CASE REPORT

Eastern Journal of Medicine
East J Med 23(3): 218-221, 2018
DOI: 10.5505/ejm.2018.30075

A Rare Case of frontonasal malformation: The clinical features and surgical outcome

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ABSTRACT

Frontorhiny is a type of frontonasal malformation that also known as median facial cleft syndrome characterised by hypertelorism, wide nasal bridge, short nasal ridge,splayed nasal bone, bifid nasal tip, widened columellar, long philtrum and midline notch in the upper lip. This sporadic congenital disorder is a rare autosomal recessive caused by homozygous mutations of ALX 3 gene, which is important in facial embryogenesis. There were 42 cases reported worldwide from 1980 to 2009, mainly from Brazil (10 cases), followed by London (5 cases), Bahamas (4 cases) and Venezuela (3 cases).
We present the first extremely rare case of frontorhiny in Malaysia, highlighting the clinical features and the surgical outcome.
Frontorhiny, ALX-3 related FNM is an extremely rare frontonasal malformation with typical clinical features that presents a surgical reconstructive challenge and some cases may need multi stage surgery.

Key Words: Frontonasal malformation, frontorhiny, frontonasal dysplasia, median facial cleft, ALX gene mutations

Introduction

The process of craniofacial development is an extraordinary complex process. It requires organised and properly arranged integration of multiple specialised tissues to generate the specific of central and peripheral nervous system, skeleton, muscles and connective tissues of the face specifically and head generally. All of these are developed from the neural crest, mesoderm and endoderm. (1)

Embryogenesis of the face started as early as 4th weeks of gestation. The extreme dynamic and intricate process is needed in the development of the vertebral face and its' complex structures. Any misstep during the embryological development will lead to a chain effect of the malformation and disfigurement. Therefore, a tight regulated growth, fusion and patterning of the facial primordial are crucial. Facial malformations are among the most common developmental defects that causing mobidity. (2)

There are 5 facial primordia formed during the development of the face. The frontonasal prominence surrounds the venterolateral part of the forebrain and forms the upper border of the stomodeum. (3) The maxillary and mandibular prominences formed the lateral and caudal borders of the stomodeum respectively and derived from the first pair of pharyngeal arches.

The upper lip tubercle and philtrum, the nasal tip, primary plate and premaxilla are developed from the midline merging of the medial nasal prominence (4). The maxillary prominence forms the lateral portion of the upper lip, the up of maxilla and the secondary palate. While, the oral commissure is from the lateral unions of the maxillary and mandible prominences.

Disturbances of this complex developmental sequences lead to frontonasal malformations (FNM). FNM is a rare craniofacial defect that was first described by Sedano and Gorlin (5). The abnormal development during craniofacial embryogenesis of the frontonasal prominence will lead to FNM. The main features includes at least 2 of the following characteristic : hypertelorism, broad nasal root, median facial cleft, nasal alar cleft, malformed nasal tip, anterior cranium bifidum occultum or a V-shaped hair pattern on the forehead.

Case Report

We present a rare case of frontonasal malformation in Malaysia which is associated with

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Received: 30.08.2017, **Accepted:** 09.06.2018

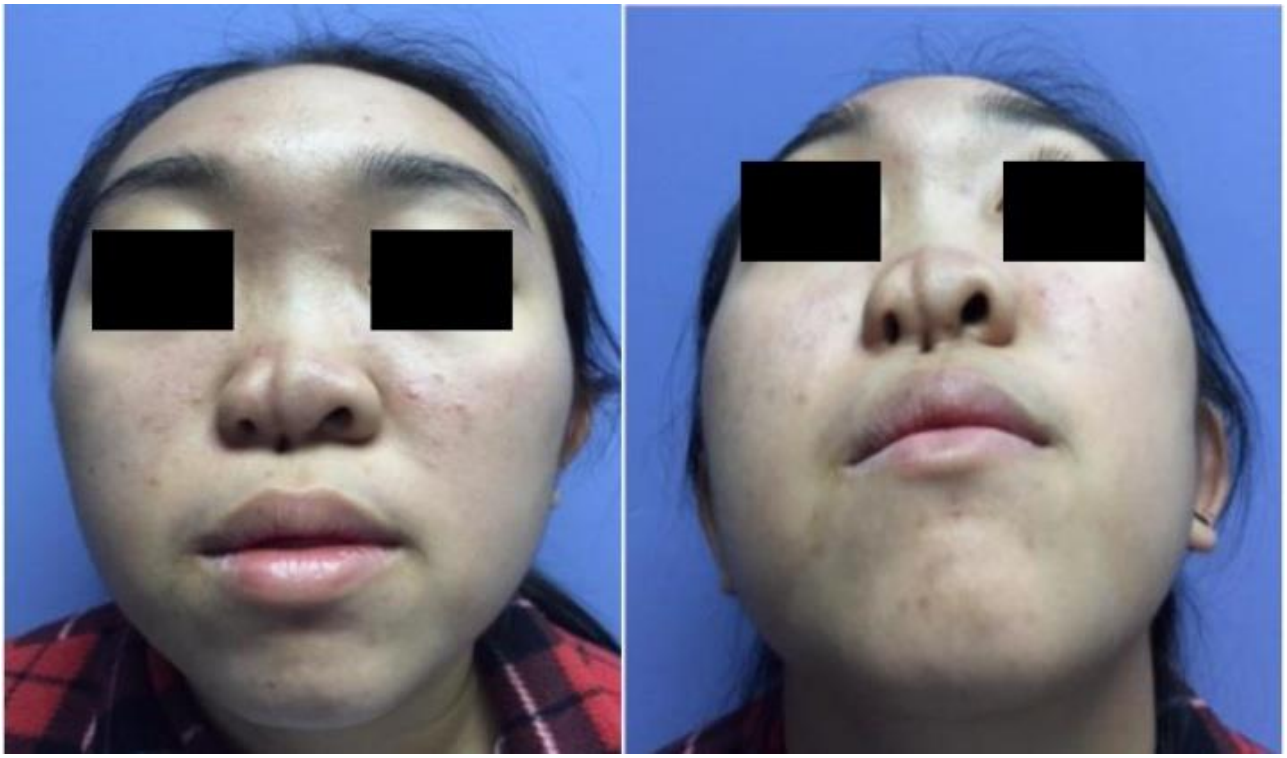

Fig.1. Showing the clinical features of this patient, hypertelorism, braod nasal bridge, short nasal ridge, splayed nasal bone, bifid nasal tip, widened columellar, long philtrum with philtrum pit

unilateral posterior choanal atresia and philtrum pit.

17 year old Chinese lady with non-consanguineous marriage was born full term at 39 weeks of gestation via a spontaneous vaginal delivery. She was born with facial deformity with features of hypertelorism, wide nasal bridge, short nasal ridge, bifidum nasal tip, infantile right vestibule, widened columella, long philtrum with philtrum pit (Figure 1). She has no gross developmental delay and she has good performances in school.

She also complains of right nasal blockage since childhood with intermittent nasal discharge which is yellowish to greenish in colour.

Nasal endoscope showed right posterior choana atresia, deviated nasal septum to the right, right nasal floor elevated and narrowed, hypo plastic of inferior turbinate that attached to nasal floor anteriorly and hypoplastic of medial turbinate that attached to septum anteriorly. (Figure 2)

On general examinations, there was no other congenital abnormality found in this patient.

CT head and neck showed right hypoplastic nasal cavity with mid nasal bony septum with no connection to right posterior choana. Also hypoplastic right side of turbinate, enlarged right posterior ethmoidal air cells and absent right sphenoid sinus (Figure 3).

This patient was scheduled for 2 staged surgeries. The first stage surgery was endoscopic transnasal repair of right posterior choana atresia and excision of philtrum pit. Post-operatively the posterior choana was widened and patent (Figure 4).

The second stage surgery was septorhinoplasty with cartilage graft. On follow-up the aesthetic outcome was satisfactory (Figure 5a & 5b).

Discussion

FNM which is also termed as frontonasal dysphasia or median facial cleft syndrome is a developmental abnormality of the facial prominence due to incomplete growth and fusion. ALX gene family which is ALX 1, ALX 3 and ALX 4 are very important in facial development. Hence, mutation of these genes will lead to FNM (2).

In ALX 1-related FNM, the features are severe oblique facial cleft characterised by marked hypertelorism, extreme microphthalmia and cleft palate (2). This type of FNM is associated with variety of upper face malformations including wide nasal bridge, hypoplasia of ala nasi, lack of eyebrows, sparse eyelashes and mild mental retardation but unaffected motor development. (6)

Homogenous mutations on ALX 3 gene is known to underlie the autosomal recessive disorders

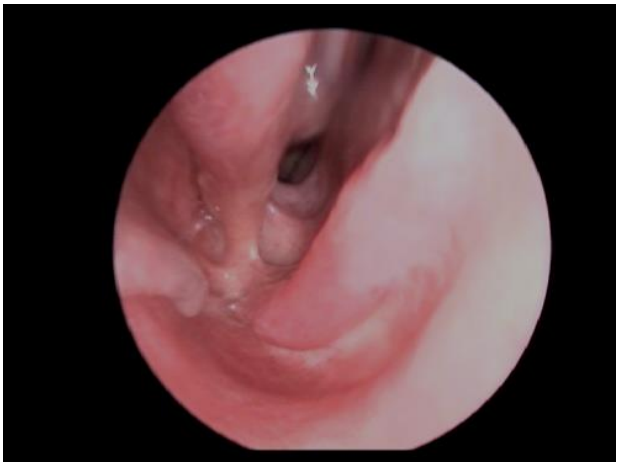

Fig. 2. Endoscopic view of right nasal cavity. Nasal floor was narrowed, with hypoplastic inferior and medial turbinates with posterior choana atresia

known as frontorhiny (6, 7). Major features of frontorhiny are hypertelorism, wide nasal bridge, short nasal ridge, splayed nasal bones with bifid nasal tip, broad collumela, widely separated slit-like nares and long philtrum. They may have prominent philtrum ridges that sometimes have additional bilateral swelling that run into nares and midline notch in the upper lip and alveolus.

In ALX 4-related FNM, it is associated with non-facial findings such as genital abnormalities, skull defects and alopecia (2)

Twigg et al and Lees at al. also described a unique frontonasal malformation termed frontorhiny, an autosomal recessive syndrome characterised as a distinctive entity falling within the spectrum of frontonasal malformation (7). Twigg et al rerouted 3 cases presenting with the classic features of frontorhiny. In the same study, a causative ALX 3 homeboy gene for frontorhiny was identified (7). Lees et al described 2 additional patients with the same clinical features and the same genetic mutations (8)

The cases reported by De Moor et al. showed association of frontonasal dysplasia with a congenital heart defect (tetralogy of fallot) in 3 of the child which were unrelated. All of them has a typical features of frontorhiny without mental deficiency. (9)

Meinecke and Blunck also described an association of frontonasal dysplasia with congenital heart defect (10) and the case had similarities to the patient reported by De Moor et al. (9)

In this case, the patient has the similar characteristics that matched ALX 3-related FNM also termed frontorhiny. She also has additional

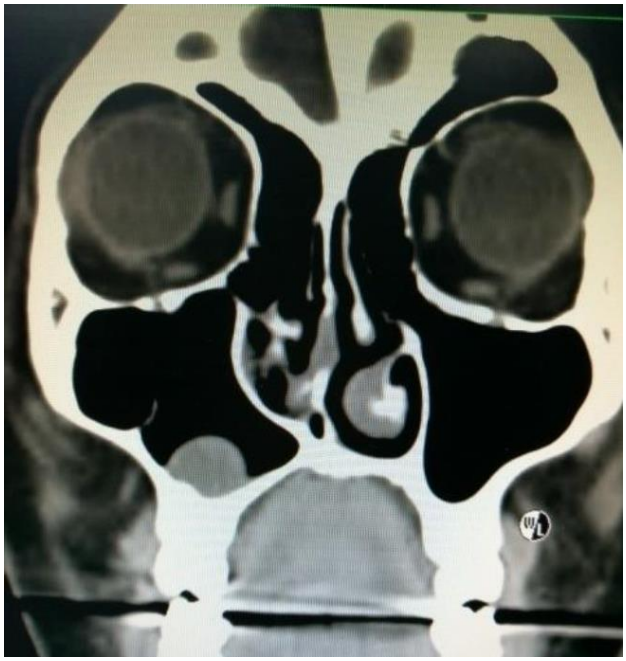

Fig. 3. CT scan showed hypoplastic right nasal cavity with narrowed nasal floor and hypoplastic right inferior and medial turbinates. There is periapical cyst in the right maxillary sinus

features such as philtrum pit and unilateral posterior choana atresia as well as hypoplastic right nasal cavity which had been repaired via endoscopic transnasal approach.

The surgical procedure was aimed mainly to correct the facial disfigurement. The aesthetic outcome must be one of the priorities in choosing the surgical approaches. For the correction of the nasal abnormalities, definitive rhinoplasty surgery will be surgically challenging especially in aesthetic aspect. The primary aesthetics challenges presented by frontorhiny are telecanthus, widened nasal root and dorsum, broad alar base and unprotected nasal tip, collumela widening and bifid its and wide philtrum with increased philtrum height (11). Therefore, multiple stages of surgery must be counselled to patient to get a great aesthetic outcome.

In this performed surgery case she was planned for 2 stages of surgeries. The first stage was aimed to repair the unilateral choana atresia as well as hypoplastic right nasal cavity via endoscopic transnasal approach. The second stage was the definitive septorhinoplasty surgery which the outcome was satisfactory. The outcome of the second stage surgery was highly dependent on the surgeon's expertise and the healing process of the patient. Graft selection and the technique of the surgery will determine the aesthetic end result of the septorhinoplasty. Nguyen et al

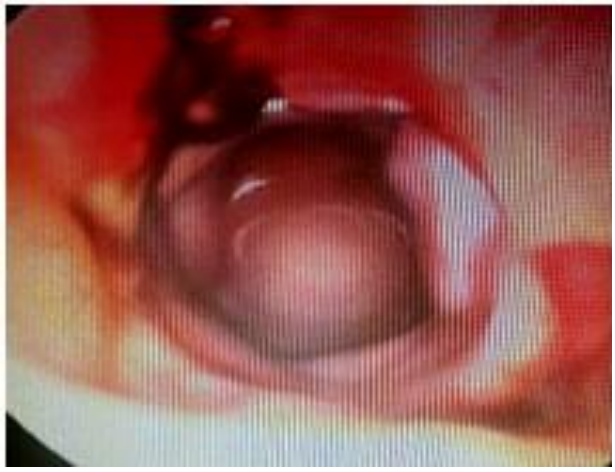

Fig. 4. Endoscopic view of right nasal cavity post-surgery day 12 (Endoscopic Transnasal repair of right posterior choanal atresia). Huge right nasal cavity with patent posterior choana.

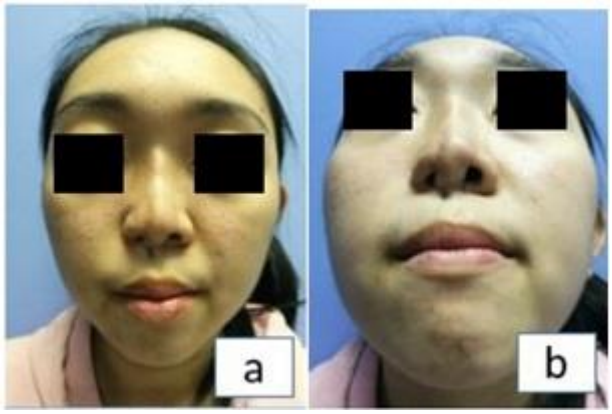

Fig. 5a & 5b. One month after open septorhinoplasty

reported the surgical technique done in 3 cases of frontorhiny. All 3 cases were treated with reconstructive open rhinoplasty approach with attention to collumelar contouring, eradicating bifidity, columellar lengthening with V-Y closure and enhancing tip projection (11).

Frontorhiny is an extremely rare frontonasal malformation with typical clinical features that presents a surgical reconstructive challenge and some cases may need multiple stage surgery. As per this case report, the patient is planned for 2 staged surgery, endoscopic transnasal repair followed by septorhinoplasty later.

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