ISSN: 2320-5407

International Journal of Advanced Research

Publisher's Name: Jana Publication and Research LLP

www.journalijar.com

REVIEWER'S REPORT

Manuscript No.: IJAR-52976 Date: 25/07/2025

Title: "COMPARATIVE EVALUATION OF FRACTURE RESISTANCE OF MANDIBULAR BICUSPIDS INSTRUMENTED WITH HAND FILES, TRUNATOMY, ROTARY FILE AND RECIPROCATING FILE SYSTEM: AN IN VITRO STUDY"

Recommendation:

Accept as it is .....

Accept after minor revision.....Yes.....

Accept after major revision .....

Do not accept (*Reasons below*) .....

Rating	Excel.	Good	Fair	Poor
Originality	•			
Techn. Quality		•		
Clarity	•			
Significance		•		

Reviewer Name: Dr. Sireesha Kuruganti **Date:** 25/07/2025

Reviewer's Comment for Publication.

(*To be published with the manuscript in the journal*)

The reviewer is requested to provide a brief comment (3-4 lines) highlighting the significance, strengths, or key insights of the manuscript. This comment will be Displayed in the journal publication alongside with the reviewers name.

The manuscript presents an in vitro study comparing the fracture resistance of mandibular bicuspids after instrumentation with various endodontic file systems. The topic is relevant to endodontics, as maintaining tooth integrity post-treatment is crucial. The study design appears sound, and the methodology is generally well-described.

Detailed Reviewer's Report

This in-depth review analyzes the provided manuscript, referencing specific line numbers for clarity.
Detailed In-Depth Review of Manuscript "COMPARATIVE EVALUATION OF FRACTURE RESISTANCE OF MANDIBULAR BICUSPIDS INSTRUMENTED WITH HAND FILES, TRUNATOMY, ROTARY FILE AND RECIPROCATING FILE SYSTEM: AN IN VITRO STUDY"
Overall Assessment:
The manuscript presents an in vitro study comparing the fracture resistance of mandibular bicuspids after instrumentation with various endodontic file systems. The topic is relevant to endodontics, as maintaining tooth integrity post-treatment is crucial. The study design appears sound, and the methodology is generally well-described. However, there are areas where clarity, detail, and scientific rigor could be improved, particularly in the introduction, discussion, and consistency of claims.
Specific Comments by Section:

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

1. Title (Lines 1-7):
* The title is clear and accurately reflects the study's content.
2. Abstract (Lines 8-33):
* Introduction (Lines 10-16):
  * Line 12 states the primary goal of endodontic therapy is to "eliminate the infected dental tissue and disinfect the entire root canal using various instruments and material". This is a good concise statement.
  * Line 13 mentions NiTi instruments enabled "better canal shaping" due to flexibility. This is a valid point.
  * Lines 14-16 discuss that motorized endodontic files can weaken dentin and reduce fracture resistance. This sets the stage for the study's objective.
  * Line 15 mentions the evolution of instruments to greater tapers (4%-9% taper). This is an important detail.
* Objective (Line 17): Clearly states the objective: "To comparatively evaluate the fracture resistance of mandibular bicuspids instrumented with hand files, trunatomy, rotary and reciprocating file system- an in vitro study".
* Method (Lines 18-26):
  * Sample size and type are mentioned (50 single-rooted extracted human permanent premolars). This is appropriate.
  * Sample preparation (decoronation to 14mm root length) is outlined.
  * Grouping into 5 groups is stated. The specific file systems used for each group are listed: Group 1 (Hand file), Group 2 (Trunatomy file), Group 3 (Protaper universal), Group 4 (Endostare3), and Group 5 (Waveonegold file system).
  * Obturation method (lateral compaction with AH plus sealer) is noted.
  * Fracture resistance evaluation method (compressive loading using a universal testing machine) and statistical analysis (one way ANOVA and Tukey HSD test) are mentioned. This is comprehensive for an abstract.
* Results (Lines 27-28): States the highest mean compressive strength was in Group 2 (Trunatomy), followed by Group 1 (Hand file), Group 5 (Waveonegold), Group 4 (Endostare3), and Group 3 (Protaper universal). This provides a clear hierarchy of results.
* Conclusion (Lines 30-31): The conclusion directly supports the objective and results, stating Trunatomy files showed the highest fracture resistance and that lesser tapered instruments improve fracture resistance.
* Keywords (Lines 32-33): Relevant keywords are provided.
3. Introduction (Lines 34-45):
* Lines 36-37 reiterate the goals of endodontic therapy.
* Lines 38-39 discuss the evolution of instruments from 2% taper manual to modern rotary and reciprocating tools with 4%-9% taper. This is a good expansion from the abstract.
* Lines 39-40 state that preparation procedures can damage root dentin, leading to fractures.
* Lines 42-45 restate the research goal to determine bicuspids' resistance to fracture, specifically comparing TruNatomy (TRN) files against hand files, Pro Taper Universal (PTU), Endo star E3, and Wave one gold file. This is a clear objective statement for the main text.
4. Method (Lines 46-80):
* Sample Collection and Preparation (Lines 47-50):
  * 50 freshly extracted permanent mandibular premolars were collected.
  * Cleaning with tap water.
  * Decoronation with a diamond disc to a standard root length of 14 mm from the anatomical apex. This standardization is crucial for an in vitro study.
* Grouping (Lines 51-53): Divided into five groups (n=10) – one control and four experimental groups. This indicates a well-structured experimental design.

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

* Instrumentation Techniques (Lines 56-70):
  * GROUP 1 (Hand Files): ISO2% K file (Mani, Japan), apical enlargement from ISO# 10 to #25. This serves as a good control group.
  * GROUP 2 (TruNatomy File): Crown down technique, 4% TRN file system (Dentsply, Maillefer, Switzerland). Specific instruments and their sequence (TRN orifice modifier, #17 TRN Glider, TRN small file, TRN prime shaping file) are detailed.
  * GROUP 3 (Pro Taper Universal): Crown down technique, PTU file (Dentsply, Maillefer, Switzerland). Instruments used (Sx, S1, S2, F1, F2) are listed.
  * GROUP 4 (Endo Star E3 azure): Crown down, Endo Star E3 azure (Endo star, Poldent, UK). File sequence (File 1: ISO Apical size 30 and 8% taper; File 2: ISO apical size 25 and 6% taper) is provided. The taper description is clear.
  * GROUP 5 (Wave One Gold): Crown down, Wave One Gold primary file (25.07) in reciprocating motion at 350rpm. Sx was used for root canal orifice flaring.
* Irrigation and Obturation (Lines 71-74):
  * Irrigation with 5.25% sodium hypochlorite and EDTA gel for lubrication.
  * Final flush with 5ml of 17% EDTA for 1 minute, followed by distilled water rinse.
  * Obturation by lateral compaction technique using gutta percha and AH plus sealer for all groups. This ensures consistency across groups.
* Sample Mounting (Lines 75-78):
  * Root surface covered with two layers of adhesive tape, apical root end (approx. 7mm) embedded in self-cure acrylic resin block, exposing 7mm of coronal portion. This setup aims to mimic physiological conditions by providing some periodontal ligament simulation, as mentioned later in the discussion.
  * Space filled with light body additional silicon impression material after tape removal. This is a good method for simulating the periodontal ligament.
* Figure 1 (Line 80): "GROUPING OF SAMPLES". This visual aid is helpful for understanding the experimental setup.

5. Fracture Resistance Testing (Lines 81-89):
* Equipment: Universal Testing Machine (UTM).
* Setup: Blocks with mounted samples positioned on the lower part of the machine, coronal side upward. Custom-made metal point (0.5 mm diameter) secured to the upper section.
* Force Application: Applied vertically along the root's long axis. Continuous compressive strength force at a crosshead speed of 1mm/min.
* Measurement: Samples loaded until fracture, maximum breaking loads recorded in Newtons. This is standard procedure for fracture resistance testing.
* Figure 2 (Line 90): "SAMPLE MOUNTED ON UNIVERSAL TESTING MACHINE". Good visual representation of the testing setup.

6. Results (Lines 91-97):
* Clearly states the mean fracture resistance for each group.
  * Trunatomy File Group: 1733.60 N (Highest)
  * Hand File Group: 1692.30 N
  * Wave One Gold Group: 1666.30 N
  * Endo Star E3 Group: 1203.80 N
  * Protaper Universal Group: 1031.60 N (Lowest)
* Total mean fracture resistance: 1465.52 N.
* The results are presented numerically and are consistent with the abstract.

7. Graph 1 and Table 1 (Lines 98-99):
* Graph 1 "FRACTURE RESISTANCE": A bar graph visually represents the mean fracture resistance for each group, making the results easily digestible.

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

* Table 1 "DESCRIPTIVE STATISTICS": Provides detailed descriptive statistics (N, Mean, Std. Deviation, Std. Error, Minimum, Maximum) for each group and the total. This level of detail is excellent and allows for a more thorough understanding of the data variability.
* Lines 100-102 reiterate the main finding: Trunatomy file group demonstrates the highest fracture resistance, supporting the use of minimally tapered instruments. This is a strong concluding statement for the results section.

8. Discussion (Lines 103-159):

* Importance of Maintaining Tooth Form (Lines 104-105): States that maintaining original tooth form is essential for reliable clinical results and that endodontically treated teeth can fail due to various factors like access cavity preparation, instrument design/taper, and obturation space. This sets the context for the discussion.
* Standardization and Simulation (Lines 109-112):
  * Mentions decoronation to 14mm and apical diameter of 25mm for standardization. The apical diameter being "25mm" seems like a typo, perhaps it should be "ISO #25" or "0.25 mm". This needs clarification.
  * Discusses simulating the periodontal ligament with a silicone layer to allow root movement, minimizing external reinforcement. Acknowledges that these modifications can alter force distributions and make mimicking periodontal structure harder. This shows awareness of study limitations.
* Impact of Taper on Fracture Resistance (Lines 113-115): Cites Zandbiglari et al. that more tapered instruments and excessive coronal expansion weaken the tooth, increasing fracture risk. This aligns with the study's findings and provides external support.
* Hand Files vs. Other Systems (Lines 116-117): States that hand files showed higher fracture resistance than other systems due to less taper. This is a direct comparison from the results. However, the result section states Trunatomy has the highest mean, then Hand files. This sentence in the discussion should be rephrased to accurately reflect the study's results (Trunatomy > Hand Files), or explain why hand files in general might show higher fracture resistance, while in this specific study Trunatomy outperformed them. This is a crucial point of inconsistency that needs to be addressed.
* TruNatomy File Characteristics (Lines 118-122):
  * Describes TRN files as having a "varying backward taper," optimal conservation of pericervical dentin (PCD), and maintaining original anatomy.
  * Made of heat-tempered NiTi alloy with a parallelogram cross-section.
  * Utilizes a 0.8 mm NiTi wire versus a 1.2 mm wire, maximizing PCD conservation and tooth integrity. These details explain why Trunatomy might perform well.
* Reciprocating Motion (Lines 123-127): Discusses reciprocating motion as effective for improving instrumentation by reducing file separation and canal distortion, and reducing stress and preparation time in curved canals. This provides background for WaveOne Gold and Endostare3.
* WaveOne Gold (WOG) (Lines 128-131):
  * Describes WOG as a single-file, single-use technique in reciprocating motion, developed from M-wire WaveOne.
  * Mentions modified cross-section with off-centered parallelogram design and different tapers compared to original WaveOne.
* Endostare3 File System (Lines 132-136): Explains its dual motion (rotary under low stress, reciprocating under increased stress). This is a good explanation of its unique mechanism.
* Protaper Universal (PTU) (Lines 137-140):
  * States PTU resulted in the least fracture resistance in the study.
  * Cites Bier et al. regarding file taper contributing to dentinal cracks.
  * Explains that PTU files involve the use of SX, which has significantly more taper than other rotary file systems. This provides a clear explanation for PTU's lower performance.
* Irrigation and Obturation Rationale (Lines 141-152):

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

* Concentration of sodium hypochlorite (5.25%) and rationale for higher concentrations in clinical settings.
* Rationale for obturation: obturating materials increase fracture resistance of endodontically treated teeth.
* Use of epoxy resin-based sealers (AH Plus) for mechanical locking with canal walls, increasing retention. This is good justification for the chosen materials.
* Reiteration of Key Finding (Lines 153-155): Concludes that TRN files show the highest fracture resistance due to regressive taper and maximum preservation of pericervical dentin. This reinforces the study's primary conclusion.

9. Conclusion (Lines 156-160):
* Summarizes the findings: TruNatomy file had higher FR than Hand files, Protaper universal, Endostare3, and WaveoneGold file systems.
* Reiterates that utilizing minimum tapered instruments improves the FR of endodontically treated teeth. This is a clear and concise conclusion, consistent with the abstract and results.

10. References (Lines 161-192):
* The references appear to be relevant and appropriately formatted for a scientific journal. Each citation is linked to specific information in the text, which is excellent.

Areas for Improvement:
* Consistency in Discussion regarding Hand Files:
* Problem: In the Results section and abstract, Trunatomy is clearly stated as having the highest fracture resistance, followed by Hand files (Trunatomy: 1733.60, Hand files: 1692.30). However, in the Discussion (Lines 116-117), it states: "Hand files showed higher fracture resistance than Trunatomy, PTU, Endostare3 and waveone gold file system, which is because of less taper of hand K files." This directly contradicts the study's own results.
* Recommendation: This sentence must be corrected to reflect the actual findings (Trunatomy had higher fracture resistance than Hand files, albeit by a small margin, but still higher). If the intention was to discuss the general principle that less taper leads to higher resistance, and hand files generally have less taper, then it needs to be carefully rephrased to acknowledge that in this specific study, Trunatomy slightly outperformed them despite its own "lesser taper" advantages. Perhaps, "While hand files are generally associated with higher fracture resistance due to their less tapered design, in this study, TruNatomy files demonstrated slightly superior fracture resistance, likely attributed to their unique design features that optimize dentin preservation."
* Clarification of Apical Diameter (Line 109):
* Problem: "Apical diameter of root were kept 25mm." An apical diameter of 25mm (2.5 cm) for a root canal is extremely large and likely a typo. It is probably meant to be ISO #25 (0.25 mm) or similar.
* Recommendation: Correct this typographical error to the appropriate measurement or ISO size.
* Elaborate on "Varying Backward Taper" (Line 118):
* Problem: The term "varying backward taper" is used to describe TruNatomy files. While the subsequent lines explain the thinner wire and PCD conservation, a slightly more technical explanation of what "varying backward taper" entails and how it contributes to the observed results would be beneficial for readers less familiar with this specific file design.
* Recommendation: Briefly expand on the "varying backward taper" concept, perhaps in relation to how it affects the amount of dentin removed at different coronal-apical levels compared to traditional continuous taper files.
* Statistical Analysis Interpretation in Discussion:
* While ANOVA and Tukey HSD are mentioned, the discussion could briefly touch upon the statistical significance of the differences observed between groups. For example, explicitly stating if the difference between Trunatomy and Hand files was statistically significant, or if the differences between the lowest

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

groups (Protaper Universal, Endo Star E3) and the higher groups were significant. This would strengthen the claims made in the discussion.

Minor Points/Suggestions:

* Grammar and Phrasing: A few minor grammatical points could be refined (e.g., "The goals of endodontic therapy are to restore the periapical tissues that ensure tooth 37 function and remove the contaminated pulp and dentin from the root canal" - could be rephrased for smoother flow). However, these are minor and do not detract significantly from the content.

* Consistency in Terminology: Ensure consistent use of "pericervical dentin" or "PCD" throughout.

By addressing these points, the manuscript will be significantly strengthened in terms of clarity, accuracy, and scientific impact.