Endovascular management of an iatrogenic vertebral artery injury following internal jugular venous catheterization

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Central Venous Catheterization

- CV catheterization is not only an invaluable diagnostic modality but also an essential tool for the treating physician.

- It enables rapid and reliable intravenous administration of drugs and fluids.

- Provides access for haemodialysis in patients suffering from acute or chronic renal disease.
Complications from IJV Catheterization

- Pneumothorax
- Local hematoma
- Haemothorax
- Hydrothorax
- Central venous thrombosis
- Air embolism
- Cardiac tamponade
- Infection
- Arterial injury
Arterial complications from IJV catheterization

Early
- Haemorrhage
- Dissection
- Neurological damage

Late
- Arteriovenous fistula
- Pseudoaneurysm
Case Report Day-1

- 79-year old female patient
- ESKD under hemodialysis
- High fever and chills
- PMH
  - AF (anticoagulant therapy)
  - Previous stroke
- Right IJV catheter
- Removal of the permanent IJV catheter and de novo re-insertion of a new temporary catheter
  - 3 laborious attempts under US guidance
  - Final placement by the landmark technique
Case Report-Day 2

• Post-intervention, the patient was hemodynamically stable with no gross evident hematoma.

• The catheter’s right position was verified by chest X-ray.

• The following day the patient underwent an uncomplicated haemodialysis session.
Case Report-Day 3

- The patient presented with right upper limb sensory and motor paresis.
- The Neurology team was called based on the clinical suspicion of a new-onset cerebral infarction.
- Physical examination revealed a large cervical hematoma extending to the upper back.
- A 3-unit drop in Hemoglobin levels was also observed (10g/dl → 7g/dl).
Case Report-Day 3

- Urgent MDCT (*Ingenuity Core, Philips Healthcare, The Netherlands*).

- Large lesion (10.4 x 5 cm) with soft tissue densities in the right supraclavicular area.
Case Report-Day 3

- Neck CTA: active extravasation from the V1-2 segment of the right vertebral artery.

- In the meantime the patient showed signs of hemodynamic instability and was immediately transferred to the operating room.
Case Report- Endovascular Repair

- The procedure was performed under local and IV anesthesia with a portable C-arm (Philips BV Pulsera, rel. 2.3; Philips Medical Systems NL B.V, The Netherlands)

- 5F angiographic sheath in the peripheral right brachial artery

- Selective catheterization of the RVA with a vertebral catheter (Tempo Aqua® - Cordis, CA, USA) combined with a hydrophilic wire 0.035” (Radifocus Guidewire®, Terumo, JP).
Case Report- Endovascular Repair

- Active extravasation from the proximal part of V2 segment of RVA into the supraclavicular space.
• Rapid exchange BE covered-stent 4 X 20 mm (*PK Papyrous®, Biotronic, Switzerland*) in the V2 segment of the RVA covering the extravasation point.

• Post-stenting angio: confirmation of the sealing of the arterial disruption.

• Completion angio of the intracranial segment of the verterbro-basilar system: intact intra-cerebral arterial circulation.
There were no peri-procedural complications and the patient was then admitted to the ICU.

Unfortunately, the fulminant infection was non-reversible and the patient died on the 3rd post-operative day due to septic shock from candidemia.
Discussion

- Only a few cases of Vertebral artery injury (VAI) have been reported so far (incidence ranging between 0.5% and 11.4%).

- To date, there is no specific algorithm proposed for the treatment of vertebral artery iatrogenic injuries.

- Both surgical\(^1\) and endovascular\(^2\) treatment options have been described in the literature.
  - **Surgical approach**: higher mortality and morbidity
  - **Endovascular treatment**: contributes to a more rapid recovery, decreased neurological injury incidence and lower recurrence rate.

Discussion

• Endovascular management of these injuries has evolved considerably and is now the treatment of choice, especially in the distal segments (V2 and V3) of the VA, surgery being reserved for specific indications.

• Repair of a traumatic vertebral artery injury with a stent graft was first described in 1998\textsuperscript{1}

Discussion

• Several endovascular options
  ✓ Detachable balloons
  ✓ Coil and glue embolization
  ✓ Stent graft placement
• The type of endovascular approach might vary depending on the type of complication\(^1,2\).

Conclusion

✓ Inadvertent VA cannulation arising from central venous catheter placement is rare but can occur with devastating complications especially if it becomes late-diagnosed.

✓ VA injury may remain asymptomatic, present acutely or manifest in a late fashion thus requiring a high level of suspicion.

✓ Prognosis for a patient diagnosed with a VAD is unpredictable as the natural history of the disease is largely unknown.
Conclusion

✓ Endovascular treatment represents a safe option, especially in cases where surgical repair is not feasible.

✓ Detailed knowledge of the surgical anatomy and implementation of imaging techniques is the most effective strategy in the prevention of such injuries.

✓ US guidance has gained an increasingly promising role in CVC.

✓ Alternatively, the landmark technique can be traditionally performed.
Conclusion