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Role of Plastic Surgery in Management of Cleft Lip

[1]Sultan Saleh A Almakadi, [2]Ibrahim Mohammad AlGhamdi, [3]Hatem Mostafa Abada, [1]Saeed Husain Alghamdi, [1]Abdulmohsen Mustafa Almarghalani, [1]Abdulrahaman Saud Alghamdi, [1]Kenan Adel M Binyaseen, [1]Ali Hashim M Alzahrani

[1]Physician plastic surgery resident, Al Noor Specialist Hospital, Mecca, Saudi Arabia
[2]Consultant Plastic surgery, Al Noor Specialist Hospital, Mecca, Saudi Arabia
[3]Consultant Plastic surgery, Al Noor Specialist Hospital, Mecca, Saudi Arabia

Abstract

Plastic surgery is a very tiny subspecialty of surgery, having roots that date back over three millennia to India. In the US, there are about 6900 plastic surgeons in active practice, and there are about 230 residency spots available annually. Plastic surgery is perhaps one of the most diversified medical specialties, despite its tiny size. The most common congenital anomalies to occur repeatedly impacting the orofacial area are cleft lip and palate. It can happen on its own, in different combinations, or in addition to other congenital abnormalities, including congenital cardiac conditions. For a patient with an orofacial cleft malformation to be functionally and aesthetically well, treatment must be started at the appropriate age. Care for a newborn with a cleft lip and palate must be coordinated and supplied by several different specialists for the infant to be managed successfully. This study's objective was to look into if plastic surgery has a crucial role in treating cleft lip, hence enhancing the quality of life for those who are born with this disease. Correcting cleft lip defects both aesthetically and functionally is mostly dependent on plastic surgery.

Keywords*:* plastic surgery, cleft lip, cleft palate, facial deformity.

Introduction

Plastic surgery is a very tiny subspecialty of surgery, having roots that date back over three millennia to India. In the US, there are about 6900 plastic surgeons in active practice, and there are about 230 residency spots available annually. Plastic surgery is perhaps one of the most diversified medical specialties, despite its tiny size. Many people refer to plastic surgeons as the "problem solvers" of surgery since they perform operations on patients from birth to death and from head to toe. Complex wounds, traumas, and tissue defects are situations when other surgical and medical disciplines require the assistance of plastic surgeons. Cosmetic surgery focuses specifically on defects in the shape and function of the epidermis and the anatomic structures below, including the head and neck, trunk, limbs, breast, and perineum. These defects are fixed, taken care of, swapped out, and rebuilt [1].

The most frequent serial congenital abnormalities affecting the orofacial area are cleft lip and palate. It can happen on its own, in different combinations, or in addition to other congenital abnormalities, including congenital cardiac conditions. Treatment for a patient with an orofacial cleft malformation needs to begin at the right age in order for them to be functionally and visually normal [2].

These are the most serious birth defects affecting the mouth and associated components. The palate forms the roof, while the structures at the mouth's floor form the flooring. It is limited laterally from the cheeks.

An unusual void or distance in the palate, alveolus, or upper lip that develops at birth is called a cleft. Harelip is the slang word for this illness. Because this phrase implies inferiority and denigration, it should be avoided [3].

Thus, cleft palate and lip can be described as: A split of variable size through the lip, alveolus, and nasal floor is the consequence of the failure of the frontonasal and maxillary processes to fuse. This condition is known as cleft lip (CL). Cleft palate (CP): A cleft of the hard and/or soft palate is caused by the failure of the palatal shelves of the maxillary processes to fuse together [3].

The area of surgical care for children with orofacial clefts is so vast, complex, and rich in history that it stands alone as a distinct surgical specialist [4].

This study's objective was to look into if plastic surgery has a crucial role in treating cleft lip, hence enhancing the quality of life for those who are born with this disease. Correcting cleft lip defects both aesthetically and functionally is mostly dependent on plastic surgery.

Literature review

A Synopsis of Cleft Lip and Palate Correction History

Around 390 AD, cleft lip restoration was first recorded in China. In 1766, a French dentist named Le Monnier is recognized with performing the first successful cleft palate repair in history. Historic manuscripts include a variety of approaches and advancements while managing cleft lip deformity; however, the most notable advancement in this field occurred in the 1950s, thanks to the work of Ralph Millard, a plastic surgeon, and Oscar Asensio, a Guatemalan oral and maxillofacial surgeon. Using a quadrangular flap advanced medially from the cleft section, Dr. Asensio's approach rotated the philtral segment of the noncleft side inferiorly. In the middle of the 1950s, Ralph Millard revealed his well-known method, which is almost exactly the same as Asensio's method [5].

Embryology

When tissues the newborn has an improperly fused mouth and face, it can result in cleft lip and cleft palate. Usually, the fusion occurs during the second and third trimesters of pregnancy. The failure of the palatal shelves to fuse in the midline can result in cleft palate either alone or in conjunction with cleft lip. The inability of the maxillary prominence and medial nasal prominence to fuse results in cleft lip. When tissues of the roof of the mouth and upper lip are unable to correctly fuse together during fetal development, cleft lips and cleft palates result [6].

Together, the five key facial prominences define the fundamental morphology of the face. The strong and delicate tissues that make up the roof of their mouth are the consequence of poor mixing and integrating of rectal protrusions, which leads to CLP. A failing mix causes cleft lip in the fourth and sixth months of gestation, whereas Between the sixth and twelfth month, cleft palate develops. The full process occurs within the period of five to fourteen days of life [2].

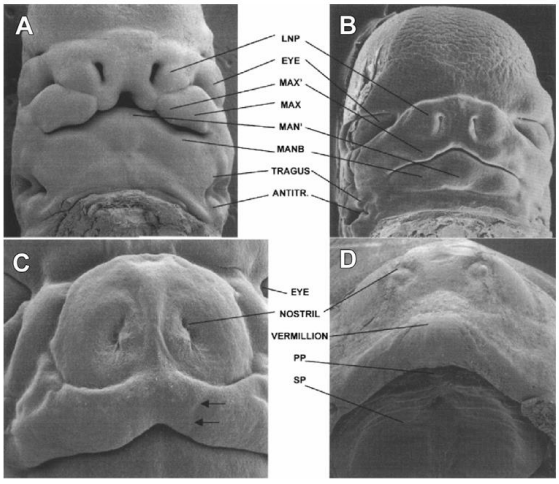

Figure (1) scanning electron micrographs of human embryos' faces at various developmental stages [5].

Incidence, Genetics, and Cause

Incidence

One frequent congenital anomaly affecting the head and neck is cleft lip and palate (CLP). The frequency of cleft lip with or without cleft

palate (CL/P) is 1:1000, but the frequency of isolated cleft palate (CPO) is 1:2500. While the frequency of CPO is constant across ethnic groups, the frequency of CL/P changes with race (occurrence in Asians > Caucasians > Africans). With CL/P (2:1), boys are more likely to be impacted, whereas CPO has the opposite ratio (male/female, 0.5:1) [7].

One of the most common deformities in the head and neck area is cleft lip and palate (CLP). The origin of this deformity is complex, and social, racial, cultural, and geographic variables can all have an impact on the occurrence of clefts. According to current information, orofacial clefts affect about 1 in 700 live births, and as the world's population grows, 3200 additional instances are anticipated year [8].

About 1 in 600 to 800 live births have cleft lip and palate overall (1.42 in 1000), while about in two thousands live births have isolated cleft palate. Consequently, the usual range of cleft types is [2]:

1. Cleft lip by itself: 15%

2. 45% have cleft lip and palate

3. 40% have an isolated cleft palate.

Genetics, and Cause

Cleft lip genesis is believed to have a complicated etiology involving genetic effects and varying relationships resulting from environmental variables. The causes of cleft lip can be categorized as follows:

A. Non genetic:

This comprises a range of teratogenic (environmental) risk factors that have the potential to develop CL. Environmental variables are just as significant in the genesis of CL as genetic ones. Numerous environmental elements consist of [9]:

(a) Smoking: There is a small but significant connection between CLP and maternal smoking. Numerous studies have consistently demonstrated that relative risk falls between 1.3 and 1.5. When mother smoking combined with a favorable genetic background, the total effect was higher. Additionally, the study found that the combination of maternal smoking and newborn MSX1 genotypes increased the risk of CLP by 7.16 times [9].

(b) Alcohol: In addition to increasing the risk of fetal alcohol syndrome, heavy maternal drinking raises the chance of CLP. Researchers found that in a dose-dependent manner, maternal drinking increased the risk of CLP by range from 1.5 to 4.7 times. On the other hand, moderate alcohol use did not appear to raise the likelihood of orofacial clefts. It has not yet been shown how genotypes and alcohol use relate to the risk of CLP [9].

(c) Others: Maternal illnesses, stress during pregnancy, and chemical exposure are examples of environmental factors. reduced blood flow in the area of the nose and mouth. While greater parental age has been linked to cleft palate exclusively, increasing mother’s and father’s age is also thought to raise the chance of both palate and cleft lip. Retinoids can cause severe craniofacial abnormalities in fetuses [9].

B. Genetic:

The groundwork for the role of genetics in the genesis of cleft lip and palate has been built by a number of epidemiological observations. Researchers have demonstrated that the concordance percentage of monozygotic twins is 60%, whereas dizygotic twins and siblings have a concordance rate of 5–10%. Among the genetic causes are [10]:

(1) Syndromic: Here, there is another abnormality linked to the cleft. Usually, a one gene defect is to blame [10].

(2) Non-syndromic:

The majority of the cleft is an independent characteristic that affects up to 70% of people with cleft lip or palate. In this type, there is no known reason for the illness and the cleft is not an acknowledged malformation pattern [10].

Classification

The following is the most often used categorization system for clefts in clinical practice:

(A) partial cleft.

(B) one-sided cleft.

(C) Clefts on both sides.

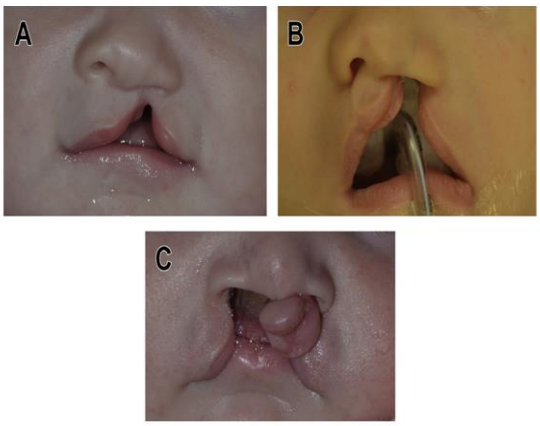

Figure (2) Cleft categorization. There are three types of clefts: incomplete, unilateral, and bilateral [5].

Management by surgery

Preoperative planning for cleft lip

Lip adherence might be helpful for those who have significant lip-taping patients with unilateral or bilateral CL who are unable to finish or nasoalveolar molding (NAM). This procedure is usually carried out at one month of birth to set up a second-stage lip restoration. In order to prevent postanesthetic apnea and airway difficulties brought on by obligatory nasal breathing the initial several months of life, definitive lip healing often happens around the age of three months (or ten weeks). Weight (preferably 4.5 kg [10 lb]) and hemoglobin level (ideally 10 g/dL), sometimes refers to the rule of tens and initially reported by Wilhelmsen and Musgrave, are other criteria that influence when surgery should be performed. Sufficient NAM completion or taping might postpone surgery. Before surgery, caregivers should be informed about the hazards involved, which include dehiscence, hypertrophic scarring, poor cosmesis, and the existence of nasolabial fistulas [11].

Surgical Procedure

For the restoration of the bilateral and unilateral CL, the researchers either employ the Millard approach. While the Fisher technique is referred regarded be an anatomic subunit approach, the Millard technique is founded on rotation advancement concepts. Surgeons in the United States also commonly employ other Mohler and Noordhoff rotation advancement procedures. A surgeon will frequently utilize this particular surgical method to repair both full and incomplete CL. Three objectives are set out for both unilateral and bilateral CL repair: (1) symmetry; (2) cosmesis; and (3) oral competency through a full orbicularis oris. During this procedure, a tip rhinoplasty may be carried out to enhance the breadth, location, shape, and contour of the afflicted ala and nasal tip [12].

Under general endotracheal anesthesia, lip repair or cheiloplasty is carried out. Usually, an oral endotracheal tube with a straight angle is used to situate the endotracheal tube away from the surgery site and inferiorly. The use of local anesthetic is dictated by the surgeon. Crucial markers for the Millard repair are the alar bases, the columellar base, the high and low points of Cupid's bow, and the selection of the proper Cupid's bow high point on the cleft side's lateral lip. The lateral lip of the cleft side is advanced and the noncleft side is rotated inferiorly as the fundamental idea of the Millard repair. The C flap can be incorporated or expanded into the nasal sill or columella. It originates from the medial non-CL. The mucosal M and L flaps can be adjusted to bridge the alveolus and lessen the resulting fistula. The marks, flaps, and closure for the Millard repair are shown in Figure (3) [13].

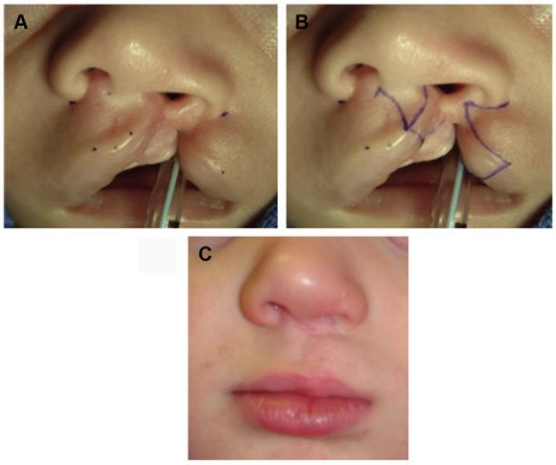

Figure (3) correction of unilateral CL with the Millard method. (A) Marks from surgery. (B) Friction. (C) The outcome after surgery [13].

There are differences between unilateral and bilateral CL repairs. Further mobility of the muscle across the premaxilla is required to provide sufficient muscle reaproximation following surgery since the orbicularis oris muscle is lacking from cleft defect bilaterally in the central prolabium. The columella is often absent in the bilateral CL. Both Millard's unilateral CL repair and the bilateral CL repair have similar marks. The migration of the lateral lip toward the midline, which roughly corresponds to the inferior center low point of Cupid's bow, is the evident difference. The marks, flaps, and closure for the bilateral CL repair are displayed in Figure (4) [13].

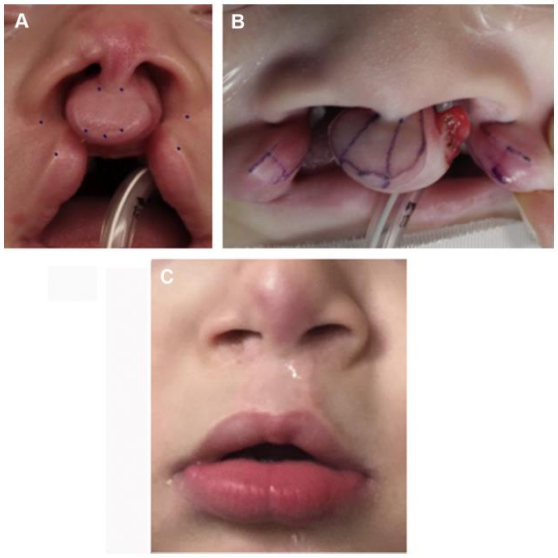

Figure (4) bilateral CL restoration. (A) Marks from surgery. (B) Friction. It displays a natal tooth in the premaxilla. (C) The outcome of the surgery [13].

Follow up and facial growth

Individuals suffering with CLP frequently have aberrant facial development as a result of their deformity and/or surgical procedures used to try to rectify it. Research on the development of facial bones after palate or cleft lip repair typically suggests that the surgical treatments used in an attempt to fix the cleft can have a greater influence on more than the initial abnormality itself, face growth. Adult cleft individuals who have not had surgery still have normal capacity for maxillary development [14].

It is unclear how maxillary development patterns change after surgical correction in cases of single cleft lip. Research on animals has demonstrated a statistically significant impact on the maxilla's cephalometric growth. However, most clinical follow-up studies are unable to show any meaningful impact on children's maxillary development. In a well-known publication, individuals with full unilateral cleft lip and palate showed that functional closure of the lip considerably decreased the transverse anterior cleft regions in early maxillary development [15].

It is crucial to monitor patients for a long time after having a cleft repaired. Currently, the aesthetic outcomes of final surgical repair become apparent only after a certain amount of time has elapsed. Consequently, it could be essential for the patient to go back to the operating room so that adjustments can be made to enhance the look and functionality of the repair. Following the initial procedures, deformities may include scars in the muscular, vermillion, or mucocutaneous areas [16].

Some surgeons now support the use of contemporary medical adhesives as an additional skin closure approach in light of recent improvements in practice. According to the same research, adhesives such as Dermabond provide mature wound cosmesis that is comparable to typical suture closure in the restoration of cleft lip. They also have the

advantage of not requiring further dressing changes or anesthesia for suture removal [17].

Complications

Pediatricians believe that the lack of a "shake-down cruise," which would have given them the opportunity to properly assess and diagnose the patient if they also had other congenital anomalies, is to blame for the estimated 10-15% early mortality rate among patients with cleft lip in the first few days of life [18].

Nonetheless, modern doctors still adhere to the 10-10-10 guideline (the rule of ten is still relevant). Wilhelmsen and Musgrave suggested that cleft lip repair should occur when the patient meets the following cut-offs: weight 10 pounds, hemoglobin 10 g/dL, and white blood cell count <10,000 mm3. In certain situations, the patient may also undergo presurgical orthopedics, which would postpone surgery until the patient is older. As a result, it is easier to prevent problems from concurrent congenital anomalies or from anesthesia. Similar to every surgical operation, there might be related problems [19].

According to early research, the main major risks associated with primary lip surgery are postoperative bleeding, lip repair breakdown, and pneumonia (4.3%). Less common concerns include otitis media, diarrhea, partial suture line rupture, and moderate upper respiratory infections. Subsequent research has identified problems associated with dehiscence of the incision, hemorrhage, pneumonia, respiratory compromise, and respiratory arrest. Regardless of the surgical method, results in the formation of a cleft lip scar, which if left untreated can have detrimental effects on both functionality and appearance [20].

Conclusion

A genetic or environmental injury that occurs in the initial trimester of gestation during the development of the maxilla and palate can result in congenital cleft lip deformity. The non-syndromic variant has a complex etiology, most likely caused by prenatal exposure to teratogens like smoke. Cleft lip results in different levels of dysfunction in the mouth sphincter, trouble speaking, and an unusual look of the nose and upper lip. The primary goals of surgery restoration are to resume regular feeding abilities, ability to speak, and attractiveness of the face at a young age.

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