AN ANTHROPOMETRIC EVALUATION OF DIFFERENT METHODS FOR PRIMARY REPAIR OF UNILATERAL CLEFT LIP NASAL DEFORMITY

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INTRODUCTION

Clefts of the lip are associated with varying degrees of nasal deformity. Occasionally quite marked nasal deformity occurs in a mild cleft **(McComb, 1990)**

The clinical manifestations of unilateral cleft lip nasal deformity include the following: The alar dome on the cleft side is retrodisplaced; The angle between medial and lateral crura on cleft side is excessively obtuse; The ala is buckled inward on the cleft side, with alar arch webbing; The alar facial groove on the cleft side is absent; The columella is shorter on the cleft side and positioned obliquely; and there is bony retrusion of the maxilla on the cleft side **(Bardach et al., 1991)**.

Authors differ in their explanation of the pathogenesis of the nasal deformity: Stark and Kaplan, Pigott, Millard, and Pfeiffer concur that there is a decreased amount of primordial tissue resulting from disorder in the migration, differentiation, and proliferation of neural crest cells, "the intrinsic theory". However, Green, Atherton, Huffman and Lierle, and Stenstrom and Oberg concluded that the nasal deformity occurred because of extrinsic forces distracting the nasal structures, "the extrinsic theory" **(Riffley and Thaller, 1996)**.

Although techniques of cleft lip repair have been known hundreds of years ago, primary correction of the unilateral cleft lip nose was performed starting after the first quarter of the twentieth century. From that time on, many surgeons have introduced their techniques of primary cleft nose repair. In 1952 Le Mesurier, 3 years after publishing his method of lip repair, regarded correction of the associated nasal deformity as " the most important and most difficult part of the procedure " **(McComb, 1990)**.

However when only the conventional method without rhinoplasty is performed in cleft lip patients, late rhinoplasty is usually more difficult and less successful. Nasal deformity can also bring about psychological trauma in these patients. Moreover the geographic and economic conditions in the third world make it desirable that simultaneous primary rhinoplasty be performed at the time of cleft lip repair **(Kim et al., 2004; Boo-Chai, 1987)**

Given the above favorable considerations and the fact that research done by **Broadbent et al., 1984**; **Pigott, 1985**; and **Kim, 2004** and others later have disproved the adverse effect of primary repair on nasal growth and cartilage development, it is not surprising that the primary repair of cleft lip nasal deformity is gradually becoming the expected standard of care in many cleft centers around the world

(Salyer et al., 2003)

Principles of primary repair of unilateral cleft lip nasal deformity include releasing of the tip and alar cartilages from their existing soft tissue cover allowing them to be repositioned. Also we reshape the cartilage and attempt to match it to the cartilage of the opposite side, and to hold it in this position during healing; and we reposition the laterally displaced alar base and restore nostril floor **(LaRossa and Donath, 1993)**. Also the caudally rotated alar cartilage should be corrected, the alar cartilage with attached vestibular lining is lifted to shorten the nose on the cleft side **(McComb, 1985)**; and the columella on the cleft side should be lengthened **(Bardach et al., 1991)**

Different authors including **Salyer et al.,2004**; **Byrd and Salomon, 2000** and **McComb, 1990** have proposed different techniques of repositioning the freed alar cartilage and of reshaping the nose, most of these techniques are based on using sutures tied on bolsters on the outside of the nose .

Over time there is tendency for the lower lateral cartilage to retain its memory, and subsequently recreate the preoperative nasal deformity. Therefore **Yeow et al., 1999** and **Yuzuriha et al., 2001** supplemented their repair techniques by use of external nasal splinting, and **Wong et**

al., 2002 supplemented their repair by the use of resorbable internal splint.

Salyer et al., 2004 have found postoperative nasal splinting to be useful. They found that nasal stents decrease scarring , vestibular stenosis , and alar collapse. They recommend the use of silicone nasal retainer after suture removal for three months or more .

The methods used to assess the results of primary cleft lip nose repair are either subjective, objective, or anthropometry. Anthropometric measurements include linear measurements such as nasal tip projection, nasal width and columellar length; They also include angle measurements and indices **(El-Hussuna et al., 2003)**. One of the subjective methods have given the post-operative result a score based on the degree of improvement or the degree of residual deformity **(Yeow etal., 1999).**

Despite the presence of various techniques, still the selection of a technique for primary cleft rhinoplasty is challenging because each surgeon recommends his technique based on his own judgment without thorough evaluation.

There is no consensus on a method of standardized postoperative evaluation for cleft patients. Most studies of postoperative evaluation are either retrospective, not controlled, focus only on anthropometric assessment which has nothing to do with esthetic result, or focus only on subjective assessment which does not reflect growth and dimensions. So there is a need to develop a method for evaluation of various methods of cleft lip-nose repair that is prospective, controlled, and includes subjective assessment of esthetics and anthropometric assessment of dimensions and growth.

THE AIM OF THE WORK

The aim of this study is to develop anthropometric measurements of the nose for normal Egyptian children and to evaluate different methods of primary cleft nasal repair with and without nasal retainer in Egyptian patients .

1- EMBRYOLOGICAL DEVELOPMENT OF THE FACIAL MIDLINE IN NORMAL AND CLEFT CONDITIONS

I- Preliminary events

The most typical feature in development of the head and neck is formed by the pharyngeal or branchial arches. The pharyngeal arches form in carniocaudal succession: the first arch appears on day 22; the second and third arches appear sequentially on day 24; and the fourth and sixth arches appear sequentially on day 29. (fig 1-1) **(Larsen, 1993)**

The first two pharyngeal arches are most closely associated with development of the face and cranium. The first arch develops into the maxilla and mandible. The muscles of facial expression and mastication are also derived from the mesoderm of the first and second pharyngeal arches **(Helms et al., 2006).**

Neural crest cells migrate in a segmental manner so that cells from a given neuromere populate specific pharyngeal arch (Fig 1-2). Deficiencies in neural crest tissue migration and proliferation produce a varied and extensive group of craniofacial malformations referred to as neurocristopathies. **(Saddler, 2000)**.

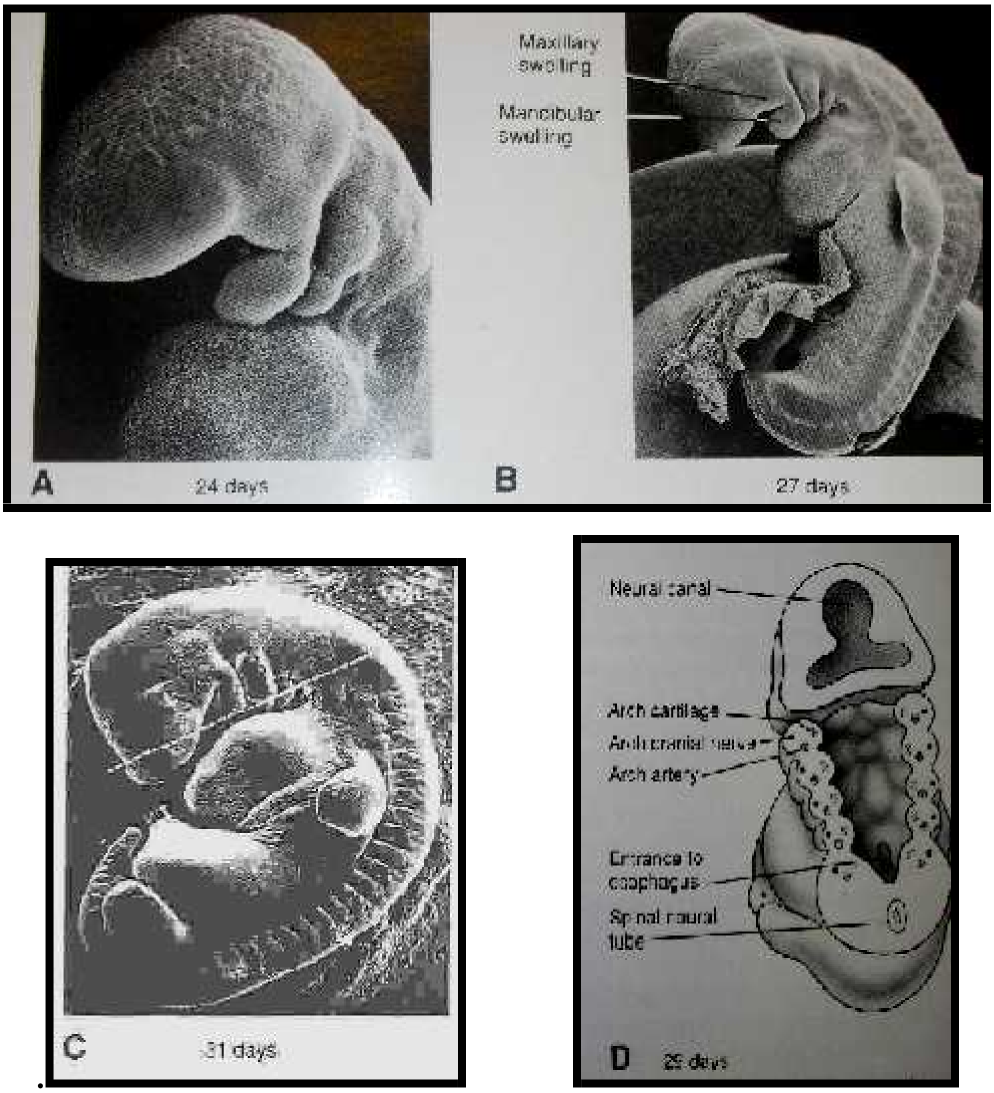

Fig 1-1 Formation of pharyngeal arches **(Larsen, 1993).**

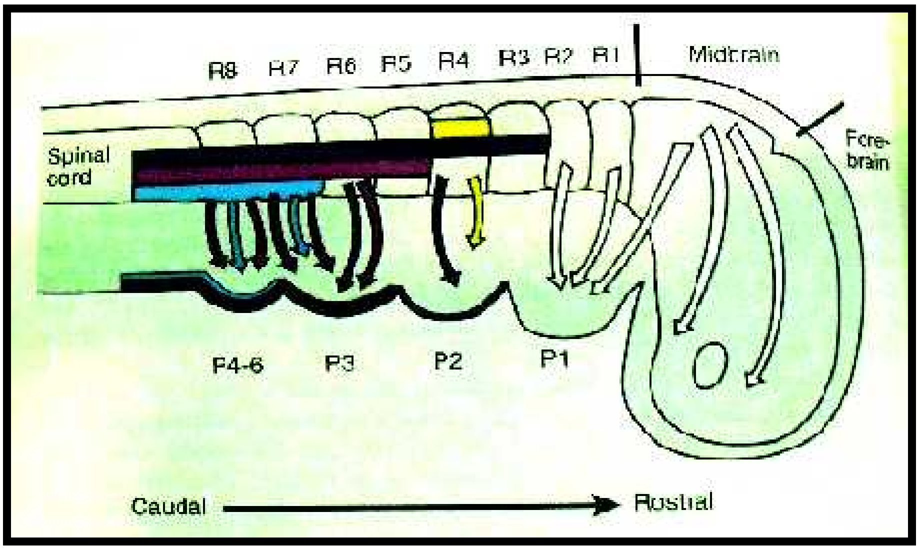

Fig 1-2. Patterns of neural crest cell migration into the pharyngeal arches **(Saddler, 2000).**

II- Development of definitive structures

A- Development of the face (Fig 1-3).

Development of the face begins in the fourth week (stage 10 according to Carnegie staging system) of embryogenesis with migrating neural crest cells that combine with the core mesoderm and the epithelial cover to establish the facial primordia. At stage 11 (about 24 days) the primitive mouth, or stomodeum, is bound rostrally by the developing forebrain and caudally by the swelling mandibular arches **(Jiang et al., 2006)**.

By stage 12 (about 26 days of gestation) the facial primordia consist of five separate prominences surrounding the stomodeum. At the rostral side of the stomodeum is a symmetrical unpaired frontonasal prominence, which is fitted ventrolaterally to the forebrain. The stomodeum is bound laterally by a pair of maxillary processes and caudally by a pair of mandibular processes **(Jiang et al., 2006)**.

From stage 13 to stage 15 (4^{th} to 5^{th} weeks) the frontonsal prominence widens, while the medial ends of the mandibular processes gradually merge in a caudal to rostral direction to form the mandible. At stage 14 (about 32 days) thickening of surface ectoderm occurs bilaterally on the ventrolateral part of the frontonasal prominence, giving rise to the nasal placodes. The frontonasal process grows and bulges around the nasal placodes, resulting in the formation of the nasal pits and the horseshoe-shaped lateral and medial nasal processes. In adaptation to the development of the telencephalic vesicles, the rostral end of the embryo forms a paired configuration with a median groove extending in between the paired medial nasal processes and into the stomodeum. The nasal pits are also in continuity with the stomodeum at this stage **(Jiang et al., 2006)**.

By stage 15 (35 days) rapid growth of the maxillary processes have pushed the nasal pits medially, while the medial nasal processes have grown ventrally, converting the nasal pits from round depressions into dorsally pointing slits. At this stage the upper lip consists of the maxillary processes laterally and medial nasal processes medially with the lateral nasal processes wedged in between. Fusion between the medial and lateral nasal processes has initiated, while maxillary process lie below the lateral nasal process. Studies in mouse embryos demonstrated that fusion between medial and lateral nasal processes occurred initially at the posterior part of nasal pits and proceeds in an anterior direction similar to the human embryo **(Jiang et al., 2006)**.

By stage 16 (38 days) rapid growth of maxillary and medial nasal processes has pushed the lateral nasal process further rostrally and brought the distal ends of maxillary and medial nasal processes into direct contact(fig1-4) **(Jiang et al., 2006)**.