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RESEARCH ARTICLE
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AN ASSORTMENT OF SOLUTIONS FOR THE DIMINISHED VESTIBULAR DEPTH: A CASE SERIES OF FIFTEEN CASES

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Abstract:

Periodontal plastic and mucogingival surgery has witnessed a stealthy yet steadfast rise in the ranks from oblivion to cognizance. Diminished vestibular depth is a sapient mucogingival deformity warranting appropriate treatment to correct the same. According to Freidman et al, insufficient vestibular depth results in a significant impediment for oral hygiene maintenance. As a corollary of this, plaque accumulation results which leads to the initiation and progression of periodontal pathology around natural teeth and intraoral prostheses encompassing dental implants. This case series aims to elucidate a diverse melange of techniques to deepen the vestibule which in turn is conducive for periodontal health.

INTRODUCTION

In the periodontal lexicon, the term vestibular depth is synonymous with the distance from the crest of the lip to the greatest concavity of the mucobuccal fold or alternatively as the distance spanning the expanse from the coronal border of attached gingiva till the mucobuccal fold.[1,2] The depth of vestibule and width of attached gingiva needs to be scrupulously assessed and ascertained dichotomously either as adequate or inadequate during primary screening as its inadequacy may lead to an array of perturbations in the dental health including difficulty in maintaining proper plaque control measures, compromised aesthetics and dentinal hypersensitivity , to state a few.[3-8] The significance of a minimum width of attached gingiva in maintenance of periodontal health is subject to controversy; while there are proponents of this dogma- Nabers (1966), Lang and Loe (1972),Ochsenbein and Maynard (1974),and Matter (1982); this proposition was refuted by Lindhe and Nyman (1980) and Freedman (1992).[24] Despite these disparate views , inadequate attached gingiva and diminished vestibule have been agreed upon to be mucogingival deformities warranting

preventive and interceptive treatment. According to Freidman et al, inadequate vestibule might exert tension via the high muscular and frenal attachments on the marginal gingiva thus leading to a heightened proclivity to apically migrate and pull away from the tooth surface.[9] A select few studies have even posited that an inverse relationship exists between vestibular depth and plaque and bleeding indices.[10] Additionally, a reduced vestibular depth has a detrimental bearing on fixed prostheses as it predisposes towards marginal leakage and subsequent gingival recession and compromised aesthetics , especially in the anterior region.[11,12] Deepening of vestibule results in the gain of attached gingival width. Goldman and Cohen in 1979 drove home the significance of attached gingiva by postulating the "tissue barrier "concept wherein they vehemently stated that a dense band of collagenous tissue has the edge over the loose-fibre laden alveolar mucosa in terms of averting the progression of inflammation thus reducing the occurrence of recession [14]
Vestibuloplasty is a soft-tissue plastic surgical procedure aimed at increasing the depth of the vestibular sulcus and correcting any aberrations of vestibular morphology. [13] While various techniques have been proposed in literature since times immemorial , vestibuloplasty is more commonly performed using the Kazanjian's technique, Clarke's technique, modified apically repositioned flap, augmentation with free gingival autografts and displaced envelope flap with connective tissue graft. This case series aims to elucidate a diverse melange of techniques to deepen the vestibule which in turn is conducive for periodontal health.While fifteen cases were carried out in total, one case typifying each technique is elucidated in detail.

CASE REPORTS
1.CLARKE'S TECHNIQUE

Figure 1-Pre-operative image with inadequate vestibular depth and aberrant frenal pull

Figure.2 Vestibular deepening done using Clarke's technique

Figure.3 Post-operative image with increased vestibular depth and obliteration of frenal pull

Using Clarke's technique two cases were done. Under LA, a horizontal incision was placed at mucogingival junction with respect to 43 to 33, which was followed by supraperiosteal dissection upto the desired vestibular depth.The mucosa on the labial side was then undermined and the mucosal flap was sutured with resorbable synthetic 5-0 suture at the depth of vestibule. The raw area over the alveolar bone was left to heal by secondary intention. Coe pak periodontal dressing was placed for wound protection was removed after 14 days. The healing after 2 weeks is shown where increased vestibular depth can be appreciated, after 3 months there is reduction in vestibular depth compared to 2 weeks. However there was adequate attached gingiva and patient could maintain her oral hygiene .

2.KAZANJIAN'S TECHNIQUE

Figure.4 Pre-operative image showing diminished vestibular depth

Figure.5 Vestibular deepening done using Kazanjian's technique

Figure 6: Postoperative image with increased vestibular depth

Using Kazanjian's technique 5 cases were done. After a meticulous phase one therapy, it was decide to perform Kazanjian's technique of deepening the vestibule.After obtaining informed consent and administering adequate local anaesthesia, a curvilinear labial incision (at a distance of 2mm plus twice the vestibular depth[Romanos formula]) was given over the labial mucosa in the region of 33 to 43 and large mucosal flap was reflected pedicled off the lip while taking care not to incise the periosteum overlying the alveolus. This was followed by apical dissection characterised by dividing the fibres of the lower labial frenulum and the mentalis muscle. Then the mucosal flap was transposed onto the periosteum and sutured to the desired vestibular depth using resorbable suture material. The wound in the lip was left to heal by secondary epithelialization. Coe pak periodontal dressing was placed for wound protection and was removed after 14 days. The healing after 2 weeks is shown where increased vestibular depth can be appreciated, after 3 months there is reduction in the surgically obtained vestibular depth but greater than the pre-operative level nonetheless.

3.VESTIBULOPLASTY USING CONNECTIVE TISSUE GRAFT

Figure. 7:Preoperative image revealing diminished vestibule with marked inflammation of the gingiva

Figure 8: Connective tissue graft placed and covered with bridge flap to secure a predictable gain in vestibular depth

Figure 9: Postoperative image after 1 month showing increased vestibular depth

Figure 10: Post operative image after 3 months with increased vestibular depth and recreation of the normal anatomical architecture of the surgical site.28

One case was performed employing this technique. After administration of local anaesthesia, the recipient bed was prepared by incising along the labial mucosa at the desired vestibular depth and partially dissecting towards the gingiva while remaining supraperiosteally ensuing which a sulcular incision was placed along the gingiva of 31 and a partial thickness flap was thence raised.

The two independently raised flaps were merged to a singular plane and thus their rendezvous facilitated coronal advancement as well gain in vestibular depth. After stabilizing the recipient bed with a moistened gauze, the task of procuring the connective tissue graft was undertaken. The surgical site was delineated to the safe area between distal aspect of left canine and mesial aspect of first maxillary molar to avert the possibility of any neurovascular ramifications. A horizontal incision was placed preserving 2 mm of palatal gingiva and a vertical incision delimiting the distal boundary of the graft was placed. Subsequently, partial dissection was carried out with a directed trajectory towards the midline and once at the desired depth, the connective tissue is obtained by placing incisions towards the bone along the mesial, distal and medial extent.The graft thus procured was stabilized at the recipient site with sling sutures along the tooth and closed with the coronal advancement of the prepared recipient site flap which was subsequently anchored via periosteal sutures and interrupted sutures to hold its newly coronally advanced position steadfast.This site was further secured with a periodontal dressing.In order to preserve the volume of the donor site, PRF membrane was placed prior to suturing the donor site using cross mattress sutures anchored along the buccal aspect of maxillary premolars. Post operative instructions were given and antibiotics and analgesics were prescribed. The patient was recalled after 2 weeks for suture removal. On successive follow-ups at 1 and 3 months, healing was satisfactory while a significant gain of attached gingiva and augmentation of the gingival phenotype was noted thus creating a favourable milieu facilitating the upkeep of adequate oral hygiene. Intriguingly at the third month follow-up, a piquant finding of a mandibular labial frenum which was previously non-existent was also stumbled upon.

4.VESTIBULOPLASTY WITH FREE GINGIVAL GRAFT

Figure 11: Preoperative image of vestibular insufficiency

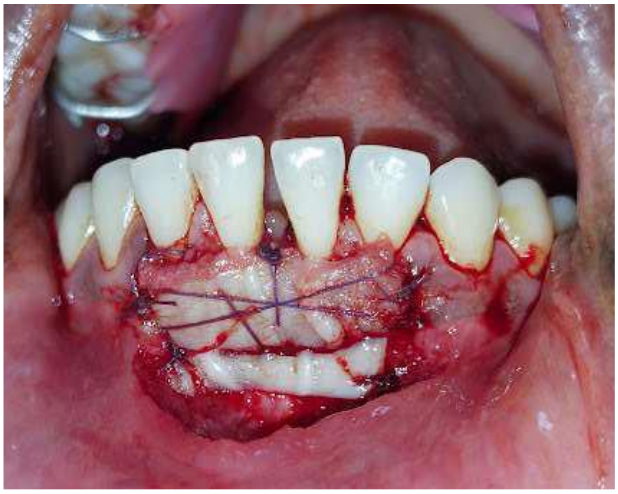

Figure 12:Free gingival graft secured at the recipient bed to augment the vestibule

Figure 13: Post operative after 3 months reveals a newly gained vestibule with augmented phenotype

Using free gingival graft 5 cases were done. After administration of local anaesthesia, the recipient bed was prepared by dissecting at the level of the aberrant frenal attachment and extending to include a sufficient zone of mucogingival junction mesiodistally till the desired vestibular depth. Vertical releasing incisions were placed on either side and a horizontal incision was placed 1 mm coronal to the CEJ thus preserving the interdental papilla. The recipient bed thus prepared was de-epithelialized and protected with a moistened gauze. The free gingival graft was harvested from the left side of the palate . A partial thickness graft comprising of the epithelium and a thin layer of underlying connective tissue was harvested from the earmarked safe zone extending from the distal aspect of canine till the mesial aspect of first molar while care was taken to preserve 2-3 mm of gingival tissue along the palatal aspect of the corresponding teeth.The graft thus obtained was stabilized at the recipient bed and immobilized using a combination of periosteal sutures, sling sutures , horizontal and cross mattress sutures following which periodontal dressing was placed to secure the site.After primary haemostasis was achieved at the palatal donor site, the patient was asked to use the upper Hawley's appliance as the palatal stent while she was asked to refrain from using the lower Hawley's appliance for 2 weeks following periodontal surgery. Post operative instructions were given and medicines were prescribed. After a couple of weeks elapsed, suture removal was done. Follow-up subsequently at 1 month revealed plain sailing healing at the donor site and an admirably perceptible gain in vestibular depth.

5.VESTIBULOPLASTY WITH APICALLY REPOSITIONED FLAP:

Figure 14: Pre-operative image depicting inadequate vestibular depth

Figure 15: Apically repositioned flap with a collagen sponge covering the raw periosteal bed carried out to deepen the vestibule during second stage implant surgery

Figure 16: Postoperative image following prosthetic rehabilitation of the placed implant with adequate depth of the deepened vestibule.

Using this technique two cases were done. Under local anesthesia, using a 15 blade, incision was placed at the mucogingival junction and subsequently supraperiosteally extended until the desired vestibular depth was achieved while keeping in mind an additional margin of safety to compensate the anticipated shrinkage. Subsequently, the flap on the labial mucosa was undermined

and then sutured to the periosteum using 4-0 vicryl surures. The exposed periosteal surface was then ensheathed with a collagen sponge which was secured using resorbable sutures, After the cover screw was exposed using punch incision, a gingival former was placed and the surgical site was protected with a periodontal dressing. Post-operative instructions were duly given and antibiotics and analgesics were prescribed. The patient was recalled after two weeks and the removal of periodontal dressing was followed by removal of the remnants of suture material. Healing was deemed to be satisfactory and a pronounced gain of vestibular depth was noted thus rendering this surgical procedure propitious.

TABLE 1: CASE SUMMARY

S.NO.	TECHNIQUE EMPLOYED	NO. OF CASES
1	VESTIBULOPLASTY USING CLARKE'S TECHNIQUE	2
2	VESTIBULOPLASTY USING KAZANJIAN'S TECHNIQUE	5
3	VESTIBULOPLASTY USING CONNECTIVE TISSUE GRAFT	1
4	VESTIBULOPLASTY USING FREE GINGIVAL GRAFT	5
5	VESTIBULOPLASTY USING APICALLY REPOSITIONED FLAP	2
TOTAL		15

DISCUSSION

Mucogingival therapy encompasses an assortment of therapeutic measures undertaken to increase the dimensions of the gingival tissues to prospectively prevent recession and quell the possible occurrence of dentinal hypersensitivity occurring secondarily. This helps the patients to maintain proper plaque control and to enhance aesthetics .[15] Vestibuloplasty is the surgical alteration of the gingiva-mucous membrane relationships by virtue of deepening the vestibular trough, repositioning frenal and muscular attachments and procuring a markedly widened zone of attached gingiva which is indeed the elixir of periodontal health when coupled with proper plaque control measures.[16] Kazanjian in 1924 proclaimed what is now the prototype of vestibuloplasty wherein the labial flap pedicled off the alveolar process is used to shroud the periosteum over the alveolar process whereas the labial surface is allowed to heal by secondary intention. The major spanner in the works as far as this procedure is concerned is the limited flexibility of the lip due to severe scarring. In order to combat this, Clark in 1953 recommended a flap pedicled off the lip and raw area left over the alveolar process rather than the labial mucosa as he entrusted the rich regenerative potential of periosteum. Though endowed with advantages as such, this technique is

limited by the whimsicality and uncertainty clouding relapse of the vestibule to its preoperative depth and the possibility of cicatrisation of the vestibule. [17] The gold standard panacea for mucogingival deformities is the free gingiva autografts described by Bjorn in 1963. By scrupulous execution of this time-tested technique, it is possible to obtain an augmented attached gingival zone and a deepened vestibule in a predictable manner and the results thus obtained were found to be stable with the passage of time. [18] Although flanked by a plethora of merits, it is marred by a few shortcomings akin to the need for a second surgical site and the pain and discomfort associated with the donor site during healing, excessive bleeding during procurement of the graft, failure in graft union, delayed healing and unaesthetic appearance due to colour mismatch between the grafted tissue and the recipient site. [19] Overcoming these shortcomings, the recent years have witnessed a rise in the coronally advanced flap (CAF) with subepithelial connective tissue graft (CTG) to the coveted elusive rank of being anointed as the gold standard procedure in the treatment of mucogingival deformities. The combination of CTG + CAF provides enhanced vascularization of the graft owing to the duality of the blood supply from both the supraperiosteal vessels as well as the from the flap which overlies it and more pertinently results in appeasing aesthetic results due to the dearth of any hue disparity. [20-22] Carnio and Miller in 1999 described the modified apically repositioned flap (MARF) technique for widening the zone of attached gingiva. The advantages of this method include lack of perplexity in execution, a credible colour match and hence uncompromised aesthetics, shortened surgical time and the absence of a second surgical site. However, this technique requires a presurgical minimum width of 0.5 mm of attached gingiva lest recession occurs post-operatively due to bony dehiscence. [23]

CONCLUSION:

In all the cases described in this article, a significant gain in vestibular depth was observed. Three months post-operatively, despite a slight reduction in the surgically deepened vestibule, the depth per se allowed for the proper functioning of oral physiotherapy and mastication not encumbered by food lodgement. No evidence of gingival recession was noted during followup which further underscored the value of vestibuloplasty as a peerless preventive procedure by virtue of emancipating the gingiva from the tractional forces exerted by the muscles and frenum. Upon pensive collation, it is evident that a predictable and stable gain in vestibular depth in long term follow up as an upshot is more substantially noted when vestibuloplasty is performed in conjunction with the placement of an interpositional material like free gingival graft or collagen sponge than when techniques bereft of these are performed akin to Kazanjian's technique and Clarke's technique. The ability of the grafted tissue to act as an impediment to encroachment of the gained vestibular space by adjacent soft tissue ingrowth could be postulated as a reason to substantiate this observation.Thus vestibuloplasty requires to be addressed with due cognizance and gravity owing to its sterling contribution to edification of function and upheaval of aesthetics.

REFERENCES

1. Ward VJ. The depth of the vestibular fornix in the mandibular anterior region in health. J Periodontol 1976;47:651-5.
2. Swamy A, Sogi GM, Sudan J, Vedi A, Sharma H. "Assessment of oral health status among teaching and non-teaching employees of Maharishi Markandeshwar (deemed to be University) Mullana Ambala" – A cross-sectional study. J Indian Assoc Public Health Dent 2018;16:203.
3. Khan MA, Gupta S, Tripathi AK, Saimbi CS, Chandra D. Vestibular deepening procedure. Int J Health Allied Sci 2016;5:192-
4. Wennstrom J, Zucchelli G. Mucogingival therapy: Periodontal plastic surgery. In: Lang N, Lindhe J, editors. Clinical Periodontology and Implant Dentistry. 6th ed. West Sussex: John Wiley & Sons, Ltd.; 2015. p. 969-1042.
5. Gottsegen R. Frenum position and vestibule depth in relation to gingival health. Oral Surg Oral Med Oral Pathol 1954;7:1069-78.
6. Rosenberg NM. Vestibular alterations in periodontics. J Periodontol 1960;31:231-7.

7. Corn H. Periosteal separation – Its clinical significance. J Periodontol 1962;33:140-52.
8. Carranza FA, Carraro JJ. Effect of removal of periosteum on post-operative results of mucogingival surgery. J Periodontol 1963;34:223-6.
9. Friedman, Nathan: Mucogingival surgery. Texas D. J. 75:3 58, 1957
10. Addy M, Dummer PM, Hunter ML, Kingdon A, Shaw WC . A study of the association of fraenal attachment, lip coverage, and vestibular depth with plaque and gingivitis. J Periodontol 1987;58:752-7.
11. Ochsenbein C. Newer concept of mucogingival surgery. J Periodontol 1960;31:175-85.
12. Natarajan S, Banu F, Kumar M, Lavu V. Management of shallow vestibule with reduced attached gingiva in fixed prosthetic intervention. Cureus 2019;11:e4975
13. Prato GP, Clauser C, Cortellini P. Periodontal plastic and mucogingival surgery. Periodontol 2000. 1995 Oct;9:90-105. doi: 10.1111/j.1600-0757.1995.tb00058.x. PMID: 9567980.
14. Lang NP, Loe H. The relationship between the width of keratinized gingiva and gingival health. J Periodontol. 1972;43: 623e627.
15. Smith RG. Gingival recession: reappraisal of an enigma condition and a new index for monitoring. J Clin Periodontol.1997;24:201e205.
16. American Academy of Periodontology (AAP). Glossary of periodontal terms [internet]. 4th ed. Chicago: AAP; 2001. Available from https://www.perio.org/sites/default/files/files/PDFs/Clinical%20Resources/GlossaryOfPeriodontalTerms2001Edition.pdf
17. Chari H, Shaik KV. Preprosthetic surgery: Review of literature. Int J Sci Study. 2016;3(4):9-16.
18. Bjorn H. Free transplantation of gingiva propria. Sven Tandlak Tidskr. 1963;22:684e689.
19. Brasher J, Rees T, Boyce W. Complication of grafts of masticatory mucosa. J Periodontol. 1975;46:133e138.
20. Zucchelli, G.; Marzadori, M.; Mounssif, I.; Mazzotti, C.; Stefanini, M. Coronally advanced flap + connective tissue graft techniques for the treatment of deep gingival recession in the lower incisors. A controlled randomized clinical trial. J. Clin. Periodontol. 2014, 41, 806–813. [Google Scholar] [CrossRef]
21.Aroca, S.; Molnár, B.; Windisch, P.; Gera, I.; Salvi, G.E.; Nikolidakis, D.; Sculean, A. Treatment of multiple adjacent Miller class I and II gingival recessions with a Modified Coronally Advanced Tunnel (MCAT) technique and a collagen matrix or palatal connective tissue graft: A randomized, controlled clinical trial. J. Clin. Periodontol. 2013, 40, 713–720. [Google Scholar] [CrossRef] [PubMed]
22. Hwang, D.; Wang, H.L. Flap thickness as a Predictor of Root Coverage: A Systematic Review. J. Periodontol. 2006, 77, 1625–1634. [Google Scholar] [CrossRef]
23. Carnio J, Miller PD Jr. Increasing the amount of attached gingiva using a modified apically repositioned flap J Periodontol. 1999;70:1110–7.
24. Swarna, Chakrapani; Govada, Surekha; Susmitha, Karyamsetti; Sowjanya, Chintapalli. Increasing the width of attached gingiva by using modified apically repositioned flap – A case series. Journal of Indian Society of Periodontology 23(2):p 172-176, Mar–Apr 2019. | DOI: 10.4103/jisp.jisp_379_18.