

Trauma surgeons insight: Speed, Cars, Crashes, The Recovery

NRSPP
NATIONAL ROAD SAFETY

PARTNERSHIP
PROGRAM



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Moderator

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Housekeeping



Webinar is = 45 mins
Question time = 15
mins



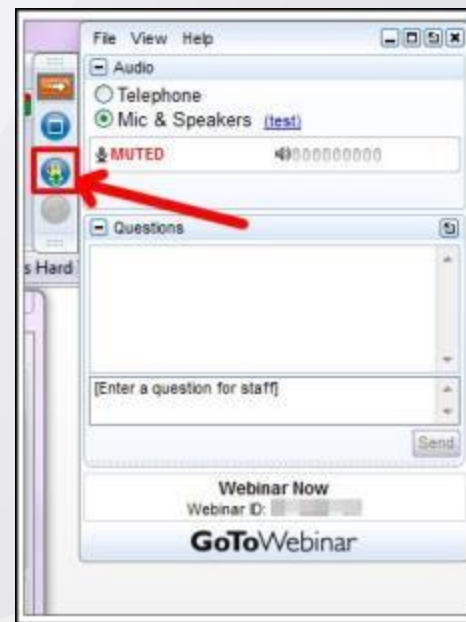
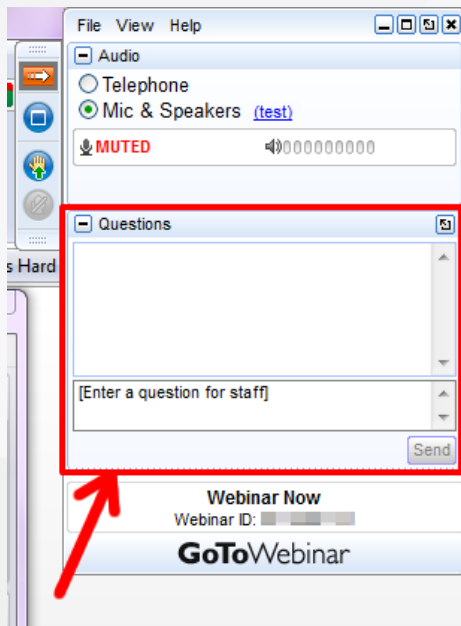
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Please type your questions here

18th October 2017

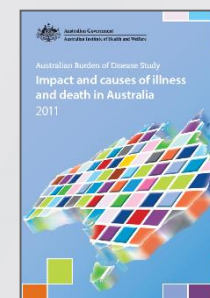
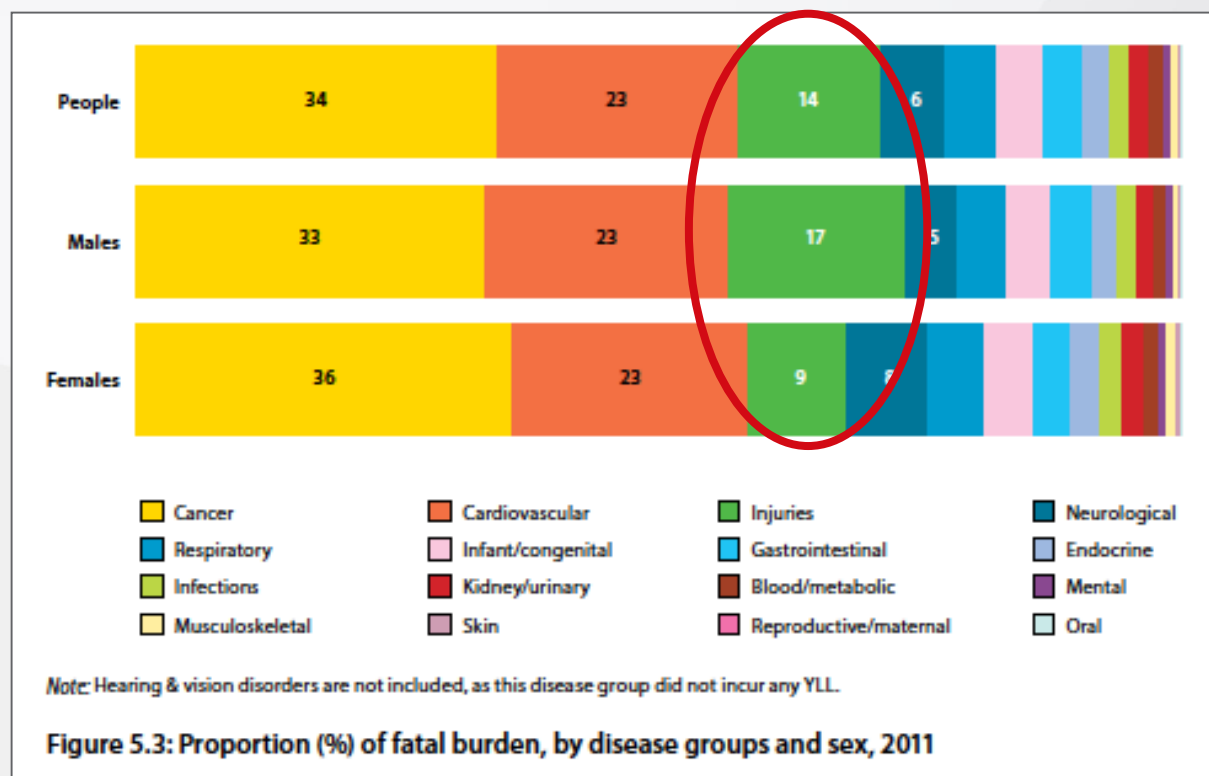
Speed, Cars, Crashes and The Recovery

Dr Scott Ferris: Plastic and Reconstructive Surgeon
Dr Kate Martin: General and Trauma Surgeon



Burden of Trauma

Australian Burden of Disease Study: Impact and causes of illness and death in Australia 2011.



Burden of Trauma

- Injury is the 3rd most common cause of death in Australians, accounting for 14%.
- For Australians under the age of 45 years, injury is the most common cause of death.

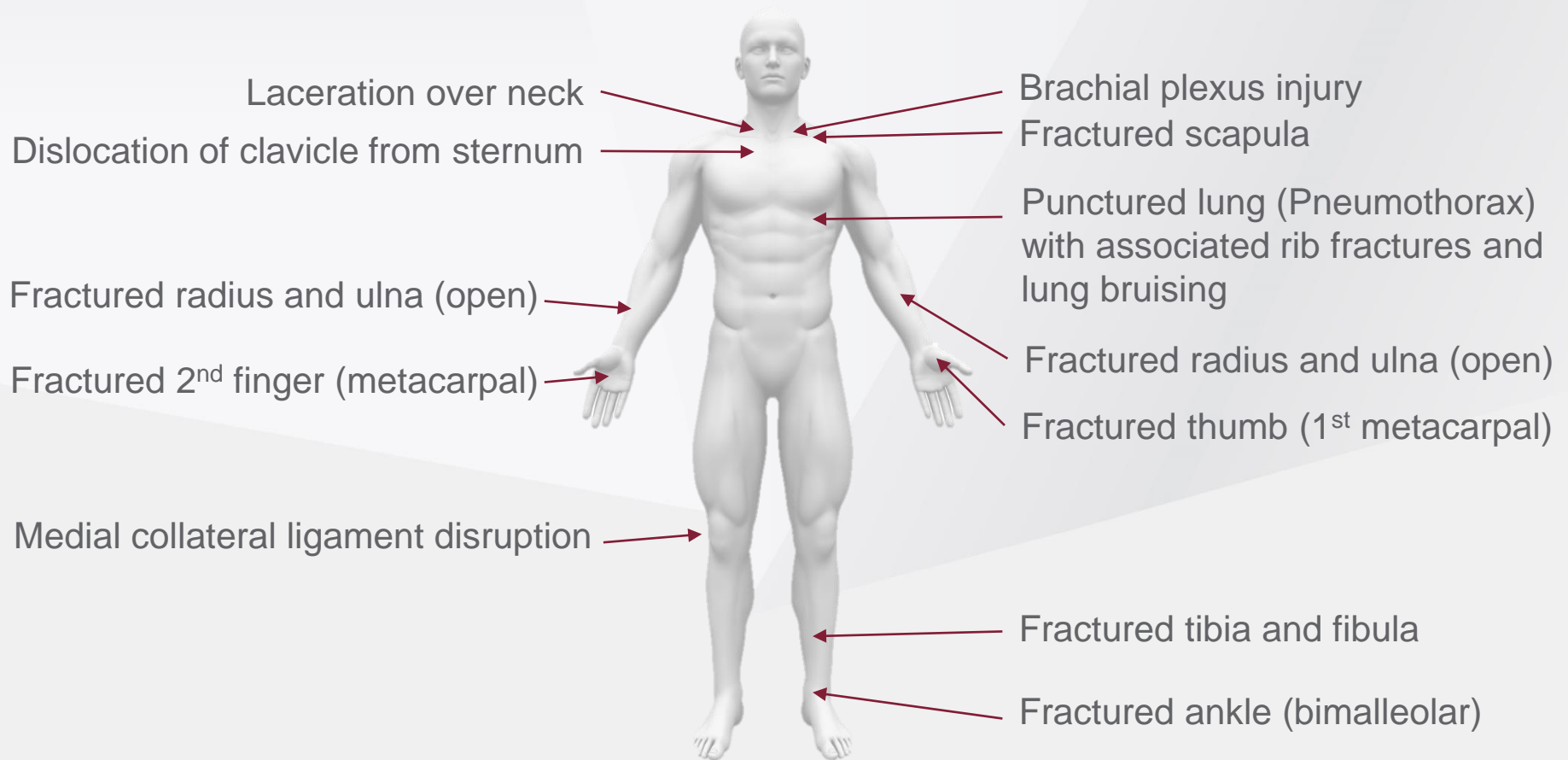


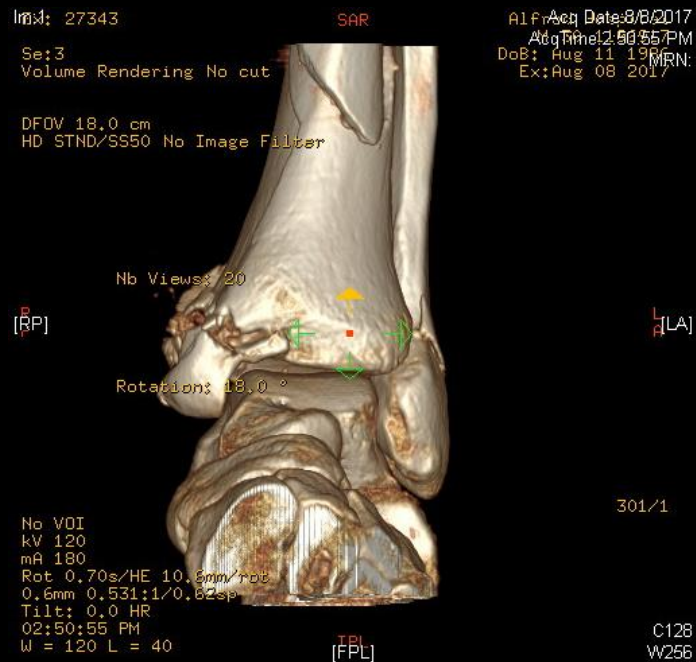
Adam's Story: 5th August 2017





Injuries Sustained





Treatment Received



- Breathing supported by a machine- induced coma
- Tube inserted into the left side of is chest to allow the lung to re-expand
- Blood transfusion required due to blood loss from multiple fractures

Surgery

Day 1:

- Internal fixation of right forearm with fasciotomy (splitting of skin to allow muscles to swell)
- Internal fixation of left forearm with fasciotomy
- Internal fixation of right 2nd finger
- Internal fixation of left thumb
- External fixation of left lower leg and ankle

Day 4:

- Internal fixation of left leg
- Partial closure of open right forearm wound
- Partial closure of open left forearm wound

Surgery: continued

Day 5:

- Skin graft to right forearm
- Skin graft to left forearm

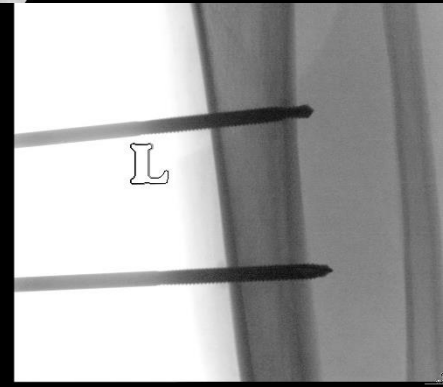
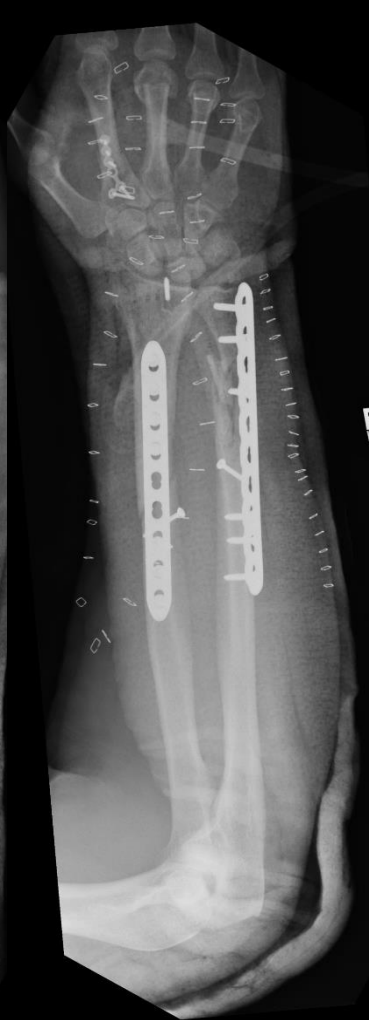
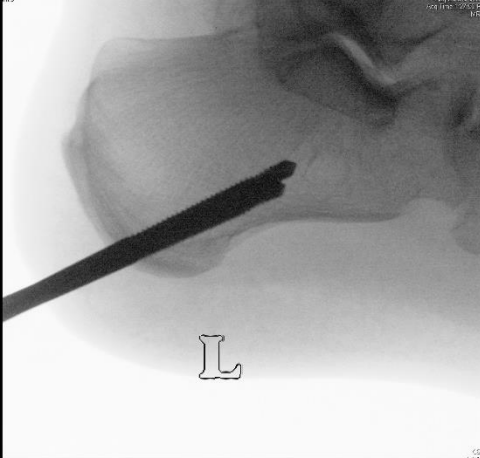
Day 18:

- Internal fixation of left ankle
- Right knee reconstruction

Imaging (X-Rays) Required

- CXR: 6
- CT Scans: 3 (Head, neck, trunk, spine, ankle)
- Plain x-rays of limbs including theatre, post-op and after discharge: 83
- MRI: 2 (knee and brachial plexus)





Adam's Journey Up Until Now

- Inpatient at the Alfred from 5th – 24th August
- Intensive care until 9th August
- Inpatient at rehabilitation from 24th August - 11th October
- Since discharge: 5 appointments back at the Alfred to see surgeons and have tests

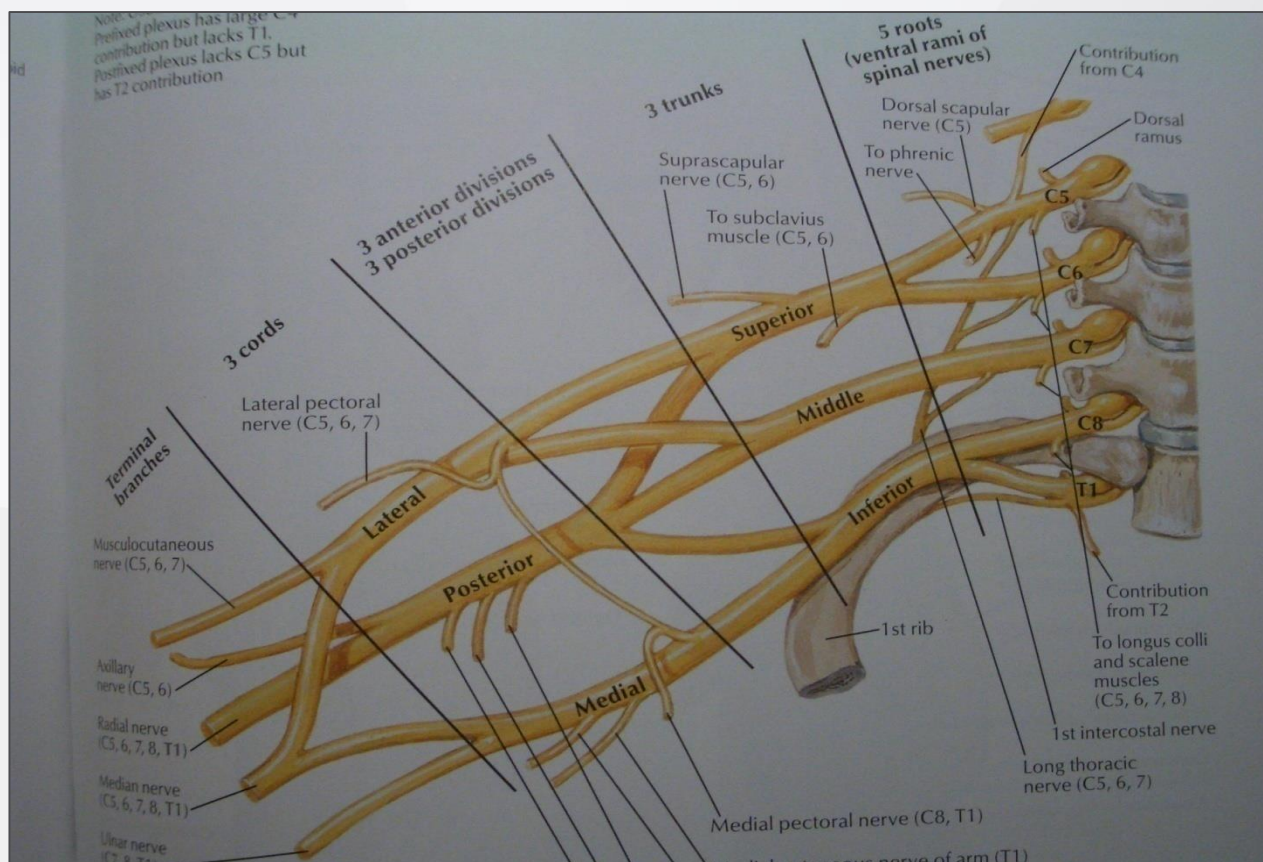




Brachial plexus – one of many vulnerable tissues

- 5 large nerve roots emerge from the spine
- Complex anatomical course before ending in the final nerves which control power and feeling in entire upper limb
- After head/neck/upper limb trauma, is injured in various well recognised patterns
- Was one of Adams many injuries

Anatomy



Degree of individual nerve injury directly relates to nature of trauma

- Higher velocity = greater injury *****
- 'Bruised nerves' mildest – likely recover
- Nerves 'internally disrupted' – some recovery possible but unpredictable and incomplete
- Nerves 'completely severed' – recovery without intervention will not happen

Number of nerves/extent of injury directly relates to degree of trauma

- Greater speed = more nerves injured *****
- Partial upper BPI - commonly upper 2 of 5 levels not working (shoulder and elbow paralysed, hand OK)
- Complete BPI - all 5 levels not working (arm hangs flail beside the body 'dead arm')

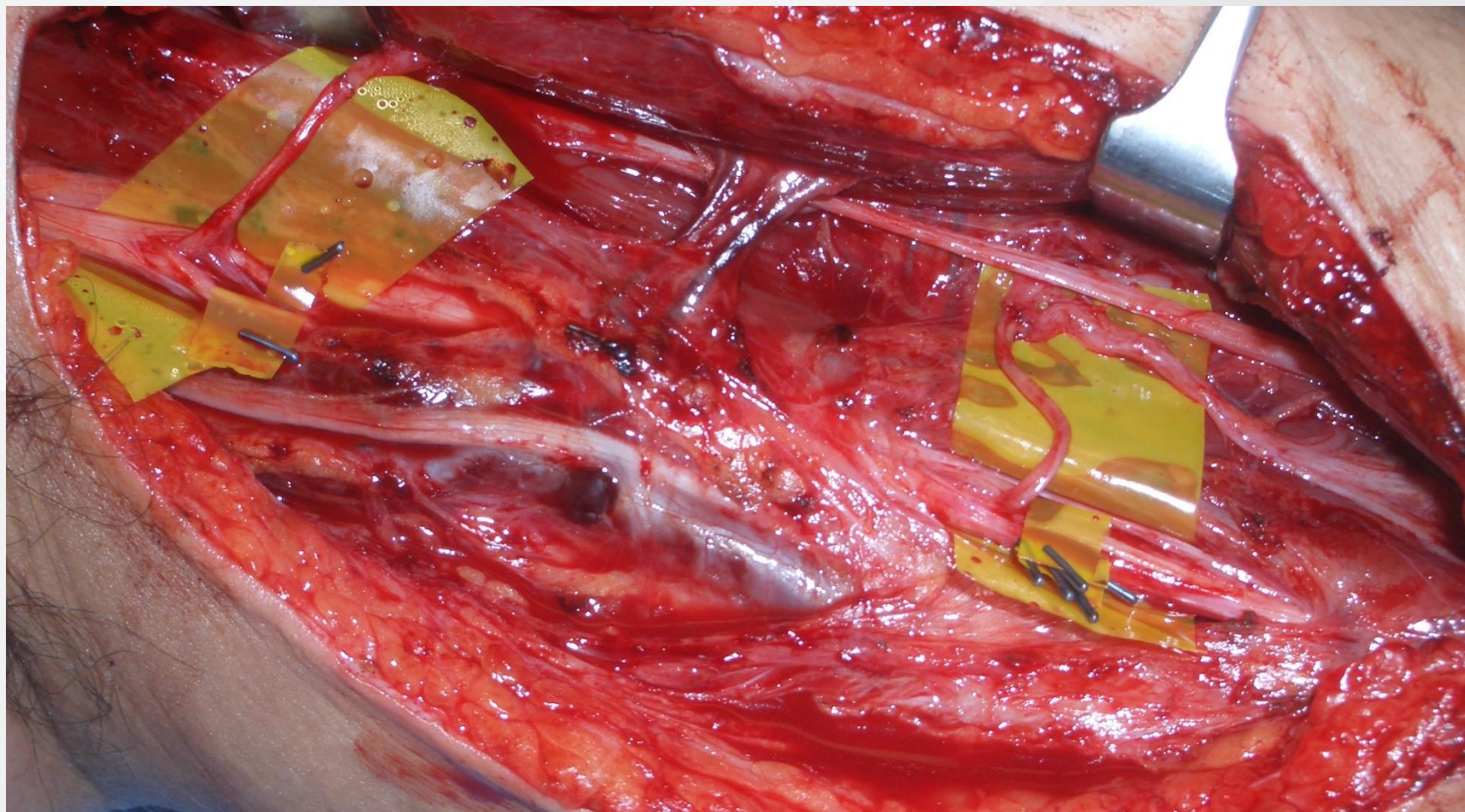
5 level injury appearance at surgery



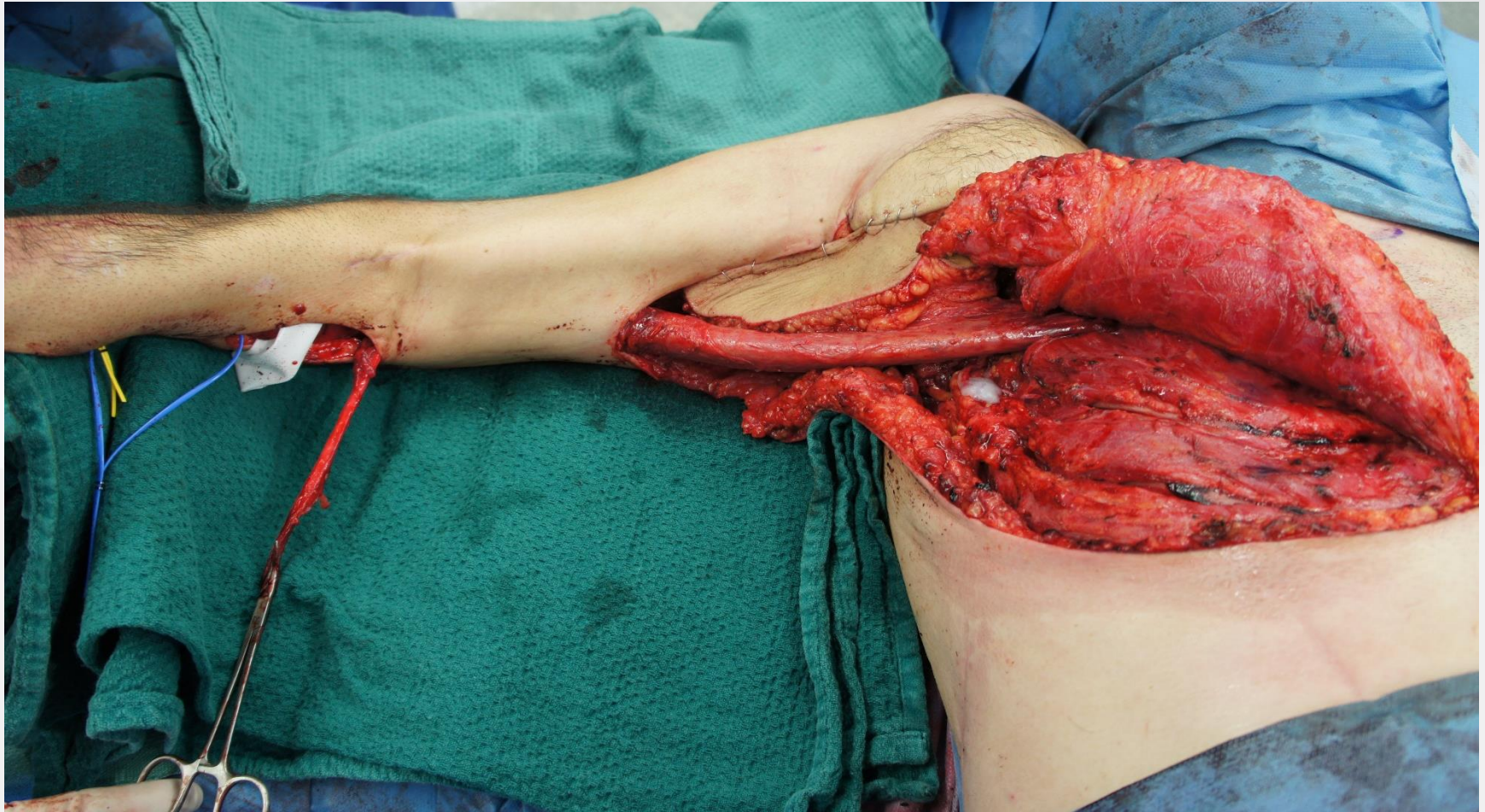
Surgical Treatment

- Nerve transfers – repurposing functioning n's
- Nerve grafts – bridging nerve gaps
- Tendon transfers – repositioning intact tendon
- Functioning free muscle transfers – importing new muscles, and joining vessels and nerves
- Joint fusions – stiffening joints for stability or creating better function elsewhere

Elbow Flexion Nerve Transfers



Free Functioning Muscle Flap



Rehabilitation Phase

- Hand therapy
- Physiotherapy
- Surgical reviews
- Second daily to 2nd weekly depending
- Ongoing for 2-5 years
- Home program in addition to above appts
- Often additional further surgeries....

Outcomes After Complete BPI

- Commonly 4-8 major surgeries
- Plateau 4-5 years after injury
- Ideal circumstances and all going well – restore a ‘helper hand’ level of function
- Often ongoing chronic pain which is frequently extremely debilitating
- Commonly do not return to work

Outcomes After Partial BPI

- Commonly 2-3 surgeries
- Plateau 2-3 years after reconstruction
- Ideal circumstances and all going well – very good limb function can be restored
- Often pain controlled or settled well
- Return to work is usual but not guaranteed
- (This is our hope for Adam, but there is a long road ahead....)

Why was Adam so badly injured?

A moving body has kinetic energy- when that body stops, the energy is transferred to another body or converted to another forms.

Adam's kinetic energy was transferred into other forms of energy: heat, compression, cavitation and shearing forces.

These forces then broke Adam's limbs, and sheared the nerves running from his neck to his arm.

Laws of Kinetic Energy

Kinetic energy is the energy an object possesses by virtue of moving

Kinetic energy is determined by the weight of the object moving as well as the speed at which it is moving

$$\text{kinetic energy (KE)} = \frac{1}{2} \text{ mass (kg)} \times \text{velocity (km)}^2$$
$$(\text{ke} = 0.5m \times v^2)$$

Speed Matters More Than Weight

$$\text{kinetic energy (KE)} = \frac{1}{2} \text{ mass (kg)} \times \text{velocity (km)}^2$$
$$(ke = 0.5m \times v^2)$$

- When considering moving energy (KE), speed has more impact than weight

For example...

double the weight will double the energy

but,

double the velocity (speed) and you will quadruple the energy

How Much Energy in a Moving Motorbike (Rider)?

- Rider weighing 70kg travelling at 60kph: approximately 126,000 joules
- Rider at 55kph: approximately 106,000 joules
- Rider at 65kph: approximately 148,000 joules

How Can We Protect Road Users?

Built To Withstand - Graham



Decrease the Speed

Even a small decrease in speed can result in a significant difference in injuries sustained

Summary

- Injury is common
- We have excellent facilities to treat you if you are injured on the road
- Non-life threatening injuries can have a profound affect on our lives
- Speed has a major impact on the energy transferred to us in a road accident
- We can't be built like Graham, but we can travel at a speed appropriate for the prevailing conditions

Thank-you!



Adam and Jenny

