

TECHNICAL CONSIDERATIONS AND FUNCTIONAL OUTCOME OF 22 MAJOR REPLANTATIONS (THE BSSH DOUGLAS LAMB LECTURE, 2005)

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Twenty-two consecutive major replantations carried out over a 5-year period were assessed with a minimum follow-up of 2 years. Only two patients suffered guillotine amputations. The remainders were either crush, or crush avulsion amputation. Replantation was successful in 20 cases. When analysed by Chen's criteria, there were three Grade I, nine Grade II, six Grade III and two Grade IV results. Most patients with successful replants put the hand to greater use with time and replantation greatly added to the overall well-being of the patient. We consider major replantation as a worthwhile procedure. Radical debridement, bone shortening and well laid out protocols to reduce the ischaemia time are important for success. The technical details which we believe to be important for success are outlined. With decreasing numbers of such injuries in most countries, this paper may help surgeons faced with an occasional patient with a major amputation to make the right decisions.

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The first upper limb replant was done in 1962, for an amputation near the shoulder in a 12 year-old boy (Malt and McKhann, 1964). It raised questions about patient safety and the usefulness of the procedure (McDowell, 1973). Today, a discussion on major replants raises the same questions, in spite of enough evidence being available that a replanted upper limb is functionally far better than the best available prosthesis (Graham et al., 1998; Peacock and Tsai, 1987). Results are better in replantations distal to the wrist, but, in the event of failure, secondary reconstructive options such as toe transfers are available (Wei et al., 2004). For a patient suffering a major proximal amputation, alternative reconstructive options to replantation are few and inadequate. Having established this fact, making the procedure safe for the patient becomes the prime concern. Complications due to the procedure are directly related to the ischaemia time and the volume of the ischaemic muscle mass. Well thought out protocols based on experience will reduce the ischaemia time.

We have analysed the results of 22 major upper limb replantations done over a 5-year period and detail the technical considerations which we think are critical for success. With the decreasing number of such injuries worldwide, we hope that this paper will help the surgeon faced with an occasional patient with a major amputation of the upper limb to make the correct decisions.

PATIENTS AND METHODS

Twenty-two consecutive major replantations of the upper extremity were carried out between 1997 and 2002. The

mean age was 27 (range 12-56) years. There were four through arm, one through elbow, six proximal forearm, six mid-forearm, one distal forearm and four proximal wrist amputations. The mechanism of injury was crush in seven, avulsion in three, crush-avulsion in ten and guillotine amputation in two patients. Details of age, level of amputation, mechanism of injury, technique of bone fixation, extent of bone shortening, details of vessels and nerves repaired, ischaemia time, bone union time, follow-up period and secondary procedures carried out are given in Table 1. The patients remained under directly supervised physiotherapy in our department for at least 1 year.

During the same time period, 25 patients with major amputations or crush injuries of the proximal upper limb had closure of the amputation stump. Arrival ischaemia time of more than 6 hours, severe non-salvageable crush injury of the distal part and associated major injuries were the main reasons for these limbs not being salvaged.

The functional outcomes were assessed by Chen's criteria after a minimum follow-up of 2 years. Seventeen patients were recalled for assessment. Three patients who could not come were evaluated on the basis of their last follow-up visit. The mean follow-up after replantation was 37 (range 24-72) months.

RESULTS

Twenty of the 22 replants survived. One crush amputation at the mid-forearm level failed on the table. One arm replant had to be removed on the fourth day because of systemic complications. Twelve underwent at least one secondary procedure and each secondary procedure