The importance of surgical sequence in the treatment of lower extremity injuries with concomitant vascular injury: a meta-analysis

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CRD summary
The authors found that surgical sequence did not appear to affect the amputation rate associated with surgical repair of lower extremity fracture with concomitant vascular injury. In view of the lack of prospective controlled evidence, marked heterogeneity between the studies and poor reporting in the review, these conclusions may need to be interpreted with caution.

Authors' objectives
To determine whether the sequence of surgical repair of lower extremity injuries with associated vascular injury had an effect on outcomes.

Searching
PubMed (1966 to 2006) and The Cochrane Library were searched for studies. Search terms were reported. The reference lists of studies retrieved were handsearched, as were the abstracts from Orthopaedic Trauma Association meetings from 1999 to 2005.

Study selection
Randomised controlled trials (RCTs), case series and retrospective case reviews were eligible for inclusion provided that participants were adults with lower extremity injury (femoral or tibial fracture and/or knee dislocation) with associated vascular injury who underwent either lower extremity fixation followed by vascular repair or vascular repair followed by fracture fixation. Fixation could include external fixation, open reduction internal fixation or intramedullary rodding. Studies were required to report amputation as an outcome. Data on injuries treated with ligation were excluded from analysis.

The included studies addressed different types of injuries: in some studies most participants had closed blunt trauma and in others most had grade III open fractures; participants in some studies had multiple injuries. The most common injury sites were the femur and femoral blood vessels (where stated). The types of amputation varied (above knee and below knee). In several studies the included participants were selected from larger case reviews (for example, of trauma admissions).

Two reviewers independently selected studies for inclusion.

Assessment of study quality
The authors did not state that they assessed validity

Data extraction
Numbers of amputations and fractures were extracted for each study.

Methods of synthesis
Results for amputation rates were presented by the ordering of the intervention (fracture fixation first or vascular repair first). Mean percentages of amputations were calculated for each repair method overall and after weighting by sample size. A mixed-effects linear regression model was used to pool the data; this treated each study as a random effect and treatment as a fixed effect. The pooled odds ratio (fracture/vascular) and 95% confidence interval (CI) were estimated.

Results of the review
Fourteen studies were included in the review and 210 patients were included in meta-analysis (range was three to 43 in each study); 86 patients had fracture repair first and 124 had vascular repair first. All studies were retrospective reviews or case series (where reported). The highest level of evidence available was retrospective cohort study.
Amputation rate: Fracture repair first was associated with an amputation rate of 11.6% (±14.5%) and vascular repair first with a rate of 13.1% (±15.1%). The difference was not statistically significant. The equivalent weighted means were 13.9% (±36.1%) and 18.5% (standard deviation 48.6%).

Authors' conclusions
Surgical sequence did not appear to affect the amputation rate associated with surgical repair of lower extremity fracture with concomitant vascular injury.

CRD commentary
The objectives and inclusion criteria of the review were clear and relevant sources were searched for studies. It was not clear whether the search was limited by language. Steps were taken to minimise reviewer bias and error by having more than one reviewer independently select studies for inclusion, but the process for data extraction was not reported and it did not appear that study validity was systematically assessed. Little information was reported about the individual studies (such as design, participant selection and follow-up rates). These factors made it difficult to assess the validity of the findings presented. It was unclear whether it was appropriate to pool the data, in view of the heterogeneity between the studies in clinical and methodological characteristics as well as in event rates (which ranged from nil to 47% in individual studies). Moreover, no forest plot was presented and the results of the meta-analysis were not reported. In view of the lack of prospective controlled evidence, marked heterogeneity between the studies and poor reporting in the review, the authors' conclusions may need to be interpreted with caution.

Implications of the review for practice and research
Practice: The authors stated that ischaemia time appears to be a relative but not absolute predictor of amputation.

Research: The authors did not state any implications for further research.

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