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Surgical Treatment of Lumbar Spinal Discal Cyst: Is It Enough to Remove the Cyst Only without Following Discectomy?

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Abstract

Discal cysts are a rare cause of low back pain and radiculopathy with unknown pathophysiologic mechanism. Associated symptoms are difficult to distinguish from those caused by extruded discs and other spinal canal lesions. Most discal cysts are treated surgically, but it is unclear whether the corresponding intervertebral disc should be excised along with cyst. We conducted a retrospective clinical review of 27 patients who underwent discal cyst excision at our institution between 2000 and 2017. The mean follow-up period was 63.6 months. We recorded symptoms, radiographs, operative findings, postoperative complications, and short- and long-term outcomes. Structured outcome assessment was based on Numeric Rating Scale (NRS) for pain intensity, Oswestry disability index, and Macnab classification. All patients underwent partial hemilaminectomy and microscopic cyst resection without discectomy. All patients had preoperative back or leg pain. Other preoperative clinical features included motor weakness, neurogenic intermittent claudication, and cauda equina syndrome. After surgery, NRS scores of back and leg pain decreased. The other symptoms also improved. During long-term follow-up, patients reported no restrictions on daily life activities, and were satisfied with our intervention. There were no cases of cyst recurrence. We conducted a review of the literature on lumbar discal cysts published before January, 2018. Including our cases, 126 patients were described. We compared two surgical modalities—cystectomy with and without discectomy—to elucidate both effectiveness and long-term complications. We found that microsurgical cystectomy without corresponding discectomy is an effective surgical treatment for lumbar discal cysts, and is associated with a low recurrence rate.

Key words: intervertebral disc cyst, intervertebral disc, radiculopathy, intervertebral disc disease, microsurgery

Introduction

Discal cysts are extradural cystic spinal lesions that cause low back or leg pain.[1,2] This entity is distinguished from other cystic spinal lesions by the communication between an adjacent intervertebral disc and the cyst.[3] These lesions are rare, and are mostly reported in Asia; their pathogenesis is still unknown.[4,5] Because of these features, there is no well-established treatment strategy, but the literature suggests that surgical treatment is the best option for discal cysts.[6] Various surgical therapeutic strategies have been suggested, but a standard surgical treatment method has not been established.[3] Here, we report the clinical outcomes of our institution's strategy, namely partial hemilaminectomy and microscopic cyst resection without concurrent excision of the corresponding disc. In addition, we provide a summary of previously published scientific literature on treatment options for lumbar discal cysts.

Materials and Methods

Diagnosis of discal cyst

Discal cysts were diagnosed from patients' symptoms, neurologic exams, and lumbar spine magnetic resonance imaging (MRI). We did not perform traditional discography or computed tomography (CT) discography, as MRI has replaced discography as

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the primary diagnostic tool for discal cysts. MRI is both noninvasive and sensitive in diagnosing discal cysts and identifying surrounding structures.[1)]

Patient characteristics

We conducted a retrospective review of medical records and found 27 patients who underwent surgical treatment for discal cysts between March, 2000 and August, 2017 at our institution. There were 25 males (92.6%) and two females (7.4%). Mean age at diagnosis was 32.5 ± 14.4 years (range 16–72 years) (Table 1). Medical records were reviewed, and data were compiled on symptoms, operative findings, postoperative complications, radiographic findings, histopathologic findings, short-term (1 month) outcomes, and long-term (>3 years) outcomes. We used the Numeric Rating Scale (NRS), Oswestry disability index (ODI), and Macnab classification criteria to evaluate clinical outcomes. The mean follow-up period was 63.6 months.

Table 1 Patient, discal cyst characteristics, and clinical presentation

Patient characteristics	
Mean age in years (±SD)	32.5 (±14.4)
Mean follow-up period in months	63.6 (±66.3)
Gender	*n* (%)
Male	25 (92.6)
Female	2 (7.4)
Preoperative pain scale (NRS ± SD)	
Back pain	4.2 (±3.0)
Leg pain	5.5 (±1.9)
Preoperative neurologic symptom	*n* (%)
Motor deficit	4 (14.8)
NIC	6 (22.2)
Cauda equina syndrome	1 (3.7)
Trauma history	10 (37)
Discal cyst characteristics	***n* (%)**
Cyst level	
L1-2	0
L2-3	4 (14.8)
L3-4	4 (14.8)
L4-5	15 (55.6)
L5-S1	4 (14.8)
Cyst location	
Central	3 (11.1)
Paramedian	21 (77.8)
Foraminal	3 (11.1)
Cyst diameter (mm)	
<5	2 (7.4)
5 ≤ diameter < 10	17 (63)
10 ≤ diameter < 15	7 (25.9)
≥15	1 (3.7)
Bulging disc	
Present	23 (85.2)
Absent	4 (14.8)

NRS: Numeric Rating Scale score, NIC: neurogenic intermittent claudication, SD: standard deviation.

Surgical technique

For decompression of spinal nerve root impingement due to mass effect from the discal cyst, but not from a herniated intervertebral disc, all patients underwent partial hemilaminectomy and microscopic cyst resection without corresponding discectomy.

Patients were placed in the prone positioned with a Wilson frame to decrease abdominal pressure to avoid venous bleeding during the operation. To confirm the spinal level at the surgical site, we used intraoperative lumbar spine lateral X-ray imaging with pinning before incising the skin. Following skin incision, all subcutaneous soft tissue, including paraspinal muscle, was fully retracted to maximize procedural space. We detached the ligamentum flavum from the lamina and performed partial laminectomy using a Kerrison punch. The dorsal layers of the ligamentum flavum were cut to identify the dural sac. We then carefully looked for a connection between the discal cyst and adjacent discs using blunt dissection under microscope. After identifying the communicating stalk between the discal cyst and the corresponding intervertebral disc, we incised and ruptured the cyst wall, resulting in nerve decompression; we then removed the cyst wall without discectomy using pituitary forceps (Fig. 1). During the operation, it is important to verify the presence of a communicating stalk to rule out other possible intraspinal cyst lesions.

Results

Preoperative findings

Preoperatively, all patients had back pain (mean NRS score of 4.2 ± 3.0) or leg pain (mean NRS score of 5.5 ± 1.9). Four patients (14.8%) were not able to actively overcome the force of gravity [grades below 3 on the Medical Research Council (MRC) power scale] with their lower limbs. Other preoperative signs and symptoms included neurogenic intermittent claudication (NIC) in six patients (22.2%) and cauda equina syndrome in one patient (3.7%). Ten patients (37%) had a history of trauma (Table 1).

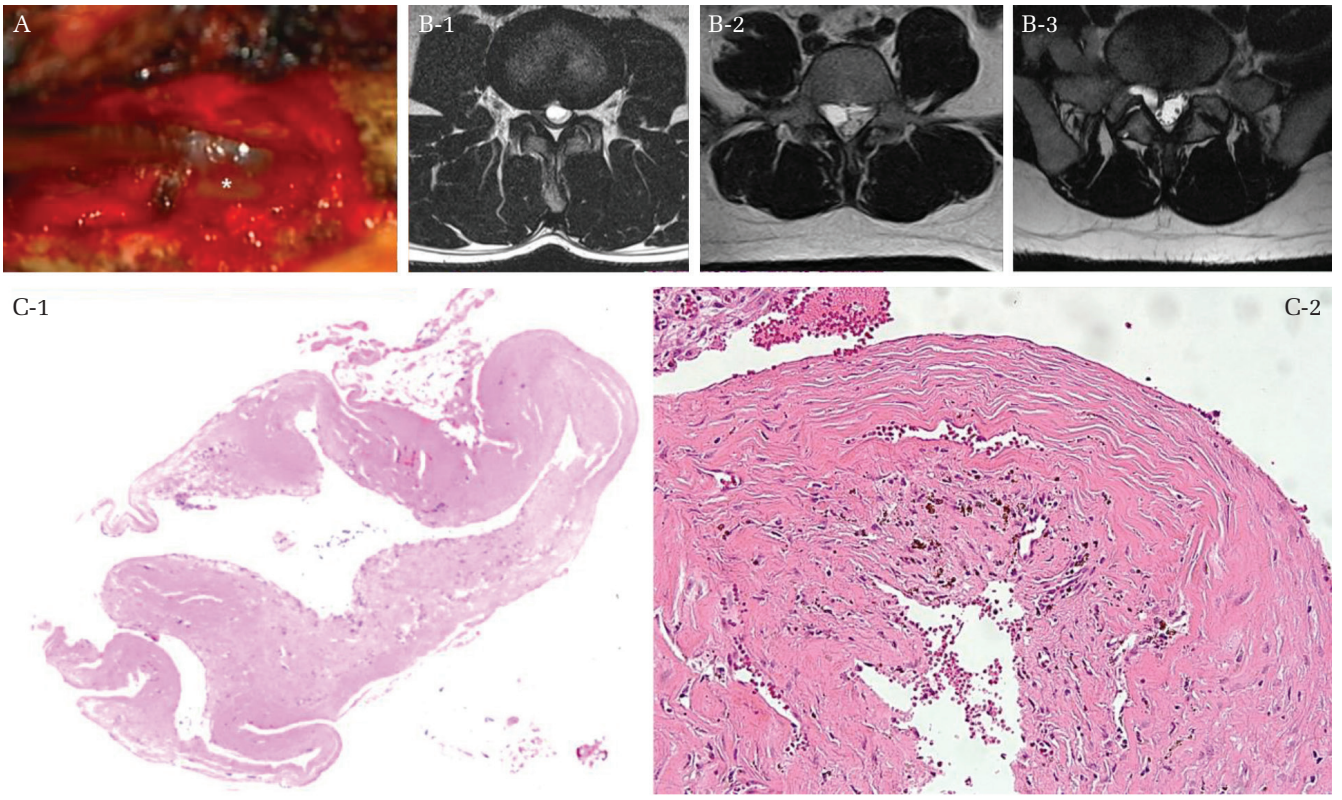

Fig. 1 Gross, MRI, and histologic images of a discal cyst. (A) intraoperative features (*; unruptured discal cyst). (B-1) Central type. (B-2) Paramedian type. (B-3) Foraminal type. (C-1) Histologic section of cyst (hematoxylin and eosin; original magnification). (C-2) Histologic section of cyst (hematoxylin and eosin; original magnification 200×).

Radiologic features

Most discal cysts were located at the level of L4–5 (15 patients, 55.6%); the remainder of the lesions were equally distributed at the L2–3, L3–4, and L5–S1 levels [*n* = 4 (14.8%) for each]. Cyst location was either paramedian (*n* = 21, 77.8%), central (*n* = 3, 11.1%), or foraminal (*n* = 3, 11.1%) (Fig. 1). Two patients (7.4%) had cysts smaller than 5 mm in diameter, 17 patients (63%) had cyst diameters between 5 and 10 mm, seven patients (25.9%) had cyst diameters between 10 and 15 mm size, and one patient (3.7%) had a cyst that was larger than 15 mm in diameter. Discal cyst with bulging disc—whether compressing neural tissue or not—was identified in 23 patients (85.2%) on preoperative MRI (Table 1).

Postoperative clinical outcomes

All of the patients' symptoms improved. The mean NRS score for back pain improved to 1.6 ± 2.0 1 month after surgery; leg pain also improved to a mean NRS score of 0.9 ± 1.7 1 month after surgery. Among the four patients whose preoperative lower limb power was less than MRC grade 3, two patients improved to MRC grade 4 (active movement against some resistance). The other two patients improved to MRC grade 5 (normal power). Full recovery of NIC and cauda equina syndrome was observed in all cases (Table 2). Among the 27 patients, we collected data on 15 patients who had been observed for longer than 3 years after surgery for long-term clinical outcome evaluation. These patients reported no restrictions on daily life activities, and were satisfied with our

Table 2 Postoperative outcomes for 27 patients

	POD #30	Last F/U
Postoperative pain scale (NRS ± SD)		
Back pain	1.6 (±2.0)	0.4 (±1.0)
Leg pain	0.9 (±1.7)	0.1 (±0.6)
Postoperative neurologic symptom	*n* (%)	*n* (%)
Motor deficit	2 (7.4)	1 (3.7)
NIC	0	0
Cauda equina syndrome	0	0

Mean follow-up period was 63.6 ± 66.3 months. F/U: follow-up, NIC: neurogenic intermittent claudication, NRS: Numeric Rating Scale score, POD: postoperative day, SD: standard deviation.

surgical intervention. Compared with before their surgeries, back pain, leg pain, and all other symptoms were reported as improved long-term (Table 3).

Histopathologic findings

Pathologists examined and confirmed the tissues obtained from surgery. All discal cyst specimens had simple fibrous capsules without synovial lining cells and not included intervertebral disc material. Some specimens showed signs of prior hemorrhage, including hemosiderin deposits (Fig. 1).

Complications (at final follow-up)

Two patients (7.4%) experienced postoperative complications. One patient (3.7%) underwent reoperation and received antibiotics for surgical site infection. The second patient (3.7%) had revision surgery to repair a cerebrospinal fluid leak. No recurrent cysts were found during follow-up.

Discussion

Discal cysts are extradural cystic spinal lesions, with subtypes including synovial cysts, ganglion cysts, and Tarlov perineural cysts.[7] Compared with joints in extremities, the occurrence of these entities in the spinal canal is relatively rare, and their pathophysiologic mechanisms remain unknown.[8,9] In the late 1990s, several published reports described cases of spinal discal cysts, mainly from Asian countries such as Korea and Japan.[4,5,10] Chiba et al.[2] suggested that discal cysts have the following characteristics: (1) clinical symptoms related to a unilateral single nerve root compression like disc herniation; (2) occurrence at a younger age; (3) low T_1 signal and high T_2 signal intensity on MRI; (4) connection between the cyst and the corresponding intervertebral disc; (5) improved radiating pain after surgery; (6) intralesional, bloody-to-clear serous fluid contents with a fibrous cyst wall; and (7) the absence of both disc material inside the cyst or a specific cell lining on histological examination. These findings are important clues toward discovering the etiology and pathogenesis of discal cysts.

Table 3 Long-term (longer than 3 years) postoperative outcomes for 15 patients

Oswestry disability index	*n*
Minimal disability	15
Moderate disability	0
Severe disability	0
Cripple, pain impinges on all aspect of patient's life	0
Patients are bed-bound or exaggerating their symptoms	0
Macnab criteria	*n*
Excellent	14
Good	1
Fair	0
Poor	0

Mean follow-up period was 63.6 ± 66.3 months.

Chiba et al.[2] proposed that discal cysts are the result of previous disc injury. Because of underlying disc injury, epidural venous plexus hemorrhage leads to an epidural hematoma. The discal cyst then develops secondary to incomplete hematoma resorption. The observation that most discal cysts contain hemosiderin deposits supports this theory.[2,11] However, this proposed mechanism does not explain the communication between intervertebral discs and cysts through an annular defect, because the putative bleeding point is the epidural vasculature, and not the annulus fibrosus.[12] Kono et al.[7] proposed that such cysts reflect degenerative intra-articular changes resulting from excessive or prolonged mechanical strain. Mechanical stress-induced focal degeneration of the disc wall leads to fluid collection in the juxta-articular space. Subsequently, reactive pseudomembrane formation takes place around the fluid collection, and finally, discal cyst formation occurs. This theory can be confirmed by histological and surgical findings, such as the presence of fibrous connective tissue without synovial lining cells, annular fissure formation in degenerated discs, and communication between intervertebral discs and cysts through a stalk.[6,13] Furthermore, discal cysts do not originate from degenerated discs. If a cyst has developed from degenerated disc material, the corresponding disc should appear moderately or severely degenerated on MRI. The signal intensity of a discal cyst is different from that of a degenerated herniated disc.[2,14] In our cases, MRI did not show moderately or severely degenerated herniated discs, for which resection would be otherwise needed to decompress neural tissue.

In contrast, synovial cysts of the facet joint, which frequently occur in elderly patients, are dorsolateral to or inseparable from the facet joint. Degeneration may result in a protrusion of the synovial membrane caused by joint capsule defects. This causes the juxta-articular space to be filled with synovial fluid.[15] Synovial cysts are lined by synovial cells and do not have a communicating stalk with the intervertebral disc.[16–18] When a cystic lesion is located near an intervertebral disc or facet joint without having a definitive connection to the intervertebral disc on preoperative MRI, there is no way to achieve a radiologic diagnosis; intraoperative findings, such as

a connecting stalk of the cyst to the intervertebral disc, must be demonstrated.

We summarized previous literature on discal cyst treatment and compiled the data (Table 4).[1–4,7,10,11,17,19–48] For patients with tolerable pain or without neurologic deficits, the literature suggests conservative treatment for discal cysts, initially.[4,6,45] Conservative management options include bed rest, analgesics, physical therapy, percutaneous steroid injection, and image-guided cyst aspiration.[6,13,21,22,37,45] In studies we analyzed, only 19 patients (15%) were successfully treated with conservative management (Table 4). Outcomes of conservative treatment among studies are inconsistent, and sometimes improvement is not seen. In a review of 56 lumbar discal cysts by Aydin et al.,[4] eight cases (14%) were

Table 4 Review of literature of discal cyst cases

	Author (year)	No.	Treatment	Main complications	F/U
1	Kono et al. (1999)	2	Cystectomy with corresponding discectomy	No	NA
2	Demaerel et al. (2001)	1	Medical therapies	No	4 months
3	Chiba et al. (2001)	8	Cystectomy with corresponding discectomy (in two cases) Cystectomy without corresponding discectomy (in six cases)	No	45 months (mean)
4	Coscia and Broshears (2002)	2	Cystectomy without discectomy	No	NA
5	Jeong and Bendo (2003)	1	Cystectomy with corresponding discectomy	No	12 months
6	Koga et al. (2003)	1	Percutaneous CT-guided aspiration and steroid injection	No	6 months
7	Norman et al. (2006)	1	Percutaneous CT-guided aspiration and steroid injection	No	NA
8	Kishen et al. (2006)	1	Cystectomy with corresponding discectomy	No	NA
9	Lee et al. (2006)	9	Cystectomy without corresponding discectomy	One recurrence discal cyst	NA
10	Nebeta et al. (2007)	5	Cystectomy with corresponding discectomy (in four cases) Cystectomy without corresponding discectomy (in one case)	No	31 months (mean)
11	Murata et al. (2007)	1	Cystectomy without corresponding discectomy	No	30 months
12	Hwang et al. (2008)	1	Cystectomy without corresponding discectomy	No	NA
13	Kang et al. (2008)	8	Percutaneous CT-guided aspiration	One recurrent disc herniation	13 months (mean)
14	Marushima et al. (2008)	1	Cystectomy without corresponding discectomy	No	NA
15	Kim et al. (2009)	1	Cystectomy without corresponding discectomy (Percutaneous endoscopic interlaminar approach using a laser)	No	NA
16	Kim et al. (2009)	2	Cystectomy with corresponding discectomy (Percutaneous endoscopic transforaminal approach)	No	NA
17	Dumay-Levesque et al. (2009)	1	Percutaneous fluoroscopic-guided steroid injection	No	12 months
18	Kim and Lee (2009)	14	Cystectomy without corresponding discectomy (CO_2 laser)	No	20.1 months (mean)

(*Continued*)

Table 4 (Continued)

	Author (year)	No.	Treatment	Main complications	F/U
19	Kobayashi et al. (2010)	2	Cystectomy with corresponding discectomy	No	24 months
20	Matsumoto et al. (2010)	7	Cystectomy without corresponding discectomy (Endoscopic, corresponding intervertebral disc was coagulated)	No	27.9 months (mean)
21	Dasenbrock et al. (2010)	1	Percutaneous CT-guided aspiration	No	19 months (mean)
22	Aydin et al. (2010)	5	Cystectomy with corresponding discectomy	No	16 months (mean)
23	Aydin et al. (2010)	1	Cystectomy with corresponding discectomy	No	NA
24	Takeshima et al. (2011)	1	Medical therapies	No	5 months
25	Prasad et al. (2011)	1	Medical therapies	No	NA
26	Lin et al. (2011)	1	Cystectomy with corresponding discectomy	No	NA
27	Hyung-Jun et al. (2011)	1	Cystectomy without corresponding discectomy	No	NA
28	Shibata et al. (2011)	1	Cystectomy without corresponding discectomy	No	3 months
29	Lame et al. (2011)	1	Cystectomy without corresponding discectomy	No	10 months
30	Khalatbari and Moharamzad (2012)	1	Cystectomy without corresponding discectomy	No	84 months
31	Ha et al. (2012)	8	Cystectomy with corresponding discectomy (Endoscopic) (in six cases) Multiple cystic fenestration with corresponding discectomy (in two cases)	One persistence of symptoms	6 months
32	Certo et al. (2014)	1	Cystectomy with corresponding discectomy	No	24 months
33	Friedman et al. (2015)	1	Percutaneous CT-guided aspiration and steroid injection	No	NA
34	Subash et al. (2015)	1	Cystectomy with corresponding discectomy (Endoscopic)	No	2 months
35	Subash et al. (2016)	2	Medical therapies	No	6 months
36	Yu et al. (2016)	1	Percutaneous fluoroscopic-guided steroid injection	No	3 months
37	Bansil et al. (2016)	1	Cystectomy without corresponding discectomy	No	NA
38	Bertrand Mathon et al. (2018)	1	Cystectomy without corresponding discectomy	No	NA
39	Our cases	27	Cystectomy without corresponding discectomy	One CSF leak and one surgical site infection	63.6 months (mean)

F/U: follow-up, NA: Not available.

treated conservatively. Among them, spontaneous regression occurred in three cases (37.5%), whereas failure of medical therapies and subsequent surgical intervention was reported in five cases (62.5%). Nevertheless, these conservative medical treatments are considered, and instituted in cases of severe medical illness or other contraindications for surgery.[9] Another previous study demonstrated that the most effective treatment for discal cysts is surgical treatment.[1,3,4,17,25,34,42,49] The goal of surgery is to excise the cyst and decompress the neural structures. There are various surgical techniques for nerve decompression, such as endoscopic and microscopic resection of the cyst, with or without corresponding intervertebral discectomy. It is unclear, however, whether or not excision of the

corresponding intervertebral disc in connection with the cyst results in better outcomes.[1,25,50]

In our review of literature, we found that 31 patients (25%) underwent removal of their cyst with corresponding discectomy to improve their symptoms and prevent recurrence. Among 31 patients, one patient (3%) suffered persistent paresthesia after surgery. Ha et al.[25] presume that the persistent paresthesia may have been due to iatrogenic L5 nerve root injury during surgery. Likewise, Certo et al. preferred to excise the discal cyst as well as perform a microdiscectomy, predicting that a more radical excision might decrease the risk of recurrence; their patient did not experience any cyst recurrence at 2-year follow-up.[1] However, this option remains controversial, in part because of the impact of corresponding discectomy on spine biomechanical influence in younger patients. As mentioned above, discal cysts often occur at a young age.

In our summary of literature, we found that 76 patients (60%) were treated with cystectomy without discectomy. Of these patients, one discal cyst (1%) recurred 1 year after surgery. We believe that performing a discectomy in young patients might violate their spine biomechanism and cause future instability of the vertebral column. The potential for microdiscectomy-induced spinal instability is already proven in previous studies.[51,52] There are no long-term follow-up studies about instability of the whole spine after corresponding discectomy in discal cyst patients. According to our experiences, as well as the results reported in this paper, we suggest that removal of the cyst alone might be sufficient for effective treatment of lumbar discal cysts.

There are some limitations to this study. Since this study was retrospective, there is potential for bias, especially because of the small number of patients who had long-term follow-up. However, since the study involved patients from a single institution, uniform surgical technique was used, and by utilizing previous literature, we feel this limitation was partly overcome.

Conclusion

Microsurgical cyst resection without excision of the corresponding disc is an effective surgical treatment that is associated with a low recurrence rate.

Conflicts of Interest Disclosure

There are no conflicts of interest regarding this study.

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