# EFFECT OF TWO STEP RINGLESS INVESTMENT ON THE SURFACE ROUGHNESS AND MARGINAL FITNESS OF NICKEL-CHROMIUM COPING.

# تاثير كسوة الدرجتين الغيرحلقى على نعومة السطح و الانطباق الحافى لغطاء النيكل كروم

THESIS
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# INTRODUCTION

The marginal sharpness of a cast restoration is greatly affected by different casting methods. The more fit is the casting, the less likelihood of leakage and secondary caries. Marginal adaptation is considered to be a primary and significant factor in the prevention of secondary caries and tissue biocompatibility, also it is an important indicator of the overall acceptability of the cast restoration. Many methods and techniques could affect and improve the overall acceptability of the cast restoration.

Surface roughness exists in all cast surfaces, instead of being confined to certain areas. The significance of these surface irregularities lies in the fact that their height governs the relative roughness or smoothness of the surface. Proper fit of the crown is affected by surface roughness on the inner surface. The shallower the surface roughness the more accurate will be the fit of a restoration of correct size.

All these factors were affected through manipulation of the casting ring. Accuracy of the casting ring was not considered the main factor that affected the surface roughness and marginal

fitness. So the aim of this study was to evaluate the hidden factors that affected the surface roughness and the marginal fitness as the pressure application, type of mix and the presence of a casting ring.

# REVIEW OF LITERATURE

***Effect of ring casting, type of investment and type of metal used on marginal fitness.***

**Barreto et al** [2] in 1980, studied three commercially available phosphate-bonded investments (Cerami-gold, cerami-gold II &Complete) and their influence on the quality and completeness of casting made from a high fusing precious metal and three base metal alloys (SMG II, Biobond CB,Wiron S & Jelbon II).Castings were evaluated for porosity and surface roughness. It was found that there is definite interaction in castability between the three different phosphate-bonded investments and the four different alloys tested in this study.

**Duncan** [11] in 1980, designed an experiment to test the casting accuracy of 4 nickel-chromium alloys (Ultratek, Omega, Microbond N/P² and Nobil-ceram) compared to a precious alloy (Jelenko "O"). A chromium-Cobalt replica was used as a test model. The discrepancy of fit was measured and all of the castings exhibited marginal discrepancies. The casting accuracy of the nickel-chromium alloys was less than the precious alloy.

**Saas and Eames** (52) in 1980, compared the seating ability of three-unit bridge and four types of casting rings (3 round rings in different sizes and an oval ring). The larger oval and round rings produced fixed partial dentures with better seating ability than the smaller round casting rings when phosphate-bonded investment and type III gold were used. The seating of the fixed partial denture was affected by the casting ring size but not shape.

**Finger et al** (19) in 1980, presented a gypsum-bonded investment with negligible setting expansion and thermal expansion of 1.7%. This investment can and should be used without a steel casting ring. In combination with die-spacing technique the new investment facilitates the production of gold inlays and crowns with a suitable degree of fit on the preparations in the patient's mouth.

**Arikawa et al** (1) in 1981, made experimental cast crowns under various casting conditions and measured their dimensional change and inner cervical margin and ring volume change compared with wax patterns. It was concluded that with ringless

casting method, the cast crown gave best fit of metal die & distortion was very small. (Abstract) [Article in Japanese].

**Finger et al** [18] in 1982, stated that an improvement of the conventional casting technique by introduction of a new concept in the dental precision is highly desirable. The main steps in this concept are: (1) The application of a die spacer with known and uniform thickness of the surface and master die. (2) The use of an investment compound with negligible setting expansion but significantly unrestricted thermal expansion to compensate for the solid thermal shrinkage of the casting alloy. And (3) Omission of the steel casting ring (ringless technique). The purpose of this study was to develop a refractory investment compound with negligible setting expansion and sufficient unrestricted thermal expansion and applicable in the casting of both traditional gold alloys and gold alloys for porcelain veneering.

Setting expansion in air and water was measured on specimens cast in paper cylinders using a dial gauge method. The surface roughness was measured with an electronic surface analyzer (Perthometer C5D, Dr Perthen, Germany).

The results showed that it is possible to produce a high-temperature casting investment. The setting expansion is negligible

and the thermal expansion required to compensate for the solid thermal shrinkage of dental gold alloys could be obtained by using glycerol as an additive. Since the experimental product proved crack-resistant during preheating and casting on the condition a sufficiently extended wax elimination time at 200°C, the employment of a steel casting ring is unnecessary when large sprue diameters (3mm) were omitted and the standardized peridental casting was satisfactory. The application of a die spacer with a uniform thickness of about 30 um on the master model is a basic requirement in the new concept of the indirect technique. Accordingly, castings showing slide-fit on the master model will exhibit loose-fit in or on the preparation in the patient's mouth.

**Lacy et al** (34) in 1983, studied the related effects of (1)mixing rate, (2) ring liner position, and (3) storage conditions on the setting expansion of both gypsum-bonded and phosphate-bonded investment molds; and subsequently to correlate casting size with measured expansion data. Measurements of the gingival diameter and occlusogingival length of each wax pattern and casting were made using a comparator microscope. The phosphate-bonded investment showed greater overall setting expansion than the gypsum-bonded investment for the same ring/ liner/ mix mode