

UNIVERSITI TEKNOLOGI MARA

**A RANDOMISED CONTROLLED TRIAL
COMPARING CLINICAL PERFORMANCE
AND SURVIVAL OF ARTISANAL
VERSUS COMPUTER ASSISTED DESIGN-
COMPUTER ASSISTED MANUFACTURED
ZIRCONIUM SILICATE FILLED
COMPOSITE ENDOCROWNS.**

NOOR AAINA BINTI ZAINON

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ABSTRACT

Introduction: Endocrown has been proven as an advantageous option for rehabilitation of endodontically treated molar tooth with extensive cuspal loss mostly using ceramic based materials. A double-blinded (patients and examiners) and equally randomized parallel groups, non-inferiority trial was carried out to assess the clinical performance and survival of artisanal versus computer assisted design-computer assisted manufactured (CAD-CAM) zirconium silicate filled-composite endocrowns after 18 months. **Methodology:** 28 patients (mean age: 42.14 years old) randomly received endocrowns constructed by a single operator from two commercially available zirconium silicate filled-composite material (Artisanal: CERAMAGE Shofu (n=14) and CAD-CAM: SHOFU Block HC (n=14)) according to the inclusion and exclusion criteria. The endocrown restorations were evaluated by three calibrated examiners at 1-week post-insertion (baseline), 1, 6, 12 and 18 months using the modified USPHS criteria. The primary outcomes are success and survival; the secondary outcomes are prognostic factors and complications. Survival of the endocrowns was analysed using Kaplan-Meier survival curves, the log-rank test, and the Cox proportional hazards regression analysis. **Results:** Survival rates of artisanal and CAD-CAM zirconium silicate filled composite endocrowns were 85.7% (95% CI: 53.9, 96.2, $P>0.05$) and 72.5% (95% CI: 33.7, 90.9 $P>0.05$) while the success rates were 61.2% (95% CI: 24.6, 84.2, $P>0.05$) and 72.5% (95% CI: 33.7, 90.9, $P>0.05$) respectively. The Fisher's exact test showed no significant difference between the clinical performance of artisanal and CAD-CAM zirconium silicate endocrowns during the short-term evaluation period ($P>0.05$). Prognostic factors such as patient demographics (age, gender and ethnicity) and clinical factors (arch of prosthesis, depth of pulp chamber, crown lengthening procedure and methods of endocrown fabrication) were not significantly associated with the clinical performance of both artisanal and CAD-CAM zirconium silicate endocrowns ($P>0.05$). Seven endocrowns failure were observed in the form of technical and biological complications such as mild chipping (n =1), debonding (n = 1), bulk fracture or severe chipping (n = 4) and endodontic complication (n =1) following 6-months evaluation period. No abutment or root fractures was seen during the observation period. **Conclusion:** Although, zirconium silicate filled composite endocrowns appear to be a convenient and safe technique to restore the extensively damaged endodontically treated molar teeth, their selection should be based on proper case selection and informed consent from the patient due to the low success and survival rate based on short-term observation.

Keywords: Endodontically treated tooth, Zirconium silicate filled composite endocrowns, CAD-CAM fabrication, Clinical performance, Survival.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

Over the years, great emphasis has been placed on the restorative aspect following the endodontic treatment of teeth. This comes about following a series of microleakage and radiographic studies that dramatically unfolded how coronal seal significantly contributed to the clinical success of an endodontic treated tooth in addition and in fact more than apical seal to prevent bacterial ingress (Barrieshi, Walton, Johnson, & Drake, 1997; Ray & Trope, 1995; Saunders & Saunders, 1994). The sooner the better is advocated when it comes to a definitive restoration to prevent microleakage and periapical recontamination (Safavi, Dowden, & Langeland, 1987). Restorative procedures must take into consideration tissue bio-conservation and reinforcement using adhesive materials and when possible with biomimetic properties (Didier Dietschi, Duc, Krejci, & Sadan, 2007).

The endodontically treated tooth (ETT) presents as an extreme environment for any adhesive restorative material that may test their performance due to the altered physical-mechanical properties of dentin that may interfere with bonding (Pashley, 2001). Alteration in dentin's collagen from irrigants, medicaments and heat during endodontic procedures has been associated with a decrease in flexural strength of dentin and a reduction in the bulk of dentin for the access preparation in itself that may predispose the ETT to fracture (Kishen, 2006).

The endocrown is an alternative restoration for the ETT that was pioneered by Pissis in 1995 as a monoblock restoration consisting of a porcelain crown-core. The aimed of this novel prosthesis was the elimination of a metal post to improve light transmission and thus the final aesthetics of the rehabilitated tooth (Pissis, 1995).

Mormon and Bindle expanded on this concept by employing the prosthesis for the restoration of severely destroyed posterior teeth with minimal coronal tooth structure. These teeth were taken down and prepared with circular equigingival butt margin and following that they were adhesively restored with Computer Assisted Design-Computer Assisted Manufacturing (CAD-CAM) generated ceramic restoration that extended from the crown into the pulp chamber.