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Soft Tissue Expander versus the Use of Platelet Rich Fibrin in Closure of Secondary Palatal Fistula

Hanaa E. Shams El-Deen[1*], Susan A. Hassn[2], Hatem Al-Ahmadi[2]

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azhardentj@azhar.edu.eg

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ABSTRACT

Purpose: to compare the efficiency of tissue expander versusthe platelet rich fibrin (PRF) in closure of secondary palatal fistula (PF). **Patients and Methods:** a prospective comparative study with 3 follow-ups (FU) at 1, 3 weeks, and 6 months was undertaken in 2 groups. Patients from Group I (GI) received tissue expander at the 1st session for expansion of oral mucoperiosteum; the expanded palatal mucosa was used in the 2nd session as 2nd oral layer, whileGroup II (GII) in which PF was closed in 1session by nasal layer then PRF as a substitute for oral layer. **Results:** GI showed good results regarding measurements of surface area SA of defect at 6 months and better outcome withGII regarding to the clinical healing score at 7, 15 days. **Conclusion:** Based on the limited size study we concluded that the methods of using either self-inflating tissue expander or PRF are available alternatives. However in both groups not all the cases showed completePF closure and further studies are needed to confirm the success of these techniques.

KEYWORDS

Palatal fistula, Tissue expander, Platelet Rich Fibrin.

INTRODUCTION

Cleft palate (CP) is the 2nd most common human birth defect. It poses a great physiological and social challenge to the affected patients. The main aim of palatoplasty is to obtain complete isolation between oral and nasal cavities. The term PF is usually used for persistent unrepaired CP or break down of repaired palate. Oronasal fistula cause

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1. Demonstrator of Oral and Maxillofacial Surgery, Faculty of Dental Medicine for Girls, Al-Azhar University.
2. Professor of Oral and Maxillofacial Surgery, Faculty of Dental Medicine for Girls, Al-Azhar University.

* Corresponding author email: hanaa.elmorsi@yahoo.com

air escape from the nose, nasal regurgitation of food and liquids, chronic inflammation, decrease speech intelligibility, halitosis, hearing impairment, food reflux, maxillary hypoplasia, greatly harming and annoying for the patient[1].

There is a high incidence rate in bilateral cleft cases than unilateral or incomplete. The rate is higher in case of wide clefts.Causative factors may include tension on the local sutures, infection, injury, hematoma, hemorrhage, tissue necrosis, fever, flap trauma orvascular compromise. After palatoplasty small fistula(1-2mm) may heal or can be closed by flip over flap. Medium size (10-20 mm) fistula can be closed with local, vestibular and buccal mucosal, tongue or buccal fat pad flaps. LargePF more than 20mm needs large flaps e.g., temporal fascia flap, facial artery muscle mucosal flap or free flap which may become ischemic andshow high rate of failure[2].

A recent technique for PF closure is thetissue expanders as expansion of soft tissue is a reconstructive surgical procedure that induces space for providing additional tissues as skin or mucoperiosteum to allow ridge augmentation in cases of severe ridge resorption viainsertion a tissue expander beside the defect site, causing enlargement of soft tissues that allow closure without tension.On the other hand recent study in the field of tissue engineering aim for repairing, regenerating, restoring and supporting tissues, including cell, tissue, and organs.So PRF was used over the closed nasal layer to induce regeneration and repair of oral mucosa[3].

PATIENTS AND METHODS

This study included 8 patients with secondary PF. They were selected from the outpatient clinic of the Oral and Maxillofacial Surgery Department, Faculty of Dental Medicine Girls, Al-Azhar University and from El Zahraa University Hospital from May 2015 to 2019.This study was approved by the Research Ethics committee of the Faculty of Dental Medicine for Girls, Al-Azhar University. Treatment options, goals of treatment, risks and benefits associated with the treatment were explained to all patients, and a written informed consent was obtained from all patients or their parents (if they were younger than 21 years). The patients were divided into 2 groups: GI received soft tissue expander in the 1st session for expansion of oral mucoperiosteum; the expanded palatal mucosa was used in the 2nd session as 2nd layer (oral), while GII in which PF was closed in 1 session by nasal layer then PRF as asubstitute to oral layer.Patients with secondary large PF free from any systemic disease that may interfere with surgerywere included, while syndromic patients and patients with small PFthat could be closed primarily were excluded from this study.

Surgical steps: in GI, the PF was closed in 2 stages; the1st stage was performed for placement of a tissue expander, gingival incisions was done away from the margin of defect, reflection of oral mucoperiosteum by mucoperiosteal elevator forming a tunnel in which the template was placed to confirm the correct size of expander. A self-drilling mini screw was used to fix the device to the palatal bone to prevent its movement. Repositioning of the flap and inter dental sutures was done. Expansion occurs immediately after absorption of blood from the surrounding tissue (Fig.1). The 2nd stage: for removal of expander and closure of nasal and oral layer by local flip over flap with or without mucosa of nasal septum by inverted interrupted suture using 4-0 vicryl then, closure of oral layer was done by direct closure using 3-0vicryl by horizontal mattress sutures.

In GII, closure of the nasal layer by flip over flap in 1 session where the oral mucosa was inverted to be closed as a nasal layer, followed by placement of PRF membrane as a substitute for oral layer. Surgicel was placed over the PRF membrane, and sutured in place with 3-0 vicryl. The protocol for fabrication of PRF clot and membrane was as follows; a quantity of blood was drawn from patient's peripheral vein (10ml blood); 5ml of blood was transferred to each

sterile glass tube (without anticoagulants) and immediately centrifuged at 3,000 rpm for 10 minutes in laboratory centrifuge machine (80-1 centrifuge machine CE made in china). A structured PRF clot was formed in the middle of the tube, below which was a red blood cell layer,while the top most layer was a thin layer of supernatant plasma platelet poor plasma (PPP). The PRF clot was drawn and placed over the closed nasal layer and sutured with resorbable sutures 3.0 vicryl.

Figure (1): Insertion of screw at the attachment end of device for fixation of the device under palatal mucosa.

Model follow up or (cast analysis): A stone cast model was done at 6 months and optical scanning was done for preoperative cast and this cast to measure the surface area of the defect pre and postoperatively on the 3- matic software.B-Stone cast model was also evaluated at 6 months to detect percentage of closure (25%- 50%- 75%- 100%).

Clinical FU: Patients were evaluated clinically at 1, 3weeks to detect wound healing, granulation tissue formation, and approximation of edges of oral layer in GII, and at 6 months to detect PF closure, percentage of closure (25%- 50%- 75%- 100%) regardingthe presence or absence of communication. Patients were also evaluated at (7-15-30-90-180) days to detect 5 criteria, the sum of these criteria represent the clinical healing score. Finally, when the score was closer to 0, it meant better healing, and vice versa.

RESULTS

Regarding the clinical healing score there was high significant difference toward GII at 7 days, 15 days of P-value was 0.005 and 0.003 respectively, but the results was not significant at 30,90,180 days. Regarding the measurements of surface area of the defect there was significant value $p<0.05$ toward GI as in (Table 1).

This table revealed that the difference between pre- and post-operative surface area was larger in the GI compared to GII with a mean difference of (76.3% in GI with 74.2% change against 4.5 in the GII with 2.9% change). The difference between pre and post operational surface area in GIwas statistically significant ($P<0.05$) while the difference was statistically non-significant in GII ($P>0.05$).

Table (1): *Comparison between pre and post operational surface area in studied groups.*

Variable	PreMean±SD	PostMean±SD	Mean change	% change	Paired t test	P value
GI	102.9±36.0	26.56±28.1	76.34	74.2	2.918	0.033*
GII	153.5±98.0	149.03±168.1	4.47	2.9	0.091	0.931

**Statistically significant difference at p<0.05*

DISCUSSION

PF is a communication between the oral and nasal cavity. It represents the most common complication after palatoplasty with a reported incidence of 58% and recurrent rate nearly 33% [4]. Multiple factors contribute to the occurrence of PF among those are inadequate dissection during primary palatoplasty, closure under tension, bleeding and hematoma between oral and nasal cavities and infection. PF is very annoying to the patient and his parents affecting patient's socialization because it causes halitosis, nasal air escape, food and liquid regurgitation, hyper nasality and indefinite phonation [1].

In GI, although PF closure was carried out in 2 stages, this chronic expansion was preferred to prevent tissue necrosis and ischemia that may occurs in case of acute expansion. This protocol was previously used by many authors PF closure [5- 8]. In the current study cylinder form of Osmed self -inflating expander was chosen to be oriented to sit directly over the bony hard palate. This shape was also preferred by other coworkers who used that form of expander for closure of palatal defects, other forms of expander were also used such as spherical or oval [5, 7].Expanders can be placed through a flap, pocket or tunnel or an endoscopic approach. The endoscopic approach was employed by some authors [6, 10], while others preferred to insert the device through a periosteal pocket or tunnel performed via small incision in the palate sub-periosteally to allow for direct fixation to the bone [5 -8], despite that, others chose to place it supraperiosteally for easy insertion, removal of expander, and to minimize bone resorption that might occur with sub-periosteal implantation [9]. After creating a pocket for the device it was fixed to the palatal bone by micro screw to maintain the expander adjacent to bone as was described by multiple authors [6, 11]. In GII, PRF was placed over the closed nasal layer as a substitute to oral layer. This autologous membrane was used as surface covering agent in various regenerativeprocedures and chronic non healing hard and soft tissue wounds all over the body [10, 11].

The results were analyzed in 2 ways; the 1st way was by the clinical healing score used by observers. The results were better toward GII at 7 and 15 days. This was due to the potential of PRF in tissue renewal and wound healing in consistent with previous studies [11, 12]. The 2nd method of analysis was SA measurements of the defect; it was verified to be better in GI as the expanded palatal mucosa was more efficient to cover the nasal layer and protecting it from being disrupted [13].

CONCLUSION

Based on the limited size of the sample, we concluded that the methods of using either self - inflating tissue expander or PRF are available alternatives.However in both groups not all the cases showed complete PF closure and further studies are needed to confirm the success of these, and other techniques.

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