

## A macroanatomic study on the facial vein and its branches in the Van cat

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**ABSTRACT:** In this study, five adult Van cats of both sexes, which were obtained from the Van Cat Research Centre, were used as materials. After the washing of the veins of the cats with saline via an external jugular vein, latex was injected via the same vessel into the vein system. Then, materials were fixed and after solidification of the latex, the veins were dissected, identified and presented in images. The majority of the venous drainage of the face is done by the facial vein, which is the direct continuation of the linguofacial vein in the intermandibular region, and its branches. In the Van cat, the facial vein gives off the inferior labial vein, the deep facial vein, the angular vein of the mouth and the masseteric branch on the lateral surface of the face. The facial vein then gives off the medial inferior palpebral vein, the superior labial vein and the lateral nasal vein at the level of the levatory nasolabial muscle and the angular vein of the eye and the dorsal nasal vein at the level of medial angle of the eye. The presence of a masseteric branch which is given by the facial vein and the ramifying of the deep facial vein into the descending palatine vein, the anastomotic branch of the superficial temporal vein and the external ophthalmic vein which is given by the deep facial vein in the Van cat demonstrates that there are differences in the presence, ramification and distribution either of the facial vein or of its branches as compared to domestic cats.

**Keywords:** Van cat; facial vein; anatomy

The Van cat is a breed (middle-long-haired cat), which lives in the Van region of Turkey. This cat is known locally as the “odd-eyed cat”. Its eyes are usually coloured blue and orange, while its body is white in colour and it features patches of colour on the head, legs and tails (Odabasioglu and Ates, 2000). The anatomy of this affectionate cat has been the subject of interest of anatomists who have studied some of the morphological peculiarities of this cat in the last decade. The reports available in the literature include studies on physiological and morphological peculiarities (Ates, 2000), the coronary arteries (Nur and Aksoy, 2000) and the axillary artery and its branches (Karadag et al., 2001). These studies have reported significant morphological differences in the circulatory system of the Van cat compared to the domestic cat. Hence, the goal of this investigation was to describe the facial veins and their branches in the Van cat, which may help facilitate understanding of the circulatory system of this cat and aid in clinical settings.

In cats, venous drainage of the face is carried out by a facial vein that is the continuation of the linguofacial vein. It leaves from the intermandibular region via the vascular notch and reaches the facial region (Frenzel, 1967; Ghosal et al., 1981; Nickel et al., 1981; Ari, 2000). In this region, the facial vein runs parallel to the rostral border of the masseter, then runs rostroventrally under the levator nasolabialis and reaches the medial angle of the eye where it terminates by giving off caudodorsally the angular vein of the eye and rostroventrally the dorsal nasal vein. During its course on the border of the masseter, it gives off the inferior labial vein, the angular vein of the mouth and the deep facial vein and under the levatory nasolabialis it gives off the superior labial vein, the medial inferior palpebral vein and the lateral nasal vein (Frenzel, 1967; Ghosal et al., 1981; Nickel et al., 1981; Ari, 2000; Konig and Liebich, 2004). It was also reported that the masseter vein is given by the facial vein at the level of the masseter in dogs (Frenzel, 1967).

The deep facial vein which is a branch of the facial vein, reaches the pterygoid fossa with a caudodorsal course under the masseter where the deep facial vein gives off the minor palatine vein, descending palatine vein, infraorbital vein and an anastomotic branch to the temporal vein. Subsequently, the deep facial vein runs as the ventral external ophthalmic vein (Frenzel, 1967; Ari, 2000). Frenzel (1967) reported that the minor palatine vein could originate from the major palatine vein.

The angular vein of the eye gives off the medial inferior palpebral vein and the frontal vein dorsal to the eye in cats (Frenzel, 1967; Crouch and Lackey, 1969; Ghosal et al., 1981; Nickel et al., 1981). Furthermore, Frenzel (1967) and Ari (2000) have reported that the frontal vein gives rise to the anastomotic branch to the anterior auricular vein.

No macroanatomic study on the facial vein and its branches has been carried out in the Van cat. Therefore, in this study the facial vein and its branches were studied by injecting latex into the facial vein of the Van cat.

## MATERIAL AND METHODS

Five adult Van cats, which were obtained from the Van Cat Research Centre, were used as materials. The cats had recently died and were brought to the Anatomy Department of the Veterinary Faculty between the years 2005–2008. The external jugular veins of the cats were dissected on each side. A catheter was placed into the external jugular vein on one side and sodium saline (0.9%) was injected via the catheter. Injection was terminated when saline solution leaked from the split on the other side of the external jugular vein. Then, blue-coloured latex (Setacolor™, Cobalt blue, num. 20; PEBCO cedex, France) was injected via the same catheter (Aycan and Bilge, 1984). Following the hardening of the latex, the cadavers were kept in 10% formaldehyde until dissection. Subsequently, the facial vein and its branches were dissected, identified and presented in images.

## RESULTS

The facial vein (Figure 1/4), was the continuation of the lingofacial vein after giving off the lingual vein in the intermandibular space. The facial vein coursed rostrally in the intermandibular space and

passed to the lateral of the face via the vascular notch (incisura vasorum facialium). The vein ran dorsal to the cranial border of the masseter then reached the ventral border of the levator nasolabialis. During its course it gave off cranially an inferior labial vein to the lower lip, an angular oris vein to the lateral angle of mouth, a superior labial vein to the upper lip and caudally, a profound facial vein to the temporal region and a masseteric branch to the superficial face of the masseter. The facial vein coursed rostro-dorsally under the levator nasolabialis and gave off the angular vein of the eye and the dorsal nasal vein at the level of medial angle of the eye. The vein also gave, cranially, a medial inferior palpebral vein at this region.

The inferior labial vein (Figure 1/6), was the first branch that arose from the facial vein on the body of the mandible. This vein ran rostroventrally and ramified on the depressor labii inferioris in the inferior lip. In this region it anastomosed with the submental vein (Figure 1/5) and the same vein of the opposite side.

The masseteric branch (Figure 1/9), arose from the facial vein both on the body of the mandible and at the level of the levator nasolabialis. Both branches distributed to the superficial layer of the masseter.

The angular vein of the mouth (Figure 1/8), originated from the front wall of the facial vein just dorsal to the angle of the mouth and ramified in the zygomaticus and the orbicularis oris.

The superior labial vein (Figure 1/10), left from the facial vein under the levator nasolabialis and ran dorsal to the angle of the mouth. The vessel distributed to the superior lip following its course between the canine and the levator labii superioris.

The medial inferior palpebral vein (Figure 1/11), emerged from the facial vein at the level of the levator nasolabialis. The vessel reached the medial of the inferior palpebra with a dorsocaudal course.

The lateral nasal vein (Figure 1/13), left from the facial vein ventral to the medial angle of the eye. It coursed to the lateral border of the nostril on the levator labii superioris. The vessel drained the skin on the lateral side of the nostril and received branches from the levator labii superioris and nasal plane.

The dorsal nasal vein (Figure 1/14), originated from the facial vein in the medial angle of the eye. The vessel ramified into the dorsal branch (Figure 1/14<sup>I</sup>), and ventral branch (Figure 1/14<sup>II</sup>), after its origin. The dorsal branch anastomosed with the same branch on the opposite side on the dorsal of the nose. The ventral branch anastomosed with the

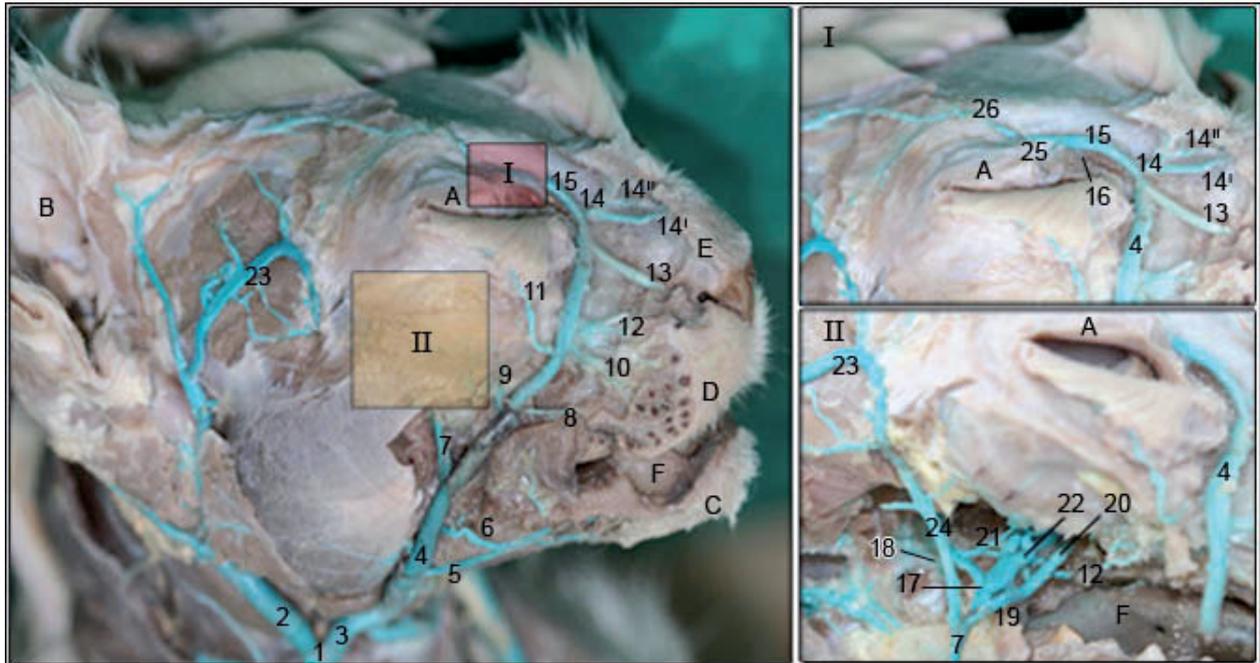


Figure 1. The facial vein and its branches in the Van Cat. A = palpebra superior, B = auricula, C = labium inferius, D = labium superius, E = nasus, F = lingua. 1 = jugular vein, 2 = maxillar vein, 3 = linguofacial vein, 4 = facial vein, 5 = submental vein, 6 = inferior labial vein, 7 = deep facial vein, 8 = angular vein of the mouth, 9 = masseteric branch, 10 = superior labial vein, 11 = medial inferior palpebral vein, 12 = infraorbital veins, 13 = lateral nasal vein, 14 = dorsal nasal vein, 14<sup>I</sup> = dorsal branch, 14<sup>II</sup> = ventral branch, 15 = angular vein of the eye, 16 = medial superior palpebral vein, 17 = root of major and minor palatine vein, 18 = minor palatinal vein 19 = descending palatine vein, 20 = sphenopalatine vein 21 = major palatine vein 22 = ventral external ophthalmic vein, 23 = superficial temporal vein 24 = anastomotic branch of the superficial temporal vein, 25 = frontal vein, 26 = anastomotic branch of the rostral auricular vein

same branch on the opposite side after coursing rostroventrally on the lateral wall of the nose.

The angular vein of the eye (Figure 1/15), which was the continuation of the facial vein, left from the facial vein at the medial angle of the eye and reached the dorsal of the orbita with a dorsocaudal course. The angular vein of the eye gave off a medial superior palpebral vein to the superior eyelid, the frontal vein to the muscles of the ocular bulb and the rostral auricular vein to the ear.

The medial superior palpebral vein (Figure 1/16), left from the angular vein of the eye on the dorsal of the eye and distributed to the medial of the superior eyelid.

The frontal vein (Figure 1/25), left from the angular vein of the eye on the dorsal of the orbita. The vessel ended on the frontal and the corrugator supercili.

The anastomotic branch of the rostral auricular vein (Figure 1/26), anastomosed with the anastomotic branch of the frontal vein on the dorsal of the lateral angle of the eye where it ran to the ear.

The deep facial vein (Figure 1/7), left caudodorsally from the facial vein on the body of the mandible. After its origin, the vessel coursed caudodorsally in the superficial and the profound masseter and reached the ventral of the zygomatic arch. The deep facial vein gave off an anastomotic branch to the superficial temporal vein here, then gave off the descending palatine vein (Figure 1/19), and the root of the major and minor palatine vein on the medial of the zygomatic arch and the ventral external ophthalmic vein (Figure 1/22).

The descending palatine vein (Figure 1/19), left from the deep facial vein medial to the zygomatic arch. The vein first gave off the sphenopalatine vein (Figure 1/20), at the pyregoid fossa.

The sphenopalatine vein (Figure 1/20), emerged from the descending palatine vein. After giving off the infraorbital vein, the vein distributed to the inside of nose by passing from the sphenopalatine foramen.

The infraorbital vein (Figure 1/12), originated from the sphenopalatine vein at the medial to the zygomatic arch. It reached the upper lip by passing

through the infraorbital canal. The vein ended with branching in the upper lip.

The common root for the major palatine vein (Figure 1/17), and minor palatine vein emerged from the deep facial vein in the pterygoid fossa. The major palatine vein distributed into the hard palatine. The minor palatine vein (Figure 1/18), distributed into soft palatine.

The anastomotic branch of the superficial temporal vein (Figure 1/24), left from the deep facial vein ventral to the zygomatic arch. The vein coursed caudodorsally between the layer of the profound and the superficial masseter and anastomosed with the superficial temporal vein (Figure 1/23) dorsal to the lateral angle of the eye.

The ventral external ophthalmic vein (Figure 1/22), emerged from the deep facial vein medial to the zygomatic arch. The vein contributed to the ophthalmic plexus.

## DISCUSSION

It has been reported that the facial vein leaves from the linguofacial vein in the intermandibular space and crosses from the facial groove to the lateral face of the cheek in the domestic cat (Frenzel, 1967; Ghosal et al., 1981; Nickel et al., 1981; Ari, 2000). These observations are here found to hold true also for the Van cat.

Previous studies have described that the facial vein gives off the inferior labial vein, the angular vein of the mouth and the deep facial vein in front of the masseter, the superior labial vein, the medial inferior palpebral vein and the lateral nasal vein at the level of the levator naslabialis before dividing into the angular vein of the eye and the dorsal nasal vein and terminating in the medial angle of the eye. The situation is found to be similar in the Van cat. However, two masseter branches were seen in this region in the Van cat.

Frenzel (1967) and Ari (2000) have demonstrated that the inferior labial vein and the angular vein of the mouth are distributed in the angle of mouth and in the inferior lip, respectively. Once again, these data are also valid for Van cat.

As reported in many previous studies (Frenzel, 1967; Ghosal et al., 1981; Nickel et al., 1981; Ari, 2000), the deep facial vein originates from the facial vein in front of the masseter and courses caudodorsally between the superficial and the profound layers of masseter before reaching the ventral zygo-

matic arch. The last branches of the deep facial vein were described to be the anastomotic branch of the superficial temporal vein, the sphenopalatine vein, the major palatine vein and the inferior palpebral vein in Frenzel's 1967 study Frenzel (1967), and the anastomotic branch of the temporal superficial vein, the ventral external ophthalmic vein, the minor palatine vein, the descending palatine vein and the infraorbital branch in the study of Ari (2000). However, the last branches of the deep facial vein were seen to be the anastomotic branch of the superficial vein, the ventral external ophthalmic vein and the descending palatine vein in the Van cat. In the present study, it was also observed that the deep facial vein gave off an origin to the major palatine vein and the minor palatine vein.

As stated in the literature (Frenzel, 1967; Ghosal et al., 1981; Nickel et al., 1981; Ari, 2000), the superior labial vein goes to the superior lip, the lateral nasal vein goes to the lateral wall of the nose and the dorsal nasal vein goes to the dorsal wall of the nose in the Van cat.

Consistent with the reports of Frenzel (1967) and Ari (2000), the angular vein of the eye was observed to give off an anastomotic branch of the rostral auricular vein, the frontal vein and the medial superior palpebral vein dorsal to the eye. The angular vein of the eye then joined to the dorsal external ophthalmic vein.

As a result, venous drainage of the face is performed by the facial vein and its branches in the Van cat. However, the last branches of the deep facial vein of the Van cat differ in their branching, which could be due to variations in vessel systems or differences between breeds.

## Acknowledgements

We thank the Van cat Research Centre of the University of Yuzuncu Yil for providing the materials.

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Received: 2011–02–08

Accepted after corrections: 2011–08–26

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