Introduction

In dentistry, especially in periodontology, a wide range of dental materials and equipment’s burst upon our view. One of basic pillars of periodontal surgery is open flap surgery, which helps the regeneration of the periodontium. Our working team combined open flap debridement with the usage of air-abrasive treatment for conditioning the root surfaces while we also tried to avoid the total lack of the cementum. The main goal of this procedure was to present the effects of air-polish device (Varios Combi Pro – NSK) usage in surgical treatment to assist periodontal attachment and regeneration.

Background

The major role of cementum by its structural and dynamic qualities is to serve as the site of attachment for principal collagen fibers [1]. Cementoblasts have biological activity and reactivity which perform different functions. They produce two collagen-containing types of cementum with different properties [2]. In periodontal disease, cementum may vary which leads to the loss of connecting tissue attachment to cementum [3]. On periodontally diseased root surfaces bacteria and their endotoxins penetrate into the cementum. It is generally accepted, that removal of plaque and calculus from cementum which infected by pathogenic microorganisms is the main step in periodontal treatment [4]. Then the main goal is to obtain a treated root surface with smooth and hard surface characteristics without endotoxins. Air-abrasive device is an opportunity for root debridement which helps the aim to probing depth reductions and removal of subgingival biofilm [6,7].
Description of Clinical Procedure

Patients with chronic periodontitis, deeper than 4 mm sockets participated in our 4 cases. Before surgery, all patients received oral hygiene instructions and full mouth supra- and subgingival scaling, in order to reduce the soft tissue inflammation [8]. Following a hygienic phase, 4 female patients aged 40 to 62 years in good general health, non-smokers, are agreed to participate in this case series. After scaling, doing curettages and motivating our group members to perform ideal oral hygiene, we prepared them for open flap surgeries [8]. In order to reduce the mobility when it was needed, the teeth were splinted by steel retainer. Participants have single-rooted front teeth or first molars and have bleeding on probing. Almost every case member has deep intrabony defect with suprabony component. Defects were located in the interproximal area. For the first examination full mouth plaque scores were recorded which revealed the presence of plaque. Each patient periodontal parameters had been registered (PPD, GR, CAL, BoP, PI) 2 days before the surgical procedure. The measurements were implemented on examined teeth, at six locations per tooth using a standardized periodontal probe. Every case was operated with the same surgical method. The patients volunteered for the study after receiving verbal and written information and a signed informed consent approved by Department in Community Dentistry of Semmelweis University, Hungary.

Surgical Procedure

Patients were asked to rinse with 0.2 % chlorhexidine for 2 minutes before perioral disinfection. Surgeries were performed in local anesthesia. The initial incision was carried out buccal, oral and interproximal intrasulcular incision to the alveolar crest at the experimental site, involving one to two teeth apart. When the wide papilla sizes indicated, we made papilla preservation techniques [9]. A mucoperiosteal flap was elevated to the level of the alveolar crest. After contouring flaps, we had opened view of roots and defects. The granulation tissues were removed, and the defects were fully debrided and root surfaces were scaled by ultrasonic instruments [8]. In the next step, we decontaminated the root surfaces by applying air polish device (Varios Combi Pro perio function) with glycine-based powder (Perio-Mate Powder) [7,10]. The flexible nozzle tip can follow tooth contours and it is insertable on root surfaces by applying air-polishing device as debridement of the cementum. Periodontal parameters registered then the open flap surgery proceeded. In this case we completed the conditioning of root surfaces with air-polishing device as debridement of the cementum.

Case 1

A 47-years old woman reported pain and bleeding that occurred while brushing around lower and upper front teeth. During oral examination minimal marginal gingiva hyperplasia was visible. After periodontal status radiograph horizontal bone resorption with vertical components at front and molar area revealed. Patient had narrow and plain papilla’s, beside the hyperplastic margin and the patient also had deep suprabony pocket components. Probing pocket depth ranged from 4 to 5 mm. As we sum the treatment up before, non-surgical debridement and oral hygiene reinstruction was provided which leaded to reduction of marginal inflammation. Periodontal parameters registered then the open flap surgery proceeded. In this case we completed the conditioning of root surfaces with air-polishing device as debridement of the cementum.

| Case 1 |
| --- |
| Initial periodontal chart. Registered parameters in the examined areas: lower and upper front teeth. (PPD, GR, BoP, PI). |

| a) Mean parameters before surgery (Figures 1-6): |
| b) PPD (mm): 3.1 |
| c) GR (mm): 0 |
| d) BoP (%): 65 |
| e) PI (%): 21 |
| f) CAL: 3.1 |
A 62-years old woman complained of massive gingival bleeding on touching entirely of her mouth. The mixture of vertical and horizontal bone loss was detectable on periodontal status radiograph. Because of the bone and the average inflammation, teeth had first class mobility that is why we splinted the upper and lower front teeth before surgery. Besides fixation, we provided supportive non-surgical therapy. During the surgery, we decontaminated the root surfaces with air-abrasion device (Tables 1 & 2).

Table 1: Results are expressed as the average values of the 4 cases. PPD = probing pocket depth, GR = gingival recession, BoP = bleeding on probing, PI = plaque index, CAL = clinical attachment level.

|       | PPD (mm) | GR (mm) | BoP (%) | PI (%) | CAL |
|-------|----------|---------|---------|--------|-----|
| Case1 | 1.7      | 0.2     | 12      | 0      | 1.9 |
| Case2 | 1.7      | 1.3     | 5       | 8      | 0.4 |
| Case3 | 1.8      | 3       | 0       | 0      | 4.8 |
| Case4 | 2.3      | 0.8     | 0       | 33     | 3.1 |

Table 2: Results are expressed as the average values of the 4 cases. PPD = probing pocket depth, GR = gingival recession, BoP = bleeding on probing, PI = plaque index, CAL = clinical attachment level.

|       | After 7 months: | PPD (mm) | GR (mm) | BoP (%) | PI (%) | CAL |
|-------|-----------------|----------|---------|---------|--------|-----|
| Case1 |                 | 1.0      | 1.6     | 0       | 0      | 2.6 |
| Case2 |                 | 0.9      | 2.5     | 0       | 0      | 3.4 |
| Case3 |                 | 1.6      | 2       | 0.1     | 0      | 3.6 |
| Case4 |                 | 1.8      | 1.4     | 0       | 0      | 3.2 |

Average registered parameters (Figures 7-12):
Case 3

A 60-years old woman presents heavy periodontitis, unfortunately we had to extract molar and premolar teeth with third class mobility and suppuration. Thus, the left lower molar quadrant could be prepared for open flap debridement with glycine-powder air-polish supplement. At the mesioapproximal site of the left lower first molar tooth, an average 8 mm deep 3 walled vertical bone defect was examined preoperatively. After oral hygiene improving, we produced the same open flap operation. We conditioned the root surface in the bone defect with air-polishing device. For the perfect healing and the proper regeneration of the defect we applied enamel matrix protein (Emdogain®-Straumann) [12]. Mean pre-surgery parameters (Figures 13-15):

- PPD (mm): 3.2
- GR (mm): 0.5
- BoP (%): 50
- PI (%): 40
- CAL: 2.7

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- BoP (%): 50
- PI (%): 40
- CAL: 2.7
Case 4

A 40-years old woman with moderate periodontitis complained of her right lower first molar because of swelling and bleeding while brushing. During oral examination, a crown was visible on this first molar which had no proper contact with the preparation border of the tooth. At the mesioapproximal site of the first molar, three walled bone defects were diagnosed. Besides this, furcation lesion class-I was detected. For the first step we removed the crown then we accomplished supra- and subgingival scaling and prepared her for the surgery. In this case, we also cleaned the root surface with air-abrasive device then we also applied Emdogain® to the defect. During surgery procedure, furcation was degranulated and scaled. Because of the classification of the lesion, we decided to apply Emdogain. The tunneling technique of the furcation lesion was declined, because less than 0.33% of the furcation was open [12].

Average parameters before surgery (Figures 16-20):

- PPD (mm): 5.5
- GR (mm): 2.3
- BoP (%): 66
- PI (%): 50
- CAL: 7.8

Case 4

Figure 15: Initial status of lower right first molar.

Figure 17: Initial status of lower right first molar.

Figure 18: Cleaning the root surfaces with air-abrasive device.

Figure 19: Emdogain application.

Figure 20: Results of the 4 Cases after 7 months.
obvious. (Figure 18) Measurements obviously demonstrate that
in merit improved. As a result, clinical attachment level gain was
1.3 mm. We observed slight (2 mm) gingival recession. The results
imply the following in regard to clinical practice: In every cases
the mean pocket depth reduction measured 2.1 and 2.3 mm,
in two Emdogain applicated cases reduction were 3.9 and 2.7 mm.
The average clinical attachment gain in two cases measured 0.5
and -0.7 mm, while in two cases with Emdogain usage were 4.2 and
1.3 mm. We observed slight (2 mm) gingival recession. The results
imply the following in regard to clinical practice: In every cases
pocket depth was significantly reduced while gingival recession
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obvious. (Figure 18) Measurements obviously demonstrate that
open flap surgery in regenerative or in regenerative treatment (in
our two cases used enamel matrix derivate) with pre-surgical
conservative therapy preserve a proper treatment. In these cases,
using air-polish device as surface conditioning seemed right
supplement without side effects. Figure 18: Results of the 4 Cases
after 7 months.

Results

The primary outcome measures for 1 month postoperatively
were just visual check-outs to be aware of the proper healing.
There was no suppuration or swelling around the operated
area, except around Emdogain® applied defects. In these cases,
in 1-5 days minimal inflammation were detectable, which had
automatically improved. However, as in every case, for Emdogain®
supplied operations we prescribed antibiotics post-operative. The
following clinical parameters were assessed 3 and 7 months after
the surgical procedure using the same type of periodontal probe:
probing pocket depth (PPD) gingival recession (GR), bleeding on
probing (BoP), plaque index (PI) and clinical attachment level
(CAL). Measurements were made at six sites per tooth: mesiobuccal
(mb), midbuccal (mb), distobuccal (db), mesiooral (meo), midoral
(mo) and distooral (do).

The cemento-enamel junction (CEJ) was used as the reference
point. In one case where the CEJ was not visible, a restoration
margin was used for these measurements. After 7 months in two
cases the mean pocket depth reduction measured 2.1 and 2.3 mm,
in two Emdogain applied cases reduction were 3.9 and 2.7 mm.
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Discussion

In general, periodontitis has many factors to come into play,
so choosing an appropriate treatment can be the utmost concern
to every clinician. Patients with general health, progression of the
disease and all of the factors should be reflected. In periodontal
treatment, non-surgical conservative therapy is the first step or
can be a supportive course before surgical phase to achieve post-
therapy maintainable periodontal health, so its essential role is
obvious.

Surgical side of a treatment is diversified, which means that
the basic steps during an open flap surgery can happen by the
same methods. Thus, alternative implements are available to
complete the different surgical steps, such as surface conditioning,
decontaminating, or cleaning. We pursued a different procedure
of therapy that utilized air powder abrasion to decontaminate the
afflicted site, with occasionally applying regenerative material.

Conclusion

The result is that, the open flap debridement with air-polish
addition revealed in these treatments a well-combined surgical
therapy. Although the absence of morbidity and uneventful healing
period our cases exhibited suggest that technique described may
present a successful process. Based on the results of this report,
decontamination in this way can be considered.

Conflict of Interests

The authors declare that there is no conflict of interests
regarding the publication of this paper. The case report was
approved by the Regional and Institutional Committee of
Science and Research Ethics and the Hungarian Office of Health
Authorization and Administrative Procedures and was conducted
in accordance with the Declaration of Helsinki.

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ISSN: 2574-1241
DOI: 10.26717/BJSTR.2019.13.002376
Németh Orsolya. Biomed J Sci & Tech Res

Cite this article: Nemeth O, Simon F, Gango J, Kivovics M. Function of Air-Abrasion Device During Open Flap Surgery in Resective and Regenerative Periodontal Therapy: Case Reports. Biomed J Sci & Tech Res 13(2)-2019. BJSTR. MS1D.002376. DOI: 10.26717/BJSTR.2019.13.002376.