

Intraoperative lacrimal intubation to prevent epiphora as a result of injury to the nasolacrimal system after fracture of the naso-orbitoethmoid complex

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Abstract

Treatment of fracture of the naso-orbitoethmoid (NOE) complex is difficult. There are not only aesthetic issues but also functional consequences related to the lacrimal system. Because prophylactic lacrimal intubation for such fractures remains controversial, we have assessed the effectiveness of intraoperative lacrimal intubation to prevent epiphora as a result of such injuries. Thirteen patients diagnosed with cranio-maxillofacial fractures including fractures of the NOE complex were included in the study; 10 had unilateral fractures and 3 bilateral. Computed tomography (CT) showed all patients had displaced fragments that had the potential to damage the lacrimal duct. In 7 patients the fractures included the canthal region and in 6 they did not. All patients were treated by open reduction and internal fixation under general anaesthesia, followed by intraoperative lacrimal intubation unilaterally or bilaterally as required. Lacrimal intubation with a silicone tube was successful in all 13 patients (16 sides). The tube was removed 2–9 months (mean 3.8) postoperatively and no subsequent epiphora were seen during follow-up (mean (3–29 months) 11.3 months). Lacrimal intubation for at least 2 months may prevent epiphora caused by injury to the nasolacrimal system after fractures of the NOE complex.

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Introduction

Fractures of the naso-orbitoethmoid (NOE) complex are often challenging to repair, and surgeons must consider not only aesthetic issues but also functional consequences related to the lacrimal system. Symptomatic lacrimal obstruction develops after 0.2% of nasal fractures and 3% of maxillary fractures (Le Fort II or III fracture),¹ but the incidence is

considerably higher with fractures of the NOE complex, at 12–29.3%.^{2–4} Because intubation of the lacrimal pathway during repair of the fractured bone may injure an intact lacrimal system, and given that postoperative lacrimal dysfunction can resolve spontaneously within a few months of the injury, a delayed approach to surgical treatment of post-traumatic lacrimal obstruction is usual.² However, the incidence of permanent post-traumatic epiphora is high and additional invasive treatment with dacryocystorhinostomy (DCR) is required. Because prophylactic lacrimal intubation for fractures of the NOE complex remains controversial, the

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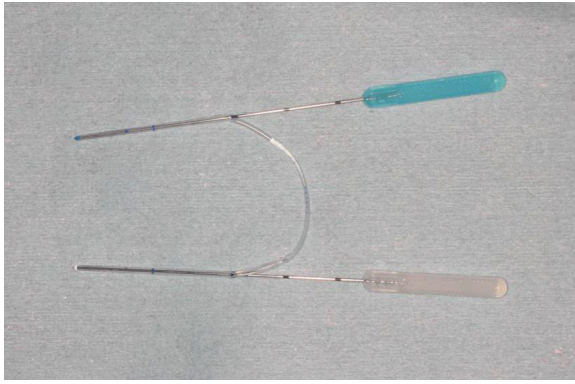


Fig. 1. A lacrimal silicone tube (N-S tube; KANEKA MEDIX, Osaka, Japan).

purpose of this study was to assess the effectiveness of intraoperative lacrimal intubation to prevent epiphora as a result of injury to the nasolacrimal system.

Patients and methods

Thirteen patients who were diagnosed between June 2005 and April 2011 with craniomaxillofacial fractures including the NOE complex on physical examination, and computed tomography (CT) with three-dimensional reconstruction, were included in the study. There were 11 men and 2 women, mean age 29 years (range 16–52). Ten patients had unilateral and 3 had bilateral fractures. CT showed that all patients had displaced fractures, which means the potential for damage to the lacrimal duct. In 7 patients the fracture included the medial canthal region; in 6 it did not. All patients were treated by open reduction and internal fixation under general anaesthesia, followed by intraoperative lacrimal intubation unilaterally or bilaterally, as required, by plastic surgeons. We used a lacrimal silicone tube (N-S tube; KANEKA MEDIX, Osaka, Japan) that is used for non-surgical treatment of obstructions of the nasolacrimal duct (Fig. 1). The material consists of two malleable, stainless steel probes (55 mm long and 0.45 mm in diameter) connected by 105 mm of silicone tube (inner diameter 0.5 mm, outer diameter 1 mm). There is no need to fix the tube, and removal is easy. The tube has different coloured tips (blue and clear), which are useful for endoscopic examination in the nasal cavity because the different colours are used to indicate the superior and inferior lacrimal canaliculus. We investigated retrospectively whether or not intraoperative lacrimal intubation using the silicone tube prevents epiphora caused by nasolacrimal injury after fractures of the NOE complex.

Results

In all 13 patients (16 sides), lacrimal intubation with the silicone tube was successful (Fig. 2). The tube was removed 2–9 months (mean 3.8) postoperatively (Table 1). None of the



Fig. 2. Successful lacrimal intubation with the silicone tube.

patients had epiphora during follow-up (mean (3–29 months) 11.3 months) after removal of the tube.

Discussion

Diagnosis of fracture of the NOE complex is based on physical examination and CT images.³ Three-dimensional CT can be helpful for diagnosis and to plan treatment.⁵ According to Glatt's⁶ evaluation of lacrimal duct obstruction secondary to facial fracture using CT or CT-dacryocystography, epiphora and injuries to the lacrimal system can be caused by the plates or wires, or both, that are used for internal fixation. Surgeons must therefore pay careful attention to avoid iatrogenic epiphora during operation.

Temporary epiphora are caused by lacrimal compression from post-traumatic oedema, whereas permanent epiphora result from direct injury such as laceration or interruption of the nasolacrimal duct.² Unger³ reported that 5 of 25 patients with evidence of fracture of the nasolacrimal fossa or the canal, or both, on CT had post-traumatic epiphora, and that 3 of the 5 patients had DCR for epiphora that persisted during follow-up. The incidence of permanent epiphora was 12%. Becelli et al.² retrospectively analysed 58 patients with fractures of the NOE complex, and the incidence of post-traumatic postoperative epiphora was 47% (27/58 patients). Of their 58 patients, 10 (17%) with temporary epiphora and 17 (29%) with permanent epiphora had DCR. Post-traumatic permanent epiphora were often associated with the loss of lacrimal bone and delayed treatment of the facial fracture.² Uraloğlu et al.⁷ made a delayed assessment of the nasolacrimal system in 19 patients with such fractures,

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