Intramedullary nailing of tibial shaft fractures: a scoping review

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Introduction

Intramedullary (IM) nailing is the typical fixation for adult tibial shaft fractures, the most common long bone fracture **[1]**. Techniques to perform IM nailing vary, and studies comparing approaches show conflicting results. The absence of a validated, cohort-specific outcome measure has led to a wide range of outcome measures reported, making comparisons difficult. The true extent and prevalence of outcome measures in use is currently not known.

Aims

- Summarise the outcome tools reported in the assessment of tibial shaft fractures treated with IM nailing.
- Provide insight into the extent, range, and nature of the publications.
- Identify any gaps in the literature and provide recommendations for future work.

Methods

PubMed and Embase databases were searched in November 2021. Covidence™ was used for article screening and data extraction. All study designs and populations were included. *Ex vivo* studies without the presence of tibial shaft fracture were included; studies reporting on open or intra-articular fractures only, or other fracture fixation were excluded. The methodology followed current scoping review guidelines **[2, 3]**.

Results

- **165 papers included for data extraction** (Figure 1):
  - 137 *in vivo* studies, 26 *ex vivo* studies, two papers included both study types.
- 47% of papers were published within the last decade (Figure 2).
- 27 different countries of origin:
  - most (35%) were from the USA. *(supplementary material)*

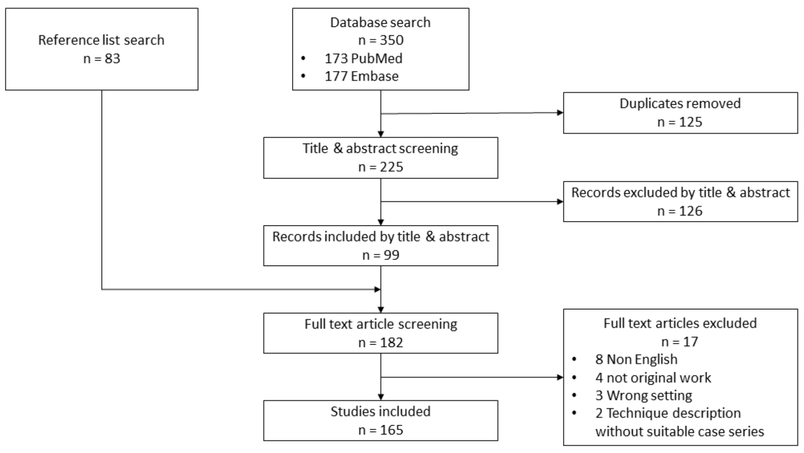

Figure 1: PRISMA flowchart.

Table 1: Number of different IM nailing approaches. See supplementary material for detailed breakdown.

	in vivo		*ex vivo*			
Approach	n_{fracs}	**%**	n_{tibias}	**%**	**Total**	**%**
IPN	6147	48.8	199	54.5	6346	49
SE	432	3.4	–	–	432	3.3
SPN	1869	14.8	110	30.1	1979	15.3
ND	4141	32.9	56	15.3	4197	32.4
Totals	12589	100	365	100	12954	100

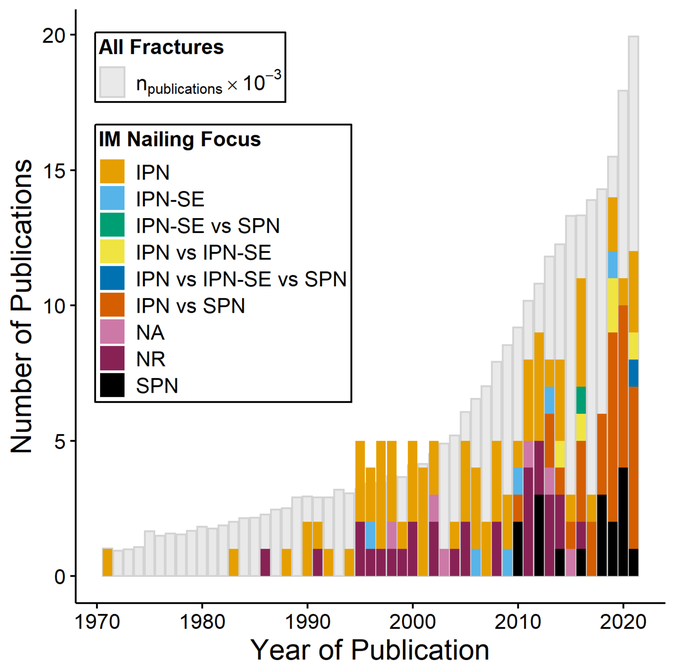

Figure 2: Number of publications per year grouped by IM nailing focus. All "fracture" publications in PubMed also presented.

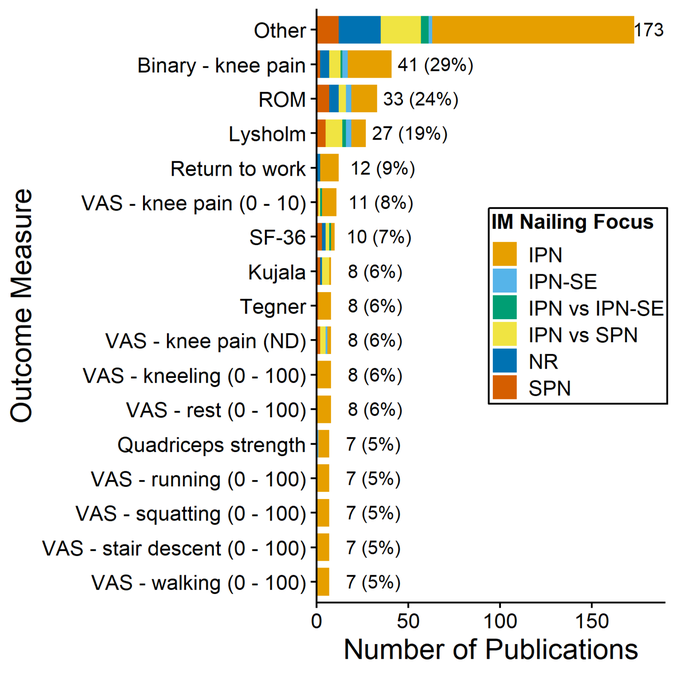

Figure 3: Patient outcomes for in vivo studies grouped by IM nailing focus. See supplementary material for full list of patient outcomes.

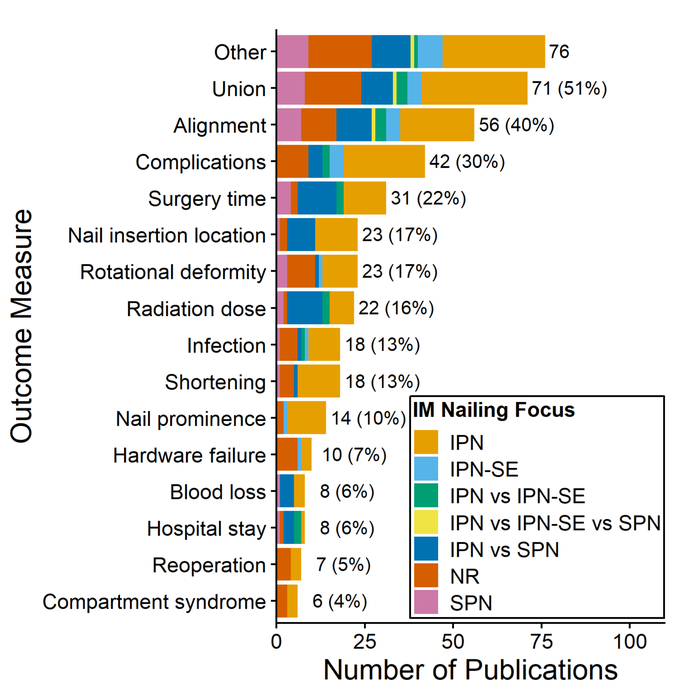

Figure 4: Clinical outcomes for in vivo studies grouped by IM nailing focus. See supplementary material for full list of clinical outcomes.

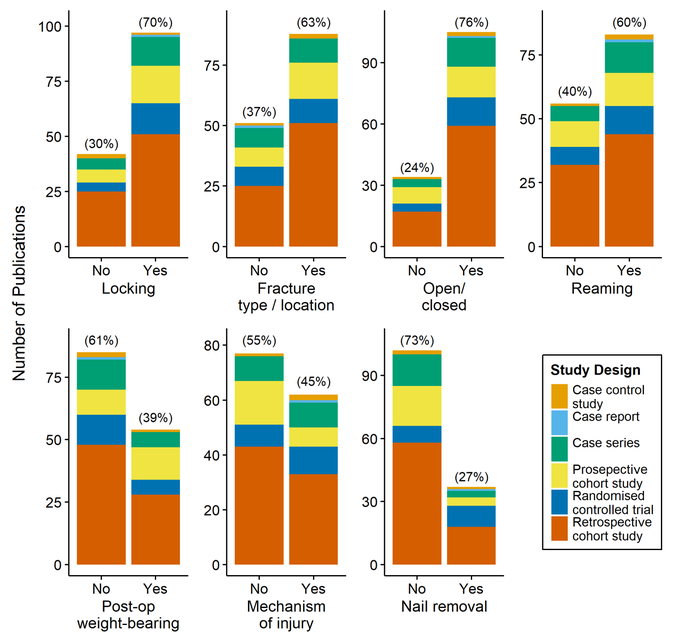

Figure 5: Ditribution of papers describing important study characteristics.

In Vivo Studies

- 12,589 fractures reported (Table 1):
  - **33% of fractures did not describe the nailing approach,**
  - medial parapatellar IPN approach was most common (21%).
- 126 unique patient outcomes (Figure 3):
  - **A binary (yes/no) assessment of knee pain was most common (29%),**
  - VAS and NRS scores accounted for 46% of all unique patient outcomes.
- 69 unique clinical outcomes (Figure 4):
  - fracture union was most common (51%).
- **Most studies did not describe:**
  - **post-operative weight-bearing regime (61%), or**
  - **the mechanisms of injury (55%)** (Figure 5).
- Most frequent follow-up times were 6 and 12 months (22% each). *(supplementary material)*
- 47% were III evidence. *(supplementary material)*

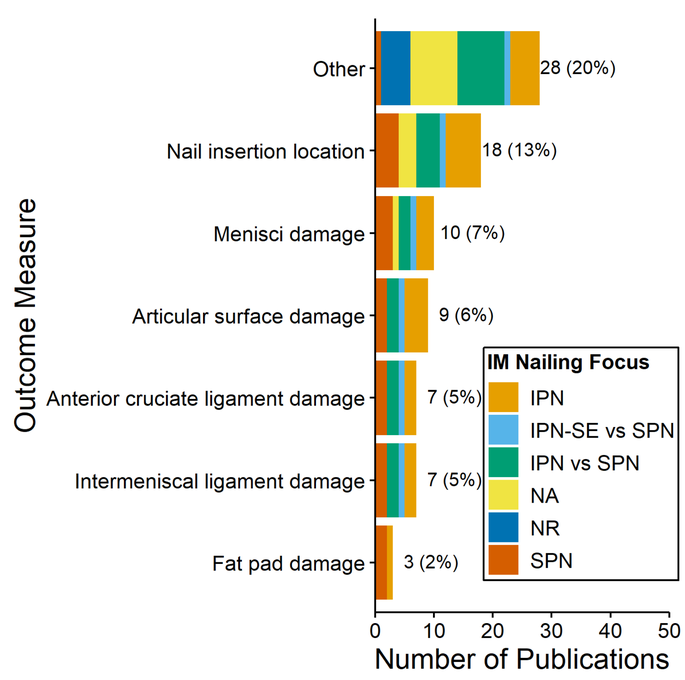

Figure 6: Outcomes for ex vivo studies grouped by IM nailing focus. See supplementary material for full list of outcomes.

Ex Vivo Studies

- 365 tibias included (Table 1).
- 33 unique outcomes (Figure 6):
  - nail insertion location was most common (13%).

Conclusion

This is the first study to detail the outcome measures used in this cohort. There was found to be considerable heterogeneity in reporting. **The most frequent modality was simply asking whether any knee pain exists**. Notably, a number of the scores routinely used were designed for other pathologies and do not contain a kneeling component, shown to cause the most severe pain within this cohort **[4]**. These results have highlighted a number of gaps in the literature and provide motivation for a validated, cohort-specific outcome measure. This work should ultimately help to inform surgical decision-making on whether an optimal IM nailing technique exists.

Acronyms

IM – intramedullary; IPN – infrapatellar nail; SE – Semi-extended; SPN – suprapatellar nail; ND – no description; NA – not applicable; ROM – range of motion; VAS – visual analogue score; NRS – numerical rating score.

More Information

Scan the QR code below to find out more.

References

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