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CASE REPORT

Delayed lymphocele formation following lateral lumbar interbody fusion of the spine

Hwee Weng Dennis Hey[1] · Keng Lin Wong[1] · Asrafi Rizki Gatam[2] · Joel Louis Lim[1] · Hee-Kit Wong[1]

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Abstract
Purpose This paper aims to describe the rare post-operative complication of a lymphocele formation after lateral lumbar interbody fusion.
Methods The patient in this case was a 76-year-old lady with a 10 year history of low back pain and neurogenic claudication. She had previously underwent multiple spine surgeries for her condition. She presented to our institution for a recurrence of her low back pain and right anterior thigh pain. She then underwent surgery in two stages; first, a mini-open lateral interbody fusion at L3/4 and L4/5; second, posterior instrumentation of T3 to S1 with sagittal spinal deformity correction.
Results The patient recovered uneventfully in the initial post op period and was discharged within 8 days. However, she developed abdominal distension and discomfort 6 months after surgery. MRI and CT scan of her abdomen showed a retroperitoneal fluid collection compressing her left ureter, resulting in hydroureter and hydronephrosis. She was managed with a CT-guided drainage of the fluid collection. Fluid analysis was consistent with a lymphocele. Since the procedure, the patient has been asymptomatic for 2 years.
Conclusions Delayed lymphocele formation is a potential complication of lateral lumbar interbody fusion. When present, it can be managed conservatively with good results. This case suggests that surgeons should have a low threshold to investigate for a lymphocele development post-anterior or lateral lumbar spine surgery. The authors recommend the placement of a post surgical retroperitoneal drain, as it might assist in the early detection of a lymphocele formation.

Keywords Complication · Hydronephrosis · Lymphocele · Lateral lumbar interbody fusion · Revision surgery

✉ Hwee Weng Dennis Hey
dennis_hey@nuhs.edu.sg

Hee-Kit Wong
heekit_wong@nuhs.edu.sg

[1] University Orthopaedics, Hand and Reconstructive Microsurgery (UOHC), National University Health System, 1E Kent Ridge Road, NUHS Tower Block Level 11, Singapore 119228, Singapore

[2] Department of Orthopaedics and Traumatology, Faculty of Medicine, Universitas Indonesia, Ciptomangunkusumo National General Hospital, Jakarta, Indonesia

Introduction

Parallel to the increasing popularity of sagittal profile correction for adult spinal deformity surgery, lateral lumbar interbody fusion is also increasingly performed over the recent years. It confers some advantages over the existing posterior methods of interbody fusion in terms of lordosis correction and lower chance of cage subsidence. This makes it an attractive option in adult spinal deformity surgery.

There are multiple ways of performing this procedure. It can be approached from a direct lateral incision or an oblique incision and can be done either via an open or a minimally invasive approach. Just like any other surgical procedures, complications can occur based on the choice of approach. Particularly for the lateral approach, the development of a lymphocele is extremely rare. Nevertheless, it is theoretically possible and poses as both a diagnostic as well as a therapeutic challenge to the attending surgeon.

We present a case of lymphocele formation diagnosed 6 months following lateral lumbar interbody fusion that

was treated conservatively with good results. We hope to highlight some of the pertinent features of this condition and add on to the sparse existing literature involving this condition.

Materials and method

History

A 76-year-old lady presented with low back pain with a progressive hunch of her back for 10 years. These symptoms worsened over the past 2 years and were associated with neurogenic claudication felt over both buttocks and lower limbs. She had multiple previous surgeries performed for her spine prior to this visit.

Her index surgery was decompression laminectomy and instrumented posterolateral fusion from L2 to L5 in 2008 for her condition of spinal stenosis and spondylolisthesis at L4/5 and L5/S1. This was complicated by proximal junctional L1 fracture within a year of the index surgery for which a second operation involving extension of posterior instrumentation up to T10 was performed. She then developed pseudoarthrosis of the L3/4 and L4/5 levels with loosening of L4 and L5 screws bilaterally. A third operation was performed to remove these screws in 2012 when her symptoms of low back pain worsened significantly which at that time was attributed to screw loosening. This gave her transient relief of her symptoms which recurred 1 year later.

Subsequently, she presented to our institution with symptoms of severe low back pain and right anterior thigh pain. She was unable to ambulate beyond 20 m due to her pain. She did not experience any weakness, loss of sensation, or change in urinary and bowl habits. Her low back pain did not improve despite regular analgesics and a full course of physiotherapy for 4 months.

Physical examination

Physical examination showed a hunched posture with the limitation of range of motion of the entire spine. Neurological examination of her lower limbs was unremarkable and she had normal lower limb reflexes. Her gait was also normal. EOS® X-rays (EOS imaging, Paris, France) of the spine showed a Sagittal Vertical Axis (SVA) of +13 cm, pelvic incidence (PI) of 70°, lumbar lordosis (LL) of 16°, and a pelvic tilt (PT) of 44°. Her X-ray images are shown in Fig. 1a and b. In view of her condition, she was scheduled for a two-stage surgery spaced 1 week apart. Pre-operative computed tomography (CT) scan of the spine was performed and shown in Fig. 2a and b.

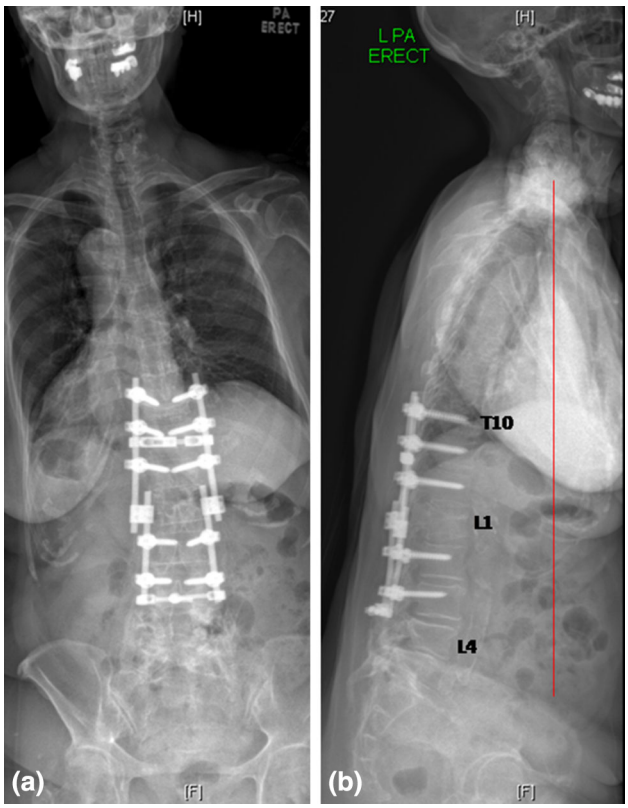

Fig. 1 Erect whole spine radiographs using EOS technology. EOS® X-rays (EOS imaging, Paris, France) of the spine showed a Sagittal Vertical Axis (SVA) of +13 cm, pelvic incidence (PI) of 70°, lumbar lordosis (LL) of 16°, and a pelvic tilt (PT) of 44°

Operations

Significant issues that would pose as operative concerns were listed below.

1. Previous posterolateral fusion mass at the lumbar spine with pseudoarthrosis at L3/4 and L4/5 levels.
2. Existing spinal deformity with flat back of the lumbar spine and spondylolisthesis at L4/5 and L5/S1.
3. T10 fracture with proximal pedicle screws at T10 cut-out into the T9/10 disc associated with proximal junctional kyphosis.
4. Previous screw holes in L4 and L5 pedicles which may compromise fixation.

The first stage of her surgery comprised of a mini-open lateral interbody fusion at L3/4 and L4/5 levels. No drain was placed in the retroperitoneal space after the first-stage surgery. She then underwent the second stage comprising of posterior instrumentation of T3 to S1 with sagittal spinal deformity correction which was performed 1 week later. The previous instrument in the patient was selectively removed, and in-line connectors were used to extend the construct both proximally and distally.

Fig. 2 Pre-operative computed tomography (CT) scan of the spine as shown above. **a** T10 fracture and screw cut-out. **b** Posterolateral fusion mass

Results

A post-operative EOS X-ray showed good sagittal balance with an SVA of +3.5 cm, a PI of 70°, an LL of 37°, and a PT of 48°. Her post-operative images are shown in Fig. 3a and b. The patient was discharged well from the hospital after 8 days following the second-stage operation.

However, 6 months post-operatively, she developed abdominal distension and discomfort. Magnetic resonance imaging (MRI) showed a retroperitoneal fluid collection measuring 6 by 5 cm causing obstruction of the left ureter leading to the left hydroureter and hydronephrosis (see Fig. 4). In view of the patient's symptoms, a DJ stent was inserted to relieve the distension of the left upper urinary system and a CT-guided aspiration of the fluid is performed. 60 mL of clear fluid was aspirated and sent for the analysis which showed fluid creatinine level of 70.5 μmol/L. This was significantly lower than her serum creatinine levels of 95 μmol/L. The fluid urea level was also negligible, which was measured at less than 12.5 mmol/L, consistent with a lymphocele formation. Fluid cultures were negative.

After the drainage of the lymphocele, there was resolution of the abdominal symptoms. She is currently 2 years post surgery and remained asymptomatic.

Her pre-operative Owestry Disability Index (ODI) score was 74, which improved to 6 at 1 year post surgery. Her Visual Analog Scale (VAS) pain score improved from 90 pre-operatively to 0 after 1 year following surgery. Her

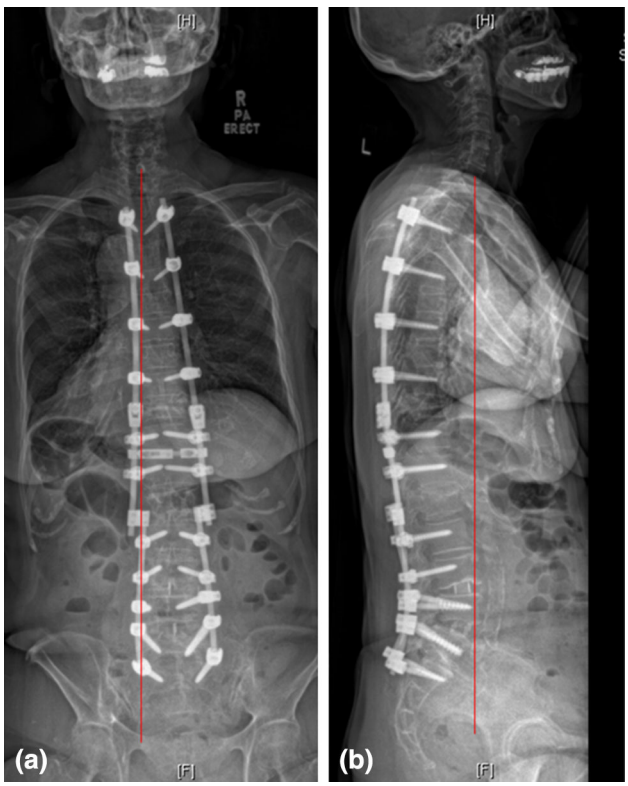

Fig. 3 Post-operative erect whole spine radiographs using EOS technology. Post-operative EOS X-ray showed good sagittal balance with an SVA of +3.5 cm, a PI of 70°, an LL of 37°, and a PT of 48°

Short Form 36 (SF-36) scores were 27.72 for the physical component score and 41.4 for the mental component score before surgery. These scores improved to 52.3 for the

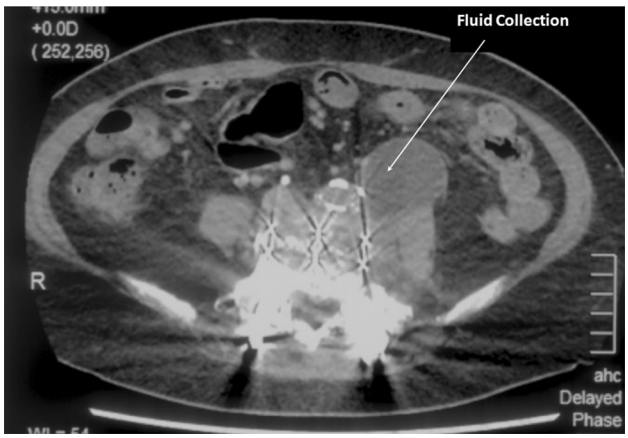

Fig. 4 MRI scan of the abdomen showed a retroperitoneal fluid collection measuring 6 by 5 cm causing obstruction of the left ureter leading to the left hydroureter and hydronephrosis

physical component score and 56.8 for the mental component score at 1 year post surgery.

Discussion

The human lymphatic system consists of countless vessels that start at a cellular level in the body and eventually drain into lymphatic trunks [1]. These lymphatic trunks run parallel to veins and coalesce to form larger channels before draining into the venous system. In the abdomen, lymph is collected in a retroperitoneal sac called the cistern chyli before progressing into the thoracic duct and eventually drained into the subclavian vein [2].

Lymphatic injury after spine surgery is an uncommon complication and occurs in only 3 out of 1000 procedures [3]. Symptomatic lymphatic injury in the form of lymphocele formation leading to pressure effects on surrounding organs can occur particularly in the upper chest wall, groin, and pelvis. This uncommon condition is usually reported in the cases of renal transplant or major gynaecological procedures [4, 5]. Abdominal retroperitoneal lymphocele formation after lateral spine surgery is an exceedingly rare condition with only few reports on the condition exists in modern literature [1, 6–12]. This case is particularly special, because the clinical presentation was delayed and diagnosed only 6 months after the spine surgery. It highlights the possibility of late presentation for this approach related complication.

With recent evidence emphasizing on restoring sagittal spinal balance and lumbosacral parameters as determinants of good patient reported outcomes [13], many surgeons strived to give the lumbar spine greater lordosis than what was deemed non-critical in the past [14]. Strategies to do so include the use of posterior column subtraction techniques (Smith–Peterson Osteotomy [15], pedicle subtraction osteotomy [16]) or anterior releases [17], and placement of larger and more reliable strut cages [18]. This lends to the rekindled interest in anterior surgery over the past few years [19]. Particularly, for lateral cages that span across the apophysis ring of the vertebral column, multiple biomechanical and clinical studies have demonstrated its long-term advantages over posteriorly inserted intervertebral cages in terms of less subsidence with time [20, 21].

Scarcity in the incidence of lymphatic injury in anterior and lateral spine surgery is hypothesized due to the low pressure within these lymphatic channels. This reduces the ability for lymph to accumulate substantially and promotes faster healing of these channels from the injury [22]. Some studies have also proposed that pre-operative fasting may contribute to a faster healing process due to the lack of gastrointestinal reabsorption [2]. However, these characteristics of lymphatic vessels also lead to a challenge from a technical standpoint. As lymphatic vessels are not visible to the naked eye, to avoid injury to these delicate structures is technically impossible and literally unpredictable.

Lymphocele development in this case is suspected to be caused by dissection around the aorta or iliac artery that results in the disruption of lymphatic vessels, leakage of lymph, and reduction in its drainage [7, 9]. The delay in the diagnosis of lymphocele could be attributable to the fact that lymphatic flow can be as slow as 1 ml/min, which in turn will take time to become symptomatic [7]. Moreover, the symptoms resulting from lymphocele formation are non-specific and may be masked by the expected post-operative symptoms. Given that no intraoperative or immediate post-operative suspicion of lymphatic injury was present, the only possible diagnostic clue imaginable could be if a retroperitoneal drain was placed after the first-stage operation. As such, the authors recommend placement of a retroperitoneal drain after anterior or lateral surgery to enable early diagnosis.

To diagnose a retroperitoneal lymphocele, several differential diagnoses should be considered. They include urine collection secondary to ureteric injury, significant cicatrix development, cerebrospinal fluid leak with accumulation, and hematoma formation [7, 9, 23]. The current gold standard in diagnosing a lymphocele involves conventional contrast lymphangiography. However, this procedure is technically challenging and has a considerable risk of complications, such as skin necrosis, infection, and pulmonary embolism [7]. Our patients underwent MRI scan as an alternative diagnostic tool, instead, as it was deemed to be safe and also effective. Demonstration of negative attenuation of the collection due to fat within the fluid conforms to the classic description of a lymphocele collection [9]. Moreover, fluid that was aspirated demonstrated a negligible urea count with lower fluid creatinine

levels as compared to serum levels [12]. All these affirms the diagnosis of a lymphocele formation.

Due to its rare occurrence, hardly any literature gives strong recommendations in the treatment of post-operative symptomatic retroperitoneal lymphocele. The goals of treatment in lymphatic injury are to slow the production of chyle, remove excessive accumulated chyle, and prevent secondary complications, such as renal, pulmonary or vascular compromise due to pressure effects [24]. First-line treatment is conservative, consisting of bed rest, initiation of low fat diet to decrease chylomicron production which will reduce lymph flow [2, 24, 25]. However, when a debilitating secondary complication, such as hydronephrosis occurs, more invasive procedures may be required. Simple percutaneous aspiration is relatively safe, but has high recurrence rate as high as 50–80 %. Using a similar concept, a closed simple percutaneous drainage system can also be established but carries a risk of infection with recurrence rate up to 40–50 %.

In a specific higher risk group of patients, such as those with renal transplantation, the complication rate for lymphocele formation is approximately 3 %. One of the most well-documented strategies is to aspirate the fluid and immediately followed by the application of sclerosing agent, such as doxycycline, povidone iodine, tetracycline, ethanol, and fibrin glue [25]. It is hypothesized that these agents release free radicals that incite inflammatory mediators within the lymph vessel wall [26]. Occasionally, a complex surgical procedure which involves a peritoneal window procedure for the drainage of lymph into the peritoneal cavity may be attempted. This procedure may prevent recurrence and lead to the resolution of lymph drainage [27]. According to Hussain et al., choices of lymphocele management depend on patient symptoms, neurologic issue, and the amount of fluid. They proposed an algorithm for managing lymphocele post-anterior spine surgery [8].

Conclusion

Lymphocele formation post retroperitoneal lumbar surgery is technically unpreventable and literally unpredictable. It can also occur as a form of delayed complication at 6 months after the spine surgery. A high index of suspicion and a low threshold to investigate for this complication is warranted. The authors recommend the placement of a post surgical retroperitoneal drain, as it might assist in the detection of any possible lymphocele formation.

Compliance with ethical standards

Conflict of interest None.

References

1. Upadhyaya CDPP, La Marc F (2007) Chyloretroperitoneum following anterior spinal deformity correction. J Neurosurg Spine 7:562–565
2. Patel AASW, Daubs MD, Brodke DS, Cheng I, Glasgow RE (2008) Retroperitoneal lymphocele after anterior spinal surgery. Spine 33(18):E648–E652
3. Propst-Proctor SLRL, Bleck EE (1983) The cisterna chyli in orthopaedic surgery. Spine 11:787–792
4. Dodd G, Rutledge F, Wallace S (1970) Postoperative pelvic lymphocysts. AJR 108(2):312–323
5. Zletek Z, Sulikowski T, Tejchman K, Slenko J, Janeczek M, Iwan-Zietek I et al (2007) Lymphocele after kidney transplantation. Transpl Proc 39:2744–2747
6. Bailey SHMM, Holman JM, Nelson EW (2003) Laparoscopic treatment of post renal transplant lymphoceles. Surg Endosc 17:1896–1899
7. Hanson DMS (1998) Lymphatic drainage after lumbar surgery. Spine 22(8):956–958
8. Hussain NSHD, Oskouian RJ (2012) Chyloretroperitoneum following anterior spinal surgery. J Neurosurg Spine 17:415–421
9. Jagannathan JAT, Baweja H, Kleiner DE, Peeler B (2008) Evaluation and management of abdominal lymphoceles after anterior lumbar spine surgery. Spine 33(22):E852–E857
10. Levi AD (1999) Treatment of a retroperitoneal lymphocele after lumbar fusion surgery with intralesional povidone iodine: technical case report. Neurosurgery 45(3):658–660 **(discussion 660–1)**
11. Pee YH, Kim KJ, Choi YG, Jeon SH, Park JD, Lee SH (2007) Lymphocele formation after anterior lumbar interbody fusion at L4–5. Case report. J Neurosurg Spine 7(5):566–570
12. Wagner WH, Regan JJ, Leary SP, Lanman TH, Johnson JP, Rao RK, Cossman DV (2006) Access strategies for revision or explantation of the Charité lumbar artificial disc replacement. J Vasc Surg 44(6):1266–1272
13. Videbaek T, Bunger C, Henriksen M, Egund N, Christensen F (2011) Saggital spinal balance after lumbar spinal fusion. Spine 36(3):183–191
14. Kumar M, Baklanov A, Chopin D (2001) Correlation between sagittal plane changes and adjacent segment degeneration following lumbar spine fusion. Eur Spine J 10:314–319
15. Gill B, Levin A, Burd T, Longley M (2008) Corrective osteoromies in spine surgery. J Bone Joint Surg 90(11):2509–2520
16. Ridwell K, Lewis S, Lenke L, Baldus C, Blenke K (2003) Pedicle substraction osteotomy for the treatment of fixed sagittal imbalance. J Bone Joint Surg 85(3):454–463
17. Uribe J, Smith D, Dakwar E, Baaj A, Mundis G, Turner A (2012) Lordosis restoration after anterior longitudinal ligament release and placement of lateral hyperlordotic interbody cages during the minimally invasive lateral transpsoas approach: a radiographic study in cadavers laboratory investigation. J Neurosurg Spine 17:476–485
18. Lee M, Walter B, Bransford R, Bellabarba C, Chapman J (2010) Lordosis restoration after Smith–Petersen osteotomies and interbody strut placement: a radiographic study in cadavers. Spine 35(25):1487–1491
19. Gumbs A, Shah R, Yue J, Sumpio B (2005) The open anterior paramedian retroperitoneal approach for spine procedures. Arch Surg 140:339–343
20. Nayak A, Guiterrez S, Billys J, Santoni B, Castellvi A (2013) Biomechanics of lateral plate and pedicle screw constructs in lumbar spines instrumented at two levels with laterally placed interbody cages. Spine J 13:1331–1338

21. Wang T, Ball J, Pelletier M, Walsh W (2014) Biomechanical evaluation of a biomimetic spinal construct. J exp Orthop 13:1–8
22. White M, Mueller P, Ferucci J, Butch R, Simeone J (1985) Percutaneous drainage of postoperative abdominal and pelvic lymphoceles. AJR 145:1065–1069
23. Sato RKS, Uchida K, Yokoyama O, Baba H (2005) Retroperitoneal lymphocele associated with lumbar spine fracture: report of an unusual case. Spinal Cord 43:687–690
24. DeHart MMLW, Conely AH, Roettger RH, West JL, Cain JE (1994) Management of retroperitoneal chylous leakage. Spine 19(6):716–718
25. Schizas C, Foko'o N, Matter M, Romy S, Munting E (2009) Lymphocoele: a rare and little known complication of anterior lumbar surgery. Eur Spine J 18(2):228–231
26. Montalvo BMYJ, Casilas VJ (1996) Percutaneous sclerotherapyof lymphocele related to renal transplant. J Vasc Interv Radiol 7:117–123
27. Hamza AFK, Koch E (2006) Diagnostics and therapy of lymphoceles after kidney transplantation. Transplant Proc 38:701–706