

Lower Limb Bone Shortened by 10 Cm and Replantation Extension in Children

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Abstract

Children complex limb disconnection, most of them undergo amputation after evaluate MESS score and then mounting prosthesis. In this case, the mess score of right calf amputation is above 7, and we adopted short 10cm replantation. After the limb replantation survived smoothly, we performed bone lengthening by Ilizarov technique. After 4 years follow-up, satisfactory clinical results have been obtained.

INTRODUCTION

A 7-year-old male patient was admitted to hospital in a half-hour coma on December 19, 2013, after a train crush caused a broken right calf. The right leg was disconnected from the tibial plateau by 6.0cm, and the contusion of the stump was severe. Distal end combined with the middle and upper 10.0cm bone, skin and muscle complex tissue defect, and the limbs below the level of ankle joint are preserved completely (Fig1). There is no skin covering above the ankle and severe hemorrhagic shock, so replantation reserved length is very difficult. The family urged the limb to be saved and decided to shortening replantation.

CASE PRESENTATION

Replantation Preparation

To save lives first after admission, use tourniquet at the thigh root of both lower extremities, block the blood supply of both lower limbs. Increase effective return cardiac flow and antishock therapy. At the same time, blood matching, blood transfusion and preoperative examination were completed in the 30min clock. The broken limbs entered the operating room in advance for debridement, trimming the skin margin, removing the distal dirt, blood clots and inactivated tissue. The anterior tibial artery, posterior tibial artery and accompanying vein were debrided under the

microscope, and the small arteries and veins that could be anastomosed were found and marked. Remove inactivated tissue and retain repairable tissue.

One - Stage Operation

The proximal osteotomy of the right tibiofibula was shortened by about 10.0 cm, and all the non-viable tissues were removed, and the replanting was performed in a completely normal tissue plane. The tibia was fixed with simple external fixator and Kirschner needle, but fibula was not fixed. Anastomosis of main arteries such as anterior and posterior tibial artery and accompanying vein, great saphenous vein, anastomosis of 6 small arteries and veins that can be anastomosed. The common peroneal nerve, tibial nerve and well-known cutaneous nerve were repaired. The tendon was embedded in the remnant muscle abdomen according to the anatomic mark, and the skin defect was covered with VSD material. No vasospasm, distal skin blisters and other complications were found within 1 week after replantation. After replacement of VSD 2 weeks after operation, epidermal growth factor (EGF) and conventional flushing solution (papaverine chymotrypsin glucose hyperbaric oxygen) were used to wash the wound surface alternately for 3 weeks, the granulation tissue grew well and left thigh free skin graft was taken to cover the wound. After 4 weeks, the skin graft survived, and the wound healed well 8 weeks later, a little scar formed.

Second Stage Operation

After 40 days, the limb replantation survived smoothly, and the lower limbs were not of equal length. Tibial osteotomy was performed by Ilizarov bone lengthening technique considering the growth and development factors of children. The lengthening speed of bone was 1.0 mm/d. After three months, the lower limbs recovered to equal length (fig2). After six months the feet gradually recover their senses, producing sweat and pain.

Follow-Up Visit and Results

Follow up for 4 years, with the last follow-up in December 2017, the gait was normal, the knee joint can move autonomously. The active and passive function of ankle joint is weaker than that of the healthy side, but the foot maintains the functional position, does not affect the patient's daily life, such as walking to school, and does not show obvious lameness. Paley's [1] criteria were used to evaluate the curative effect, and the results of bone and function were excellent.

DISCUSSION

Selection of Treatment Options

This case is a 7-year-old child, right calf injury combined with complex tissue defect, accompanied by severe hemorrhagic shock, mess score is much higher than 7 points [2]. According to the related literature, the open fracture of the ankle with MESS 7 or above, and the open fracture of elbow with 9 or more, may still have limb salvage. In this case, the retention length replantation is a serious threat to the safety of the child because of the length of the operation and the trauma. For the sake of children's life safety, the advantages outweigh the disadvantages for the retention of length. After active communication with

patients' families, the treatment plan was worked out: One stage emergency debridement and replantation, after survival and wound healing; Second stage limb lengthening, reconstruction of limb length, appearance and function.

The Significance of Bone Shortening and Lengthening for Limb Salvage in Children

We know that the data from the Mess score do not really represent the outcome of the recovery [3,4]. According to the relevant literature reports, it can be found that the success rate of limb salvage is between 33% and 100%, and the change of data is relatively large [5-7]. In 1987, De Bastiani [8] first put forward the concept of callus lengthening, that is, delayed osteotomy for a period of time, then lengthened after fibrous callus formation, in order to accelerate bone healing. Reducing the incidence of nonunion. Ilizarov ring external fixator may be a treatment that can be used to solve open fracture, bone defect, which has been widely accepted by orthopedic doctors around the world because of its reliable treatment effect [9,10]. Ilizarov technique is based on the theory of distraction tissue regeneration, bone transfer or bone lengthening is used to treat bone defect, especially the complex bone defect of limb shortening, which is of great significance for limb repair and reconstruction. The author thinks that Ilizarov bone lengthening technique is more reasonable than that of lengthening prosthesis after amputation. With the reference of healthy nerve plane, thus the plantar sensation can be recovered better, and the complications such as plantar ulcer, claw type foot and achilles tendon contracture can be avoided. Of course, we also need to overcome the problems, such as nail infection, pain and complications of adjacent joints.



Fig 1. Appearance of the right lower leg before replantation



Fig 2. After bone lengthening for 6 months, the lower limbs are basically equal in length.



Fig 3. Appearance of lower limbs in the last follow-up

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