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Review

# Systematic review: Early versus late dangling after free flap reconstruction of the lower limb<sup>☆</sup>

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## KEYWORDS

Dangling;  
Rehabilitation;  
Free flap;  
Lower limb trauma

**Summary** *Introduction and aims:* Dangling regimes after free flap surgery to the lower limb vary between centres and clinicians. There is currently no accepted gold standard. This review examines the evidence for early versus late post-operative dangling after free flap reconstruction of the lower limb. The secondary aim is to evaluate the regimes used.

*Material and methods:* Medline, Embase and the Cochrane library were searched for all studies on dangling or rehabilitation after free flap reconstruction in the lower limb (December 2015). All studies outlining a clear dangling regime were included. Data were extracted by two authors independently and analysed using the software package Review Manager (RevMan 5). All authors were contacted for further information.

*Results:* 197 patients were included from 8 studies: 1 randomized, 6 cohort and 1 case-series. Although some studies did not state the aetiology, of those that did; 42% were trauma, 31% oncology, 20% complex wounds and 7% infection. The majority of flaps were latissimus dorsi, 18% parascapular, 15% anterolateral thigh and the remainder was mixed. Forty-eight percent of patients dangled on post-operative day (POD) 7, 29% on day 6, 4% on day 5 and 18% on day 3, with varying regimes. A meta-analysis of comparable studies showed circulatory benefit after 4 days of dangling using tissue oxygen saturation as a measure. Four flap failures (2.0%) were reported.

*Conclusions:* There is physiological benefit in post-operative dangling. A 3-day flap training regime is sufficient for physiological training. However, the optimal flap training regime remains unclear. It may be appropriate to start dangling as early as POD 3. More research is needed to determine the optimal time to start dangling and the regime.

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## Background

### Description of the condition

Lower limb reconstruction ranges from simple measures such as skin grafts and local flaps to free flap reconstruction. There are many options for the type of reconstruction depending on the aetiology, host and choice of patient and surgeon. The type and timing is typically negotiated by the patient and treating surgeon depending on preference and need.

Free flap reconstruction may be required for composite defects after trauma, oncological resection, infection or other wound healing problems.<sup>1</sup> Here, tissue is transferred to

a new location in the body, and relies on vascular anastomoses for arterial inflow and venous drainage.<sup>2</sup> Free flap surgery carries a higher risk profile than other reconstructive options, and requires commitment by the surgeon and patient.

### Description of the intervention

After free flap reconstruction, it is usual to rehabilitate the tissue in its new position by progressive dangling regimes.<sup>3,4</sup> Here, the operated limb is taken below the horizontal for a defined period of time. This gradually habituates the flap to the fluctuations in arterial pressure, venous pooling and oedema in its new environment.<sup>5,6</sup> The dynamic changes are thought to be as a result of angiogenesis, remodelling

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