Minneapolis Heart Institute® at Abbott Northwestern Hospital

ECMO Vascular Complications

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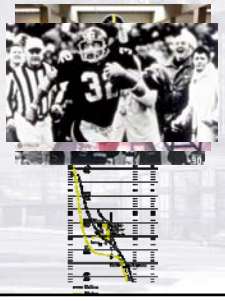
The Immaculate reception

- 1972 AFC divisional playoff
- Steelers vs Raiders
- Steelers trail the Raiders by 1 with 30 seconds left and facing a fourth and ten
- The pass towards John Fuqua is broken up and the ball deflects 24 feet backwards
- It is caught by John Franco as the ball is about to land on the ground
- He proceeds to then run more than 60 yards to score a touchdown and win the game.



The Immaculate Cannulation

- Pt is a 39 y/o female who presents with abdominal pain and fevers
- CT shows large pelvic abscess, concern for ruptured appendicitis
- CT guided drain is placed but pt does not clinically improve
- Plan for operative exploration and drainage
- Prior to laparotomy the pt has respiratory decompensation with ARDS and is unable to be oxygenated with ventilator
- Pt is taken to cath lab for VV ECMO

ECMO cannulation

Summary/Conclusions

PRESENTATION / INDICATIONS
- Hypoxic respiratory failure
- ARDS
- Severe sepsis

INTERVENTION
- The right internal jugular sheath was accessed under US and fluoroscopic guidance and upsized to a 17Fr inflow ECMO canula and positioned at the superior vena cava/RA junction.
- The RFV was accessed under US and fluoroscopic guidance and an attempt was made to place a 25Fr venous sheath in the right femoral vein but, secondary to tortuosity and fibrotic tissue, was unsuccessful (was able to dilate up to 20Fr over a stiff wire but nothing larger would pass). Initial access likely through inguinal ligament precluding successful placement of ECMO canula. An 18Fr Cook sheath was then placed with no bleeding around the sheath access site.
- The LFV was then accessed under US and fluoroscopic guidance and upsized successfully to a 25Fr outflow ECMO canula positioned within the low-mid RA.
- Full oxygenation was then provided via VV ECMO with prompt improvement in saturations

RECOMMENDATIONS & PLAN
- Successful placement of VV ECMO as outlined above
- Tranfer to ANW for ongoing management
- Will need IV heparin for large bore RFV sheath and may need surgical consultation for closure

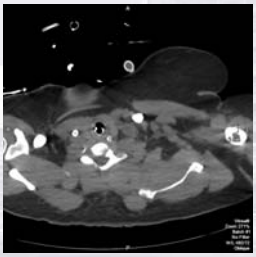
The Immaculate Cannulation

- Pt transferred to Abbott Northwestern on VV ECMO through R IJ and left CFV
- 18 Fr sheath in right groin
- Vascular consulted for management
  - Option 1 pull and hold pressure
  - Option 2 surgically remove
  - Option 3 leave it be?

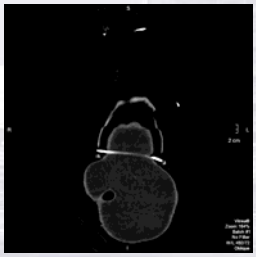
The Immaculate Cannulation

- Given uncertainty surrounding access and possible proximal entry into external iliac vein which would raise risk for retroperitoneal/intraperitoneal bleeding CT scan obtained

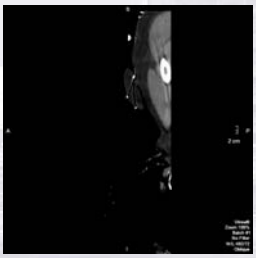
CT Scan (axial)



CT Scan (coronal)



CT Scan (sagital)



CT scan

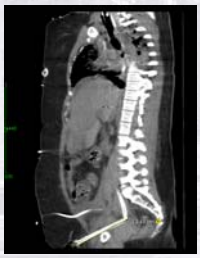
- Appears to be in the vena cava
- When aspirated the sheath draws easily

Operative removal

- Right groin exploration
  - Interesting finding#1: sheath does not appear to enter right common femoral vein
  - Interesting finding#2: sheath does not appear to enter right external iliac vein and in fact runs much more caudally into the deep pelvis
- Exploratory laparotomy
  - Interesting finding#3: sheath appears to enter the left internal iliac vein
- Increasing the challenge of this case was the pelvic abscess that limited exposure

The Immaculate Cannulation

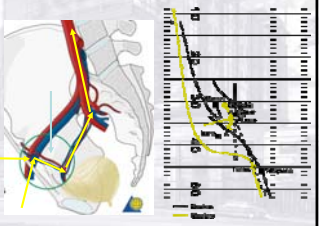
- Venous access appears 13.5 cm (5.4 inches) from skin
- House of God Law #6
  - There is no body cavity that cannot be reached with a #14G needle and a good strong arm.



The House of God, Samuel Shem

How did this happen?

- Either magic or the corona mortis
- The corona mortis (Latin for crown of death) is a connection between the external iliac vessels and the obturator vessels (in this case veins)
- I think body habitus contributed with a steeper vein access angle



Corona Mortis: An Anatomical Study with Clinical Implications in Approaches to the Pelvis and Acetabulum

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Clinical Anatomy 20:433–439 (2007)

- Cadaver study (40 cadavers, 80 Hemipelvises)
- Arterial anastomosis identified in 29/80 (36%)
- Venous anastomosis identified in 48/80 (60%)

How to avoid

- Pass wires under fluoroscopic guidance
- Note odd areas of resistance wire deflection
- In AP projection it maybe difficult to detect as the vessels run nearly parallel
- Most importantly if something is wrong stop, reassess and if needed find other access

Case #2 bilateral leg ischemia in VA ECMO

- 61 y/o male with cardiac arrest and coronary revascularization from right CFA access
- IABP placed for support through right femoral access
- The pt was persistently hypotensive and was placed on VA ECMO through left femoral artery. Pt had drop in regional sats in left leg, so a distal perfusion catheter was placed in left SFA

Case #2

- In ICU pt was noted to have downward trending regional sats in the right leg (where IABP was)
- Coronary angiogram films (of the femoral access) showed a dissection in the femoral artery
- Femoral repair not possible with IABP in place
- IABP felt to be necessary

Case #2

- Options:
  - Remove IABP, repair artery, replace IABP
  - Move to central cannulation
  - Subclavian artery access for IABP with femoral repair
- Option #4 (what we selected) place a second distal perfusion cannula in the right SFA
- Femoral artery repaired at time of decannulation

References

- Darmanis S, Lewis A. Mansoor A, Bircher M. Corona Mortis: An anatomical study with clinical implications in approaches to the pelvis and acetabulum. Clinical Anatomy 2017;20:433-439