

Limb salvage and long-term outcomes in patients with lower limb threatening vascular injuries following blunt trauma at a Major Trauma Centre.

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Introduction

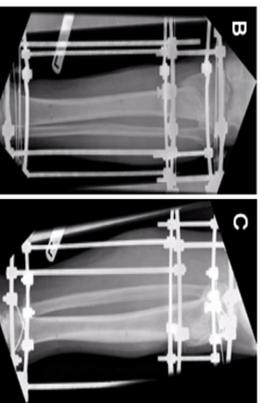
- In 2012, 26 Regional Trauma Networks (RTNs) were introduced nationwide, each comprising of a Major Trauma Centre (MTC) supported by satellite Trauma Units (TU).
- Lower limb trauma with vascular injury comprises 1.4% of trauma admissions [1], and is separated into penetrating and blunt mechanisms.
- Most frequently seen in young males and is correlated with violent behaviour and high risk taking activities [1,2].
- Crucial factors of limb salvage are: early recognition of vascular injury and ischaemic time [3].
- Potentially devastating outcomes, principally loss of limb or life [4].

Aims:

- Determine the limb salvage rate at an MTC.
- Establish patient complications and long-term outcomes following injury.

Methods

- Patients treated via ATLS guidelines including history, examination, investigations and subsequent appropriate limb repair [Figure 1].
- Retrospective analysis of paper and local electronic records.
- Inclusion criteria: adult patients with arterial lower limb injury secondary to blunt trauma treated at LGI.
- Long-term patient outcomes included: lower limb function, psychological impact, pain levels and socio-economic impact, compiled from postal questionnaires.
- Limb function was determined via the Tegner Activity Scale, pain levels via the Visual Analogue Scale (VAS) and psychological impact by the Impact of Event Scale – Revised (IES-R) [5-7].



Results

- 30 patients, comprising of 32 injured limbs, were identified.
- 24 males and 6 females, their mean ages were 32 and 49 respectively.
- Most common mechanism of injury was a road traffic accident (n=21).
- A fracture was the most frequent lower limb injury (n=27) and most commonly of the tibia (n=16).
- Dislocation occurred in 6 limbs – 5 at the knee.
- Most common site of vascular injury was the popliteal artery (n=12).
- 29 patients had ischaemic times documented, 19 were under 6 hours, and 10 over (Table 1).

Cohort	Median ischaemic time
Overall (1)	4 hours 5 minutes
Salvaged (2)	4 hours 5 minutes
Amputees (3)	3 hours 57 minutes

Table 1: Median ischaemic times. Key: 1 = 29 patients, 2 = 25 patients with salvaged limbs and 3 = all four amputees.

- 27 limbs were salvaged and 5 were amputated.
- 3 limbs underwent primary amputation and 2 needed secondary amputations.
- 1 patient died 29 days post-injury in intensive care.
- 14 limbs required fasciotomies – all at their initial operation – 11 prophylactically and 3 due to diagnosed compartment syndrome.
- 3 patients contracted deep infections of either bone (n=1) or soft-tissue (n=2) post-injury.

Scoring system	Salvaged	Amputees	Overall
Tegner pre-injury	7	4	6
Tegner post-injury	2	0	2
VAS	40	10	38
IES-R	39	10	32

Table 2: Mean Tegner pre-injury, Tegner post-injury, VAS and IES-R scores of patients with salvaged limbs, amputees and of the entire cohort.

- 15 responses to the questionnaires revealed since injury (Table 2):
- 10 patients have experienced financial difficulties
- 6 have had to change or lost jobs
- 3 were left unable to drive
- 3 required adaptations to their homes
- 5 needed long-term paid/non-paid carers to assist with daily living

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Discussion

- Site of orthopaedic injury is often strongly correlated with the neighbouring vasculature [8].
- Findings contradict ischaemic time's role as a pivotal factor in limb salvage.
- Severity of injury judged to be a better determinant of limb prognosis [9].
- Tam et al. stated that ischaemic time is dependent on a patient's tolerance to limb ischaemia which can be determined by co-morbidities and presence of collateral flow [5].
- Limb salvage rate comparable – if not better – than to other literature [9,10].
- The 1 mortality resulted from multi-organ failure with no complications of their bilateral limb repair.
- Fasciotomy rates (44%) were lower than that of comparable studies – Hatzel et al. 47% and Hlynh et al. 60% [4,10].
- 1 patient contracted a deep infection – of unknown source – requiring secondary amputation, also resulting in a protracted hospital stay and multiple revisits to theatre.
- Marked decrease in limb function post-injury.
- Encouragingly, VAS score (37) of 3C fractures less than those at LGI prior to it becoming an MTC (64) [12].
- Psychological impact variable but neither amputee or non-amputees had mean score \geq 33 associated with post-traumatic stress disorder [7].

Conclusion

- Limb salvage rate of 84%.
- 3 patients had primary amputations.
- 27/29 limbs with attempted salvage, were successful.
- Despite a low complication rate, the implications can be significant
- Long-term impacts are wide-ranging physically, mentally and socio-economically.



West Yorkshire
Major Trauma Network Teaching Hospitals
NHS Trust



The Leeds
Leeds General Infirmary
Leeds Teaching Hospitals
NHS Trust

Figure 1: A) Displaying the application of an external fixator and a vascular shunt in-situ. B) and C) AP and lateral X-ray, respectively showing on iliazov frame.