

# Changes in the periodontal condition after replacement of swaged crowns by metal

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## SUMMARY

Evidence based clinical studies have shown exact recommended design for artificial crown reconstruction with acceptable long-term results taking into an account the biological price.

Previous histological and clinical studies proved that fixed prostheses might influence the periodontal condition of crowned teeth, if not all biological criteria have been considered.

The aim of the present study was to assess the periodontal condition of the crowned teeth after stainless steel swaged crowns were replaced by cast metal ceramic crowns.

Participants were selected at the Institute of Stomatology, Stradin's University. Selection criteria included need to replace existing swaged crowns by metal ceramic crowns for patients with absence of any systemic disease.

Following symptoms of periodontal condition were examined – presence of inflammation (clinical signs, probing) and pocket depth. Assessments were carried out at four different points of time (first appointment after replacement existing swaged crowns by temporary crowns; two weeks after cementation of permanent metal ceramic restoration; after three month; after six month).

Overall bleeding score "2" and "3" at the first measurement was observed in majority of study population. Bleeding scores between the 1st and the 4th measurement was significantly lower ( $p < 0.01$ ). The same trend was observed also in the reduction of pocket depth. Overall mean value of pocket depth gradually decreased from the 1st till the 4th measurement.

Replacement of swaged crowns by metal ceramic improves gingival health and leads to better long-term prognosis for restored teeth. It is recommended that swaged crowns be replaced with more biologically friendly crowns.

**Key words:** swaged crowns, periodontal condition, gingival index, pocket depth.

## INTRODUCTION

Evidence based clinical studies have shown exact recommended design for artificial crown reconstruction with acceptable long-term results taking into an account the biological price [1-3].

Previous histological and clinical studies clearly proved that fixed prostheses might influence the periodontal condition of the crowned teeth, if not all biological criteria have been considered [4-8]. It was shown that crowns with subgingival margins exhibited more gingival inflammation provoked by increased accumulation of plaque when compared to control teeth [4-6]. It was also determined that significantly higher gingival indexes and sulcus depth were found in teeth with subgingival crown margins. Therefore, a margin placed into the zone of biological width (into connective tissue attachment violates important biological principles which may have adverse consequences for long-term gingival health [7,8].

The relationship between bacterial plaque accumula-

tion and gingival inflammation has been well documented since 1965 [9]. Patient's susceptibility to gingival inflammation is not based solely on the quantity of dental plaque, but also same contributing factors, for example, ill-fitting, overhanging stainless steel swaged crowns. Furthermore, it has been reported that alveolar bone loss may be associated with overhanging artificial crown margins [10].

The use of the stainless steel prefabricated swaged crowns to replace lost tooth substance was a common practice in Latvia. Since 2003 the accepted standard medical technologies in dentistry did not include use of swaged crowns [11]. However, the use of such restorations still remains high by the general dental population.

The aim of this prospective study was to assess the periodontal condition of teeth with swaged crowns and after replacement with cast metal ceramic crowns.

## MATERIAL AND METHODS

The participants were selected at the Institute of Stomatology, P.Stradin's University.

Selection criteria included the need to replace existing swaged crowns by metal ceramic crowns. Patients with systemic diseases were excluded.

The following signs of periodontal condition were examined – presence of inflammation (clinical signs, bleeding on probing) and pocket depth.

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**Table 1.** Distribution of bleeding scores after replacement of swaged crowns by cast crowns (n=36)

Bleeding	1 <sup>st</sup> measurement		2 <sup>nd</sup> measurement		3 <sup>rd</sup> measurement		4 <sup>th</sup> measurement	
	No	%	No	%	No	%	No	%
0	6	16.7	25	69.4	33	91.7	25	69.4
1	8	22.2	9	25	3	8.3	11	30.6
2	10	27.8	2	5.56	-	-	-	-
3	12	33.3	-	-	-	-	-	-

**Table 2.** Mean values of pocket depths (mm) after replacement of swaged crowns by cast crowns (n=36)

Measurement	Pocket depth (mm)	
	Mean	SD
1 <sup>st</sup> measurement	4.6	0.9
2 <sup>nd</sup> measurement	4.3	0.8
3 <sup>rd</sup> measurement	4.1	0.7
4 <sup>th</sup> measurement	4.0	0.7

Presence of inflammation in the marginal portion of the gingiva was recorded by means of probing assessment [12], according to the principles of the Gingival Index [13]. Entire absence of visual signs of inflammation in the gingival unit was scored as "0", while a slight change in colour and texture was scored as "1". Visual inflammation and bleeding tendency from the gingival margin right after a periodontal probe was briefly run along the gingival margin was scored as "2", while overt inflammation with tendency to spontaneous bleeding was scored as "3".

Probing pocket depth (PPD) was defined as the distance from the gingival margin to the location of the tip of a periodontal probe, inserted in the pocket with moderate probing force. The pocket depth was assessed at each surface of the tooth. Pocket depth values of <4 mm was regarded as falling within normal variations.

Assessments were carried out at 4 different points of time:

- 1) one week after replacement existing swaged crowns by temporary crowns;
- 2) two weeks after cementation of permanent metal ceramic restoration;
- 3) after three month control period;
- 4) after six month control period.

#### Statistical analysis

Since teeth are not independent units, the mouth was used for analyses as a basic independent unit, which represents changes in periodontal conditions during and after replacement of swaged crowns by cast metal ceramic crowns.

Differences between mean values of pocket depth at the first and subsequent measurements were tested by means of paired t-test. Differences between proportion of individuals with certain gingival bleeding index at the first and subsequent measurements were tested using McNemar test.

## RESULTS

Thirty-six individuals (39% males and 61% females) participated in this study.

At the 1<sup>st</sup> measurement the overall bleeding score of "2" and "3" (tendency to spontaneous bleeding) was observed in the majority of the study population. Decrease in bleeding score was observed after the 2<sup>nd</sup> measurement and this trend continued up to the last measurement (Table 1). The bleeding scores between the 1<sup>st</sup> and the 4<sup>th</sup> measurement decreased significantly ( $p < 0.01$ ). There were no indi-

viduals present with bleeding score "2" and "3" at the 4<sup>th</sup> measurement. However, at the 4<sup>th</sup> measurement the proportion of individuals with bleeding score of "1" was significantly higher when comparing to the 3<sup>rd</sup> measurement ( $p < 0.1$ ). No statistically significant difference of bleeding score was observed among males and females.

The same trend was observed also in the reduction of the pocket depth. The overall mean value of pocket depth gradually decreased from the 1<sup>st</sup> till the 4<sup>th</sup> measurement (Table 2).

Despite moderate changes of the mean value, range of pocket depth changed from 3-7mm at the 1<sup>st</sup> visit to 3-5mm at the 4<sup>th</sup> measurement.

There was difference in the mean value of pocket depth among males and females at the 4<sup>th</sup> measurement, respectively 3.8mm and 4.1mm ( $p < 0.1$ ), but the trend of reduction was observed in each gender.

## DISCUSSION

The most important factor controlling the effects of restorations on gingival health is the location of the crown margin relative to the gingival margin [14,15]. However, overhangs are inevitable with swaged crowns and are a main biological reason to replace them by metal ceramic crowns with precise margins. A number of studies have shown that overhanging and subgingival margins impinge on the gingival and periodontal tissues, increasing plaque accumulation [14-21], and therefore, are may be considered as risk factors in the development of periodontal pathology [22-24].

In the study the timing of the first periodontal assessment was dilate one week following of the swaged crown removal and replacement by precise provisional restorations, because of the severe reactions of the tissues: swelling and extensive bleeding. This was do to the deep subgingival placement of the swaged crowns margins.

It has been reported, that differences in forces applied during probing can differ between persons performing measurement, which potentially can cause bias [12,25-27]. To further improve accuracy of the periodontal measurements, one person carried out all probing depth (A. P-B).

Bleeding on probing to the base of the periodontal pocket is a reliable method of assessing the presence of subgingival inflammation [25,28]. Sites with bleeding have an increased risk for further attachment loss [29,30]. In this study there was significant reduction of bleeding on probing from the first to the last visit. Slight increase of bleeding score of "1" between the third and the fourth measurement can be explained by reduced oral hygiene maintenance within same individuals during six month control period.

The value recorded in a periodontal examination using a periodontal probe have generally been assumed to represent a fairly accurate estimate of the pocket depth or attachment level for a given site, but many studies have shown that it may not be so [31-33]. Factors such as timing of the probing,

probing pressure, diameter of the probe, health of the tissues and position of the probe among other things will influence the precision of the data acquired by this method [34]. In spite of the pitfalls of probing this diagnostic method is still a gold standard in measurement in changes of the periodontal tissues. Periodontal probing was used as a descriptive data to provide information of the changes of periodontal tissues and not as demonstration of the disease activity. Reduction of pocket depth as assessed by periodontal probing following removal of the irritation, are not necessarily signs of formation of a new connective tissue attachment, but may merely represent a resolution of the inflammatory process without an accompanying attachment gain [12]. Therefore, resolution of the inflammation and healing of gingival margin could explain the reduction of pocket depth in this study.

A central hypothesis in periodontal research and dental care delivery has been that plaque causes periodontitis and that personal plaque control is essential in controlling chronic periodontitis. Unfortunately, there is not still enough evidence to support this leading role [35] and to exclude importance of local contributing factors.

Overhanging restorations such as crown margins have been shown to result in loss of alveolar bone support and development in periodontal pockets [20,26,36]. Furthermore, such sites are more susceptible to irritation from plaque. In this study it was shown that subgingival margins from swaged crowns caused gingival hyperplasia, oedema and bleeding on probing. These pathological features were significantly reduced when swaged crowns were removed and replaced with crowns with precise margins.

## CONCLUSION

Swaged crowns with subgingival margins cause gingival inflammation.

Removal of swaged crowns and replacement with crowns with precise margins reduces bleeding (Gingival Index) and pocket depth around crowned teeth, and improves gingival health.

It is recommended that swaged crowns not to be used as permanent restoration.

Swaged crowns with subgingival margins should be replaced with more biologically friendly constructions.

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Received: 11 12 2005  
Accepted for publishing: 25 09 2006