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Management of an absent pulse following arterial catheterization

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Abstract

Arterial cannulation is a common procedure for diagnostic as well as interventional catheterisation. The incidence of arterial damage varies from around 1% to 45 % depending on the size of the patient, size of catheters used, repeat procedures, pre-existing vascular disease and whether the procedure was interventional as opposed to diagnostic (twelve times higher risk with intervention). The absence of a pulse following catheterisation can result from spasm, local thrombus formation, formation of a flap of endothelium, dissection or avulsion of the artery. In order to minimize the risks of arterial damage the following factors may help: a clean puncture, small French catheters, tapered well-fitting introducer sheaths, a short procedure time and administration of heparin (50 to 100 units/kg with further dose/s if the procedure lasts more than 75 minutes).

MeSH: Arterial Injury, Catheterisation, Anticoagulation, Fibrinolysis, Heart defects, congenital

Following arterial catheterisation, which is usually percutaneous and often through the femoral vessel, clinical observations include palpation of distal pulse, colour, temperature and capillary return of the used limb, as well as bleeding and haematoma formation. If any of these observations indicate reduced perfusion to the limb, remove any tight dressings, nurse the limb exposed and at room temperature and make sure that there is no line of demarcation as this indicates severe circulatory compromise. The clinical observations can be confirmed by Doppler and the blood pressure in the affected limb can be measured and compared with the contralateral one, if unused.

Step 1: Anticoagulation

The initial treatment consists of heparin 100 U/kg as a single stat dose, followed by an infusion of 20 U/kg/hr. If there is clinical improvement in perfusion but the pulse

remains absent after 4 hours of infusion, check the activated partial thromboplastin time (APTT) and adjust the heparin dose appropriately to achieve a level of around 2.5 times the control value. Continue with heparin if improvement continues, otherwise go to the next step i.e. thrombolysis.

Step 2: Thrombolysis

Thrombolysis should be considered if there is no clinical improvement with heparin or if the pulse fails to return despite improvement in limb perfusion after 4 hours of infusion and so long as there is no contraindication. Take baseline clotting profile (repeat APTT, prothrombin time and thrombin time) haemoglobin, fibrinogen level and cross match one unit of blood. Ensure that patient has adequate venous access. The two commonest agents used are streptokinase and recombinant tissue plasminogen activator (rTPA).

Streptokinase

Initial bolus 1000 units/kg followed by an infusion of 1000 units/kg/hr.

rTPA Regime 1

Initial bolus of 0.7 mg/kg followed by an infusion of 0.2 mg/kg/hr.

rTPA Regime 2

Infusion 0.1 to 0.5 mg/kg/hr (incremental increase of 0.1 mg/kg/hr).

End Points

1. Return of pulse.
2. Bleeding at entry site.
3. Internal bleeding e.g. haematemesis, melaena, cerebral haemorrhage, retroperitoneal bleed.
4. If no response after 6 hours or if clinical deterioration

If pulse becomes weaker after stopping lytic agent, start heparin infusion 10 units/Kg/Hr with the option of further increasing the dose. If pulse disappears after stopping lytic therapy, further thrombolysis can be carried out. Patients should not be discharged for 24 hours after stopping lytic agent to make sure that pulse patency persists and that there are no signs of bleeding. The risk of bleeding can be as high as 50%.

Step 3: Invasive measures

If the pulse or limb perfusion fail to return despite adequate thrombolysis as assessed by thrombin time and fibrinogen levels (fibrinogen levels must be < 1.9) or if the viability of the limb is in question, consider surgery in infants or children. Adults may benefit from an intervention e.g. angioplasty or stent. Surgery often consists of thrombectomy, repair of intimal flap or repair of avulsed vessel.
Heparin alone is expected to be sufficient in around 75 – 80%. The rest will receive a lytic agent with complete restoration of the pulse in 65%, partial restoration in another

20% and the remaining 15 % will require surgery. Overall, surgery will be required in less than 5 %, and very rarely, will the limb require amputation.

Further reading

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