



Case Report

First Time Using Saphenous Vena Homograft for Complex Vascular Trauma in Children

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Abstract

Background: Vascular injuries are rare in small children and difficult to treat when there is a complex lesion required a graft and high risk of infection, because the suitable graft material is not available. In practice, the saphenous vein is rarely used as a homograft (allograft), but may be appropriate in this situation. Methods: A descriptive study of a clinical case of very complicated contusion of left arm and forearm injury caused by a traffic accident in a 6-year-old boy who underwent surgery to restore the superficial venous system by saphenous homograft at Viet Duc University Hospital in November 2020. Result: Main injury included crushed left middle third, extensive skin peeling, and complicated vascular injury. First emergency surgery: needle insertion to fix the elbow, treating the skin peeling, cutting the contusion and anastomosis of brachial artery, not treating the contusion occlusion of superficial vein system due to the lack of autologous grafting material. Postoperative follow-up showed that the arterial flow gradually weakened, the forearm was very swollen and purple in the form of stasis due to venous obstruction. Decided to have a second surgery after 18 hours to restore superficial venous circulation with saphenous homograft taken from a brain dead donor in deep cryopreservation. Surgical technique: grafting the cephalic and basilic veins with homograft, transferring the skin flap to cover the graft, opening the fascia of forearm - hand. Hand perfusion improved immediately after surgery and recovered well. The wound was carefully cared and the third surgery was performed 21 days later to transfer the vascular flap covering the elbow area and a thin autologous skin graft. The wound healed well and the patient was discharged 18 days later. Periodic check-up after surgery up to 12 months gives positive results. Left hand function has recovered more than 50%. Conclusion: Saphenous vein homograft is a lifesaver to restore circulation in severe vascular injury in small children.

Keywords: Homograft; Saphenous vein; Vascular trauma; Children

Introduction

Vascular trauma is a rare injury in young children, and is mostly mild, such as spasm or short contusion of the artery, rarely requiring surgical revascularization [1]. Therefore, when encountering a complicated trauma case, such as crushing - losing a long segment or damaging both arteries and veins on the open wound, peeling skin, muscle contusion, broken bone, etc., it is very difficult to find a treatment solution, especially finding suitable graft materials. Amputation in young children is a serious psychological trauma, greatly affecting the future of children. Since the 1970s, deep cryopreserved great saphenous vein allografts have been used

in some cases of lower extremity vessel injury [2] and coronary artery bypass grafting [3] in the absence of autologous vascular graft material [4] or with surgical site infection [5]. However, mainly for applications on the arterial system and in the lower extremities [6], there have been no separate reports of application in the reconstruction of the superficial venous system of the upper extremities. Viet Duc University Hospital is the largest and oldest surgical center in Vietnam, with the largest number of tissue and organ transplants from brain dead donors over the past 10 years. The hospital is also the only place that is allowed to harvesting and deep cryopreservation of tissues and organs for transplantation for patients, including cardiovascular tissue (heart valves, vascular tissue) with more than 100 cases of experience [7]. Homograft saphenous vein tissue has been used for about 3

years now in a number of surgeries such as coronary artery bypass grafting [4], liver transplantation from a living donor, complex kidney transplant, etc. This clinical case is the first case of using homograft saphenous veins to reconstruct the superficial venous system in young children with complex hand injuries.

Clinical case description

It is a 6-year-old boy who was involved in an accident between a motorbike and a car in December 2020, the car wheel pressed over the patient's left hand, causing severe contusions and serious injuries from 1/2 under the arm to 1/2 on the forearm (Figure 1), from open skin peeling – muscle contusion to vascular trauma, fracture. First emergency surgery 4 hours after the accident: fix the elbow and fracture with a needle, treat the peeling skin, cut the 2cm segment of the contusion brachial artery - direct anastomosis, do not treat the bruised superficial vein system - occlusion due to the absence of compatible vascular graft.



Figure 1: Contusion lesion of left arm and forearm.

Postoperative follow-up showed that the radial pulse gradually weakened, the forearm was very swollen, cold and purple in the form of stagnation due to venous obstruction. Doppler ultrasound of the left forearm showed that the anastomosis was still open but the flow was very weak. The definitive diagnosis was made of edema due to stagnant venous return of the left forearm. Re-operation to reestablish superficial venous circulation is necessary, but the most difficult thing is the selection of vascular graft material for the superficial venous system with an open wound and severe soft tissue contusion – very high risk of bypass infection. However, there is no other option than the saphenous vein homograft. Decided to have a second surgery after 18 hours to restore circulation to the superficial venous system with the vascular graft material of saphenous venous homograft taken

from a brain dead donor being deep cryopreserved at the hospital. Surgical technique: grafting of the cephalic and basilic veins with saphenous homograft, transferring the skin flap to cover the graft, opening the fascia forearm - hand (Figure 2).



Figure 2: 2nd surgery reconstruction of superficial venous system.

Immediately after the 2nd surgery, the hand immediately improved perfusion, more ruddy and less edematous. The wound was carefully taken care, has gradually healed and has grown into a granular structure. The third surgery, 21 days later, was to transfer the vascular flap covering the elbow area, and autologous thin skin graft to cover the remaining skin defect (Figure 3). The wound healed well and the patient was discharged 18 days later. Periodic check-up after surgery up to 12 months gives positive results. Left hand function has recovered more than 50%.



Figure 3: Damage recovery after 1 month.

Discussion

The saphenous vein is a very popular vascular graft material in the treatment of trauma, penetrating wounds of peripheral arteries with its advantages of availability, low cost, good resistance to infection, simple postoperative treatment, and good early - medium term results. Therefore, the saphenous vein homograft

was studied and applied very early in the early 1970s, for difficult cases of vascular grafting, vascular bypass or risk of infection, but mainly focused on coronary artery bypass grafting and vascular grafting for lower extremity artery lesions [2], [3]. The most common method of using saphenous veins homograft is in the form of deep cryopreservation with the time from 1 to 2 years from the time of collection to the time of using [3,5,6]. However, it can be used in fresh preserved form with physiological saline mixed with antibiotics within 7-10 days from the time of harvesting from the donor, or used immediately after collection from the donor in some special cases [4]. The use of immunosuppressive drugs after allogeneic saphenous vein transplantation is controversial, but the majority support the trend that drug maintenance is not required after vascular tissue transplantation [2,4-6]. However, the long-term results also show some limitations compared with autologous saphenous vein grafting. Therefore, it is indicated for use only in special cases when there are no other equivalent or better options – such as autologous saphenous vein, autologous artery or artificial vessel. Viet Duc University Hospital has started the application of allogeneic cardiovascular tissue transplantation since 2009 (heart valve, vascular tissue), the first stage is fresh preservation (2009 - 2012), and from 2013 is deep cryopreservation with the longest shelf life from the beginning of storage is 2 years. To now, more than 100 cases have been technically successful, without infectious complications or other quality-related complications [7]. This patient is a 6-year-old boy with a normal autologous vessel size (such as the saphenous vein) that is too small to be used as vascular graft material. Injury to his left hand is very complicated, may indicate amputation. With conservative treatment, the probability of success is not high. Of these lesions, complete loss of the left arm's cephalic and basilic veins is the most complicated, because conventional graft material is difficult to find and the risk of infection leading to graft rejection is very high. With the advantage of being available in the hospital, we have boldly used it with the desire to bring a chance, no matter how small, for the patient. Postoperative care is also very complex to avoid the risk of venous bypass infection and soft tissue recovery. Fortunately,

the patient was finally out of danger and his hand was saved with quite good function restored. It is necessary to closely monitor the patient periodically to promptly detect the sequelae of the injury, especially the superficial venous system, in order to have timely intervention and treatment solutions.

Conclusion

The success of the first clinical case of using a homogenous saphenous vein to reconstruct the superficial venous system in a young child with severe upper extremity trauma, which, although somewhat fortunate, has opened up a new direction for treatment of complex vascular lesions of the extremities.

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