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## Lumbosacral Perineural Cysts

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### Abstract

**Objective:** The treatment of lumbosacral nerve root cysts is both difficult and challenging because it produces manifestations of nerve root compression which may result from many other sources of pain such as facet joints, discs, and canal stenosis. Different surgical procedures to manage perineural cysts are being used, but consensus on which methods are best has not been reached. We analyzed surgical results for eleven patients whom we treated between 1997 and 2001 to determine the efficacy of the procedures and factors that influence the outcome.

**Patients and Methods:** Eleven patients with one or more lumbosacral perineural cysts presented with intractable radicular pain in one or both lower limbs which was not responding to medical treatment, underwent surgical decompression and marsupialization of the cyst. The patients' data was analyzed for pre-operative clinical and radiological findings. All the patients were examined for 1 week post-operatively and were followed up for 3 to 60 months to assess the surgical outcome.

**Results:** All the patients in this study presented with clinical findings similar to those associated with other spinal epidural lesions at the same locations. Both computed tomography and magnetic resonance imaging aided in accurate diagnosis of perineural cysts. Surgical results were excellent in 8 patients, and good in 3. There were no major intra-operative complications or new post-operative neurological deficits.

**Conclusion:** Perineural cysts are a rare intra-spinal epidural cysts filled with CSF, and have inconsistent relation to nerve roots, without communicating with subarachnoid spaces. Surgical excision of the wall of perineural cysts usually results in considerable improvement in the patient's condition.

### Introduction

**PERINEURAL** cysts were first described and defined by Tarlov in 1938 [19]. The spinal perineural cyst arises between the arachnoids that covers the nerve root (perineurium) and the outer surface of its pia (endoneurium), its walls are formed of these elements. The cyst may extend around the circumference of the nerve or into the substance of the nerve root and dorsal ganglion [5]. The incidence of these cysts and their prevalence has been estimated to be 4.6% among general population [13]. The majority of these cysts are asymptomatic and discovered accidentally or incidentally during

investigation of the spine, up to one fifth of the cysts can produce neurological compressive signs and symptoms, so it must be considered in differential diagnosis of intraspinal epidural compressive lesions of the spine like meningeal diverticula's, arachnoids nerve root sheath dilatation, ganglionic cysts and synovial cyst [13]. The cause of the perineural cysts remains unknown but several hypotheses have been put forward like congenital, traumatic, degenerative, inflammatory but most seem to idiopathic [2,8,11, 14]. Irrespective of the exact etiology of these cysts, the hydrostatic pressure and pulsatile forces of CSF are mainly responsible



for the growth and the symptoms they produce [1]. Surgical treatment is recommended for the symptomatic perineural cysts. In the literature several methods have been used to treat these symptomatic lesions, with variable results. Minimally invasive methods used by neuroradiologists include percutaneous CT guided needle aspiration of the cysts. However, the cysts recurred within few months in most cases [13]. Attempts to treat recurrent cysts with CT guided infusion of fibrin glue yielded variable results and this method was associated with high rate of aseptic meningitis [12]. Neurosurgical techniques used for the treatment of perineural cysts include bony decompression alone, cauterization of the cyst wall, complete cyst and root excision, over sewing of the cyst wall, microsurgical cyst fenestration and imbrication of the redundant nerve root sheath and lumboperitoneal shunt to drain CSF [10,15,17,21,9,1]. Although favorable results are reported, surgical failures have also been described for each method.

#### Patients and Methods

Between 1997 and 2001, 11 patients (four men & seven women) with the diagnosis of lumbosacral perineural cysts were admitted and surgically treated at the Banha University Hospital, Kasr El-Eini University Hospital and King Fahd hospital. The mean age of the patients was 32 years (range 23-45 years). Neurological examination and lumbosacral MRI & CT were performed on all patients before surgery (table 2&3). All the patients presented with radiculopathy of one or both lower limbs, four reported weakness of the ankle dorsiflexion, and six had no ankle reflex. All the patients showed positive stretch test and also experienced increased pain at night. Four had urinary urgency with hesitancy. The diagnosis of perineural cysts was confirmed by MRI, all cysts presented as well delineated epidural masses which were located anterolateral to the thecal sac with extension to the neural foramen and with foraminal enlargement in 8 cases. On CT all the cysts appeared as

hypodense intraspinal epidural masses with characteristic spinal bony changes in the form of localized widening of the spinal canal and scalloping of the vertebral bodies or sacrum. All the patients underwent surgical exposure of the cysts either through laminectomy (8 patients) or hemilaminectomy (3 patients). The cysts were fenestrated to drain CSF, in order to confirm that there was no communication with the subarachnoid space, the operative field was observed for any continuous CSF leak or collapse of the dural sac after opening of the sac. No perineural cyst in any patients in this study was communicating with the subarachnoid space. As much as possible thin transparent meningeal wall of the cyst was excised and thick wall close to the nerve root was not manipulated so not to injury to the nerve fibers traversing this part of the cyst wall. The dural nerve root sheath was left opened, and the nerve roots were not covered by any tissue like fat or muscle pieces. The wound was closed in ordinary fashion. No post-operative CSF accumulation or leakage through the wound was noted in any patient. The Patients outcome was assessed according to the modified scale of Macnab [16]: (1) excellent: - complete resolution of symptoms. (2) Good:- marked improvement, occasional pain. (3) Fair:- some improvement, need for pain medications with significant functional restrictions. (4) Poor:- no change in symptoms, or worse. All the patients were examined daily for the first week post-operatively and followed thereafter in the clinic for a period of 3-60 months.

#### Results

##### *Clinical findings.*

Eleven patients included in this study presented with intractable radicular pain in one leg (7 patients), and two legs (4 patients). This radicular pain was spontaneous, severe, exaggerated at night, not relieved by analgesics and not related to the activity of the patients. Two patients had unilateral weakness of ankle dorsiflexion while two



had bilateral weakness. Five patients had absent ankle reflex. Lasegue's test was positive and very characteristic (10-30 degrees) in all patients (table 3).

#### *Radiological findings.*

All the patients were investigated by spinal CT & MRI. All the cysts appeared as well delineated epidural masses (the cysts were solitary in 7 patients, bilateral in 3, and triple in 1) located anterolateral to the thecal sac with extension to neural foramen in 8 cases. CT scan showed localized widening of the spinal canal opposite to the cyst in all cases. Predominantly cyst location was at the sacral region (7 patients) S1: 3 patients, S1-S2: 2 patients, S2: 2 patients and only 4 patients had cysts at lumbar region (L4/5: 2 patients, L4: 1 patient, L3: 1 patient) (table 2). The cyst contents showed the same density and intensity as that of CSF in both CT and MRI scans. There was no enhancement in the cases where intravenous contrast was given.

#### *Operative management.*

The surgical technique used was similar to that for disc excision, with a wide exposure to enable a clear view of the cyst and the surrounding structures to avoid nerve

root injury. For operative approach either laminectomy (in 8 patients) or hemilaminectomy (in 3 patients) was chosen according to imaging studies. Cysts were aspirated first through a fine needle syringe which revealed CSF like fluid and the wall was fenestrated with a scalpel and the most of it was excised. No cyst was found communicating with the subarachnoid space. No major intraoperative complications were observed only some epidural venous bleeding after excision of the cyst wall and this was easily controlled by application of pieces of surgical.

#### *Surgical Outcome.*

All the patients were examined during the first postoperative week and thereafter for a period range from 3-60 months with average 25 months. Surgical outcome was excellent in 8 patients and good in 3. Three patients with symptoms of motor weakness recovered completely within the first week after surgical intervention and 3 with urinary hesitancy regained normal bladder control after surgery. There were no postoperative neurological deficits, CSF leak, or wound infections. There was no recurrence of the pre-operative symptoms in any patient during the follow up period.

Table 1: Comparison between perineural and synovial cysts

Type of cysts Variable	Perineural Cyst	Synovial Cyst
Age of the patients	young	Old
Location	The majority at sacral region	The majority at L4-5
Intraspinial position	Anterolateral	Posterolateral
Relation to		
Facet joint	Not related	Related
Ligamentum flavum	Not related	Usually involved
Nerve root	Usually involved	Not related
Contents		
Fluid	CSF	Viscid, gelatinous
Color	Colorless	Colored (yellow or brown)
Gas	Absent	May be present
Radiological		
Calcification	Absent	Peripheral calcification
Bony changes	Enlargement of spinal canal and/or neural foramen	Facet degeneration
Spinal Instability	Not related	Associated with : Joint Hypermobility, Spondylolithesis

Table 2 : Radiological finding of patients with perineural cysts

Radiological Findings	No. of cases
<b>Location</b>	
L3	1
L4	1
L5	2
S1	3
S1-2	2
S2	2
<b>NO. of cysts</b>	
ONE	7
TWO	3
THREE	1
<b>Bony changes of the spine</b>	11

Table 3: Clinical and surgical results of patients with perineural cysts

Findings	No. of cases
<b>Symptoms</b>	
Unilateral sciatica	7
Bilateral sciatica	4
Weakness	4
Night pain	11
Urinary Disturbance	3
<b>Signs</b>	
Sensory hypoesthesia	10
Absent ankle reflex	8
Weakness of DF ankle	4
SLR test	11
<b>Surgical approach</b>	
Laminectomy	8
Hemilaminectomy	3
<b>Surgical outcome</b>	
Excellent	8
Good	3



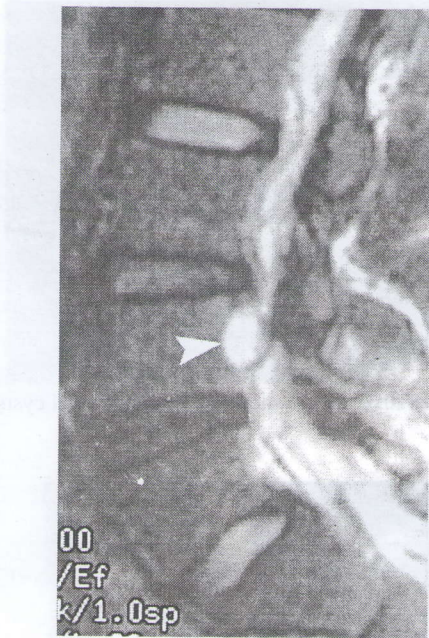


Fig. (1): MRI saggital T2 showed perineural cyst opposite L4.



Fig. (2): MRI sagittal veiw T2 showed huge perineural cyst opposite S2.

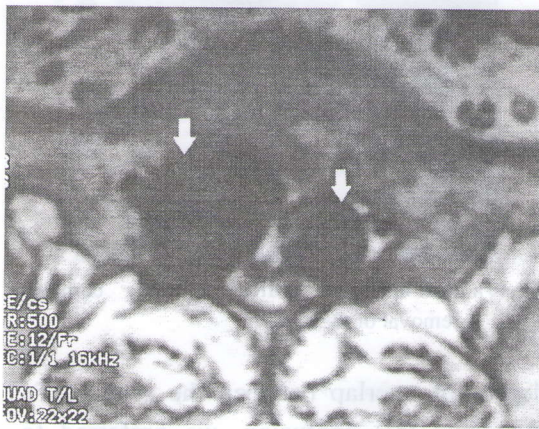


Fig. (3): MRI axial veiw showed bilateral sacral perineural cysts.

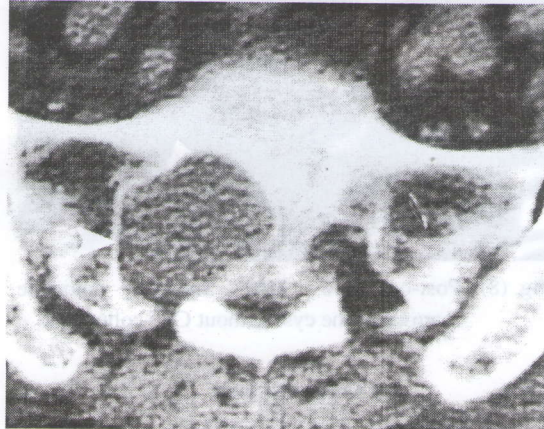


Fig. (4): CT scan of the sacrum showed enlargement of the neural foramina.

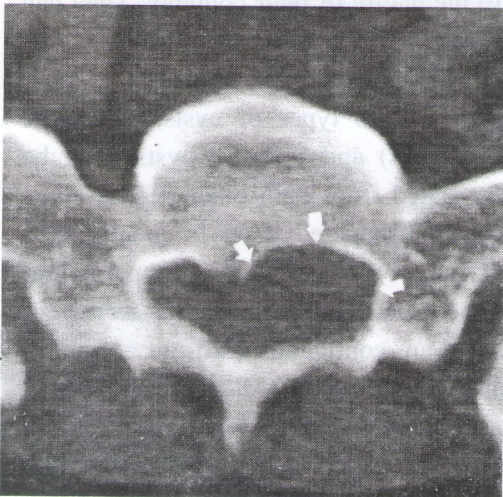


Fig. (5): Scalloping of the sacrum.





Fig. (6): Operative picture showed bilateral perineural cysts.



Fig. (7): Operative picture showed three perineural cysts.



Fig. (8): Post-operative MRI showed complete removal of the cyst without CSF collection.



Fig. (9): Post-operative MRI showed complete removal of the cyst.

### Discussion

Intraspinal epidural cysts are detected frequently during neuroradiological examination. Cysts of different pathological origin like perineural cysts, meningeal cysts or diverticula, nerve root sheath dilatation, synovial cysts and ganglionic cysts may develop within the spinal canal and may present similar radiographic and clinical picture [6,10]. There is a lot of confusion in the classification of spinal cysts due to the following reasons [22]: a) Various terms have been applied to the same entities by different authors. b) Imprecise description of the cysts. c) Incomplete knowledge of the origin of some of these lesions. d) There is some

degree of overlap between the groups. To overcome this confusion, we preferred to classify intraspinal extradural cysts according to the nature of their contents. They can be grouped as: cerebrospinal fluid (CSF) cysts, synovial cysts, inflammatory cysts & neoplastic. Two types of cysts, perineural (Tarlov cysts) and synovial cysts must be differentiated from each other because they are being discovered more frequently than others (table1). Anatomically the perineural cysts are usually related to sacral nerve root S2-3 and are contiguous with the arachnoid membrane and the dura of the existing posterior nerve root [15]. In this study it was related to the sacral nerve root in 7 cases



(64%). The clinical course of the patients with lumbosacral perineural cysts is due to nerve root compression by the mass effect of the cyst; furthermore, large unilateral or bilateral cysts compress the adjacent sacral thecal sac, which may lead to associated urinary problems. The cause of cysts enlargement remains unclear; Tarlov [18] postulated this growth as a result of blockage of venous drainage in the layers of the nerve sheath due to local trauma. Fortuna [4] considered the cyst to be the result of congenital arachnoidal proliferation. Paulsen et al [13] supported the theory of a ball-valve effect, whereby CSF enters the cyst with systolic pulsation but unable to exit through the portal during diastole. Surgery is generally recommended for symptomatic perineural cysts, with the aim of obliterating the cyst and preventing recollection of CSF. Patients should be examined thoroughly to rule out any coexisting spinal lesions producing nerve compressive syndrome. Patients who undergo surgery for perineural cysts, fenestration and excision of thin transparent wall of the cyst without disturbing the thick wall of the cyst may prevent damage to root fibers which may be splayed over the surface of the cyst. Simple aspiration of the cysts is not recommended as it has produced poor results with fluid reaccumulation [20]. Simple bony decompression has proven not to be successful [6]. Cysts and nerve root resection often results in a neurological deficit [16]. Drainage of the cysts with imbrications of the redundant nerve root sheath is a favorable method, but it may be difficult to obtain a watertight closure of the redundant nerve root sleeve [9]. Lumboperitoneal shunt has been performed in 3 patients [1] in one series, but further study is needed to establish long term efficacy of this procedure.

### Conclusion

Spinal perineural cysts are frequently encountered more than before in patients presenting with nerve root compressive syndrome due to increase in the availability and sensitivity of MRI as a diagnostic modality for the spine. Spinal MRI gives easy, accurate and precise information about the location and extension of the spinal perineural cysts. Our surgical approach is simple and usually results in considerable improvement in complaints and objective findings, and is recommended as the technique of choice for surgical treatment of lumbosacral perineural cysts.

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