up visits, the patient showed significant improvement in strength and sensation in the affected limb. His motor function returned to normal, and sensory deficits improved considerably. No signs of recurrence were noted during the follow-up period, which was 2 months after surgery (Figure 3).

DISCUSSION

Brachial plexus tumors are underreported and rare types of tumors posing significant diagnostic and therapeutic challenges due to their nonspecific symptoms and anatomical location.[1] In this case, the clinical presentation of paresthesia, numbness, and progressive flaccid weakness that particularly affects the C5 dermatome highlights the diagnostic challenges of these tumors. Brachial plexus tumors often result in delayed diagnosis due to the absence of swelling and the overlap of symptoms with other neuromuscular conditions, as documented in similar case reports.[2] The role of advanced imaging modalities, such as MRI, provides a clear picture of tumor size, encapsulated nature, and its proximity to the plexus. Previous studies also emphasized the role of MRI in assessing the anatomical and pathological characteristics of brachial plexus tumors.[3] Moreover, nerve conduction studies (NCS) helped confirm the nerve involvement, hence complementing imaging findings and aiding surgical planning.[4] The transclavicular neurosurgical approach that has been utilized in this case highlights the importance of selecting an optimal operative technique based on tumor location and its relation to surrounding structures. The transclavicular approach allowed for adequate exposure and reduced damage to neurovascular structures. The benefit of transclavicular and other extended neurosurgical approaches for complete tumor excision in such complex cases has been highlighted by previous studies, but their utilization remains limited to specialized centers.[5-6] Given the tumor's close association with the superior and middle trunks of the brachial plexus, the successful preservation of neural function during this case is noteworthy. The patient experienced strength recovery postoperatively with significant improvement in motor strength, sensory function, and no evidence of recurrence in a month's follow-up. These favorable outcomes align with existing literature that suggests early intervention and complete tumor excision are key factors in achieving optimal neurological recovery.[7] The rarity of these tumors limits the availability of large-scale studies, making individual case reports as ones crucial for surgical techniques and advancing clinical understanding. Despite its rarity, the successful management of this case at our institution highlights the importance of multidisciplinary collaboration and

the need for enhanced clinical awareness when encountering unexplained neurological symptoms. This case report adds significant awareness to the postoperative outcomes, surgical approach, and clinical implications of managing such a rare neoplasm.

CONCLUSION

This case report highlights the diagnostic and therapeutic challenges associated with brachial plexus tumors due to their complex anatomical location. However, Imaging studies, a multidisciplinary approach, and nerve conduction studies were important in achieving favorable outcomes. The transclavicular neurosurgical approach was meaningful in tumor excision while preserving normal neurological function.

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Additional Information

Disclosures:

Conflicts of Interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following:

- **Financial Relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.
- **Other Relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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Human Subjects: Written informed consent was obtained from the patient for participation in this study and for publication of clinical details and associated images.

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AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
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2.	Mumtaz Ali & Yasir Ashraf, Akram Ullah	2. Paper writing.
3.	Mumtaz Ali, Mansoor, Muhammad Aneeq & Jabir Shah	3. Data collection and calculations.
4.	Mumtaz Ali, Yasir, Hanif Ur Rahman, Mansoor & Jabir Shah	4. Literature review and referencing.
5.	Mumtaz Ali, Ramzan Hussain, Amjid Ali & Hanif Ur Rahman	5. Editing and quality insurer.