

## Arguments on Current Management of Symptomatic Sacral Cysts

Review Article

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### Abstract

Although sacral perineural cysts are mostly seen as incidental findings on computed tomography (CT) or magnetic resonance imaging (MRI), occasionally they may become symptomatic. Generally only follow-up is recommended in asymptomatic cases. However, there are various non-surgical or invasive interventions for the treatment of symptomatic cases, but optimal treatment strategy is not clear yet. Debates continue regarding the etiology, pathogenesis and treatment of these cysts.

**Keywords:** Sacral Perineural Cyst; Computed Tomography; Magnetic Resonance Imaging; Cyst Fenestration.

### Introduction

Perineural cysts, also known as Tarlov cysts, are serberospinal fluid-filled growths that originate between the perineurium and endoneurium [1]. It was first described as an incidental finding during autopsy by Tarlov in 1938 [2]. These cysts develop between the dorsal root ganglia and the posterior nerve root. Although the exact etiology is not known clearly, congenital and acquired causes have been suggested [3]. Connective tissue diseases such as Marfan syndrome and Ehler-Danlos syndrome have been listed as congenital causes. Acquired causes include inflammation within the nerve root cyst, hemorrhagic infiltration of spinal tissue, and impaired venous drainage in the perineurium and epineurium secondary to hemosiderin storage after trauma [3 - 6]. However, it is believed that the possible mechanism in cyst growth is valve-like microcommunication, which allows inflow of cerebrospinal fluid but restricts its outflow [1, 7].

Perineural cysts are mostly seen in the sacral spine region [3]. However, they may be seen in the cervical, thoracic and lumbar regions [8, 9]. Additionally, perineural cysts may be seen in more than one location in the same patient. In a case report published in 2021, a total of 39 perineural cysts at 17 different levels were detected in the same patient [10].

### Incidence and prevalence

In a study performed in 1994, the prevalence of was stated as 4,6 % in a 500 consecutive lumbosacral MR [11]. However, in a recently published radiological study, its incidence was reported as 13.2% [12].

### Clinical presentation of sacral perineural cysts

These lesions are typically asymptomatic and are incidentally detected on computed tomography or magnetic resonance imaging [13]. However, they may rarely cause compression of the adjacent nerve root, leading to neurological symptoms, including pain and sensorimotor disorders [14, 15]. Symptomatic cyst rate was reported as 1% in 500 consecutive lumbosacral spine MRI examinations by Paulsen et al. [11].

Pain related with these cysts may be listed as localized sacral pain, coccygodynia, perineal pain, low-back pain, radicular type pain, sacral nerve root pain (sciatica) [16, 17]. Sacral insufficiency fractures, leg weakness, neurogenic claudication, weakness in related sacral myotomes, sexual dysfunction and bowel and bladder disturbances have been reported as the clinical findings [6, 11,

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17, 18]. Symptoms may show acute or gradual onset and may be exacerbated by coughing, standing, and change of position and decreased by recumbent positioning. This exacerbation and decrease may be explained by the increase in CSF pressure, leading to the activation of ball-valve mechanism [17].

### Radiological diagnosis

Although plain radiographs are limited in the diagnosis of sacral perineural cysts, they may show bony erosions of the spinal canal or of the sacral foramina [11]. CT may show sacral erosions, asymmetric epidural fat distribution, and cystic masses that are isodense with CSF [19, 20]. CT of a 40 year-old man showing bony erosion and cystic masses (fig 1&2).

Magnetic resonance imaging (MRI) is the gold standart in radiological diagnosis of these cysts [11, 16]. MRI has advantages of providing better resolution of tissue density, showing the relationship with surrounding structures, absence of bone interference, multiplanar capabilities and being a noninvasive [11, 21]. Since these cysts contain CSF, they have low signals in T1-weighted images and high signals in T2-weighted images [11, 21]. MRI images of the aforementioned patient are seen (Fig 3&4).

If MRI cannot be performed due to various reasons or is not available, a CT myelogram may be used [22]. Myelographic studies using oil-based contrast, resulted in delayed filling of the cyst however, studies using water-soluble contrast allow for a more rapid filling [11, 19]. Myelography is helpful to determine the relationship between the perineural cyst and subarachnoid space. Delayed contrast filling of a cyst is suggestive of the valve-like microcommunication which indicates the presence of symptomatic perineural cyst [1]. If there is a suspicion of pathology such as an arteriovenous fistula in the cyst, CT angiography also helps in the differential diagnosis [23].

### Treatment

Three important factors should be taken into consideration when deciding to manage these cysts. First, there is no cyst and symptoms are related to pathology. Second, there is a cyst as a

secondary cause and there is another pathology that causes the symptoms. Lastly, the cyst is only pathology that can explain the presence of symptoms [17].

Although only follow-up is recommended for the treatment of asymptomatic cases, the definitive treatment of symptomatic ones is still unclear [1, 24]. It has been reported that if the symptomatic cyst is not treated, the complaints would continue and even progress [1, 16]. Various authors emphasized that CT-guided percutaneous aspiration is an important prognostic procedure in identifying patients who would benefit from surgical intervention [1, 25]. Case series yield contradictory results regarding surgical indications [26].

In symptomatic cysts, we can generally group the treatment under two headings as conservative treatment and surgical treatment.

### Conservative treatment

Conservative treatment, including medical therapy (with analgesic and nonsteroidal anti inflammatory medications) and physical therapy, is suggested as a first option [17]. In an article published in 2008 on the conservative treatment of symptomatic perineural cysts, Mitra et al. reported a successful treatment with steroids. In this article, intralaminar steroid injection was administered to a 61-year-old male patient. In this case, it was shown that the cysts disappeared completely 5 months after the injection. Their second case was a 38-year-old female patient with cervical perineural cyst which was given 6 days of oral steroid treatment [8].

### Surgical treatment

It is possible to examine the surgical treatment of perineural cysts under two headings. The first of these is the CSF flow diversions including CT-guided percutaneous aspiration and modifications, lumboperitoneal shunt, or cystosubarachnoid shunt. The second method is the direct microsurgical approach [17].

Variable success rates of various surgical methods have been reported, including microsurgical cyst excision, cyst fenestration, and minimally invasive methods [27 - 31].

Figure 1-2: Sagittal ( figure 1) and axial ( figure2) CT images.

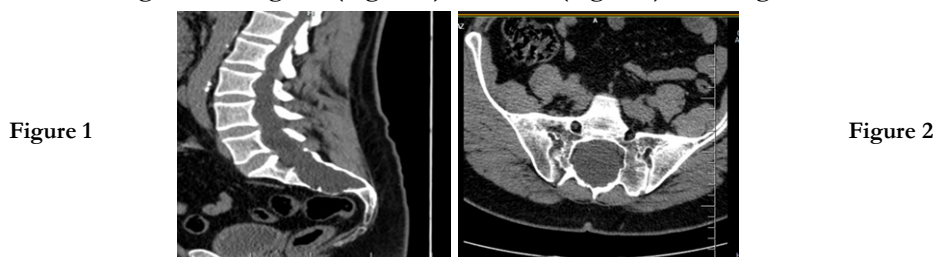
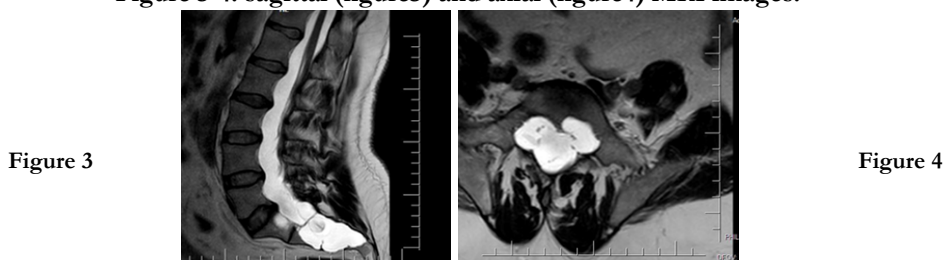
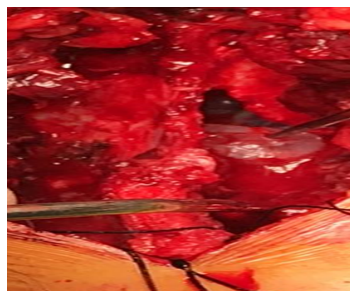
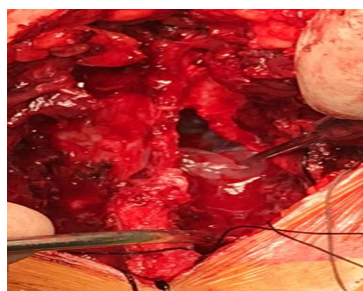


Figure 3-4: sagittal (figure3) and axial (figure4) MRI images.



**Figure 5-6: Intraoperative view of the cyst after hemilaminectomy.****Figure 5****Figure 6**

CT-guided percutaneous drainage techniques were used in patients with symptomatic sacral perineural cysts and after this procedure, instant pain relief lasted from 3 weeks to 6 months without the risk or cost of spine surgery [11]. In a study conducted on 213 patients in 2016, the effect of CT-guided 2 needle cyst aspiration and fibrin sealing was investigated. Patients were followed for at least 6 months. Excellent results were achieved in 54.2% of the patients. Good or satisfactory results were obtained in 27.6% of the patients, and a positive result was reported in 81% of the patients with this method. This study reported that there were no clinically significant complications, and as a result, it was reported that this method showed promise as a safe and effective treatment option for relieving cyst-related symptoms in the majority of patients with little risk [15]. However, complications such as refilling of the cyst with CSF and rarely septic meningitis have been reported in CT-accompanied procedures [32].

Smith et al. in their technical notes published in 2011 have described sacral laminoplasty and microscopic cystic fenestration in the treatment of symptomatic sacral perineural cysts. The authors stated that this technique could be effective in preventing CSF leaks, cyst recurrence and sacral insufficiency fractures. Authors believed that replacing the sacral roof would benefit the dural closure by acting as bolstering and supporting. Only one of the 18 patients required revision surgery for CSF leakage [29].

In 2012, Xu et al. also reported three different modalities in patients with symptomatic perineural cyst, which were microsurgical cyst fenestration and cyst wall imbrication, modified surgical procedure, during which the cerebrospinal fluid leak aperture was located and repaired, and medication and physical therapy. Authors stated that all patients who underwent microsurgical cyst fenestration and imbrication experienced complete or substantial relief of their preoperative symptoms. However, symptom recurrence in one patient and CSF leakage in another patient were reported. Modified surgical operation experienced complete or substantial-resolution of preoperative symptoms, with only one patient who experienced temporary worsening of preoperative urine incontinence. However, it has been reported that a new postoperative neurological deficit, CSF leak and recurrence could not be seen in these patients [33]. In a similar article published recently, microsurgical cyst fenestration was associated with good long-term results and a low degree of complications' was stated [1]. In the study reporting the results of a single institution in 2019, it was concluded that cyst fenestration and nerve root imbrication are both surgical techniques to treat symptomatic cysts and can result in clinical improvement [34].

In an observational study reported by Jiang et al. comparing micro

surgical cyst fenestration and irrigation, C-arm fluoroscopy guided percutaneous fibrin gel injection and conservative treatment, authors concluded that C-arm fluoroscopy guided percutaneous fibrin gel injection therapy could be recommended as a better consideration for symptomatic cysts [35].

Tsitsopoulos et al. also reported the result of cyst fenestration and the use of a vascularized fasciocutaneous flap, successfully obliterated all cysts, with satisfactory clinical efficacy in symptomatic sacral cysts [13].

Symptomatic sacral perineural cysts accompanied by intra-cystic hemorrhage are rare. It has been recently reported that in the presence of an underlying arteriovenous fistula, the transcatheter arterial embolization of AVF leads to a reduction in both hematoma size and cyst sizes without the need for additional surgical intervention, and the symptoms are significantly reduced [23].

## Conclusion

Although perineural cysts are encountered frequently in clinical practice, there is still no certainty about either etiology, pathogenesis and treatment, and discussions continue about all of these subjects. Although successful results have been reported for each method in the management, the decision of treatment by talking to the patient of all possible risks and consequences of the appropriate intervention for the patient to be applied continues to be the basic truth of medicine.

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