Complex limb salvage or early amputation for severe lower-limb injury: a meta-analysis of observational studies

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CRD summary
This review compared the outcomes of complex limb salvage surgery or early amputation in patients with severe leg-threatening injury. The authors concluded that there are no significant differences in the functional outcomes of these patients, irrespective of the initial approach. The conclusions have to be viewed with caution since they are based on methodologically less rigorous studies.

Authors' objectives
To compare the outcomes of complex limb salvage or early amputation for severe leg-threatening lower limb injury.

Searching
MEDLINE, CINAHL and EMBASE were searched from inception to October 2006; the search terms were reported. Studies published in languages other than English were excluded.

Study selection
Study designs of evaluations included in the review
Both prospective and retrospective observational studies were eligible for inclusion.

Specific interventions included in the review
Studies investigating limb salvage surgery or primary amputation were eligible for inclusion. Only one study reported the criteria for amputation rather than limb salvage; no further details of the interventions were reported.

Participants included in the review
Patients with severe leg-threatening injury were eligible for inclusion. Two of the included studies reported that the majority of limb salvage patients had a grade IIIB injury.

Outcomes assessed in the review
Inclusion criteria for the outcomes were not stated, but studies had to report data according to treatment group. The outcomes reported included length of hospital stay, total rehabilitation time, clinical outcomes, failure rates for limb salvage, function and quality of life, pain, return to work, factors associated with poor outcome, and patient preference.

How were decisions on the relevance of primary studies made?
Two reviewers applied the inclusion criteria independently and resolved any differences by consensus.

Assessment of study quality
One reviewer recorded whether the study analysed the outcomes after adjusting for injury severity.

Data extraction
One reviewer extracted the data from eligible studies.

Methods of synthesis
How were the studies combined?
The studies were individually described and, where possible, the pooled relative risk (RR) and corresponding 95% confidence interval (CI) were calculated using a random-effect meta-analysis for some of the outcomes.

How were differences between studies investigated?
Statistical heterogeneity was assessed using the I-squared statistic. A value greater than 50% was considered to indicate significant heterogeneity.
Results of the review

Eight trials (n=885) from nine publications were included; one study was prospective and the remaining seven were retrospective. Complete reports on outcomes were available on 609 patients from the included trials.

Only one trial performed analyses adjusted for characteristics of the patients and their injuries. The authors found significant heterogeneity in the outcome measures and the time to follow-up between the studies.

Length of hospital stay (4 studies): only one out of 3 studies found a shorter median length of hospital stay for the primary amputation group (48 days, range: 19 to 116 versus 71 days, range: 28 to 218).

Total rehabilitation time (1 study): the median rehabilitation time after primary amputation was significantly shorter than after the limb salvage procedure (median 12 months, range: 2 to 108 versus 30 months, range: 12 to 72, p<0.009).

Clinical outcomes (5 studies): one study reported that, compared with primary amputation, patients undergoing the limb salvage procedure were more likely to require additional surgery (19.1% versus 5%, p<0.001), undergo rehospitalisation (47.6% versus 33.9%, p=0.002) and develop osteomyelitis (9.4% versus 3.1%, p=0.02). There were no differences in the rates of unhealed soft tissue injury and other infections. One study found that limb salvage patients were more likely to experience leg swelling than those who underwent primary amputation (24 out of 41 versus 2 out of 30, p<0.001). Another study found no differences and 2 studies did not seem to provide a comparison.

Failure rate of limb salvage (4 studies): the failure rates for attempted limb salvage resulting in secondary amputation ranged from 9 to 40% in different studies.

Function and quality of life (8 studies): the majority of studies found no significant differences in quality of life between the two groups. Two studies found better functional results for limb salvage patients.

Pain (5 studies): there was no statistically significant difference between the limb salvage and primary amputation groups (RR 1.24, 95% CI: 0.24, 3.12; 4 studies). There was evidence of statistical heterogeneity.

Return to work (7 studies): the pooled meta-analysis did not show any statistically significant differences between the two groups (RR 1.017, 95% CI: 0.96, 1.08).

Cost information

The costs associated with primary amputation were significantly lower than those associated with limb salvage in 2 studies (the actual values were not given).

Authors' conclusions

Functional outcomes among patients who present with leg-threatening injuries are similar whether they are managed with limb salvage or primary amputation.

CRD commentary

This review addressed a well-defined question in terms of the participants, interventions, outcomes and study designs. Many relevant databases were searched and the search terms were reported. Only papers published in English were selected and there appears to have been no attempt to retrieve unpublished papers, which could lead to language and publication bias. The study selection process was conducted in duplicate, whereas only one reviewer carried out the data extraction and methodology assessment, which introduces the possibility of errors and bias at these stages. Individual studies used diverse outcome measures and the results varied, thus hindering the synthesis and interpretation of the evidence base. The authors' conclusions need to be viewed with caution given the review methodology and that they are based on the results of methodologically less rigorous studies.

Implications of the review for practice and research

Practice: The authors did not state any implications for practice.

Research: The authors stated the importance of research to optimise triage decisions to avoid failure of limb salvage. They also advocated research on interventions targeting important psychological prognostic variables.
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