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Effect of Different Access Cavity Designs on Fracture Toughness of Endodontically Treated Teeth- A Systematic Review and Network Meta-Analysis

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OBJECTIVE

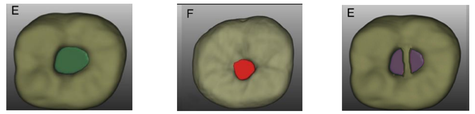
To compare the effect of different Endodontic Access Cavities on fracture toughness of extracted endodontically treated human teeth.

MATERIAL & METHODS

Study Design: Systematic Review & Network Meta-analysis

Study Duration: Till September 2020

REGISTRATION # CRD42020203986



Contracted access | Ninja access | Truss access

PICOS Model

- **P** Fully formed (mature) human teeth
- **I** Conservative/Contracted endodontic access, truss access, ultraconservative ‘‘ninja’’ access cavity
- **C** Traditional/Conventional endodontic access cavity
- **O** Fracture strength/toughness
- **S** Clinical trials and in-vitro studies

SEARCH STRATEGY

- **Literature research:**
- PubMed (NLM)
- CINAHL Plus (EBSCO)
- Dent & Oral Science
- Hand search

[“Fracture” OR "Flexural Strengths" OR "Flexural Resistance" OR "Flexural Property" OR "fatigue, strength to fracture" OR "resistance to fracture" OR "fracture strength" OR "fracture resistance” OR “fracture toughness”] AND [conservative endodontic cavity” OR “traditional endodontic cavity” OR “endodontic cavity” OR “traditional endodontic” OR “dentin conservation” OR “contracted endodontic cavity” OR “minimally invasive endodontics“ OR “dental pulp cavity" OR “cavity” OR "pulp cavities" OR "dental pulp chambers“]

INCLUSION & EXCLUSION CRITERIA

Inclusion Criteria: Retrospective/Cohort, Clinical trials / In Vitro studies, English language only

Exclusion Criteria: Case reports/series, Reviews, Animal studies, Studies on immature or artificial teeth

STUDY SELECTION

Systematic literature search initially yielded 829 articles . After screening, 125 articles were excluded due to duplication, 676 articles were irrelevant according to inclusion criteria, 22 had irrelevant objectives, leaving final 14 relevant articles.

RESULTS

Table I: Characteristics of studies included in Network meta- analysis

Characteristic	Value	Characteristic	Value
Number of Interventions	5	Number of Interventions	4
Number of Studies	9	Number of Studies	7
Total Number of Patients in Network	426	Total Number of Patients in Network	240
Total Possible Pairwise Comparisons	10	Total Possible Pairwise Comparisons	6
Total Number of Pairwise Comparisons With Direct Data	9	Total Number of Pairwise Comparisons With Direct Data	6
Is the network connected?	TRUE	Is the network connected?	TRUE
Number of Two-arm Studies	1	Number of Two-arm Studies	3
Number of Multi-Arms Studies	8	Number of Multi-Arms Studies	4
Average Outcome	1700	Average Outcome	761.8

Figure I: Network Structure

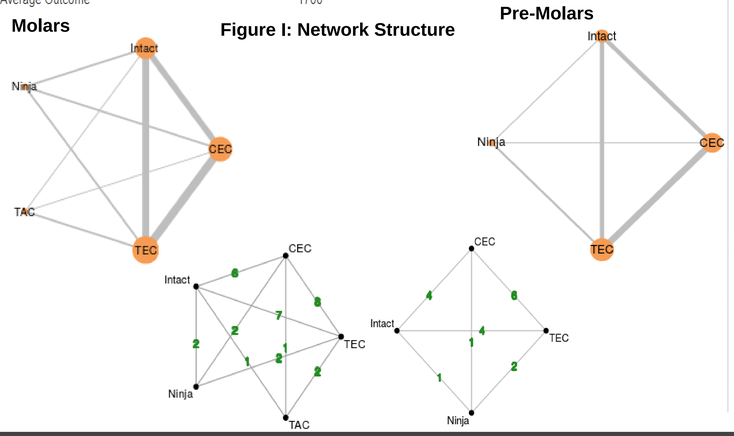


Table II: SUCRA (Surface Under the Cumulative Ranking)

Ranking table for all studies - Probability for each treatment to be the best **Molars**

	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
CEC	0.04605	0.54861	0.34361	0.06107	0.00065
Intact	0.84530	0.12995	0.02234	0.00241	0.00000
Ninja	0.08061	0.22162	0.36860	0.24349	0.08568
TAC	0.02804	0.09950	0.23892	0.43761	0.19592
TEC	0.00000	0.00031	0.02652	0.25541	0.71775

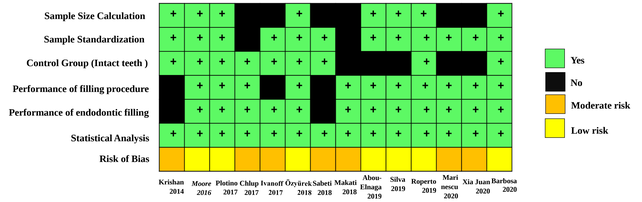
Rank	Intervention
1	Intact
2	CEC
3	Ninja
4	TAC
5	TEC

Pre-Molars

	Rank 1	Rank 2	Rank 3	Rank 4
CEC	0.47778	0.34923	0.14441	0.02859
Intact	0.28076	0.38259	0.24204	0.09461
Ninja	0.22582	0.18769	0.27504	0.31145
TEC	0.01564	0.08050	0.33851	0.56535

Rank	Intervention
1	CEC
2	Intact
3	Ninja
4	TEC

Figure II: Risk of Bias of individual studies



CONCLUSION

In the overall analysis, the network meta analysis demonstrated that CEC’s fracture toughness is significantly greater than TECs in **premolars as well as molars.** According to the RANK table, CEC presented the highest probabilities of being ranked the most effective access cavity design.

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