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Medial canthopexy of old unrepaired naso-orbito-ethmoidal (noe) traumatic telecanthus

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ABSTRACT

Introduction: Traumatic telecanthus resulting from injuries to the naso-orbito-ethmoidal (NOE) complex is a difficult deformity to treat and involves both esthetic and functional aspects. Delayed or inadequate primary treatment often results in scarring and secondary deformities that are severe and make them extremely problematic to correct. The intricate anatomy of this area makes NOE injuries one of the most challenging areas of facial reconstruction. Several techniques were described to reconstruct the medial canthal tendon (MCT) and repair the telecanthus deformity. Transnasal wiring remains the gold standard. However, the procedure is technically difficult. It necessitates wide exposure sufficient to allow transverse passage of wires through bony fenestrations deep within the orbit, and involves dissection of the contralateral orbit.

Aim: This study proposes a minor modification to simplify transnasal-wiring technique in the difficult cases presenting with telecanthus following unrepaired NOE fractures.

Patients & methods: The study included 13 patients (11 males and 2 females) presenting with telecanthus, at least six months after sustaining NOE fractures. Transnasal canthopexy was the fundamental step in reconstruction. Two wires held independently the anterior and posterior limbs of the MCT to ensure an adequate grip. They were delivered in a single pass through a single hole instead of two to avoid weakening of the thin lacrimal bones. The wires were then secured to a titanium mesh fixed to the contralateral medial orbital rim to guarantee a stable fixation.

Results: The technique restored the normal canthal position along the lacrimal crest. Good functional and esthetic results are reported based on the measurement of pre- and postoperative intercanthal & canthal–midline distances over a period of 2-years, with an average follow-up period of 12 months.

Conclusion: The results reveal the simplicity and reliability of this technique in restoring palpebral shape and intercanthal distance without any recoded functional complications throughout the follow-up.

1. Introduction

The medial canthal tendon (MCT) is a crucial soft tissue component of the naso-orbito-ethmoid (NOE) complex arising from the medial margin of the upper and lower tarsi and the orbicularis oculi muscle. It inserts in a tripartite fashion (anterior, posterior, & superior limbs) into the region of the lacrimal crests at the medial orbit (Zide and McCarthy, 1983). The normal bony insertion of the MCT may disrupt following trauma. Failure to reattach the MCT results in medial canthal dystopia (Yamamoto et al., 2001).

Injuries to the NOE complex involve esthetic and functional and aspects (Baumann and Ewers, 2001). Aesthetically, the medial canthal region comprise precise three-dimensional characteristics (Herford et al., 2005): a sharp angle of the medial palpebral fissure, a nasal prominence with a 1:1 relationship in regards to the distance from the cornea to the nasofrontal junction and that from the lateral canthus to the cornea; an ideal nasoorbital angle approximately 115–130°; an ideal distance between the medial canthi approximately one third of the distance between the lateral canthi and one-half the interpupillary distance. Functionally, The medial canthus completely invests the lacrimal sac, which is seated within the lacrimal fossa. The action of the muscles and tendon allow for

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propagation of tears through the nasolacrimal system. In addition, the MCT acts as a suspensory sling for the globe, maintaining its support along with the lateral canthal tendon. Finally, the MCT ensures close apposition of the eyelid to the globe (Bedrossian, 2002).

The complexity & density of the anatomic components of the NOE area presents a challenge to the reconstructive surgeon. Medial canthal injuries can be broadly divided into two categories: degloving injuries and injuries associated with bony disruption (NOE fractures) (Robinson and Stranc, 1970). By definition, soft-tissue degloving injuries do not include bony disruption. They result from shearing forces and avulsion of soft tissue along the medial canthus, typically transmitted from the brow or forehead across the medial canthus to the lower eyelid/cheek complex. NOE fractures may also have a degloving component. In these cases, bony fragments should be reduced and fixed prior to soft-tissue reconstruction (Wilkins, 1970; Priel et al., 2011).

Treatment of NOE fractures involves reconstruction of the complex three-dimensional anatomy of the glabellar region with special attention to the nasal dorsum and medial canthus. The aesthetics of the NOE region dictates that the anatomy be restored and thus using a cantilevered bone graft to reconstruct the sagittal height since the nasal dorsum is often wide and flattened along with depression of the radix, and an upturned nasal tip. The displacement of the medial canthus results in rounding of medial canthus & shortening of palpebral fissure, which is corrected by a canthopexy (McCarthy et al., 1990).

Medial canthopexy requires precise identification of the correct anatomical location for tendon placement, and secure fixation of the tendon to the bone. Multiple techniques have been described. These include transnasal wiring (Mustarde, 1966; Converse and Smith, 1966; Converse and Hogan, 1970; Stranc, 1970; Duvall et al., 1981; Tessier, 1981; McCarthy et al., 1990; Markowitz et al., 1991) or ipsilateral techniques such as the nylon anchor suture (Callahan, 1963), the stainless steel screw (Callahan and Callahan, 1983), the cantilevered miniplate (Shore et al., 1992; Wittkampf and Mourits, 2001), the Mitek mini-GII anchor (Antonyshyn et al., 1996), and the transcaruncular barb & miniplate canthopexy (Hammer, 1995; Engelstad, 2011) or the combined transcaruncular-transnasal suture technique (Lauer and Pinzer, 2008). Unilateral techniques rely on anchoring the MCT to the ipsilateral medial orbit. Although they were introduced to simplify the procedure, these techniques are difficult to use when there is no stable bone around the NOE region. The use of a miniplate was incorporated to overcome this problem. However, it requires a coronal incision in the majority of cases especially if the transcaruncular approach was used, which is also reported to distort the upper canaliculus (Engelstad et al., 2012).

Transnasal wiring remains the gold standard & the most commonly used technique. However, the procedure is technically difficult. It necessitates wide exposure sufficient to allow transverse passage of wires through bony fenestrations deep within the orbit, and entails dissection of the contralateral orbit. Some clinicians (Fedok, 1995; Sargent and Rogers, 1999) even advocated temporary removal of the nasal bone for identification of the "canthal bearing bone" and for facilitation of the passage of transnasal wires, which further adds complexity to an already challenging procedure.

Traumatic telecanthus is best treated early (Lew and Sinn, 1997; Cunningham and Haug, 2004). Delay results in scarring and secondary maladaptive changes that compromise the reestablishment of the three-dimensional anatomy of the NOE region. The deformities that result from unrepaired NOE fractures are severe and extremely difficult to correct, requiring NOE osteotomies and grafting, and satisfactory results are seldom reported.

2. Aim of work

This study proposes a minor modification to simplify transnasal-wiring technique in the difficult cases presenting with telecanthus following unrepaired NOE fractures.

3. Patients & methods

The study was conducted at the department of plastic surgery, Ain-Shams University, Cairo, Egypt, over a period of two years. It included 13 patients (11 males and 2 females) whom presented with telecanthus following unrepaired NOE fractures. The age of the patients at the time of presentation ranged from 11 to 39 years with a mean age of 23.5 years. The cause of injury included motor vehicle accidents (5 patients), interpersonal violence (5 patients), and bicycle accidents (3 patients). The average duration from the initial injury to the clinical presentation ranged from 6 months to 4.5 years with an average of 3.2 years.

All patients underwent clinical examination for telecanthus. The distance (in millimeters) between the medial canthus and facial midline was recorded. It was compared to that of the contralateral uninvolved side. The intercanthal distance, the nasofrontal angle, and the ratio of nasal prominence (lateral canthi to cornea: cornea to radix) were also recorded. Examination included canthal position, eye movement, levator function, and patency of nasolacrimal system. The diagnosis of telecanthus was established based on the presence of an intercanthal distance exceeding one-half the interpupillary distance (intercanthal distance is equal to horizontal palpebral fissure distance), shortened palpebral aperture width and rounding medial palpebral angle along with lower lid laxity, and a positive bowstring test. There were concomitant displaced NOE fractures and a vertically or obliquely oriented scar extending from the forehead crossing the eyebrow, medial canthus and cheek area. In some cases, upper lid ptosis with or without lacrimal system injury were present. Standard preoperative photographs were reviewed (Table 1). Radiological studies were done and included preoperative coronal and axial CT scan and three-dimensional axial tomography.

Medial canthopexy was conducted following realignment of all displaced bone segments and reconstruction of the orbital volume and shape. In all unilateral cases, the disrupted medial canthus from its bony insertion, and a vertically or obliquely oriented scar extending from the forehead and traversing the medial canthal region were constant findings. Exposure was done through the existing scar while breaking it at the medial canthus during closure. A curved vertical incision was made a few mm in front of the medial canthus of the uninjured side. In bilateral cases, a coronal approach was used instead. Dissection of the medial orbital wall was carried out in a subperiosteal plane. It was confined to a limited area in the anterior one third of the uninjured medial orbital wall enough to accommodate a mesh plate. A single hole was drilled from the uninjured contralateral to reach posterior and superior to the lacrimal crest of the affected side while protecting the lacrimal sac and the ocular globe (Fig. 1A). This hole was widened further posteriorly at the injured side to accommodate the bulkiness of the canthal tendon and sutures at the time of tightening and to allow for overcorrection. Both anterior and posterior limbs of the MCT were grabbed separately with wire sutures. They were delivered in a single pass through a single hole with the aid of a wire-passing awl introduced from the uninjured side (Fig. 1B). Snugging of the medial canthus into the ipsilateral bone hole was accomplished through twisting and securing the wires over the contralateral mesh plate (Fig. 2). In children, non-absorbable sutures were used instead. Dacryocystorhinostomy was performed when indicated. Subcutaneous closure of the wounds was done prior to tightening of the wires and resuspension of the medial canthal tendon. A tie-