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Original Article

Synovial cysts at the cervicothoracic junction: Illustrative series of three cases

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ABSTRACT

Background: Spinal synovial cysts are an uncommon pathology, estimated to affect 0.65–2.6% of the population. Cervical spinal synovial cysts are even rarer, accounting for only 2.6% of spinal synovial cysts. They are more commonly found in the lumbar spine. When they occur, they can compress the spinal cord or surrounding nerve roots resulting in neurological symptoms, particularly when they increase in size. Decompression and cyst resection are the most common treatment and typically result in resolution of symptoms.

Methods: The authors present three cases of spinal synovial cysts occurring at the C7–T1 junction. They occurred in patients aged 47, 56, and 74, respectively, and presented with symptoms of pain and radiculopathy. Diagnosis was made with computed tomography (CT) scan and magnetic resonance imaging (MRI). The cysts were managed with laminectomy, resection, and fusion.

Results: All patients reported full resolution of symptoms. There were no intra or postoperative complications.

Conclusion: Cervical spinal synovial cysts are an uncommon cause of radiculopathy and pain in the upper extremities. They can be diagnosed through CT scans and MRI, and treatment with laminectomy, resection, and fusion results in excellent outcomes.

Keywords: Laminectomy, Spinal synovial cysts, Spine surgery

INTRODUCTION

Synovial cysts are extradural soft-tissue masses that arise from extrusion of the synovium through a defect in the joint capsule.[5-7] They most commonly occur from herniations out of the facet joints of the spine but can also arise from the ligamentun flavum or other spinal ligaments and discs.[3,9] Histologically, they are characterized by a pseudostratified columnar cell layer surrounding clear fluid. They are an uncommon cause of spinal cord and nerve root compression, but when present, may cause signs typical of mass effect. They may increase in size and become symptomatic as they grow and compress neural structures in the spinal canal.[3,5-7,9] Surgical resection is the most common treatment and typically results in resolution of symptoms [Tables 1 and 2].[3,5-7,9]

We present three cases of synovial cervical spinal cysts emerging from the C7–T1 facet joint treated with surgical resection, laminectomy, and fusion. Two are unilateral, while one was bilateral. All patients were followed for a minimum of 1 year after surgery [Table 1].

MATERIALS AND METHODS

A 47-year-old woman presenting to the emergency room with a 4-day history of upper back pain and 1 day with numbness spreading distally from the abdomen and weakness resulting in some difficulty ambulating.

Her physical examination showed loss of sensation below her abdomen and weakness bilaterally in hip flexion and dorsiflexion bilaterally. On magnetic resonance imaging (MRI), bilateral synovial cysts at the C7–T1 junction were found [Figure 1]. Facet hypertrophy in combination with the aforementioned synovial cysts caused severe left and moderate right foraminal stenosis, as well as spinal cord compression.

The cyst was treated surgically with a C7–T1 laminectomy, facetectomy, and resection with a C5–T3 posterior fusion with autograft and fixation. The large synovial cyst was encountered in the left facet joint and opened. As much as possible was resected through the foramen in the C7–T1 area. Further bone was removed to allow room for the nerve root and to allow dissection of the smaller cyst.

RESULTS

Immediately after surgery, the patient reported improvement in function. Three-month postoperatively, the patient reported resolution of neurological symptoms. Her weakness resolved and she was able to ambulate normally. Anteroposterior and lateral X-rays 1 year after surgery show fusion and stable hardware placement [Figure 2].

All three patients recovered fully, with no evidence of cyst recurrence at 1 year after surgery [Table 1].

DISCUSSION

Cervical synovial cysts in the C7–T1 junction are rare, making up an estimated 2.6% of all synovial cysts found in the spine. Machino *et al*. found that only 51 cases reported in the past 20 years.[6] Bilateral cervical synovial cysts are even more rare, with only one other being reported in the literature.[7] However, cervical cysts at the C7–T1 level account for about a third of the cases of cervical spinal synovial cysts, making it the most common location.[3,5-7,9] It is unknown why the C7–T1 level is particularly vulnerable to synovial cysts, despite degeneration and disc herniation being more common in higher levels of the cervical spine. Because it is the junction between the flexible cervical spine and the inflexible thoracic spine, it is comparatively less flexible than the rest of the cervical spine but far more flexible than the thoracic spine below. This change in flexibility may predispose a joint to synovial cysts, as the second most common location of cervical spinal synovial cysts is at the atlantoaxial junction, which is also a joint that is far more flexible than the joints below it.

The etiology of cervical spinal cysts is uncertain, but they are often associated with trauma, spinal surgery, hypermobility, or inflammatory disorders such as rheumatoid arthritis.[5-7] It is thought that these events could cause a weakening of the wall of the facet joint capsule, leading to erosion through the wall and eventual herniation through the defect. Inflammation may also play a role, as upregulation of inflammatory factors such as angiopoeitin-1, basic fibroblastic growth factor, substance P, platelet-derived growth factor, and interleukins has been noted in diseased joints and can lead to synovial hyperplasia causing cyst formation. In our patients, there were

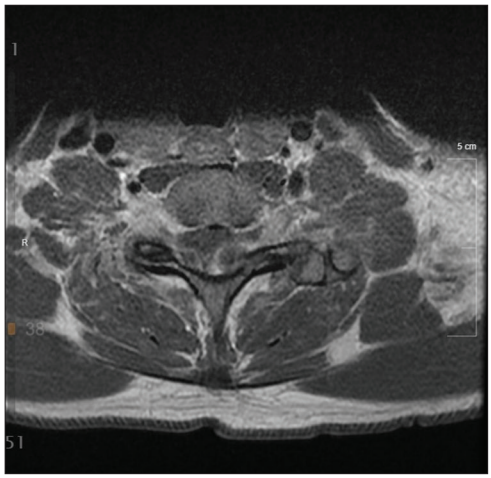

Figure 1: Transverse view of magnetic resonance imaging of spine at cervicothoracic junction showing bilateral synovial cysts.

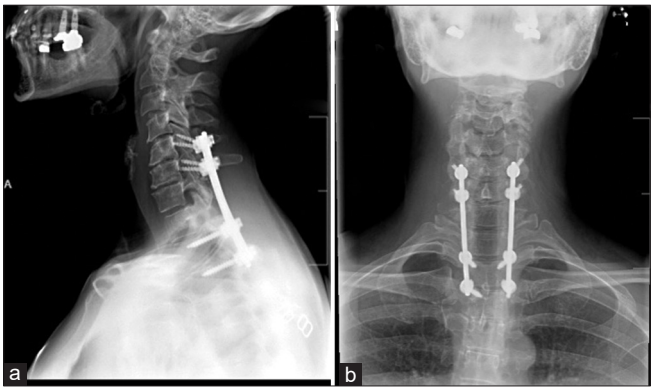

Figure 2: Lateral (a) and anteroposterior (b) X-rays one year after surgery show fusion and stable hardware placement.

Table 1: Summary of cases.

Case number	Patient demographic	Presenting symptoms	Physical exam	Imaging	Surgery	Outcome
Case 1	72 year old Male	Severe right arm pain with weakness	Neurologically intact	7 x 10 x 11 millimeter synovial cyst found on MRI (magnetic resonance imaging)	C7-T1 laminectomy with resection of synovial cyst and C5-T2 posterior fixation with allograft, autograft, and fixation	Resolution of pain
Case 2	47 year old Female	Upper back pain, numbness spreading distally from abdomen, weakness resulting in difficult ambulating	Loss of sensation below abdomen, weakness bilaterally with hip flexion and dorsiflexion	Bilateral facet synovial cysts one measuring 0.8 x 1.1 x 1.4 centimeter and the other measuring 0.6 x 0.6 x 0.9 millimeter found on MRI	C7-T1 laminectomy, facetectomy and resection with a C5-T3 posterior fusion with autograft and fixation	Resolution of neurological symptoms at 3 month follow up
Case 3	56 year old Female	Right upper extremity pain and paresthesia	Neurologically intact	Synovial cyst at C7-T1 junction	C7-T1 laminectomy and resection of cyst; C5-T2 posterior fusion and fixation	Resolution of symptoms within a few days

C5: Fifth cervical vertebral bone, C7: Seventh cervical vertebral bone, T1: First thoracic vertebra, T2: Second thoracic vertebra

Table 2: Summary of Previously Published Cases.

Author, Year, Number of patients	Lesion location	Presenting symptoms	Treatment
Nijensohn, 1990[8]	(R) C4-5, C5-6 (L) C5-6	RVE and bil LE weakness	C4-6 Laminectomy/Fusion
Colen, 2006[1]	C7-T1	Radiculopathy	None: Spontaneous resolution
Nojiri, 2009[9]	(R) C7-T1 (L) C2-3	Gait disturbance Gait disturbance, early myelopathy	C5-7 Laminoplasty; C7 laminectomy C2-3 Laminectomy
Lyons, 2011[5]	Literature Review Multiple Locations	Cervical radiculopathy/myelopathy	Various
Machino, 2012[6]	(L) C4-5	Myelopathy	C3-7 Laminoplasty
DS Kim, 2014[3]	(L) C7-T1	Acute myelopathy	C7-T1 Laminectomy
SW Kim, 2014[4]	(L) C7-T1	Brown-Sequard Syndrome	C5-6 Laminoplasty; C7 Laminoctomy
Correador, 2015[2]	(L) C5-6	Myeloradiculopathy	C4-6 Laminectomy/Fusion
Mustroph, 2019[7]	Bilateral C7-T1	Myeloradiculopathy	C7-T1 Laminoctomy (bilateral)
Radouane, 2020[10]	(L) C7-T1	Neck pain and acute LLE weakness, secondary to hemorrhage	(R) C7-T1 Hemi Laminectomy

C2-7: Second, third, fourth, fifth, sixth, seventh cervical vertebral bone, T1: First thoracic vertebra, L: Left, R: Right, RVE: Right ventricular enlargement, Bil: Bilateral, LE: Lower extremity, LLE: Left lower extremity

some associated events such as overhead lifting or falls with their symptoms, but it was unclear if the events were causally related. Our cases occurred either idiopathically or alongside degeneration, with one patient having noted disc degeneration and spondylolisthesis reported before his cyst was found.

Patients with spinal synovial cysts also present with variable complaints. Because synovial cysts are slow growing, symptoms often do not appear until the cyst grows large enough to compress the spinal cord or the surrounding nerve roots. However, the cysts may undergo sudden changes, especially if they are exposed to stress. Synovial cysts have been known to spontaneously resolve,[1] increase in size,[5] hemorrhage,[10] calcify,[8] or become infected.[2] This can lead to variable clinical presentations, with some patients presenting with no significant physical examination findings while others can present with severe myelopathy or even Brown Sequard syndrome.[4] In our series, two patients had a gradual onset, while the other was more acute.[2] Symptom severity was also highly variable, with one patient reporting only pain and stiffness without any physical findings, whereas

another presented with lower extremity weakness and numbness. This is most likely due to a multitude of factors, such as the difference in cyst size and placement, leading to compression of either spinal cord, nerve roots, or both. MRI was crucial in locating the defect, as the cysts are usually not well visualized with computed tomography scans and X-rays.

Surgery has been shown to be an effective treatment for synovial cysts causing symptomatic compression of the spinal cord or associated nerves. Decompressive laminectomy is most performed, with excision and removal of the synovial cyst.[6] This is usually followed with spinal fusion. Few complications have been reported with this treatment strategy, and full resolution of symptoms is typical, with some patients reporting residual paresthesia, but overall improved function. No recurrence of cervical spinal cysts has been reported in the literature thus far, though spinal synovial cysts have been noted to appear or recur after other spinal surgeries, particularly in the lumbar region where fusion may not be performed. Fusion after spinal surgery appears to reduce rate of lumbar spinal cyst formation or recurrence. Our patients all recovered uneventfully with resolution of their symptoms.

CONCLUSION

We present three cases of cervical spinal synovial cysts at the C7–T1 junction. It is an uncommon pathology, and little is known about the etiology. All three were treated with decompressive laminectomy and fixation leading to resolution of symptoms.

Declaration of patient consent

Patients' consent not required as patients' identities were not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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