

Analysis and Research on the Characteristics of Blood Vessels in the Leg Based on Modern Technology

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Abstract: The angiographic photos of the lower extremity artery were observed and studied. The perforating vessels of the lower abdominal artery and the anastomosis between the anterior and posterior cavities of the artery were analyzed, which provided the image basis for the design and clinical application of the perforated foot flap. Methods: the imaging results of patients with arteriography of lower extremity were collected retrospectively. To observe the travel, distribution and connection between the perforating vessels of anterior tibia, posterior tibia and peroneal branch of peroneal artery. The skin and soft tissue defects of the leg and leg were repaired by the perforator flap of the leg artery, anterior tibial artery and posterior tibial artery. Results: the perforating vessels of fibular artery, anterior tibial artery and posterior tibial artery were found to branch on the skin during walking to the skin. The direct anastomosis of clavicle like blood vessels can make the blood flow "channel" of skin have a clear direction. The area of the perforating branches of the posterior tibial artery and the fibular artery exceeded the blood supply of the two unrestricted areas without blood flow disturbance. Conclusion: angiogram can clearly show the shape and direction of perforating vessels and the connection between adjacent perforating vessels.

1. Introduction

From September 2015 to may 2017, there were no congenital vascular malformations, occlusion or stenosis in patients undergoing angiography and surgical treatment. The average age at 15 is 35 men and 24 women. Digital contrast subtraction angiography machine (made by Philips). Microcatheter: outside diameter of catheter made in Japan. Main contrast agents[1]: UV paclitaxel reagent (contrast agent), sodium chloride injection glass bottle, Caine, heparin.

2. Contrast Method

The average age of the experiment is 38 years old (age), the average age is 38 years old (male) 35, male 35, female 24, is the patient who was hospitalized in the Affiliated Hospital of Jin Yi Medical University from September 2015 to may 2017. After infection, including trauma, burns, local skin and soft tissue defects in patients[2]. Among them, 30 cases, 16 cases, 13 cases were fibular artery, anterior and posterior angiography. There was no congenital vascular malformation, occlusion or stenosis in 59 cases. The renal function was normal before operation, and there was no physiological or pathological micturition. As required, he received necessary treatment such as monthly conditioning, hypoglycemia and hypotension. There was no skin injury or infection at the puncture site. Give patients appropriate sedatives, such as mental pressure, fluid iodine allergy test, groin skin preparation. The conditions for patients and their families are described, and the effectiveness, necessity, estimated cost and possibility of examination are explained[3]. After the family members fully understand and agree, they should regularly sign the preoperative agreement with the patients and their families. Relevant treatment. All the interventional operations were performed in the interventional operating room of the Affiliated Hospital of Jinyi Medical

University. The patient was supine. The senior doctors in the intervention Department disinfected and disinfected the patients daily and used 10% lidocaine at the puncture site of groin. Under the skin, local infiltration anesthesia, after anesthesia, the femoral artery of thigh was inserted into the abdominal cavity for puncture, after the vascular photography guide, the microcatheter was guided according to the guide wire, the external artery, through the general intestinal artery bone, after that, the opposing external artery arrived, and entered the opposite femoral artery of big leg. The flow rate of contrast medium was 3 ml / sec[4]. The images of the above 3-axis through branches are collected. The obtained image is processed by a computer for digital silhouette processing and image processing. After the operation, bandage was used for bandaging. The patient was required to lie on his back, puncture the medullary segment on one side of the hand and foot for 8 hours, and move on the bed for 8 to 24 hours[5]. After pinhole bleeding, there is no local skin bleeding, redness or swelling. The patient can puncture the pinhole by himself to avoid bleeding. In order to prevent deep vein thrombosis, appropriate activities can be carried out after X-ray photography of lower limbs on the non puncture side. In order to let the patient spit out from the kidney quickly, please instruct them to drink more water.

Table 1 Angiographic data of perforating branch of peroneal artery

Number of branches	position	internal diameter	Average pedicle length
First branches	<6	>6	4.73±0.96
Second branches	7.11±0.67	1.15±0.45	5.23±0.79
Third branches	9.84±0.93	1.33±0.39	5.87±0.73
Fourth branches	13.42±0.90	1.30±0.46	5.83±1.73

3. Result

The angiographic results showed that in 59 patients, the peroneal artery, the anterior coelomic artery and the perforating branch of the postembryonic artery (in the figure, the ascending and the descending branches were all sent out during the course of going to the superficial layer, and the longitudinal direct chain vascular anastomosis was formed between the perforating branches from the same axis of the cardiovascular system. The connection vessel had a thick inner cavity, smooth contrast medium, clear development and true vascular anastomosis. Under the condition of angiography, the fibular branches of the splenic artery were found, and the average branches and perforating branches were found in all parts[6]. The incidence is very high. The longitudinal axis of the fibular head is from the most prominent point of the fibular head to the posterior margin of the outer palate. The most convex part was the standard point, the fibular head of perforating vessel was below (9.84 ± .93), the proximal part was (13.42 ± .93), (13.42 ± .90), (17.2 ± 1.13), 97%, 97%, 100%, 94%, the diameter of perforating branch was (1.03 ± .39), (1.00 ± .34), (1.97 ± .2), (1.2 ± .3). The vessel length was (5.87 ± 0.73) and (5.44 ± 1.09) respectively. (5.1±1.93)。 The above-mentioned 4 porous branches are basically fixed, which are suitable for the internal diameter of the blood vessels to anastomose with the blood vessels. The length of the vascular flap is about 5cm, which is enough to act as the flaky vascular flap. In the case of posterior chamber arteriography, 74 puncture branches were found, with an average of 5.70. The location of perforating branches was found in all parts, with a high incidence. The longitudinal axis is the line connecting the most significant point of the inner potato chips to the bone in the cavity. The most salient point of visceral recoil was used as the measurement reference point. The most significant points from the distal end of the perforating vessel to the proximal end of the medial vessel were 7.8 ± 0.67, 13.2 ± 1.13, (21.1 ± 0.27), 100%, 92%, 92%, respectively. The diameter of branches was 1.24 ± 0.63, 1.27 ± 0.30, (1.22 ± 0.23), the stem length of vessels was 5.47 ± 0.47, 5.44 ± 1.09, (5.11 ± 1.93). The above three perforating branches are basically fixed, the diameter of blood vessel is about 1mm, suitable for vascular anastomosis, the length of vascular flap is about 5cm, and the flap vascular flap has enough length. 16 cases underwent anterior angiography. It was found that 74 cases (4.60 on

average) had posterior lumen perforating arteries[7]. There were 5 cases with perforating branches, mostly 2 cases. The most significant point of fibular head is that the external impetuous posterior border connection is the axis in the direction of long hand line. The measurement standard point of fibular head is the most convex, the proximal end-to-end distance.

Table 2 Angiographic data of the perforating branches of the posterior chamber artery

Number of branches	position	internal diameter	Average pedicle length
First branches	6.10 ± 0.77	1.05 ± 0.25	6.13 ± 0.56
Second branches	7.81 ± 0.67	1.24 ± 0.63	5.47 ± 0.47
Third branches	11.41 ± 0.35	0.75 ± 0.46	5.48 ± 1.73
Fourth branches	13.24 ± 1.13	1.27 ± 0.30	5.44 ± 1.09
Fifth branches	17.22 ± 0.44	1.08 ± 0.46	5.45 ± 1.36

The pore diameter rate of fibular head (7.18 ± 0.67 and (23.20 ± 1.23) is 94%, and the length of vascular cavity is $1.24 \pm .63$, $(1.27 \pm .30)$, $(5.47 \pm .47)$, (5.44 ± 1.9) . The two porous branches are basically fixed, which are suitable for vascular internal diameter anastomosis[8]. The vascular flap is about 5cm long. Babepedi. In order to repair the dorsum of foot smoothly, the fibula, anterior and posterior great vein flaps were removed. All flaps remained, the incision healed well, the flap material felt soft, the thickness and color were good, and the function recovered well. One case of the anterior great vein perforator flap is the blood supply range through the perforator region with a small amount of necrosis at the distal end of the flap after operation. The dressing changed to cure the wound. The typical case is a 24-year-old female who was admitted to the hospital due to the dysfunction caused by the small hole contracture in the right manic region. After admission, the "scar dissolution and local metastasis of the right splenic artery perforator flap" was carried out, and a large perforating hole was found in the right shape during the operation. The neural Atlas of monkeys was preserved. After operation, the flap was soft, rough and well cut[9]. The patient was male, who was placed in hospital due to "trauma" and was hospitalized due to skin defect. The "left splenic artery perforator flap local transfer repair" was performed. After observation, the skin is in good shape, with satisfactory function and feeling.

4. Case

The patient is a 55 year old male who was admitted to the hospital due to a skin defect in the front of the right lower extremity caused by a car accident. After admission, local metastasis was carried out and the right posterior transcutaneous artery perforator flap was repaired. After observation, the acne performed well, and the function and mood recovered well. The patient, a 39 year old male, was admitted for a stone defect caused by a right medial skin defect. After admission, local metastasis was carried out and the right posterior transcutaneous artery perforator flap was repaired. A 22-year-old female patient was admitted because of "skin defect of right leg and back caused by car accident". After admission, local arterial flap was used for local metastasis and repair. The patient is a 42 year old male. He was admitted to the hospital because of "traumatic pain of the right thumb and dysfunction for several hours" and underwent "resection of the right thumb". After follow-up, the reconstructed thumb has a good shape, its function is recovered by back movement, and it feels that it will recover later.

5. Discuss

A skin flap is a tissue mass containing skin tissue with a blood supply. With the in-depth understanding of flap surgery, flap has been widely used in clinical development. From the initial repair of skin defects, improvement of body surface appearance and recovery of tissue function, to later organ reconstruction and repair of wounds healed due to malnutrition. The initial clinical application is mainly random skin flakes, which grow slowly. From 1950's to 1950's, especially with the progress of surgical operation, flaky operation developed rapidly. During this period, a lot

of axial lamellae were found, which were characterized by the formation of deep axial vascular valve through lamellae. Flaky blood flow is reliable. This is the traditional axial sheet. In the meantime. Greater clinical advantage however, due to many disadvantages (such as greater donor site damage and flowering and fruiting performances), new lamellae are often used to replace the traditional axial lamellae. At the end of 1970s, the basic research of flakiness continued to deepen and the number and type of clinical application increased greatly. Flakiness is the rapid development of surgery. The appearance of many new types of flakiness, such as neurocutaneous, vena cava skin flakiness and skin lawyers who are preparing to be purchased, is related. In recent years, with the rapid development of mechanization industry, agricultural machinery is widely used, and the number of patients with leg and foot disabilities is increasing. The traditional axial lamellae can not meet the aesthetic and functional needs of patients after wound healing, and Pafu resistant lamellae can better solve this problem. At the end of 1980's, the perforator flap was developed on the basis of the flap and the rib. After years of development, the clinical application is more and more extensive, and the understanding of perforator lamellae is more and more mature. In 1989, we first reported the free flap with perforating vessels as perforating tube, i.e. perforating flap.

6. Conclusion

The results of this study show that there is a direct vascular anastomosis between the fibular vessels of the peroneal artery and the posterior cavity of the perineum artery, which has a reticular vascular system through valves and strengthening collateral circulation. In this study, compared with the current fresh cadaver flow and arterial dissociation, the more distinct images, the more reliable data, are used to guide the patients' arterial connection between the branches in clinical practice, in order to observe the digital silhouette angiography. Ways to promote new values.

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References

- [1] Nabil A. Al-Zoubi, Rami J. Yaghan, Haitham A. Qandeel,. (2017). Spontaneous Anterior Tibial Artery Avulsion and Tibio-Peroneal Trunk Transection Resulting into a Pseudoaneurysm: A Case Report. *American Journal of Case Reports*, vol. 18, pp. 90-95.
- [2] Zhang H C. (2017). Enhancement maximum slope of increase of magnetic resonance angiography in patients with diabetes lower extremity arterial disease and its correlation with endothelial injury and oxidative stress, vol. 23, no. 2, pp. 123-126.
- [3] Illuminati G, Calio F G, Pizzardi G, et al. (2017). Results of infrageniculate bypasses using the profunda femoris artery as inflow source, vol. 47.
- [4] William Shaffer, Mary Maher, Michael Maristany,. (2017). Persistent Sciatic Artery: A Favorable Anatomic Variant in a Setting of Trauma. *Ochsner Journal*, vol. 17, no. 2, pp. 189-194.
- [5] WANG Ning, LIU Zhaoyu. (2017). Interventional treatment of infrapopliteal arteriosclerosis occlusive disease:latest clinical progresses. *Journal of Interventional Radiology*.
- [6] ZHANG Dan-qiao, QI Yi-qin, FENG Wan-ting,. (2017). Relationship between Diabetic Retinopathy and Peripheral Arterial Disease in Type 2 Diabetes Patients. *Journal of Sun Yat-sen University(Medical Sciences)*.

- [7] Sorin Giusca, Dorothea Raupp, Dirk Dreyer,. (2018). Successful endovascular treatment in patients with acute thromboembolic ischemia of the lower limb including the crural arteries. *World Journal of Cardiology (WJC)*, vol. 10, no. 10, pp. 145-152.
- [8] Amer, Hatem, Suchyta, Marissa, Carlsen, Brian,. (2017). The Posterior Tibial Artery Flap as a Sentinel Flap in Face Transplant:, Maximizing Solid Organ and Composite Tissue Allotransplant Team Coordination. *Transplantation*, vol. 101.
- [9] Pandeng Li, Guoliang Shen. (2019). Posterior Tibial Artery Perforator Flaps Carrying Partial Gastrocnemius Muscle for Repair of Soft Tissue Defects With Dead Space in the Ankle and Foot. *Annals of plastic surgery*, Publish Ahead of Print(&NA;).