CASE REPORT

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A Case of Brachial Plexus Schwannoma

Young Woo Kim, M.D., Sung Ki Ahn, M.D., Joon Ho Song, M.D.

Department of Neurosurgery, Hallym University College of Medicine, Hallym Sacred Heart Hospital, Anyang, Korea

Brachial plexus schwannoma is rare. A case of a 28-year old woman who complained of a palpable mass in the right axilla is presented. She had previous incisional biopsy on the axillary mass. Brachial plexus magnetic resonance imaging revealed a well circumscribed contrast enhancing mass on the right distal cord of the brachial plexus. EMG revealed normal. Tumor resection was performed with the transaxillary approach. Though dense granulation tissue obscured normal brachial plexus nerve anatomy, using the surgical microscope and nerve stimulator, grossly total tumor resection was performed. She is free of any neurologic symptom at three months postoperatively.

KEY WORDS : Brachial plexus schwannoma · Transaxillary approach.

Introduction

Tumors of the brachial plexus region comprise less than 5% of tumors of the upper extremities. Their rarity makes them a neurosurgical challenge to the present-day physician despite his arsenal of surgical adjuncts including intraoperative monitoring and the operative microscope. Historically, in 1886 Courvoisier described the first excision of a brachial plexus schwannoma[7]. Since then, several series of brachial plexus tumors have been reported with improvement in functional outcome and reduction in surgical morbidity. In the past few decades, the introduction of preoperative neurodiagnostic studies and intraoperative neurophysiologic monitoring have contributed to improvement in surgical outcomes. In 2001, Ganju et al reported large series of brachial plexus tumors from Louisiana State University (LSU) Medical Center (111 tumors in 107 patients) with impressively low surgical morbidity and mortality rates[4]. In the management of brachial plexus lesion, thorough understanding of brachial plexus anatomy, appropriate surgical approach and microsurgical technique are important for safe tumor removal[13]. A case of brachial plexus schwannoma treated by surgical resection is presented with a review of literatures.

Case Report

28 year old woman presented with painless palpable mass in the right axilla for 18 months. She was admitted at the department of general surgery three months ago for palpable mass in the right anterior chest and right axilla. She underwent incisional biopsy. Her anterior chest mass was lipoma but axillary mass was encircled by the brachial plexus nerve. Because the general surgeon did not warn the patient about the nerve surgery, only biopsy for the axillary mass was performed.

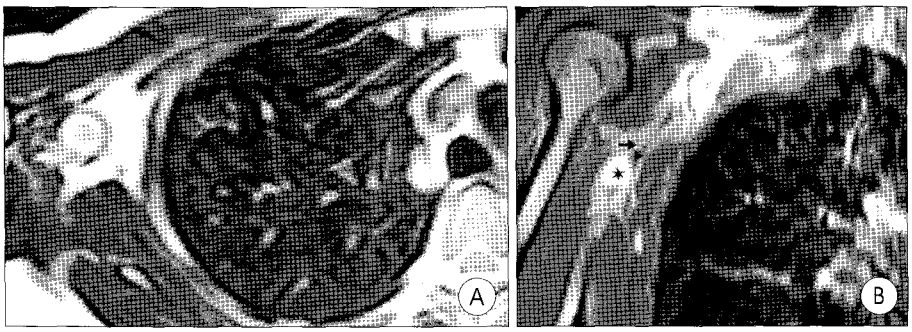

Fig. 1. A : On contrast enhanced T1 weighted axial magnetic resonance image, typical target appearance (hyperintense rim and hypointense center) is demonstrated in the distal cord of the brachial plexus. B : On contrast enhanced T1 weighted coronal magnetic resonance image, tumor and brachial plexal element is identified. (tumor mass (*), ulnar nerve (▶), musculocutaneous nerve (→)).

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• Address for reprints : Young Woo Kim, M.D., Department of Neurosurgery, Hallym University College of Medicine, Hallym Sacred Heart Hospital, Pyeongchon-dong, Dongan-gu, Anyang 431-070, Korea Tel : +82-31-380-3771, Fax : +82-31-383-6164, E-mail : ywmoses@hallym.or.kr

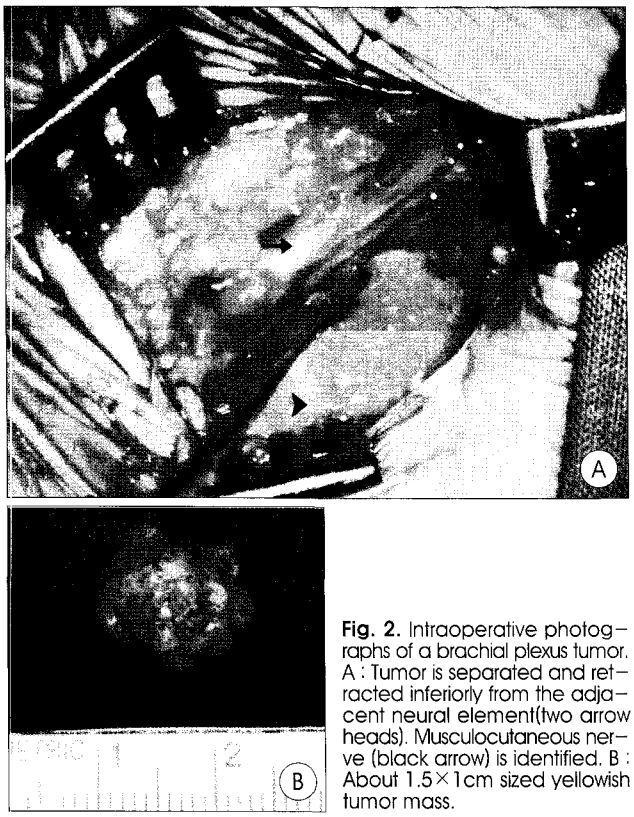

Fig. 2. Intraoperative photographs of a brachial plexus tumor. A : Tumor is separated and retracted inferiorly from the adjacent neural element(two arrow heads). Musculocutaneous nerve (black arrow) is identified. B : About 1.5×1cm sized yellowish tumor mass.

Axillary mass was movable, painless, and soft. On contrast enhanced T1 weighted axial brachial plexus MRI, contrast rim enhancing mass was demonstrated (Fig. 1A). On contrast enhanced T1 weighted coronal images with contrast enhancement, isosignal intensity well circumscribed mass with contrast enhancement was demonstrated in the distal cord of the brachial plexus (Fig. 1B). Electromyography on her right upper arm revealed normal finding.

Using transaxillary approach, the incision is transaxillary below hairline and transverse between the pectoralis major muscle anteriorly and the latissimus dorsi muscle posteriorly. After subcutaneous tissue dissection, the tumor which was densely wrapped with a granulation tissue, was exposed (Fig. 2A). Though the distal and proximal end of the tumor was identified, nerve was not clearly demarcated from the tumor due to scar tissue. With the surgical microscope and nerve stimulator, nerve free tumor surface was dissected circumferentially by separating granulation tissue from the tumor. With the aid of the EMG monitoring, median nerve, musculocutaneous nerve, ulnar nerve, radial nerve were confirmed. Median nerve was slightly displaced inferiorly by the tumor mass and attached to the ulnar nerve which was in the inferior portion of the mass. Musculocutaneous nerve lied on the superior portion of the tumor. Axillary artery and radial nerve was confirmed at the posterior edge of the tumor. Circumferential dissection was performed under the operating microscope. Grossly total removal of tumor was performed. About 1.5cm sized yellowish rubbery tumor was resected (Fig. 2B). Pathology revealed the schwannoma. Light microscopic examination of the excised tumor indicated a benign schwannoma with parallel arrangement of elongated tumor cells that also formed palisades (Antoni A type) and a loose cellular part (Antoni B type) (Fig. 3).

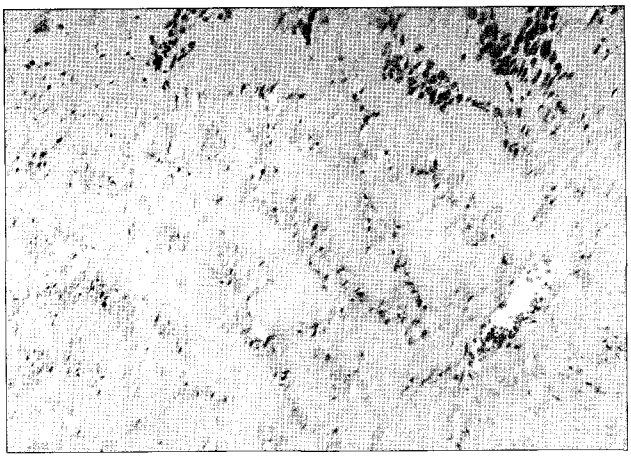

Fig. 3. Histological examination of a benign schwannoma shows parallel arrangement of elongated tumor cells that also form palisades (Antoni A type) and loose cellular part (Antoni B type) (H&E, ×400).

After the surgery, patient complained of mild hypesthesia in her index finger tip without motor weakness which subsided after 2 weeks. The patient is free of any neurologic symptom at the 3 months postoperatively.

Discussion

Schwannomas are the most frequent and largest category of benign nerve tumors. They are variously referred to as neuromas, neurinomas, and neurilemmomas in the literature. Their origin is from a cell with a basement membrane resembling a schwann cell. As even though schwannoma is categorized as a neural sheath tumor, its origin is most likely from an intraneural supporting or glial cell[11].

The most frequent site is in the head and neck, which comprises 25% of all the schwannoma, but it can arise anywhere in the body innervated by cranial nerve, sympathetic nerve, and peripheral nerve[1].

Tumors of the brachial plexus are relatively rare. The first surgical case report of a tumor arising from the brachial plexus was that of Courvosier in 1886[7]. The tumor was a schwannoma and probably originated from the C5 root or the superior half of the upper trunk inasmuch resulted in paralysis of both the deltoid and the biceps muscles. In the past few decades, the introduction of preoperative neurodiagnostic studies and intraoperative neurophysiologic monitoring, surgical microscope have contributed to the improvement in surgical outcomes. In 1987, Lusk et al reported their experience of 57 tumors

involving the brachial plexus with excellent results[12]. More recently, Ganju et al reported another large series of brachial plexus tumors from Louisiana State University(LSU) Medical Center (111 tumors in 107 patients) with equally impressively low surgical morbidity and mortality rates. They reported that the most common benign brachial plexus tumors of neural sheath origin was neurofibroma that comprises 35% (59 cases), and schwannoma comprices 26% (44 cases). 39% of brachial plexus tumor was non neural sheath origin including malignant tumor[4]. In Korea, Ahn et al first[1] reported brachial plexus neurilemmoma in 2002 and a few cases of brachial plexus tumor combined with other lesion[3,9].

The clinical manifestation of brachial plexus schwannoma is usually painless palpable mass, local radiating pain, motor loss, and sensory loss[4,10]. In our case the patient presented with a palpable, painless mass in the axilla without neurologic sign.

In diagnosis, brachial plexus magnetic resonance imaging is considered to be the method of choice for the brachial plexus lesion. Nearly 75% of the nerve root tumors have the same signal intensity as the spinal cord on T1-weighted Image and nearly all nerve sheath tumors enhance following contrast administration. More than 95% have very high signal intensity on T2-weighted image. In schwannoma, there is no direct correlation between Antoni A and Antoni B tissue types and features recognized on MRI scans. On histology, approximately 40% of spinal schwannomas have a cystic component. A target appearance (hyperintense rim and hypointense center) is often seen on contrast enhanced T1-weighted image. Cystic or necrotic degeneration is responsible for the target appearance on magnetic resonance imaging. In our case typical target appearance was revealed on contrast enhanced T1 weighted images[2,16].

Several benign or malignant tumors should be considered in differential diagnosis before making a treatment strategy and operation[4,12]. Neurofibromas arise from the fibroblast and may be solitary or multiple occurring within the fascicle itself; slowly growing none capsulated tumors that are composed of cells arranged in cords and nests and surrounded by thick collagen bundles in a sparse mucinous matrix which the excision leads to an inevitable neurological deficit. Axons are often found traversing the substance of the tumor.

Though the neurofibroma and the schwannoma comprise the most of the brachial plexus tumor, benign non neural sheath origin tumor (desmoid tumor, ganglioneuroma, lipoma, hemangioma, etc), malignant neural sheath tumors (malignant schwannoma, neurogenic sarcoma), malignant non neural sheath tumors (Ewing's sarcoma, osteosarcoma), metastatic tumor (breast, pancreatic cancer, melanoma, etc) should be included in differential diagnosis because the treatment strategy and prognosis is quite different in malignant lesion. In malignant brachial plexus lesion, total resection is often impossible without severe functional and vascular loss and nerve graft with sural nerve may be needed in case of sacrifice of plexal element. Usually functional status can be worse in malignant tumor postoperatively. Most of the patient with malignant brachial plexus tumor died within 3-year follow up period regardless of radiotherapy and chemotherapy. Clinically most remarkable characteristics in malignant lesion are that the patients complain of painful, rapidly growing mass with neurologic deficit. So it is important that surgeon should warn the patient about possible malignancy, nerve graft, sacrifice or amputation of the plexal element, worse functional outcome and poor prognosis in case of malignant lesion before surgery[4,7].

Surgical resection is the treatment of choice for most benign neural sheath tumors and complete resection of these tumors results in cure[3,6,9]. Because schwannoma arises from schwann cell that encapsulating nerve fascicle, tumor arises eccentrically from the nerve and it can usually removed without damage to the underlying nerve trunk. Once the plane of cleavage between the capsule and nerve fasicle has been found enucleation is generally straight forward[14]. For surgical resection of brachial plexus region tumor, it is better to expose widely and avoid any needle or incisional biopsy. Open incisional biopsy often results in peritumoral scar formation, which can obscure the surgical plane and thus render subsequent tumor resection more difficult[7,13]. In our case because of previous incisional biopsy, tumor was densely wrapped with scar tissue, normal brachial plexus anatomy around tumor was not visible so tumor resection was difficult. Although it is quite uncommon, it is important to be prepared and to obtain the consent of the patient for a possible nerve graft prior to surgery. Sural nerve is usually used in case of nerve graft[4]. Intraoperative neurophysiologic monitoring can be helpful in dissection of the tumor[15]. The choice of surgical approach is important and can be selected according to the tumor size, tumor site, and relationship with adjacent organ. A variety of surgical approaches are used including anterior supraclavicular or infraclavicular, combined/transclavicular, posterior subscapular, transaxillary approach[8,13]. Anterior supraclavicular approach can be used in tumors involving roots, trunks, and supraclavicular branches of brachial plexus and infraclavicular approach is used in tumors involving cords and braches of brachial plexus. In case of tumors involving the very proximal and lower levels of the brachial plexus roots, scarring due to prior anterior approach or radiation therapy, posterior subscapular approach is used. Transaxillary approach is used in tumors palpable at the axilla and adhering to the distal cords of the brachial plexus[5]. Compared with supra- or infraclavicular approach, transaxillary approach is easy, time saving procedure because after subcutaneous dissection, surgeon is directly encountered with the distal plexal

element. But it should be used only when the mass is palpable in the axilla and in tumor confined to the axilla.

Conclusion

Brachial plexus region tumors are uncommon and often present a challenge to neurosurgeons. A thorough understanding of the tumor pathology, brachial plexus anatomy, appropriate surgical approach and management enables the neurosurgeon to optimize the care of the patients. The surgeon must warn the patient about possible tumor character, prognosis on the basis of the neurologic examination and diagnostic study, possibility of the sural nerve graft. The choice of surgical approach is primarily determined by tumor location. With appropriate intraoperative microsurgical dissection technique and electrodiagnostic monitoring, brachial plexus surgery can significantly improve the patient's outcome.

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