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CORRESPONDENCE AND COMMUNICATION

The use of suspension frames as an adjunct to complex soft tissue reconstruction of the extremities

Dear Sir,

Limb positioning is a major problem in free tissue reconstruction of extremity defects. The main concern is to prevent any pressure on the flap or vascular pedicle either during or after the operation. Bulky dressings or positioning on supporting cushions run the risk of slipping which may lead to pressure on the flap and ensuing complications. There is commonly the issue of stabilizing a concomitant fracture, requiring the addition of back slab casts to the dressings. This further compounds the risk of stress to the flap and pedicle, leading to complications or failure of the reconstruction.

Our solution to these issues is the suspension frame. Suspension frames are bespoke constructions using the external fixation system. The frame suspends the limb above the operating table to facilitate access to the recipient vessels and subsequent inset of the flap (Figure 1). Most importantly, the frame allows stable post-operative elevation and prevents contact on the posterior aspect of the limb thereby removing the risk of pressure on the flap or its pedicle. The frame also allows minimal dressings or splints to be used, which in turn permits better flap visualization. In the lower limb, incorporating the foot into the frame in the appropriate posture prevents equinus deformities as these patients are confined to bed rest for a variable length of time following surgery (Figure 1). If there is a co-existing fracture, the frame can be extrapolated from the components used to stabilize the fracture. This is carried out by using the tube to rod coupling devices, irrespective of whether the external fixator is a uniplanar or multiplanar system.

The use of these frames can be extended to any flap reconstruction of the upper (Figure 2) and lower limb, and not limited to the posterior soft tissue defects. Potential complications of the suspension frame are similar to the complications of any external fixation system, i.e. infection[1] and nerve[2] or vessel injury from the pin insertion.

In the majority of the cases, there is no requirement for the insertion of extra pins beyond the ones required for fracture stability. However, we are unsure whether the creation of a suspension frame around an external fixation system contributes to its loosening and subsequent fracture instability. In cases where there is merely a soft tissue defect, without any fracture, we feel that the application of a suspension frame is justified despite the potential complications. In our opinion, the overall benefit of the frame, particularly in preventing flap loss from limb malposition, outweighs the minimal risks of the frame application. The frame is removed soon after the critical post-operative period, usually between the seventh and tenth post-operative day. Between January 2012 and July 2013,

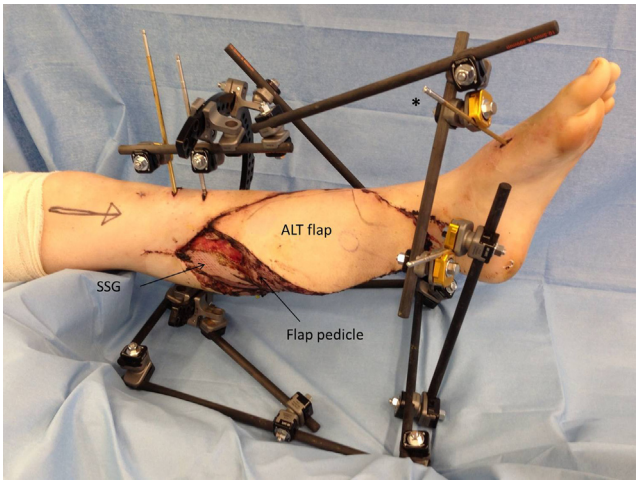

Figure 1 Reconstruction of a large soft tissue defect and open tibial fracture with a free anterolateral thigh (ALT) flap and split skin graft (SSG) to the left lower limb. The position of the flap pedicle is demonstrated (in this case, anastomoses of the flap vessels were performed end to side to the posterior tibial vessels). The suspension frame incorporates the external fixator pins inserted for fracture stabilisation and a fourth pin (*) to prevent an equinus deformity. Apart from moist dressings over the skin graft to prevent desiccation, no other dressings were applied onto the limb, allowing easy visualisation of the flap.

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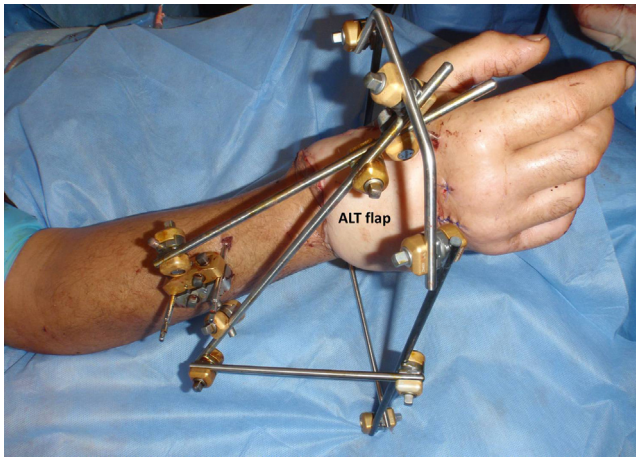

Figure 2 Reconstruction of an open carpal fracture-dislocation and degloving injury with a free anterolateral thigh (ALT) flap. The flap vessels were anastamosed end to side to the radial artery and vena comitantes. No other dressings or splints were applied to the limb in the immediate post-operative period, enabling unobstructed views of the entire flap.

we employed the suspension frame in eleven lower extremity and 5 upper extremity cases (including one case of replantation at the wrist). There were no flap failures, need for frame revision, fracture non-union or mal-union.

We therefore recommend the use of suspension frames as an important adjunct in achieving successful upper and lower limb reconstruction.

Conflict of interest/funding statement

None.

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