

## Effect of Shoulder and Deep Chamfer Finish Lines on Marginal Fitness of Electroformed P.F.M. Restorations

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### Abstract

**Objective:** Comparison of the effect of shoulder with deep chamfer finish lines in P.F.M restorations using electroforming.

**Method:** This experimental study was performed on 20 samples that were randomly selected. Two cutting designs shoulder and deep chamfer were created on dies via a standard turning machine. The diameter rim was 8mm and the height was 6 mm and the depth of cutting edge in cervical area, was 1mm. Impressions were made from dies and 10 acetone dies were prepared for each group. Silver was used on the dies to the finish line and a copper wire was connected to the die by making a foramen 1 mm away from finish line. The collection of die and wire were attached to the head of electroforming machine and gold coping was created with electroforming. The gap between the die and the crown was measured by electron microscope; data was recorded and evaluated by the t-test.

**Results:** According to statistical data, the average gap in shoulder lathe was 24.42 microns and in deep chamfer was 20.66 microns.

**Conclusions:** The deep chamfer design in electroforming method had a better marginal fitness in comparison to the shoulder design.

**Keywords:** Shoulder; Deep chamfer; Marginal fitness; Electroforming; Standard die

### Introduction

Improper marginal adaptation between tooth and crown or in other words if there is a large gap between the tooth and crown finish line (FL), dental cements will dissolve and the tooth will be exposed to the oral environment [1]; flow of saliva under the crown will cause decay. On the other hand poor marginal adaptation causes plaque, gingivitis and gingival margin discoloration and in advanced cases increases pocket depth and losses attached gingival [2].

Electroforming may be used with any kind of FL for marginal adaptation in metal ceramic restorations; it was first introduced by Armstrong in 1961 [3,4].

In one study, the effect of FL in marginal adaptation of metal ceramic restorations with electroforming was evaluated and concluded that there were certain differences in marginal electroformed metal copings. Another study showed that FL had no obvious effect on marginal adaptation [4]. Considering the apparent contradictions between studies, this study was done to evaluate the effects of two cutting designs, the shoulder and deep chamfer on marginal fitness.

### Materials and Methods

This experimental study was performed on 20 samples in which two cutting designs, the shoulder and deep chamfer were evaluated as invitro with electroforming method. It was used from standard brass dies that had 8mm diameter and 6 mm height (Figure 1-6).

The depth of cutting in the cervical area was 1mm; half of these dies had shoulder design and half of them had deep chamfer design. The sampling was random and all confounding factors were removed. Cutting was created with a lathe machine from under the FL area on plaster mounted die; then the gap was assessed from 40 points in 4 areas.

### Results

This research was evaluated by one sample Kolmogrov Smirnov test in both groups. the average and maximum gap from normal distribution was confirmed ( $P < 0.05$ ); comparison between averages of



Figure 1: Standard brass die.

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Figure 2: Gold coping on the duplicated plaster die.



Figure 3: Gold coping made using electroforming.



Figure 4: Plaster die mounted in brilliant acrylic and it is cutting below finish line.

gap in 40 points and maximums of gap in 40 points in 2 types of cutting design was done, t-test was used for data with supposition of unequal variances and considering first statistics error (Table 1) (Chart 1-2).

### Discussion

This study showed that the average gap in the deep chamfer cutting plane compared with shoulder design via electroforming method is very low and is ideal in clinical conditions. Results of this study is similar to a research in 2006 by Such in who concluded that marginal adaptation of metal coping produced by electroforming is better than cast porcelain [5]. In another study in 2003, Zasschi conducted to review adaptation of metal- ceramic restorations showed that coated metal-

ceramic produced using electroforming had better adaptation than conventional metal- ceramic restorations similar to our recent results [6]. Shillingberg stated that by adding a bevel to existing shoulder can create better marginal fitness than shoulder FL alone (similar to our research) [7].

However, in another study in 1382 Jannati compared shoulder FL with bevel FL and sloping shoulder FL on cast coated marginal fitness and concluded that the marginal fit is similar in both groups but sloping shoulder FL is more suitable for anterior teeth because of its biological advantages and esthetics.

Group	Number	Mean	Standard deviation	Error mean
Average gap Shoulder	10	24.4244	3.62926	1.14767
Deep chamfer	10	20.6639	1.49505	0.47278
Max average gap Shoulder	10	30.4100	4.13022	1.30609
Deep chamfer	10	24.5600	1.40174	0.44327

Table 1: Mean and standard deviation of gap with separating of Shoulder and Deep chamfer groups.

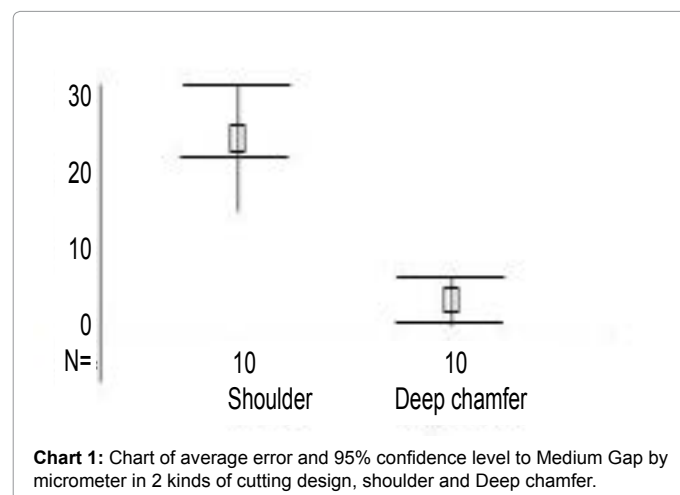


Chart 1: Chart of average error and 95% confidence level to Medium Gap by micrometer in 2 kinds of cutting design, shoulder and Deep chamfer.

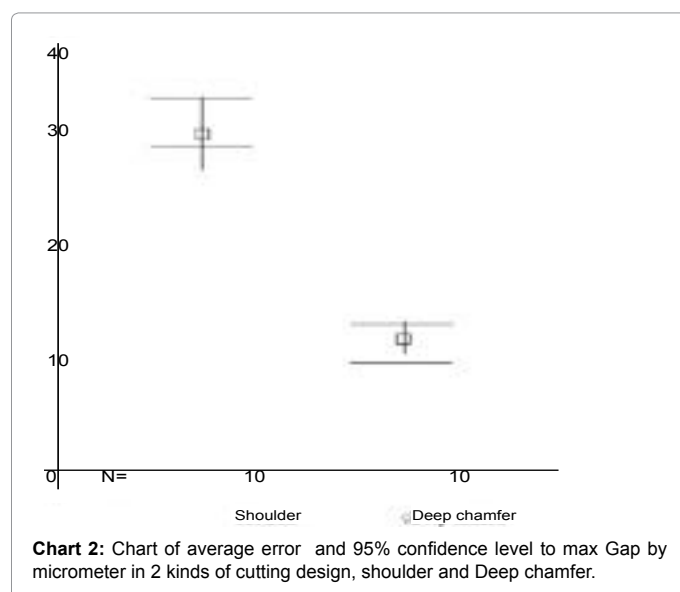


Chart 2: Chart of average error and 95% confidence level to max Gap by micrometer in 2 kinds of cutting design, shoulder and Deep chamfer.



Figure 5: Electronic microscope pictures from the gap between die and electroforming restoration in shoulder type FL.

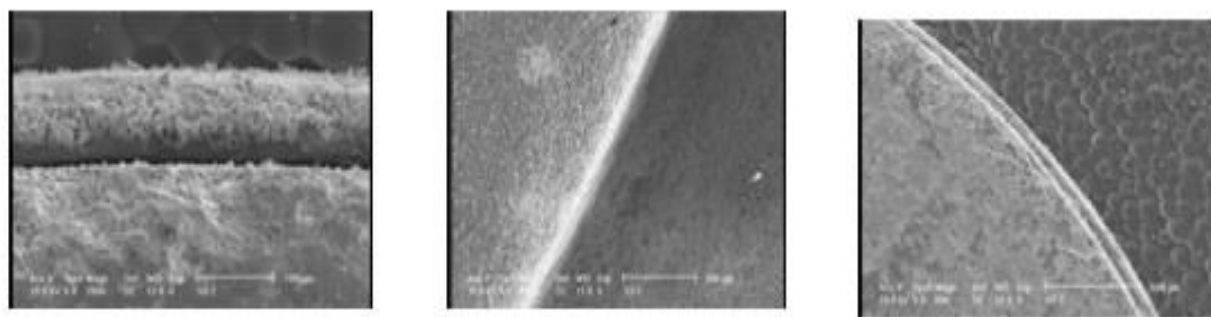


Figure 6: Electronic microscope pictures from the gap between die and electroforming restoration in deep chamfer FL.

## Conclusion

From the view of marginal fitness, in metal- ceramic restorations, deep chamfer design had significantly less gap than shoulder design and results showed that the gap in deep chamfer design in metal-ceramic restorations using the electroforming method is very low. Thus, use of the deep chamfer design and electroforming for metal ceramic restorations from the point of marginal fitness is one of the most important factors for long- term success of restorations.

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