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Identification of the trochlea with reference to the lacrimal caruncle, and its significance as a landmark in orbitofacial surgery

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Summary *Purpose:* The purpose of this study was to identify the location of the trochlea in order to prevent injury during orbitofacial surgery and to determine the reliability of the lacrimal caruncle as a visible external landmark for the trochlea at the superomedial orbital rim.
Methods: Fifty-one orbits from 27 embalmed cadavers were dissected. The lacrimal caruncle and supraorbital notch/foramen were used as external and bony landmarks, respectively. The location of the trochlea was determined with respect to these structures, and the size of trochlea was measured.
Results: The trochlea was 3.6 mm wide and 5.6 mm long, with a flange breadth of 5.4 mm. The vertical distance from the apex of the lacrimal caruncle to the superolateral tip of the trochlea was 15.8 mm, and that from the top of the supraorbital notch/foramen to the bottom of the trochlea was 11.4 mm. As the coefficient of variation and standard deviation were smaller for DCT (11.5 and 1.8, respectively) than for DST (17.0 and 1.9, respectively), it appears that the lacrimal caruncle is a reliable landmark.
Conclusions: In contrast to the supraorbital notch, the lacrimal caruncle allows easy identification and serves as a reliable and visible external landmark for the prediction of the location of trochlea. The trochlea was located directly at 15.8 mm (i.e., approximately 1.5 cm) superior to the lacrimal caruncle. This anatomical study has yielded accurate measurements of the

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location of the trochlea, which may facilitate a safer orbitofacial surgery by preventing morbidity associated with trochlea injury.

Introduction

The trochlea is attached to the anteromedial orbital roof. The tendon of the superior oblique muscle passes through the inside of the trochlea, which redirects it, thus becoming the functional origin of the superior oblique muscle for movement.[1] Trochlea injury has sometimes been reported during blepharoplasty[2–4] and orbital surgery,[5,6] and following traumatic eyelid injuries.[7–9] Injury to the trochlea remains an infrequent occurrence, but can potentially result in devastating complications such as diplopia, abnormal head posture, and ocular motility disturbances.[10,11]

The trochlea can be palpated along the superomedial margin of the orbit only by highly skilled experts, because it is small, located deep in the orbital tissue, and firmly attached to the bone.[12] For these reasons, its anatomy is not familiar to surgeons such as neurosurgeons, plastic surgeons, and even oculoplastic surgeons. Therefore, accurate knowledge of anatomical landmarks that can be used to predict the location of the trochlea is very important to facilitate approaches of orbitofacial surgery and avoid complications.

The location of the trochlea has been determined previously using the supraorbital notch/foramen as a bony landmark.[13] However, it can occasionally be difficult to palpate the supraorbital notch/foramen due to anatomical variability,[14] and if it exists as a supraorbital foramen rather than a notch, it is difficult to palpate externally and without dissection. Therefore, in addition to this bony landmark, a simple and easily accessible external landmark is required to accurately predict the location of the trochlea. We have found that the location of trochlea commonly corresponds to the lacrimal caruncle of the eye. The present study conducted a cadaveric investigation to determine whether the lacrimal caruncle can serve as a reliable external landmark for the underlying trochlea.

Materials and methods

Fifty-one intact orbits of 27 embalmed adult Korean cadavers (15 males and 12 females) were dissected. Three orbits disrupted anatomically by previous orbital surgery (1) and trauma (2) were excluded. The age of the subjects at death was 71.6 ± 16.5 years (mean ± standard deviation (SD)), and ranged from 43 to 104 years. None of the cadaveric specimens was affected by eyelid or orbital abnormality, or was disrupted anatomically (e.g., by previous oculofacial disease, surgery, or trauma). The lacrimal caruncle, which is a small, triangle-shaped pink bump in the corner of the surface eye can be easily identified, is well demarcated, and is palpable on the eye. In this study, the lacrimal caruncle was used as a visible external landmark to predict the location of the trochlea. This study was undertaken in accordance with the principles outlined in the Declaration of Helsinki.

Measurements

The medial corner of the external eyelid surface and orbit were dissected meticulously. The lacrimal caruncle, trochlea, supraorbital notch, and bony origin (orbital process of the maxillary bone) of the medial canthal ligament (MCL) were identified (Figure 1). The following parameters were measured:

1. Vertical distance from the apex of the caruncle to the superolateral tip of the trochlea.
2. Vertical distance from the top of the supraorbital notch/foramen to the lower base of the trochlea.
3. Horizontal distance from the sagittal plane crossing the apex of the lacrimal caruncle to the superolateral tip of the trochlea.
4. Distance from the bony origin of the MCL to the apex of the caruncle.
5. Length of the MCL.
6. Breadth of the MCL.

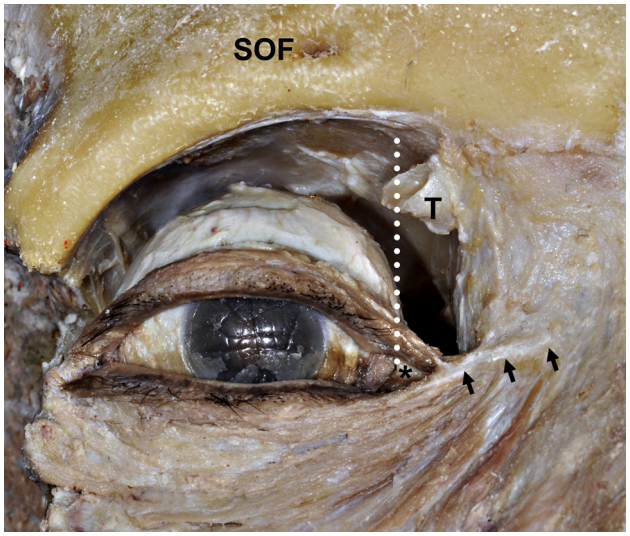

Figure 1 A cadaveric dissection demonstrating the location of lacrimal caruncle (asterisk), trochlea (T), supraorbital notch/foramen (SOF), and medial canthal ligament (arrows). The white dot line is the reference vertical line passing the top of lacrimal caruncle.