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*Case Report*

# Delayed-onset spinal subdural hematoma after kyphoplasty

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## ABSTRACT

**Background:** Spinal subdural hematoma (SDH) is a very rare complication of percutaneous balloon kyphoplasty. Here, a 66-year-old male developed delayed-onset spinal SDH following kyphoplasty.

**Case Description:** A 66-year-old male with a history of atrial fibrillation on Eliquis developed a SDH on day 4 following a T3 single-level kyphoplasty for an osteoporotic compression fracture. The patient presented with progressive lower extremity motor/sensory paralysis that eventually ascended to the cervical region. The magnetic resonance (MR) imaging revealed a large dorsal subdural hematoma extending from T1 to S2. The patient underwent a decompressive laminectomy for hematoma to remove cement fragments and repair a dural tear. Postoperatively, the patient partially recovered sensation but no motor function and expired in the intensive care unit due to major comorbid factors.

**Conclusion:** SDH is a potentially serious risk of performing a kyphoplasty. This is particularly true for patients on anticoagulants who should be stringently monitored with MR if indicated to avoid a major postoperative hemorrhage and paralysis.

**Keywords:** Cement leakage, Dural tear, Osteoporosis, Percutaneous kyphoplasty, Spinal subdural hematoma

## INTRODUCTION

The risk of major adverse events (AE) associated with kyphoplasty is estimated at 4.9%.[7] Mild AE may include temporary increases in pain, acute radiculopathy,[9] cement leakage,[3] new fractures,[13] and infections,[1] while major AE include acute hemorrhages and paralysis. In the literature, there are few reports of spinal subdural hemorrhages following kyphoplasty[6,12,15] or percutaneous vertebroplasty[4,8,11,14,16,17] [Table 1]. Here, we present a 66-year-old male who developed a spinal subdural hematoma (SDH) following a single-level kyphoplasty.

## CASE PRESENTATION

A 66-year-old male with atrial fibrillation on Eliquis (Apixaban) complained of severe back pain for 2 weeks. When the magnetic resonance imaging (MRI) showed a vertebral compression fracture at the T3 level with a 16% loss of height, the patient underwent a bilateral

**Table 1:** Previous reports of intradural hematoma (SDH and SAH) following percutaneous vertebroplasty or kyphoplasty.

| Authors (year) | Type of hematoma | Age (yrs), Sex | Fracture level | Cause of fracture | Initial treatment | SIH onset | Clinical symptoms |
|---|---|---|---|---|---|---|---|
| Nogami *et al.*[12] (2022) | SAH | 80, M | T12, L1 | Osteoporotic | Kyphoplasty (PBKP) | 2 days | Complete paraplegia |
| Kaplan *et al.*[6] (2019) | SDH first, SEH later | 58, F | L1-L3 | Osteoporotic | Kyphoplasty (PBKP) | 3 days | Paraparesis |
| Lee *et al.*[8] (2012) | SDH | 40, F | T11-T12 | Traumatic | Vertebroplasty | 2 weeks | Back pain No paresis |
| Mattei *et al.*[11] (2015) | SDH | 49, F | T8 | Traumatic | Vertebroplasty | Immediate | Mono-paresis |
| Tropeano *et al.*[14] (2017) | SDH | 63, M | L1-L3 | Oncological | Vertebroplasty | 2 weeks | Para-paresis |
| Becker *et al.*[2] (2007) | SAH | 76, F | T12 | Osteoporotic | Kyphoplasty (PBKP) | Immediate | Complete paraplegia |
| Cosar *et al.*[4] (2009) | SDH | 18, M | L2-L4 | Traumatic | Vertebroplasty | 12 h | Back pain and Paraparesis |
| Cosar *et al.*[4] (2009) | SDH | 75, F | L1 | Osteoporotic | Vertebroplasty | 12–24 h | Paraparesis |
| Von Der Brelie *et al.*[15] (2019) | Combined SDH & SAH | 63, M | T12 | Traumatic | Kyphoplasty (PBKP) | 1 h | Complete paraplegia |
| Yang *et al.*[17] (2022) | SDH | 70, F | L1 | Traumatic | Vertebroplasty | <12 h | Back pain, paraparesis and dysesthesia |
| Wang *et al.*[16] (2018) | SDH first, SEH later | 64, F | T12 | Traumatic | Vertebroplasty | Immediate | Progressive paraparesis and dysesthesia of both lower extremities |
| Present case | SDH | 66, M | T3 | Osteoporotic | Kyphoplasty (PBKP) | 4 days | Paraplegia progressing to tetraplegia |

| Authors (year) | Type of hematoma | Age (yrs), Sex | SIH level | Treatment for SIH | Anti-coagulants | Cause analysis | Clinical outcome (motor and sensory) |
|---|---|---|---|---|---|---|---|
| Nogami *et al.*[12] (2022) | SAH | 80, M | T5-T12 | DL T11-L1 and SHE | None | Medial deviation of the needle in the pedicle | Recovery |
| Kaplan *et al.*[6] (2019) | SDH first, SEH later | 58, F | L1-L3 | DL; levels not mentioned | LMWH 6,000 units for PE prophylaxis post-kyphoplasty | Venous congestion due to cement thrombosis of vertebral venous plexus | Gradual improvement |
| Lee *et al.*[8] (2012) | SDH | 40, F | T10-L5 | Conservative | Not described | The puncturing damage | Recovery |
| Mattei *et al.*[11] (2015) | SDH | 49, F | C7-T9 | DL T7-T9 and SHE | None | Spinal venous congestion | Motor: improved in left leg at 3 months Sensory: Persistent Sx on left side treated with Gabapentin |

*(Contd...)*

**Table 1:** *(Continued).*

| Authors (year) | Type of hematoma | Age (yrs), Sex | SIH level | Treatment for SIH | Anti-coagulants | Cause analysis | Clinical outcome (motor and sensory) |
|---|---|---|---|---|---|---|---|
| Tropeano *et al.*[14] (2017) | SDH | 63, M | Conus medullaris | DL L2-L3 and SHE | Not described | Wrong insertion of the needle and venous congestion | Gradual improvement until full recovery |
| Becker *et al.*[2] (2007) | SAH | 76, F | T8-L3 | None | None | Wrong insertion of the needle | Recovery |
| Cosar *et al.*[4] (2009) | SDH | 18, M | T1-L2 | DhL T1-L2 and SHE | Not described | Cement leakage causing a dural tear | Recovery |
| Cosar *et al.*[4] (2009) | SDH | 75, F | T12-L3 | DL T12 and SHE | Not described | Cement leakage causing a dural tear | Recovery |
| Von Der Brelie *et al.*[15] (2019) | Combined SDH & SAH | 63, M | T8-L3 | DhL T8-T11 and SHE | Preoperative medication of Aspirin | Medial deviation of the needle in the pedicle and anticoagulation | Recovery |
| Yang *et al.*[17] (2022) | SDH | 70, F | L1-L3 | DL L1-L3 and SHE | Not described | Cement leakage causing a dural tear | Recovery |
| Wang *et al.*[16] (2018) | SDH first, SEH later | 64, F | T4-T12 | DL T3-T12 and SHE (anterior, then posterior) | Not described | The puncturing damage of an abnormal blood vessel of the spinal dura | Gradual improvement until full recovery (after rehabilitation and physical therapy) |
| Present case | SDH | 66, M | T1-S2 | DL T3-T10 (skipping T5) and SHE | Therapeutic anticoagulation post-kyphoplasty | Anticoagulation, injury to the epidural/subdural veins due to needle deviation, dural tear from cement leakage | Gradual improvement |

PBKP: Percutaneous balloon kyphoplasty, SIH: Spinal intradural hematoma, SDH: Subdural hematoma, SAH: Subarachnoid hemorrhage, SEH: Spinal epidural hematoma. M: Male, F: Female. DL: Decompressive laminectomy, DhL: Decompressive hemi-laminectomy, SHE: Spinal hematoma evacuation, LMWH: Low molecular weight heparin

T3 percutaneous balloon kyphoplasty (PBKP) [Figure 1]. Eliquis was discontinued for 5 days prior to the procedure but was resumed just 8 h following the kyphoplasty itself. The patient did well until postoperative day 4, when he suddenly developed complete lower extremity motor/sensory paralysis. Symptoms also extended acutely into the cervical region. The thoracic MRI revealed a large dorsal SDH extending from T1 to S2, resulting in severe spinal cord/thecal sac compression [Figure 2]. The patient immediately underwent bilateral T3–T10 (skipping T5) laminectomies for removal of a dorsal subdural hematoma (i.e., cardiology insisted on continuing anticoagulation due to the patient's cardiac status). In surgery, a small dural tear was identified and repaired at the T3 level where additional multiple cement fragments were also identified and removed. Postoperatively, sensation returned above the L3 level, but distally, he was fully paraplegic. The patient also developed obtundation 8 days after the laminectomy; the brain computed tomography showed an acute subarachnoid hemorrhage. The family agreed to Do Not Resuscitate/Do Not Intubate, and the patient expired on postoperative day 9.

## DISCUSSION

There are very few cases of SDH following PBKP;[6,12,15] we identified just eight cases post-vertebroplasty.[4,6,8,11,15-17] The symptoms for spinal SDH following kyphoplasty/vertebroplasty vary significantly and may occur anywhere from immediately postoperatively up to 2 weeks after these procedures.[5,10,18] Notably, seven of eight cases cited

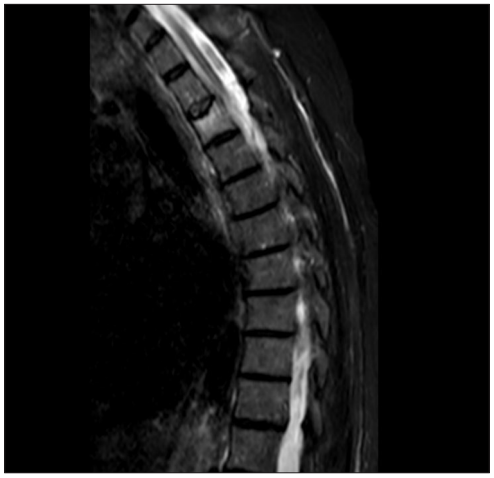

**Figure 1:** Preoperative imaging findings. Magnetic resonance imaging with high short tau inversion recovery signal at the vertebral fracture site.

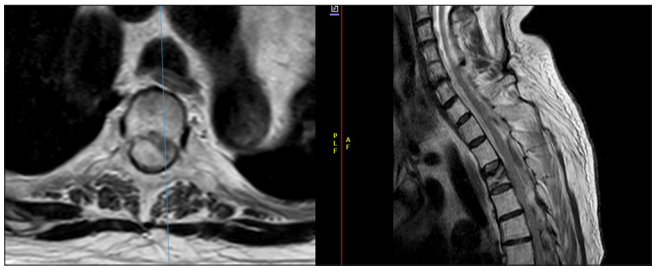

**Figure 2:** Post-kyphoplasty imaging findings. T2-weighted Magnetic resonance imaging axial (left) and sagittal (right) show a large subdural hematoma extending from T1 down to S2 level, causing severe compression of the spinal cord and thecal sac.

successfully underwent emergency surgery, exhibiting gradual to full postoperative neurological improvement.[11]

## CONCLUSION

This case highlights the critical importance of closely monitoring patients who have undergone kyphoplasty for post-procedure hemorrhages (i.e., including subdural hematomas) especially where anticoagulation has been reinstituted.

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