THE FRACTURED NECK OF FEMUR

INTRODUCTION

- When you find yourself on a trauma list you will undoubtedly be doing a lot of these
- Routine but can be challenging cases as:
  - Very frail patients
    - NB; given the surgery is the definitive way to alleviate pain and without repair mortality is almost certain
      - A repair of a #NOF is considered a palliative procedure
      - Therefore virtually no one is "unfit for surgery" – they are just very high risk
  - Delirious/demented
    - Anaesthetic history/cooperation/consenting is challenging
  - High turnover – therefore your list will be full
    - But don't neglect spending time assessing these patients!
- Mortality and morbidity associated with an admission with a #NOF is high and outcomes are closely monitored
  - To improve this most anaesthetic departments have protocols/guidelines on how to manage these patients
  - Look up your local guidelines – they are useful resources!

PRE-ASSESSMENT

- Expect frail, co-morbid patients
- Key areas you need to ascertain:
  - Medical co-morbidities
    - Pay special focus on any cardiac issues – look at recent echos
      - Severe aortic stenosis is common in this age group and causes us concern
        - It means their heart cant increase its cardiac output in response to profound vasodilation (caused by a spinal or to a lesser extent a GA) to maintain blood pressure
        - Which can lead to impressive cardiovascular collapse, hence in these patients a GA is often preferred
    - Look at an ECG
      - Don't be caught out by missing fast AF or complete/trifascicular heart block (refresh in your head how to spot these)
        - As these may be one of the few reasons to delay to optimise the patient
  - Functional state
    - Carers, exercise tolerance, able to do stairs etc
  - Cognitive state
    - Have the surgeons snuck in a consent form 1 on a patient that clearly doesn't have capacity?
      - Best to pick up earlier rather than in the anaesthetic room
    - If they clearly lack capacity, speak to next of kin
      - Although time consuming this is important
        - Gives you a full idea of the background of the patient
        - Allows you to communicate the risk of the procedure/anaesthetic clearly (document this)

PRE-ASSESSMENT CONTINUED

- Key areas you need to ascertain:
  - Signs of infection
    - Is this why they fell and broke their hip?
    - If septic may need antibiotics and resuscitation before the procedure
  - Reasons not to do a spinal
    - Clopidogrel taken in the last 7 days (aspirin is fine)
    - Platelets < 80
    - Warfarin with INR>1.5
    - DOAC not stopped long enough (see later slide)
    - Cardiovascularly vulnerable
      - Ie severe aortic stenosis or LVF
      - Risk of severe hypotension after spinal
  - Look at the bloods
    - Anaemic?
      - If < 80 consider pre-op transfusion
      - If < 100 consider cross matching 2 units of PRBC, there can be significant blood loss associated with these operations
    - CKD/AKI present?
      - Ensure no drastic electrolyte abnormalities
      - Tight BP control intraoperatively
      - If eGFR < 30 avoid gentamicin
    - Coagulopathic?
      - May need Vitamin K or prothrombin complex concentration pre-operatively
    - Group and save
      - Often need blood products post operatively
      - Ensure they don't have any antibodies
        - As if they do it can take hours to obtain appropriate blood for them

ANTICOAGULANTS AND TIME TO REGIONAL

- See the table on the next slide
- Obtained from AABGI guidelines:
  - https://anaesthetists.org/Portals/0/PDFs/Guidelines%20PDFs/Guideline_regional_anaesthesia_patients_abnormalities_coagulation_2013_final.pdf?ver=2018-07-11-163756-520&ver=2018-07-11-163756-520
- Don't worry about learning it – just take a screenshot on your phone and refer to it as needed

Drug	Time to peak effect	Elimination half-life	Acceptable time after drug for block performance	Administration of drug while spinal or epidural catheter in place[1]	Acceptable time after block performance or catheter removal for next drug dose
Heparins					
UFH sc prophylaxis	< 30 min	1–2 h	4 h or normal APTTR	Caution	1 h
UFH iv treatment	< 5 min	1–2 h	4 h or normal APTTR	Caution[2]	4 h
LMWH sc prophylaxis	3–4 h	3–7 h	12 h	Caution[3]	4 h[3]
LMWH sc treatment	3–4 h	3–7 h	24 h	Not recommended	4 h[4]
Heparin alternatives					
Danaparoid prophylaxis	4–5 h	24 h	Avoid (consider anti-Xa levels)	Not recommended	6 h
Danaparoid treatment	4–5 h	24 h	Avoid (consider anti-Xa levels)	Not recommended	6 h
Bivalirudin	5 min	25 min	10 h or normal APTTR	Not recommended	6 h
Argatroban	< 30 min	30–35 min	4 h or normal APTTR	Not recommended	6 h
Fondaparinux prophylaxis[5]	1–2 h	17–20 h	36–42 h (consider anti-Xa levels)	Not recommended	6–12 h
Fondaparinux treatment[5]	1–2 h	17–20 h	Avoid (consider anti-Xa levels)	Not recommended	12 h
Antiplatelet drugs					
NSAIDs	1–12 h	1–12 h	No additional precautions	No additional precautions	No additional precautions
Aspirin	12–24 h	Not relevant; irreversible effect	No additional precautions	No additional precautions	No additional precautions
Clopidogrel	12–24 h		7 days	Not recommended	6 h
Prasugrel	15–30 min		7 days	Not recommended	6 h
Ticagrelor	2 h	8–12 h	5 days	Not recommended	6 h
Tirofiban	< 5 min	4–8 h[6]	8 h	Not recommended	6 h
Eptifibatide	< 5 min	4–8 h[6]	8 h	Not recommended	6 h
Abciximab	< 5 min	24–48 h[6]	48 h	Not recommended	6 h
Dipyridamole	75 min	10 h	No additional precautions	No additional precautions	6 h
Oral anticoagulants					
Warfarin	3–5 days	4–5 days	INR ≤ 1.4	Not recommended	After catheter removal

Drug	Time to peak effect	Elimination half-life	Acceptable time after drug for block performance	Administration of drug while spinal or epidural catheter in place[1]	Acceptable time after block performance or catheter removal for next drug dose
Rivaroxaban prophylaxis[5] (CrCl > 30 ml.min^{-1})	3 h	7–9 h	18 h	Not recommended	6 h
Rivaroxaban treatment[5] (CrCl > 30 ml.min^{-1})	3 h	7–11 h	48 h	Not recommended	6 h
Dabigatran prophylaxis or treatment[7]					
(CrCl > 80 ml.min^{-1})	0.5–2.0 h	12–17 h	48 h	Not recommended	6 h
(CrCl 50–80 ml.min^{-1})	0.5–2.0 h	15 h	72 h	Not recommended	6 h
(CrCl 30–50 ml.min^{-1})	0.5–2.0 h	18 h	96 h	Not recommended	6 h
Apixaban prophylaxis	3–4 h	12 h	24–48 h	Not recommended	6 h
Thrombolytic drugs					
Alteplase, anistreplase, reteplase, streptokinase	< 5 min	4–24 min	10 days	Not recommended	10 days

REASONS TO DELAY A #NOF REPAIR

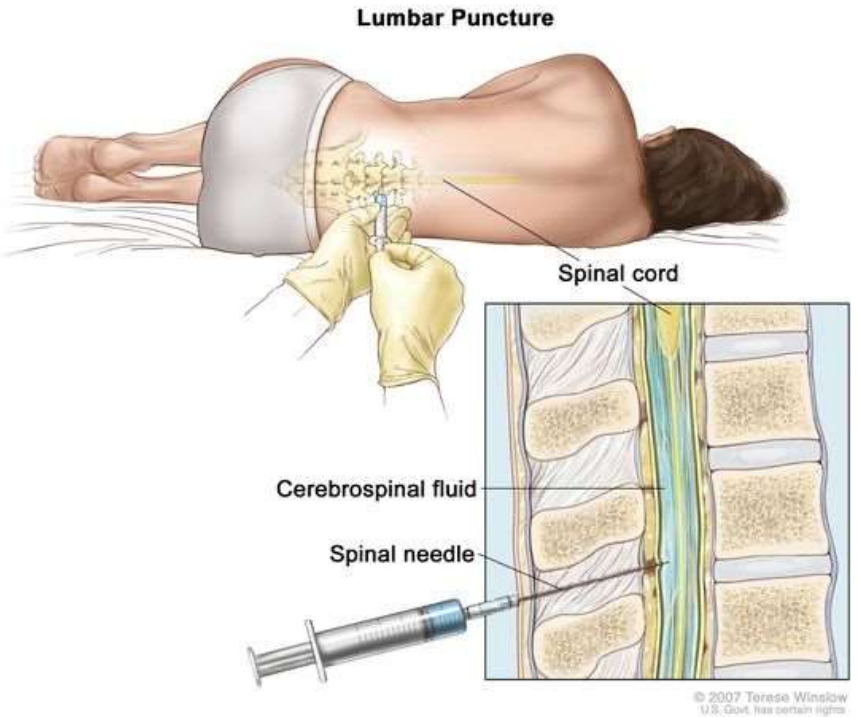
- Very few!
  - There is a big drive to minimise time between admission and repair to improve patients outcomes
  - Where mostly we aim to have patients operated within the first couple of days of their admission
  - Therefore there has to be a good reason to postpone the surgery
- Reasons to consider postponing include:
  - Hb < 80 g/dl – transfuse up
  - Na < 120 or > 150, K < 2.8 or > 6.0
  - Uncontrolled or acute onset left ventricular failure
  - Reversible coagulopathy
  - Correctable cardiac arrhythmia with a ventricular rate > 120/min
  - Significantly uncontrolled diabetes (ie DKA/HSS)

SPINAL V GA

- Most departments tend towards a spinal as
  - Less sedation/anaesthetic given therefore thought to have less impact on cognitive function post operatively
  - Not mechanically ventilated, less risk of developing post operative chest complications
  - Spinal provides post-operative analgesia, less opiates needed
- However the evidence supporting this is in question, if you are interested speak to a trauma anaesthetist about it!
- Despite the uncertain evidence base the general rule is do a spinal unless contraindicated or patient refuses

SPINAL ANAESTHESIA – TECHNIQUE

- Takes time and practice to get right – be patient
  - Plus you are doing the procedure on old patients with arthritic backs and small spaces, expect to fail a fair few!
- General tips
  - Palpating and finding the midline is key, make sure you are convinced you have done so
  - Look at the anatomy of the lumbar spine and imagine where you are with your needle
  - Learn to "walk your needle off bone"
    - This is where you make small adjustments either up or down after encountering bone
    - If you can get further by doing this but hit bone again make an adjustment in a similar direction and see if you get further still
  - Anchor your introducer and needle carefully to keep still once you have got CSF



SPINAL ANAESTHESIA – DRUGS

- Typical of anaesthetics there is some variability in practice here
- Typically local anaesthetic +/- opiate
  - 2.5 – 3ml of 0.5% heavy or plain (see next slide) bupivacaine
  - Fentanyl or diamorphine used as adjunct in the spinal
    - Acts as longer acting pain relief, reduces post operative opiate requirement
      - Diamorphine in a spinal can provide pain relief for up to 16 hours post operatively, long after the local anaesthetic has worn off
    - However adding opiates to spinals for #NOFs is becoming a less common practice as
      - A good FIB block and actually fixing the fracture usually provides sufficient pain relief
      - Concerns about extra opiate in the spinal contributing to respiratory depression in frail patients
    - See what your department does and ask them why!

HEAVY V PLAIN BUPIVACAINE

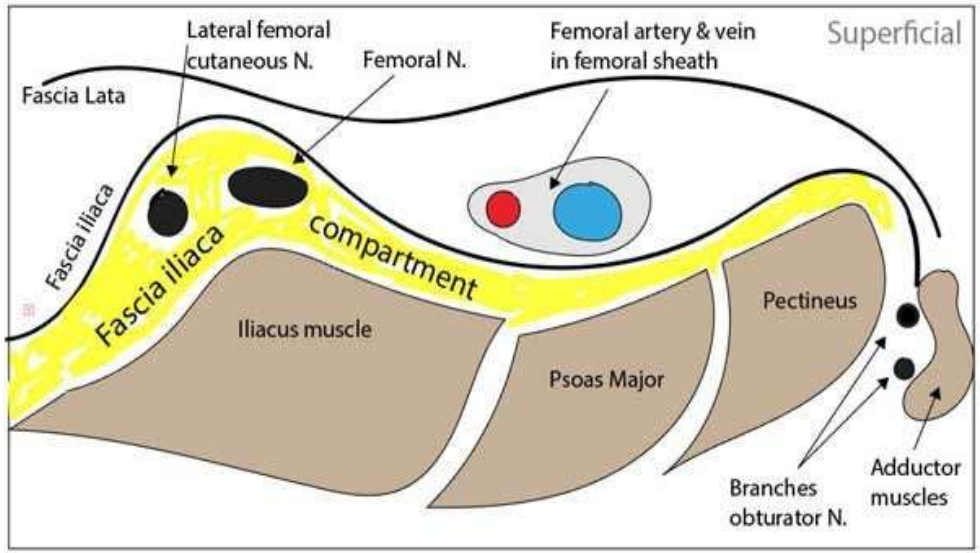
- Heavy (hyperbaric) bupivacaine
  - Why is it heavy?
    - Glucose is added to the solution to make it relatively heavier than CSF
    - Therefore it will sink/migrate more when injected
    - This means the dermatomal level of anaesthesia you get is higher and is easier to manipulate by positioning
    - It also means using this in a #NOF with the bad hip up when doing the spinal (common practice) that you have to quickly get them on their back once the spinal is in or else it will all sink to the good, non-operative side
    - The glass spine
      - https://www.youtube.com/watch?v=XQ7zh5rdu6o&ab_channel=OAAinfo
      - An old, but good resource that demonstrates how the baricity of local anaesthetic affects its migration
      - Worth a watch, all the consultants will quote it when talking about this topic!
  - More commonly used in obstetrics
- Plain (normobaric) bupivacaine
  - More commonly used in #NOF
  - Less migration/manipulation of block level
    - Will "stick" at the level you have injected it

FASCIA ILIACA BLOCK

- Done after the spinal (or GA) to provide pain relief after surgery
- This is an entry level regional anaesthetic technique – probably the first one you will learn
  - And one you could be doing independently soon if you get enough under your belt
- Its "plain block"
  - This means you are aiming for a fascial plain rather than individual nerves
  - Therefore you use high volumes (~30mls 0.25%mls bupivacaine) to wash the local anaesthetic proximally from your needle to target multiple nerves at once

FASCIA ILIACA BLOCK – ANATOMY

- Can do by landmark technique
  - But we are new age anaesthetists, learn to use ultrasound!
- As the name suggests your local anaesthetic is aiming to be deposited below the fascia iliaca
  - That way it can spread to anaesthetise the
    - Femoral nerve
    - Lateral cutaneous nerve of the thigh
    - Obturator nerve
- Two ways to do it, infra or suprainguinally (above or below the inguinal ligament0)
  - Infrainguinally is the more basic technique so likely the one you will learn first – so will be described here



FASCIA ILIACA - TECHNIQUE

- As with any regional technique youtube is a great resource
  - https://www.youtube.com/watch?v=a87131FE7Yw&ab_channel=TheBlockist%28USGNerveBlocks%29
- Biggest challenge is keeping your needle "in plain"
  - Ie directly below the ultrasound probe's beam, a credit cards width!
  - Takes time, practice and getting used to
  - Top tips
    - Make small adjustments each time
    - Remember its not just the where you have placed the probe on that patient but also the angle your probe is pointing, both of these have to be adjusted to get your needle in view
    - If you are completely lost, take your eyes off the screen and look at the probe – does it look like its pointing down where your needle is?
    - Once you have found your needle keep the probe hand still (easier said than done!)
- Advance your needle through first the fascia lata and then the fascia iliaca (may feel a "pop" each time)
- See how your local anaesthetic spreads
  - Should see a clear black bleb of anaesthetic spread down and medially towards the femoral nerve

INTERESTED IN REGIONAL? WANT TO LEARN MORE?

- I would recommend the app AnSo
- Costs around £7
- Really simplifies and shows clearly the
  - Anatomy
  - Patient positioning
  - Needle path
- It has really helped me quickly look up/remind me of what I'm looking for when preparing for a block

TYPES OF #NOF ORIF

- Important to know as affects patient positioning at length of operation
- DHS (dynamic hip screw) +/- femoral nail
  - Fracture lower down (subtrochanteric)
    - Therefore blood supply to femoral head not compromised
    - Therefore don't need to replace the femoral head – reduction and fixation of the fracture sufficient
  - Quicker procedure
  - Patient remains supine (and table goes high up in the air)
  - Needs traction and X-ray to reduce fracture and ensure alignment
    - Get your lead gown on!
- Hemiarthroplasty
  - Fracture higher up (subcapital)
    - Blood supply to femoral head potentially compromised
    - Therefore femoral head needs to be replaced with a prothesis or else will necrose
  - Longer procedure
  - Done in lateral position, bad side up
  - Surgeons have good access to joint capsule – good place to infiltrate local anaesthetic
    - Therefore FIB not always needed – check beforehand
- Total hip replacement
  - Done in patients whose fracture compromises blood supply to the femoral head
  - But are younger (relatively!) and likely to get more use out their hip
    - Here hemiarthroplasties would likely wear down too quickly and need revisions, to a THR is done
  - Lateral position, longer procedure
- Peri-prosthetic fracture repair
  - Can be very long procedures! Will your spinal last long enough?
    - Expect ~90 minutes of surgical anaesthesia from a spinal, these operations can be longer than that
  - Consider using opioid adjuncts in the spinal or GA in these cases
  - Lateral positioning

SEDATION WITH A SPINAL

- Orthopods earn their reputations as carpenters for a reason; during the operation there is a lot of
  - Hammering/banging
  - Drilling
  - Shaking around
- This is understandably unpleasant to hear happening to your own body so often sedation is used
- A popular sedation used now is a propofol targeted controlled infusion (see TIVA resource)
  - As its easy to titrate up or down and wears off quickly
  - Usually aim for CPT (target plasma concentration) of 0.5 – 1 micrograms/ml
    - Titrate to effect – want a sleeping patient who is easily rousable
    - Stick a $EtCO_2$ probe in their oxygen mask and ensure they are not obstructing
      - Loss of CO_2 suggests this and needs a jaw thrust/turning down the propofol

OTHER DRUGS COMMONLY GIVEN

- Antibiotics
  - Check local guidelines
  - Usually flucloxacillin and gentamicin
    - Check allergies and eGFR!
- Tranexamic acid
  - Thought to reduce blood loss and need for post operative transfusion
  - If awake give slowly
    - Causes tachycardia, hypotension, nausea and vomiting if given too quick

A NOTE OF GA FOR #NOF ORIF

- Usually second line anaesthetic
- Key points
  - Slow and gentle as with any GA in the elderly
  - Tube or not to tube?
    - Strictly speaking given this is trauma there is a high chance of gastroparesis (and therefore risk of aspiration) – therefore intubation is indicated
    - However intubating a patient requires a deeper anaesthetic and more time on the ventilator, which has its own negative consequences
      - Hence some consultants elect to manage these cases on a supraglottic airway device (eg igel)
    - See what your consultants do and ask why
  - Still do a FIB
    - Even more important in these patients as there is no spinal to provide pain relief

BONE CEMENT IMPLANTATION SYNDROME

- A time during the operation to be vigilant
- Surgeons often give you a warning before implanting the cement
  - Or you may also smell the cement being mixed before
- Unclear pathophysiology
  - ?due to cement itself or the displaced bone marrow entering the circulation and embolising
  - ?Due to inflammatory response to the cement
- This syndrome is associated with a pulmonary embolus type phenomena
  - Ie hypoxia and cardiovascular collapse
- What do we do with the warning?
  - Ensure the patient has a sporting blood pressure (so they start off at a better place)
  - Monitor closely for signs of desaturation/hypotension
  - Not much else!
    - It is a rare phenomena, just one to be aware of and vigilant to identify early

RECOVERY ROOM CARE

- Post op analgesia
  - Spinal – oral paracetamol and opiates sufficient
  - GA – may need IV opiate boluses
- Haemocue
  - Available in most departments
  - Pin prick capillary blood sample to tell you their Hb
  - Have a low threshold to transfuse these patients
    - Hb > 80 in most patients, > 90 if have a history of IHD
- Ongoing vasopressor requirements
  - Requiring 5-10ml/hr of metaraminol/phenylephrine is not an uncommon sight in these patients
  - Ensure
    - Adequately fluid filled – low threshold to use blood, an excellent colloid!
    - You have seen a post operative ECG
      - Peri-operative MIs are common, resulting pump failure can lead to a low BP
    - You liaise with critical care
      - It takes some bravery to try to sell a 84 year old #NOF patient to ICU however an admission to HDU for 24 hours of vasopressor is not unreasonable

SUMMARY

- A common procedure you will see
- Anaesthetic pre-assessment
  - Co-morbidities/functional status
  - Identify infection
  - Can we do a spinal in this patient?
- Provision of anaesthetic
  - Spinal v GA (usually spinal)
  - Watch for hypotension
  - Do a FIB (ultrasound guided)
- During the operation
  - Consider what the operation is and the positioning
  - Use sedation for spinals
  - Watch for bone cement implantation syndrome
- Recovery room care
  - Analgesia
  - Hb
  - BP