SHORT REPORT

A Modified Technique for Endoscopic Transposition of Upper Arm Basilic Vein in Autologous Arteriovenous Fistula Creation


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A good functioning arteriovenous (AV) fistula or prosthetic graft is indispensable to a hemodialysis-dependent renal failure patient. The superiority of an autologous AV fistula to a prosthetic graft is well known, but the creation of a native AV fistula is usually difficult in older or re-do patients due to the scarcity of usable superficial veins. The transposition of the upper arm basilic vein for brachiobasilic AV fistula creation provides the advantages of an autologous fistula. However, more pain and wound complications from the larger incision have made this procedure less commonly performed. Presently, endoscopic harvesting of the great saphenous vein employed in coronary bypass surgery is feasible and effective in reducing wound complications. We report the modified technique and cases using endoscopic transposition of the upper arm basilic vein for brachiobasilic fistula creation.

Keywords: Endoscopy; Basilic vein transposition; Arteriovenous fistula.

Introduction

Autologous AV fistulas have shown superior long-term patency, lower incidence of complications and even longer patient survival. With the increasing numbers of elderly and re-do vascular access patients, the shortage of available superficial veins has restricted the construction of such autologous AV fistulas. The implantation of a prosthetic bridge AV graft in the upper extremities provides an alternative. However, AV grafts have higher thrombosis and infection rates than autologous AV fistulas. One way to extend the availability of the autologous vein is through the use of a transposed basilic vein. Dagher et al. first described this technique in 1976. Although the transposition of the upper arm basilic vein provides the advantages of an autologous vein, this procedure is underused because a single large or multiple small incisions are generally needed and these result in severe wound pain and further complications. We describe the technique, used in great saphenous vein harvesting for coronary bypass surgery, with modification for endoscopic transposition of the upper arm basilic vein and brachiobasilic fistula creation in two patients.

Technique

The patient underwent general anesthesia in the supine position with the left upper extremity 90° ab ducted and put on the hand-table. The endoscopic transposition of the basilic vein was performed using the Vasoview system (Guidant, Cardiac and Vascular Surgery Inc., Menlo Park, CA). This unique system utilizes CO2 insufflation to facilitate visualization and dissection. The operator stood at the left of the table, the same side to the treated limb. A 2 cm oblique incision along the skin crease at axilla was done. The basilic vein at the join to...
axillary vein was located and a few centimeters were directly dissected. Then, a seal trochar was inserted and the balloon was inflated. The CO2 was started at 12–15 mmHg. The dissector was carefully advanced distally towards the elbow in a plane anterior to the vein. There is usually no problem with angles in term of the chest wall although in some cases we need to lift the arm slightly. The median cutaneous nerve was identified and dissected free from the basilic vein. The dissection was continued circumferentially as far as required according to the size and length of the vein. The side branches were carefully dissected, electrocauterized and divided with endoscopic bipolar scissors (Fig. 1). After the optimal length and size of basilic vein was reached, another 2 cm longitudinal incision was created 2 cm anterior to the target site of the distal vein near the elbow. Next, the basilic vein was transected distally. The pedicle was retrieved from the axilla incision and the proximal part of the vein remained attached to the deep vein (Fig. 2). Subsequently, the vein was distended with heparinized saline and the branches were closed with hemoclips. The anterior surface of the vein was marked to prevent torsion after tunneling. A subcutaneous tunnel was created with a curved tunnel passer between the axilla and elbow incisions at the anterior surface in the upper arm. The vein was brought through the tunnel and the brachial artery was dissected in the same elbow incision. Thus, the basilic vein was anastomosed to the brachial artery in an end-to-side fashion with a running 7–0 polypropylene suture (Fig. 3). Fistulography was performed to determine the satisfactory maturation 2–4 weeks later prior to needle puncturing for hemodialysis being permitted.

**Clinical Experience**

An 84-year-old female patient with ESRD had maintenance hemodialysis (HD) for 6 years. A right radiocephalic AV fistula and right brachiocephalic loop graft had both failed. A brachiobasilic loop AV graft in the left forearm was constructed 2 years ago. She had had two thrombectomy operations and two percutaneous transluminal angioplasty (PTA) procedures for graft dysfunction over a period of 6 months. Angiography revealed a patent basilic vein of good size over the left upper arm behind the recurrent stenosis of vein-graft junction. Therefore, endoscopic transposition of basilic vein for brachiobasilic AV fistula was performed. After 2 weeks, the AV fistula was successfully used for HD access and has been functioning well for over 1 year.

A 50-year-old male patient with ESRD secondary to diabetes had maintenance HD for 10 years. He had coronary bypass surgery 5 years ago. The patient had
bilateral radiocephalic fistulas that had both failed. A left brachiopheliac fistula had just failed after 3 years. Therefore, an AV graft was planned in the left upper arm. During the operation, the upper basilic vein at axilla was explored first and found to be good in size. Therefore, an endoscopic transposition of the upper arm basilic vein and a brachiobasilic AV fistula was created. After 4 weeks, the AV fistula matured and was successfully used for HD access for over 1 year.

Discussion

The long-term survival of patients receiving chronic hemodialysis has increased. Patients usually outlive the durability of their AV fistulas or grafts and often need multiple vascular access procedures or may run out of all the utilizable access sites in their lifetime. Thus, the conservation of hemoaccess sites is essential. In 1997, the National Kidney Foundation published the Dialysis Outcome Quality Initiative (DOQI) guidelines, which stressed the importance of autologous AV fistulas in order to improve vascular access quality. The basilic vein in the upper arm is relatively large and deep rooted. It is not visible by simple inspection and as a result is more protected from damage by venipunctures or intravenous catheter. The reported patency rates of transposed brachiobasilic AV fistulae are superior to prosthetic AV grafts ranging from 90 to 70% at 1 year and 86 to 49% at 2 years. The incidence of infection in transposed AV fistulae (3.4%) is significantly lower than the prosthetic AV graft (16.1%). Most surgeons still practice the conventional technique of basilic vein transposition through creating a large or multiple small incisions to dissect the basilic vein in the upper arm from the elbow to the axilla. Murphy et al. reported that 69% of patients developed complications. The most common complications were arm edema (24%), thrombosis (22%), bleeding (18%), infection (15%) and steal (15%).

The less invasive technique of endoscopic basilic vein transposition was first reported by Martinez et al. in 2001, Tordoir et al. in 2002, and Hayakawa et al. in 2002. The results were similar and satisfactory with a low incidence of complications and 1-year patency ranging from 75 to 88%. In this report, we adopt the device and technique of endoscopic saphenous vein harvesting employed in coronary artery bypass grafting surgery. This method has demonstrated several wound improvements and good preservation of venous quality. A perfect visualization of the vein with the CO2 inflation system was achieved to facilitate precise evaluation of the vein size and meticulous management of the vein sidebranches. Modification of the surgical technique began with endoscopic dissection from the axilla instead of the elbow. Therefore, the elbow incision was minimized according to the vein size and the subcutaneous emphysema of the chest possibly induced by the CO2 pressure was avoided. In these two cases, the basilic vein of case 1 was well arterialized directly by a previous forearm loop graft and, therefore, matured earlier. The basilic vein of case 2 was only preconditioned indirectly by a previous radiocephalic fistula and therefore a longer maturation time was required. Both cases gave appropriate indications of optimal basilic vein sizes and lengths for successful secondary transposed fistulas creation, as the early patency and maturation rates of the secondary transposed brachiobasilic fistulas are superior to the primary (no previous hemoaccess in the treated limb). The importance of adequate vein dilatation prior to transposition should be emphasized. We believe that endoscopic transposition of the upper arm basilic vein for autologous brachiobasilic fistula creation in selected patients undergoing chronic hemodialysis is technically feasible and of great value in improving vascular access quality.

References


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