

Drain tube removal in the presence of anticoagulation in Spinal Surgery

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Abstract:

Venous thromboembolism (VTE), the collective term for Deep Vein Thrombosis (DVT) and Pulmonary Embolism (PE), remains a major cause of morbidity and a significant cause of mortality in hospitalised patients across Australia and internationally. It is important that adequate prophylaxis is provided for patients at risk. Measures including; anti-clotting medication, graduated compression stockings, adequate hydration and early mobilisation are known to be effective in reducing the incidence of VTE.

The prevention of VTE in acute care hospitals has been recognised worldwide as a priority patient safety issue because of the strong evidence base for preventive measures and high potential for improvements in patient outcomes.

With the introduction of risk assessment tools identifying patients of increased risk of VTE, more neurosurgical patients are now receiving VTE prophylaxis during their postoperative clinical course. This raises the question of the role and the impact of VTE anticoagulation when it comes to surgical drain tube removal and the risk of bleeding after spinal surgery. With multiple neurosurgeons and a variety of opinions, the clinical nursing team decided to review the role of anticoagulation and drain tube removal through evidence based research.

Key words: *venous thromboembolism, VTE prophylaxis, spinal surgery, haematoma, neurosurgery, surgical drain tube, low molecular weight heparin (LMWH).*

Case Review:

A 53 year old male presented to St. Vincent's Private Neuroscience Unit for an elective C3-C7 decompressive cervical laminectomy for chronic cervical radiculopathy of the left arm. At the time of admission he weighed 77kgs (BMI 25.5). His relevant past history included Type 2 Diabetes and osteoarthritis. His perioperative pathology was all within normal limits.

Postoperatively, his recovery was unremarkable. He returned to the ward with a closed suction sub-fascial drain tube in situ. His vital signs were all within normal limits and he had full strength and sensation in both his arms and legs.

He was commenced on Clexane 20mg BD with his first dose at 20:00hrs Day 1 post operatively. At this stage the drain output was approximately 200mls.

He received a second dose of Clexane 20mg the following morning and reviewed by the surgical team where the decision was made to remove the drain, as was standard practice. The drain tube now had an output of 220mls. The drain was removed with no difficulty or resistance by an experienced registered nurse.

Immediately after removal, the drain tube site bled and the patient rapidly developed symptoms of weakness and altered sensation in the right arm. An escalation call was initiated and the patient was immediately returned to theatre for urgent evacuation of a haematoma.

Due to the unplanned return to theatre, the case was critically reviewed by the surgical team and the conclusion was made that the patient had a large posterior extradural haematoma as a result of acute bleeding following the removal of the posterior cervical drain.

The incident raised concerns for the nurses within the neuroscience unit. One hypothesis was that venous thromboembolism (VTE) prophylaxis with low molecular weight heparin (LMWH) may be a contributor to post

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-operative hematoma formation. As a result, nursing staff began questioning the medical staff about anticoagulation therapy. In particular, the nursing staff queried whether the LMWH should be withheld until after the drains had been removed, or to administer the LMWH and remove the drain several hours later.

A review of clinical polices on surgical drain tube removal was undertaken, utilizing the hospital's policies database and the intranet; however, neither gave the staff direction on best clinical practice. Medical records and medication charts were then reviewed. The review suggested that there was no standard practice guideline on the administration of LMWH and the removal of surgical drains. This confusion regarding drain tube removal and anticoagulation therapy was the catalyst to investigate further as to what is the best practice surrounding drain tube removal following spinal surgery in the presence of VTE prophylaxis.

In understanding the significance of VTE prophylaxis and drain tube removal, it is important to recognize that there is strong evidence that preventative measures and risk reduction strategies such as early mobilization, the use of graduated compressive stockings, sequential compressive sleeves and the use of LMWH (standard recommendation of 40mg subcutaneously daily) all assist in the prevention of deep venous thrombosis (DVT) and pulmonary embolism (PE), the collective term being VTE (Joanna Briggs, 2016). These complications remain a major cause of morbidity and a significant cause of mortality in hospitalized patients across Australia and internationally (The Australian & New Zealand Working Party on the Management and Prevention of Venous Thromboembolism, 4th Edition)

Risk screening tools are within the neurosurgical unit, with many patients undergoing spinal surgery falling within the high risk category - Major surgery & Age >40 years

(Major surgery refers to operations >45 minutes duration) (The Australian & New Zealand Working Party on the Management and Prevention of Venous Thromboembolism, 4th Edition).

As a result, more patients are screened and identified to be at risk and implementation of risk mitigation strategies are now common practice (Joanna Briggs Institute, 2016). A Cochrane review showed that combing compression and anticoagulation

was more effective that a single preventative measure for preventing DVT in surgical patients (Joanna Briggs, 2016).

Given the information already obtained and lack of best practice information available within the policy database and hospital intranet, a medical record audit was conducted on patients having spinal surgery who met the following criteria: Over 40 years in age who had "Major Surgery" of greater than 40 minutes

Of the sixty medical records reviewed, 55% received LMWH in addition to compression stockings. 66% had a suction drain in situ.

For those having LMWH, there were a variety of doses and times used by the treating neurosurgeons:

Time Administered	Dosage (Variance)	Percentage
Mane	40mg (1x60mg)	20%
Nocte	40mg (1x30mg)	50%
BD	20mg (2x40mg)	30%

This highlights that there was no general consensus on the dosage or administration time for LMWH within the neurosurgical unit.

Although haematoma formation following spinal surgery is a rare complication, its consequences can be severe. (Yi, Yoon, Kim, Kim and Shin, 2006). The surgical drain tube is often used in spinal surgery to remove fluid and blood away from the surgical site to reduce haematoma formation (Joanna Briggs, 2015). The clinical presentation of haematoma formation can include, pain, swelling/ooze at the suture line, nerve damage, weakness and/or numbness, saddle paresthesia and urinary and bowel dysfunction – all depending on the level of the collection (Hickey, 2014). Competent and efficient nursing assessment is paramount for the early detect of hematoma formation. This will prompt immediate return to the operating theatre to evacuate the collection before irreversible nerve damage occurs.

Review by the neurosurgeon is usually performed Day 1 post operatively. At this

point discussion is around improvement from pre-operative symptoms, plan for the remainder of the admission and the removal of the surgical drain tube. Nursing staff within the neurosurgical unit are highly proficient and competent in the removal of surgical drain tubes in spinal surgery. Upon removal, the tip of the drain is examined by two experienced registered nurses to ensure complete removal. Regular monitoring of the insertion site is performed to ensure there is no leakage and no signs of post-operative infection. Any concerns regarding the patient's condition is fed back to the treating neurosurgeon.

Due to a lack of adequate information and resources surrounding best practice guideline, a systematic literature review was undertaken. A data base search was completed using Joanna Briggs, EbscoHost, Medline, Pub Med and ACU Library. Key words used included drain tube removal, spinal surgery, haematoma/haemorrhage, anticoagulation and LMWH.

These key search terms were used alone or in combination. The search results demonstrated a deficiency in available and well-designed research or literature reviews on the use of anticoagulation therapy and drain tube removal in spinal surgery.

VTE prophylaxis	Drain Tube
OR Heparin	OR Bellovac
OR Low molecular weight heparin	OR Surgical Drain tube
OR Unfractionated heparin	OR Redivac
OR Clexane	
Spinal Surgery	Haematoma
OR Lumbar laminectomy	OR Bleeding
OR Neurosurgery	OR Haemorrhage
OR Lumbar fusion	
OR Cervical/Thoracic	

Literature Review:

When reviewing the literature, it was evident that there was no consistent best practice guideline for the use of LMWH in the background of spinal surgery.

Awad, Keksish, Donigan, Cohan and Kostuik, (2005), performed the largest study looking at the risk factors associated for the development of postoperative spinal epidural haematoma. Over a period of 2 years and 14935 patients, the authors looked at the incidence of patients returning to theatre with the complication of postoperative hematoma. Of the 14935 patients only 32 (0.21%) returned to theatre within one week due to haematoma formation. Awad et al (2005) concluded that the use of well controlled anticoagulation therapy for DVT prophylaxis and the lack of surgical drains were not associated with the development of spinal epidural haematoma. The authors stated that although drains are commonly used as prophylaxis against haematoma formation, there is no evidence in the literature to support that hypothesis. The authors went on further to say that anticoagulation therapy in the postoperative phase is safe as long as it is monitored carefully. If anticoagulation is well controlled, it is not associated with increased incidence of haematoma. However, individual assessment is paramount. Kanayama, Togawa and Hashimoto, (2010) suggest that although well controlled anticoagulation was not associated with epidural haematoma formation, patients who were coagulopathic from their procedure or from overmedicated with anticoagulants had a higher risk of epidural haematoma formation.

However, in caring for patients undergoing spinal surgery, not all neurosurgeons explore the benefits of DVT prophylaxis and the use of drain tubes. Chementi and Molinari, (2013), looked at 1750 patients over an 8 year period, who had undergone spinal surgery to determine the incidence of epidural haematoma. Out of the 1750 patients, 4 (0.23%) had sub-fascial wound suction drains in place. Three of those patients developed neurological deficits with the drains in situ, whilst one patient had the drain removed 24 hours post op. The authors suggested that there appeared to be no increased risk with the use of spinal suction drains and the incidence of epidural haematoma. Of interest, however, none of the patients in this study received chemoprophylaxis for DVT prevention postoperatively. Intermittent pneumatic compression stocking were used instead.

When looking at best practice guidelines for DVT prophylaxis, it is suggested that the use of combined modalities of compression and anticoagulation and careful individual evaluation of risk will produce the best outcome for patients, (Joanna Briggs Institute, 2016; Morse, Weight and Molinari, 2007). Al-Dujaili, Majer, Madoun, Kassis and Saleh,

(2012) explored this further by looking at the use of multimodality DVT prophylaxis and the incidence of epidural haematoma in spinal surgery. The authors looked at 158 patients. One patient developed a DVT, whilst three patients (1.8%) developed an epidural haematoma. Similarly to the Joanna Briggs Institute (2016), Al-Dujaili et al (2012) suggest that early mobilisation, mechanical and chemical prophylaxis is effective in decreasing the risk of postoperative DVT formation without significantly increasing the risk of haematoma formation.

The authors go on further to say that neurosurgeons must look at the risk vs benefit ratio of DVT prophylaxis and the potential for bleeding complications. Preoperative assessment and evaluation of risk (comorbidities) is vital to determine the most appropriate course of action for each individual patient (Yi et al 2006). Both Awad et al (2005) and Chementi et al (2013) suggest that one risk factor for epidural formation could be patients of an age greater than 60-years.

Al-Dujail et al (2012) and Browd, Ragel, Davis, Scott, Skalabrin and Couldwell, (2004) state that there is unfortunately no consensus regarding DVT prophylaxis regime amongst neurosurgeons. Browd et al (2004) goes on further to state that based on the current literature, the use of LMWH appears safe when given at least 24hours after the conclusion of the surgery. However, Choo (2009) suggests that the administration of LMWH should be delivered 6 hours post-operatively as this does not significantly increase the risk of bleeding; however it does retain the efficiency for VTE prophylaxis. This differs from Morse et al (2007) who states that full anticoagulation should be used carefully in the early postoperative period. Although, in this clinical case review, the patient (who was admitted for multi-level lumbar decompression) required full anticoagulation due to cardiac ischemia which occurred 13 hours postoperatively. The author's state that thoughtful evaluation of risk and potential benefits need to be assessed (Morse et al, 2007).

Although it has been suggested in the literature that there is no apparent link between chemical prophylaxis and epidural haematoma formation post drain tube removal, a retrospective study by Aono et al (2011) suggest that there appeared to be a link between spinal epidural haematoma and suction drain tube removal. The study suggests that there was no standard protocol for the removal of the drain, stating that some sur-

geons may remove the drain if the output is <50ml per 12 hours, whilst other surgeons may tolerate larger volumes. Limiting the results of this study, the authors do state that they have a small cohort (26 patient). Nine out of those 26 had associated illness involving haemorrhage. However, the authors state that half of the patients in the study developed an epidural haematoma post suction drain tube removal.

Conclusion:

Spinal epidural haematoma can have devastating consequences and its assessment and treatment should be carefully considered. Within the literature, it has been highlighted that although epidural haematoma is a rare complication, the prophylactic treatment of haematoma formation is vague and non-consistent. The literature has been unable to definitively state that there is a link between anticoagulation therapy for VTE prophylaxis and the potential for hematoma post removal of the surgical drain tube. There is a lack of consensus and guidance from neurosurgeons as to the time of anticoagulation administration and removal of drain tubes. This makes the management of these patients all the more difficult. As demonstrated, there is no clear evidence or guideline as to what is the best clinical practice for the administration of anticoagulation therapy for VTE prophylaxis and removal of drain tubes. Further evidence and research is required. Given that LMWH peaks at two hours and has a half-life of 12 hours, it could be suggested that it be administered as a nocte dose. What is the gold standard of the administration of anticoagulation therapy and the removal of drain tubes for patients having spinal surgery? The suggestion could be made to err on the side of caution and take direction from the neurosurgeon involved.

References:

- Al-Dujaili, TM, Majer, CN, Madoun, TE, Kassis, SZ, and Saleh, AA (2012), 'Deep Venous Thrombosis in Spine Surgery patients: Incidence and Haematoma Formation', *International Surgery*. Vol. 97: pp. 150-154.
- Aono, H, Ohwada, T, Hosono, N, Tobimatsu, H, Ariga, K, Fuji, T. and Iwasaki, M (2011), 'Incidence of postoperative symptomatic epidural haematoma in spinal decompression surgery', *Journal of Neurosurgery: Spine*, Vol. 15: pp. 202-205.
- Awad, JN, Keksish, KM, Donigan, J, Cohan, DB and Kostuik, JP (2005), 'Analysis of the risk factors for development of postoperative spinal epidural haematoma'. *The Journal of Bone and Joint Surgery*, Vol. 87, No. 9: pp. 1248-1252.

Browd, SR., Ragel, BT, Davis, GE, Scott, AM, Skalabrin, EJ and Couldwell, WT (2004), 'Prophylaxis for deep venous thrombosis in neurosurgery: a review of the literature', *Neurosurg. Focus*, Vol. 17, No. 4: pp. 1 – 6.

Chimenti, P and Molinari, R (2013), 'Post-operative spinal epidural haematoma causing American Spinal Injury Association B spinal cord injury in patients with suction drain tubes' *The Journal of Spinal Cord Medicine*, Vol. 36 , No. 3: pp. 213-219.

Choo, M (2009), 'Case Report: Intraoperative low molecular weight heparin and postoperative bleeding', *International Journal of Medicine and Medical Sciences*, Vol. 1 , No. 4: pp. 102 -109.

Hickey, JV (2014), 'The Clinical Practice of Neurological and Neurosurgical Nursing 7th Edition. Lippincott Williams & Wilkens.

Kanayama, M, Oha, F, Togawa, D, Shigenobu, K, and Hashimoto, T (2010), 'Is Closed-suction Drainage Necessary for Single-level Lumbar Decompression?' *Clinical Orthopaedics and Related Research*, Vol. 468 , No. 10: pp. 2690-2694.

Morse, K, Weight, M. and Molinari, R (2007), 'Extensive Postoperative Epidural Haematoma After Full Anticoagulation: Case Report and Review of the Literature' *The Journal Of Spinal Cord Medicine*, Vol. 30 , No. 3: pp. 282 – 287.

The Australian & New Zealand Working Party on the Management and Prevention of Venous Thromboembolism (2010), 'Best Practice Guidelines for

Australia and New Zealand, 4th Edition .

The Joanna Briggs Institute (2015), 'Closed Wound Suction Drainage: Removal - Evidence Summary: Wound Drainage Site', pp: 2 -5.

The Joanna Briggs Institute (2016), 'Deep Vein Thrombosis (DVT) Prophylaxis', pp 1-6.

Yi, S, Yoon, DH, Kim, KN, Kim, SH, and Shin, HC (2006), 'Postoperative Spinal Epidural Haematoma: Risk Factors and Clinical Outcome', *Yonsei Medical Journal*, Vol. 47, No. 3: pp. 326 – 332.

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