

CASE REPORT

Dental implant causing lateral rectus muscle traumatic laceration

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**Abstract**

Dental implants are often used in maxillofacial surgery. Extraocular muscle (EOM) laceration is a rare complication of the mandibular-zygomatic drilling accidentally penetrating the orbital space. In a single previous report of a lost lacerated lateral rectus muscle post-dental implantation, the muscle was not found, and transposition of the vertical muscles was performed to restore ocular motility partially. Here we present a case of traumatic laceration of the lateral rectus muscle and a successful reconstruction six weeks after injury. Our case demonstrates the EOM laceration was missed on initial radiological assessment, which led to a delayed surgical exploration. Fortunately, the lacerated muscle was re-attached. Botulinum toxin was injected to the antagonist medial rectus muscle in order to improve surgical outcome. Radiological assessment may not be sufficiently sensitive to detect EOM cut. Therefore, surgical exploration should be performed according to clinical suspicion. Even if the surgical procedure is delayed due to hematoma or edema, there is a potential for complete functional recovery.

Introduction

Traumatic strabismus may result following head and/or orbital trauma due to extraocular muscle (EOM) or cranial nerve involvement. Globe sparing in such cases is associated with better visual prognosis. Isolated traumatic laceration of an EOM is rare,^[1] even more so of the lateral rectus muscle.^[2] Few case series^[3,4] and several case reports of detached or lacerated lost muscles have been previously described.^[5-7] Approximately half (16 of 36) had total rupture of an EOM during sinus or orbital surgery.^[3] The prognosis of EOM injury cases not related to strabismus surgery was better.^[4] Lost muscle complications of strabismus surgery are considered challenging.^[8] Injury may involve more than one muscle and is diagnosed according to

ocular motility disturbances. Locating a lost muscle, especially when the medial rectus is involved, is difficult.^[8] Muscles that are transected posterior to the equator are the most difficult to retrieve.^[1] However, even if found, muscle function cannot always be restored. It is recommended to take a proper action in a timely manner to improve functional outcomes.

Dental implants are often used in maxillofacial surgery. When the mandible or maxillary bones are thin, elongated pins are introduced to stabilize the implant. A possible complication of implantation procedures is EOM laceration, caused by accidental drilling into the orbital space. During mandibular-zygomatic drilling, incidental orbital trauma may go unnoticed and present clinically when the patient wakes up. One case has been reported of lateral rectus muscle injury, with acute diplopia post dental

implantation. The muscle was not found, and transposition of the vertical muscles was performed to restore ocular motility.^[9]

Here, we would like to present a case of traumatic laceration of the lateral rectus muscle and subsequent reconstruction after 6 weeks. A dramatic functional improvement is demonstrated in clinical and Hess screen examinations before and after the surgery.

Case Report

A 68-year-old female underwent an elective dental surgery, which included placement of zygomatic dental implants (Noris medical, Israel). Medical history included left eye relative mild amblyopia since childhood. Under general anesthesia, tunnels were drilled in the zygomatic bones and metal implants were placed. No adverse events were noted during the procedure. At the end of the procedure, the maxillofacial surgeon noticed periorbital hematoma and subconjunctival hemorrhage in the patient's left eye [LE, Video 1, Figure 1].

Upon awakening, the patient complained of diplopia. Ophthalmological evaluation revealed a marked left esotropia, with complete left abduction deficit and limited elevation. The diplopia worsened in left gaze [Figure 2, Video 1]. Visual acuity was 20/25 on the right and 20/40 on the left. Bilateral lid ecchymosis and subconjunctival hemorrhage of the left eye with periorbital hematoma were noted. A yellowish mass suspected of being protruding orbital fat was noticed beneath the left conjunctiva at the temporal inferior quadrant [Figure 1].

Computerized tomography (CT) [Figure 3] was performed to evaluate orbital anatomy. Initial interpretation stated a well-placed zygomatic implant with no orbital damage. Both lateral recti muscles were thin and not completely demonstrated. Due to the highly specific clinical scenario, additional radiological review was requested. A suspected entry hole in the orbital floor was detected [Figure 3].

Under conservative treatment and observation, the hematomas resolved. Although the patient reported no diplopia,

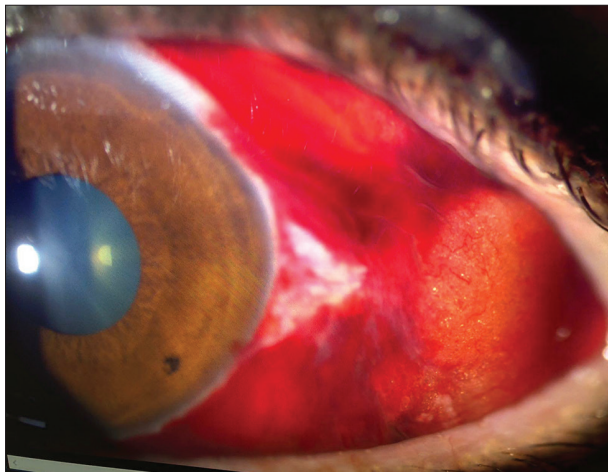


Figure 1: Color image, left eye. Note subconjunctival hemorrhage and protruding yellowish temporal orbital fat or muscle stump

clinical examination demonstrated persistent esotropia with severe limitation of left eye abduction. Six weeks following the maxillofacial surgery, muscle reconstruction surgery was performed under general anesthesia. Exploration showed the proximal left lateral rectus (LLR) muscle attached to the lateral fornix, with total resection 10 mm posterior to the original insertion. The inferior oblique (IO) muscle was also partially cut. It was decided to suture the distal muscle to the original insertion, to avoid vertical deviation since the IO was also involved. Intraoperative injection of 3 units of botulinum toxin A to the left medial rectus (LMR) was performed.

Hess screen [Figure 4] 1 week after the surgery revealed complete abduction of the left eye, with mild limitation in adduction of the LMR. One month post repair, there was almost complete left eye abduction movement (75%) with mild limitation in adduction [Video 2]. The patient reported no diplopia, but moderate ptosis was noted. Both adduction deficit and ptosis were attributed to the botulinum toxin A injection.



Figure 2: Extraocular eye movements. One week post zygomatic dental implantation. Note the left eye abduction deficit. (a) Mild limitation in left upgaze. (b) Left adduction. (c) Limited left abduction. (d) Downgaze

Discussion

This is a case report of an acute diplopia post dental implantation surgery under general anesthesia. Since the surgeon did not report orbital penetration during the procedure, the differential diagnosis included ischemic sixth cranial nerve palsy and traumatic muscle laceration. However, there was vertical diplopia, which directed toward laceration of the LR and the IO. Initial CT neuroradiological interpretation reported identical

lateral recti appearance bilaterally. Only during surgical orbital exploration, a muscle stump near the original LLR insertion was found.

Locating a lost EOM is often challenging, and functional results can be unpredictable despite surgical repair.^[3,9] Time to intervention ranges from 7 to 10 days to avoid antagonist muscle contractures^[10] and up to 5–6 weeks, to allow accurate ocular motility evaluation and imaging studies. Waiting several weeks also enables resolution of hemorrhages and edema with some restoration of orbital anatomy. The best restoration of function can be achieved in end-to-end muscle anastomosis if possible. Botox injection to weaken the LMR was performed to allow for better initial functionality of the reattached LLR muscle, as indicated.^[11]

Surprisingly, 1 day post operation, the patient demonstrated complete ocular movements, including abduction in the left eye. It is well known that once an EOM has been completely lacerated, retrieval of both ends of the muscle should be attempted.^[3] However, long-term results of re-suturing injured muscles are not always satisfactory. In this case, we decided to resect the LR, to overcome abduction weakness and overaction of adduction. Similarly, after traumatic fractures of the orbit,

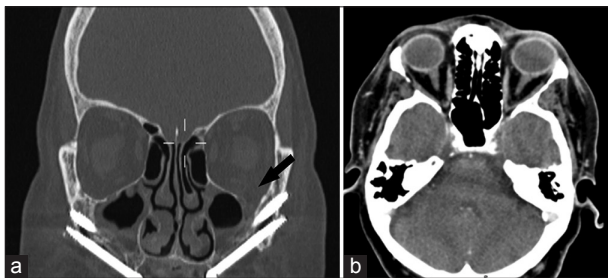


Figure 3: Computerized tomography scan. (a) Note the two zygomatic dental implants on each side, with small fracture of the left orbital floor (arrow). (b) Similar appearance of both lateral recti

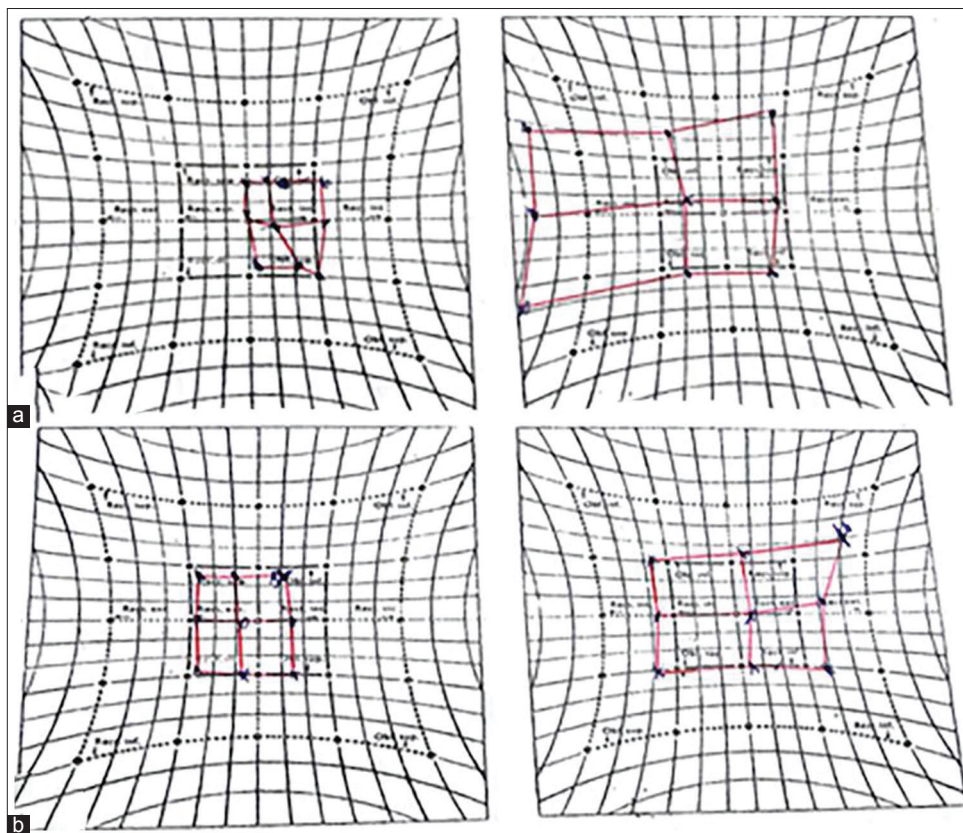


Figure 4: Hess screen: Before and after left lateral rectus muscle repair. (a) Limitation of abduction of the left eye with left superior oblique overaction most probably due to disruption of the lateral rectus-inferior oblique complex. Note the secondary deviation of the right eye superior rectus and medial rectus. (b) Almost complete restoration of eye movement of the left lateral rectus but note the limitation in adduction after botulinum toxin A injection to the left medial recuts. No oblique overaction is detected. The right eye demonstrates secondary deviation in abduction and adduction with mild superior rectus involvement

releasing an entrapped muscle does not always result in restored function. The pathophysiology of muscle dysfunction following surgical reconstruction is not fully understood. It is theorized that ischemic damage to the muscle tissue may be the culprit.^[3]

In a similar case following a dental implant operation, when the lateral rectus muscle was lost and not located in subsequent exploration.^[9] A muscle transposition was then performed to restore ocular motility. EOM transpositions are less surgically demanding compared to recovering the lost proximal muscle stump (not the stump attached to the globe), but the results are inferior to recovering and reinserting the damaged muscle.^[6] EOM transpositions at best can establish fusion within a relatively small area resulting in a limited area of single binocular vision.^[6,9] Given the availability of an anterior orbital approach, it is reasonable to attempt muscle stump recovery since it will give the possibility of a larger area of single binocular vision and decrease the risk of anterior segment ischemia.^[6] Another option is tethering procedures to the orbital walls, but this should be considered only if the damaged proximal stump cannot be found.^[5]

Conclusion

Rupture of the lateral rectus without globe perforation is an infrequent injury. Here, we report a good functional outcome 6 weeks after inadvertent lateral rectus muscle laceration. Clinical suspicion of orbital injury should be high if periorbital hematoma, subconjunctival hemorrhage, and new strabismus appear immediately post dental implantation. Radiological assessment may not be sufficiently sensitive to detect EOM lacerations. In such cases, surgical exploration should be performed as soon as possible. Even if the surgical procedure is delayed due to hematoma or edema, there is a potential for complete functional restoration of the resected muscle. Improved surgical outcomes can be achieved by intraoperative botulinum toxin injection to the antagonist muscle.

Authorship

All authors attest that they meet the current ICMJE criteria for authorship.

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