



بسم الله الرحمن الرحيم

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Accuracy of Computer-Aided Full Tray vs Computer-Aided Sectional Tray in Indirect Bonding of Orthodontic Brackets; A Randomized Clinical Trial

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Dedication

*Dedicating my work to my beloved **parents***

*For their continuous encouragement
and endless support*

&

*My little **Son***

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List of Abbreviations

Abb.	Full term
<i>3D</i>	<i>Three-dimensional</i>
<i>ABD</i>	<i>Aptus Bonding Device</i>
<i>BL</i>	<i>Buccolingual</i>
<i>CAD/CAM</i>	<i>Computer-aided designing and manufacturing</i>
<i>DLP</i>	<i>Digital light processing</i>
<i>FA</i>	<i>Facial axis</i>
<i>FDM</i>	<i>Fused Deposition Modeling</i>
<i>IBT</i>	<i>Indirect Bonding tray</i>
<i>IDB</i>	<i>Indirect bonding</i>
<i>IOS</i>	<i>Intraoral scanners</i>
<i>LACC</i>	<i>Long axis of the center of the clinical crowns</i>
<i>MD</i>	<i>Mesiodistal</i>
<i>MIP</i>	<i>Moisture insensitive primer</i>
<i>MIT</i>	<i>Massachusetts Institute of Technology</i>
<i>OG</i>	<i>Occlusogingival</i>
<i>SLA</i>	<i>Stereo lithography</i>
<i>SLS</i>	<i>Selective Laser Sintering</i>
<i>STL</i>	<i>Standard triangle language</i>
<i>SWA</i>	<i>Straight-wire appliance</i>
<i>TIJ</i>	<i>Thermal inkjet</i>
<i>UV</i>	<i>Ultraviolet</i>
<i>VOT</i>	<i>Virtual orthodontic treatment</i>

Introduction

There has been tremendous progress in orthodontics since **Edward Angle** first popularized the fixed orthodontic appliance at the turn of the century. Recent years have seen an increased demand for orthodontic treatment from both adolescents and adults and, in addition, patient and clinician expectations of treatment outcomes continue to rise.

The last few years have seen many advances in orthodontics in the fields of materials as well as in techniques and appliance systems.

Orthodontists have been always searching for new methods simplifying their maneuver and providing comfort for the patient. Proper bracket placement is necessary to achieve maximum advantages from fixed orthodontic appliances. This will also facilitates the final treatment phases and leads to an optimal occlusion.

In 1970s, **Silverman** ¹ first proposed indirect bonding concept in which brackets were first positioned on dental model with cement, then transferred to the patient`s teeth by transfer tray. However, this procedure was complicated and limited by the materials as well as laboratory process.

Today, accuracy requirements of bracket positions are becoming more challenging and indirect bonding is gaining more popularity than before by solving the visibility issues, reducing chair time and improving patient comfort.²

The bracket transfer step is important to obtain high accuracy in indirect bonding and affected by orthodontist skills, tray material properties and different technical and laboratory processes.

As technology advances, a series of digitalized indirect bonding systems^{3,4} appeared allowing orthodontists to simulate the process of aligning the teeth, positioning brackets, designing and printing 3D customized trays.^{5,6}

There has been little academic research on the accuracy of this technology.

In this study, the indirect bonding procedure was digitalized by 3Shape system and the accuracy of computer aided trays was investigated.

Review of Literature

The evolution of straight wire appliance and the emerging need of indirect bonding techniques, and the recent use of digital world in orthodontics as well as the use of computer aided indirect bonding and the accuracy of desktop and intraoral scanners will be highlighted. The review was divided into the following subtitles for the purpose of organization and simplification.

I- Straight wire appliance

A- History.

B- Ideal orthodontic bracket position.

II- Indirect Bonding

A- Conventional indirect bonding.

- 1- Evolution, methods and techniques.
- 2- Accuracy and reliability.
- 3- Advantages over direct bonding.

B- Computer-Aided indirect bonding.

1. Evolution and techniques.
2. Accuracy and reliability