Effects of direct dental restorations on periodontium - clinical and radiological study

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Summary

The authors have performed a clinical study - 175 crown obturations of class II, II, V and cavities have been analyzed in 125 patients, following their impact on the marginal periodontium and a radiological study - consisting of the analysis of 108 proximal amalgam obturations and of their negative effects on the profound periodontium.
The results showed alarming percentages (over 80% in the clinical examination and 87% in the radiological examination of improper restorations, which generated periodontal alterations, from gingivitis to chronic marginal progressive periodontitis.
The percentage of 59.26% obturations that triggered different degrees of osseous lysis imposed the need of knowing the negative effects of direct restorations on the periodontium and also the importance of applying the specific preventive measures.
Key words: dental anatomy, gingival embrasure contact area, under- and over sizing, cervical extension, osseous lysis.

Introduction

Dental restorations and periodontal health are closely related: periodontal health is needed for the correct functioning of all restorations while the functional stimulation due to dental restorations is essential for periodontal protection.

Coronal obturations with improper occlusal modeling, oversized proximally or on the vestibular/oral surfaces of teeth, along with fillings lacking interproximal contact, negatively influence the healthy periodontium and, moreover, constitute an additional source of irritation for the periodontium already affected by disease.

An adequate treatment must take into account the carrying out of correct dental anatomy, as follows:

Correct occlusal anatomy

Occlusal surfaces must be modeled in such a manner that forces are directed along the longitudinal axis of teeth. Cuspidian slopes of an improperly modeled restoration in relation with the antagonist tooth can trigger enlargement of the contact point during functional movements. This allows interdental impact of foodstuff, with devastating consequent effects on interproximal periodontal tissues.

Marginal occlusal ridges must be placed above the proximal contact surface, and must be rounded and smooth so as to allow the access of dental floss.

Correct proximal anatomy

Proximal surfaces and dental crowns must be divergent, beginning from the contact area towards vestibular direction, orally and apically.

They must be smooth and polished and the interdental contact area must be correctly made, in order to prevent interdental food settling.

Location of contact point

Alteration of the interproximal contact surface entails food retention, gingival inflammation, pocket formation, bone loss and finally dental mobility. Food settling is a common cause

of chronic marginal gingivo- and periodontopathies.

That is why the following factors are consequential:

- the contact surface in a lateral tooth must be situated at 1-2 mm below the maximal height of the marginal ridge; it will not exceed 1-2 mm in length in occluso-gingival direction and it will measure approximately 25% of the oro-vestibular width of the neighboring tooth;

- in the upper arch the contact surface is situated slightly towards the vestibular area, from the median mesio-distal line and in the lower arch is located on the median line;

- the contact surface enlarges with patient's aging.

Vestibular and oral surfaces

These surfaces, if well proportioned, play an important role in maintaining gingival health. Undercontoured vestibular and oral surfaces they may alter the normal route of food and cause its stuffing and accumulation in the gingival groove.

Over contouring will deviate food beyond the marginal gingiva, reaching the attached gingiva. This fact deprives the marginal gingiva of self-cleaning mechanical action of food, which can stagnate in overprotected gingival groove.

Cervical extension of restorations

The cervical limit of restoration should be placed, whenever possible, supragingivally and it should present an optimal marginal closing.

When the obturation margins are placed subgingivally, they always constitute and irritation for the marginal periodontium.

Obturations that appear clinically and macroscopically perfect, when analyzed microscopically, almost always show marginal deficiencies.

The microscopical spaces at the tooth-restoration interface constitute niches for plaque accumulation.

Excessively contoured margins of oversized obturations result in the appearance of gingivitis.

From periodontal point of view, the most important element is the gingival niche (embrasure).

Periodontal disease triggers tissue destruction, diminishing the level of the alveolar bone and creating greatly enlarged interdental spaces.

Restorations can be made to respect the coronal and radicular morphology, maintaining the embrasure enlarged and the interdental space open. Teeth can be remodeled through restorations so as the gingival embrasure is replaced near the new level of the gingiva. This is made by modifying the contour of the proximal surfaces and by placing the contact areas more apically. The interdental gingiva takes again the normal shape, filling the new embrasure, which must have adequate dimensions.

The aim of our survey - is to assess clinically and radiologically the health status of the marginal periodontium in relation to direct dental restorations.

Material and methods

Clinical study

Patients presented in the Odontology Clinic between 1 October 2002 and 1 May 2003 were examined. The odonto-periodontal status was assessed, assessing the restoration (obturation) marginal periodontium relation.

The batch comprised 125 patients aged 18 to 65, of which 82 were females and 43 males.

Through clinical examination we assessed the existence of periodontal alteration (gingivitis, chronic marginal periodontites), as related to the presence of crown obturations, applied in class II, III and IV cavities and compound cavities, totalizing 175 odontal treatments. The following aspects have been observed at their level:

- improper remodeling of proximal contours;
- absence of contact points;
- excessive obturation margins;
- significant excess and compaction of filling material in the interproximal spaces;
- improper remaking of proximal embrasures and crown morphology;
- absence of polishing and finishing of obturations.

Periodontal examination was made by inspection, palpation and assessing of dental mobility.

Results

Out of the 175 obturations clinically examined:

- 98 were of silver amalgam and 82 of physiognomic materials;

- 145 obturations determined different types of periodontal diseases, due to improper remodeling of crown morphology;

- 30 were correct *(Table 1, Graphic 1).*

The 175 obturations presented the following deficiencies *(Table2).*

The very low percentage (17.14%) of correct restorations that did not affect the marginal periodontium was noticed, as compared to 82.9% of restorations that affected the interdental papillae, gingival scallop or even the marginal or profound periodontium.

Out of the 145 obturations with deficiencies in modeling and polishing, only 10-20 could be improved by removing certain material excesses or by better finishing and polishing; the rest of fillings required total removal and functional remodeling.

Radiological study

Having analyzed 745 radiographs taken in our clinic, we selected 92, in which we could examine 123 amalgam proximal obturations.

At their level we evaluated:

- the adaptation of fillings to the gingival threshold (presence of filling materials as an irritating spine for the marginal periodontium);

- the lack of contact point, favoring food impact;

- the presence of alveolar resorption phenomenon;

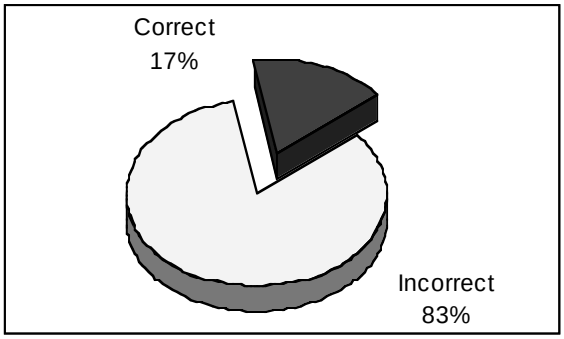
- the presence of marginal secondary decays.

Results

Out of the 123 proximal obturations, 108 showed inadequate remodeling of the contact

Table 1. Correct and improper obturations

Total number of obturations	175
Improper obturations	145
Correct obturations	30



Graphic 1. Percentage of correct and improper obturations

Table 2

Obturations in class II, III, V and compound cavities	**Number**	**Percentage**
Improper remodeling of proximal contours	27	15.42%
Absence of contact point	39	22.28%
Excessive obturation margins	9	5.14%
Important exceedings, compacting of obturation material in the interproximal space	7	4%
Improper restoration of proximal embrasures and crown morphology	32	18.28%
Unfinishing and unpolishing of obturations	31	17.71%
Apparently correct obturations	30	17.14%
Total number of examined obturations	**175**	**100%**

Table 3. Radiological analysis of proximal obturations

Proximal obturations	Number	Percentage
Excessive material	72	58.53%
Absence of contact points	36	29.27%
Apparently correct obturations	15	12.20%
Total	**123**	**100%**

Table 4. Analysis of improper obturations

Proximal improper obturations	Number	Percentage
Lysis of osseous septum	64	59.26%
Secondary decays	30	27.77%
Osseous lysis + secondary decays	14	12.97%
Total	**108**	**100%**

Figure 1. Proximal amalgam obturation on the mesial surface of the 6-year molar, with excessive material in the interproximal area, without observing the gingival niche; permanent irritating spine for the marginal and profound periodontium; osseous resorption

Figure 2. Improper proximal amalgam obturation with improper occlusal anatomy that does not restore the masticatory niche, with excessive material in the interproximal area and decapitation of the alveolar limbus

point and 15 were apparently correctly made. *(Table 3).*

From the 108 improper obturations, 78 induced lysis of the alveolar limbus, 44 showed marginal secondary decays at the level of the gingival threshold and 14 had both defects *(Table 4).*

Discussion

The high percentage of improper crown obturations with negative impact upon the superficial and profound periodontium revealed by the clinical (83%) and radiological (87.80%) examination requests the need of acknowledgement and application of preventive measures against such noxious effects.

Healing of the gingival tissue is mandatory before applying the restorative dental treatment, mainly if the cervical margin of the obturation must be placed subgingivally.

In order to protect and maintain the health status of the gingival tissues, the following methods can be applied: rubber dam, wedges, matrices, retraction cord, local removal of excessive gingival tissues (by help of solutions, electrical cauterization, LASER, etc) or surgical alteration of gingival architecture.

In order to achieve an adequate restorative treatment, maintenance of adequate dental anatomy should be taken into account, by achieving correct occlusal, proximal, vestibular, oral and cervical anatomy.

Existing plastic restorations, if inadequate, might be remodeled and polished, if by this manner they can be improved.

Gingival trauma should be minimal, in every clinical procedure of the restorative treatment.

Conclusion

The clinical study of crown obturations, related to their impact on marginal periodontium, revealed the following aspects:

- 83% of the restorations generated different types of periodontal diseases (from gingival inflammation to periodontal pockets);
- 22.28% showed absence of contact point;
- 18.28% had improper remodeling of proximal embrasures, gingival niches (extremely important elements for the protection of the marginal and profound periodontium);
- 15.42% had improperly remade proximal contours;
- 17.71% of obturations had unfinished and unpolished surfaces, thereby determining the accumulation of bacterial plaque and scale, with negative consequences on the marginal periodontium (from gingivitis to chronic marginal progressive periodontitis);
- the percentage of only 17.14% of apparently correct obturations is alarming, because at a microscopical analysis, any obturation presents marginal adaptation deficiencies and inadequately polished surfaces (porosities, irregularities).

The radiological examination of profound periodontium, affected by the analyzed proximal obturations, showed a percentage of 87.80% improper restorations that generated osseous lysis in 59.26% of cases.

These conclusions determine us to draw attention once more to the need of acknowledging the negative effects of dental restorations through obturations, upon the periodontium and of applying the specific preventive measures, aspects highlighted by the present study.

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