hemodynamic characteristics, which may be relevant to the assessment of the angiosome of the SAI flap. In our practice, CDU is used as an effective means for pre-operative SAI flap design. The supraclavicular artery can be identified while crossing the junction of the middle and lateral thirds of the clavicle. Subsequently, the supraclavicular artery is traced proximally to its origin, where the diameter and hemodynamic characteristics of the supraclavicular artery are measured. The most distal point is traced to the point at which the CDU signal cannot be detected. If the supraclavicular artery is divided into smaller branches, all the branches are traced and marked as long as these branches can be traced and marked. The distal point of the SAI flap is determined according to the most distal point as confirmed on CDU. An edge not more than 3 cm distal to the point is marked as the distal-most point of the SAI flap. The length of the vascular pedicle of the supraclavicular flap was defined as the distance measured from the “turning point” to the proximal part of the defect area. Different from the supraclavicular fossa as taken as the “turning point” by other reports, the starting site of transverse cervical artery was used as the “turning point” in our study. In this regard, it required the skeletonization of the cervical segment of transverse cervical artery during the harvesting of the supraclavicular island flap. The advantages as follows: 1) Removal of the adipose connective tissue around the root of transverse cervical artery to prevent local lymph node recurrence; 2) Skeletonization of the transverse cervical artery to enlarge the range of motion of the flap, so as to facilitate the transfer and shaping of the flap in the recipient site; 3) Root of the transverse cervical artery is closer to the donor site than the supraclavicular fossa, which can realize a repair of the defect at a higher position when selecting the former one as the “turning point.” On the contrary, for defects with the same height, when the “turning point” is designed at the root of transverse cervical artery, there may be a closer distance between the defect and the donor site, and hence flap pedicle of shorter length is needed for repair. In other words, the flap may be closer to the supraclavicular artery, showing a more abundant blood supply at the end of the transferred flap.

2. Approach to reduce the necrosis rate of distal flap

As described in the letter, the distal part is vulnerable to ischemic condition due to inadequate blood perfusion and hence may result in the necrosis of the distal part of the flap. In this regard, it is of great significance to determine the range of perfusion of the supraclavicular artery in the clinical practice. In our process of operation, an anterograde dissection of the transverse cervical artery was made to locate the origin of the supraclavicular artery and determine the “point,” namely, the starting point of the supraclavicular artery. After that, another anterograde dissection of the supraclavicular artery was carried out for 1–2 cm in length, and an “extension line” was made along the direction of the vessels as the long axis of the flap [Figure 1A]. The flap was then designed on this axis to ensure that the resected flap was within the perfusion range of the supraclavicular artery, which could

Authors’ Reply: Pre-operative imaging of the supraclavicular artery island flap plays a vital role in the flap design

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Thank you very much for reviewing the case report carefully and proposing meaningful comments on evaluating angiosome of the supraclavicular flap. In view of your opinions and based on our clinical experience, we hereby reply as follows:

1. The safe length of the vascular pedicle of the flap

When harvesting the supraclavicular island flaps, we follow the principle that the position, size, and shape of the flap in the donor site are determined by the location, size, and shape of the defect. We take the originating site of transverse cervical artery as a “turning point” of the vascular pedicle of the flap. The length of the vascular pedicle of the supraclavicular flap was defined as the distance measured from the “turning point” to the proximal part of the defect area. Different from the supraclavicular fossa as taken as the “turning point” by other reports, the starting site of transverse cervical artery was used as the “turning point” in our study. In this regard, it required the skeletonization of the cervical segment of transverse cervical artery during the harvesting of the supraclavicular island flap. The advantages as follows: 1) Removal of the adipose connective tissue around the root of transverse cervical artery to prevent local lymph node recurrence; 2) Skeletonization of the transverse cervical artery to enlarge the range of motion of the flap, so as to facilitate the transfer and shaping of the flap in the recipient site; 3) Root of the transverse cervical artery is closer to the donor site than the supraclavicular fossa, which can realize a repair of the defect at a higher position when selecting the former one as the “turning point.” On the contrary, for defects with the same height, when the “turning point” is designed at the root of transverse cervical artery, there may be a closer distance between the defect and the donor site, and hence flap pedicle of shorter length is needed for repair. In other words, the flap may be closer to the supraclavicular artery, showing a more abundant blood supply at the end of the transferred flap.

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significantly reduce the necrosis rate of the distal part of the flap [Figure 1B].

In addition, for the repair of tissue defects locating at the same height, the position of the “turning point” of the flap is quite important to reduce the necrosis of the distal flap. When the “turning point” is designed in the supraclavicular fossa, there is a need for a longer pedicle, which indicates a longer distance between the distal part of the flap and that of the supraclavicular artery. While the “turning point” is designed at the origin of transverse cervical artery, the pedicle length can be saved to realize a better perfusion of the tissue flap.

3. Preoperative assessment of the angiosome of SAI flap

Many methods are available for preoperative assessment of SAI flap. Doppler ultrasonography (CDU) is one of the common choices for preoperative vascular location in flap surgery. In our experience, “point line anterograde dissection” is superior to preoperative CDU examination and other methods. It can be interpreted as follows: 1) The development of supraclavicular artery can be directly observed and evaluated under direct vision. The safety of blood supply at the distal part of flap shall be considered when determining the length of pedicle. 2) Conventional CDU can be used to detect vessels with the minimum diameter of about 0.5 mm. Thus, it can only possess the ability to mark the development of supraclavicular artery, yet with the absence of the capability of tracking its direction. 3) The development of drainage vein can not be explored by using CDU.

The “point line anterograde dissection” adopted in our study can achieve a simultaneous exploration of the development and direction of transverse cervical artery, as well as identifying its accompanying vein, which is not always developed. Significantly, the new strategy is time-saving for harvesting and ensures the safer blood supply of the flap. However, it shall be noted that for patients with medical history of neck surgery and radiotherapy, it is recommended to carry out digital subtraction angiography (DSA) preoperatively to identify the integrity of the responsible blood vessels.

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Conflicts of interest

None.

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Figure 1: “Line” (green double arrow line) is extended from the starting 1–2 cm segment of the responsible vessel, which originates from the starting point of the supraclavicular artery (A). The extension line (green double arrow line) indicates the responsible vessels axis, which is located in the center of the harvested island flap and guarantees the flap blood supply (B). CDU: Color Doppler ultrasonography; SAI: Supraclavicular artery island.