doi: https://doi.org/10.5704/MOJ.2607.017

Retained Drain Tube Entangled with the Cross-link Removed via Minimally Invasive Tubular Microscopic Technique: A Case Report

Iwamae M[1,2], MD, **Lee SY**[1], MBBS, **Chiu CK**[1], MS Orth, **Chan CYW**[1], MS Orth, **Kwan MK**[2], MS Orth

[1]Department of Orthopaedic Surgery, National Orthopaedic Centre of Excellence for Research and Learning (NOCERAL), Universiti Malaya, Kuala Lumpur, Malaysia
[2]Department of Orthopaedic Surgery, Osaka Metropolitan University Graduate School of Medicine, Osaka, Japan

Date of submission: 01st July 2025
Date of acceptance: 28th January 2026

ABSTRACT

A 24-year-old female with high-grade dysplastic spondylolisthesis, underwent posterior decompression, L4 to S2-ilium instrumentation, and in situ fusion with two fibular strut grafts. Subfascial closed suction drains were placed to prevent hematoma formation. On post-operative Day 2, the drain tube snapped during removal, leaving a retained portion in the wound. Removal of the retained drain tube was performed using a minimally invasive tubular microscopic technique. The drain tube was found to be entangled with the cross-link. This case highlights the possible entrapment of deep fascial drain over the cross-link and feasibility of removal using a minimally invasive technique.

Keywords:
spinal fusion surgery, retained drain tube, cross-link, high-grade, dysplastic spondylolisthesis

INTRODUCTION

In spinal surgery, it is a common practice to place a closed negative suction drain underneath the deep fascia to prevent post-operative neurological complications caused by epidural hematomas. However, the absolute necessity of using a surgical drain remains inconclusive[1]. Besides, unintended suturing of the surgical drain during wound closure could be disastrous, potentially complicating drain removal[2].

In this case, two deep fascial drains were placed. However, during the post-operative removal, one of the drain tubes was found entangled with the cross-link, leading to breakage of the drain tube, requiring re-operation for removal of the retained portion of the drain. The patient was informed that data concerning the case would be submitted for publication, and she provided consent.

CASE REPORT

This was a case of a 24-year-old female, diagnosed with a high-grade L5/S1 dysplastic spondylolisthesis (Meyerding classification grade Ⅳ). She suffered from radicular pain and cauda equina syndrome, motor weakness, intermittent claudication after 30 minutes of walking, and urinary incontinence. Her radiographs showed high-grade spondylolisthesis of L5/S1 with dysplastic features of dome-shaped sacral promontory and anterior slippage of L5 vertebra on S1 upper endplate. The pre-operative slip angle was 78°. A T2-weighted magnetic resonance image (MRI) revealed severe compression of the dural sac and nerve roots at L5/S1 levels (Fig. 1).

She underwent posterior decompression and instrumented in situ fusion of L4 to S2-ilium with two fibular strut grafts. The decompression was performed from L5 to S2 levels, followed by screw placements from L4 to S2-ilium levels. In the cases of high-grade dysplastic spondylolisthesis, overcorrection of spondylolisthesis was reported to have a high incidence of neurological deficits due to the traction of L5 nerve root[3]. Therefore, in situ spinal fusion was performed to avoid neurological deficits. To prevent pseudoarthrosis, fibular strut grafts were harvested to be used to augment the interbody fusion at the L5/S1 level. Under fluoroscopic guidance, a guidewire was inserted from the entry point between the S1 nerve root and dura mater toward the L5 vertebral body, passing through the L5/S1 disc. A 9mm diameter bone tunnel was created with the guidewire, and the fibula bone graft was trimmed to a 9mm

Corresponding Author: Mun Keong Kwan, Department of Orthopaedic Surgery, National Orthopaedic Centre of Excellence for Research and Learning (NOCERAL), Faculty of Medicine, Universiti Malaya, Kuala Lumpur, Malaysia
Email: munkeong42@hotmail.com

Table I: Step-wise checklist to prevent drain-related complications.

Precautions	Descriptions
Drain Placement	Avoid positioning the drain over or adjacent to cross-links or hardware junctions, which can entrap the drain.
Fascia Closure Check	Withdraw the drain by approximately 2-3cm after deep fascia closure to ensure it is not sutured.
Team Communication	Maintain clear and explicit communication between the surgeon and assistant during wound closure.
Drain Tip Documentation and Handling	Document the drain position and the length of the remaining perforated drain tip intra-operatively, especially if the perforated portion of the drain is shortened or cut before insertion. Keep the cut end of the perforated drain tip for reference, if required, after drain removal. When shortening the perforated portion of the drain, avoid cutting through the drain holes and instead cut the drain in an oblique fashion.
Resistance Handling	If resistance is encountered during drain removal, gently rotate the drain several times before applying further traction.

diameter prior to insertion. Two 5.5mm titanium rods were placed following the in-situ fusion. Two cross-links were secured between the two rods.

The operation was uneventful. Two closed suction surgical drains were inserted before closure to prevent post-operative epidural hematoma formation. Following the deep fascia closure, drain tubes were routinely pulled out approximately 2cm to 3cm to ensure that they were not entrapped by the sutures. Post-operatively, the slip angle improved from 78° to 35°. The operative time was 409 mins, and the intra-operative blood loss was 1092mL. This patient did not require any blood transfusion intra-operatively and post-operatively. The Hb drift was 1.7g/dL. There was no neurological deficit post-operatively.

The patient recovered well post-operatively. The left-sided surgical drain was removed on post-operative Day 1 without any issue. On post-operative Day 2, while attempting the removal of right-sided surgical drain, the drain tube snapped after pulling out approximately 5cm. A computed tomography (CT) scan was then performed which confirmed the retained drain tube. Post-operative radiographic and CT images obtained following posterior decompression and instrumented in situ fusion are presented in Fig. 2a and 2b. These imaging revealed a retained surgical drain tube in situ, with the tip found entrapped on right side of the cross-link junction (Fig. 2c).

The patient was counselled for removal of the retained surgical drain tube via minimally invasive surgery. Three days following the initial surgery, the patient underwent re-operation. Intra-operatively, the position of the drain tube entangled by cross-link junction was confirmed using fluoroscopy. A tubular retractor (14mm diameter) was inserted (Fig. 3a). The entrapped drain was identified over the right side of the cross-link junction (Fig. 3b and 3c). The entangled drain tube was disengaged from the cross-link junction and removed in a complete piece using the pituitary forceps (Fig. 3d). The post-operative antibiotics regimen consisted of three doses of intravenous cefuroxime 1.5g following both the index and second surgeries.

DISCUSSION

Although the use of drains in spinal surgery is routine to prevent post-operative neurological complications caused by epidural hematomas, the overall effectiveness remains inconclusive. Previous reports suggest that surgical drains may cause pain, excessive blood loss, and hinder mobilisation, raising doubts about their value[1,4]. To date, reports of retained drains in spine surgery are limited, and there is no consensus on whether surgical removal or leaving the drain in place is preferred. Gausden *et al* reported seven cases of retained drains following spine surgery at a single institution between 1990 and 2008[5]. In two of the seven cases, drains were left in the wound without complications or migration. However, there are no reports on the long-term outcomes of retained drains in spine surgeries. Considering this patient's age, we believe that the decision for surgical removal of the retained drain would be appropriate.

Hao *et al* reported using spinal endoscopy to retrieve a ruptured drainage tube that had been inadvertently sutured during wound closure, which was broken beneath the fascia during removal[2]. In contrast, in our case, the drain was mechanically entrapped by the cross-link during removal, resulting in retention of a broken segment within the wound. While Hao *et al* utilised a spinal endoscopic technique for retrieval, our institution adopted a minimally invasive surgical approach under microscopy, creating a separate approximately 2cm incision lateral to the primary wound to retrieve the entrapped drain fragment. The key learning point from our case is the importance of avoiding drain placement near cross-link junction. Based on our experience, we propose the following recommendations to minimise the risk of this complication, as summarised in Table I: (1) avoid positioning the drain over or adjacent to cross-links, (2) withdraw the drain by approximately 2-3cm after deep fascia

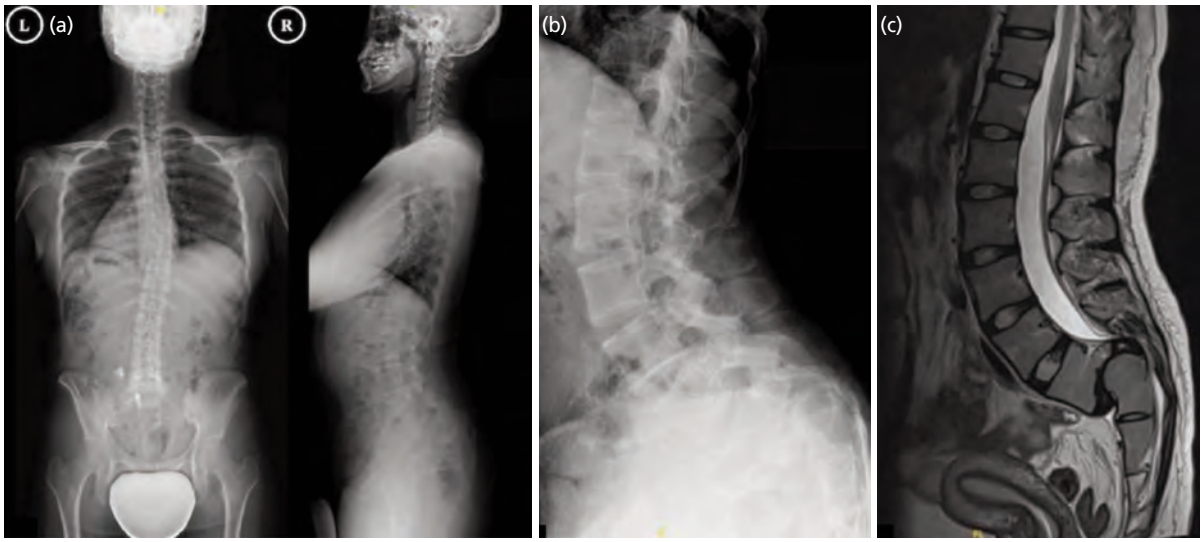

Fig. 1: Pre-operative radiographic and MRI images. (a, b) Pre-operative radiographs demonstrated high-grade spondylolisthesis of L5/S1 (Meyerding classification grade IV). (c) Sagittal view of T2-weighted MRI demonstrating a severe compression of dural matter and nerve roots at L5/S1 level, with dysplastic features of dome-shaped sacral promontory and anterior slippage of L5 vertebra on S1 upper endplate.

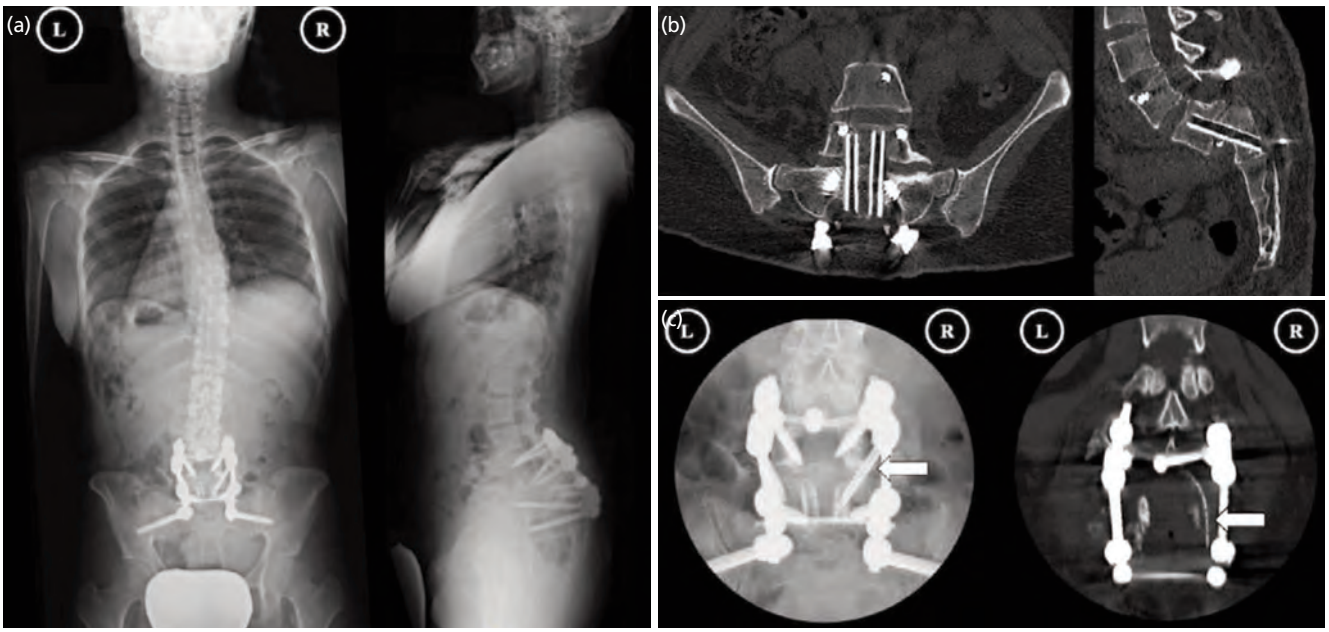

Fig. 2: Post-operative radiographic and CT images. (a) Post-operative whole spine radiographs after posterior decompression and instrumented in situ fusion (L4 to S2-ilium). (b) Post-operative CT images showing the fibula grafting penetrating through the L5/S1 disc. (c) Post-operative radiograph and coronal CT image showing the retained drain tube entangled beneath the cross-link junction (white arrow).

closure to ensure it is not sutured, (3) maintain clear communication between surgeon and assistant during wound closure, (4) document the drain position and avoid cutting through the drain holes when shortening, and (5) if resistance is encountered during drain removal, gently rotate the drain several times before applying further traction.

This is a rare complication associated with surgical drains. Moreover, this incident could not be avoided by pulling the deep fascial drain following closure, as the entrapment may occur near the cross-link rather than from fascia sutures. By sharing this case, we hope to provide information for spinal surgeons to avoid placing drains near cross-links to prevent entanglement and potential re-operation.

In conclusion, we encountered a rare case of an entangled drain tube with the cross-link that led to retained drain tube during removal, necessitating re-operation for extraction. Surgical drains should avoid cross-link areas to reduce the risk of entrapment during removal. A minimally invasive tubular microscopic technique could be considered when removal is necessary.

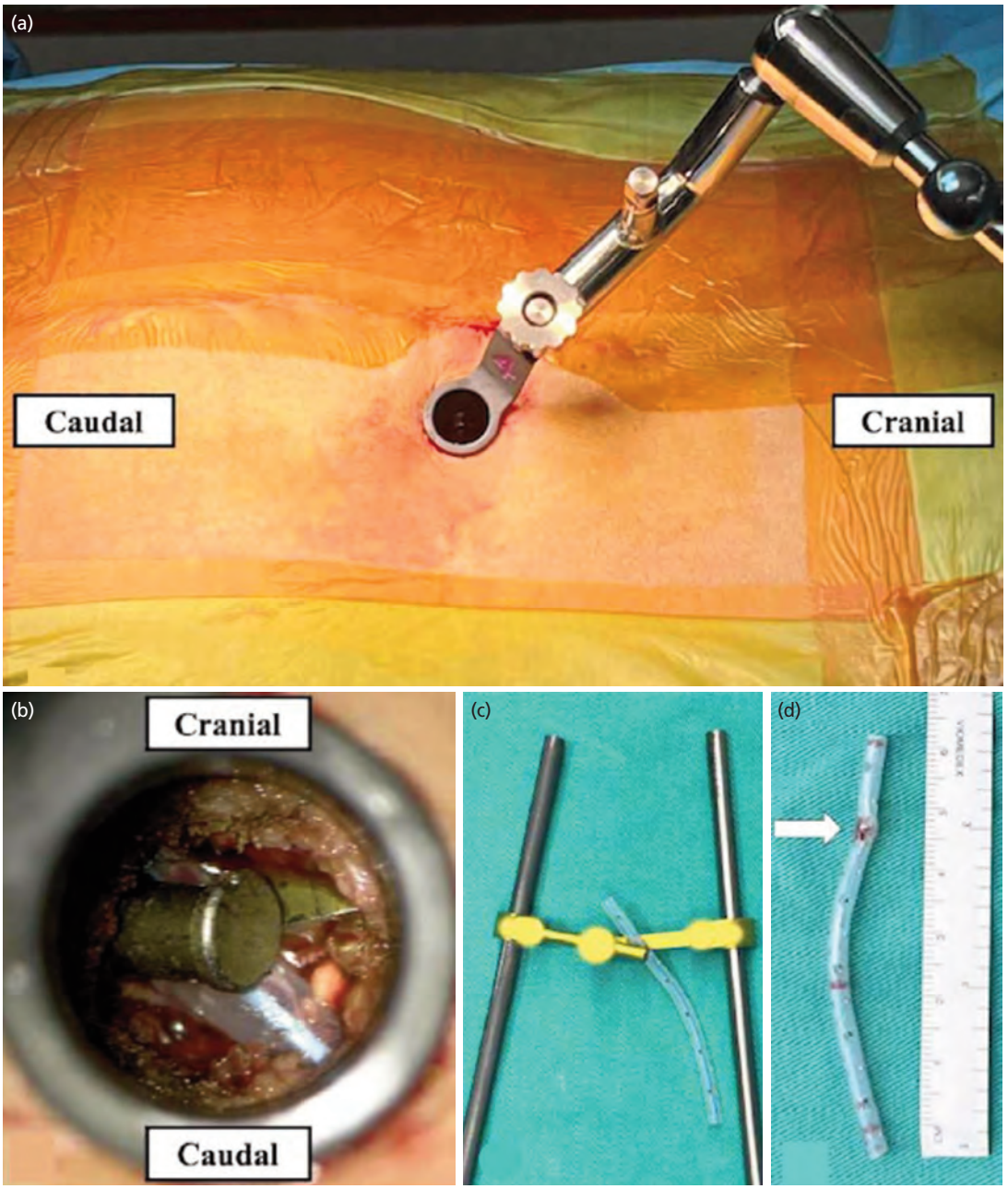

Fig. 3: The photographs obtained during revision surgery. (a) Photograph taken after setting the tubular retractor using fluoroscopy. (b) Microscopic view showing the retained drain tube entrapped by the cross-link. (c) Simulated image illustrating how the drain was entangled in the wound. (d) Photograph of the retained drain after removal. The white arrow indicates the notch that was entrapped by the cross-link.

CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

ACKNOWLEDGEMENT

The authors would like to acknowledge Universiti Malaya Medical Centre for their invaluable support and assistance, which has contributed to the successful completion of this work.

REFERENCES

1. Brown MD, Brookfield KF. A randomized study of closed wound suction drainage for extensive lumbar spine surgery. *Spine (Phila Pa 1976)*. 2004; 29(10): 1066-8. doi: 10.1097/00007632-200405150-00003
2. Hao S, Dong S, Li H, Liu S, Chen H, Zhang Z. Endoscopy-aided retrieval of broken drainage tube after lumbar spine surgery. *BMC Surg*. 2022; 22(1): 212. doi: 10.1186/s12893-022-01655-3
3. Koucheki R, Rocos B, Gandhi R, Lewis SJ, Lebel DE. Surgical management of high-grade paediatric spondylolisthesis: meta-analysis and systematic review. *Eur Spine J*. 2023; 32(2): 436-46. doi: 10.1007/s00586-022-07408-3
4. Hung PI, Chang MC, Chou PH, Lin HH, Wang ST, Liu CL. Is a drain tube necessary for minimally invasive lumbar spine fusion surgery? *Eur Spine J*. 2017; 26(3): 733-7. doi: 10.1007/s00586-016-4672-4
5. Gausden EB, Sama AA, Taher F, Pumberger M, Cammisa FP, Hughes AP. Long-term sequelae of patients with retained drains in spine surgery. *J Spinal Disord Tech*. 2015; 28(1): 37-9. doi: 10.1097/BSD.0b013e31826983ad

Cite this article:

Iwamae M, Lee SY, Chiu CK, Chan CYW, Kwan MK. Retained Drain Tube Entangled with the Cross-link Removed via Minimally Invasive Tubular Microscopic Technique: A Case Report. *Malays Orthop J*. 2026; 20(2): 122-6. doi: 10.5704/MOJ.2607.017