Guidance and standard for:

1. **Recognition and initial management of emergency vascular injury as a complication of adult spine surgery**
2. **Provision of emergency vascular cover for spine surgery services**

Executive Summary

- The aim of this document is to communicate the need for compliance with the regulation 28 report on the need to recognise and act on vascular injury as a complication of spine surgery.
- The regulation 28 report also requires the provision of emergency vascular services for spine surgical services in NHS and private providers of spine surgery.
- Vascular injury is a rare but serious complication of all spine surgery including posterior lumbar spine surgery.
- Inform patients about the risk of vascular injury (in addition to other complications) during the consent process.
- Preparation for cases with a high risk of vascular injury should include informing the vascular service of the case and joint MDT discussion (e.g. revision anterior lumbar surgery).
- There must be a low threshold for looking for this complication in the event of unexplained tachycardia or hypotension, breach of the anterior annulus in posterior lumbar surgery.
- It should also be recognised when there is an obvious haemorrhage or direct vascular injury in other approaches to the spine.
- There must be emergency vascular equipment available in any theatre suite carrying out spine surgery.
- There must be a clear education programme for all personnel involved in spine surgery outlining the risk of a vascular injury, identifying it and the policy to be triggered if it occurs.
- There must be a standard operating policy (SOP) to be implemented in the case of a vascular complication occurring.
- There should be a written agreement and established protocols with the nearest vascular surgical service allowing emergency transfer of a patient with a vascular complication AND consideration for allowing an on call vascular surgeon to attend and operate in the primary hospital if the patient is not fit for transfer. This should be available for every hospital that provides spinal surgery including NHS and independent providers.
- There should be on site vascular surgeon availability for revision anterior lumbar surgery.

Contents

Who does this policy affect?

Patient group

This policy affects all patients undergoing spine surgery. All spine surgical procedures (including posterior lumbar procedures) carry a small but serious risk of vascular injury which can be rapidly life threatening. For lumbar spine surgery the reported incidence varies from 0.03% to 4% depending on approach[1,2].

Clinical staff

Spine surgeons and surgical team, theatre and recovery personnel, anaesthetic teams, vascular surgical services, emergency services

Managerial staff

Responsible theatre managers, directorate managers, divisional managers, associate directors and Chief Operating Officer for each Trust in the RSN undertaking spine surgery (spinal hub, spinal partner and private provider hospitals) must be aware of this policy and be involved in acting on this policy.

What is the policy trying to achieve?

In 2017, Anne Mary Christine Pember, Senior Coroner for the coroner area of Northampton published a regulation 28 report relating to the death of DM following a L4/5 unilateral discectomy. The death was due to an unrecognised iliac artery injury[3]. The regulation 28 report is a call for action to prevent further deaths. HM Coroner asked for action to be taken to make patients and personnel aware of vascular injury as a potentially fatal complication of elective spine surgery. HM Coroner felt that action should be taken to prevent future deaths.

The most recent NHS England Spine Surgery service specification also outlines the need for vascular surgeon support when carrying out anterior lumbar surgery[4].

The Vascular Society of Great Britain and Ireland endorse these guidelines which reflect current UK practice in most units consistent with the Vascular Society document 'Provision of Vascular Services 2021'. Responsibilities of vascular surgical colleagues are outlined in Chapter 28, ‘Assisting other specialities’ [6]

Recognising an inadvertent vascular injury

Inadvertent vascular injury can result from:

1. Anterior approaches to the spine where vascular structures are being manipulated for access to the spine (e.g. anterior lumbar interbody fusion (ALIF), anterior cervical discectomy and fusion (ACDF)).
2. Use of high speed or sharp instruments to decompress a segment (e.g. vertebral artery injury in ACDF).
3. Implants into the spine (e.g. vertebral artery injury in posterior cervical instrumentation, thoracic pedicle screws).
4. Removing disc material via a posterior approach in the lumbar spine (e.g. discectomy, interbody cage).

Vascular injury can cause:

1. Immediate haemorrhage (potentially life threatening).
2. Late haemorrhage due to a contained injury (potentially life threatening).
3. Pseudoaneurysm and its consequences.
4. End organ ischaemia or infarct.

Major potentially life threatening haemorrhage can be defined as bleeding which leads to a heart rate more than 110 beats/min and/or systolic blood pressure less than 90 mmHg. Hospitals must have locally agreed triggers (Joint UK Blood Transfusion and Tissue Transplantation Services Professional Advisory Committee)[5].

Vascular injury can be recognised if the following happen:

1. Obvious direct injury to a vessel with obvious haemorrhage.
2. Breach of planes / structures normally protecting vessels (e.g. anterior annulus).
3. Unexplained sudden hypotension or tachycardia in theatre, recovery or the ward.
4. Pseudoaneurysm pain or pressure symptoms.
5. Ischaemic or infarct consequences.

Spine surgeon responsibilities

Recognising risk

1. Preoperative planning should include an evaluation of the individual risk of vascular injury depending on procedure, approach and individual anatomy.
2. Carrying out and interpreting preoperative imaging to identify risk (e.g. MRI) and initiating specialist investigations where needed (e.g. CT angiography).
3. Alerting a vascular surgeon if a high risk procedure is planned. Consider discussion of complex cases in a MDT (e.g. revisional cases)**.** Alert with sufficient notice to provide cover for the case, invite vascular surgeon to participate in spine MDT or to review imaging at vascular MDT. Consider IR support when required.
4. Ensuring that a SOP is in place in case of inadvertent life threatening vascular injury and that all personnel are aware of the SOP in the event of a vascular event.
5. Informing patients about the risk of vascular injury (in addition to other complications) during the consent process. Risk will vary with approach and procedure. The patient should be made aware that in the event of a vascular injury, the consequences could be life threatening or life changing. The life changing risks could be loss of limb or end organ infarct such as a stroke.

Recognising the injury

For early / potentially life threatening vascular injuries:

1. Obvious direct injury to a vessel with obvious haemorrhage.
2. Breach of planes / structures normally protecting vessels (e.g. anterior annulus).
3. Unexplained sudden hypotension or tachycardia in theatre, recovery or the ward.
4. Ischaemic or infarct consequences.

For late presenting vascular injuries:

1. Pseudoaneurysm pain or pressure symptoms.
2. Ischaemic or infarct consequences.

If the surgeon is concerned that there has been a life threatening vascular injury they should alert the anaesthetic and theatre team and vigilance should be high.

If a major haemorrhage becomes obvious the agreed SOP should be triggered.

Institutional responsibilities

1. The hospital that the spinal surgery is performed in should be able to facilitate any preoperative planning required to recognise and reduce risk.
2. There must be a major haemorrhage protocol in place.
3. There must be a repeated education programme for all personnel that includes recognising and treating inadvertent vascular injury as a component.
4. The hospital and theatres should be equipped to handle an inadvertent life threatening vascular injury:
    a. A major haemorrhage protocol in place and initiated
    b. A SOP for inadvertent vascular injury in place and initiated
    c. Rapid transfusion devices
    d. Processing urgent blood requests including group and save / cross matching
    e. Provide immediate cross matched, type specific and universal (Group O) blood for transfusion (initial 4 – 6 units may be required and repeat)
    f. Provide blood products to counteract coagulation abnormalities (FFP, cryoprecipitate, platelets)
    g. Tranexamic acid as a 1g bolus
    h. Vascular sets in agreement with the covering vascular service
    i. The ability to transfer patients emergently to a vascular service
    j. The ability to allow a vascular surgeon to attend the theatres if the patient is not haemodynamically stable and carry out life-saving procedures
    k. Emergency access to an on-site or off-site interventional radiology suite for angiography or endovascular procedures (under guidance of the vascular surgeon)
    l. Intraoperative arrangements for cell salvage if available
5. An agreement will need to be place with the nearest vascular surgical service / network to facilitate these actions.
6. Any revision anterior lumbar surgery (or other surgery deemed very high risk) should have vascular surgeon on site during the procedure.

Template standard operating procedure for inadvertent vascular Injury in spinal surgery resulting in haemodynamic instability.

PREOPERATIVE

Recognise and evaluate level of risk
MDT approach with spinal surgery, diagnostic radiology, interventional radiology and vascular surgery if high risk
Carry out appropriate investigations
Inform patient during consent process
Alert Vascular service / anaesthetist and theatre teams if high risk
On site vascular surgeon for revision anterior lumbar surgery / other designated high risk

RECOGNISING AN INJURY

1. Obvious direct injury to a vessel with obvious haemorrhage.
2. Breach of planes / structures normally protecting vessels (e.g. anterior annulus).
3. Unexplained sudden hypotension or tachycardia in theatre, recovery or the ward.
4. Ischaemia or infarct consequences.

SUSPICION ALERT

If there is suspicion of injury make sure all personnel are aware:

1. Anaesthetist and ODA (both should remain in theatre)
2. Surgeon and assistant
3. Scrub nurse and circulating personnel
4. Porter

SUSPICION CONFIRMED

1. Initiate major haemorrhage protocol and ask for additional staff
2. Alert designated vascular surgeon that there is a vascular injury with haemodynamic consequences
3. Theatre staff to prepare vascular trays
4. Consider tranexamic acid 1g bolus
5. Spinal surgeon to pause procedure / stabilise spine rapidly if necessary
6. Pack any accessible bleeding site with haemostatic substance e.g. Floseal and surgical swabs (appropriate size)
7. Leave site undisturbed until vascular surgeon arrives
8. If patient stabilises notify vascular surgeon and follow advice
9. If no vascular service on site and patient stable for transfer
    a. Prepare for emergency transfer with appropriate monitoring and blue light ambulance
    b. Off- site vascular team prepared to receive and operate as a vascular emergency
    c. Anaesthetist to accompany transfer and handover to vascular team
10. If no vascular service on site and patient not stable for transfer
    a. Continue major haemorrhage protocol and resuscitation
    b. Vascular surgeon to attend site as emergency (written agreement must have provision for this)
    c. Initial vascular control to be achieved as emergency
    d. Prepare for emergency transfer with appropriate monitoring and blue light ambulance
    e. Off-site vascular team prepared to receive and operate for definitive vascular procedure
    f. Anaesthetist to accompany transfer and handover to vascular team

Contributors

BASS executive 2021-22
SBNS executive 2021-22
BSS executive 2021-22
VSGBI Executive 2021-22

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