Neurol Med Chir (Tokyo) 41, 620～625, 2001

Presacral Solitary Giant Neurofibroma Without Neurofibromatosis Type 1 Presenting as Pelvic Mass

—Case Report—

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Abstract

A 35-year-old woman presented with a solitary neurofibroma in an unusual presacral location without neurofibromatosis manifesting as bilateral chronic sciatica for 2 years. She was initially considered as having a giant right ovarian mass, but was referred with a prediagnosis of solitary giant sacral nerve sheath tumor. The initial differential diagnosis was based on neuroimaging. A right-sided J incision with the extraperitoneal approach provided good exposure and handling of the tumor bed. Almost total excision without neurological deficit was possible. The histological diagnosis was neurofibroma. Benign retroperitoneal neural sheath tumors in patients without von Recklinghausen's disease are quite rare. Intrapelvic tumors are often diagnosed at a later stage. Neuroimaging is very helpful to delineate this unusual site and the extent of tumor development, and to determine the appropriate surgical intervention. A clear understanding of retroperitoneal anatomy is essential for safe removal of such tumors. Complete resection is preferred to prevent local recurrence and malignant transformation. Although root section is inevitable, neurological deficit is unlikely.

Key words: neural sheath tumor, neurofibroma, pelvic mass, presacral tumors, retroperitoneal tumors

Introduction

Neurofibromas account for 16–30% of all spinal tumors[30,40] and 13.7% of spinal tumors of nerve sheath origin.[35] Most spinal tumors including schwannomas are distributed evenly along the spinal canal. The thoracic region is the most common site for neurofibromas, followed by the cervical and lumbar regions. Only 1–5% of all spinal neurofibromas are localized in the sacral region.[1,27] Benign neural sheath tumors (NSTs) located in the pelvic retroperitoneal space are very rare, and represent a special entity, as the diagnosis and management can be difficult. Most NSTs are small, solitary, and benign, and rarely exceed 6 cm in diameter.[31,36] However, intrapelvic tumors are often diagnosed at an advanced stage, and may masquerade as discogenic radiculopathy. Late diagnosis contributes to the difficulty of surgical extirpation.[12]

Received May 10, 2001; Accepted September 7, 2001

We report a case of solitary giant presacral neurofibroma which was treated successfully with surgical intervention without persistent neurological deficit.

Case Report

A 35-year-old woman complaining of bilateral sciatica radiating to the right inguinal and lumbar area for 2 years was referred from the Department of Obstetrics and Gynecology in February 1999. She was initially presumed to have a giant right ovarian mass. Neurological examination found no limb paresis. Transvaginal Doppler ultrasonography revealed a 8×7 cm intrapelvic mass near the posterior aspect of the bladder, with smooth heterogeneous echogenic contours. The mass was not adhered to the uterus but was located very close to the posterior of the right ovary. Transvaginal color Doppler ultrasonography showed high-speed circulation within the mass. Computed tomography (CT) revealed a smooth-contoured hypodense lesion which

had displaced the uterus and rectum to the left (Fig. 1A). The fat plane was obliterated between the mass and the right sacral foramina, which was relatively enlarged and contained soft tissue isodense with the mass (Fig. 1B). Magnetic resonance (MR) imaging showed a 8 × 7 × 7.5 cm presacral lobulated mass as intermediate intensity on the T_1-weighted images and high intensity on the T_2-weighted images with a well-circumscribed low intensity center. The mass has expanded the right S-1 neural foramen into the spinal canal and encircled the S-1 neural root epidurally. The mass within spinal canal and sacral foramina was totally enhanced and the intrapelvic mass partially enhanced after contrast medium injection (Fig. 2).

An extraperitoneal approach through a right J incision obtained adequate exposure deep in the presacral space with the help of obstetricians. A well-circumscribed giant mass emanating from the first neural foramen of the sacrum was found at the level of promontorium and displaced the uterus and rectum to the left (Fig. 3). The tumor originated from the S-1 root fibers. The mass was almost totally excised, except for the intrasacral portion, by sacrificing the intervening S-1 root fibers.

The well-circumscribed, oval-shaped firm mass was white yellow with homogeneously gray and gelatinous cut surfaces. Histological examination revealed moderate cellularity with fusiform and elongated cells containing many dark-stained nuclei embedded in a collagenous matrix. There were many thickened and hyalinized vessels, and a few inflammatory lymphocytes. Immunohistochemistry showed strong vimentin and fibronectin positivity, but no S-100 protein, cytokeratin, glial fibrillary

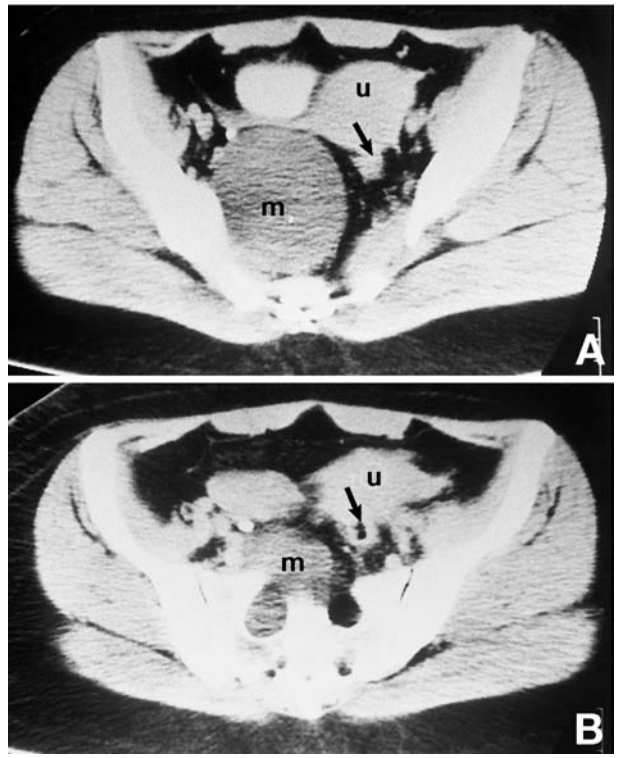

Fig. 1 A: Axial computed tomography (CT) scan showing a smooth-contoured hypodense mass lesion (m) which had displaced the uterus (u) and rectum (*arrow*) to the left. B: Axial CT scan displaying the enlarged right sacral foramina, containing soft tissue, isodense with the mass. The fat plane was obliterated between the foramen and the mass.

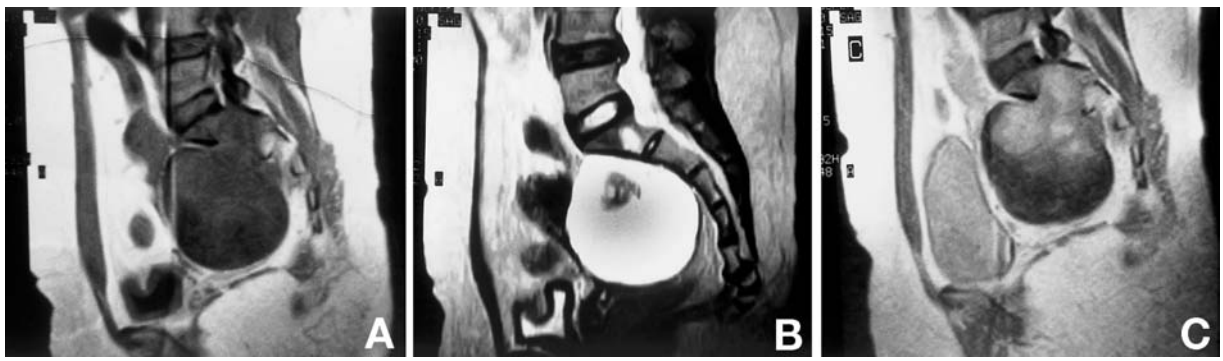

Fig. 2 Magnetic resonance images showing a 8 × 7 × 7.5 cm presacral lobulated mass as intermediate intensity on the T_1-weighted image (A), and high intensity on the T_2-weighted image with a well-circumscribed low signal intensity center (B). The tumor had expanded the S-1 neural foramen, entered the spinal canal, and encircled the right S-1 root epidurally. The intrapelvic mass was partially enhanced, and the foramen and spinal canal were totally enhanced by contrast medium (C).

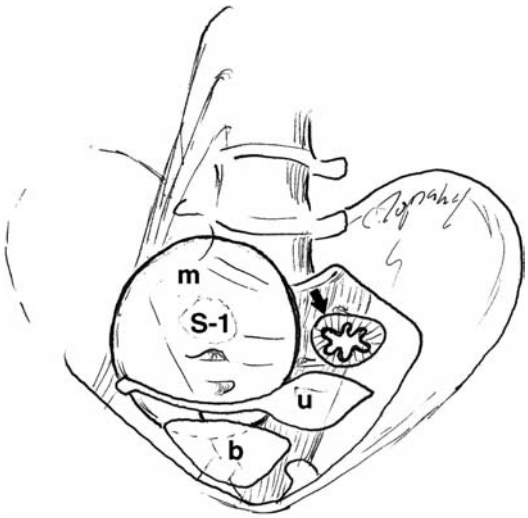

Fig. 3 Operative illustration showing the tumor mass (m) and its relationship to contiguous structures and the first sacral foramina (S-1). b: bladder, u: uterus, *arrow*: rectum.

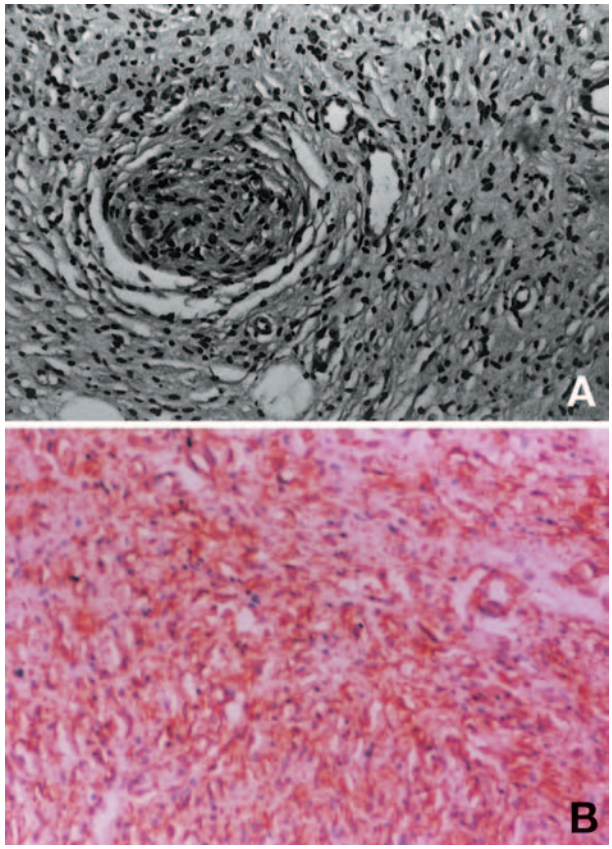

Fig. 4 A: Photomicrograph of the benign neurofibroma consisting of fusiform and elongated cells with dark-stained nuclei embedded in collagenous matrix. Thickened hyalinized vessels and few inflammatory lymphocytes are also seen. HE stain, ×200. B: A vimentin-positive area is seen in the center. ×200.

acidic protein (GFAP), desmin, or factor VIII-related antigen staining, which confirmed the diagnosis of neurofibroma (Fig. 4). The patient had no stigmata of neurofibromatosis (NF).[24]

The postoperative course was uneventful and the patient was discharged on the postoperative 15th day with no neurological deficit, but ongoing pain. Her complaints had resolved at the follow-up examination after 5 months and she was doing well. Postoperative MR imaging delineated a small intrasacral residual tumor mass visible on both T_2- and T_1-weighted images (Fig. 5).

Discussion

Neurilemmomas (schwannomas) and neurofibromas are closely related but are not identical.[10,33] Neurofibromas are often multiple and plexiform, are associated with von Recklinghausen's disease (NF type 1: NF1), and may become malignant. The parent nerve is usually identified in plexiform tumors but not in the solitary type. Neurofibroma is rarely solitary and non-encapsulated. Schwannomas are solitary, rarely plexiform, and usually encapsulated with the parent nerve identified. Multiple schwannomas usually occur with NF type 2 and almost never become malignant.[4,11] Solitary neurofibroma, especially if cutaneous may be a typical and exclusive lesion of NF1,[31] although about 90% of central and peripheral neurofibromas may be solitary and unrelated to systemic NF.[8,16,33] A patient with a single neurofibroma represents a true sporadic case or carries the defective gene with only mild clinical presentation.[35] Therefore, we examined our patient for the stigmata of NF, which were absent.[24] The retroperitoneal location is extremely rare in patients without NF.[2]

The principal cells comprising the peripheral nerve sheath are the Schwann (endoneurium-ectoderm) cells, the perineural cells (perineurium-neural crest), and fibroblasts (epineurium-mesoderm).[11] Neurofibromas, in contrast to schwannomas, are composed of all of these cells[13] embedded in a collagenous matrix,[17,37] but ultrastructurally and histochemically the cells demonstrate the features of perineural cells,[11,16] by staining poorly for S-100 protein[16,17] but strongly for vimentin.[17] Cultured perineural cells express fibronectin which is not produced by Schwann cells,[26] and show cytoplasmic actin containing stress fibers and

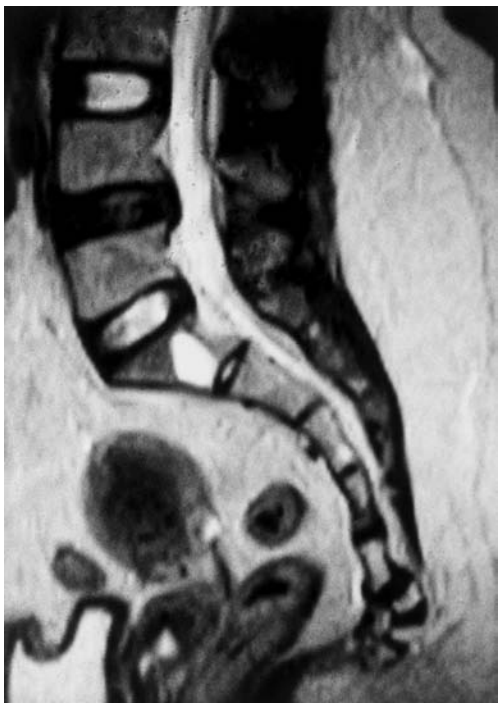

Fig. 5 Postoperative T_2-weighted magnetic resonance image revealing the small intrasacral residual tumor mass.

staining for vimentin. In our case, staining for fibronectin and vimentin was positive but negative for S-100 protein. Absence of staining for cytokeratin, GFAP, desmin, and factor VIII-related antigen excluded any relationship to epithelial, glial, muscle-derived, or endothelial cells, respectively. Neurofibromas have widely separated fusiform cells with wiry cell processes separated by individual collagen bundles, with the latter absent in peripheral neurofibromas.[33] The extracellular space consists of acid mucopolysaccharide, thin-walled vessels, perivascular mast cells, some lymphocytes, and few fibrocytes[11] (Fig. 3). The consistency and histological appearance vary from myxoid to fibrous according to the differentiation of the neoplastic elements.[16] Sometimes electron microscopy and histochemical studies are required to distinguish neurofibromas and schwannomas, and the differentiation cannot be made on only clinical and biologic findings. Neurofibroma is a slow-growing neoplasm that may lack a well-defined capsule in some areas in contrast to schwannomas[13,33] and may extend into the retroperitoneal, presacral, and soft tissue planes. Neurofibroma does not generally undergo malignant histological degeneration[5,13,31,40] except in 4–11% of cases associated with NF1.[40]

The median age at diagnosis of neurofibroma is similar in patients with NF1 and without NF1, although both groups are younger than patients with spinal schwannomas, whose median age at presentation is in the fifth decade.[32] The sex distribution is equal in all.[23] The rarity of pelvic neurofibroma, even in association with NF1, may be due to the silent nature of these tumors, as there is usually very little neurological deficit. However, these tumors unlike their peripheral counterparts may reach a considerable size and occupy an unusual position, compressing the contiguous structures and causing severe pain.[29,36] The most common symptom of retroperitoneal tumors is poorly localized pain which may be referred to the genitalia or lower extremities, often accompanied by numbness and tingling[18,28] and occasionally urinary symptoms.[23] Recovery may take several months after release of the compression, as in our case.[35]

Radiological investigation and differential diagnosis of retroperitoneal NST is very difficult, as the differential diagnosis is between neurofibroma and neurofibrosarcoma for a large dumbbell tumor. Isolated neurofibroma tends to be smaller than neurofibrosarcoma.[8] CT is a useful diagnostic tool which can indicate the extent of the tumor as well as any association with the sacral plexus, but a large neurofibroma can not usually be differentiated from neurofibrosarcoma based only on bone changes[5] (Fig. 1). MR imaging provides the exact anatomic location, the relationship to the adjacent viscera, and possible compression and displacement caused by the tumor.[4,15] This anatomic information aids in the decision on the extent of resection and in following the patient postoperatively.[3] MR imaging provides high definition of soft tissues and multiple plane images, which allows preoperative differentiation of several types of spinal tumor, in particular rare dumbbell tumors such as meningioma, ganglioneuroma, and hemangioendothelioma.[9] The imaging characteristics of NST depend on the relative amounts of fibrous and myxoid material.[16] T_1-weighted MR imaging shows a slightly higher signal intensity than muscle and T_2-weighted MR imaging shows markedly higher signal intensity[7,33] (Fig. 2A, B). Multiple central areas of decreased signal intensity, particularly on T_2-weighted images, indicates poorly cellular fibrous-collagenous tissue[7,13,33] (Fig. 2B). The tumors show nonuniform contrast in the central areas after injection of gadolinium.[33] A discrete central low-intensity focus on T_1-weighted imaging with contrast medium is called the ''dot sign,'' and characterizes spinal canal tumor as neurofibroma or schwannoma.[13,38] The dot sign corresponds to edema, microcysts, foam cells, hyalinization of blood vessels, old hemorrhage, and dystrophic cal-

cification.[13] We did not see any dot sign in our case. Rim enhancement occurs more commonly in schwannomas and can be used to differentiate from neurofibromas, but cannot be distinguished without contrast medium.[22]

Arteriography can demonstrate the blood supply to the tumor.[14] Angiography usually shows benign neurofibromas as avascular tumors whereas schwannomas can be hypervascular and cause troublesome intraoperative bleeding[28] like malignant tumors,[14] as only some schwannomas[28] and neurofibrosarcomas are avascular.[16]

We did not perform ultrasonography-guided needle and aspiration biopsy because this provides an inadequate amount of tissue[3] containing highly pleomorphic cells, which is difficult to interpret,[15,18,28] and may be associated with complications, such as injection or hemorrhage from the hypervascular tumor.[12,28] Presacral tumors require resection via an infra/intraperitoneal approach. A Pfannenstiel's or a J incision and an extraperitoneal approach is the most appropriate for most intrapelvic tumors.[3] Successful laparoscopic resection of a high-level retroperitoneal solitary neurofibroma indicates an alternative approach.[19] Combined anterior and posterior approach (transverse H incision on the sacrum) can be used when needed. The S1–3 nerves should be preserved to retain the function of the bowel and bladder.[12,39] Malignant transformation is unlikely in patients without NF1, so simple enucleation or even partial excision and nerve salvage has been advocated.[6,23] However, incomplete tumor removal may be followed by local recurrence[23,28] or malignant transformation of the residual tumor.[18] Therefore, complete surgical resection is the treatment of choice for retroperitoneal NSTs.[18,20] Sacrifice of the nerve root is often required to achieve total removal of large tumors, but resection does not always result in postoperative neurological deficit.[25,34] Analysis of 66 spinal neurofibromas found that nerve fibers involved in a neurofibroma can usually be resected as the roots probably retained no function and would not degenerate further.[21] Radical resection is possible without neurological deficit if microsurgical preservation of the unaffected nerve fibers is impossible or if the risk of recurrence is judged to be unduly high.[20] Preoperative electromyography is helpful for predicting the outcome after the resection of spinal tumors.[21] Denervation indicates a greater likelihood of deficit after root division (38%), but the deficits were mild and of nondebilitating nature. Absence of denervation shows the risk is low.

Presacral NSTs are usually evaluated initially by obstetricians and other clinicians, and diagnosis occurs at a relatively late stage. MR imaging is very helpful to delineate this unusual site and the extent of tumor development, in differential diagnosis, and deciding on the appropriate surgical intervention. Resection of sacral neurofibroma requires knowledge of the pelvic retroperitoneal anatomy to avoid injuries to the nearby vascular and urinary structures. Complete resection should be performed if possible. Root resection can be performed since neurological deficits after sacrifice are usually not disabling.

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