Can a dermoid cyst lead to an abnormal origin of an extraocular muscle?

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A 5-year-old boy presented with a large 5 cm × 5 cm cyst covering the left eye completely since birth. The cyst was excised in toto and was sent for histopathological examination. During the surgery, the inferior oblique (IO) muscle was seen originating from medial orbital wall, 10–12 mm behind the medial orbital margin, just posterior to the lacrimal bone and moving laterally, downward, and posteriorly from its origin making a more acute angle - around 20° to its site of origin. The insertion of the IO to sclera was at its normal site. The abnormal origin of IO was confirmed later by magnetic resonance imaging. The ocular movements of the left eye were tested 2 weeks after the surgery and were found to be normal in all directions. However, the child was hypertrophic and amblyopic. The histopathological findings showed the orbital cyst to contain dermal elements, respiratory, and intestinal epithelium.

Key words: Abnormal, dermoid, inferior oblique, origin

The common embryologic mesoblastic tissue differentiates to give rise to the extrinsic ocular muscles. Various developmental errors during the cleavage of common embryologic mesoblastic tissue lead to abnormalities in the structure and innervations of the extrinsic ocular muscles.[1] Irregularities in the gross anatomy and the insertion of inferior oblique (IO) muscle have been reported in the international literature.[2] A case of unusual origin of the IO muscle is being reported for the first time.

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Case Report

A 5-year-old boy presented with a large 5 cm × 5 cm cyst covering the left eye completely since birth [Fig. 1]. A written informed consent was taken from the father of the patient for publishing the clinical photographs. The visual acuity in the right eye was 20/20 with unremarkable anterior and posterior segment findings. There were no known systemic complaints. The cyst was excised in toto and was sent for histopathological examination. During the surgery, the IO muscle was found to have an abnormal origin [Fig. 2].

The IO muscle was originating from the medial orbital wall, 10–12 mm behind the medial orbital margin, just posterior to the lacrimal bone and moving laterally, downward, and posteriorly from its origin making a more acute angle - around 20° to its site of origin [Fig. 2]. The muscle belly was grasped and pulled with toothed forceps to observe and confirm the primary action of IO – extortion. The insertion of the IO to sclera was found to be at its normal site –12 mm behind the insertion of the lateral rectus near its inferior border. The abnormal origin of IO was further confirmed later by magnetic resonance imaging. The ocular movements of the left eye were further tested 2 weeks after the surgery and were found to be normal in all directions. However, the child was slightly hypertrophic and amblyopic [Fig. 3]. The histopathological findings showed the orbital cyst to contain squamous epithelium, hair shafts, sebaceous glands, sweat glands, inflammation, respiratory epithelium, and intestinal epithelium.

Discussion

Abnormal insertion of the IO muscle has been reported previously. To the best of the authors' knowledge, abnormal origin of the IO muscle has not been reported in the literature to date.

At 8.5 mm stage of the embryological development, a process arises from the ventrocaudal portion of the premandibular mesodermal condensation and develops into the inferior rectus, IO, and medial rectus muscles.[2] The IO and inferior rectus muscles are separated from their point of junction by 12.5 mm stage and grow in two different directions to their point of origin and insertion. The cranioventral extremity of the IO muscle

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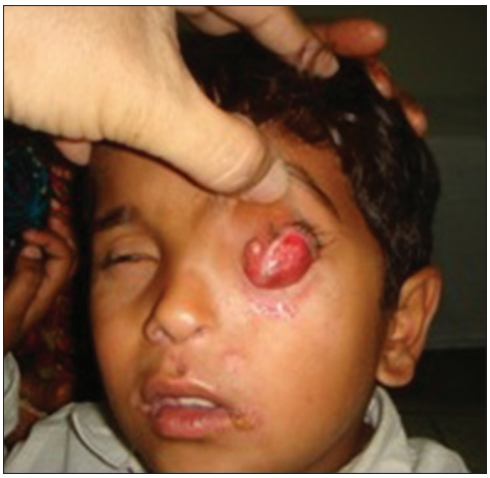

Figure 1: The patient having a cyst, measuring 5 cm × 5 cm and covering the left eye completely since birth

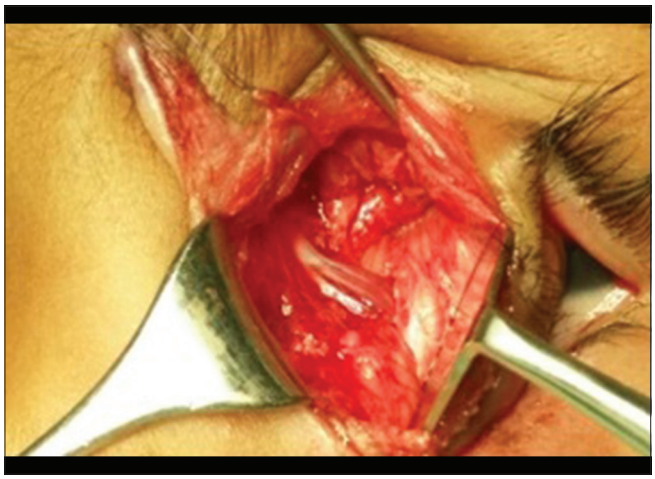

Figure 2: During surgery, the inferior oblique muscle was seen originating from the medial orbital wall, just posterior to the lacrimal bone and moving laterally, downward, and posterior from its origin

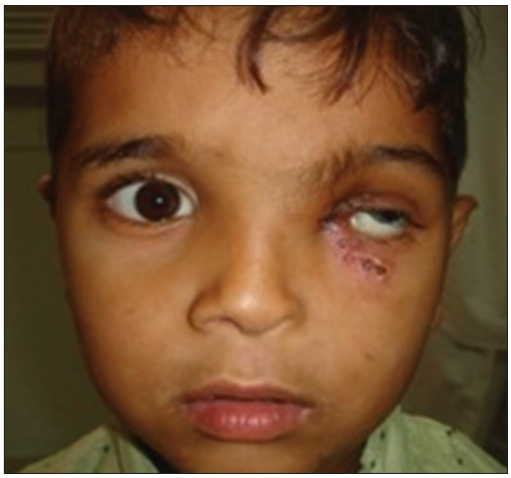

Figure 3: The left eye of the patient is hypertrophic after surgery (2 weeks postoperative)

reaches the orbital surface of maxilla whereas the caudodorsal extremity is inserted just medial to the insertion of lateral rectus muscle, shifting backward to its normal position later.[2]

The IO muscle is the shortest extraocular muscle measuring 37 mm in length and has an orbital and an ocular surface. The muscle originates from the orbital floor formed by the orbital plate of the maxilla, 5 mm posterior to the inferior orbital rim. The point of origin coincides with a line extending from the supraorbital notch to the infraorbital foramen.[3] The muscle moves backward, upward, and laterally to insert in the external and posterior aspect of sclera, under the inferior border of the lateral rectus muscle, through a short tendon (1–2 mm) after passing between the floor of the orbit and inferior rectus muscle.[4]

Developmental and innervation irregularities associated with the IO muscle have been reported previously. These irregularities include congenital isolated absence,[5] anterior and nasal transpositions,[6] and abnormal insertions.[1,2]

In the current case, the IO muscle originated from the orbital plate of the ethmoid bone instead of originating from the orbital plate of the maxilla [Fig. 2].

The authors propose that a mechanical obstruction; the dermoid cyst in the current case at around 12.5 mm stage of the embryological development forced the IO to alter its route toward its unusual site of origin as it separated from the inferior rectus muscle to proceed toward its usual site of origin and insertion.

Periorbital dermoids develop between 3 and 5 weeks of gestation along the zygomaticofrontal suture[7] whereas nasal cysts develop around 8 weeks of gestation within the prenasal space as the nasal capsule ossifies.[8] The authors believe that as the IO muscle separated from the inferior rectus muscle to proceed toward its usual site of origin and insertion at 12.5 mm stage (7th week of gestation), the periorbital dermoid cyst, already started developing during the 3rd and 5th week of gestation, in the current case, obstructed the normal course and forced the IO to move toward the medial wall of the orbit instead of the orbital floor.

The periorbital cyst in the current case was excised in toto. The histological contents of the dermoid cyst in the current case shared the contents of the orbital cysts reported by Shields *et al*.[9] and Reissis *et al*.[7]

To the best of authors' knowledge, this is the first case of orbital dermoid cyst presumably causing an extraocular muscle to change its site of origin during embryological development.

Developmental anomalies of extraocular muscles influence the ocular motility and may cause varying degrees of ocular deviation.[2] However, in the current case, no limitation of ocular movements was observed after the removal of the dermoid cyst.

This case report provides useful information not only to ophthalmologists but also to neurosurgeons, anatomists, plastic surgeons, and oral and maxillofacial surgeons by introducing a new landmark for the origin of IO muscle. This new landmark must be kept in mind while operating in the orbital region to

avoid inadvertent damage to the IO muscle. The case report also invites research into possible role of mechanical factors such as dermoid cysts in etiopathogenesis of congenital anomalies in the topographic anatomy.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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