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Case Report

Pheochromocytoma, Giant Plexiform Neurofibroma, Meningocele and Dural Ectasia in an Adult Neurofibromatosis Type 1 Patient: A Case Report and Review of the Literature

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Abstract

This case report presents a patient with a giant gluteal plexiform neurofibroma and a concurrent pheochromocytoma and anterolateral sacral meningocele. The patient underwent successful surgical resection of the tumors. The case highlights the challenges and considerations involved in managing large gluteal tumors, particularly when associated with other significant anomalies such as meningocele and pheochromocytoma. The outcome demonstrates the efficacy of a carefully planned surgical approach, emphasizing the importance of multidisciplinary collaboration in complex cases to achieve favorable results.

***Keywords:** Plexiform Neurofibroma, Meningocele, Pheochromocytoma, Neurofibromatosis*

1. Introduction

Neurofibromatosis type 1 (NF1) is the commonest phacomatosis, which are neurocutaneous syndromes of neural crest origin[1].

NF-1, also known as von Recklinghausen's disease, is an autosomal-dominant disease caused by genetic mutations of the NF-1 gene located on chromosome 17q11.2, is a multisystem genetic disorder associated with neurofibromas, optic pathway gliomas and other tumors like phaeochromocytoma. [1].

2. Case Presentation

A 48-year-old woman was admitted to the ER with low back pain, high blood pressure and tachycardia. She presented a history of neurofibromatosis diagnosed at birth, with healthy parents, café au latte spots, freckling, Lisch hamartomas and a giant plexiform neurofibroma[2] (Fig.1) involving the gluteal region and the right lower limb. She complained of a painful lump in the lumbar region for the last 2 months and there were no focal neurological deficits.

Studies

Spinal malformations were evaluated with magnetic resonance imaging (MRI) and the results revealed a large cystic pelvic mass consistent with an anterior sacral meningocele and a giant plexiform neurofibroma[3] (Fig.2).

A contrast enhanced pelvic MRI[4] showed a large, well-defined, right lateral sacral cyst extending through defects to the anterior lateral aspect of sacrum (Fig. 2). The lesion had a similar signal intensity to that of cerebrospinal fluid, with low signal intensity in T1-weighted images and high signal intensity in T2-weighted images without solid components. The neck of the meningocele was noted in the posterolateral part of the S1, S2 and S3 vertebral body.

A new MRI showed the extension of the plexiform neurofibroma in the right buttock in the subcutaneous fat passing through the midline and spanning all the right lower limb.

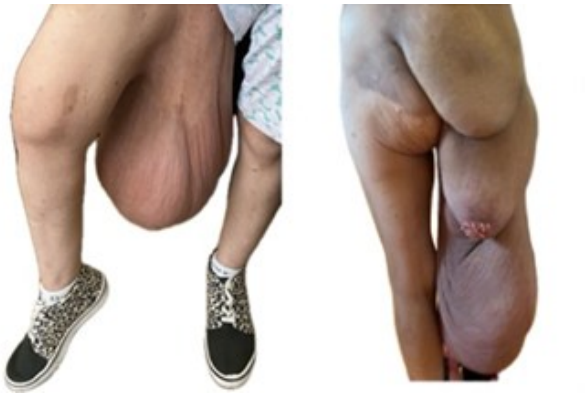

Fig 1. Plexiform Neurofibroma overlying giant café-au-lait macule.

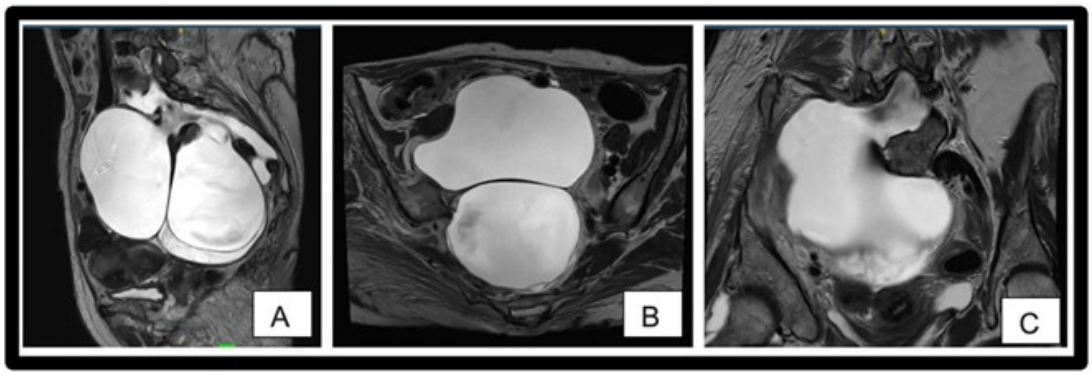

Fig 2. *Ventrolateral sacral meningocele (VMC) that is partially filling the lesser pelvis. Sagittal (A), axial (B) and coronal plane(C) T2-weighted MRI show a large, well-defined cystic meningocele mass, dural ectasia, scalloping of the sacral vertebral bodies and dorsal neurofibroma.*

The patient underwent a PET scan[5] that incidentally revealed mild asymmetric uptake in the region of the right adrenal gland and in the plexiform neurofibroma. The PET-CT FDG scan showed glucose uptake at the right adrenal level (SUV 4.3) and diffuse uptake (SUV 2.8) at the level of the plexiform neurofibroma (Fig.3).

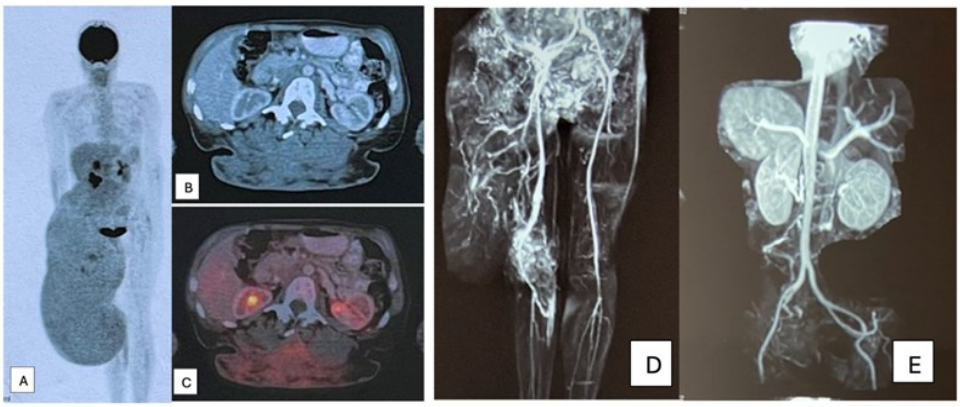

Fig 3. A, B, C- *PET CT scan.* ***D and E:*** *Angiogram, show the profuse vascularization of the pheochromocytoma and the NF plexiform.*

Hormonal assessment for adrenal hypersecretion was performed with the following results: urinary adrenaline 282 ug (less than 20 ug/24 h), urinary noradrenaline 414 ug (15-80 ug/24hs), mandelic vainillin acid 12.8 mg/24hs (to 8 mg/24hs) and metanephrine 13.600 ug (30-180 ug 24hs) and normetanephrine 219 ug/24hs (119- 451 ug 24hs). The patient underwent a successful right laparoscopic adrenalectomy and pathology revealed a well-circumscribed pheochromocytoma. Postoperatively, her blood pressure remained normal.

Treatment

A biopsy was performed and revealed a plexiform neurofibroma without atypical degeneration.

The patient underwent a successful laparoscopic adrenalectomy and pathology revealed a well- circumscribed pheochromocytoma. Postoperatively, her blood pressure remained normal off antihypertensive medications.

Followed later, surgical removal of the pedunculated portion of the plexiform neurofibroma were carried out and the pain disappeared (Fig. 4).

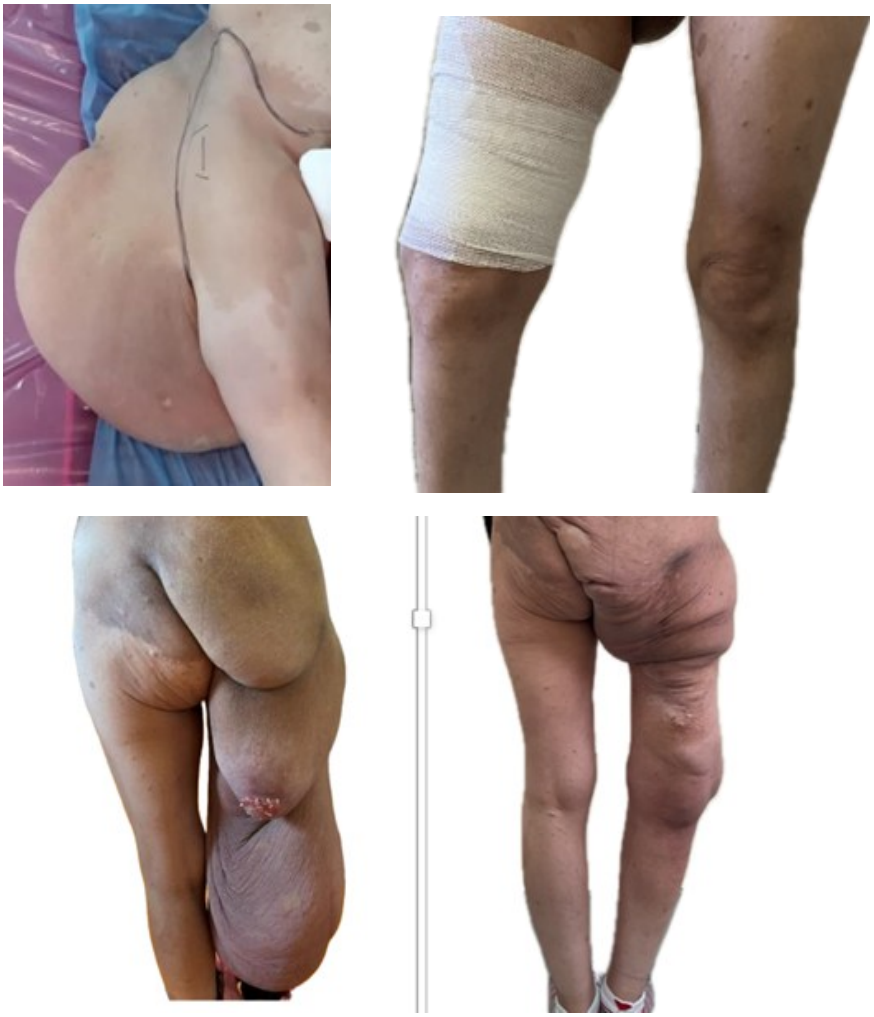

Fig 4. *Pre and postoperative patient.*

3. Discussion

The association of spinal meningoceles[6] with neurofibromatosis type 1 is well known and can be observed in 60 to 85% of all NF1 cases, but descriptions of ventrolateral meningoceles of the sacral spine are rare lesions with only very few published cases so far, with a slight female predominance. Meningocele in NF1 are commonly associated with dural ectasia and herniation of the thecal sac through a defect in the lateral aspect of the vertebra or through the widened intervertebral foramen.

The pathogenesis of anterior spinal meningoceles (ASM) can be interpreted by the hypothesis of congenital neural tube defects arising during embryonic development at the stage of neurulation. Meningocele development is explained by CSF pulsation eroding the weakened spinal wall or intervertebral foramen and leading to out-pouching Asymptomatic meningocele do not require surgery, while in the symptomatic ones surgery is mandatory.

The MR is the gold standard for visualizing the abnormal anatomy of a meningocele, as well as the connection to the dural sac, extremely important for ASM diagnosis. These images give us an accurate information on the shape, size, anatomical relations with surrounding organs and intrinsic characteristics of the cystic mass and its neck.

Small multiple celes usually remain without symptoms and do not require surgical intervention. Larger lesions cause headache, sometimes back pain with or without motor and sensory deficits, in these cases they should be treated surgically.

Various surgical approaches have been proposed for the treatment of symptomatic meningoceles, but decisions are made on a case-by-case basis. Depending on the approach and extent of surgery, we advise a multistage procedure with an interdisciplinary team.

The goal of surgery should be the disconnection of the linkage between the cyst and the CSF from the subarachnoid space to prevent further enlargement of the cyst and reaccumulating of cystic fluid. When the meningocele occur in the sacrococcygeal region, the most used surgical procedure is the anterior transabdominal approach and posterior approach through sacrococcygeal laminae, also endoscopic procedures. Placement of cyst peritoneal and lumboperitoneal shunts using fixed pressure and programmable valves, has also been reported as a possible treatment.

Anterior spinal meningocele is a kind of rarely encountered malformation with the unclarified mechanism of pathogenesis.

Plexiform Neurofibroma

These neurofibromas are benign Schwann cell tumors arising from the fibrous tissue surrounding peripheral nerve sheaths and are composed of Schwann Cels, fibroblasts, perineural cells, and mast cells.

In some cases, however, neurofibromas are located along the nerves, in the subcutaneous tissue and follow the nerves affecting large areas and are defined as plexiform neurofibromas. Patients with neurofibromatosis have a higher mortality rate which is mostly related to the possibility of malignant transformation.

In many cases, surgical excision[7] is complicated due to the involvement of the main nervous branches within the plexiform neurofibromas. The chance of recurrence will depend on whether a partial or total resection was performed[8].

Neurofibromatosis was defined by the National Institute of Health conference in 1987 and updated in 2021. The revised criteria for NF1 incorporate new clinical features and genetic testing[9]. Plexiform neurofibroma (PN) occurs grossly in approximately 50% cases of NF1 and are usually present from birth. The NP can be superficial or deep location, the superficial ones can cause physical disfigurement[10] and therefore psychological disorders, while the deep ones can turn on into malignant peripheral nerve sheath tumors (MPNST). Treatment remains as a challenge and surgery is a procedure that not always is possible to perform, due to the location of the lesion or the compromise of vital structures.

In 2020, were published the results of a trial in children with neurofibromatosis type 1 and inoperable plexiform neurofibromas which demonstrated durable tumor shrinkage and clinical benefit from selumetinib[11,12].

Pheochromocytoma

Pheochromocytoma is a rare tumor that arises from chromaffin cells, which are derived from the neural crest and produce and secrete catecholamines. These tumors can cause symptoms such as headache, sweating, palpitations, and hypertension. Diagnosis is made by measuring catecholamines and their metabolites in blood or urine.

Pheochromocytoma is usually treated with surgery to remove the tumor. However, before surgery, specific blood pressure medications may be prescribed to block high-adrenaline hormones and lower the risk of developing dangerously high blood pressure during surgery.

Patients with neurofibromatosis may develop pheochromocytoma tumors in the adrenal gland or other parts of the body. This association is rare (NF/PHEO), with an estimated frequency of 0.1–5.7%, approximately, 10 times greater than the general population but this is increased to 20–56% in patients with hypertension and NF1. This tumor has been found at autopsy in 3.3–13.0% of patients with NF1[13]. They are predominantly women in their early forties.

Although the majority of NF1 associated pheochromocytomas are benign, approximately 11% are malignant with metastasis at initial presentation.

Most patients have symptoms, but 20% are asymptomatic, only 10% of patients have bilateral and 6% ectopic tumors.

We would like to bring attention to the increased morbidity of untreated phaeochromocytoma, and to highlight the importance of considering this tumor in appropriate settings when encountering patients with NF1[14].

4. Conclusion

Giant lumbosacral plexiform neurofibromas, sacral meningocele and pheochromocytoma are extremely rare.

After diagnosis of NF1, patients who have episodes of hypertension, sweating, headache and palpitation should be evaluated for PHEO.

Variability in clinical presentation of NF1 with possible manifestation of severe systemic benign and malignant diseases requires strict follow-up and specific screening of extra-cutaneous lesions.

Conflicts of Interest

The authors declare no conflicts of interest.

Acknowledgement

None

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