

Case Report

Manifested strabismus in a case of Apert syndrome

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Received April 28, 2010; accepted July 9, 2010

Abstract

A full-term female baby was diagnosed as having Apert syndrome with craniosynostosis, hypertelorism, syndactyly, polydactyly, and cleft plate. At her first ophthalmic visit at 8 months old, she was noted to have bilateral exophthalmos with epiblepharon on her lower lids, exotropia, and right inferior oblique muscle overaction (IOOA) and manifested right dissociated vertical deviation (DVD). There was no keratopathy or optic neuropathy. Bilateral lateral rectus muscles and right inferior oblique muscle recession were performed with correction of bilateral epiblepharon at 1 year of age. Orthotropia was achieved postoperatively. However, recurrent exotropia with left inferior oblique muscle overaction and manifested left DVD developed 2 years later. We performed left medial rectus muscle resection and left inferior oblique muscle recession, and the patient maintained orthotropia. Her best-corrected visual acuity was 6/8.6 in the right eye and 6/7.5 in the left eye at the latest follow-up. Amblyopia, OD, was still noted. We report this case of Apert syndrome with exophthalmos, exotropia, and IOOA. The exophthalmos progressed as the patient grew, thus the strabismus pattern changed during follow-up. Frequent follow-up and titrated management may be needed for such case to ensure good binocular vision.

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Keywords: Apert syndrome; Craniosynostosis; Exotropia; Inferior oblique muscle overaction

1. Introduction

Apert syndrome is one of the most common craniofacial synostosis syndromes characterized by craniosynostosis, midfacial hypoplasia, and symmetrical syndactyly of the hands and feet. The first case was described by Wheaton in 1894, and later Apert summarized nine cases in 1906. It is an autosomal dominant inheritance disorder. Mutation of the allelic gene of fibroblast growth factor receptor 2 (FGFR 2) leads to increased cranial bone matrix formation, and premature cranial suture closure results in the restriction of intracranial and orbital space expansion. Ocular features of Apert syndrome included down-slanting palpebral fissure, hypertelorism, strabismus, proptosis, ptosis, refractive errors, papilledema, optic atrophy, and exposure keratopathy. We report

a typical case of Apert syndrome with progressive exophthalmos and changing strabismus pattern.

2. Case report

A full-term female baby was born to a 33-year-old mother *via* cesarean section because of breech presentation. The family history was noncontributory, and the antenatal period and the labor course were uneventful. General examination revealed asymmetric face, hypertelorism, syndactyly of first to sixth digits in both hands and feet, polydactyly, and cleft plate. Skull routine revealed prominent fontanel without visible fissure lines, compatible with craniosynostosis (Fig. 1). At her first ophthalmic visit (age of 8 months old), the patient was noted to have exophthalmos with epiblepharon at lower lids, exotropia (30–35 prism degrees by Krimsky test), and the extraocular movement revealed right inferior oblique muscle overaction (IOOA) with manifested right dissociated vertical deviation (DVD) (Fig. 2). The fixation pattern was central,

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Fig. 1. Patient's picture when newborn, showing craniosynostosis with asymmetric face and hypertelorism; syndactyly and polydactyly of hands and feet. (Photo with permission).

steadily, maintained (CSM), OU. Alternate patching therapy and convergence training were started, but there was limited improvement in the ocular alignment. We performed bilateral lateral rectus muscles recession 7.5 mm and right inferior oblique muscle recession with anteriorization to 1 mm behind the inferior rectus insertion and correction of bilateral epiblepharon at 1 year of age. Orthotropia was achieved post-operatively, and the refractive status was $+0.0/-0.5/88^\circ$ OD and $+0.0/-0.75/4^\circ$ OS. The fundoscopic examination revealed attached retina and the optic disc was not pale in both eyes. As the patient grew, recurrent exotropia (14–16 d prism degrees by alternative prism cover test) developed 2 years later, and the extraocular movement revealed left oblique muscle overaction with manifested DVD (Fig. 3). We performed left medial rectus muscle resection 5.0 mm and left inferior

oblique muscle recession with anteriorization to 1 mm behind the inferior rectus insertion. At the latest follow-up (14 months after second operation), the patient remained orthotropia. Her refractive status was $+0.0/-1.50/1^\circ$ OD and $+0.25/-2.0/177^\circ$ OS, and the best-corrected visual acuity was 6/8.6 in the right eye and 6/7.5 in the left eye. There was no optic disc pallor or edema in both eyes and no exposure keratopathy.

3. Discussion

Apert syndrome is a rare autosomal dominant disorder characterized by craniosynostosis, craniofacial anomalies, and symmetrical syndactyly. The prevalence is estimated at 1 in 65,000 live births.¹ It is caused by point mutations (Ser252Trp

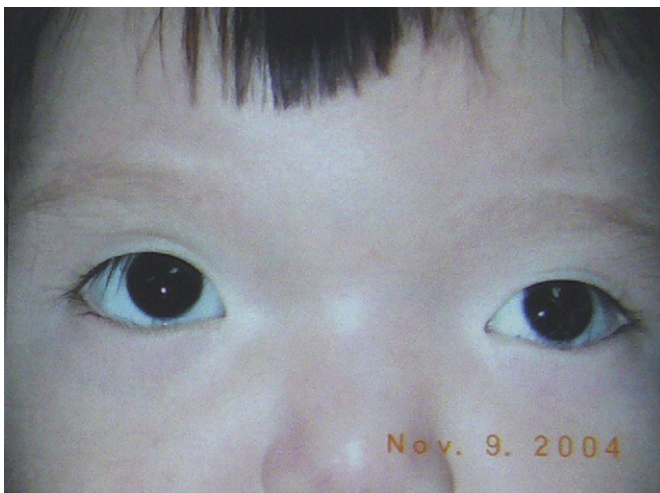


Fig. 2. Exotropia, inferior oblique muscle overaction with manifested dissociated vertical deviation and epiblepharon on bilateral lower lids. (Photo with permission).



Fig. 3. Recurrent exotropia with left inferior oblique muscle overaction and manifest dissociated vertical deviation preoperative (up) and postoperative (down). (Photo with permission).

or Pro253Arg) of *fibroblast growth factor receptor 2* gene (*FGFR2* gene). The mutations lead to increased cranial bone matrix formation, and premature cranial suture closure results in the restriction of intracranial and orbital space expansion.^{2,3} Because of early closure of the cranial suture, shallow orbit with exophthalmos and IOOA are usually present.

Ophthalmic features may include visual impairment, strabismus, amblyopia, corneal abnormality, pale disc, and nasolacrimal duct disorders.^{4,5} Compressive optic neuropathy secondary to craniosynostosis was thought to be the major cause of visual impairment in the past before the era of craniofacial surgery.^{4,6} In Khong et al's study, amblyopia, with a prevalence rate of 35% including strabismic, ametropic, and mixed amblyopia, was the primary cause resulting in visual impairment.^{3,4} Tien et al reported similar findings in 55 cases of craniosynostosis, which revealed a high prevalence rate (44.6%) of visual impairment, and amblyopia, and ametropia were the major causes.⁶ Nowadays, strabismus, refractive error, and corneal abnormality should also be taken into consideration for the cause of visual impairment. The management of strabismus in Apert syndrome and other craniosynostosis is quite a challenge for the ophthalmologists. The exact and best timing for strabismus correction surgery is still controversial. In Diamond et al's retrospective study, 9 out of 140 cases of craniosynostosis who had major craniofacial surgery showed changes in the primary ocular position post-operatively.⁷ Craniofacial surgery seemed unlikely to affect pre-existing strabismus, and the author proposed that strabismus correction surgery should be performed early in such cases to reconstruct binocularity. However, another author suggested that strabismus surgery should be delayed in the first 18–24 months in life because of the need for decompressive craniofacial surgery to prevent chronic elevated intracranial pressure because the strabismus pattern often changed after craniofacial surgery.⁸

Besides horizontal strabismus, dissociated eye movement was also observed in a large proportion of Apert syndrome and other craniosynostosis.^{1,6} In addition to inferior oblique overaction and superior oblique under action, exocyclorotation of muscle cone with the upper pole of the eyeball tilted away from midline was also observed in such cases.⁹ Under the hypothesis of exocyclorotation of muscle cone, Clement et al modeled the mechanics and proposed that not only the surgery

of the rectus muscle but also the weakening of the oblique muscle should be performed to ensure effective result.¹⁰

The strabismus patterns might change as the patients grow in such cases, which might be caused by progressive bone change and progressive exophthalmos. So, titrated surgeries are needed for better ocular alignment to ensure visual development. Also, patching therapy with poor compliance may be seen in an exophthalmic patient, making amblyopia treatment fruitless. In conclusion, as ophthalmologists, we need to maintain frequent follow-up for patients with Apert syndrome. The routine examination should include visual acuity, refractive errors, ocular alignment and movement, exposure keratopathy and fundus examination, and timely managements are essential.

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