PERIOPERATIVE PREVENTION & MANAGEMENT OF VENOUS THROMBOEMBOLISM

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CASE HISTORY

'Ms J, a 32-year-old woman, collapsed in her home the day after having undergone a right arthroscopic repair of a torn anterior cruciate ligament.

The collapse was witnessed by her mother, who was at the patient's home caring for her two preschool grandchildren.

Emergency paramedic responders provided full resuscitation and rushed her to the emergency department of a community hospital.

The ED caregivers continued the resuscitation efforts until the patient's parents and husband arrived at the hospital 30 minutes later.

The clinical nurse specialist escorted the patient's husband and mother to the bedside to witness the efforts of the team.

At this point, the physician leading the resuscitation indicated that their efforts were not going to be successful and halted resuscitation.

The patient's cause of death was identified as deep vein thrombosis (DVT) and pulmonary embolism (PE)' secondary to surgery'

(LARKIN, MITCHELL & PETRIE 2012, P. 513)

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When do you connect SCD?

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We do not ever look at adverse event to 'scoff' but rather to 'learn'

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CASE HISTORY

- Mr SM was a 32-year-old obese male with an intellectual disability and a recent ankle injury
- A week before his death, Mr SM was admitted to hospital with acute appendicitis and peritonitis
- He underwent emergency surgery and returned to the ward before midnight where he remained on low flow oxygen
- In the early hours of the next morning he was tachycardic and hypotensive

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CASE HISTORY

- His calves were checked and noted to be soft
- The following day, Mr SM showered himself sitting on a chair
- He appeared to need encouragement to mobilise
- He was found to have low oxygen saturations (Sa02) at 85% and required oxygen via a mask to maintain Sa02 of 97%

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CASE HISTORY

- On postoperative day three, Mr SM developed abdominal pain with distension, and was diagnosed with a paralytic ileus
- A nasogastric tube was inserted which eased his condition
- However, he experienced periods of hypoxia with Sa02 levels of 78-80% whenever he removed his oxygen
- Over the next couple of days, Mr SM had ongoing tachycardia and hypoxia, with episodes of abdominal pain

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CASE HISTORY

- He was seen by the surgeon and diagnosed with aspiration pneumonia
- His pain levels gradually improved as did his bowel function, but he remained dependent on low flow oxygen
- On post-operative day six, Mr SM complained of dizziness while mobilising to the bathroom
- He sat on a chair, became unresponsive, and despite resuscitative efforts, was unable to be revived

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Coronial Report

- An autopsy revealed a large saddle embolus in the pulmonary trunk, originating from deep vein thrombi in the right calf (which was 2.5cm larger than the left calf)
- Microscopic examination reported that the thrombi and emboli were a few days old
- The pathologist identified Mr SM's postoperative state, previous inflammatory condition, obesity, and immobility as risk factors for the development of deep vein thrombosis

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Investigation

- The coroner had access to the root cause analysis (RCA) completed by the health service to assist in the investigation, and also engaged an independent medical practitioner in clinical forensic medicine to review the case
- The RCA team found that certain post-operative observations were not recorded on every occasion, some were not trended, and some scores were not added up correctly
- The RCA concluded that had an early warning observation tool been completed properly, it would have flagged Mr SM for review more frequently, highlighting the persistently low saturations

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Investigation

- Mr SM was a general surgical patient admitted to the orthopaedic ward as an outlier, which meant the treating team reviewed him on an ad-hoc basis
- At the time, the surgical handover did not have a formal structured approach, and staff would often leave during the handover to commence theatre lists or clinics
- Another area of concern was the use of oxygen without medical input
- In most cases nursing staff reported low saturations to medical staff but there was no evidence that the reports raised significant concerns or were escalated

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Investigation

- Mr SM was on oxygen for six days following his surgery
- The continual and unrestricted use of oxygen masked the underlying problem that an otherwise healthy 32 year old male with no medical history could not maintain adequate saturations without supplemental oxygen
- The RCA recommended the implementation of oxygen prescribing within the health service and changes to the national inpatient medication chart to facilitate oxygen prescribing

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Investigation

- The independent medical opinion considered that while Mr SM received appropriate prophylaxis for VTE (subcutaneous heparin and compression stockings), the management of post-operative hypoxia was lacking
- The medical practitioner did not agree that the chest x-ray showed evidence of aspiration pneumonia
- He considered that blood gases should have been obtained and earlier diagnosis may have changed the outcome for Mr SM

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Coronial Findings

- The coroner found that there was a failure to identify and appropriately investigate the cause Mr SM persistently low oxygen saturations
- This arose from a combination of systemic issues which resulted in a failure to escalate earlier and more frequent reviews of Mr SM
- The coroner was satisfied that the health service had taken action to rectify the issues the RCA highlighted, and did not proceed to inquest (Department of Forensic Medicine Monash 2017)

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Discussion

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VENOUS THROMBOEMBOLISM (VTE) RISK ASSESSMENT TOOL

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VENOUS THROMBOEMBOLISM (VTE) RISK ASSESSMENT TOOL

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PRE ASSESSMENT - RISK FACTORS FOR VTE

- Moderate to major surgery with an operating time > 45 minutes and/or involves abdomen
- Prior history of VTE
- Known thrombophilia (including inherited disorders)
- Active malignancy or cancer treatment
- Significantly reduced mobility relative to normal state
- Age > 60 years
- Congestive heart failure

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PRE ASSESSMENT – RISK FACTORS FOR VTE

- Myocardial infarction
- Active or chronic lung disease
- Active infection
- Inflammatory bowel disease
- Active rheumatic disease
- Obesity (BMI > 30kg/m2)
- Hormonal replacement therapy
- Oestrogen-based contraceptives
- Myeloproliferative neoplasms

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PRE ASSESSMENT – RISK FACTORS FOR VTE

- Pregnant or < 6 weeks post-partum (refer to obstetrics consultant / team prior to commencing pharmacological and/or mechanical prophylaxis)
- Varicose veins/chronic venous stasis
- Nephrotic syndrome
- Dehydration
- Sickle cell disease

(National Institute for Health and Clinical Excellence (NICE) Guidelines. Venous thromboembolism: Reducing the risk of venous thromboembolism in patients admitted to hospital. August 2019)

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OLD RESEARCH

A Caretrack Australia study reported that appropriate care (in line with evidence-based or consensus-based guidelines) is being provided for VTE in just over half of eligible encounters (Hibbert et al. 2016)

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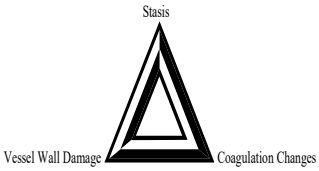
WHY CLOTS FORM

VIRCHOWS TRIANGLE



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STASIS

- The slowing of the flow of circulating blood
- Venous stasis occurs intra operatively as well as postoperatively

Risk factors

- Prolonged surgical time
- Prolonged recumbence postoperatively

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TREATMENT

STASIS

- Sequential compression device (SCD) / atrial venous impulse (AVI plantar venous compression)
- Graduated compression stockings

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VESSEL WALL DAMAGE

Suspected causative factors include:

- Vessels kinks during surgical manipulation
- Pooling of venous blood causing venous distention and possible endothelial damage

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VESSEL WALL DAMAGE

Risk Factors

- Major orthopedic surgery
- Varicose veins
- Inflammatory bowel disease

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TREATMENT

VESSEL WALL DAMAGE

- Graduated compression stockings

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COAGULATION CHANGES

- Postoperative hypercoagulation states exist with elevated levels of thromboplastins and fibrinogen
- Activation of the extrinsic coagulation pathways in areas of surgical tissue damage

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TREATMENT

COAGULATION CHANGES

- Intermittent pneumatic compression / sequential compression device
- Low molecular weight heparin

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DISCUSSION OF SURGICAL SAFETY CHECKLIST

- 27% of surgical safety checklists are not completed
- 40% of patients at risk of DVT do not receive appropriate prophylactic treatment

(Duff 2017)

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PREVENTION

- The current surgical safety checklist (SSC) asks for discussion on thromboprophylaxis
- Surgical safety checklists are designed to improve team communication and consistency in care, ultimately avoiding complications (Biffl et al. 2015)
- Compliance with SSC completion in the OR has wide variation and is generally suboptimal (Biffl et al. 2015)
- This was an American study, do you think this is correct in Australia?

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WHEN TO CONNECT IN THEATRE

- Perhaps a suggestion would be to ask each surgeon for their preference and have the information on their surgical preference cards
- If pre-assessment suggests that surgery over 45 minutes puts a patient at high risk, then surely, we should connect SCD in surgical procedures longer than 45minutes
- But what about anaesthetic time?
- Also SCD should be connected in all patients who present a high risk

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Discussion

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- Larkin, B, Mitchell, K & Petrie, K 2012, 'Translating Evidence to Practice for Mechanical Venous Thromboembolism Prophylaxis ', AORN, vol. 95, no. 5, pp. 513-27.
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