Abstract

Avulsion amputations constitute a severe problem because of significant lesions in nerves and vessels. Both arterial and venous anastomoses are relevant factors, which determine the success in replantation of avulsed fingers. Surgical experience in vessel dissection, election of venous and nervous grafting as reconstruction methods are as well of considerable importance.

Purpose: The goal of this research was to assess the survival and functional rates in finger replantations after complete or partial amputations through avulsion mechanism.

Methods: The followed criteria were used in this study: 1. Complete/partial finger amputations at the level of proximal phalange or distal to the proximal interphalangial joint. 2. Elected surgical treatment: replantation or microsurgical reperfusion - arterial followed by venous anastomosis (in a direct manner or with venous grafting). 3. Two point discrimination sensation obtained after replantation/revascularization - equivalent to a functional result.

Results: 9 patients were grouped in this study. Survival rate was 57% for complete amputated fingers and 43% for partial amputations.

Keywords: finger avulsion, finger amputation, hand surgery outcomes, replantation, revascularization

Introduction

The appearance of microsurgical techniques constituted a big step forward for amputated and avulsed finger replantations. The type of lesions produced in avulsions represent a significant problem, also hard to manage as treatment, because of a complex skin, vascular and nervous involvement.

Replantation/reperfusion of amputated finger through an avulsion mechanism is the most delicate contest in hand surgery and failure is not a rare condition. After a series of replantations in such cases, we could draw the conclusion that the replantation of a degloved segment was successful when the blood vessels included in avulsed skin didn’t have lesions at multiple levels or they were complete destroyed (we are talking also about
the peripheral circulation which in such type of traumatic mechanism may be irreversible closed). Although replanted fingers recover some function, such an aim was proved to be hard to realize. That’s why indications and contraindications for surgery candidates in degloving amputated fingers continued to evolve to exclude those with a bad functional prognosis from the very beginning. The surgeons continued to extend the limits of microsurgery. There were implemented new techniques to manage the difficulties in order to save avulsed fingers.

Avulsed lesions are usually quoted as the type of injuries with unsatisfactory functional results [1,2,3], mainly in complete amputations or with associated joint destruction. Recent studies showed good functional results after avulsed finger replantations, even though, contesting these recommendations [6].

The purpose of this study is to make a systematic analysis of avulsed finger replantations in order to offer reliable evidence in rates of survival and functionality. Secondary objective was to compare functional results after avulsed finger replantations to the results obtained in replantation of amputated fingers in the second zone with flexor tendon and digital nerve repair. The overview of functional results obtained with these two methods, forms the ground for future comparison.

Methods and Materials

The purpose of this study was to show that this method of microsurgical replantation/reperfusion actually can be successful in avulsed finger replantations. During 2007-2010 9 replantations of complete or partial amputations through avulsion were performed. There were 6 female, 3 male; 26-59 years of age; under ring block anesthesia.

All of patients were right handed. The affected fingers were: left ring finger in 4 patients, pollicis in 2 patients (Figure 1 A,B,C,D) and index/medius in 3 patients (Figure 2 A,B,C,D).

Complete amputations at the level of proximal interphalangeal joint were noticed in 2 cases and 1 case at the level of distal interphalangeal joint. The successfully replantated fingers were drained by one venous anastomosis (direct/venous graft). In all cases local anesthesia was used associated with a Tourniquet at the base of the finger. When starting the procedure the amputated part is examined under operative microscope (OM) first. An unique longitudinal incision is done on the volar side for identification of nerves and arteries. It is important to avoid making two incisions, because of high risk of necrosis of the skin in between those two. Arteries and veins are marked on the amputated part and also on the remnant stump. The quality of blood vessels is evaluated under OM and the edges are cut in healthy tissue. After bone fixation and tendon repair, arterial anastomosis is performed using 9.0-10.0 prolene suture. Venous anastomosis is done in a termino-terminal manner or interposing venous grafts where the tension occur using 10.0-11.0 prolene suture. After successful reperfusion loose skin suture is executed.

Results

Our report includes a total of 9 cases of amputations through avulsion, 4 of which were complete and 5 partial. There were registered 2 cases of total failure (1 female and 1 male), 3 cases of partial failure (partial necrosis which were solved by future surgeries), 1 patient needed a venous graft in order to perform the anastomosis, in 2 patients an arthrodesis was needed at the level of proximal interphalangeal joint and 1 at the distal interphalangeal joint. In all cases only one vein was repaired and in 3 cases venous grafting was needed. Out of all successful cases just one showed signs of poor venous flow and medicinal leeches were used (Figure 3 A,B,C,D,E,F). None of the patients did need blood transfusion.

All patients were followed up at 3, 6 and 12 months. Every one of them was satisfied with the functional results achieved. None did ask for late amputation because of the esthetics of the finger, neuromas, rigidity, cold intolerance.

Medium range of motion at interphalangeal joints was 135º for complete amputations and 160º in partial amputations. Protective sensibility was recovered in all the cases. Every patient of the group study was socially and professionally rehabilitated after an average period of 3-4 months.

Discussions

Replantation/reperfusion after amputation through an avulsion mechanism are usually for the poor functional results [1,2,3,7], particularly after complete amputation or when associated bone, joint, soft tissue, vascular, nervous destruction was present [5,7].

In cases when venous grafting was used to restore venous blood outflow, controlling the permeability of the anastomosis and sometimes revising it was usually done. Only after that, repair of other injured structured was performed. This simple, easy and rapid method permitted the overview of twisted, convoluted grafts.

Tendon, nervous, venous grafting allows for good functional results even in such cases of amputation through avulsion. Subcutaneous vein harvesting represented a simple and quick repair technique in such cases [4].
Figure 1. A,B. Complete amputation through avulsion of pollicis with long flexor, extensor tendon avulsion. C,D. 1 year follow-up view

Figure 2. A,B. Index avulsion prooperative view. C,D. Postop view
Conclusions

Generally, the prognosis after amputation through avulsions is rather reserved compared to those through cutting mechanism. The recovery of function is reduced and the number of complications is higher than in the avulsion amputations. Nervous regeneration is close to zero because of the elongation/avulsion mechanism of injury. In time patients develop a type of sensibility called protective sensibility. Functionally speaking, range of active/passive motion is recovered near 50%.

Even with bad functional recovery, keeping the finger meant an important factor in maintaining an optimal level in quality of life, especially for children and female patients.

The use on a large scale of venous grafting techniques for venous outflow in traumas through avulsion with complete amputations, increases the rates of success and may keep the length of the finger.

Given the type of injury, most of patients necessitate secondary surgical procedures.

References


