

Cervical Subaxial Synovial Cyst with Progressive Myelopathy: Report of a Case and Review of the Literature

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ABSTRACT

Subaxial cervical synovial cyst is a rare but curable example of an extradural spinal pathology responsible for progressive neurological deficit. In careful review of the literature the authors found 28 cases of subaxial cervical synovial cyst with detailed information

Herein, we present a 75-year-old male with a history of progressive weakness of all extremities and unsteady gait where his neurological examination revealed spastic quadriparesis. MRI showed a right-sided mass that was hyperintense in T2-weighted and hypointense in T1-weighted images at the C6-C7 level. CT scan showed a cystic lesion with ossified capsule. These images were compatible with a synovial cyst and its surgical removal resulted in marked recovery. Besides presentation of this case, which is a demonstrative one, a review of the literature will be done. Furthermore, the pathogenesis, clinical picture, imaging features, the most appropriate treatment and the outcome of this pathology will be discussed in detail.

KEY WORDS: Cervical spine, juxtafacet cyst, MRI, subaxial cervical spine, synovial cyst

INTRODUCTION

Extradural benign cysts located in the vicinity of the facet joints are so called juxtafacet cysts. These include synovial, ganglion and ligamentum flavum cysts. Juxtafacet cysts are not evenly distributed in the spine. Most of these cysts occur in the lumbar region with incidence of 95% followed by cervical spine with 3.5% while the least common is the thoracic one with 1.5% incidence. About one third of the juxtafacet cysts of the cervical spine occur at the upper cervical spine and the remaining two thirds are located at the subaxial cervical region. The first example of the synovial cyst of the subaxial cervical spine was reported by Kao et al in 1974 and since then only 27 more cases have been published so far (1,3-6,8,9,11-17,19,20,22,23,25-30). Apparently, cervical synovial cyst at C7-T1 which are designated as cervicothoracic cysts are not included in this review.

Herein a new case in a 75-year-old male experiencing rapid and progressive quadriparesis is presented. Radiological surveys were compatible with a right-sided juxtafacet cyst of the cervical spine at the C6-C7 level. Surgical removal of the cyst resulted in dramatic recovery of the patient. Furthermore, 29 cases, including the current case with intraspinal juxtafacet cysts of the subaxial cervical spine from the C3 to C7 vertebrae including the current case will be reviewed

CASE REPORT

A 75-year-old man was admitted because of progressive weakness of all extremities, difficulty in walking and urgency in voiding of three-month duration. During the last two weeks, he could not feed himself, had difficulty in buttoning or unbuttoning, and was unable to walk without assistance. His neurological examination revealed spastic quadriparesis with hyperactive reflexes, and positive Hoffman's and Babinski's signs. His MJOA score was 9/16.

Cervical spine plain radiographs were not conclusive and did not show any pathologic issue other than degenerative changes.

T2-weighted MRI showed a right-sided hyperintense round mass at the C6-C7 level whereas the mass was hypointense in T1-weighted images. CT scan in axial cuts showed a round cystic mass with calcified rim on the right side at the C6-C7 level. Reconstructed sagittal 2D films showed the same pathology but more clearly.

Under general anesthesia, with the patient in the prone position and via a midline incision from C2 to C7, laminectomy from C3 To C6 was done where a big epidural cystic mass was seen on the right side at C6 level. The cyst was carefully isolated from the surrounding tissues as well as the dura mater and was subsequently removed. After cyst removal, normal pulsation of the cord appeared. Thereafter, the wound was closed.

Postoperatively, the patient showed steady but marked recovery. At the 3-months follow-up, he became able to walk independently and feed himself, with normal urinary continence. Now, at one-year follow-up, he has become almost independent with MJO score of 14.

DISCUSSION

Cysts around the facet joints are called juxtafacet cysts. These include synovial and ganglion cysts (2,10,21,36,37). Juxtafacet cysts are thought to be caused by repetitive trauma and micro-instability producing areas of focal weakness in the facet capsule. Herniation of synovium will result in appearance of synovial serous fluid filled cyst or so-called synovial cysts. With losing their communication with the facet capsule and their further myxoid degeneration, they are called ganglion cysts (2,10,21,36,37). Juxtafacet cysts can occur throughout the spine but are typically found in mobile segments and especially the lumbar spine followed by cervical spine (22,31,32). This clearly reflects their rarity in the immobile thoracic spine. These cyst are usually single in the cervical spine, but rarely they can be multiple on the ipsilateral or contralateral side (18).

The external layer of these cysts, regardless of terminology, is covered by connective tissue. In synovial cysts, the internal lining of the cyst is stratified cuboid epithelium. However, in ganglion cysts, the internal lining does not contain this epithelium. The cyst's content in synovial cysts is viscous but in the ganglion ones is gelatinous (2,10,21,36,37).

Two major hypotheses have been proposed in the formation of the juxtafacet cysts of the spine which include

repeated micro-trauma and segmental instability or both (2, 10,21,25,36,37). Along with these factors, degeneration of the corresponding facet joint is a prerequisite.

Juxtafacet cysts of the subaxial cervical region are now reported with increasing frequency, probably due to increased availability of MRI. However, despite this fact, in a Medline and Pub Med search using key words of synovial cyst, ganglion cyst, ligamentum flavum and juxtafacet cyst of the cervical spine, we could find only 28 cases in subaxial region with detailed clinical information (1,3-6,8,9,11-17,19,20,22,23,25-30). Combining these cases with our new case presented in this paper yielded 29 cases for analysis (Table 1).

Our survey revealed that most of the patients tend to be in their seventh decades of life with male (16) to female (13) predominance. The average age of presentation was 64 years, ranging from 16 to 86 years of age (1,3-6,8,9,11-17,19,20,22,23,25-30).

The clinical picture of the subaxial cervical juxtafacet cyst has been myelopathy in the majority followed by radiculopathy and a combination of both respectively. The course of the disease varied from a few days to several months in the majority and even a year or two on rare occasions (1,3-6,8,9,11-17,19,20,22,23,25-30). Acute myelopathy has been seldom reported. Rapid deterioration of previous neural deficit or rapid development of myelopathy can be either due to sudden expansion of the cyst or intra-cystic bleeding, although this has been only observed in the cysts of atlantoaxial location (24,39). Trauma and manipulative therapy have been reported as precipitating factors in rapid deterioration of the clinical picture (24,35).

The cervical spine face and lateral radiographs can only show marked degeneration, in particular at the facet joints which is necessary in the development of juxtafacet joints. However, dynamic lateral flexion X-ray is necessary for detection of the instability (25,33). It is not unusual to see mild degenerative slippage in lateral flexion extension radiographs.

MRI is the tool of choice for the diagnosis of uncomplicated juxtafacet cysts and its appearance is rather specific. Actually, this pathology is demonstrated as a sharply demarcated round spinal extradural cyst with a well-defined capsule. The cyst content shows variable intensity depending on the type of the fluid. In serous ones it is hypo-intense in T1-weighted MRI and hyper-intense in T2-weighted images whereas in gelatinous ones, it might be isointense in both T1- and T2-weighted images. The

capsule of the cyst is thin and has low signal intensity which is enhanced in gadolinium-contrasted MRI (34). Peripheral rim enhancement is seen in a majority of uncomplicated juxtafacet cysts. In chronic cases, the capsule of the cyst becomes thicker and rim enhancement might be extensive. Rarely, the cyst's content signal intensity varies due to

spontaneous intra-cystic bleeding (31,32,39,40). In the case of intra-cystic hemorrhage, the MRI picture of the condition varies depending on the stage in the biochemical evolution of the hematoma. The majority of the patients with bleeding in synovial cysts are diagnosed in the subacute phase, beginning from the second week to one month. In this stage,

Table 1: Review of Subaxial Cervical Synovial Cysts from C2 to C7

No	Authors	Year	Sex	Age	Location	Clinical Picture	Surgery
1	Kao et al.	1974	M	52	C6-C7	Radiculopathy	Laminectomy
2	Jaber et al.	1987	M	60	C6-C7	Myelopathy	Laminectomy
3	Patel & Sanders	1988	F	42	C4-C5	Radiculopathy	Hemilaminectomy
4	Nijensohn et al.	1990	M	58	C5-C6	Radiculomyelopathy	Laminectomy + PSF
5	Sabo et al.	1996	(*)	(*)	C4-C5	(*)	Laminectomy
6	Krauss et al.	1998	F	53	C6-C7	Radiculopathy	Hemilaminectomy
7	Krauss et al.	1998	M	62	C3-C4	Radiculomyelopathy	Hemilaminectomy
8	Krauss et al.	1998	M	70	C4-C5	Radiculopathy	Hemilaminectomy
9	Krauss et al.	1998	M	74	C4-C5	Myelopathy	Hemilaminectomy
10	Kaiser & Holland	1998	M	74	C4-C5	Radiculopathy	Hemilaminectomy
11	Cudlip et al.	1999	M	75	C3-C4	Myelopathy	Laminectomy
12	Hatem et al.	2001	F	65	C3-C4	Radiculopathy	Hemilaminectomy
13	Jost et al.	2003	F	72	C6-C7	Radiculopathy	Laminectomy
14	Fonoff et al.	2004	M	64	C3-C4	Myelopathy	Hemilaminectomy
15	Cheng YY et al.	2004	M	59	C6-C7	Myelopathy	Laminectomy
16	McGuigan et al.	2005	M	86	C4-C5,	Myelopathy	Laminectomy
17	Cheng WY, et al.	2006	F	58	C6-C7	Brown Squared	Laminectomy
18	Kostanian VJ et al.	2007	F	66	C6-C7	Radiculopathy	CT guided aspiration
19	Nojiri H et al.	2009	F	77	C2-C3	Myelopathy	Laminectomy
20	Moon HJ et al.	2010	M	74	C5-C6	Myelopathy	Hemilaminectomy
21	Tofoku et al.	2011	F	78	C5-C6	Myelopathy	Laminoplasty
22	Machino et al.	2012	M	56	C4-C5	Myelopathy	Laminoplasty
23	Seo et al.	2012	F	77	C3-C4	Radiculomyelopathy	Hemilaminectomy
24	Pikis et al.	2013	F	71	C5-C6	Radiculopathy	Hemilaminectomy
25	Attwell et al.	2014	F	75	C3-C4	Myelopathy	Laminectomy
26	Overvliet t al.	2014	F	16	C6-C7	Radiculopathy	Conservative
27	Corredor & Oan	2015	M	67	C5-C6	Radiculomyelopathy	Laminectomy + Fusion
28	Phan & Mobbs	2016	F	40	C5-C6	Radiculopathy	Laminoplasty
29	Present case	2016	M	76	C6-C7	Myelopathy	Laminectomy

F: 13 vs. M: 15, Mean age: approx. 64, Location: C2-C3: 1 C3-C4: 6 C4-C5: 7 C5-C6: 6 C6-C7:9, Most prevalent: C6-C7, least prevalent: C2-C3, Radiculopathy: 11, Myelopathy: 12, Radiculomyelopathy: 4, Laminectomy: 13, Hemilaminectomy: 11, Laminoplasty: 3, conservative: 1, CT guided aspiration: 1.



Figure 1: CT Scan, (A) Axial CT slice showing a calcified lesion inside the spinal canal in the posterolateral position. (B) Sagittal view the lesion is seen clearly. (C) Even in 3 D images the cyst can be seen.

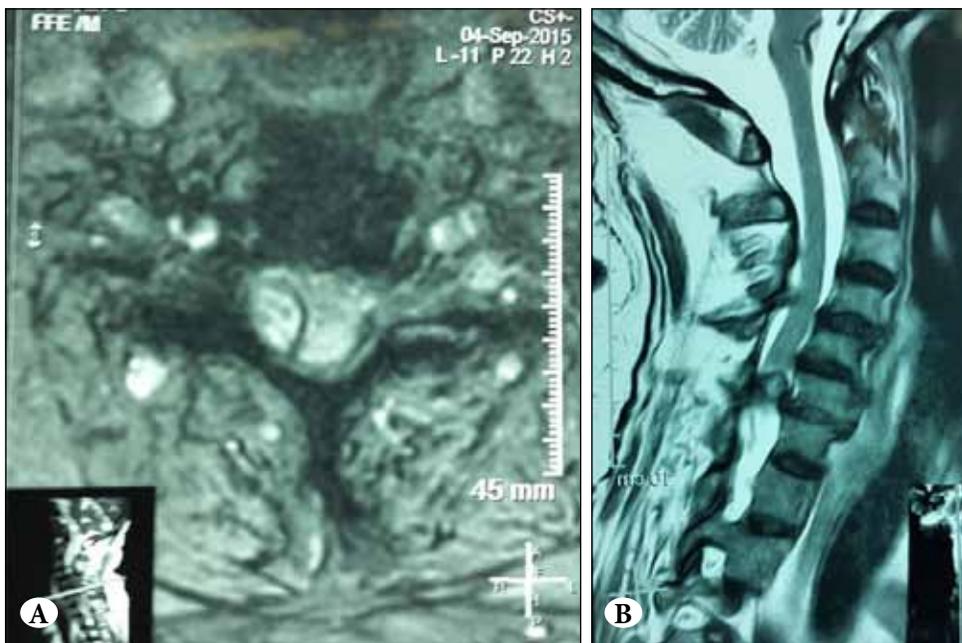


Figure 2: (A) Axial T2 weighted MRI showing a hyperintense mass on the right side (B) T2-weighted sagittal paramedian MRI showing the same lesion occupying almost the whole canal's anteroposterior diameter.

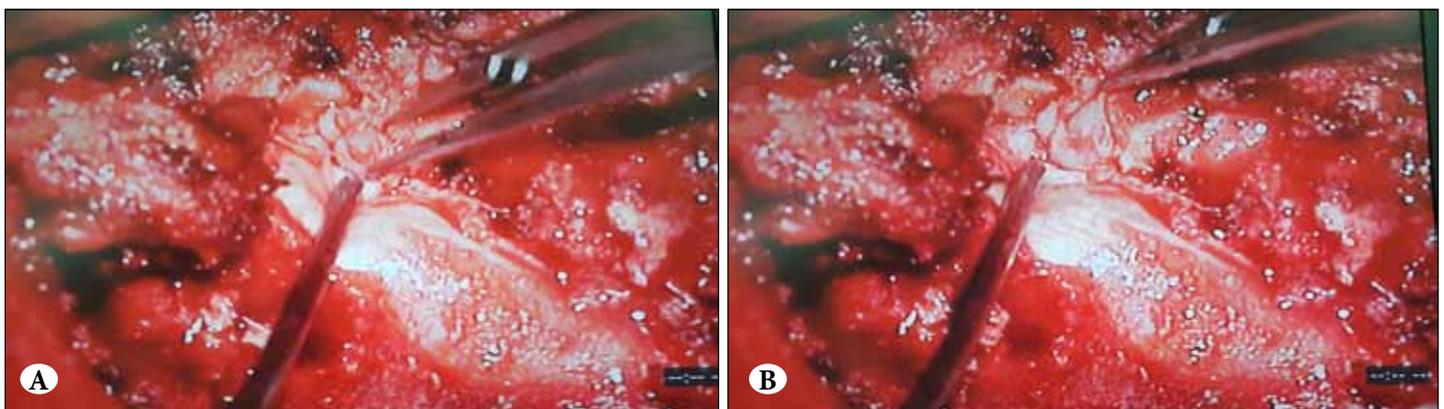


Figure 3: Intra-operative View: (A, B) removal of the cyst.

with the clot's gradual degradation, it is seen as an isointense to heterogeneous mass in T1 images because of the variable mixture of methemoglobin and deoxyhemoglobin. In T2-weighted images, the clot is heterogeneous at this phase (31-32). In chronic forms, strong rim enhancement might be seen after gadolinium injection because of the vascularization of the capsule of the hematoma as well as the cyst (39,40). At this stage, the cyst content has mixture of hypo and hyperintensity both in T1- and T2-weighted MR images (34).

Juxtafacet cysts of mobile segments of the subaxial cervical spine are usually of small size with thick and even calcified capsule at the time of diagnosis. Therefore, CT scan images of uncomplicated cysts are well documented and typically show a round extradural mass adjacent to a degenerated facet joint. It may have dense rim because of calcification (26). However the cyst content density is generally near to the density of CSF, but occasionally contains gas or appears hyperdense due to intracystic hemorrhage. On CT myelogram, one can demonstrate a round extradural defect located posterolaterally. CT facet arthrography may show continuity of the synovial cyst with the facet joint lesion and infiltration of contrast medium into the lesion (38). However, this is not really necessary and does not change surgical decision making.

The differential diagnosis includes extradural cystic tumors such as cystic schwannomas, migrated disc fragment in the course of spontaneous resolution and a small localized epidural abscess. Surprisingly, in the pre MRI era, most of the cases have been diagnosed as a free disc fragment. However, MRI is of great help in the detection of schwannomas that have higher intensity in T1 images than uncomplicated juxtafacet cysts but lower than that of hemorrhagic cysts.

The mainstay in treatment of subaxial juxtafacet cysts is surgical excision. However, the most advantageous and appropriate surgical technique in terms of outcome and safety depends on the location and size of the cyst and associated instability or concomitant spondylosis. Where smaller cysts can be accessed by a microsurgical or mini-invasive approach, larger cysts would necessitate hemilaminectomy, laminectomy or laminoplasty. However, since some of the lower cervical synovial might be associated with multilevel cervical spondylosis and relative stenosis, extended decompression from C3 to C7 might be indicated. In the case of instability, following laminectomy and cyst removal, screw-rod fixation will be indicated (2,25,33).

However, with consideration of the fact that this pathology mostly occurs in the elderly who suffer from osteoporosis, pedicle screws are preferred to lateral mass screws. Furthermore, CT-guided needle aspiration of the cyst's content has been described by some authors (17,31,32). This however can lead to cyst fluid content re-accumulation associated with recurrence of the neurological deficit.

Conservative management of juxtafacet cysts has been reported in a few cases and in the cervical subaxial region in one rare occasion with a good result (7). This shows that in the patients with a diagnosis of synovial cyst with signs of neurological deficit where regression is demonstrated, observation and follow up might be justified.

In the reviewed cases, laminectomy (14 cases) was the procedure of choice in the majority followed by hemilaminectomy (11 cases) and laminoplasty (4 cases). CT-guided aspiration was done in one case.

The outcome depends on the time of diagnosis and from diagnosis to surgery. Surgical intervention is usually associated with very satisfactory outcome and low morbidity. Obviously, with delay in diagnosis or surgery, the prognosis may be unsatisfactory.

In summary, cervical synovial cysts are rare and usually the subject of case reports. These cysts despite their infrequency remain a treatable condition with good prognosis in particular if are diagnosed early. Where excision of the cyst is the mainstay of surgery, screw rod fixation is advised in the case of instability. Percutaneous aspiration of cysts appears to have a much higher recurrence and failure rate, so this may be followed by surgery if warranted.

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