The outcome of the main surgical techniques of palatoplasty

Essay

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To my family

It's your unconditioned love that keeps my heart beating.

It's you who add life to my days.

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You are the light of my way.

List of abbreviations

BCLP:	bilateral cleft lip and palate
CAPS:	Cleft Audit Protocol for Speech
CHOP:	Children's Hospital of Philadelphia
CLP:	cleft lip and palate
CNs	Cranial nerves
CP/P:	cleft lip with or without cleft palate
CP:	cleft palate
CPO:	cleft palate only
D5:	dextrose 5%
EGFR:	epidermal growth factor receptor
GWAS:	genome wide association studies
GDM:	gestational diabetes mellitus
GPA:	greater palatine artery
GPF:	greater palatine foramen
GPN:	greater palatine nerve
IRF6:	interferon regulatory factor 6
IVVP:	intravelar veloplasty
ICU:	intensive care unit
OSA:	obstructive sleep apnea
PRS:	Pierre Robin sequence
PSG:	polysomnography
PGDM:	pregestational diabetes mellitus
JAG2:	protein jagged 2
SCP:	submucous cleft palate
VWK:	The Veau–Wardill–Kilner
TGF:	transforming growth factor
VPD:	velopharyngeal dysfunction
VPI:	velopharyngeal insufficiency
VL:	von Langenbeck
WHO	World Health Organization
UCLP:	unilateral cleft lip and palate

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Abstract

The management of a patient with cleft palate is complex. Patients with cleft palate should be managed by a multidisciplinary team. The team approach has decreased the number of operations needed to obtain better outcomes as the surgeon has gained knowledge from the other specialists involved in cleft care.

Currently, there is no universal agreement on the suitable treatment strategy to follow. Normal speech is the main objective around which, the therapeutic plan should be constructed. The increased application of methods that incorporate reconstruction of the levator palatini muscle has produced much more predictable speech results. Jeopardizing facial growth should be minimalized, but not at the cost of speech impairment since the resultant facial distortion can be satisfactorily managed by surgery, while speech impairment can often be irreparable.

It is important to recognize that a critical review of the literature still does not provide clear answers to the important questions regarding comparative outcome results for cleft palate repair, consequently there is no simple answer when thinking about the ideal technique of palate repair, because the research results are part of a big controversy between the centers.

There is a necessity for well-controlled, prospective research to confirm the reliability of the claimed superior outcomes from different procedures. Cleft palate remains a significant and interesting challenge for current and future plastic surgeons.

Keywords:

Cleft palate, palatoplasty, outcome, techniques, review

Introduction

Affecting around 1:800 live births worldwide, Cleft palate is considered the most common congenital anomaly affecting craniofacial region in humans, having a baby born with cleft palate into any family is connected with massive emotional and psychological distress to the entire family. Cleft palate affects appearance, speech, hearing, growth, psychosocial wellbeing and social integration**. (de Oliveira et al., 2015).**

Many factors play a role in the etiology of cleft palate, yet the exact causes are unknown, it is supposed to be produced by the mixture of environmental and genetic factors. The diabetic women and those who smoke are at higher risk to get a child suffering cleft palate. **(Giampietro, 2014)**

Antenatal scans done around the 20th week of gestation can diagnose cleft palate in up to 40% of cases. Although antenatal diagnosis allows parents to prepare themselves for the baby's birth and consequent care pathway, it may negatively influence the rest of pregnancy because of the psychological burden on parents, so it is vital to afford parents with appropriate and timely support. **(Taib, 2015)**

To prepare the infant and parents medically, physically, and psychologically, children born suffering from cleft palate require harmonized care from a multidisciplinary cleft team encompassing a diversity of specialties and fields, including, plastic surgeons, otolaryngologists, oral maxillofacial surgeons, pediatricians, speech pathologists, audiologists, social workers, geneticists, and psychologists **(Burg et al., 2016).**

Irrespective to the type of surgery being used, a number of factors must be optimized before going to the surgical theatre. The general wellbeing plus the developmental status of the baby will affect the timing to do surgery and are vital for anesthetic and surgical management. Audiology evaluation is routinely obtained preoperatively giving the chance for the otolaryngologist to place ventilating tubes in the tympanic membranes if indicated, saving the baby a further anesthetic. **(William, 2013)**

Goals of palatoplasty embrace the separation of the oral cavity from the nasal cavity, creation of a competent velopharyngeal valve for both swallowing and speech while allowing maxillary growth. Many surgical procedures for palate correction have been established yet, the best surgical technique for repair of palatal clefts continues to provoke a huge controversy **(Campbell et al., 2010).**

Many outcomes have been reported and used to compare cleft palate treatment, and these include dentofacial growth and development, soft palate mobility, facial appearance, Eustachian tube function, intelligible speech, articulation and nasal air escape, hearing, nasal breathing, and patient satisfaction (**de Agostino et al., 2014).**

There is controversy related to the optimal time to do cleft palate repair, depending on which outcome is being considered, with varying recommendations. It is generally believed that speech and hearing are enhanced by repairing cleft palate before 24 months of age and that closure of the palate after 4 years is associated with minimized affection of midfacial growth. This controversy as to the value of early against delayed closure continues into the present (**Murthy, 2014).**

Development of normal speech is the ultimate outcome to be aimed for the surgery of a cleft palate. Timing to do the surgery and which technique to use are the factors that will predict the speech outcome. Most physicians choose to do the surgery between 9-18 months of age **(Chona, 2015).**

Cleft palate surgery is packed with number of potential post-operative complications with palatal fistula being the most common, ranging from 0-60% of cases with an average of 7-12%. To prevent fistula formation, a tension-free, watertight closure to minimalize subsequent scarring is vital requirement. **(Darren and Joseph, 2014)** Other complications are velopharyngeal insufficiency, poor speech outcome, and detrimental effect on growth of the maxilla resulting from healing by scar tissue (**Murthy, 2014).**

The perfect surgical technique to correct of cleft palate deformities continues to be a basis of controversy. Different surgical approaches and various techniques have progressed and described over the past years in a mission to balance speech development with facial growth and esthetic considerations **(Chona, 2015).**

Aim of the work

The aim of this essay is to discuss surgical management of cleft palate and the outcomes of the main surgical techniques of palatoplasty to improve the quality of life in cleft palate patient.

Chapter I:

Relevant embryology and anatomy of the cleft palate

Embryology

The hard palate acts as a strict wall allowing the tongue to move food and creating a vacuum for suckling and swallowing. The soft palate acts as a mobile obturator, closing the nasopharynx from the oropharynx during swallowing and speech. To comprehend the targets of palate closure from an anatomic standpoint, the cleft surgeon must have knowledge and appreciation for the improper embryogenesis resulting in development of the cleft palate (**Dam et al.,2013).**

Normal craniofacial development is a compound, but well-described process, with current advances regarding knowledge of the molecular and cellular processes involved with palatogenesis. Palatal development occurs between the embryonic weeks 4 -12, with the most critical period occurring through the 6^{th} to 9^{th} weeks (**Piotrowski et al., 2011).**

The process of palatogenesis involves correct and progressive distribution of many growth factors, signaling factors, and other biomolecular products, in addition to appropriately timed cell growth, differentiation, migration, transformation, and apoptosis (**Piotrowski et al., 2011).**

In the fourth embryonic week of growth, development of five prominences in the region of the face starts when cells of neural crest travel, under the regulation of genes from the neural tube reaching the craniofacial region (Fig. I-1). The five prominences are the frontonasal, the paired maxillary, and the paired mandibular **(Dixon et al., 2011).**

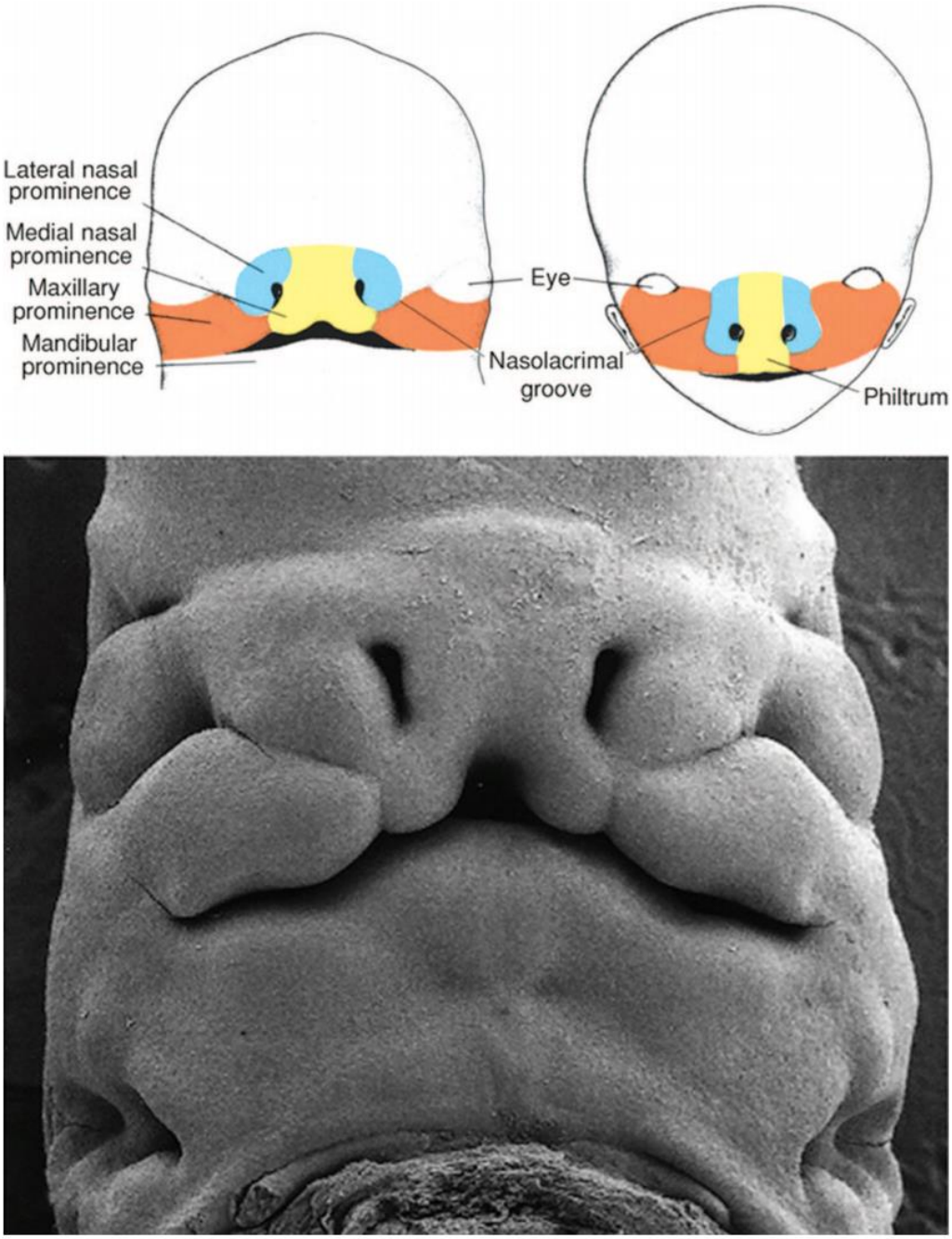

Fig. I-1: Facial development in the embryo. The medial and lateral nasal prominences join forming the nasal pit; the medial nasal prominence and the maxillary prominence fuse forming primary palate. The nasal tip, columella, and philtrum are derived from the medial nasal prominence; the lateral upper lip forms from the maxillary prominence (Dixon et al., 2011).