

Dilemma of Postoperative Scarring in Cleft Lip and Palate: A Narrative Review

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Original Article

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ABSTRACT

Abstract

Clefts in lip and palate is a highly incident abnormality affecting the facial and oral region. It affects nearly 1 in 700 live births, with various geographic origin, racial groups, Clefts can occur in either two forms; syndromic or isolated, occurring in different forms either lip only or palate only or both lip and palate. Infants suffer from esthetic disfigurement and functional morbidity in swallowing, speech, hearing and growth. Clefts are multifactorial in etiology either from genetic or environmental causes. However, despite the cooperation of the multidisciplinary team appointed for treatment and the variety of surgeries that exist in the literature, scars evolve. The literature presents different and various methods to manage this scar whether in surgical or non-surgical forms. The purpose of this narrative review is to review the methods postulated for managing these postsurgical scars to eliminate their detrimental effects and to be of aid to the surgeon and patient welfare himself.

Key Words: cleft lip, cleft palate, scar, management

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INTRODUCTION

Cleft lip and/or palate (CL/P) is a common congenital abnormality, occurring due to a multitude of factors; genetic and environmental factors, nevertheless the exact cause is quite unclear.^[1] Clefts are usually accompanied by various aesthetic and functional problems affecting infants in the facial region. Including: lip discontinuity, tooth eruption within the clefted region, speech and phonetic issues, abnormal muscle attachments, infections, oronasal fistula and deviation of alveolar segments.^[2]

Moreover; feeding, hearing, growth hinderance and eventually low self-esteem with poor communication skills in the society.^[3] Clefts usually present in different forms in the orofacial region either unilateral or bilateral, mostly in unilateral forms.^[1,3] Therefore, a teamwork of multi-disciplinaries is organized with the full understanding of this defect, its etiology, its consequences, manifestation and complications to address this abnormality to be able to offer the infant and his family the optimal treatment.^[2,4]

Therefore, to achieve the required goals of treatment in gaining acceptable esthetic appearance, normalized speech and normal masticatory function eventually allowing the child to have a stable personality.^[4] Despite the presence of various surgical repair techniques in the literature, yet scarring result which cause extra burden

to the patient and family which require another set of surgeries.^[5] This article reviews most famous methods presented in the literature that can be used for treatment of postoperative scar or even prevent it from the beginning.

Embryology

Cleft means the presence of abnormal gap in upper lip or alveolus or palate due to failure of fusion of corresponding facial processes.^[6] Clinically, they involve structures around the oral cavity extending to the face resulting in cleft involving the lip only (CL) or lip and palate (CLP) or isolated palate only (CP).^[7,8] It may present as: unilateral or bilateral, wide or narrow, only a single notch or extend till their complete separation.^[3,4]

Normally, lip development occurs between 4 – 8 weeks intrauterine from the conjoining of frontonasal and medial and lateral nasal processes. Later, by the sixth week, the primary palate is formed from the fusion of the joined medial nasal processes to form the pre-maxilla. Eventually, during 612- weeks intrauterine the secondary palate is formed; thus, cleft lip can occur with or without cleft palate. Likewise, isolated cleft palate may occur on its own without cleft lip.^[7]

Incidence of cleft lip and palate

It is observed in one of 700 live births approximately,^[1,2]

in Egypt, the mean prevalence rates of CL/P in four Egyptian governorates (Cairo, Aswan, Luxor and New valley) was 0.40/ 1000.^[9] Regarding gender, CL mainly affect males by a higher chance than females, while females on the other hand have high chances for CP.^[10] Regarding maternal age, it was found that incidence of clefts increase with maternal ages that is younger than 25 years or older than 29 years.^[10]

Uneventful impacts of cleft lip and palate

Cleft lip and palate have many effects physically and psychologically depending on the severity of the cleft. Functional problems maybe encountered as feeding problems, for instance, cleft lip does not enable the infant to have a seal during breast feeding. On the other hand, cleft palate causes the inability to generate negative pressure during feeding. Nevertheless, acquiring a cleft palate leads to breathing problems during feeding which elongates the procedure of feeding. That is why feeding is one of the most important factors requiring repair.^[2,8,13]

Difficulty in speaking and pronunciation is a very common to occur having hypernasality in their voice due to impaired functioning of the palate and pharyngeal muscles caused by cleft palate.^[13] Irregularities in speech are seen due to; altering in orofacial growth, anomalies in oronasal function.^[2] Besides, breathing, hearing issues due to deformed palatal muscles^[8] and malocclusion commonly occur. Not to mention the unappealing esthetic appearance they face caused by CL.^[3,14]

One of the detrimental effects of CL/P, is its effect on the craniofacial growth where maxillary growth is affected in three planes. Anteroposterior, transverse and vertical causing skeletal class III after surgical repair due to the scar tissue requiring orthodontic treatment, orthognathic surgeries and prosthetic rehabilitation.⁽¹⁴⁾ As for general growth of clefted children, it was reported that patients suffer from weight loss, compared to children with no clefts thereby, disturbing growth in early infancy.^[2]

Cleft palate affect growth in the transverse and sagittal dimension as a consequence from the palatal scar tissue.^[15] Another distressing consequence of the cleft palate is the formation of palatal fistula which would result in nasal regurgitation of foods and speech disturbance. All of that increases the risk of velopharyngeal insufficiency (VPI) either through the fistula or due to the additional scarring, contracture and possible muscle disruption.^[16]

Therefore, coordination of care is achieved through a teamwork of multidisciplinary specialists providing optimal treatment with minimal number of procedures giving finer result.^[14,17]

Effects of scarring on surrounding structures

Hypertrophic scar formation (HTS) is a common postoperative complication to occur requiring revision

surgery^[18], occurring 3-6 months postoperatively with a prevalence of 8-47%.^[18,19]

It is a skin condition characterized by excessive fibrosis developed during wound healing process following deep-surgical trauma. Thereby, preventing normal function and developmental growth disturbing occlusion and resulting in esthetic, physical, psychological imprints on the patients and families.^[20,21]

Newly formed scar influence both soft tissue and bone massively. Post -surgical scar that occurs after primary repair causes lip asymmetry since the contracture shortens the lip and nasal deformity in the cleft side.^[18,21] However, scarring in soft palate post-surgically leads to velopharyngeal dysfunction in almost 20–30% of patients, jeopardizing speech. Also, retarded facial growth presented in maxillary hypoplasia accompanied by malocclusion is often faced, necessitating orthognathic surgery.^[21]

Preventive techniques for postoperative scarring

Therefore, nowadays, surgeons search for methods to prevent scar formation rather than treat it, assuming that prevention is more likely to produce better cosmetic results.^[22] Several prevention techniques existed upon searching the literature, they varied between surgical and non-surgical methods. First ***Massaging*** with moisturizing cream was done after suture removal post-surgically in order to minimize scar presence, being low in cost. The theory lies in applying mechanical force to address scar adhesions which consequently alters the molecular signalling responsible for the formation of connective tissue growth, minimizing fibrosis.^[23] The frequency of massaging should be three times a day for 8 to 10 minutes per session using a lubricating gel to ensure promising results.^[24]

Another measure is ***Nasoalveolar molding (NAM)*** which aims to reduce width, tension and severity of the cleft by approaching the lip segments together, uprightening and lengthening the columella.^[25] It is recommended to construct this device as early as possible as it depends on the plasticity and pliability of the cartilage. Thereby producing a significant decrease in gap between the premaxilla and the lateral segments.^[26]

Also, ***Transforming growth factor beta (TGF-β)*** family which account for being important mediator of tissue repair. Each TGF-β isoform may have a different effect on wound healing. In specific, TGF-β1 may mediate fibrosis and stimulate collagen in adults' wounds actually causing scarring, on the other hand, TGF-β3 promotes scarless healing in the fetus and reduced scarring in adults. Therefore, therapy based on inhibition of TGF-β1 assumed to control postoperative scar in the future.^[27]

The literature reported several approaches to improve palatal wound healing have been tested in different animal studies.

Cytokines were able to reduce the palatal wound contraction when tested in animals. Moreover, *Allogeneic Cultured Dermal Substitutes (CDS)* also were found to significantly improve the delay of maxillary bone growth in rats with palatal wounds.^[28] *Bone marrow derived cells* including include stem cells, mesenchymal stem cells, circulating fibroblasts, macrophages and endothelial progenitor cells proved to be effective in minimizing palatal scarring and improving wound healing.^[29]

Myofibroblasts were identified to contribute in wound contraction as it helps in wound healing in narrowing down of the wound but on the other hand it has an excessive effect that can result in scarring. So in order to reduce the actions of myofibroblasts to avoid scarring following cleft palate; use either inhibitory factors to myofibroblasts or impair their functions or stimulate their apoptosis.^[30]

In addition, the use of *Platelet rich plasma (PRP)* which is a minimally invasive method to get high concentrations of autologous growth factors (GFs), hence, stimulating angiogenesis. Enhancing collagen synthesis and soft tissue healing, therefore decreases dermal scarring.^[31] Another method of prevention is the conventional wound closure by Suturing which offers secure closure but requires another visit for removal as it may elicit tissue reactivity.^[32] Steri-strips is an alternative method to achieve optimal wound closure, applied without tension over the surgical wound to avoid chances of dehiscence being easy and quick to apply.^[33]

On the other hand, tissue adhesives as *Octyl-2-cyanoacrylate* as called “Dermabond” offers a watertight seal closure, limiting postoperative inflammation and infection. Also, very important advantage to the parents, is eliminating the need for suture removal since it persists till skin desquamation occurs.^[34] In the meantime, *Intralesional corticosteroid injections* induce up to 50-100 % regression of both hypertrophic scars and keloids.^[35] The reason behind this is in corticosteroids that inhibit proliferation of fibroblasts, reduce collagen synthesis so reducing inflammation. *Topical silicone sheets/gel* has been used effectively for treating and preventing hypertrophic scars and keloids. Through the possibility that topical application of silicon, passes through the epidermis to the underlying dermis. Thereby, decreasing collagen deposition resulting in improvement of wound healing therefore enhancing scar appearance.^[36] Patients usually favor silicone gel over sheets as they are difficult to keep in place throughout the night without taping not to mention its unpleasant sight in the morning.^[18,37]

Laser has started to be the advent of a new treatment option for postoperative scarring. Nowadays, Fractional Carbon dioxide (CO₂) laser resurfacing is used in post-traumatic and surgical scars.^[38] Its mechanism works in ablation of only a fraction of epidermal and dermal layers of the skin. Hence, healing becomes more rapid, safer and effective with less skin damage.^[39]

Botulinum toxin type A (BTXA) injections, highly effective bacterial neurotoxin may be utilized as a preventive or therapeutic strategy. It is advantageous in improving scar appearance due to their rapid, well defined and lasting actions to decrease wrinkles,^[40] also seen effective in decreasing height, erythema and itching of the scar.^[35] It acts by inhibiting acetylcholine secretion in neuromuscular junctions which leads to the temporary paralysis of the muscles leading to muscle relaxation causing paralysis to underlying Orbicularis Oris muscle, eliminating muscular tension in the wound leading to narrower scar lasting for 3-6 months.^[41,42]

Surgical methods are applied to prevent scar by implementing specific surgical procedures to avoid wound tension as it is very important factor to avoid during the proliferative and remodeling phases of wound healing and this is achieved by the choice of incision design.^[43] *Extended Mohler repair*, a popular modification of rotation advancement technique has been made which involved extending a back cut to the non-cleft side philtral column.^[44] Another technique is *Fisher*^[44] who developed the anatomic subunit approximation technique by placing the scar at the border of anatomic subunits along the “ideal line of repair”. Moreover, it breaks up the vertical cutaneous scar hence minimizing scar contraction and improving aesthetic appearance.^[44]

Treatment methods for post -surgical scarring

Despite the various surgeries presented, yet, no single technique is able to completely prevent scar formation. Still scars may remain over time due to their weak formation.^[39] The need to correct these surgical deformities led to appearance of another version of modalities in the literature.^[5]

Autologous Fat grafting, a semi liquid filler currently used for prevention and treatment. It is completely biocompatible and available with sufficient quantity in most patients.^[45] It provides augmentation of the lip, enhances contour and improves scar appearance which is accredited to adipose-derived stem cell source which potentiates angiogenesis, healing and re-epithelialization. Injecting fat graft at the time of surgery offers a chance to optimize the healing process.^[46]

Another techniques present in the literature are *Follicular Unit Transplantation (FUT) or Follicular Unit Extraction (FUE) techniques* for hair transplantation.^[47] Since scarring might develop hair loss, therefore, hair transplantation is done in a way to restore the hair and also to camouflage scar appearance. However, transplantation sessions alone are not enough as scar tissue is not an ideal ground for the survival of the graft.^[48] First, the FUT technique is found unfavorable by surgeons as it leaves a linear scar in the donor area that can be esthetically displeasing to patients not to mention requiring a trained team personnel.^[47]

Second, the FUE technique is a minimally invasive hair restoration surgery, where individual follicular grafts are extracted from donor area and implanted in the recipient area. It is advantageous in being scarless and fast healing time. It is very significant to mention that FUE does not heal the scar by itself but helps its camouflage by growing new hair over the bald areas on hair-bearing sites of the face and scalp.^[49]

Injection of Hyaluronic acid (HA) has been used primarily for treatment of burn wounds. Nowadays, HA is most identified as a non-permanent filler for non-surgical use in lip asymmetry. Improving volume and defining lips, moreover, reducing formation of postoperative scar.^[50] It was reported the use of HA in scarred lip following primary repair in two stages, by releasing of fibrous tissue through an incision and insertion of the HA hence obtaining volume and lip symmetry for this patient.^[51]

Revision surgeries are indicated when primary repair does not meet the aesthetic goals^[52] explaining to the patient that scars will rather not disappear but rather exchange to a hopefully acceptable one.^[53] **Re-excision** of the scar is done in the form of fusiform or curvilinear incision to treat small to moderate-sized hypertrophic scars. Principally it aims to replace scar in a better place parallel to resting skin tension lines. However, its drawback lies in having the resultant scar always longer than the original.^[54]

Z-plasty is another form of revision surgery which is indicated to treat scar contracture, lengthen scars, to provide fullness and redistribute tension. It is based on a Z-shaped incision for short lip defects.^[35,55] The choice of Z-plasty lies in the assumption that the zigzag shape may allow the final scar to be less visible. Postulating that breaking a long scar into multiple smaller subunits, through the Z-plasty technique, makes scar less visible.^[54]

Abbe's flap is a well-established surgery^[35] that addresses the secondary deformities in bilateral cleft lip cases in cases of tight lip and repeated revision surgeries. It is a full-thickness composite flap which involves the transfer of skin, muscle, and mucosa of the central part of the lower lip to the upper lip; sometimes called lipswitch. It is indicated when 1- there is scarring or deficiency of the central portion of the upper lip, 2- upper or lower lip scars.^[56] Division of this pedicle can take place after the surgery by 2- 3 weeks, despite reconstructing the upper lip, but this adds extra scar burden to the lower lip.^[35]

V-Y advancement or alternatively referred to as Y-V advancement, is demonstrated as a simple and effective option utilized to treat post-surgical scar.^[35] In conclusion, the aim of this work is to pool out all invasive and non-invasive prevention or treatment methods to hypertrophic scar. In order to enlighten surgeons of how to manage such cases when encountered.

CONCLUSION

Postoperative scarring resulting from primary repair of cleft lip and palate has devastating effects on children and their parents. A multitude of techniques used for prevention and treatment of such resulted scar varying between invasive and non-invasive modalities are presented for the benefit of the patient.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

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