Endoscopic Surgical Treatment of Lumbar Synovial Cyst: Detailed Account of Surgical Technique and Report of 11 Consecutive Patients

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■ BACKGROUND: **Lumbar synovial cysts (LSCs) are an uncommon cause of radiculopathy and back pain. Open surgical treatment is associated with extensive bone resection and muscle trauma. The endoscopic tubular–assisted LSC resection has not been described in detail. Here the authors assessed the effectiveness of this technique for LSC resection.**

■ METHODS: **Eleven patients (4 female and 7 male patients) were operated on via an ipsilateral approach for resection of LSC using an endoscopic tubular retractor system. Preoperative magnetic resonance imaging was evaluated for signs of degeneration and instability. At follow-up a standardized questionnaire including the Oswestry Disability Index and functional outcome according to MacNab criteria was conducted. Additionally, a personal examination with particular reference to back and leg pain was performed.**

■ RESULTS: **The mean follow-up was 10.5 months. Preoperatively, spondylolisthesis grade 1 was noted in 4 patients (36.4%). Ten patients had bilateral facet joint effusion (90.9%). At follow-up 10 patients reported being free of leg pain (90.9%), eight patients reported no back pain (72.7%), ten patients had full motor strength (90.9%), and 9 patients had no sensory deficit (81.8%).**

Nine patients reported an excellent or a good clinical outcome (81.8%). The mean Oswestry Disability Index was 4.7%. None of the patients developed new mechanical low back pain or required subsequent fusion procedure.

■ CONCLUSION: **The endoscopic tubular–assisted procedure is a safe way to treat LSC. It offers complete resection of LSC and achieves good clinical outcome by preserving muscle and ligamentous and bony structures, which prevents delayed instability.**

INTRODUCTION

Lumbar synovial cysts (LSCs) are a relatively uncommon cause of spinal canal stenosis and nerve root compression. LSCs are extradural herniations of the facet joint synovium between 2 adjacent vertebral bodies.[1,2] Most commonly, they occur at level L4-5, followed by level L5-S1, and are located ventral to the ligamentum flavum and dorsolateral to the dural sac.[1,3,4] Due to their typical localization within the spinal canal, LSCs may impinge on exiting or traversing nerve roots and cause neurogenic claudication, radiculopathy, and back pain.

It has been reported that LSCs are associated with facet joint degeneration and some degree of spinal instability.[5-7]

Due to the nature of LSCs, a spontaneous resolution is highly unlikely even though cases of spontaneous resolution have been reported.[8,9] The ideal surgical treatment remains controversial. Image-guided aspiration or steroid injection achieves pain relief for a short-term period.[10,11] However, the surgical resection of LSCs is believed to be a definite treatment to achieve permanent relief of symptoms. Traditionally, open laminectomy or partial laminectomy with medial facetectomy is performed for resection of the LSC.

LSCs can be adhesive to the dura; therefore surgical resection might be associated with complication such as nerve injury, cerebrospinal fluid (CSF) leaks, and delayed instability.[1] Delayed instability might lead to further surgical treatment with lumbar fusion.

Since 1997, tubular-assisted procedures have been successfully performed for the treatment of degenerative cervical changes,

Key words
- EasyGO-system
- Endoscopy
- Lumbar spine
- Minimally invasive surgery
- MRI
- Synovial cyst

Abbreviations and Acronyms
CSF: Cerebrospinal fluid
HD: High-definition
LSC: Lumbar synovial cyst
MRI: Magnetic resonance imaging
NPRS: Numeric Pain Rating Scale

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lumbar disk herniation, lumbar spinal stenosis, and lumbar intradural extramedullary tumors.[12-16] Compared with open microsurgical procedures, tubular-assisted techniques are associated with several advantages such as a shorter length of hospitalization, less blood loss, less postoperative pain medication, and lower postoperative inflammatory markers.[17,18]

Additionally, trauma to ligamentous and bony structures is minimized, which might decrease the risk of delayed instability. Tubular-assisted procedures can be performed by using either an endoscope or an operating microscope for visualization. For 10 years, high-definition endoscopy has been available, allowing for superior intraoperative visualization compared with the former standard-definition endoscopy.[19]

To the best of the authors' knowledge, there has been no report of a series of >4 patients treated for LSC via an endoscopic tubular—assisted procedure.[20]

The purpose of this study is to report clinical outcome after using endoscopic LSC resection and to present the surgical technique in detail.

MATERIAL AND METHOD

Patient Population

A prospectively collected database of endoscopic spine procedures was searched for patients who underwent treatment of LSC.

Inclusion criteria for this study were complete endoscopic video recording of the procedure, a complete set of preoperative evaluations including detailed neurologic examinations with special focus on leg and back pain, a histopathologic report of the specimen, no previous lumbar spine surgery, and a preoperative magnetic resonance imaging (MRI) scan.

Postoperatively, neurologic examinations and telephone surveys were conducted for all patients at the follow-up to determine whether any new symptoms had developed since their last clinic visit. Pain was assessed via the Numeric Pain Rating Scale (NPRS). Muscle strength was assessed using the Oxford scale, whereby grade 0 is no contraction, grade 1 is visible or palpable muscle contraction but no movement, grade 2 is movement with gravity eliminated, grade 3 is movement against gravity only, grade 4 is movement against gravity with some resistance, and grade 5 is movement against gravity with full resistance.[21] Further, sensory deficit was assessed. A standardized questionnaire that was conducted included the Oswestry Disability Index[22] and functional outcome according to modified MacNab criteria. Clinical success was defined as excellent and good results according to MacNab criteria (Table 1).

Table 1. Modified MacNab Criteria

Outcome	Criteria
Excellent	Complete resolution of symptoms
Good	Marked improvement but occasional pain
Fair	Some improvement with the need for pain medications and significant restrictions in physical activities
Poor	No improvement, or worse as compared with the condition before operation

Surgical Equipment

All procedures were performed with the EasyGO spine system. The endoscopic equipment consisted of a 25-degree Hopkins Forward-Oblique telescope, an H3-Z Full high-definition (HD) camera head, and a Xenon Nova 300 cold light fountain. The intraoperative image was transmitted on a 26-inch HD flat screen. All intraoperative data were recorded via AIDA compact NEO data archiving system (KARL STORZ GmbH & Co. KG, Tuttlingen, Germany).

Surgical Technique

In all cases the EasyGO spine system was used. The procedure was performed under general anesthesia, and preoperative antibiotics were administered. The patient was placed on the operating table in prone position, and the abdomen was decompressed using a Wilson frame. Pressure points were padded, and a C-arm for lateral fluoroscopy was installed. The 3-chip HD endoscope was introduced and placed in correct position. The endoscopic unit was generally positioned on the other side of the operation table so that the surgeon could also assume a more comfortable position while doing the surgery in bimanual technique.

Before surgery the preoperative lumbar MRI was analyzed to plan the trajectory of the trocar. A spinal tap needle was used to identify the affected segment and trajectory of the trocar. The trajectory was aimed about 2—3 mm cranial to the cranial base of the synovial cyst.

The skin incision was about 2 cm paramedian of the midline and about 1.4—1.8 cm in length depending on the selected trocar.

Once the muscle fascia was opened, the smallest dilator was put in direct contact with the bony surface of the hemilamina. Soft tissue and muscles were pushed away and dilated by sliding the various dilators one over the other. Once the tissue and paraspinal muscle were dilated, the working trocar was placed and fixed in position via a holding arm. The trajectory was confirmed via lateral fluoroscopy.

Remnant muscle tissue was removed using bipolar forceps and a grasper to visualize the hemilamina. A diamond drill was used to thin out the lamina and expose the ligamentum flavum. A nerve hook with a blunt tip was used for mobilization of the ligamentum flavum. Resection of the ligamentum flavum was carried out using a Kerrison punch from medial to lateral and cranial to caudal until the cranial base of the synovial cyst was visualized. Once the cranial base of the synovial cyst was visualized, the ligamentum flavum was further resected to expose the entire margin of the cyst to the dura. If necessary, a partial facetectomy was performed using a diamond drill to expose the lateral aspect of the synovial cyst.

Depending on the localization and quality of the synovial cyst, the authors performed the resection by either peeling off the cyst or resecting it in a piecemeal fashion.

Peeling off Cyst. The authors performed this technique in 2 cases with minimal to slight adhesion of the synovial cyst and dura. Once the margin between the dura and the cyst was exposed, the dissection of the cyst was performed with a blunt instrument (i.e., dissector, nerve hook). The most cranial part of the cyst was ideal to start with. The tip of the cyst was separated from the dura, and a Kerrison punch or grasper was suitable to grasp it and to peel it off under slight tension. In case of a hemorrhagic synovial