Original Article

Lumbar parafacetal cyst-spinal segmental instability is the cause and stabilization is the treatment: A clinical report of eight surgically-treated patients

ABSTRACT

Objective: The authors report the results of "only-fixation" of the affected spinal segment without any decompression of the bones or soft tissue or manipulation of the cyst wall or contents in eight cases having lumbar parafacetal cyst (LPFC). This surgical strategy was based on the concept that LPFCs are secondary to spinal instability, has a protective or adaptive role, and is reversible following stabilization.

Materials and Methods: During the period from January 2018 to January 2023, eight consecutive patients having LPFC were surgically treated. There were 5 males and 3 females, and their ages ranged from 48 to 72 years (average 63 years). Seven patients had a single cyst and one patient had multiple cysts. The patients presented with symptoms classically attributed to lumbar canal stenosis. Apart from the cyst-affected spinal segment, degenerative alterations were observed in adjoining spinal segments in six out of seven patients having a single cyst. All patients underwent "only fixation" of the unstable spinal segments without any kind of bone or soft-tissue resection and without any manipulation or handling of the cyst wall or contents.

Results: During the follow-up period that ranged from 12 to 57 months (average 29 months), all patients improved from their symptoms. The recovery was observed in the immediate postoperative period and was lasting.

Conclusions: LPFCs are one of the several secondary alterations observed in spinal degeneration. Identification of unstable spinal segments and their fixation constitutes rational treatment of lumbar parafacetal cysts. Direct handling and resection of cysts are unnecessary.

Keywords: Lumbar canal stenosis, parafacet cyst, spinal stabilization

INTRODUCTION

We report our experience with surgical treatment of eight cases of lumbar parafacetal cysts (LPFCs). Such cysts have been named as "synovial" cysts, facet cyst, or juxtafacet cysts.[1-5] The pathogenesis of lumbar cysts in the proximity or in continuity to the facetal articulation is not entirely known. Based on their extradural location and their relationship with the facets, we have preferred to label such cysts as LPFCs. LPFCs are a discrete clinical entity and is entirely unrelated in pathogenesis and management considerations to ganglion cysts, perineural or Tarlov cysts, and arachnoid cysts.[1-5] As the pathogenesis of LPFC is unclear, the surgical treatment has not been entirely focused or uniformly practiced. The earlier reports on the surgical treatment were based on techniques that were necessary to resect the cyst.[6-10] More

Access this article online	
Website: www.jcvjs.com	Quick Response Code
DOI: 10.4103/jcvjs.jcvjs_19_24	

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Submitted: 04-Feb-24 **Accepted:** 11-Feb-24
Published: 24-May-24

How to cite this article: Goel A, Vutha R, Shah A, Prasad A, Abhinav K, Shukla AK. Lumbar parafacetal cyst-spinal segmental instability is the cause and stabilization is the treatment: A clinical report of eight surgically-treated patients. J Craniovert Jun Spine 2024;15:178-84.

recently, some authors discuss the validity of segmental stabilization following the surgical resection of the cyst.[11-14] Our study identifies that the pathogenesis of LPFC is similar to retrodontoid cysts and chronic instability is the nodal point of pathogenesis.[15-19] It was observed that such LPFCs probably have a naturally protective or adaptive role and manifestly undergo resorption following segmental stabilization. LPFCs have a common nodal point of the pathogenesis of chronic spinal instability such as osteophytes, reduction in the intervertebral disc spaces, and bulging of the intervertebral ligaments into the spinal canal. Like for retro-odontoid cysts where we resorted to only atlantoaxial stabilization[15-18] and avoided any kind of direct handling or manipulation of the cyst, we treated LPFC by "only spinal stabilization" and aimed at arthrodesis of the spinal segment. The long-term clinical and radiological outcome of seven cases of single and one case of multiple LPFC treated by only fixation is reported.

MATERIALS AND METHODS

During the period from January 2018 to January 2023, eight patients having LPFC were surgically treated at the author's institutions. This is a retrospective analysis of these eight consecutively treated cases. The minimum follow-up is 12 months. All patients provided written informed consent before surgery, and all clinical tests and surgical procedures were conducted according to the principles of the Declaration of Helsinki.

There were five males and three females in this series. The ages of the patients ranged from 48 to 72 years (average age 63 years). Table 1 summarizes the principal clinical symptoms and signs. The Oswestry Disability Index (ODI) and Visual Analog Scale (VAS) were used to grade the symptoms. Essentially, all patients had symptoms that are generally attributed to and classically described for lumbar canal stenosis. The duration of clinical symptoms ranged from 5 to 23 months (average 15 months). There was no history of significant trauma at the beginning or during clinical symptoms in any patient. The patients had progressively worsening symptoms and had failed nonsurgical or conservative treatment. All patients underwent static and dynamic flexion-extension plain radiography, computed tomography scan, and magnetic resonance imaging. The principle radiological observations are summarized in Table 2. Patients having manifest spinal instability or spondylolisthesis on static or dynamic imaging were excluded from the study cohort. The location of the cyst is presented in Table 2. Radiological evidence of spinal degeneration such as osteophyte formation, bulging of intervertebral ligaments, reduction in the intervertebral spaces, and bulging of the disc into the spinal canal were identified in all cases in the spinal segments affected by the cyst. In four patients, there was the presence of "significant" amount of fluid effusion in the affected facetal articulation [Figure 1]. In at least two of these cases, a communication of the articular fluid effusion with the cyst fluid content could be identified on imaging. Osteophytes were observed around the facetal articulation in the proximity of the cyst. Chronic degenerative alterations were observed in spinal segments in one or more adjoining spinal segments. The levels of unstable spinal segments were identified based on clinical indicators, radiological evidence of degenerative alterations, and direct intraoperative observation of unstable spinal segments by manual manipulation of bones, as is discussed in our earlier article on the subject.[20-23] Identification of unstable spinal segments and their stabilization formed the basis of surgery.

Table 1: The clinical features

Clinical features	Number of patients
Back pain	8
Leg pain	8
Claudication pain	8
Sensory complaints	3
Motor deficits	-
Bladder and bowel complaints	-

Table 2: The radiological findings in the patients

Radiological feature	Number of patients
Location of cyst	
L2–3	1
L3–4	1
L4–5	6
Size of the cyst (cm)	
0–1	2
1–2	5
2–3	1
Number of levels stabilized	
One level	1
Two levels	4
Three levels	2
Four levels	1

Surgical technique

All patients underwent surgery in a prone position that flattened the lumbar lordosis. All the standard and described precautions and care in positioning were duly adopted. A midline skin incision was taken and subperiosteal dissection exposed the facets and articulations widely on both sides. The spinal levels were confirmed using intraoperative fluoroscopy. All patients underwent transarticular facetal fixation with the technique described by Roy-Camille.[20-22] Based on clinical, radiological, and intraoperative assessments, instability was identified in the adjoining spinal segments in more than a single level in six cases. In all patients, there was "marked"

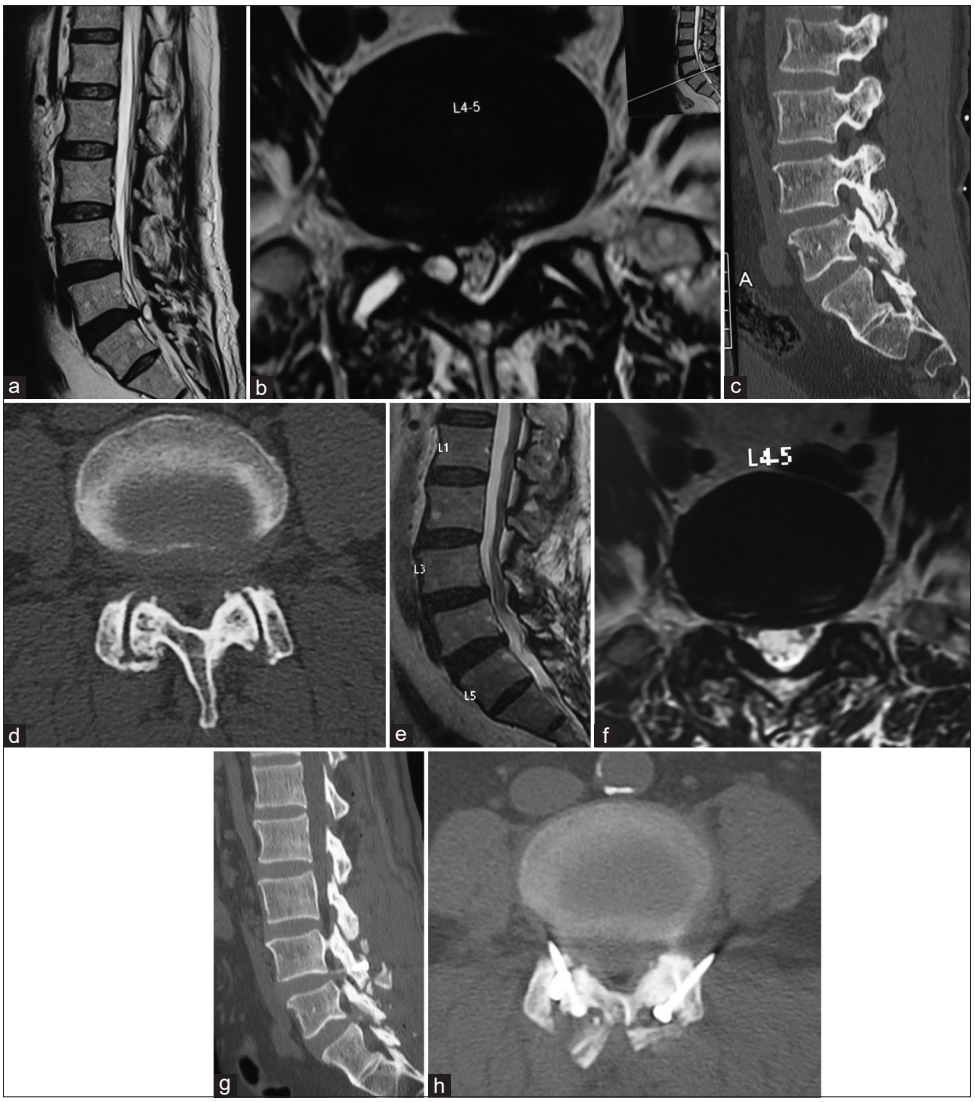

Figure 1: (a) T2-weighted sagittal magnetic resonance imaging (MRI) of the lumbar spine showing the synovial cyst at L4 – L5 level. There is a prominent disc bulge seen at the same level. (b) T2-weighted axial MRI showing the synovial cyst on the right side in juxtaposition to the facetal articulation. Also, intra-articular fluid in the right-sided joint is significantly more than on the contralateral side. (c) Sagittal cut of computed tomography (CT) scan showing degenerative changes at L4 – L5 levels. (d) Axial cut of CT scan showing the facetal degeneration in the form of multiple facet articulation adjoining osteophytes. (e) T2-weighted sagittal MRI showing the complete regression of the synovial cyst. The disc bulge also appears to have regressed. The canal dimensions are remarkably increased. (f) T2-weighted axial MRI showing complete resolution of the synovial cyst. Facetal arthrodesis can be noted. (g) Sagittal cut of CT scan showing the fixation. No decompression has been done. (h) Axial cut of CT scan showing the facetal fixation

segmental spinal instability at the level of LPFC. In one patient, a single-level fixation at the level of the cyst was performed [Figure 1]. In the patient with multiple cysts, 4-level fixation was performed. In all cases, we adopted double (14 levels) or triple insurance (2 levels) screw fixation. In one patient, Goel intra-articular spacer was used in the affected spinal segment to reinforce stability [Figure 1].[23] The self-tapping monoaxial screws were in general 18 mm long and 2.6 mm in diameter. No bone, soft tissue, or disc resection was done for decompression of the neural structures. The cyst was not exposed, manipulated, or resected. The patients were advised to wear external lumbar arthrodesis and to avoid activities that involved forward bending of the back for 4 weeks. Clinical and radiological outcome of the cyst was monitored at the end of 3 months, 6 months, and subsequently at the end of 1 year.

RESULTS

The follow-up ranged from 12 to 57 months (average 29 months). Apart from standard and internationally accepted monitoring parameters of the ODI and VAS scoring system [Tables 3 and 4], patient satisfaction scores developed in local vernacular language assessed the clinical outcome. All patients were entirely relieved of preoperative symptoms in the immediate postoperative period.

Table 3: The pre- and postoperative Oswestry disability index

Score (%)	Number of patients	
	Preoperative	Postoperative
10–20	-	8
20–30	-	-
30–40	1	-
40–50	3	-
50–60	4	-

Table 4: The pre- and postoperative Visual Analog Scale score

Time point	Back pain (VAS score)
Preoperative	6–8 (mean 7.2)
3 months' postoperative	0–2 (mean 1.1)
12 months' postoperative	0–1 (mean 0.2)

VAS - Visual Analog Scale

During the period of follow-up, none of the patients had any recurrence of symptoms or needed any kind of reoperation for the lumbar spine. There were no infections or incidence of implant rejection. Arthrodesis of the treated spinal segments was confirmed when there were no relative movements of the spinal segments on dynamic imaging and bone formation could be observed across the facets. With these minimal criteria, the fusion was identified to be successful in all cases.

DISCUSSION

LPFCs have been identified more often in "older" population. These extradural cysts are located in the posterolateral aspect of the spinal canal in proximity or continuity with the articular cavity or joint capsule of the facets. Clinical characteristics and radiological evidence of lumbar canal stenosis and/or spondylolisthesis are frequent. The symptoms are usually of subtle origin, long-standing, or chronic, and are relentlessly progressive in nature.[24-28] Average duration of symptoms in our series was 15 months (range 5–23 months). Our literature search revealed that the majority of LPFCs was located at the L4-5 level.[23-28] In our series, in six out of seven patients with a single-level cyst, the cyst was located at the L4-5 spinal level. In four cases, there was a significantly large effusion within the affected facetal articulation. There are reports in the literature that mention the association of LPFC with fluid effusion in the articular cavity.[26,27] A communication of the fluid content of the LPFC with the articular fluid content suggests that LPFC might be a "contained" spillover of articular fluid into the spinal canal. In 2021, we identified herniation or prolapse of the intervertebral disc into the spinal or root canal as a naturally protective event in the face of acute injury-related spinal instability.[29] The pain associated with disc herniation prevents movements of the spine and provides an environment for the healing of the injured soft tissues. On similar lines, LPFCs are herniated or prolapsed intra-articular fluid content into the spinal canal, are secondary to acute or chronic spinal instability, and have a protective role. LPFCs are usually single and only rarely multiple. In our series, one patient had multiple LPFCs. Some authors have identified that moderate or major trauma can initiate LPFC formation. None of the patients in our series had any significant history of trauma that could suggest acuity of origin, like that seen in acute disc herniation or prolapse. LPFCs are incriminated to be a cause of cauda equina syndrome or symptoms related to spinal degeneration such as backache, claudication pain, radiating pain, and less frequently sensory and/or motor neural deficits. In our series, all patients presented with symptoms related to chronic backache and had features that suggested claudication pain. Backache was associated with pain radiating to the leg on the side of LPFC in three patients and in five patients, pain radiated to both legs. Dermatomal sensory symptoms that could be incriminated to the LPFC were identified in three patients.

In the presence of compelling symptoms, the generally agreed treatment form is surgical extirpation of the cyst wall with its contents. Laminectomy, hemilaminectomy, interlaminar fenestration exposure, and similar surgical access routes to the cysts have been used. The relative ease of surgery makes such an option a commonly adopted surgical method. Local steroid injections have also been popularly used. More recently, some authors have identified the need for stabilization following cyst resection.[11-14]

Bruder *et al*. reviewed the recent literature on the subject and identified that 15% of patients underwent simultaneous spinal segmental fusion.[4] Lyons *et al*. analyzed their series of 194 cases. Spinal fixation following cyst extirpation was done in 9% of their cases wherein there was clinical or radiological evidence of spinal instability or spondylolisthesis.[30] In their series, 4% of their patients needed delayed surgery for spinal stabilization.[30] Boviatsis *et al*. reviewed the literature and identified that 38% of patients having parafacetal cysts with spondylolisthesis eventually needed stabilization.[5] Ramhmdani *et al*. observed that patients with spondylolisthesis were more often stabilized than those without spondylolisthesis.[12] Reviews by Weiner and Khan did not identify a significant advantage of concomitant stabilization following parafacet cyst resection.[31,32] Essentially, the current literature seems to agree that the presence of parafacet cysts cannot be equated with the presence of spinal instability and that the need for spinal stabilization is dictated more by associated radiological evidence of spinal instability.

We earlier reported that retro-odontoid "pseudotumors," retro-odontoid "pannus," retro-odontoid cysts, and retro-C2

body cysts in cases with os odontoideum are secondary manifestations of chronic atlantoaxial instability.[15-19,33] It was observed that these cysts are indicative of segmental spinal instability, probably have a protective or adaptive role, and following segmental spinal stabilization there is a spontaneous resorption or regression of these so-called "pathological" clinical entities. In contrast to the earlier opinion, we recommended atlantoaxial stabilization in these clinical conditions and observed that direct surgical resection is unnecessary and probably counter effective.

It was observed that Chiari formation, syringomyelia, basilar invagination, assimilation of the atlas, C2-3 fusion, bifid atlas, bifid axis, os odontoideum, platybasia, Klippel–Feil abnormality, short neck, torticollis, dorsal kyphoscoliosis and a host of so-called pathological clinical conditions are secondary to chronic or long-standing atlantoaxial instability and atlantoaxial stabilization is the treatment and that there is no need for direct surgical procedures that aim to decompress the neural structures.[34]

On similar lines, we observed that "chronic" weakness of muscles related to their disuse, misuse, or injury located at the back of the spine and nape of the neck that partake in human standing position led to "vertical" spinal instability, i.e. the nodal point of genesis of the cascade of degenerative spinal alterations.[35,36] Telescoping of the facets is manifested as a listhesis of the facets. Vertical instability is difficult or impossible to identify on static or dynamic images. Such vertical instability leads to several secondary manifestations such as buckling of intervertebral ligaments that include posterior longitudinal ligament and ligamentum flavum, osteophyte formation, reduction of intervertebral disc space, and ossification of the posterior longitudinal ligament. All these features are generally grouped under the term degenerative spondylotic changes. It was observed that all these "compressive" degenerative alterations are indicative of spinal instability, have a naturally protective or adaptive role and are manifestly or potentially reversible following spinal stabilization.[37]

In this article, we present similar concepts and observe that spinal cysts in the vicinity of the facetal articulations are not errors in development or a pathological clinical entity but are secondary natural responses to chronic spinal segment instability. In all the affected spinal segments there was evidence of degenerative alterations in the form of reduction of intervertebral disc space, presence of osteophytes adjoining disc space, bulging of the intervertebral disc into the spinal canal, and buckling of the posterior longitudinal ligament and ligamentum flavum, all leading to a reduction in the spinal canal and neural foraminal dimensions. The additional presence of the LPFC critically reduced the radiologically observed canal dimension. The presence of osteophytes adjoining the facets and facetal articulation, and erosion of the articular surfaces was observed in the cyst-affected facetal articulation and in the adjoining spinal segments. The facetal articulation of the LPFC-affected spinal segment had an excessive amount of effusion in at least four patients. Some authors have related the presence of fluid effusion in the joint to instability.[26,27] Although the LPFC was identified at a single spinal level, degenerative spinal alterations were observed in the adjoining spinal segments, indicating a more generalized degenerative process. Identification of instability in the cyst-affected and in the adjoining spinal segments based on radiological and clinical parameters and direct observation of instability on manual manipulation of bones during surgery formed an important surgical decision-making process.

Similar to other spinal alterations in spinal degeneration such as osteophyte formation, intervertebral ligamental buckling, and disc space reduction, these cysts probably have a protective or adaptive role, indicate spinal instability, and are potentially reversible following stabilization of the affected spinal segment. Essentially, chronic spinal instability was related to weakness of the extensor muscles that partake in human standing position. Such muscle weakness is usually generalized and results in multi-segmental rather than a single-level spinal instability. One patient in our series had multiple LPFC. Although cyst evacuation and cyst wall resection are technically not a complex maneuver, such a surgical procedure appears to be unnecessary and probably is counter-effective.

We resorted to Camille's technique of transfacetal screw insertion.[38,39] The technique involved opening the facetal articulation, denuding the articular cartilage, and subsequent insertion of screws in a transfacetal pattern. In all cases, we used two or double insurance screws (14 levels) or three or triple insurance screws (2 levels) at each facetal articulation. Adjacent segment instability was identified based on additional radiological parameters such as the presence of osteophytes, reduction in the disc space, bulging of ligamentum flavum, and similar such spinal alterations. The presence of instability was finally confirmed by direct manipulation of bones during surgery.

During the follow-up period that ranged from 12 to 57 months, all patients have remained entirely asymptomatic. The recovery in the symptoms was observed in the immediate postoperative period as soon as the patient recovered from anesthesia. The symptoms did not recur during the period of follow-up in any patient.

After a minimum follow-up of 12 months, spontaneous regression of the cyst size was observed in all cases. In five cases, the cyst disappeared entirely.

CONCLUSIONS

LPFCs are one of the several secondary manifestations of spinal degeneration. Instability is the issue and stabilization is the treatment. The cysts spontaneously reduce in size and eventually disappear after the affected spinal segments are stabilized. Any form of decompression that involves resection of bone, soft tissue, or the cyst is unnecessary and probably counter effective.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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