

## Complete Resolution of a Large Hemorrhagic Lumbar Synovial Cyst Following Spinal Fusion Alone

### Abstract

The authors reported complete regression of a large hemorrhagic lumbar synovial cyst following posterior spinal fusion without direct cystic resection. A 64-year-old woman suffered from sudden onset of the left buttock pain radiating to the left leg after waking up in the morning following the previous history of a minor accident 2 months ago. Magnetic resonance imaging (MRI) of the lumbosacral spine showed a large extradural round mass originating from the left facet joint at the level of L3–L4. The mass was hyperintense on T1-weighted images and hypointense on T2-weighted images, probably compatible with hemorrhagic joint-related cyst. Surgical treatment was chosen for her because of persistent left radicular pain with no responding to medications. The patient underwent decompressive laminectomy, subtotal facetectomy, instrumented fusion, and only tissue biopsy due to severe adherence of the mass and dura. Histopathological examination was consistent with a hemorrhagic synovial cyst. The radicular pain completely disappeared after the surgery. Follow-up MRI of the lumbosacral spine obtained 6 months after the surgery demonstrated complete resolution of the hemorrhagic cyst. Complete resolution of hemorrhagic synovial cyst seems to correlate with subtotal facetectomy, probably resulting in leakage of cyst content and subsequent resorption of the cyst wall. In addition, hematoma within the synovial cyst may resolve spontaneously over time.

**Keywords:** Hemorrhage, juxtafacet cyst, lumbar synovial cyst, spinal fusion, spontaneous resolution

### Introduction

Spinal juxtafacet cysts have been proposed to encompass both common types of facet cysts including synovial and ganglion cysts.<sup>[1]</sup> By histopathological distinction, synovial cysts have synovial lining membrane and communication directly with the facet joint, whereas ganglion cysts no synovial lining. However, the clinical presentation, treatment considerations, and prognosis of these juxtafacet cysts remain the same.<sup>[2,3]</sup> Spinal synovial cysts arise from the zygapophyseal joint capsule by the protrusion of the synovial membrane through the defect of the joint capsule, causing the formation of a para-articular cavity filled with synovial fluid.<sup>[4]</sup> The pathogenesis of spinal synovial cysts remains unclear. The formation of these cysts has been associated with degenerative spondylosis, spinal segmental instability, and trauma.<sup>[5]</sup> Spinal synovial cysts are most common in the sixth decade of life with a slight woman predominance.<sup>[6]</sup> The most common spinal level affected is L4–L5, followed by L3–L4, L5–S1, and L2–

L3.<sup>[7]</sup> The formation of these cysts has been associated with degenerative spondylosis, spinal segmental instability, and trauma.<sup>[5]</sup> The prevalence of lumbar intraspinal synovial cysts in a symptomatic population was 2.3% based on magnetic resonance imaging (MRI).<sup>[8]</sup> The presenting symptoms of lumbar synovial cysts depend on its size, site, and relationship with adjacent structures. The clinical presentation includes back pain, radicular pain, neurogenic claudication, and/or cauda equina syndrome.<sup>[6]</sup> They may be asymptomatic and discovered incidentally.<sup>[9]</sup> MRI is the modality of choice for the diagnosis of spinal synovial cysts.<sup>[4]</sup>

Hemorrhagic synovial cysts are uncommon and account for approximately 3% of all intraspinal synovial cysts.<sup>[10]</sup> These conditions may result in acute worsening of symptoms due to intracystic hemorrhage causing sudden enlargement of the cyst, or epidural hematoma from ruptured cyst.<sup>[11–13]</sup> The natural history of spinal synovial cysts remains unknown. Rarely, these cysts can spontaneously regress with corresponding changes in clinical symptoms.<sup>[9,14,15]</sup> In

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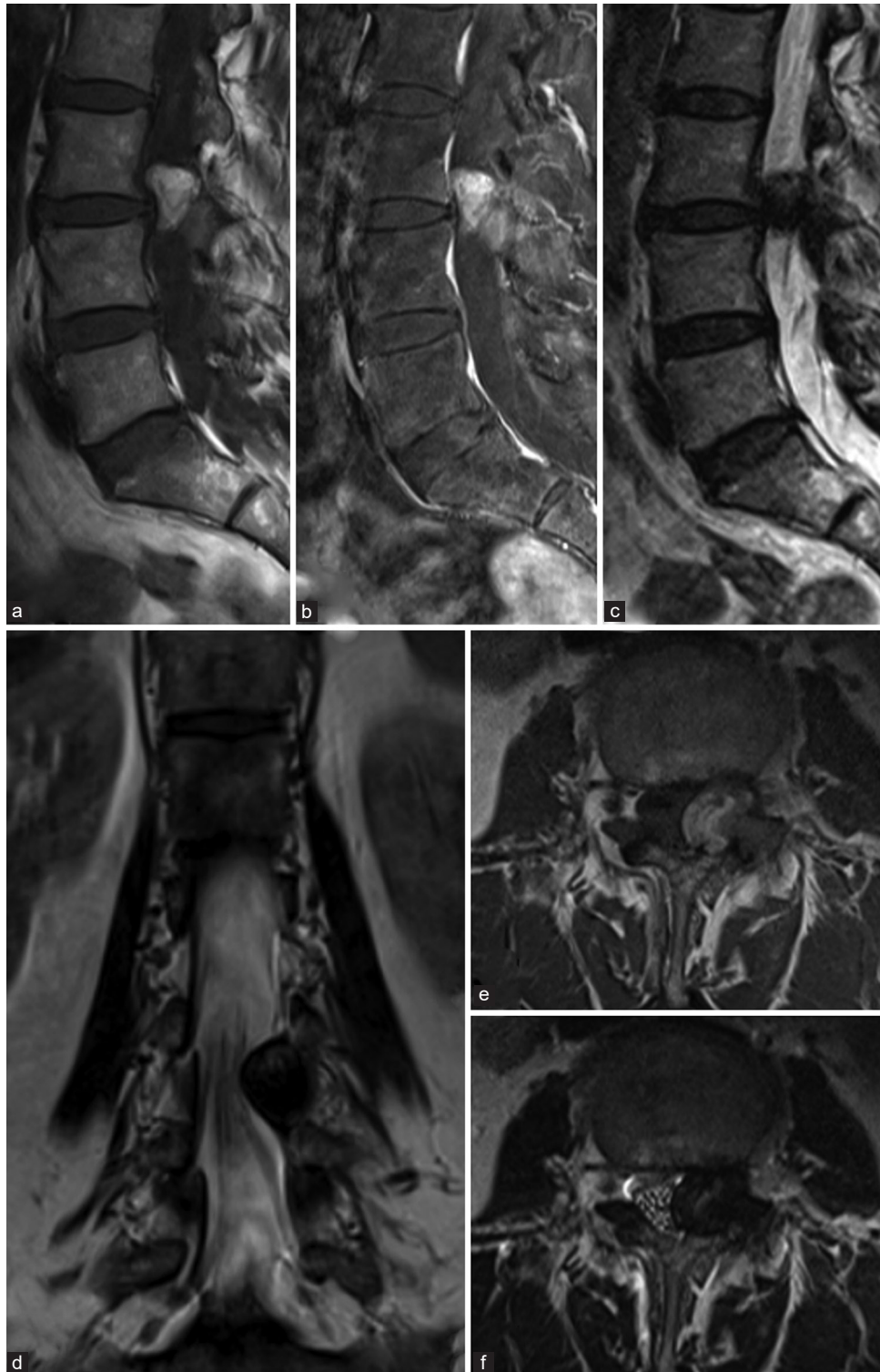
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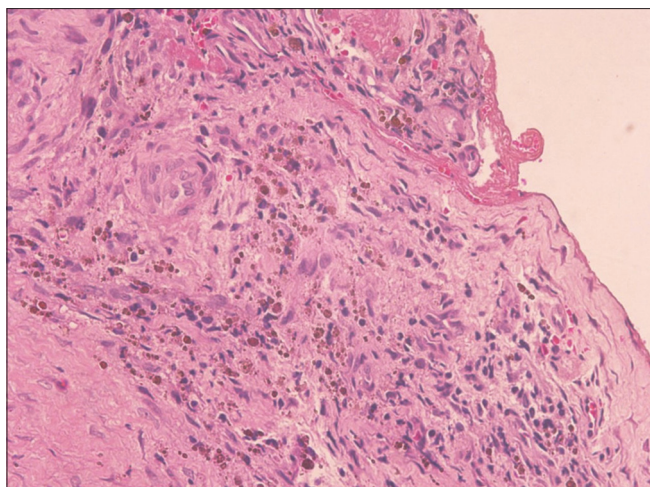
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**Figure 1:** Magnetic resonance imaging of the lumbosacral spine. Sagittal T1-weighted (a), contrast-enhanced T1-weighted with fat suppression (b), T2-weighted (c), coronal T2-weighted (d), axial T1-weighted(e), and T2-weighted (f) images show a hypersignal T1 and hyposignal T2 epidural round mass, probably originating from the left facet joint, with mild enhancement at the level of L3–L4. This lesion displaces the thecal sac to the contralateral side and compresses left-sided spinal nerve roots

addition, some authors reported spontaneous regression of synovial cysts following spinal fusion alone without resection of the cysts.<sup>[16-19]</sup> We described a patient with

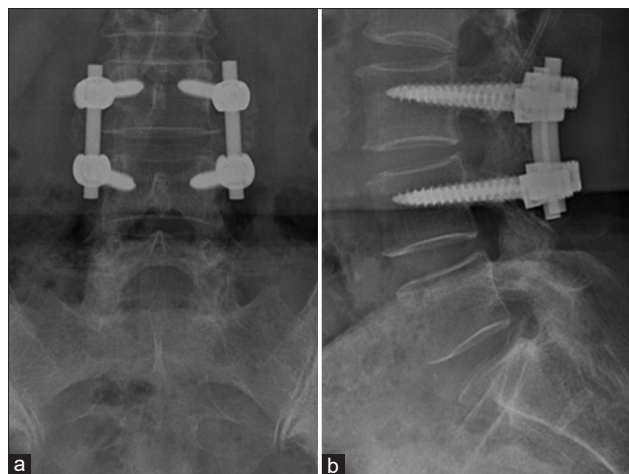
complete resolution of a large hemorrhagic lumbar synovial cyst following spinal fusion alone without resection of the cyst.



**Figure 2:** Microscopic examination of soft tissue from extradural spinal canal demonstrates fibroconnective tissue covering by synovial lining and hemosiderin-laden macrophages (H and E,  $\times 400$ )

### Case Report

A 64-year-old woman, photographer, slipped and fell on the ground and her lower back was hit by a stone bench. She experienced lower back pain and her pain subsided with medications within a week. Two months later, she suffered from sudden onset of the left buttock pain radiating to the left leg after waking up in the morning. She explained that the pain felt like sharpshooting. There was no numbness or bowel/bladder dysfunction involving. The patient presented to our institute due to persistent left radicular pain with no responding to medications for 2 weeks. The neurologic examination revealed no muscle weakness and intact pinprick sensation. Deep tendon reflexes were normal. The straight leg test was positive on the left. MRI of the lumbosacral spine showed a large extradural round mass at the level of L3–L4, probably originating from the left facet joint. The mass was hyperintense on T1-weighted images and hypointense on T2-weighted images with mild enhancement after gadolinium administration, probably compatible with hemorrhagic joint-related cyst [Figure 1]. The mass displaced the thecal sac to the contralateral side and compresses left-sided spinal nerve roots. Plain radiographs, including anteroposterior, lateral, flexion, and extension views, showed no spondylolisthesis. The surgery was scheduled in the next week. During the operation, the brownish round mass was found and tightly adhered with the thecal sac and spinal nerve roots. To avoid dural laceration, the patient underwent decompressive laminectomy, left-sided subtotal facetectomy, posterior spinal fusion, and tissue biopsy. Histopathological examination revealed fibroconnective tissue and hemosiderin-laden macrophages [Figure 2]. Multinucleated giant cells were also noted. No necrosis was seen. These findings were consistent with hemorrhagic synovial cyst. Her postoperative course was uneventful. Her left radicular pain had completely disappeared after the



**Figure 3:** Anteroposterior (a) and lateral (b) views of plain radiography of the lumbosacral spine, obtained 3 days postoperation, demonstrate pedicle screw fixation at the level of L3–L4

surgery. Postoperative plain radiography of the lumbosacral spine confirmed the proper position of pedicle screws at the level of L3–L4 [Figure 3]. MRI of the lumbosacral spine obtained 6 months following the operation disclosed complete disappearance of the left hemorrhagic synovial cyst [Figure 4]. The patient had remained pain-free without medication during a period of 3-year follow-up.

### Discussion

Hemorrhage into the cavity of synovial cyst may result in cyst enlargement leading to neural compression and acute worsening of the symptoms.<sup>[20]</sup> Based on the literature review of 44 published cases of lumbar hemorrhagic synovial cysts by Cannarsa *et al.*,<sup>[21]</sup> they found that hemorrhagic cysts more often occurred in men and at an earlier age. Hemorrhagic synovial cyst can occur in the cervical and thoracic region, resulting in myelopathy.<sup>[20,22]</sup>

The pathogenesis of hemorrhagic spinal synovial cyst remains unclear. Christophis *et al.*<sup>[3]</sup> defined cystic formations of mobile spine for space-occupying cysts of the spinal canal, including synovial, ganglion, and flavum cysts. They found that 34 (58.6%) from 58 cysts had hemosiderin deposits in histopathological findings. Furthermore, a hemosiderin deposit was detected in all cases in which an amyloid deposit was found. They speculated that hemorrhagic episodes may occur in a repeated manner as a result of greater exercise loading and more advanced tissue degeneration.

By histopathological examination, Poulis *et al.*<sup>[23]</sup> demonstrated newly formed and fragile vessels within the subintima of synovial cyst due to angiogenesis. Hemorrhage into the synovial cyst may cause by neoformed vessels following the repeated inflammations.<sup>[24]</sup> Based on a literature review of 23 cases of hemorrhagic lumbar synovial cysts, Ramieri *et al.*<sup>[11]</sup> speculated that hemorrhages are probably caused by the rupture of fragile neoangiogenic





**Figure 4:** Magnetic resonance imaging of the lumbar spine obtained 6 months following an operation. Sagittal T1-weighted (a), T2-weighted (b), coronal T2-weighted (c), axial T1-weighted (d), and T2-weighted (e) images confirm complete disappearance of the left hemorrhagic synovial cyst at the level of L3–L4

vessels related to the inflammation occurring during the formation of the cysts.

Trauma or microtrauma associated with the daily movement of the lumbar spine may increase the risk of hemorrhage into preexisting intraspinal synovial cyst. Furthermore, anticoagulant therapy may also be the cause of bleeding.<sup>[12]</sup> Recently, Lee *et al.*<sup>[25]</sup> reported iatrogenic hemorrhagic lumbosacral ganglion cyst following epidural steroid injection, supporting trauma hypothesis. However, hemorrhage in spinal synovial cysts can occur spontaneously without trauma or anticoagulant medication.<sup>[26]</sup> Kim and Kim<sup>[27]</sup> reported a patient with hemorrhagic lumbar synovial cyst caused by spinal instability following microscopic discectomy in absence of a traumatic event or anticoagulant therapy. In our case, prior trauma may relate with the occurrence of hemorrhage into the cyst.

Spontaneous resolution of symptomatic synovial cysts is extremely rare. Most patients of spontaneous disappearance of these cysts have been reports in women.<sup>[9]</sup> Spontaneous regression of lumbar synovial cysts has been hypothesized that the role of resolution of instability and spontaneous rupture of cyst are the most probable explanations for this phenomenon. The resolution of instability may change in local forces which initially led to the formation of the cyst. Spontaneous ruptured cyst results in extrusion of cystic contents and resorption of the cyst wall.<sup>[14]</sup> In addition, inhibition of inflammation may play a significant role in the pathophysiology of the resolution of lumbar synovial cysts.<sup>[28]</sup> Recently, Chiarella *et al.*<sup>[29]</sup> reviewed the literature and found 26 case reports (the mean age of 56 years) of spontaneous resolution of lumbar synovial cyst. They found that the mean time for clinical improvement was 7 months, and the disappearance of the cyst on follow-up MRI occurred in an average time of 11 months. They suggested

that surgical treatment or percutaneous procedure should be prolonged at least 6 months.

Intraspinal synovial cysts of the C1–C2 junction can occur in patients harboring atlantoaxial instability reported by some studies.<sup>[16–18]</sup> Interestingly, spontaneous regression of all these synovial cysts and clinical improvement were achieved by C1–C2 posterior fusion alone without resection of the cyst. Recently, Xie *et al.*<sup>[19]</sup> proposed a new option for the management of synovial cyst at the level of L4–L5 with segmental instability using oblique lumbar interbody fusion combined with anterior fixation without removal of the cyst. They expected that the synovial fluid would flow back to the gap in the facet joint through extending effects. Follow-up MRI of the lumbar spine obtained 3 months after the operation confirmed the spontaneous disappearance of the synovial cyst.

The optimal management of symptomatic spinal synovial cysts remains controversial. Treatment options are conservative treatment, epidural or intra-articular steroid injections with or without cyst aspiration, and surgical treatment. Conservative treatment includes bed rest, analgesia, anti-inflammatory drugs, physical therapy, bracing, etc.<sup>[9,30]</sup> Surgical treatment is indicated in patients with intractable pain not responding to conservative management or neurological deficit.<sup>[4]</sup> Most studies showed that surgical treatment was superior to conservative treatment. Surgical removal of synovial cysts is a safe and effective treatment for symptomatic relief in patients. However, the need of concomitant spinal fusion with instrumentation remains a topic of debate.<sup>[3,4,6,7,31]</sup> The main indications for spinal instrumentation include preoperative spondylolisthesis and a wide joint resection during the surgery.<sup>[24]</sup>

Based on the analysis of 195 symptomatic synovial cysts managing with surgical treatment by Xu *et al.*,<sup>[7]</sup> patients undergoing hemilaminectomy or laminectomy alone have an increased incidence of cyst recurrence and mechanical back pain within 2 years. Decompression with instrumented fusion appears to reduce the incidence of postoperative cyst recurrence and back pain. From another study about long-term follow-up after surgical treatment using facet-sparing techniques without spinal fusion of 141 cases by Bruder *et al.*,<sup>[6]</sup> they found that 7% needed surgery due to cyst recurrence, and 9% required a delayed stabilization procedure following the initial surgery.

The treatment of choice for symptomatic hemorrhagic synovial cysts is surgical treatment because acute progressive symptoms usually poorly respond to nonsurgical treatment.<sup>[11]</sup> However, surgical treatment can be challenging because of frequent dural adherence, leading to the risk for dural injury.<sup>[6]</sup> Larger cysts are more likely to be adherent to the dura and more extensive procedure may be appropriate.<sup>[4]</sup> Therefore, to achieve gross total resection of the large cyst may increase the risk of neural damage.

In the present study, surgical treatment was chosen for our case owing to acute worsening of radicular pain from a large hemorrhagic synovial cyst and no responding to conservative treatment. Unfortunately, the cyst adhered tightly with large area of the dura. We speculated that delayed surgical treatment in hemorrhagic spinal synovial cyst may increase adhesion of the dura. To avoid dural injury leading to unexpected complications, the patient underwent decompressive laminectomy with subtotal facetectomy without cyst removal. Even though there was no spondylolisthesis in our case, instrumented fusion was performed for the prevention of subsequent iatrogenic instability following facetectomy. Complete resolution of hemorrhagic synovial cyst in our case seems to correlate with subtotal facetectomy, probably resulting in leakage of cystic contents and subsequent resorption of the cyst wall. In addition, hematoma within the synovial cyst may resolve spontaneously over time.

## Conclusion

Symptomatic hemorrhagic synovial cyst and spontaneous resolution of this cyst are extremely rare. We described a case of complete resolution of a large hemorrhagic cyst following decompressive laminectomy with instrumented fusion alone. Minor trauma may relate with the occurrence of hemorrhage into the cyst in our case. Complete regression of hemorrhagic synovial cyst seems to correlate with subtotal facetectomy, probably resulting in leakage of cystic contents and subsequent resorption of the cyst wall. In addition, hematoma within the synovial cyst may resolve spontaneously over time.

## Informed consent

The patient has given consent to be enrolled and has her data published.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published, and due efforts will be made to conceal the identity, but anonymity cannot be guaranteed.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

## References

1. Kao CC, Winkler SS, Turner JH. Synovial cyst of spinal facet. Case report. *J Neurosurg* 1974;41:372-6.
2. Kjerulf TD, Terry DW Jr, Boubelik RJ. Lumbar synovial or ganglion cysts. *Neurosurgery* 1986;19:415-20.

3. Christophis P, Asamoto S, Kuchelmeister K, Schachenmayr W. "Juxtafacet cysts", a misleading name for cystic formations of mobile spine (CYFMOS). *Eur Spine J* 2007;16:1499-505.
4. Boviatsis EJ, Stavrinou LC, Kouyialis AT, Gavra MM, Stavrinou PC, Themistokleous M, *et al.* Spinal synovial cysts: Pathogenesis, diagnosis and surgical treatment in a series of seven cases and literature review. *Eur Spine J* 2008;17:831-7.
5. Khan AM, Girardi F. Spinal lumbar synovial cysts. Diagnosis and management challenge. *Eur Spine J* 2006;15:1176-82.
6. Bruder M, Cattani A, Gessler F, Droste C, Setzer M, Seifert V, *et al.* Synovial cysts of the spine: Long-term follow-up after surgical treatment of 141 cases in a single-center series and comprehensive literature review of 2900 degenerative spinal cysts. *J Neurosurg Spine* 2017;27:256-67.
7. Xu R, McGirt MJ, Parker SL, Bydon M, Olivi A, Wolinsky JP, *et al.* Factors associated with recurrent back pain and cyst recurrence after surgical resection of one hundred ninety-five spinal synovial cysts: Analysis of one hundred sixty-seven consecutive cases. *Spine (Phila Pa 1976)* 2010;35:1044-53.
8. Doyle AJ, Merrilees M. Synovial cysts of the lumbar facet joints in a symptomatic population: Prevalence on magnetic resonance imaging. *Spine (Phila Pa 1976)* 2004;29:874-8.
9. Sinha P, Panbehchi S, Lee MT, Parekh T, Pal D. Spontaneous resolution of symptomatic lumbar synovial cyst. *J Surg Case Rep* 2016;2016:rjw166.
10. Kaneko K, Inoue Y. Haemorrhagic lumbar synovial cyst. A cause of acute radiculopathy. *J Bone Joint Surg Br* 2000;82:583-4.
11. Ramieri A, Domenicucci M, Seferi A, Paolini S, Petrozza V, Delfini R. Lumbar hemorrhagic synovial cysts: Diagnosis, pathogenesis, and treatment. Report of 3 cases. *Surg Neurol* 2006;65:385-90, discussion 390.
12. Xu R, Solakoglu C, Maleki Z, McGirt MJ, Gokaslan ZL, Bydon A. Hemorrhagic synovial cyst: The possible role of initial trauma and subsequent microtrauma in its pathogenesis: Case report. *Neurosurgery* 2011;68:E858-65.
13. Wait SD, Jones FD, Lonser RR, Lee KS. Symptomatic epidural hematoma caused by lumbar synovial cyst rupture: Report of two cases and review of the literature. *Neurosurgery* 2005;56:E1157.
14. Houten JK, Sanderson SP, Cooper PR. Spontaneous regression of symptomatic lumbar synovial cysts. Report of three cases. *J Neurosurg* 2003;99:235-8.
15. Swartz PG, Murtagh FR. Spontaneous resolution of an intraspinal synovial cyst. *AJNR Am J Neuroradiol* 2003;24:1261-3.
16. Chang H, Park JB, Kim KW. Synovial cyst of the transverse ligament of the atlas in a patient with os odontoideum and atlantoaxial instability. *Spine (Phila Pa 1976)* 2000;25:741-4.
17. Morio Y, Yoshioka T, Nagashima H, Hagino H, Teshima R. Intraspinal synovial cyst communicating with the C1-C2 facet joints and subarachnoid space associated with rheumatoid atlantoaxial instability. *Spine (Phila Pa 1976)* 2003;28:E492-5.
18. Weng C, Wang LM, Wang WD, Tan HY. Bipartite atlas with os odontoideum and synovial cyst: Case report and review literature. *Spine (Phila Pa 1976)* 2010;35:E568-75.
19. Xie T, Xiu P, Yang Z, Wang D, Zeng J, Song Y. OLIF combined with anterior fixation for lumbar synovial cysts with instability. *World Neurosurg* 2020;135:76-9.
20. Kim TH, Kim MS, Park ES, Park JB, Kwon SC, Lyo IU, *et al.* Hemorrhagic synovial cyst in the cervical spine: A case report and review of literature. *Nerve* 2017;3:75-7.
21. Cannarsa G, Clark SW, Chalouhi N, Zanaty M, Heller J. Hemorrhagic lumbar synovial cyst: Case report and literature review. *Nagoya J Med Sci* 2015;77:481-92.
22. Sobowale O, Soh C, Herwadkar A, Sellu J, Karabatsou K. Haemorrhagic synovial cyst presenting as thoracic cord compression: A case report and review of the literature. *Br J Neurosurg* 2012;26:120-2.
23. Poullos C, Spiliotopoulos A, Athanasiou A, Koletsa T. A case of lumbar hemorrhagic synovial cyst. *Spine J* 2016;16:e747-e748.
24. Domenicucci M, Ramieri A, Marruzzo D, Missori P, Miscusi M, Tarantino R, *et al.* Lumbar ganglion cyst: Nosology, surgical management and proposal of a new classification based on 34 personal cases and literature review. *World J Orthop* 2017;8:697-704.
25. Lee DY, Park YJ, Kim KT, Lee JH, Kim DH. Acute lumbosacral hemorrhagic ganglion cyst after transforaminal epidural steroid injection. *Acta Orthop Traumatol Turc* 2018;52:475-9.
26. Machino M, Yukawa Y, Ito K, Kanbara S, Kato F. Spontaneous hemorrhage in an upper lumbar synovial cyst causing subacute cauda equina syndrome. *Orthopedics* 2012;35:e1457-60.
27. Kim HS, Kim SW. Hemorrhagic lumbar synovial cyst after microscopic discectomy. *Korean J Spine* 2017;14:93-5.
28. Mattei TA, Goulart CR, McCall TD. Pathophysiology of regression of synovial cysts of the lumbar spine: The 'anti-inflammatory hypothesis'. *Med Hypotheses* 2012;79:813-8.
29. Chiarella V, Ramieri A, Giugliano M, Domenicucci M. Rapid spontaneous resolution of lumbar ganglion cysts: A case report. *World J Orthop* 2020;11:68-75.
30. Boody BS, Savage JW. Evaluation and treatment of lumbar facet cysts. *J Am Acad Orthop Surg* 2016;24:829-42.
31. Lyons MK, Atkinson JL, Wharen RE, Deen HG, Zimmerman RS, Lemens SM. Surgical evaluation and management of lumbar synovial cysts: The mayo clinic experience. *J Neurosurg* 2000;93:53-7.