Doppler for Perforator Detection: What You Heard Is Not What You Get.

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ABSTRACT

Background: Detection of perforators is usually a crucial requirement for a reconstructive plastic surgeons. Despite the availability of many advanced and far reliable options for preoperative perforator detection, many relay solely on Doppler because of its low cost and ease of use. We share our experience of perforator detection ,using Doppler and assess its accuracy by intra-operative localization .

Methods: In one year prospective study, included all patients planned for ALTF. We did preoperative perforator mapping using Doppler and check their intra-operative location for accuracy of detection. We also looked for quality of detected perforator and number of non-detected perforators.

Results: Total of 276 perforators of 82 ALTF were marked. Only 194 (70.2 %) locations have perforator and 121(43.8 %) of them were of good size. Doppler marking was false positive in rest of the locations. There were also a total of 134 good sized perforators located intra operatively which were not preoperatively detected by Doppler.

Conclusion: We suggested that Doppler is not sufficient for reliable detection and planning of ALTF.

Introduction

Doppler is the most commonly used preoperative flap planning tool for anterolateral thigh flap (ALTF).[1] Since its description by Song in 1984[2], ALTF is the most frequently used free flap in reconstructive surgery. It's a versatile source of tissue that can be taken as fascio cutaneous, fascial, and supera-fascial with portion of Rectus or Vastus Lateralis muscle allowing it to be individually customized[3-7]

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From anatomical point of view, relatively constant anatomy with large caliber vascular pedicel makes this flap popular among reconstructive surgeons[8,9]. There are often more than one cutaneous perforator and flaps with two or more skin paddles[10] can be easily designed. There are few variations of pedicles also described in literature[11] for all these variations and planning of ALTF it is mandatory to identify perforators with accuracy. There are many tools available like CT Angiography, color Doppler and thermal imaging but in most of institutes Doppler is the only modality used for the detection of perforators[12]. The purpose of this study was to determine the accuracy of Doppler to locate perforator by checking actual location of perforator during flap harvesting.

Material and Methods

This was a prospective study at a tertiary care hospital, from July 2018 to July 2019 in which total of 82 ALTF were harvested. Standard preoperative marking for the harvesting of ALTF was done in supine position. The septum between rectus femoris and vastus lateralis was marked on skin by making a line from anterior superior iliac spine and supero-lateral aspect of patella. Mid of this line was marked and circle of 3 cm radius was drawn. Starting from this circle all of the anterolateral aspect of thigh was assessed for perforators using Huntleigh hand held Doppler and 8 MHz probe (Fig. 1). All the perforators were marked as a small dot using a permanent marker. During standard fasciocutaneous flap harvesting all these marked locations were assessed for presence and quality of perforator. Presence of perforator with in 2cm of preoperative mark was considered as accurate; we also considered a visible pulsation through 4x loupe magnification as a criterion of good quality perforator. We assessed a total of 276 preoperative perforator locations during flap harvesting and also looked for other perforators which were not picked by Doppler examination.

Results

During ALTF harvesting it was found out the there was a perforator in 194 (70.2 %) out of 276 marked location and 121(43.8 %) of them were of good size. Doppler marking was false positive in rest of the locations. There were also a total of 134 more perforators located intra operatively which were not preoperatively detected by Doppler.

Discussion

Uncertainty of anatomy and location of perforators are the biggest fear for harvesting an ALTF. There are many studies on anatomical locations, variations of ALTF perforator and how to detect them. Few of the centers in the world use CT angiography for the detection of perforator and reconfirm it with Doppler on table. CT angiography is a very reliable technique which can detect perforator size, location and appropriate perforator for flap planning. Only flaw with CT angiography is availability and cost. On the other hand held

Fig. 1 Huntleigh hand held Doppler and 8 MHz probe.

Doppler is easily available, cheap, and easy to master devices with many probes options. Mostly we use MHz probe because of its wide beam and low penetration, its ideal for perforator detection but there are many flaws. Doppler probe can pick signal from deep vessel, communicating vessel or superficial veins and give a false positive impression of a perforator. Doppler of person with more sub cutaneous fat on the donor area, wrong direction of probe, inexperience examiner and low blood pressure can be reasons for false negative results. One more

problem with Doppler is that it cannot predict actual size of perforator preoperatively, as many surgeons believe that a perforator should have a visible pulse in order to keep a flap well vascularized. Thermal imaging is also a useful modality and now with the availability of pocket sized thermal imaging camera we can utilize it for the perforator detection as well.

In our study we found out that with Doppler is not as reliable as we all believe, but despite the fact as also pointed out in many other studies Doppler will remain valuable gold standard for the detection of perforator partly because of convenience and low cost till a relatively cheaper and easy to use option become available. We are currently doing a study with thermal imaging combining with Doppler for the detection of perforator.

Conclusion

This study concluded that Doppler assessment is not sufficient for preoperative planning of ALTF because of its low sensitivity, specificity and half of times a good size perforator was not found on location marked by Doppler. We are currently doing a study on combining Doppler with thermal imaging to improve the accuracy of locating perforator preoperatively.

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