Case report

MODIFIED CORONALLY ADVANCED FLAP APPROACH WITH ISTHMUS DEEPITHELIALIZATION FOR THE TREATMENT OF MULTIPLE RECESION DEFECTS IN CASES WITH INTERDENTAL TISSUE LOSS

Kamen Kotsilkov

Department of Periodontology, Faculty of Dental Medicine, Medical University Sofia, Bulgaria.

ABSTRACT:

PURPOSE: This presentation demonstrates a modified surgical approach for multiple gingival recessions in sites with interdental papillae loss and a newly developed method for prediction of the possible root coverage

MATERIAL/METHODS: A 41 years old patient with a diagnosis of Periodontitis II Stage, Grade A. The main complaint was the hypersensitivity, which has even increased after the initial periodontal therapy and his chief request was to cover the exposed root surfaces. In order to achieve a harmonic gingival display and good esthetics, root coverage on all teeth from 13 to 25 was required. The surgical planning revealed a decreased height of interdental papillae. The analysis of the maximum achievable root coverage demonstrated that the intended line of coverage could not be reached with the available root coverage procedures. A new surgical technique, together with a new measuring protocol for accurate prediction of the achievable level of root coverage were developed.

RESULT: One year after treatment, a consistent root coverage was observed with an established proper gingival profile. The achieved line of the gingival margin completely coincided with the presurgical planning. The patient was fully satisfied with the esthetic result and the reduction of the hypersensitivity.

CONCLUSION: In the limitation of the presented case, the developed new method for prediction of the root coverage and modified surgical approach for cases with interdental papillae loss and preserved isthmus provided a predictable increase of the achievable root coverage. Further research is required to study the efficiency of this newly developed surgical approach.

Keywords: interdental tissue loss, prediction of root coverage, papillary isthmus deepithelialization, modified root coverage surgical protocol.

BACKGROUND:

The periodontal disease is characterized by the continuous loss of supportive periodontal structures, often leading to gingival recessions [1]. This consequence usually

presents a serious problem for the patients due to the increased teeth sensitivity causing affected function [2] and the disturbed esthetics, especially in cases with interdental papillary loss and “black triangle” formation. These cases are a real challenge for the periodontist because the available surgical techniques do not provide predictable successful results, and usually, a combined approach with restorative solutions is applied together with the root coverage procedures.

AIM:

This presentation demonstrates a modified surgical approach for multiple gingival recessions in sites with interdental papillae loss and a newly developed method for the prediction of the possible root coverage.

CASE DESCRIPTION:

A 41 years old patient came for treatment with complaints of gingival bleeding and progressing gum recessions. The examination revealed the presence of bone and attachment loss and periodontal pockets formation. The diagnosis based on clinical and radiological data was Periodontitis II Stage, Grade A. (Fig. 1, 2)

Fig.1. Initial status – clinical view.

Fig. 2. Initial periodontal status.

The initial periodontal therapy led to good inflammation control and to health in the reduced periodontium. The main complaint of the patient was teeth hypersensitivity, which has even increased after the initial periodontal therapy and his chief request was to cover the exposed root surfaces. Good soft tissue healing was considered a good prerequisite for the root coverage procedure. (Fig. 3,4).

Fig.3. Status after initial therapy– clinical view.

Fig. 4. Periodontal status after initial therapy.

In order to achieve a harmonic gingival display and good esthetics, root coverage on all teeth from 13 to 25 was required. (Fig. 5)

Fig. 5. Presurgical planning of the desired line of root coverage.

The surgical planning started with the analysis of the soft tissue volume and revealed a decreased height of interdental papillae due to periodontal disease progression. The contemporary opinion in such cases is that the loss of the papillary height decreases the possibility for coronal

flap advancement and diminishes the possible root coverage. The analysis of the maximum achievable root coverage (Zucchelliet al. 2010) [3] demonstrated that the desired line of coverage could not be reached with the available root coverage procedures (Fig. 6).

Fig. 6. Predetermination of the maximum achievable root coverage: **a)** Desired line of coverage (green line), decreased interdental papillae height; **b)** Measurement of the “ideal papilla” height (form the interdental contact point to the proximal CEJ level); **c)** Transferring the “ideal papilla height” from the current papillae tip; **d)** Maximum achievable root coverage with coronally advanced flap (red line).

The usual approach in similar cases is to perform a composite restoration on the exposed root and to transfer the CEJ to the level of the achievable root coverage, but his would contradict the esthetic requirements of the patient. A new surgical technique was developed with the usage of papillary isthmus, usually present in sites with papillary loss. (Fig. 7).

Fig. 7. Modification of the root coverage procedure: **a)** Maximum achievable root coverage according to Zucchelli et al. 2010.; **b)** Usual deepithelialization area (green zone), the papillary isthmus is not included in the standard technique; **c)** Horizontal deepithelialization of the papillary isthmus (red zone); **d)** Increase of the achievable root coverage to the line of desired gingival level (green line).

A new measuring protocol for the prediction of the achievable level of root coverage was also created. The distance from the gingival margin to the required line of coverage (RD recession depth) was measured, and the thickness of the gingival graft (1mm) was added (GT), the total presenting the coronal flap advancement necessary to achieve the desired root coverage. The second step is the determination of the required papillary height to provide a stable base for the coronal advancement of the flap by measuring the vertical papillae height (PH) and subtracting it from the sum of RD+GT. If the result has a positive value, this is the amount of horizontal isthmus deepithelialization (HID) required. The formula used is $HID = (RD + GT) - PH$. (Fig. 8).

Fig. 8. Measuring protocol for Horizontal isthmus deepithelialization calculation (HID): **a)** 13 – Recession depth (RD) – 3mm, Connective tissue graft thickness (GT) – 1mm, Papilla height – 3mm (both papillae). $HID = (3 (RD) + 1 (GT)) - 3 (PH) = 1mm$ (for both papillae). **b)** 23 – Recession depth (RD) – 4mm, Connective tissue graft thickness (GT) – 1mm, Papilla height – 5mm mesial papilla, 3mm distal papilla, HID (mesial papilla) = $(4 (RD) + 1 (GT)) - 5 (PH) = 0mm$, HID (distal papilla) = $(4 (RD) + 1 (GT)) - 3 (PH) = 2mm$.

This formula was applied to each papilla to plan the incision design (Table 1).

Table 1. HID calculation for all papillae in the premaxilla.

	13	12	22	23
Recession depth	3 mm	2 mm	3 mm	4 mm
CT graft thickness	1 mm	1 mm	1 mm	1 mm
Coronal advancement needed	4 mm	3 mm	4 mm	5 mm
Papilla height	3 mm	3 mm	3 mm Mesial / 5 mm Distal	5 mm Mesial / 3 mm Distal
Papilla isthmus present	Yes	Yes	Yes	Yes
Horizontal deepithelialization	1 mm Mesial and Distal papilla	0 mm	1 mm Mesial papilla	2 mm Distal papilla

The subsequent surgical approach was performed with a modification of the lateral approach for the coronally advanced flap for multiple recessions (Zucchelli & De Sanctis 2000) [4]. The modification consisted in:

1. Measurement of the level of the oblique incision, which separates the papilla into “surgical” and “anatomical” parts. The classical approach is to measure the recession depth and to add 1mm (Zucchelli & De Sanctis), then this distance is transferred from the buccal papilla tip. In the author’s modified approach, this distance is transferred from the calculated level of horizontal isthmus deepithelialization (HID), thus moving the line of oblique incision more coronally and increasing the size of the “surgical” papilla (Fig. 9).

Fig. 9. Calculation of the level of the oblique incisions: **a)** Standard measuring protocol; **b)** Modified measuring protocol.

2. Horizontal deepithelialization of the isthmus area with micro - scissors to the previous calculated level (Fig. 10).

Fig. 10. Horizontal isthmus deepithelialization (HID).

3. The level of the fixation of the connective tissue graft is situated on the line of the calculated achievable root coverage (Fig. 11).

Fig. 11. Fixation of the connective tissue graft – at the level of the calculated achievable level of root coverage.

4. The flap fixation in coronal position was performed not only by the classic sling sutures but also with an “O-type” suture in each papilla, thus securing good adaptation of the tip of the surgical papilla to the horizontally deepithelialized isthmus (Fig. 12).

Fig. 12. Fixation of the coronally advanced flap.

RESULT:

One year after treatment, a consistent root coverage was observed with an established proper gingival profile (Fig. 13).

Fig. 13. Result at the 1st year.

The achieved line of the gingival margin completely coincided with the presurgical planning. The patient was fully satisfied with the esthetic result and stated that the teeth hypersensitivity was significantly reduced (Fig. 14).

Fig. 14. a) Status before surgery; b) Presurgical esthetic planning of the desired root coverage; c) Result of the 1st year – fully consistent with the presurgical planning.

DISCUSSION:

The presence of gingival recessions is the main concern that drives the patient to actively seek treatment, especially in cases with a high smile line. Besides esthetics, the other reasons to consider treatment are dental hypersensitivity, root caries or non caries cervical lesions, difficulty to maintain proper dental hygiene.

A variety of approaches aiming at root coverage have been published during the years, including pedicle flap procedures (coronally advanced flap, laterally advanced flap, double papilla flap, etc.) and procedures with connective tissue graft (free gingival graft, subepithelial

connective tissue graft, tunnel technique, etc.). Since the beginning of the development of plastic periodontal surgery, one of the major reasons not to achieve full root coverage was the presence of interdental loss of papillae height. Miller (1985) [5] published one of the first internationally used classifications of gingival recessions, dividing them into 4 classes. In classes I and II, no periodontal attachment loss (bone or soft tissue) is observed in the interdental area, and in these classes, full root coverage is achievable, while in classes III, and IV periodontal attachment loss is observed in the interdental area and only partial (III class) or no root coverage (IV class) is achievable.

In a recently published classification by Cairo et al. (2011) [6], the authors separate 3 types of gingival recessions based on the presence of interproximal tissue loss, and they register a negative correlation between this tissue loss and the achievement of full root coverage. In type I, no interproximal attachment loss is detected, and 74% full root coverage is registered. In type II recessions, interproximal attachment loss is present, but its amount is less or equal to the buccal attachment loss, and in these cases, 24% full root coverage is registered. Type III recessions are characterized by higher interproximal attachment loss compared to buccal attachment loss. These cases were not treated with root coverage procedures, only gingival augmentation with free gingival graft was performed.

Aroca et al. (2018) [7] investigated the relationship between the percentages of root coverage and the distance from the tip of the papilla and the contact point. The authors concluded that there was a significant effect of this distance at baseline on the percentage of root coverage. With the increase of the distance, the percentage of full root coverage decreases, and the level of 3mm appeared to be critical, after that level, a rapid decrease of the percentage of full root coverage was observed in both jaws.

The available data from the scientific studies lead to the conclusion that the presence of interdental tissue loss is an important factor influencing the final recession reduction and the achievability of complete root coverage after different surgical procedures. It could be presumed that the level of interproximal CAL presents an ideal limit for the possible coronal shift of gingival margin and gain in the clinical attachment at the exposed root surface following root coverage procedures because of the stability of the blood clot and the permanent blood supply provided by interproximal soft tissue to the buccal flap and the connective tissue graft during the healing process. Zucchelli et al. (2010) [3] used the height of the existing interdental papilla to create a method of predetermination of the achievable root coverage. This method proved to be a reliable tool predicting the gingival margin position in 71% of treated cases 3 months after surgery correctly.

Stefanini et al. (2018) [8] proposed a protocol for decision making in root coverage procedures for the esthetic outcome. The interdental clinical attachment loss was determined as one of the major prognostic factors associated with the predictability of root coverage by peri-

odontal surgery. In these cases, with the presence of interdental bony defects, the authors proposed the use of the recently published Connective Tissue Graft Wall approach by Zucchelli et al. (2014) [9]. The surgical technique consisted of a connective tissue graft that was placed below a coronally advanced envelope flap and acted as a buccal soft tissue wall of the bony defect treated with enamel matrix derivative. One year after the surgery, clinically significant root coverage, increase in buccal keratinized tissue height and thickness, improvement in the position of the interdental papilla, and clinical attachment level gain were achieved. The radiographs demonstrated bone fill of the intrabony components of the defects.

The original idea described in this report modified surgical approach is based on the observation that with the increase of the distance between the tip of the interdental papilla and the contact point, usually the width and the length of the interdental isthmus is also increasing. The inclusion of the isthmus area in the deepithelialized area of the “anatomical” papilla provides a larger area for flap adaptation, increases the blood supply for the flap and allows more coronally flap advancement than the standard surgical approach. This approach could increase the percentage of the achieved root coverage, especially in the sophisticated cases with more than 3mm loss of papillary height.

The developed measuring protocol for the calculation of the horizontal isthmus deepithelialization could increase the precision of the surgical technique, providing more esthetic results and allowing the clinicians to predict in advance the achievable root coverage.

The application of the presented new approach to the root coverage procedures in cases with loss of interdental papillae height could provide more patient satisfying results [10] not only with the increase of the achievable root coverage in these cases but also with the provision of better soft tissue volume and color matching.

CONCLUSION:

In the limitation of the presented case, the developed new method for prediction of the root coverage and modified surgical approach for cases with interdental papillae loss and preserved isthmus provided a predictable increase of the achievable root coverage. Further research is required to study the efficiency of this newly developed modification of the surgical approach.

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Address for correspondence:

Kamen Kotsilkov, DDS, PhD - Associate Professor,
Department of Periodontology, Faculty of Dental Medicine, Medical University – Sofia,
1, St. Georgi Sofiiski str., Sofia, Bulgaria.
Private Practice: Dental Clinic Kotsilkovi, 24, Vidinikuli str., Sofia, Bulgaria.
E-mail: kamenkotsilkov@gmail.com,