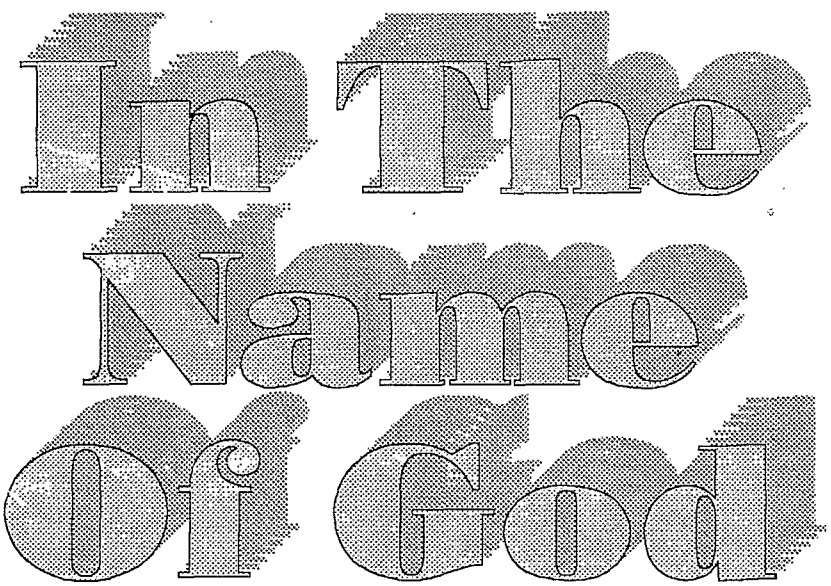

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Shiraz University of Medical Sciences
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Thesis for Partial Fulfilment Master of Science in Periodontology.

INDUCTIVE EFFECT OF PALATAL CONNECTIVE TISSUE ON ALVEOLAR MUCOSA AFTER SUBEPITHELIAL CONNECTIVE TISSUE GRAFT CLINICAL & HISTOLOGIC STUDY

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Dedicated :

To my dear family

Contents :

Introduction 1

Review of the literature 2

Attached gingiva and alveolar mucosa 3

Anatamic, morpholgic and histologic considerations 3

Different causes of narrow zone of attached gingiva 5

The significance of attached gingiva 6

How much gingiva is required? 9

Mucogingival surgery 12

Surgical techniques for increasing attached gingiva 13

Apically positioned flap 14

Laterally positioned flap 16

Double papillary flap 17

Free gingival graft 18

Healing of free gingival graft 21

Placement of free gingival graft on bone 22

Free connective tissue autograft 23

Cell differentiation of oral mucosa 28

Materials and methods. 34

Case selection 35

Pahse I of periodontal treatment 36

Baseline examination 36

Surgical procedure 37

Maintenance 40

Reexamination 40

Second Surgical procedure 41

Histological analysis 41

Data analysis 42

Results 43

Clinical results 44

Histological results 45

Statistical results 45

Discussion 47

Summary 59

Tables 64

Figures 71

References 79

Introduction

The adequate zone of attached gingiva has historically been listed among the requisities of healthy periodontal tissue . The absence or inadequate zone of attached gingiva cannot withstand the mechanical and masticatory forces or the stress of muscle retraction [5].

The establishment of adequate zone of attached gingiva is one of the goals of mucogingival surgery [37].

Based on the fact that the connective tissue carries the genetic message for karatinization of the overlying epithelium, the "free costnective tissue grafting" technique for increasing keratinized gingiva was introduced [1,7,21,48].

The purpose of this thesis is to present the results of a clinical and histologic trial for evaluating the potential use of a subepithelial connective thissue graft from palatal mucosa in induction of keratiniziation in alveolar mucosa. Comparasion of preoperative and postoperative clinical measurements, and also histolgoic investigation are utilized to evaluate the results.

Review of the literature

Attached gingiva and alveolar mucosa

(Anatomic , morphologic and histologic considerations)

The gingiva is divided anatomically into marginal, attached and interdental areas. It is firm, resilient and tightly bound to underlying periosteum of alveolar bone. It is also bound by gingival collagen fibers to the supra alveolar cementum, resulting in it's characteristic immobility[1,2,3,4]

The gingiva functions as a protective mechanism for the attachment apparatus, maintaining a seal for the underlying tissues, against debris and organisems in the oral cavity. When the gingiva becomes affected to a point, beyond it's ability to maintain the seal, inflammation spreads into deeper structures [5].

Attached gingiva is also subjected to the masticated food, that is shed from the sluice ways of the occlusal surfaces of the teeth and this offers a protective tissue against masticatory irritational forces and stress of muscle retraction[1,5].

The facial aspect of attached gingiva extends to relatively loose and movable alveolar mucosa, from which it is demarcated by the mucogingival junction. Thus attached gingiva separates two movable tissues, the alveolar mucosa and free gingival margin[1,6].

The alveolar mucosa is freely movable, loose, elastic and bound only to underlying muscles and facia. Thus being elastic and movable, it aids in masticatory process and is incapable to dissipate the pull from the fasciae. It can not withstand the functional and frictional stresses. It would exhibit

inflammatory and degenerative responses when subjected to stress[1,5,6,7,8,9,10].

The attached gingiva is composed of dense collagenous connectinve tissue with long slender connective tissue papllae . Elastic fibers are infrequently demonstrated in gingiva. It is covered by an epithelium that is keratingzed or para keratinized or present various combinations of these conditions[1,8,10,11]. The prevalent surface, however is parakeratinized . Although it is proposed by Ten cate, that the covering epithelium of gingiva is heavily keratinized [12]. It is tightly bound down by lamina propria to the underlying bone[12].

In contrast, the alveolar mucosa is composed of a loose areolar connective tissue, with abundant thick elastic fibers in the submucosa and mucosa [10]. The elastic fibers gradually decrease in size and quantity at mucogingival line. It's lamina propria is structured for mobility and is not tightly bound down to underlying structures. This histologic difference between two tissues can be explained by the functions performed by each .The alveolar mucosa appeas to be well adapted to permit movement but is incopable to withstand functional stresses[3,11,13,14].

The alveolar mucosa is covered by nonkeratinized epithelium. [10]

The width of attached gingiva is an important clincal parameter. It is determined by substracting the depth of sulcus or pocket from the distance of the gingival margin to mucogingival junction [1,8] .It should not be confused with the width of keratinized gingiva. The latter also includes the marginal gingiva or lateral wall of the pocket[1].

The width of attached gingiva vary from one individual to another and also from one site to another [1,13].

The mucogingival junction remains stationary throughout adult life. Therefore changes in the width of attached gingiva are due to modifications in the position of it's coronal end. The width of attached gingiva increases with age [1,2].

Different causes of narrow Zone of attached gingiva

Reduced or absent attached gingiva may be due to several factors:

1) The base of periodontal pocket being apical or close to mucogingival line
2) High frenal and muscle attachment that encroach on periodontal pocket or gingival margin and pull them away from the tooth surface.
3) Recession causing denudation of root surface and resulting in a narrow zone of attached gingiva, and creating a functional as well as an esthetic problem [3,5].
4) Developmentally insufficient keratinized tissue, which itself may be related to:
    a) Eruption pattern of teeth.
    b) Buccolingual width of alveolar process [15].

Morris observed that, the position of gingival margin is partly determined by the buccal or lingual prominance of the tooth surface adjacent to it . Being more apical with greater prominancy and more coronal with less prominancy in the arch [13,15,16].

The possiblilty exists that recession and loss of keratinized tissue and alveolar bone dehiscence can occure, if there is minimal or insufficient dimension or thin gingiva, facial to the tooth, prior to tooth movement .

Thus it is suggested that treatment of mucogingival problems should be accomplished prior to tooth movement[6,7,15].

The Significance of attached gingiva

Although not substantiated, it is generally believed that an adequate width of keratinized gingiva is important for maintaining gingival health[7,8,17].

It was believed by many periodontists (Nabers, 1957; Oschen ben, 1960; friedman and levine, 1964; Carranza and Carraro, and Schmid 1970; Gartrell and Matthews 1976; Hall, 1981; Matter, 1982) that the presence of an adequate zone of keratinized and attached gingiva is critical for the maintenance of gingival helath, and also for the prevention of continued loss of connective tissue attachment [6, 7,8].

This concept thus prevailed that a narrow zone of gingiva was insufficient to :

1) Protect the periodontium from injurry caused by frictional forces encountered during mastication and tooth brushing [6,18].

2) dissipate the pull on gingival margin, created by the adjacent muscles[6].

3) protect the root surface from dental caries[6].

Moreover Friedman in 1962 believed that an inadequate zone of gingiva would:

Facilitate subgingival plaque formation, because of improper pocket closure resulting from the movability of marginal tissue. This plaque would be difficult to detect and not easily removed by conventional tooth brushing[6,13].

Stern in 1976 and Ruben in 1979 stated that inadequate zone of attached gingiva favor attachment loss, periodontal breakdown extending beyond mucogingival line and soft tissue recession, because of less tissue resistance to apical spread of plaque associated lesion [6].

It was also believed by Gottsegen in 1954, Rosenberg in 1960 Corn in 1962, Carranza and Carraro in 1970, that a narrow band of gingiva and a shallow vestibule might favour:[6,19]

1) The accumulation of food particles.

2) Impediment of proper oral hygienre measures.

It has been suggested by Grant that inflammation seems to be more evident, when attached gingiva that is very narrow, than the gingiva is of normal dimension. This may be due to increased plaque accumulation [11].

Hall in 1981 claimed that a narrow zone of gingiva found apical to a localized soft tissue defect, was a contributing factor in the development of recession[6,8,20]. Support for this clinical impression was obtained from cross sectional studies, performed in humans, showing that a correlation exists between the presence of recession and width of gingiva[6]. In these circumestances futher recession may be confributed or promoted by the inability of the patient to adequately clean the exposed root surface and possibly by the adverse pull of the facial muscles[20]. Also the risk of recession seems to increase in arease, where the gingiva appears to be thin[21].

In one clinical examination, it was reported that the narrower the zone of keratinized tissue in permanant dedtition, the more frequently marginal gingivitis was observed [15].

It is claimed also that narrow bands of attached gingiva, never appears to be completely healthy and are red,regardless of the amount of bacterial plaque [7] .

Even it has been suggested that the adequacy of band of attached gingiva represents the most diagnostic clue in estimating the prognosis for periodonal treatment [16].

There is also a need for a wider zone of attached gingiva in teeth that serve as abetment for a fixed or removable partial dentures, as well as in ridge areas in relation to dentures. Teeth with subgingival restoration and a narrow zone of keratinized gingive have higher gingival inflammation scores than teeth with similar restortions and wider zone of attached gingiva[1].

However several studies have challenged the view that a wider zone of attached gingiva is more protective against the accumulation of plaque, than a thin or non existatant zone [1].

Observation by Meyasato et al. in1977, Dorfman et al. in1980, Detrey and Bernimoulin in 1980 have questioned the concept that there is a need for attached gingiva for the maintenance of gingival health[8] .

It has been suggested that no minimal width of attached gingiva has been established as a standard necessary for gingival health and it is possible to maintain gingival health despite a very narrow zone of gingiva[7].However those individuals whose oral hygiene practices are less than optimal, can be helped by the presence of kertinized gingiva and vestibular depth. These would provide room for easier placement of toothbrush and avoid brushing on tissue [1].

It is also suggested that in patients maintaining a proper plaque control, the lack of an adequate zone of does not result in an increase of soft tissue recession [8,15,22].

Even it is claimed by some investigators that in the presence of plaque areas with a minimal or no zone of attached gingiva are not more susceptible to inflammation than areas with an adequate width of attached gingiva[8] .

In one study by Wennstrom and Lindhe it was showed that in sites exposed to carfule plaque control measures, gingival health could be established and maintained without signs of gingival recession or loss of attachment and would be independent of :

1) presence or absence of attached gingiva.

2) width of keratinized gingiva

3) Height of the supporting attachment apparatus [8]

Furthermore they claimed that increasinge the width of keratinized and attached gingiva had no obvious effect on the postion of gingival margin or level of attachment[8]

How much gingiva is required?

controversy exists with respect to what should be considered an adequate width of gingiva [7].

Grant has proposed that a " functionally adequante zone of gingiva" is defined as one that is keratinized and firmly bound to tooth and underlying bone [11].

Some clinicians indicate that 3 mm is an adequate width of gingiva, others strive for more. It is difficult to apply a mathematic rule to this biologic phenomena [5,11,17] . However the demands of adequate attached gingiva have to be evaluated on:

1) The adjacent dental anatomy and alignment .

2) The presence of restoration or need for orthodontic treatment or prosthetic construction.

3) Individual's plaque Index.

4) Age of the patient [2,5]

Also it is stated that a functionally adequate zone of attached gingiva is not a matter of measurement in millimeter, but rather that amount which will dissipate the pull from the muscles [23].

Corn in 1962 claimed that the width of keratinized gingiva ought to exceed 3 mm.[6,7].

Grant in 1972 proposed that about 2mm or more width of attached gingiva would be resistant to frictional stresses and gaping , when the lip is distended. But in some mouths 1mm of truley attached gingiva, that is functionally adequate, may be sufficient[11].

Bowers studied the width of attached gingiva in 160 heman subjects from 4 to 35 years of age. He concluded that less than 1 mm of attached gingiva would be possible to maintain a clinically healthy state [5].

But he stated further that some attached gingiva is required, since alveolar mucosa is not acceptable at the soft tissue margin [5,6,7].

The other category of authors like Friedmen in 1962; Detrey and Bernimoulin in 1980 have stated that an adequate amount of gingiva is any width of gingiva which would :

1) prevent retraction of gingival margin during facial movements.

2) Be compatible with gingival health [5,6].

It has been proposed by Maynard and Wilson in 1980 , that in segments of dentition involved in restorative treatment, there is particular demand for attached gingiva. Thus they claimed that at such sites 3mm attached gingiva (about 4-5mm keratinized tissue) is required, to maintain periodontal health[6].

One of the first studies in which attempts were made to evaluate the significance of gingival zone for the maintenance of periodontal health, was carried out by Longe and Loe in 1972. It was concluded that all sited with less than 2 mm of keratinized gingiva exhibited persisting clinical signs of inflammation. The authors suggested that 2mm of keratinized gingiva, corresponding to 1 mm of attached gnigvia is adequate to maintain gingival health [1,2,6,8,17,23].

In their studies areas with less than 2 mm keratinized tissue exhibited gingival inflammation inspite of effective oral hygiene measures [13,15].

Meyasato in 1977 and Grevers in1977, on the other hand failed to support the concept that there is a need for a certain minimum width of gingiva, if proper oral hygiene is maintained [6].

In their studies it was demonstrated that it is possible to maintain clinically healthy marginal tissue in areas with less than 1 mm of keratinized gingiva [6].

Mucogingival surgery

Mucogingival surgery consists of plastic surgical procedures for the correction of gingival, mucosal relationship that complicate periodontal disease and may interfer with the success of periodontal treatment. It may be performed as an adjunct to pocket elimenation or as an independent procedure [1,10,23].

The original rational for mucogingival surgery was predicted on assumption that a minimal width of attached gingiva is required for optima gingival health to be maintained [1]. It is a clinical belief that restoring lost gingiva also helps prevent further mucoginvial complications in that site [18].

In the early 1950s, clinicians who concieved that a band of gingiva sufficient to withstand daily demands of brushing and eating coarse foods and of the action of adjacent frena was essential, sought new ways to create an intact collar of keratinized tiedown tissue, in areas where gingiva was absent or minimal. They believed that alveolar mucosa is a delicate tissue poorly designed to provide the needed protection [2].

The principal indication for mucogingival repair, that are usually stated are an inadequate width of attached gingiva , a frenal or muscle pull, inadequate vestibular depth and gingival recession . The mere presence of one of these factors is not in itself an indication for surgical intervention. There should be some indication of damage or potential of damage to the marginal gingiva; before surgery is performed. Because it has been proposed that many areas have survived for years with a minimum widht of attached gingiva [6,19].

It is also suggested that mucogingival surgery must be performed in areas where a change of gingival margin would facilitate proper plaque control or in areas with localized soft tissue recession which create esthetic or root sensitivity problems [6].Also they are used to halt progressive recession [7].

During the next 10 years, reports that questioned the need for zone of gingiva began to appear in dental literature [3]. Some researchers believed that it is not necessary or desirable to intervene when the periodontium is healthy , even if an extremely narrow zone of gingiva exists [23].

Mucogingival surgery has progressed to the stage where predictable results can be obtained. These results are based upon the use of numerous surgical procedures, which have been extensively tested by many clinical and histologic studies [24].

Surgical techniques for increasing the zone of attached gingiva

Prior to the introduction of surgical techniques to increase the zone of attached gingiva,clinicians were forced to maintain the recession by curettage. This requires frequent recall visits and often failed to control the destructive process[25].

Thirty years ago, mucogingival problems were solved by rather heroic methods. Some clinicians attempted to improve the long term prognosis of teeth with extensive recession, by resecting and discarding the entire ribbon of gingiva thus denuding the alveolar bone. At these dendation procedures resulted in protracted and painful postoperation periods and some loss of bone [2,26,27].