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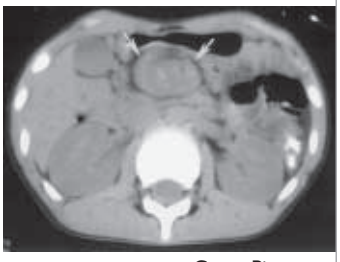

Cover Picture:
Malrotation with volvulus. Non-contrast CT shows a mass (arrows) in the mid-abdomen with whorled appearance due to volvulus.
(Refer to page 312-322)

Management of the Severely Traumatised Limb

R W H Pho

In the management of the traumatised extremity, the surgeon should consider the bone as one of the tissues subjected to trauma and revealed graphically on X-rays. The surrounding soft tissue envelope including muscles, tendons, vessels, nerves and the overlying skin all need close attention and are equally important in the overall management of the traumatised limb. The trauma surgeon should be educated to equip himself with the necessary expertise in managing this soft tissue envelope in addition to the stabilisation of the skeleton.

At the initial assessment, evaluation of the patient's general condition is of paramount importance before attention is directed to the injured extremity. For the limb, early aggressive debridement, followed by early reconstruction will offer the best outcome with the shortest rehabilitation time.

The philosophy of saving life before limb cannot be emphasised enough when assessing the injured limb. The age of the patient and factors such as the site, the level and severity of crushed injury, the extent of soft tissue and bone loss and contamination are all important in determining whether one should opt for an early amputation or persevere with limb preservation. The Mangle Extremity Severity (MESS) and other scores provide some guide[1,4,5-7]. A limb that is finally flail, painful, insensate and non functional will be inferior to amputation and prosthetic fitting. This is particularly true in the lower extremity where modern prosthetic appliances have proven to be effective in the restoration of almost normal function[10].

In limb preservation, skeletal stabilisation provides vital support for soft tissue and optimises limb length. Assuring the viability of the limb with vascular repair and reconstruction should be followed by restoring functioning muscular tendinous tissue units. Skin resurfacing completes the exercise.

Bone loss may be overcome by one of several means.

Autologous cancellous or corticocancellous bone grafts are frequently used. The former may fill small bony defects with a good vascular bed as performed with the Papineau's technique. The time to bony reconstitution is prolonged, often putting the patient's tolerance to the test[3,8].

If the bony defect is in a poorly vascularised bed, transfer of a muscle flap into the defect followed by bone grafting as mentioned above may be adequate. Skin resurfacing after bone reconstruction may often be accomplished with simple skin grafting[12].

For larger bony defects, especially in the presence of poor vascularity, a vascularised bone transfer, either locally or as a free graft may be required. In the presence of additional skin loss, a free vascularised osteocutaneous composite graft offers a one-step solution for this

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difficult and challenging problem. This topic is further discussed by Y Imran et al in this issue of the journal.

The behaviour of vascularised versus non vascularised bone grafts have been elegantly studied both experimentally and clinically[2,9,11]. Time to bony union, bone hypertrophy, bone strength and its ability to remodel are all superior in the former. The vascularised bone graft brings in new blood supply and with it the ability to overcome local infection as well as facilitating rapid bony incorporation and restoration of strength to the construct.

The advantages of a vascularised bone graft in a traumatised limb may be summarised as follows:

a) It provides a strong living internal splint that can bridge large bony defects.
b) It introduces new vasculature to an avascular bed.
c) The vascularity can overcome local low grade infection.
d) It can be transferred with overlying skin to deal with skin defects at the injured site.

The two commonly used vascularised bone grafts are the iliac crest and the fibula, both of which can be raised with muscle and overlying skin as composite osteocutaneous flaps. The vascularity to the skin may be used as a monitor for the viability of the underlying bone graft.

The two commonly used vascularised bone grafts are the iliac crest and the fibula, both of which can be raised with muscle and overlying skin as composite osteocutaneous flaps.

The iliac crest has a large surface area with considerable bone graft material. The length that can be raised can reach 14 cm. Although it is curved, it can be straightened by multiple osteotomies. Its vascular pedicle although relatively small, is long and can be based either on the superficial or deep circumflex iliac vessels. Being predominantly cancellous, the graft is incorporated early at the site of transplant. Furthermore it can be supplemented with additional cancellous bone graft from the same site.

The fibula is long and straight. Although relatively slender, it is a strong cortical bone. Lengths of up to 30 cm can be harvested in the adult. The proximal epiphysis and physeal plate can also be included in the transfer and may prove useful in joint reconstruction at the recipient site. Growth potential from the physeal plate may be useful in reconstruction in children. The vascular pedicle of the fibula is long and is of a large diameter and can be based either on the peroneal or anterior tibial vessels.

The transfer of vascularised bone grafts have revolutionised limb preservation surgery in the last three decades. However, the exercise is technically demanding, requiring microvascular expertise and facilities. To succeed, the sound surgical principles of adequate wound debridement, well equipped with orthopaedic training of skilful skeletal stabilisation and plastic surgical principles of skin resurfacing all need to be applied. In addition, one must have clear indications and very mature surgical judgement to ensure success. Even in the experienced hand, failures still occur. SMJ

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