International Journal Dental and Medical Sciences Research
Volume 4, Issue 6, Nov-Dec 2022 pp 814-818 www.ijdmsrjournal.com ISSN: 2582-6018

Comparative Evaluation Of Canal Centric Ability Between Waveone Gold And Onecurve Using Cone Beam Computed Tomography:An In Vitro Study ”

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Submitted: 16-12-2022 Accepted: 28-12-2022

ABSTRACT
Introduction: The purpose of this study was to evaluate and compare the centering ability of WAVEONE GOLD AND ONECURVE using conebeam computed tomography (CBCT) imaging.
Materials and methods
40 freshly extracted human mandibular molars were taken. Only mesio-buccal canals with curvatures of 25 degree to 35 degree were included in the study, distal roots were sectioned at the furcation level. The teeth were randomly assigned into two groups. The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS software version 20.0 (SPSS Inc. Chicago, Illinois, USA). A P-value of less than 0.05 was considered statistically significant.
Conclusions:Wave One Gold system showed less canal transportation and better centering ability than One curve.

Key Words
Centering ratio, cone-beam computed tomography wave one gold,one curve transportation

I. INTRODUCTION

Canal curvature is considered to be the major risk factor for instrument separation that resulted from flexural stresses (1, 2). Instrumentation technique has an important role in avoiding torsional stress that can increase considerably because of exaggerated pressure on the handpiece (3), a wide area of contact between the cutting edge of the instrument and the canal walls (4, 5), or the cross section of the canal is smaller than the size of the nonactive or noncutting tip of the instrument (4, 5). The latter case might result in a taper lock that can be reduced by achieving coronal enlargement and by creating a glide path for instrumentation with nickel-titanium (NiTi) instruments (6, 7). Hence, the diameter of the root canal should be greater or at least the same size as that of the tip of the first rotary instrument used (8)They are manufactured by using M-Wire NiTi to enhance its flexibility and enhance the cyclic fatigue resistance of the files (10).The elimination of residual pulp tissue, the removal of debris, and the maintenance of the original canal curvature during enlargement are the primary objectives of root canal instrumentation. The amount of dentin being removed during instrumentation is an important parameter to avoid procedural mishaps such as strip perforations. Currently, experimental results have shown that Ni-Ti rotary systems cause less canal transportation and produce a more centered and tapered preparation(9)Various methods have been used to evaluate instrumentation of different NiTi rotary systems, including histologic sections, plastic models, serial sectioning, scanning electron microscopy, radiographic comparisons, silicone impressions of instrumented canals, and micro–computed tomography (6, 11–13)Computed tomography was initially used in endodontics to confirm the diagnosis of root fractures, to analyze root canal walls and pulp chamber anatomy. More recently, this method has been used to evaluate root canal preparations [14]Furthermore, the quality of the 3-dimensional images acquired by this method is superior to other techniques, which improves its use for geometric analysis of root canal area (13, 14, 16–18) Advanced instrument designs including noncutting tips, radial lands, different cross sections, and varying tapers have been developed to improve working safety, to shorten working time and create a greater flare of preparations.

The aim of root canal shaping is to form a continuously tapered conical shape while maintaining original canal anatomy and retaining as much as healthy tissue as possible(15) The aim of the present study was to compare the canal centric

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ability with single file systems, OneCurve and WaveOneGold using CBCT

Materials and Methods

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Armamentarium

- Air rotor
- #010 round diamond point
- Safe end tapered diamond point
- Endodontic Explorer
- #10, #15 stainless steel K type hand files
- Endomotor (Xsmart plus) (DentsplyMaillefer)
- Single file systems

OneCurve(Micro-Mega,Besanc, Cedex, France)

WaveOneGold(Dentsply Tulsa Dental Specialties, Tulsa, OK)

- 2cc syringe
- 30 guage irrigation needle
- Ultrasonic cleaner
- X ray machine and sensor (shick,us)
- RVG software (shick ,US)
- AutoCAD software (Autodesk, Inc, San Rafael, California)
- CBCT imaging apparatus

WaveOne Gold which is Engineered with the latest reciprocating technology

The kinematics of this system is unchanged, but the **section, size and geometry of the files** have been modified to make the files more flexible. Additionally, the metallurgy of the files was changed from M-wire to a **gold alloy**, which provides greater flexibility than NiTi and M-wire files **7% taper at** D0-D3

One CURVE is C.wire Heat-treated of Nickel-Titanium, a One Curve exclusivity

Having Controlled memorywith Pre-bendable with size 25 file with taper 6%

II. METHODOLOGY

Samples were decoronized by maintaining root length at 14 mm .Preinstrumentation CBCT scan was done after stablizing the samples on wax blocks which inturn was placed on a customized jig acting as a chin rest on the CBCT machine,Samples were decoronized by maintaining root length at 14 mm

A standardised procedure was used to prepare endodontic access in all the teeth using an air rotor hand piece

The canal orifices were located with the help of an Endodontic Explorer and the canals were irrigated with 5% NaOCl and negotiated using a size 10 K-file.

The working length was recorded as 1 mm less when the file tip emerges from the apical foramen.

Root canal preparation was done in crown-down manner using Endomotor (Xsmartplus; Dentsply Maillefer) following manufactureres recommendations for speed and torque setting for both file system.

Copious irrigation 5% NaOCl solution was used throughout the preparation and patency maintained in all the canals by recapitulation using a K-file size #10.After preparation of all the teeth, post-instrumentation CBCT was taken.

Image Analysis:

DICOM images were transferred to NNT software for 3D image analysis.

Pre and post image analysis was made using following CBCT parameters –

❑ Centering ability:

centering ability of the instruments was evaluated by the technique developed by Gambill et.al

Mesio-distal plane $\frac{m1-m2}{d1-d2}$ and

inbucco-lingual plane $\frac{b1-b2}{l1-l2}$.

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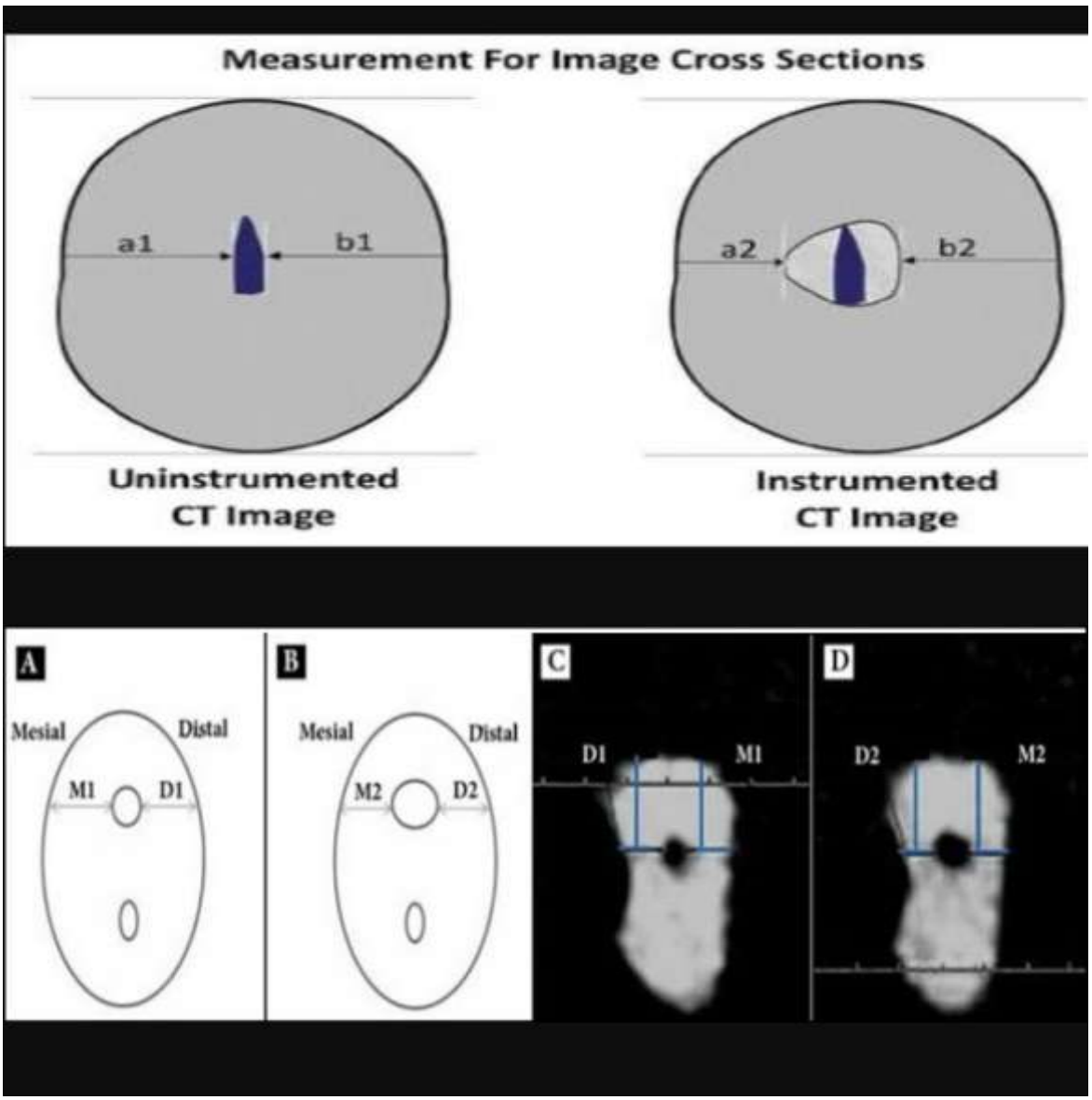

- Measured at three levels(from the inner wall to outer)
- Level 1; 3 mm from apex
- Level 2; 5 mm from apex
- Level 3; 7 mm from apex

III. STATISTICAL ANALYSIS

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS software version 20.0 (SPSS Inc. Chicago, Illinois, USA).

Analysis of variance (ANOVA) with post-hoc tests was employed for inter group comparison with respect to canal transportation and centring ability at different levels of root canal.

Distribution of mean and SD values of centric ratio and transportation at various levels

level	assesment	One curve	Wave one gold	P-value
3mm	Transportation centering ratio	0.04 ± 0.13 0.04100 ± 0.03252	0.014 ± 0.087 0.05750 ± 0.03252	.049

5mm	Transportation centering ratio	0.105 ± 0.27 0.05320 ± 0.3596	0.056 ± 0.096 0.1278 ± 0.04	.041
7mm	Transportation centering ratio	0.18 ± 0.24 0.10651 ±0.062	0.012 ± 0.045 0.12780 ± 0.04164	.17

⊡ A P-value of less than 0.05 was considered statistically significant.

IV. DISCUSSION

- The importance of preserving the natural root canal anatomy after its instrumentation has been discussed and researched upon. Professionals need to balance well between the concepts of controlled instrumentation and removal of contaminated dentin Variousthermomechanic procedures and improvement of compositioon of the alloy that is used in manufacturing niti files are aimed to improve the flexibility of niti files.Improved flexibility of niti files would minimize the intracanal transportation and would ensure an increase in the success of root canal therapy.
- This study evaluates the centering ability of two different file systems, which are One curve and Wave One gold system. The results obtained suggested that both the two systems used in centering ability showed significant variations.
- It has been highlighted from various literatures that the canal centering ability is better within Ni-Ti instruments, instruments with less crosssectional area anWaveone Gold removed less dentine than onecurve.Overall in all the three sections, Wave One Gold system showed better centering ability than One curve.d instruments with non-cutting tips.

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