INTRODUCTION

The posterior auricular artery (PAA), a small branch of the external carotid artery (ECA) and is the dominant blood supply to the auricle [1-3]. The PAA branches from the ECA superior to the occipital artery and passes between the parotid gland and styloid process before passing through a groove between the mastoid process and auricular cartilage [3, 4]. The PAA finally ascends under the cranial surface of the conchae [2]. Three to four branches of the PAA supply the cranial surface of the auricle, while other small branches either pierce the cartilage or wrap around the helix of the auricle to supply the lateral auricular surface [3]. Auricular branches of the superficial temporal artery (STA) also supply the lateral surface of the auricle and the lobule [3]. Pinar et al. [2] identified three main branches of the STA: upper, supplying the ascending helix; middle, supplying the tragus; and lower, supplying the lower margin of the ear lobe. Imanishi et al. [1] revealed that the STA supplies blood to the upper portion of the auricle as well as to the lobule, whereas the PAA supplies most of the posterior auricular surface. Park et al. [5] also identified a conchal network formed by PAA perforators through the conchal floor.

Several figures from the medical literature have...
depicted this conchal network as being formed by the PAA piercing the posterior aspect of the conchae floor [3, 6]. These images are variable and sometimes show a vascular foramen (VF) for the PAA with a high level of variation in size and position. However, the prevalence and morphology of such a VF has not been well investigated. Therefore, we aimed to investigate the morphology of the VF on the conchae floor and discuss its clinical implications.

MATERIALS AND METHODS

Ten sides from five formalin-fixed frozen Caucasian cadaveric heads were used in this study. Red latex was injected into the common carotid artery on all sides. The specimens were derived from two males and three females with the age of death ranging from 65 to 84-years-old with a mean of 76.0±7.2 years-old. The number, diameter of the VF, the diameter of the perforating artery (PA), shape of the VF (circular or oval), distance from the middle of the tragus and VF were recorded. The differences between sides were evaluated using a t-test with a p-value <0.05 considered statistically significant.

One clinical anatomist and one oral and maxillofacial surgeon performed all dissections and measurements. Measurements were made with microcalipers (Mitsutoyo, Kanagawa, Japan). The resolution was 0.01 mm and the accuracy value was ±0.025 mm. The measurement was performed three times by each observer (for a total of six times for each measurement) and averaged. The present study protocol did not require approval by the ethics committees in our institutions, and the work was performed in accordance with the requirements of the Declaration of Helsinki (64th WMA General Assembly, Fortaleza, Brazil, October 2013).

RESULTS

A total of eleven VF were identified on the conchae floor. There was one VF on 9 sides (90%) and two on 1 side (10%) (Figs. 1 and 2). On the one side with a doubled VF, two small branches arose from a common PA trunk posterior to the cartilage. As for shape, the VF was oval in four foramina (36%) and circular in seven foramina (64%) (Fig. 3). The diameter of the long axis of the VF ranged from 0.4 to 5.1 mm with a mean of 2.0±1.4 mm (2.5±1.6 mm on the right sides and 1.5±1.0 mm on the left sides). The diameter of the short axis of the VF ranged from 0.4 to 3.1 mm with a mean of 1.3±0.9 mm (1.3±1.0 mm on the right sides...
The diameter of the PA ranged from 0.2 to 1.6 mm with a mean of 0.7 ± 0.4 mm (0.7 ± 0.2 mm on the right sides and 0.7 ± 0.5 mm on the left sides). A PA diameter of 1.0 mm or more was seen in two foramina (18%). There was no significant difference between right and left sides regarding the diameter of the VF and associated PA branch (p > 0.05).

The distance from the middle of the tragus to the VF ranged from 4.7 to 13.6 mm with a mean of 10.7 ± 2.6 mm (12.2 ± 1.2 mm on the right sides and 8.9 ± 2.7 mm on the left sides). There was no significant difference between the right and left sides (p > 0.05).

The origin of the PA of the concha was the poste-
rior auricular artery on all 11 sides (Fig. 4).

DISCUSSION

Previous studies have investigated the vascular pattern of the PAA and have shown the PAA as giving rise to several branches which supply parts of the medial and lateral surfaces of the auricle [4, 7, 8]. The perforating artery of the concha of the auricle and related VF have been depicted in several texts [3, 6]. Recently, Zilinsky et al. [6] demonstrated that numerous small branches, i.e. conchal perforators, supply the auricle and this part of the external ear. Park and Roh 7 reported that the PAA had multiple perforating branches which pierced the auricular cartilage. Two (38%) to four (31%) PA which pierced the auricular cartilage to reach the anterior surface of the auricle were found in Zilinsky et al.’s study.

From a surgical perspective, conchal cartilage grafting has been used to repair traumatic orbital wall defects [9, 10], partial helical defects [11], and nasal septum reconstruction [12]. Lan et al. [13] reported that in 372 patients who underwent conchal cartilage harvesting for rhinoplasty, 1.1% (four cases) developed keloids and 1.3% (five cases) incurred hematomas. Of these, hematoma might be due to damaging the PA of the PAA. In the present study, the mean distance from the tragus to the VF was 10.7±2.6 mm. This result is similar to the findings of Zilinsky et al. (1 cm) [6] and could help surgeons identify the VF during surgery in order to avoid unnecessary injury. The risk of bleeding might depend on the diameter of the artery. Our study found that this diameter ranged from 0.2 to 1.6 mm with a mean of 0.7±0.4 mm. Although the sample size was small, 18.2% (2/11) of the specimens had large arteries. Interestingly, the shape of the VF was oval in four of the sides we examined. The diameter of the long and short axes of the VF ranged from 0.4 to 5.1 mm with a mean of 2.0±1.4 mm and from 0.4 to 3.1 mm with a mean of 1.3±0.9 mm, respectively.

CONCLUSION: An improved understanding of the site and size of VF for the PA of the PAA might decrease surgical morbidity during surgeries of the external ear. We found that the distance from the middle of the tragus to the VF ranged from 4.7 to 13.6 mm with a mean of 10.7±2.6 mm. These results could be used to establish a surgical landmark to identify or avoid this arterial blood supply.

ACKNOWLEDGEMENT: The authors wish to thank all those who donate their bodies and tissues for the advancement of education and research.

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