

Technical notes &amp; surgical techniques

## A proposal of degenerative anterior epidural cysts of the lumbar spine<sup>☆,☆☆</sup>

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## ABSTRACT

Anterior, benign epidural cysts are a rarely described cause of non discal lumbar radiculopathy. The differentiation between synovial, ganglion, fibrous annulus, posterior longitudinal ligament and disc cysts reflects the fragmentary nature of reports so far and it's probably misleading. A case of ventral L5-S1 synovial cyst is reported and the literature is reviewed. It is proposed that these lesions be all grouped together as anterior epidural degenerative cysts of the lumbar spine on the ground of shared clinical and MRI features and management options along with a common pathogenesis (response to degenerative spinal changes) and histological substrate.

### 1. Introduction

Anterior epidural cysts are among the least common etiology for lumbar radiculopathy [1,2] with only scattered reports. Given their rarity, the classification is still fragmentary and reflects histological (nature of lining tissue) and topographical (relation to intervertebral disc, posterior longitudinal ligament-PLL-) features. Hence, the kaleidoscopic terminology of synovial (“ventral” or “ectopic”), ganglion, PLL, fibrous annulus and disc cysts. Nevertheless, in analogy to the more extensively described facet cysts, it can be proposed that anterior degenerative cysts be considered a homogeneous entity since they present ubiquitous clinical/imaging findings and treatment's indications along with a similar pathogenesis (response to mechanical sollicitation) and a presumably common histological substrate [3,4].

### 2. Case report

46-year-old male with right S1 radiculopathy refractory to conservative measures. MRI displayed a right ventral-lateral L5-S1 cystic lesion (12 mm Ø) displacing the S1 root. The lesion was slightly hypointense on T1W and hyper-intense on T2W with rim enhancement after gadolinium. Neither spondylolisthesis nor arthropathy and only minimal disc degeneration were found (Fig. 1). At surgery (right L5-S1 interlaminar approach) a cystic lesion with brownish fluid content displacing the S1 root was removed en bloc. An additional microdiscectomy was performed as the cyst seemingly rooted in the disc

space (Fig. 2). Histology revealed a cystic formation with fibrotic wall and associated lymphoplasmacytic inflammation with foamy histiocytes. A synovial lining was focally present (Fig. 3).

### 3. Discussion

Lumbar facet cysts (i.e. posterior-lateral) are widely reported. The traditional distinction between “true” (synovial) and “pseudo” (ganglion and yellow ligament) cysts based on presence/absence of synovial lining and the spatial relation to posterior spinal elements has been overcome as it eventually portends no clinical implications [5–7]. An estimate of 6.5% prevalence (54% symptomatic) has been recently indicated from MRI studies [8]. Association with increasing age (6th decade onward), advanced degenerative spine disease and segmental instability (joint osteoarthritis and spondylolisthesis) are a hallmark supporting the theory that such lesions develop in response to chronic mechanical burden [9]. Surgery involves a combination of cyst excision, decompression and fusion. Enty of canal impingement, degree of listhesis and extent of facetectomy are suggested criteria to drive management options [5,10].

To a significant extent, anteriorly located degenerative cysts of the lumbar spine might be considered a less common counterpart of facet lesions with most of reports being limited to single cases or small series. Due to this scarcity, the terminology ascribed to ventral epidural cysts still reflects histological criteria (presence or lack of epithelial lining) and the relation to anterior vertebral elements, in particular a

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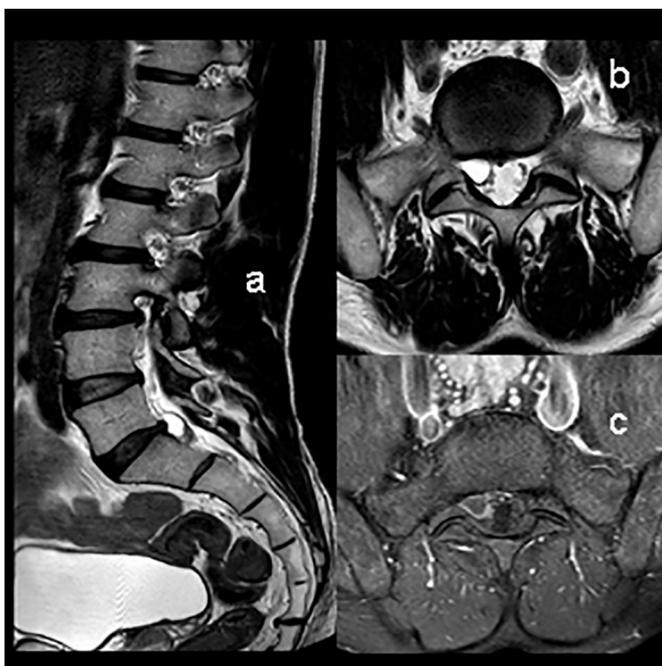


Fig. 1. T2W sagittal and axial (a,b) and post-contrast T1W (c) MRI.

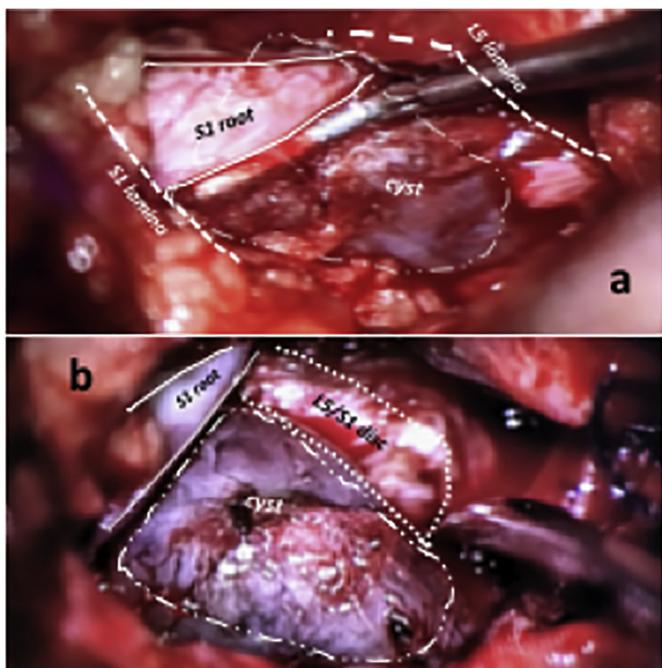


Fig. 2. Intraoperative views. (a) Cyst displacing and tapering the right S1 root (\*). (b) the lesion is freed of adhesions and dissected “en bloc”.

communication with the intervertebral disc as demonstrated by discography/CT-discography or inferred either from MRI or intra-operatively. Hence, the variegated terms of *synovial* (“ventral” or “ectopic”), *ganglion*, *posterior longitudinal ligament*, *fibrous annulus* and *disc* cysts. According to this division, our case would make for a disc cyst (in light of assumed communication with disc space) but the synovial layer would preclude this depiction. Nevertheless, it can be reasonably observed how such lesions are widely overlapping entities [3]. The so called *disc* cysts received a better characterization in literature: fluid containing lesions without synovial lining in communication with disc space (as proved by discography); associated with radiculopathy,

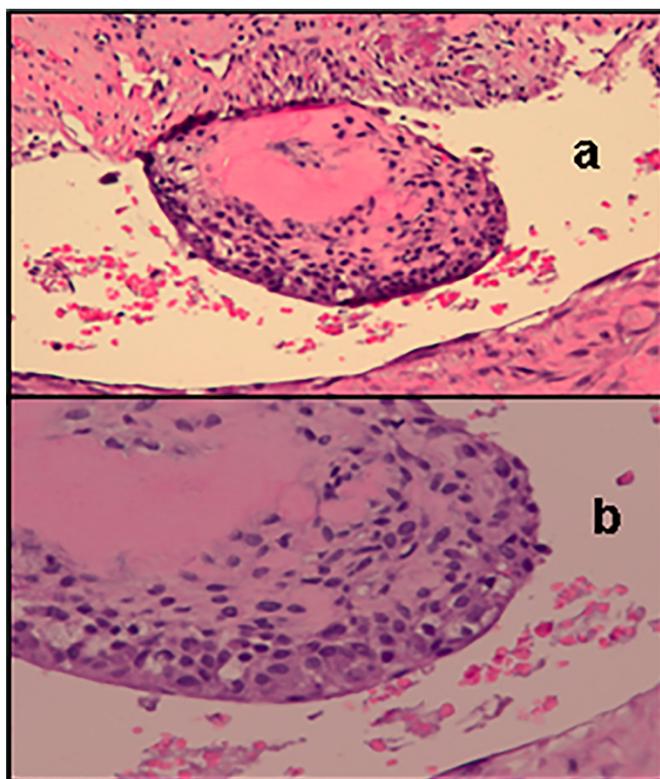


Fig. 3. Histological sections. HE, 200× (a), 400× (b). Focal synovial lining admixed with foamy macrophages.

younger age and lesser degree of spinal degeneration [11–13]. Conversely, there are only scattered reports on ventral synovial/ganglion cysts [1–3,14–17]. Table 1 is a synopsis of reported cases of anterior cysts. One could question whether a distinction is really worthy or rather to treat such lesions as a whole since they offer striking similarities. Younger age of occurrence (2nd decade onward), male prevalence and involvement of upper lumbar levels are a common denominator comparing to facet cysts. The MRI appearance is roughly unvarying: low T1W and high, fluid-like T2W signal with a peripheral low-signal ring can help differentiation from migrated disc fragments. An increase in T1 signal may relate to old hemorrhage. Contrast administration results in rim enhancement. Spinal degeneration is limited and segmental instability absent [11,12,18,19]. The use of discography or CT-discography, once advocated as a diagnostic criterion for disc cysts [13,20] has lost popularity overtime [3,11,12,21]. Since no particular advantage can be seen in differentiating disc-originated from other degenerative cysts, the performance of discography should be limited [3,22]. Differential diagnosis includes perineural and arachnoid cyst, “organized” hematoma, post-operative pseudo-cyst, extruded disc fragment, cystic schwannoma, dermoid, abscess, epidural varix and malignancy [3,15,16,18,23]. Often indistinguishable on MRI (unless flow void signal is present), epidural varices may rarely herald a condition of inferior vena cava obstruction requiring additional vascular imaging [24,25]. Several propositions have been put forward to explain the occurrence of ventral degenerative cysts in the lumbar column: a theory of “migration” calls for a cyst originating from posterior elements (like facet-derived type) but gradually losing its connection with joint and migrating inside the canal (driven by gravity and spinal motion or following the course of spinal nerve) [26,27]. An origin from “organized” epidural bleeding [28] or disc fragment resorption has been also cited [20,29,30]. More assumedly, such lesions (like their facet counterpart) represent a response to mechanical stress (although of a lesser intensity) at the level of intervertebral disc or other spinal elements outside from joints [11,31]. In this setting, some authors [4]

**Table 1**  
overview of reported cases of anterior degenerative cysts.

Author	Age/sex	Imaging	Treatment	Cyst description
Barea et al. [1]	22 M	MRI (L5-S1 lythesis)	Conservative	PLL ganglion
Kono et al. [43]	25F	MRI + discography	Open excision + discectomy	L3-L4 discal
	2M	MRI + CT discography	Open excision	L4-L5 discal
Le Breton et al. [15]	35 M	MRI	Open excision + discectomy	L4-L5 PLL ganglion
Chiba et al. [13]	19 M	Discography + CT discography + MRI	Open excision + discectomy (2 cases)	L2-L3 discal
	20 M			L2-L3 discal
	23 M			L3-L4 discal
	38 M			L3-L4 discal
	27 M			L4-L5 discal
	38 M			L4-L5 discal
	44 M			L4-L5 discal
	46 M			L4-L5 discal
Demaerel et al. [33]	44 M	MRI	Conservative (spontaneous regression)	L1-L2 discal
Eerens et al. [18]	79 M	MRI	Open excision	L4-L5 discal
Coscia et al. [44]	30 M	MRI	Open excision	L5-S1 discal
	19 M			L4-L5 discal
Jeong et al. [20]	35 M	MRI + CT discography	Open excision + discectomy	L4-L5 discal
Koga et al. [41]	37 M	MRI + CT discography	CT-guided aspiration (stable residual)	L5-S1 discal
Marshman et al. [3]	30 M	MRI	Open excision + discectomy	L3-L4 PLL ganglion
	38 M		Open excision	L5-S1 PLL ganglion
	36 M		Open excision	L4-L5 discal
Ishii et al. [45]	29 M	MRI + CT-discography	Endoscopic excision	L4-L5 discal
Lee et al. [19]	69 M	MRI	Open excision + discectomy	L1-L2 discal
	29 M		(one recurrence)	L2-L3 discal
	54 M			L2-L3 discal
	18F			L3-L4 discal
	19 M			L4-L5 discal
	21 M			L4-L5 discal
	28F			L4-L5 discal
	30 M			L4-L5 discal
	34 M			L5-S1 discal
Tokunaga et al. [46]	38 M	MRI + CT discography	Open excision	L3-L4 discal
	13 M		Open excision + discectomy	L4-L5 discal
Kishen et al. [47]	13F	MRI	Open excision + discectomy	L5-S1 discal
Norman et al. [42]	43F	MRI + CT discography	CT-guided aspiration	L4-L5 discal
Chou et al. [32]	35 M	MRI	Conservative (spontaneous regression)	L5-S1 discal
Nabeta et al. [48]	27 M	MRI + CT discography	Open excision + discectomy (4 cases)	L4-L5 discal
	30 M			L5-S1 discal
	38 M			L4-L5 discal
	38 M			L4-L5 discal
	25 M			L3-L4 discal
Okada et al. [49]	29 M	MRI + discography	Open excision	L5-S1 discal
Murata et al. [50]	40 M	MRI + CT discography	Open excision	L3-L4 discal
Kanoke et al. [51]	33 M	MRI	Open excision	L4-L5 discal
Kang et al. [40]	41 M	MRI	CT-guided aspiration	L3-L4 discal
	34 M		(one recurrence)	L4-L5 discal
	28 M			L4-L5 discal
	27 M			L4-L5 discal
	35 M			L5-S1 discal
	20 M			L4-L5 discal
	36 M			L4-L5 discal
	18 M			L4-L5 discal
Hwang et al. [52]	30 M	MRI	Open excision	L5-S1 discal
Marushima et al. [53]	25 M	MRI	Open excision	L4-L5 discal
Mizutamari et al. [16]	17 M	MRI	Open excision	L4-L5 PLL ganglion
Kim et al. [54]	27 M	MRI	Endoscopic YAG laser assisted excision	L5-S1 discal
Dumay-Levesque [55]	35 M	MRI + discography	Steroid injection under fluoroscopy	L3-L4 discal
Kim et al. [56]	28 M	MRI	Endoscopic trans-foraminal excision	L5-S1 discal
	27 M			L4-L5 discal
Kim et al. [57]	70 M	MRI + intraoperative discography	Open excision (CO2 laser assisted) + removal of extruded disc fragments	L3-L4 discal
	14F		(one additional CT-guided aspiration for residual cyst)	L5-S1 discal
	52 M			L4-L5 discal
	19 M			L4-L5 discal
	32 M			L4-L5 discal
	24 M			L5-S1 discal
	21 M			L1-L2 discal
	35 M			L4-L5 discal
	56 M			L5-S1 discal
	27F			L4-L5 discal
	33F			L3-L4 discal
	56 M			L5-S1 discal
	38 M			L3-L4 discal
	20 M			L4-L5 discal

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Table 1 (continued)

Author	Age/sex	Imaging	Treatment	Cyst description
Cho et al. [2]	35 M	MRI	Open excision + discectomy	L3-L4 PLL ganglion
	36 M	MRI	Open excision	L3-L4 PLL ganglion
Kobayashi et al. [30]	33 M	MRI + CT-discography	Open excision + discectomy	L3-L4 discal
	28 M			L3-L4 discal
Aydin et al. [11]	54F	MRI	Open excision + discectomy	L5-S1 discal
	35 M			L5-S1 discal
	38 M			L1-L2 discal
	64F			L3-L4 discal
	37 M			L5-S1 discal
Dasenbrock et al. [58]	37 M	MRI + discography	CT-guided aspiration	L5-S1 discal
Matsumoto et al. [37]	26 M	MRI	Endoscopic excision + removal of extruded disc fragment (4 cases)	L5-S1 discal
	22 M			L4-L5 discal
	25 M			L4-L5 discal
	29 M			L4-L5 discal
	28 M			L3-L4 discal
	20 M			L5-S1 discal
	26 M			L4-L5 discal
Aydin et al. [59]	67F	MRI	Open excision + discectomy	L3-L4 discal
Hyung-Jun et al. [60]	48F	MRI	Open excision	L3-L4 discal
Takeshima et al. [34]	39 M	MRI	Conservative (spontaneous regression)	L3-L4 discal
Lin et al. [61]	16F	MRI	Open excision + discectomy	L4-L5 discal
Prasad et al. [62]	41F	MRI	Conservative (spontaneous regression)	L4-L5 discal
Shibata et al. [63]	33F	MRI	Open excision	L4-L5 discal
Kim et al. [14]	29 M	MRI	Open excision	L2-L3 ganglion
Ha et al. [36]	19 M	MRI + CT-discography	Percutaneous endoscopic excision + discectomy	L4-L5 discal
	22 M		(fenestration 2 cases)	L5-S1 discal
	21 M		(4 transient radiculopathy)	L4-L5 discal
	25 M		1 persistent radiculopathy)	L4-L5 discal
	20 M			L3-L4 discal
	22 M			L4-L5 discal
	21 M			L3-L4 discal
	35 M			L4-L5 discal
Kim et al. [21]	48 M	MRI	Open excision + discectomy	L3-L4 discal
Lame et al. [28]	32 M	MRI	Open excision	L3-L4 discal
Khalatbari et al. [64]	15 M	MRI	Open excision	L5-S1 discal
Kwon et al. [22]	28 M	MRI + intraoperative discography	Open excision	L3-L4 discal
	47 M			L3-L4 discal
Endo et al. [31]	51 M	MRI + CT discography	CT-guided aspiration	L5-S1 discal
Certo et al. [12]	43 M	MRI	Open excision + discectomy	L3-L4 discal
Kim [35]	74F	MRI	Conservative	L4-L5 discal
Bansil et al. [29]	42 M	MRI	Open excision	L4-L5 discal
Shtaya et al. [17]	57 M	MRI	Open excision	L3-L4 ventral synovial
Mathon et al. [39]	45 M	MRI	Open excision + fusion	L5-S1 discal extraforaminal
Present	46 M	MRI	Open excision + discectomy	L5-S1 synovial

offered an insight to a possible pathological basis: by analyzing 985 specimens from surgeries performed for degenerative spinal disease they identified *synovial metaplasia* in 5.3% of reactive tissue outside facet joints and hypothesized that such metaplasia represents a reactive change to degenerative disorders and could theoretically evolve to cyst formation. In light of this observation, degenerative cyst of the lumbar spine could just represent endpoints on a histological continuum of “synovial-like” lesions expressing a misguided response to mechanical solicitation. The synovial lining itself could degenerate and disappear with growth thus making a histology-based distinction meaningless [3,5,6,17]. The natural history of anterior degenerative cysts is not known and spontaneous regression has been reported [32–34]. A course of conservative measures may be offered to paucisymptomatic patients [35]. Surgery follows the same paradigms as for herniated disc: cyst excision (via open or endoscopic techniques) is the treatment of choice with a near-to-zero rate of recurrence [3,11,12,17,20,36,37]. The addition of microdiscectomy is controversial and probably based on surgeon's perspective of association between the cyst and disc protrusion. Some authors would argue against it as disc removal does not add to the decompression and it is a potential accelerator of disc degeneration [38]. Instrumented fusion is required only in highly selected cases [39]. CT-guided aspiration (w/wo steroid injection) is an alternative but theoretically prone to recurrence since the cyst membrane is left behind [11,31,40–42].

#### 4. Conclusion

Synovial, ganglion and disc cysts of the anterior lumbar column are rarely encountered in clinical practice. The traditional distinction is somewhat arbitrary and they should be regarded to as a homogeneous entity in terms of diagnosis, pathogenesis and implications for treatment. Referring to such lesions as anterior epidural, degenerative cysts of the lumbar spine would help harmonize studies to come.

#### Declaration of interests

None.

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