Discal cysts of the lumbar spine: report of five cases and review of the literature

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Abstract Discal cysts are rare causes of low back pain and radiculopathy. Only few reports in the literature describe these pathologies. In this article, the authors report five cases (3 males and 2 females) of lumbar discal cysts treated surgically by microdiscectomy. These patients were admitted with a history of back pain and/or sciatalgia. Magnetic resonance imaging of the lumbar spine of all patients revealed lumbar discal cysts, causing compression to the spinal dura and roots. All patients were treated by partial hemilaminectomy and microscopic cyst resection. Postoperatively, the complaints showed improvement, and the patients were discharged with no complications. The cases of lumbar discal cysts are described in the literature as individual case reports, therefore; the authors performed a wide systemic review of all these cases published in PubMed and MedLine, including the patients in the present report. The data of all patients were analyzed to obtain statistically based estimated information about the

incidence, the epidemiology, the natural history and the optimum management of these lesions.

Keywords Discal cyst · Intervertebral disc · Lumbar vertebrae · Surgical treatment

Introduction

Discal cysts are defined as intraspinal extradural cysts with a distinct communication with the corresponding intervertebral discs [2, 21]. These lesions are extremely rare pathologies of the spine, which are difficult to distinguish from other causes of low back pain and radiculopathy. With the advances in imaging techniques, the diagnosis of these lesions has become more facilitated, with more accurate knowledge of their origin and anatomic-clinic correlation. However, due to the rarity of the discal cysts and the few reports mentioned in the literature, the definitive information about the natural history of these lesions have not been completely disclosed, and the ideal methods of management are still controversial.

The authors report five cases (3 males and 2 females) of a lumbar discal cysts treated surgically by microdiscectomy. The data of the patients in our series are summarized in Table 1. Including the cases presented in this report, the authors also performed a wide systemic review of all cases of discal cysts published in PubMed and MedLine and analyzed their data, attempting to build a statistically based estimated general scheme of the epidemiology, the pathogenesis, the natural history and the optimum management of these lesions. The searching criteria included the words ‘discal cyst’, ‘spinal cyst’, ‘spinal synovial cyst’ and ‘vertebral cyst’. Literature review revealed 20 reports, and with including the 5 cases of this article, a total of 56

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Table 1 Summary of the patients in our series

Case no.	Age/sex	Level	Symptoms	Signs	T1	T2	Post-contrast	Pathology	Follow-up (months)
1	54/F	L5–S1	Leg pain	SLR right + 40°, left hyposthesia	Low signal	High signal	Enhancement of cyst wall	Synovial cyst + serous	26
2	35/M	L5–S1	Acute low back + leg pain	SLR right + 45°	Low signal	High signal	Enhancement of cyst wall	Synovial cyst + serous	19
3	38/M	L1–L2	Leg pain	Left femoral stretch	Low signal	High signal	Enhancement of cyst wall	Synovial cyst + serous	15
4	64/F	L3–L4	Acute low back + leg pain	Right hyposthesia	Low signal	High signal	Enhancement of cyst wall	Synovial cyst + serous	12
5	37/M	L5–S1	Back + leg pain	SLR right + 35	Low signal	High signal	Enhancement of cyst wall	Synovial cyst + serous + hemosiderin	8

(T1 T1-weighted image, T2 T2-weighted image, SLR straight leg raising test)

patients' information were systemically reviewed and analyzed in a Microsoft Excel spreadsheet (Redmond, WA, USA). All data were provided as mean $\pm$ SD, and statistical analyses were performed using the paired two-tailed Student's *t* test.

Illustrative cases

Patient 2

A 35-year-old man presented with a new onset low back pain and right sciatalgia started before 2 weeks. Neurological examination revealed positive straight leg raising at 45° on the right side. Lumbar radiographs were normal, with no signs of spinal segmental instability, deformity or narrowing of disc heights. Lumbar MRI with gadolinium enhancement revealed a cystic lesion adjacent to the L5–S1 intervertebral disc, with marked compression of the ventrolateral part of the adjacent spinal cord thecal sac and right S1 spinal root. The cyst was hypointense on T1-weighted, and hyperintense on T2-weighted images, with contrast enhancement of the cyst wall on post-contrast images (Fig. 1). The patient was operated by performing right partial hemilaminectomy at L5–S1 level and microdiscectomy, with total removal of the cyst and its serous content. Intraoperatively, a connection between the cyst and the L5–S1 intervertebral disc and a defect in the annulus fibrosus were identified. No intraoperative or postoperative complications were observed, and the patient was discharged afterwards with complete relieve of the complaints. Clinical follow-up of the patient after 19 months showed no symptoms and signs with satisfactory results.

Discussion

Discal cysts of the lumbar spine are extremely rare lesions, and only few articles in the literature discussed these lesions as individual case reports. Chiba et al. [2] summarized the characteristics of discal cysts: (1) clinical symptoms of a unilateral single nerve root lesion, (2) occurring at a slightly younger age and at higher intervertebral levels than typical disc herniation, (3) minimal degeneration of the involved disc on imaging studies, (4) communication between the cyst and corresponding intervertebral discs on discographs, with severe radiating pain in the affected leg at the time of injection, (5) a cyst containing bloody to clear serous fluid, and (6) absence of disc materials or a specific lining cell layer on histological examination. All these characteristics were observed in our patients. Histologically, intraspinal cysts of the facet and the ligamentum flavum are referred as ganglion or synovial cysts [22]. The difference between discal cysts and other intraspinal cysts is based on the presence of lining cells; however, their imaging and clinical features are similar [21].

Epidemiology

Age

The mean age was found 33.5 ± 12.6 years (range between 13 and 73 years), which was more younger than the population of degenerative lumbar disc herniation [10]. This finding is compatible with the theory of discal cysts formation by mechanical stress-induced focal degeneration of the adjacent intervertebral disc wall—annulus fibrosis—and fluid collection, and formation of pseudomembrane around the fluid collection as a second step [17]. In the

Fig. 1 Lumbar spinal MRI of patient 2 demonstrating the L5–S1 discal cyst, with prominent compression of right S1 root in case 2. **a** Sagittal T1 weighted, **b** sagittal T2 weighted, **c** axial T2 weighted, and **d** axial post-contrast images

patients with degenerative disc disease, chronic mechanical stress applied on the intervertebral disc induces gradual progressive degenerative changes of the disc with subsequent herniation. This gradual progression of the degeneration explains the late onset of the clinical symptoms and the older age of the population of degenerative lumbar disc herniation. On the other hand, the pathogenesis of the discal cysts may be explained on the basis of more acute and more stressful mechanical loads, which result in more acute formation of the disc herniation, followed by acute degeneration with formation of reactive pseudo-membrane [17]. In addition, the theory of discal cyst formation secondary to epidural hematoma developed from hemorrhage of the epidural venous plexus supports the role of the acute mechanical impact in the pathogenesis of discal cysts [2, 27]. This explains the similarity of age group of the patients reported with discal cysts and synovial cysts, as these patients mostly are active and in their mid-age [17]. Moreover, according to the gender of the patients, the mean age of male patients was 33 years, while the mean age of female patients was 38 years.

Sex

The majority of discal cyst patients were males (91%), with few reported female patients (9%). This finding also supports the pathogenesis of discal cysts by particular unique

shear stress being generated in this young male population from physical activity and/or hormonal influence.

Race

The majority of discal cyst cases were reported in Asian population. Most common cases were reported in Japan (24 cases), followed by South Korea (21 cases). Other cases were reported in our country in this article (5 cases), USA (4 cases), Belgium (1 case), and France (1 case). Moreover, it is important to mention that from the four cases reported in USA, one patient was African-American and one patient was a Ukrainian emigrant [4]. The predominance of the incidence in Asia may be related to the type of activity, sports, the body mass index and/or different spinal flexibility in these populations. In addition, genetic factors may have an important role in the formation of discal cysts. However, there is no clear evidence supporting these issues, and further demographic and genetic studies are required to explain this racial distribution.

Risk factors

From the findings mentioned above, it is clear that people with high risk of discal cyst disease are young (3rd and 4th decade), physically active males, and from Asian race [1, 2, 7, 15, 19, 23–25].

Pathology and pathogenesis

Histologically, the cyst wall appears predominately of dense fibrous connective tissue, with no epithelial lining. Cyst contents vary between serous and mucinous. These findings were observed in all reports in which histopathologic examination was performed (46 cases). Hemorrhagic contents of the cyst and/or hemosiderin deposits may be found, and were reported in 30.4% of cases. In addition, myxoid degeneration may be seen, and was reported in 24% of cases. Neovascularity of the cyst wall and cartilaginous contents were rarely seen.

The etiology and pathogenesis of an intervertebral disc cyst remain unknown. Two hypotheses for the formation of these cysts have been suggested. Toyama et al. [27] and Chiba et al. [2] have proposed that an epidural hematoma is initially formed from hemorrhage of the epidural venous plexus, resulting from either a disc herniation or an underlying disc injury. The discal cyst develops as a result of an unspecified impairment in hematoma resorption. They proposed the epidural hematoma theory from the findings that most of their cysts contained either hemorrhagic fluid or hemosiderin. However, findings of discography and CT discography in previous series have clearly demonstrated that there is a communicating stalk between the intervertebral disc and cyst. A resorbing epidural hematoma would not likely demonstrate this communication, because it is the result of a disruption of the epidural vasculature and not the annulus fibrosis. Kono et al. [17] reported two cases of operatively confirmed discal cysts and proposed that the pathogenesis of disc cysts is similar to that of meniscal cysts from the knee and synovial cysts from facet joints. They hypothesize that discal cysts result from focal degeneration of an intervertebral disc producing a herniated disc with subsequent spilling of fluid from the herniated disc material. The extruded fluid incites an inflammatory response leading to reactive pseudomembrane formation and the development of the disc cyst. The histology of the cyst wall in previous series and in our case demonstrated fibrous connective tissue without synovial-lining cells, which also supports this hypothesis. Imaging and intraoperative findings of an annular fissure and a communicating stalk between disc and cyst also support this hypothesis that the underlying pathology is from an extruded or herniated disc and not from a vascular phenomenon.

Clinical features

Symptoms

The most common symptom of discal cysts was found to be sciatalgia (75%), followed by low back pain (58%). This

finding is different than of degenerative lumbar disc disease, in which the most common symptom is low back pain. This can be explained by the more rapid formation of focal cyst of the intervertebral disc compressing the spinal roots, after microtraumas [2, 17, 27].

Signs

As expected, signs of root compression signs were predominant in these patients. In 43 patients with reported signs in the literature, motor deficits were found in 40%, and hyposthesia in 30% of the patients. Straight leg raising test was found positive in 53% of the patients. One patient with high lumbar discal cyst (L1–L2) demonstrated positive femoral stretch test. Tests triggering mechanical pain were rarely positive.

Radiologic features

Most plain radiographs of the lumbar spine demonstrated no remarkable pathological changes, such as narrowing of the disc space, malalignment, spondylotic changes, or spinal instability. Lee et al. [18] documented the MRI features of discal cysts: a ventrolateral extradural cyst attached to a lumbar disc, rim enhancement on contrast-enhanced MRI, and occasional extension into the lateral recess. These MRI features are the key differentiating between a discal cyst and lumbar disc herniation. Lumbar discal cysts most commonly occurred in the L4–L5 intervertebral disc (48%). MRI mostly demonstrated spherical extradural masses with low intensities on T1 and high-signal intensities on T2-weighted images [18, 26]. However, review of the radiologic findings of the discal cysts demonstrated that these signal intensities may not be the rule. In T1-weighted images, the cyst was hypointense in 68.7% of the cases, isointense in 29%, and hyperintense in 2%. On the other hand, in T2-weighted images, the cyst was hyperintense in 96% of the cases, isointense in 2%, and hypointense in 2%. Post-contrast MRI studies showed rim enhancement in 92% of the cases.

All cases investigated with discography and/or CT discography showed contrast flow into the cyst through connective channels. This finding was not demonstrated in intervertebral disc herniation and other intraspinal cysts [8, 18]. Thus, this review shows that contrast flow into the disc demonstrated by discography is pathognomic, and this investigation is diagnostic for these lesions. However, it seems that discography may not be necessary as a primary diagnostic tool for discal cyst, and MRI is sufficient for this aim. MRI is very sensitive in the diagnosis of discal cysts, non-invasive, and better in demonstrating the relation of these lesions with the surrounding structures. Moreover, in cases of doubtful diagnosis, surgery is performed to relieve

the compression of the neural structures, as surgical treatment leads to symptom improvement, regardless of its origin [8, 18]. In addition, intraoperative findings of the apparent connection between the corresponding disc and the cyst are also possible to differentiate discal cysts from other intraspinal cysts [8, 21]. For these reasons mentioned above, we did not perform discography, and MRI was satisfactory for the management of the patients in our series.

Management

Medical treatment and follow-up

Some reports described medical treatment as the initial management of discal cysts in cases with tolerable pain and without neurologic deficiencies. Eight cases (14%) were conservatively managed. Of these cases, spontaneous regression was reported in three patients (37.5%) (2 after steroid injection, and 1 after S1 nerve block) [3, 5, 6], and failure of medical therapies and reference to surgery was reported in five cases (62.5%) [4, 9, 12, 20]. These findings show that these lesions are less controllable with conservative treatment modalities, and surgical treatment may be considered as the initial management.

Surgical treatment

Surgical techniques in the treatment of discal cysts include CT-guided aspiration of the cyst contents, and microsurgical and endoscopic resection of the cyst. Most reported cases of discal cysts were managed by partial hemilaminectomy and microscopic resection of the cyst (69.6%). This surgical technique showed good results in all patients, except for one recurrent case (2.5%). Microscopic resection of the cyst is a favorable treatment method, as it is a simple technique, with no reported related morbidity or mortality, good clinical results, and low rate of cyst recurrence. Nabeta et al. [21] mentioned that although they excised the corresponding disc that was in apparent connection with the cyst, it is not always clear whether the disc should be excised in all cases. We agree that it is difficult to decide the need for additional excision of the corresponding disc. The precise mechanism of pathogenesis and the natural history of discal cysts are still unknown, therefore; it is difficult to predict the outcome and the risk of recurrence. For this reason, we preferred the excision of both the cyst and the corresponding disc in all cases of our series, believing that more radical excision may decrease the risk of recurrence. Our patients showed satisfactory clinical results with no recurrence after this approach. However, we also believe,

as Nabeta et al [21] stated, that to decide the best surgical approach for the treatment of discal cysts, additional cases of discal cysts accompanied by sophisticated analysis and careful follow-up are required. Endoscopic transforaminal and interlaminar approaches for disc resection were performed in five patients (9%) [9, 13, 14]. These reports also showed favorable results, with no cases of recurrence. CT-guided aspiration of the cyst contents was described in two reports with nine patients (16%) [11, 16]. This method showed good results in eight patients and recurrence of the cyst in one patient (11%). These results demonstrate that only aspiration of the discal cyst contents maybe effective in the treatment of these lesions; however, the high recurrence rate may support the need for more radical resection of the cyst.

Outcome

In all cases of discal cysts reviewed in the literature, three cases (5.3%) showed spontaneous regression of the cyst after conservative treatment [3, 5, 6], five cases (9%) showed failure after conservative treatment and referred to surgery [4, 9, 12, 20] and two cases showed recurrence of the cyst (3.5%) after CT-guided aspiration [11] and microsurgical resection [18]. The natural history of discal cysts is still unknown, however; these findings support the importance of the surgical treatment of discal cysts. We believe that the management strategies and the operative indications of discal cysts are likely to be similar to lumbar disc herniation, and we recommend excision as the best treatment for discal cysts in patients with persistent and refractory neurological symptoms and leg pain. In our series, the follow-up period ranged from 26 to 6 months (mean = 16). During this period, satisfactory clinical results were achieved with no recurrence after microsurgical treatment. Moreover, no morbidity or mortality was reported related to these lesions and their treatment method.

Conclusions

Discal cysts of the lumbar spine are very rare pathologies of the spinal vertebrae, and only few reports described these lesions in the literature. Thus, the definitive information about the natural history of these lesions and the optimum methods for their management are still controversial. Including the five cases presented in this report, systemic review of the literature performed by the authors was helpful in gaining more accurate general information about the epidemiology, the natural history and the management options of these lesions.

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