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Research Article

Proboscis and its Impact on Facial Anomaly

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Abstract:

Fronto Nasal Process (FNP): normal primordia arises in the face from the mesoderm over the forebrain to develop the face. However, its abnormal development gives rise to multiple anomalies that face development. Proboscis is the term for when FNP independently stands out, hangs on the face, and fails to contribute to face development. A discussion has been made about the phylogenetic travel of proboscis across the evolutionary tree. The organization of FNP is intimately adherent to the olfactory nerve, and that may have a role in FNP's abnormal behavior in differentiating nose and face development. By citing pictures of abnormal faces, explanations are given underneath. **Fig.16** The cause may be defective olfactory.

Keywords: *Proboscis, Frontonasal Process, Cleft lip, Cleft palate, Facial anomalies*

Introduction

The frontonasal process (FNP) is the single most important structure that gives origin to proboscis and facial and palatal anomalies. It is a mesoderm that accumulates on the surface of the forehead and descends vertically in midline to the face. The optic placode appears on the lateral side of the face. It remains lateral in birds or even in lower mammals. But in higher mammals, the optic placodes progressively move medially, and the stem of the FNP is constricted to such an extent that both medial canthi of the eyes are only an inch apart. The birds have monocular vision, but humans can have binocular visual acuity to figure out the three-dimensional image of any object. This necessitates the migration of the eye from the temporal region tothe anterior face. A question arises: what is the need to develop a face? Other animals do not need it. They are living by their body composition, color, odor, or sounds. They communicate through their body language or differential sound tone, which has not yet been deciphered by humans. Opposite is the case of humans; the face is an integral part of human identity, and facial movements give a great deal of silent communication where eyes take part in effectuating a further message. Then comes the production of sound, where the lips of the mouth modulate sound character and whole facial movements in conjunction with eye rotations culminate in a meaningful message. Irrespective of language barriers, humans can propagate a great deal of message to other fellows by simply signing language in any foreign land.

Frontonasal Process (FNP): The face is developed from five primordia. One FNP, two maxillary processes, and two mandibular processes. The latter one moves very fast and joins in the midline to form the chin of the lower jaw. The FNP descends in midline, and maxillary processes (branch of mandibular) move medially from both sides in a bid to construct the upper jaw and upper lip. By this time at the lower margin of FNP is appeared with two nasal placodes to divide FNP into two

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prominences on each side of midline and nasal placodes progressively invaginate inward and divided the FNP into medial and lateral nasal processes on either side (Fig. **2**). The two medial nasal processes meet in the midline to be known as the intermaxillary process, and in adults, they are known as the philtrum, which in adults is a depressed midline skin of the upper lip (Fig. **4**). The maxillary processes, while moving medially, come into contact with lateral nasal processes and meet on the surface of the face but not subdermally, where they form ducts that stretch from the medial canthus of the eye to the nasal cavity and are known as naso-lacrimal ducts. Sometimes there may be a defect at this place, and the naso-lacrimal duct opens on the cheek. When a person cries, a tear flows on the surface of the cheek. In the next step, the maxillary process moves more medially and bridges the lower margin of the nasal pit or nasal orifice (Fig. **3**). A defect arises at this point when a cleft lip forms. The progression of the maxillary process medially is not only on the surface but deeply as well to sandwich FNP in between them, which results in making the nasal septum in the midline interiorly (Fig. **6**). In the third step, the maxillary process moves still more medially and meets with the medial nasal process to complete the formation of the upper lip (Fig. **4**).

The nasal septum is flanked by cavities, which are being formed by invaginating the nasal placode and excavating the maxillary processes to form maxillary sinuses on either side of the nasal septum (Fig. 6). When the nasal placode invigilates inside, there appears a membrane called the oronasal membrane, which acts as a separator between the nasal and mouth cavities. From the maxillary process arises a horizontal shelve on either side that inroads the oronasal membrane at the level of the lower end of the nasal septum and joins to divide not only the mouth and nasal cavities but two nasal cavities as well (Fig. **6**). This is a very important understanding. We have already said in describing face development that the maxillary process, while moving medially, forms the floor of the nasal orifice and, by doing so, completes the formation of the upper lip. If this milestone is not achieved, then a cleft lip forms. The same type of defect arises internally too. The maxillary shelve, which approaches to join the nasal septum, also fails to join either on one side or both sides of the septum, resulting in the formation of a cleft lip and a cleft palate (**Fig. 5 and 7) (caused** by trisomy 13, valproic acid, and vitamin B12 deficiency). Moore and Persaud (2003).

Proboscis

As we have discussed the variability of the behavior of the maxillary process in making cleft lip and cleft palate (which may be intrinsically or under external influences), variability appears in the behavior of FNP. It forms and remains stationed in the forehead as it juts out as a tubular process hanging on in situ (**Fig. 8 and 9**). The famous dictum 'phylogeny repeats in our ontogeny' repeats in making proboscis as if the development of elephants were in our ontogeny. The incidence of proboscis can be compared to FNP in our ontogeny. A question arises about why FNP extends from the forehead down to the middle of the upper lip. There is a purpose in doing so. It carries the vomeronasal organ of Jacobson and passes it to the mouth cavity via the incisive foramen. It is a product of the olfactory system. Place it at the bottom of the frontal part of the nasal cavity so that the odor of any food substance can be instantly perceived. Migration of the eye from the temporal to the facial region requires the constriction of FNP at the level of the medial canthus of the eye. This is one criteria of beautification of the face; the other is the more and more medial movements of maxillary processes so that more sandwiching of FNP gives rise to thinning of the nasal septum and shaping of the of the anterior prominence (cosmetic surgeons artificially shape it by implanting bone in the nasal septum from the iliac crest). An example of deficiency can be seen in **Fig. 15**. The development of FNP and its continuation in the evolutionary tree is a fact, and it serves different creatures for a variety of purposes. In butterflies, bees, and mosquitoes, it acts as a midline pipe to draw fluid or honey from flowers. That pipe is provided with sucking muscles and with olfactory nerve terminals so that it can fix its pipe to an exact target, pierce and draw honey by butterflies, blood by mosquitoes, or water by elephants. In the Indonesian zoo, the monkeys have elongated noses, which may be due to the persistence of long FNP (Fig. **17**). In elephants, FNP persists as trunks or snouts (Fig. **18**). They do not have hands, and most of their job is performed by the trunk, which contains a canal inside and is surrounded by a muscular wall and terminals of olfactory nerves. It can break a branch of a tree, suck water and spray, and hold a brass to draw pictures. It has the olfactory cells to smell any substance and can smell fresh water about 19.2 miles away (Google). The enlarged brain of elephants is so developed that it can recognize people throughout life as like pet dogs or horses (Wikipedia, May 2012).

Discussion

An attempt has been made to cite the phylogeny of proboscis in our ontogeny. As developmental errors are increasing in modern times, it is important to unfold the steps in making any complete organ. Cleft lip with cleft palate is a very highly focused topic in medical investigations and journal topics. However, its development is intimately associated with the development of proboscis, a derivative of the Fronto Nasal Process (FNP), a product of skull muscles in the forehead. The unique feature of the proboscis is that it incorporates the olfactory nerves and carries them to their ends, either at the tip of the nose or at the tip of the trunk of an elephant or mosquito. Differentiation of main or extra proboscis may be a genetic direction, olfactory need, or teratogenic secondary to iatrogenic drugs. We have seen a complete formation of the nose, but the patient presented

with an extra nose. We propose it due to an olfactory anomaly that produced extra nose or iatrogenic, as reported by Kunwar *et al. (*2021 that the production of cyclops and holoprosencephaly was by a chronic alcoholic mother. Hopefully, future research will uncover the exact cause.

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Figures are as follows:

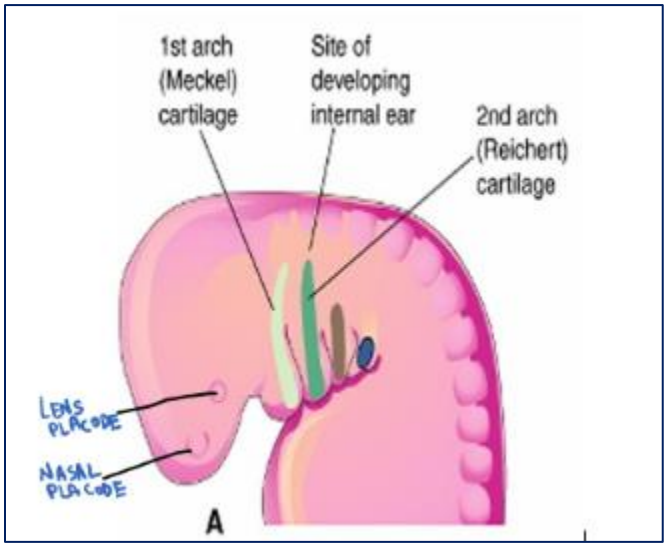

Fig 1: This diagram taken from a text book shows the FrontoNsalProcess(FNP) descending from the surface of the forehead. On its surface superolaterally is the lens placode for future eye while nasal placode is down and gets invaginated. Buccal cleft is bilaterally bounded by hanging six pharyngeal arches. The first one is mandibular arch and maxillary process originates as its branch to proceed anteriorly in the hope to meet with maxillary process of other side.

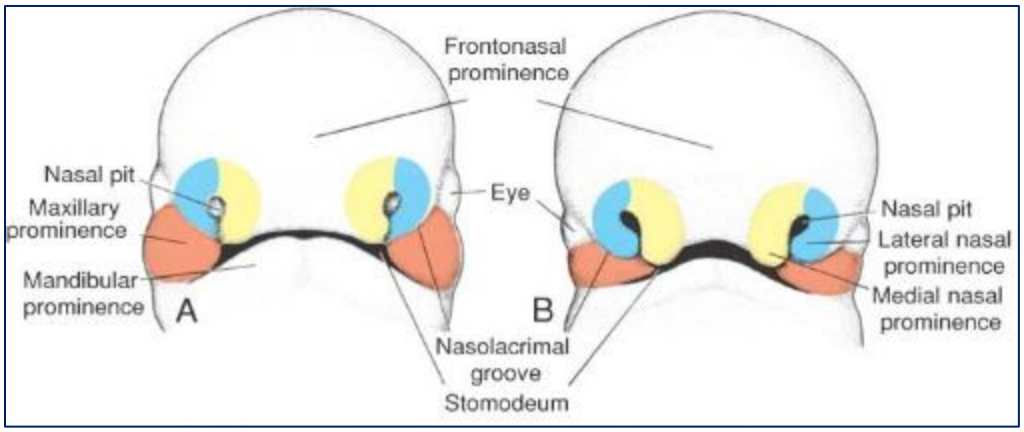

Fig. 2: The face in the making. Medial and lateral nasal processes (yellow & blue) are constructing huge FNP. The buccal/stomodeal cleft (black shadow) is bounded by maxillary processes (red) laterally, FNP above and mandibular process below. Eye is placed laterally but moves anteriorly.

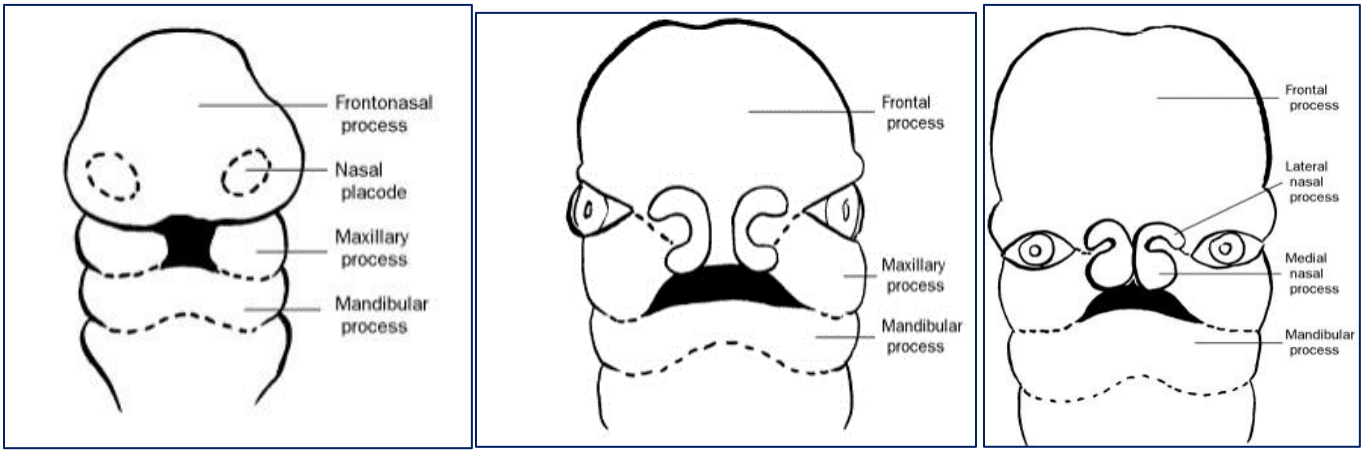

Fig. 3: Here migration of eye is prominent and going Para median and nasal orifice is taking shape when maxillary meet mainly with medial nasal process after meeting lateral nasal process and bridging nasal cleft.

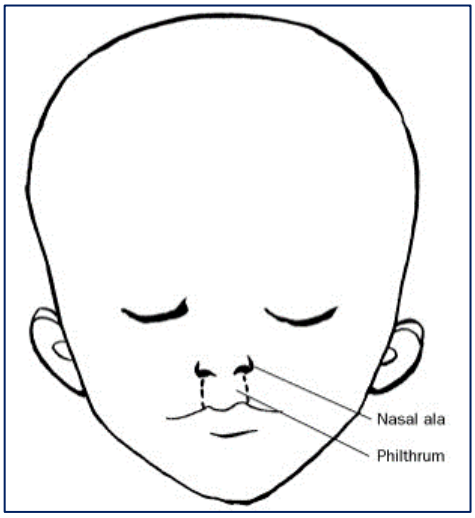

Fig. 4: Definitive shape of face has been reached. The position of philtrum in the mid upper lip is to be noted with a depressed skin, formed by meeting of 2 medial nasal processes. Its laterally lies maxillary process but not lateral nasal nasal process which forms nasal ala.

Fig. 5: This is the view of palate and nasal septum formation (whitish shadow in black) when looking from below. Arching bars are maxillary processes and in front sandwiched is the FNP to give rise to incisor teeth.

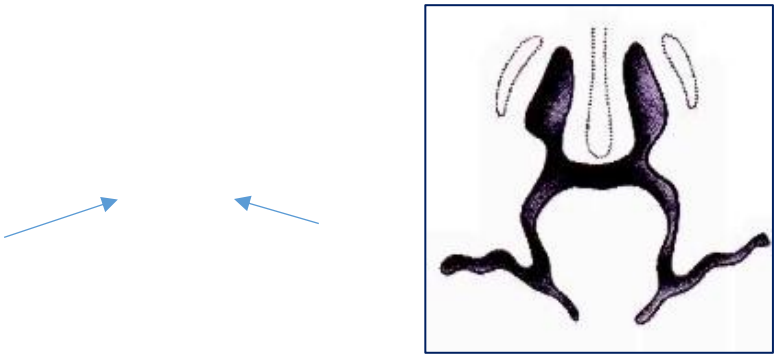

Fig. 6: Coronal section of mouth and nasal cavity. Arrows indicate palate formation to meet hanging nasal septum in midline to separate mouth from 2 nasal cavities. Tongue stands in middle of mouth cavity.

Fig. 7: In this case, midline-hanging portion of upper lip is the philtrum and maxillary processes bilaterally
Failed to meet with medial nasal process giving rise to bilateral cleft lip. The 'complete' word means it made bilateral cleft palate as well.

Fig. 8: This is a rarest case published in Google scholar, a cyclopia with holoprosencephaly. Clevage of brain failed and formed with a single eye. The FNP (proboscis) which should descend in between the 2 eyes remained arrested and hanging from the forehead just above closed single eye. No nasal orifice seen here.

Fig. 9: Cyclopia with Holoprosencephaly .published by Kunwar et al,2021. Proboscis is hanging from forehead with formation of a single eye and no nasal cavity cavity seen.

Fig. 10: A case of proboscis lateralis found from NLM ,Bethesda. Tubular in shape as if the trunk of an elephant. In a perfect nose formation and extra proboscis. This abnormality caused by abnormality of extra branching of olfactory nerve leading to formation of another nose. (Google scholar)

Fig. 11: Multiple examples of extra proboscis lateralis with one or two nasal orifices .
The differentiation to a new nasal orifice is a sequela to abnormal olfactory nerve branching and figuring out a new nasal aparture. (Google scholar)

Fig. 12: Proboscis lateralis with single nose. Accompanied by complete cleft lip and cleft palate. (Google scholar)

Fig. 13: A great example of Proboscis that reminds the mythological deity of Lord Ganesha. It is very similar in appearance of a trunk/snout of an elephant. (Google scholar)

Fig. 14: This is an unique case where independent extra proboscis seen in fig.11 has been incorporated with main nose. The extreme left orifice is added one with existing normal right and middle orifices of a nose. (Peerless hospital)

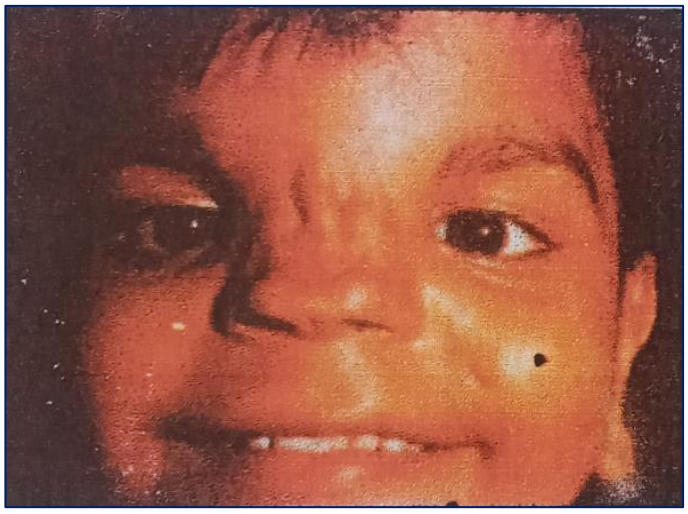

Fig. 15: This is a case where base of FNP at medial canthi of eyes is large. Eyes are placed much more away from each other. Underlying cause may be maxillary sinuses are less excavated and nasal septum is thick but not well sandwiched so formed depressed nasal bridge. (Peerless Hospital,Kolkata)

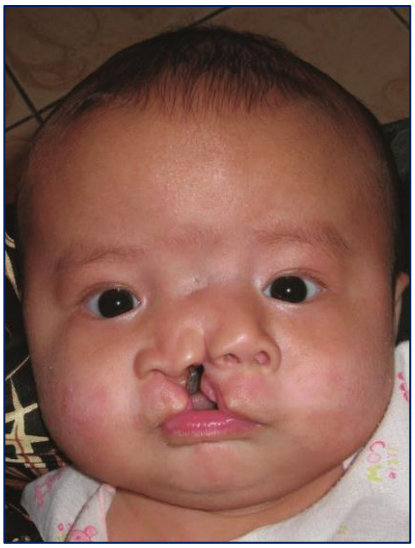

Fig. 16: A case of double bifid nose with cleft lip and cleft palate. Cause me defective olfactory signal with deficient right maxillary migration. (NLM,Bethesda)

Fig. 17: In Indonesian Zoo this long nosed monkey exists. This is another example of proboscis. (Google)

Fig. 18: The trunk/snout of elephant is a great example of proboscis. It has terminals of olfactory nerves, so before consuming it can examine whether the substance is eatable. He can sense fresh water source 19.2 miles away. He never forgets anybody once seen. The trunk works most of the jobs of forehands. (Google)

Fig. 19: This butterfly has proboscis and draw nectar from flowers (Google)

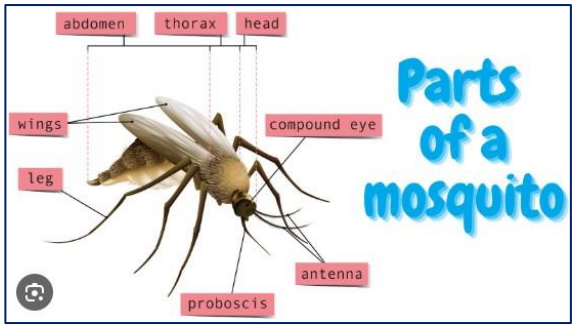

Fig. 20: The proboscis of mosquitos is syringe like, pierce through human skin and draw blood. (Google)

Fig. 21: Toucans have a great beak. It has sharp point to dissect and eat fish. It is another example of proboscis. (Google)