

An Anaesthetic Complication

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Declarations

no Declarations

Learning Objectives

- Clinically relevant
- Incidence of nerve injury following peripheral nerve block
- Complications following nerve injury
- Possible causes and pathophysiology
- Management and follow-up

Why Me?

- SRH Block Room since 2013 (3/3/20)
 - 17205 total blocks
 - 3631 axillary blocks
 - 881 axillary blocks by me
- Not an expert in nerve injury
- Recent complication



Clinical Case

60y female

- Wrist surgery
- Axillary Block
- Uncomplicated peri-operative journey

- Now has median nerve axonal injury

Incidence

- Most commonly reported incidence of 'persistent' neurological symptoms greater than 1 year:
 - 2-4/10000
 - irrespective of technique or block site
- All studies report a significant decrease in incidence over time:
 - 2.2% 3months, 0.8% 6months, 0.2% 12months [1]

Consent

RCoA

- 1/10 transient, 1/2000-1/5000 long-term (currently being revised)

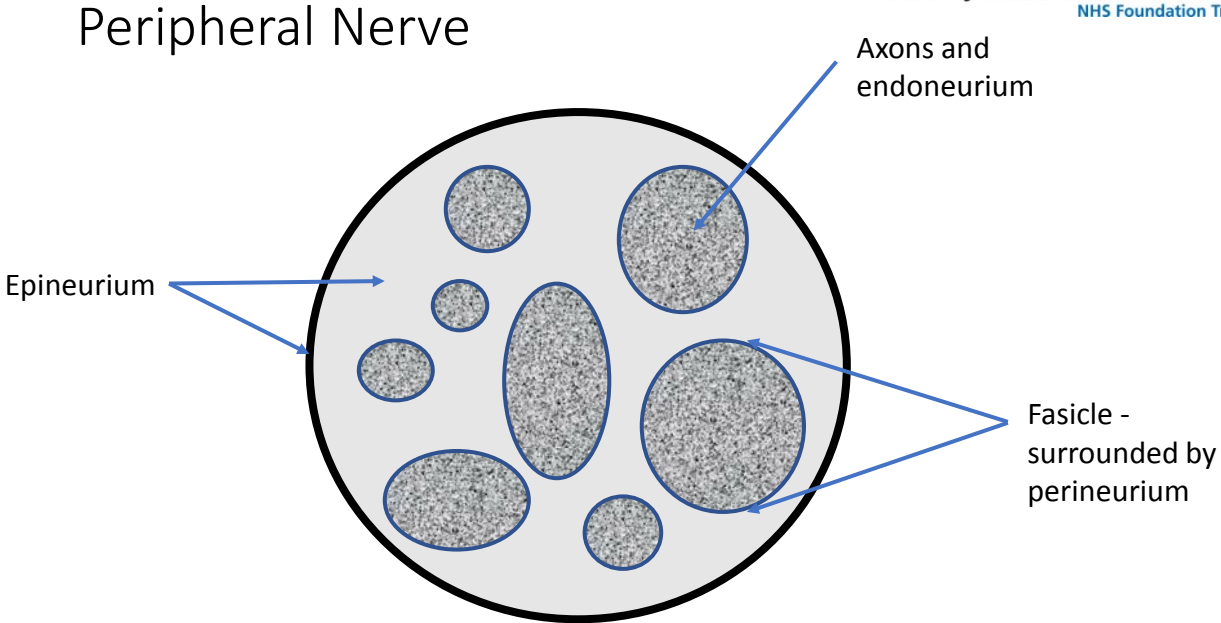
ASRA

- 2-4/10000 long-term (2015)

Sunderland Royal Hospital

- 1/10000 of nerve injury following regional anaesthesia

Peripheral Nerve



Nerve Injury - Pathogenesis

3 Types:

1. Neuropraxia – mild and reversible
2. Axonotmesis – regeneration is possible over time
 - degrees of severity and therefore prognosis
 - 'scaffolding' remains intact
3. Neurotmesis – Complete disruption of the nerve

Mechanisms of Injury

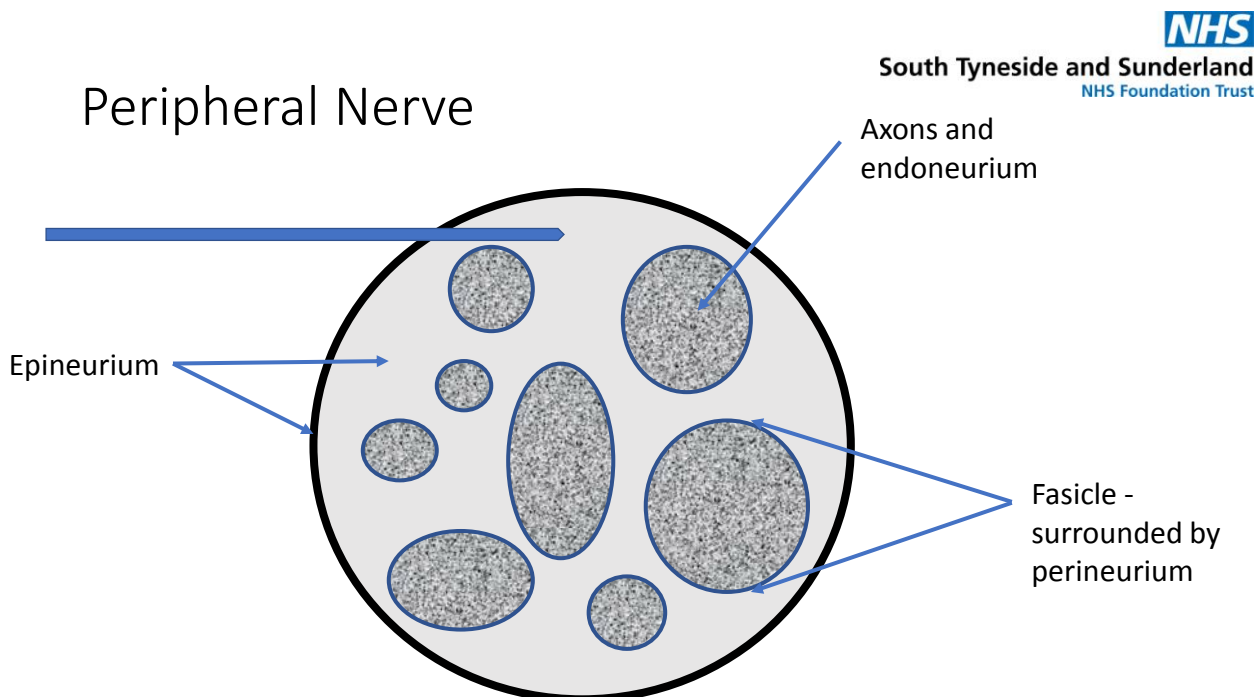
- Mechanical
 - Needle/Injection
 - Surgery
 - Positioning/stretch
 - Compression (tourniquet)
- Chemical
 - Local anaesthetic neurotoxicity

Mechanical Injury

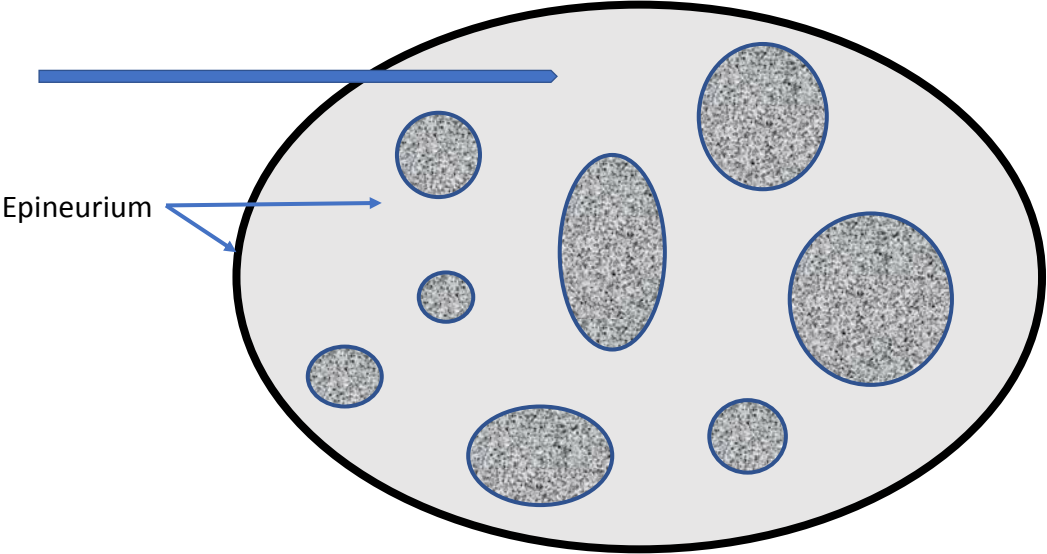
Bigeleisen. *Anaesthesiology* 2006;105:779-83

- 26 recorded USS guided axillary blocks
- 21/26 had an intraneural injection of at least 1 nerve (74/104 nerves)
- Not all patients experienced paraesthesia or dyesthesia on injection
- No change in sensory or motor testing after 6 months

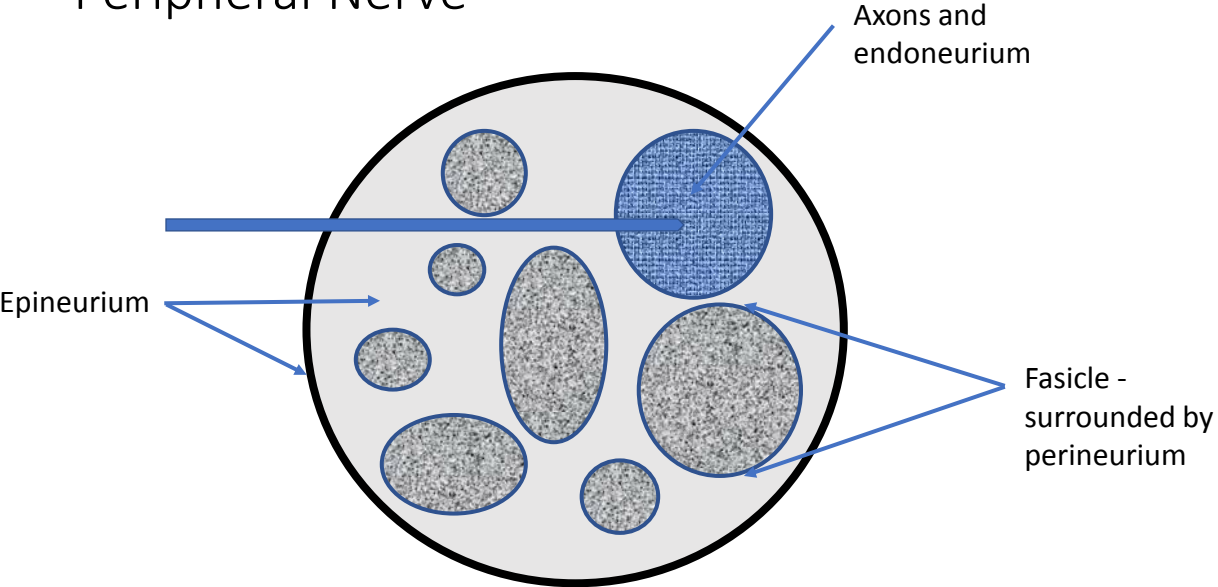
- Lupu CM, Kiehl TR, Chan VW, et al. Nerve expansion seen on ultrasound predicts histologic but no functional nerve injury after intraneural injection in pigs, *Reg Anesth Pain Med*, 2010, vol. 35 (pg. 132-9)
- Chan VWS, Brull R, McCartney CJL, et al. An ultrasonographic and histological study of intraneural injection and electrical stimulation in pigs, *Anesth Analg*, 2007, vol. 104 (pg. 1281-4)



Peripheral Nerve



Peripheral Nerve



Mechanical Injury

Intraneural vs intrafascicular injection

Injection pressure more important than nerve expansion

- Kapur E, Vuckovic I, Dilberovic F, et al. Neurologic and histologic outcome after intraneural injections of lidocaine in canine sciatic nerves, *Acta Anaesthesiol Scand*, 2007, vol. 51(pg. 101-7)
- Hadzic A, Dilberovic F, Shah S, et al. Combination of intraneural injection and high injection pressure leads to fascicular injury and neurologic deficits in dogs. *Regional Anesthesia and Pain Medicine* 2004; 29: 417–23.

In-line manometry and pressure sensitive needles

Syringe size can help

Mechanical Injury

- Positioning/Stretch
- Surgery
- Compression (haematoma, tourniquet)

Mechanical Injury

- Positioning/Stretch
- **Surgery**
- Compression (haematoma, tourniquet)

Chemical Injury - Neurotoxicity

- Sturrock et al (1979) showed cell growth inhibition and lower cell survival [3]
- Myers et al (1986) LA exposure leads to increased perineural permeability, oedema and nerve fibre injury. [4]
- Yang (2011) – higher the concentration and longer the exposure led to higher degrees of Schwann cell death. [5]

Double Crush Effect (Upton et al, 1973)

Preexisting neuropathies

- diabetic, metabolic, **nerve entrapment**
 - Increase susceptibility for further nerve damage
 - Vulnerable to longer block duration and LA toxicity to the nerve

Poor vascular supply

- Hypothermia, hypoxia, hypotension, hypovolaemia
- Smoking, vasculitis

Sunderland Royal Hospital Block Room

- Attempt to follow-up all daycase upper limb blocks (n= 4857)
- Service evaluation as well as prolonged neurological deficit
- Symptoms:
Paraesthesia, numbness, weakness, pain
- 61 required > 1 week follow-up (Incidence of 1-2/100)



Clinical Case 1

- 30y male
 - Biceps tendon repair
 - Interscalene Block/GA
 - Uncomplicated peri-operative journey
- Symptoms:
Prolonged thumb/lateral forearm numbness

Clinical Case 1 – Follow-up

Biceps tendon repair – persistent numbness in thumb

- Repeated follow-up expecting resolution
- 2 weeks, anaesthetic review
- Surgical opinion sort
- High incidence of lateral cutaneous nerve of forearm injury in particular surgical approach
- Symptoms resolved after 2months

Clinical Case 2

- 30y Male – Type 1 DM
- Multiple Trigger finger release
- Axillary Block – Median nerve top-up
- Uncomplicated peri-operative journey

- Symptoms:

Prolonged numbness, development of neuropathic pain in all fingers

Clinical Case 2 – Follow-up

Trigger Fingers release – prolonged numbness, neuropathic pain, T1DM

- Repeated follow-up expecting resolution
 - Neuropathic pain developed once numbness resolved
 - Urgent axilla USS to exclude a space occupying lesion - normal
 - Discussed with surgeon, Chronic pain referral
 - Ongoing pain distal to surgery in all fingers
- Nerve conduction studies – no nerve injury proximal to the wrist

Clinical Case 3

- 60y female
- Wrist surgery
- Axillary Block
- Uncomplicated peri-operative journey

- Symptoms:
Elbow pain but happy with block/surgery on day 1
Continued paraesthesia and pain distal to elbow

Clinical Case 3 – Follow-up

Wrist surgery – Uncomplicated axillary block

- Elbow pain at 24hr follow-up, thought to be from the tourniquet – d/c
- Severe arm pain over next 3 days (weekend) presented to A&E
- Urgent USS (7 days) – Normal
- Chronic Pain review and treatment of pain started
- MRI (3 weeks) – normal
- On-going pain, vague neurological deficit

- Nerve conduction studies – Median nerve injury proximal to the elbow

Clinical Case 3 - discussion

- Directly supervised trainee axillary block
- Documentation - no pain or paraesthesia
- Patient happy with the block and would have again – 24hr follow up

Challenges for follow up

- Patient anger/grief
- Procedural anaesthetist

SRH Incidence/Risk of Nerve injury

Transient Neurological Deficit:

Those formally followed up - 4857

Those formally followed up with transient neurological deficit – 61

1-2/100

RCoA 10/100

SRH Incidence/Risk of Nerve injury

Long-term Neurological Deficit:

Total number of individual blocks – 17200

Probable long-term nerve injury – 1

<1/10000

RCoA 1/2000-1/5000

Learning Objectives

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Thank you

References

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