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Cadaveric study on Facial Artery Perforator Flaps

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ABSTRACT

Head and neck reconstruction therefore presents unique challenges to the reconstructive surgeon. Fueled by the knowledge thatsingle perforators in other parts of the body have been shown to supply large areas of tissue (6), it was hypothesized that singleperforators of the facial artery would do the same for large areas of facial skin.However, a poor understanding of the number anddistribution of the perforating branches of the FA, limits wide acceptance of this approach.In this study, dissections wereperformed on 32 cadaveric hemifaces in fresh cadavers in the department of Anatomy, PGIMER, Chandigarh.The total length offacial arteries from origin to the level of the nasal alar rim was on average 182.78 ± 20.3 mm, ranging from 142.06 mm – 223.5mm. The corresponding mean diameter of FA was 2.39 ± 0.84 mm (range 1.22 – 3.57 mm). We found multiple facial arteryperforators arising from each facial artery. The average number of facial artery perforators, which were more than 0.5 mm, werefound to be 6 per facial artery (3 - 9).Maximum number of perforators wereobserved in the nasolabial area, about 13.5 mm to 23mm from the oral commissure. This study improves our understanding of facial vascularization, and shows that FAP flaps are aviable and valuable addition to the reconstructive techniques available to the plastic surgeon.

Key words: reconstructive; perforator; artery; flaps; oral commissure

INTRODUCTION

A thorough knowledge of vascular anatomy is crucial to the understanding and designing of perforator flaps, and many studies have been published recently (1-3). These perforator flaps allow primary closure of a defect. Because of the prominence of this region, defects of anykind in the head and neck area are in full view and entirely open to scrutiny. For this reason the demands on our reconstructive skills are, in some ways, greater than they are elsewhere in the body where function is less specialized cosmesis possibly of less significance (4). Head and neck reconstruction therefore presents unique challenges to the reconstructive surgeon. To achieve best possible results in reconstructive surgeries in this area, we should wherever possible replace excised tissue with similar tissue

(4). Cosmetic and functional considerations, such as color match and blood supply, respectively have led to local flaps based on the facial artery (FA) becoming the preferred method for such reconstructive work (5). Fueled by the knowledge that single perforators in other parts of the body have been shown to supply large areas of tissue (6), it was hypothesized that single perforators of the facial artery would do the same for large areas of facial skin. This would then provide freestyle skin flaps based on a perforator from a known source artery. However, a poor understanding of the number and distribution of the perforating branches of the FA, limits wide acceptance of this approach (7).This study is therefore aimed to investigate the facial artery perforating branches (FAP) suitable for use in facial flaps.

MATERIAL & METHOD

Dissections were performed on 32 cadaveric hemifaces in fresh cadavers in the department of Anatomy, PGIMER, Chandigarh.First of all, the facial artery was cannulated at its origin from the external carotid artery and carefully perfused with a coloured latex dye.Then, it was kept overnight and then, the facial artery was dissected from its origin at the external carotid artery to the level of the nasal alar rim. The skin was carefully incised over the course of the facial artery and reflected medially and laterally. Dye-colored vessels reaching the skin were followed back to their origin through the facial muscles into the facial artery. Only major vessels descending from the skin, which followed a direct course to the facial artery, were qualified as facial artery perforators. The total length of the facial artery as dissected was measured in millimeters, from origin to mandible to nasal alar rim. The number of facial artery perforators supplying the overlying skin and their distribution were assessed. The length of facial artery perforators from their origin at the facial artery to the skin were measured in millimeters. The diameters of the facial artery perforators at their origin were measured. All these measurements were done with digital vernier caliper and then the photographs of the specimen were taken.

RESULTS

After determining the general course of the FA, the results of the measurements were analysed. The total length of facial arteries from origin to the level of the nasal alar rim was on average 182.78 ±20.3 mm, ranging from 142.06 mm–

223.5 mm (Figure 1).

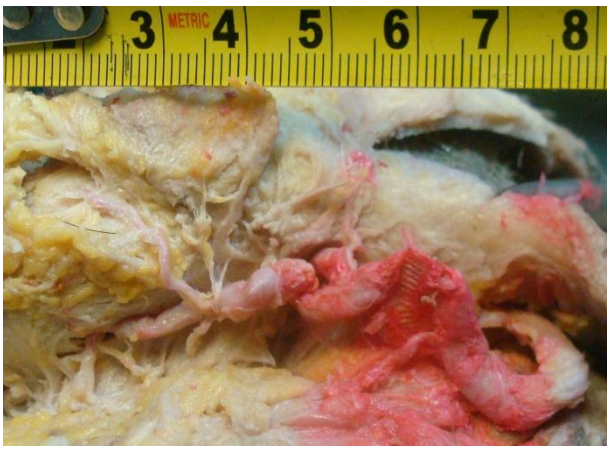

Figure 1. Figure showing facial artery (FA) and perforators arising from it (FAP)

Facial artery length from the point where it crosses the mandible to the level of the nasal alar rim, which represents the area where facial artery perforators were investigated, was on average 137.4± 12.22 mm (range, 112.3 to 162.5 mm) (Figure 2).

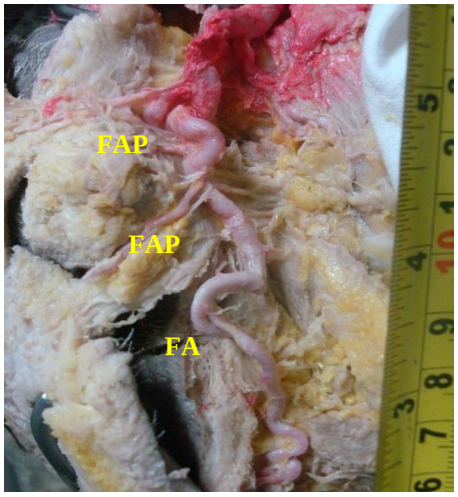

Figure 2. Figure showing course of facial artery perforators (FAP)

The corresponding mean diameter of FA was 2.39 ± 0.84 mm (range 1.22–3.57 mm). We found multiple facial artery perforators arising from each facial artery. The average number of facial artery perforators, which were more than 0.5 mm, were found to be6 per facial artery (3 - 9).The mean diameter of the perforators was 0.84 mm (0.53-1.16mm). We also observed the region with the maximum number of perforators (Figure 3).

Figure 3. Figure showing areawith maximum number of facial artery perforators (FAP)

Maximum number of perforators were observed in the nasolabial area, about13.5 mm to 23 mmfrom the oral commissure.

DISCUSSION

Numerous flaps based on the facial artery are well known and have widespread use. These flaps consist of standard nasolabial flaps with an intact

skin pedicle, islanded nasolabial flaps, and V-Y transposition flaps in the nasolabial and cheek areas (8). All these flaps are based on the knowledge of axial facial vessels, with multiple perforator branches to the overlying skin in their design (9). Previous studies have classified the course of the facial artery, but none have really investigated facial artery perforators (FAP).The feasibility of this concept was studied in cadavers to assess the number, distribution, length, and diameter of perforating vessels from the facial artery. According to the criteria set out by Lyons (10), acceptable perforator flap donor sites in head and neck surgery have four common features: a predictable and consistent blood supply, at least one large perforator (diameter >0.5 mm), sufficient pedicle length and a donor site that can be closed primarily with the absence of excessive wound tension.In the current study also, authors observed that the mean diameter of FAPwas greater than 0.5 mm and in each case, we could find either two or three perforators with diameter more than 0.5 mm. At least two or three readily dissectible perforators were identified with every facial artery. These diameters are comparable to vessel diameters reported for perforators in different areas of the body (11, 12).We also observed finding similar to previous study (5). Vessels of similar diameter in the lower extremity have been reported to supply areas of skin measuring 5 -10 cm. In the facial artery perforator flap, the vessel is located on the flap edge to enhance its arc of rotation (11, 12). In our study, we found area with maximum concentration of FAP in the proximity of nasolabial region. This allows flaps to be raised with more confidence while at the same time allowing surgical scars to be placed within or parallel to the fold and achieve good cosmesis (5).This study improves our understanding of facial vascularization, and shows that FAP flaps are a viable andvaluable addition to the reconstructive techniquesavailable to the plastic surgeon.

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