Medical Research Archives

European Society of Medicine

OPEN ACCESS

Published: January 31, 2024

Citation: Abisha, V., M., J., et al., 2024. Endodontically treated vs. vital abutments in the success of Fixed Partial Dentures (FPDs) – A Systematic review and Meta analysis. Medical Research Archives, [online] 12(1). https://doi.org/10.18103/mra.v12i1.4392

DOI: https://doi.org/10.18103/mra.v12i1.4392

ISSN: 2375-1924

REVIEW ARTICLE

Endodontically treated vs. vital abutments in the success of Fixed Partial Dentures (FPDs) – A Systematic review and Meta analysis

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ABSTRACT

Aim: Intentional Root canal treatment of abutments is preferred by many prosthodontists to satisfy the principles of parallelism and line of draw before construction of fixed partial dentures. However, intact non-supra-erupted and non-tilted teeth need not be devitalized as this weakens the abutment. Hence this systematic review was undertaken to understand if the success of fixed partial denture improves with devitalized abutments.

Materials and Methods: The systematic review was done according to the PRISMA guidelines 2020. The databases searched were PubMed, Cochrane and Google Scholar. New castle Ottava scale of risk of bias tool was used for assessing the bias. Certainty of evidence was assessed using GRADEpro. Studies eligible for Meta-analysis was evaluated using Forest plot.

Results: Eleven studies were selected for the systematic review. None of the studies found non vital abutments to be superior to vital abutments in the survival or longevity of FPDs. All the studies included in the review either concluded that vital abutments improved the longevity/survival of FPDs and decrease the risk of complications or that there was no significant difference between vital and non-vital abutments for the success of FPDs. Meta-analysis was done for 8 eligible studies using Forest plot.

Conclusion: Endodontically treated abutments are not favorable for the longevity/survival of FPDs and they present with more risk of hazards/complications. Therefore, vitality of the abutment should not be sacrificed unless there is a questionable pulpal and/or periapical diagnosis preoperatively.

INTRODUCTION:

Tooth loss may occur because of caries, periodontal disease, or trauma and is of major esthetic and functional concern for patients. Time-tested treatment options for replacing missing teeth are fixed or removable prosthesis. In view of their convenience and psychological and social advantages, patients prefer reconstruction with fixed partial dentures (FPDs) rather than removable ones[1]. But despite the emphasis on conservative preparation methods and restorative procedures, undeniable threats to pulpal integrity exist during the construction of fixed prosthetic restorations. Preparation of the tooth involves cutting dentin and odontoblastic processes during which the pulp can be subjected to desiccation. Heat is also generated during tooth preparation. Impression techniques in current use necessitate drying the surface of the cut dentin which may also desiccate dentin[2]. The literature demonstrated that each step in the fabrication of a fixed prostheses is a source of potential insult to the pulp. Polymerization of resin materials used for the fabrication of provisional restorations is associated with an exothermic reaction. This temperature rise may cause serious thermal trauma to the pulp. Temporary and permanent restorations are held in place with cements that may also irritate the pulp. Throughout the entire process, bacteria are present from saliva and caries[3]. Hence, prosthodontists, recommend intentional devitalization and endodontic treatment for these and other prosthetic considerations like principles of parallelism and line of draw. However, intact non-supra-erupted and non-tilted teeth need not be devitalized as this weakens the abutment. Endodontic procedures reduced tooth stiffness by only 5%, which is contributed entirely by the access opening. The 5% reduction in stiffness from endodontic procedures was insensitive to sequence as the same reduction resulted whether restorative procedures followed or preceded endodontic procedures[4]. Endodontically treated dentin is dessicated and inelastic. Elasticity of non-vital dentin decreases with time according to Johnson et al. Diseases of endodontic origin affecting the abutment teeth have been regarded as a biological failure of the fixed prostheses; other biological reasons for failures include caries and periodontal disease[5]. Lowenstein and Rathkamp reported 57% higher threshold for tactile perception in endodontically treated teeth. Even the periodontal ligament of endodontically treated tooth has reduced discriminative ability for hazardous force application[6]. There is a wide clinical perception that endodontic treatment weakens the tooth and makes it more brittle[7]. Intentional root canal treatment (RCT) should be planned only for teeth with presumed doubtful pulps scheduled for fixed prosthetic procedures, as well as teeth that cannot be restored without using the pulp chamber and root canals for retention and support[8] because human dental pulp is quite resilient and returns back to normal status once these procedures are stopped. Besides, endodontic complications have been observed in long term follow up studies. Compared to that for vital abutment teeth, a worse prognosis is noted for endodontically treated devital

teeth due to their susceptibility to fracture as the fracture resistance is mainly dependent on the amount of remaining sound dentin[9]. Vital teeth showed a highly sensitive sensorial function. Pulp extirpation reduced the sensitivity of the offended tooth to the applied occlusal load. This may result in teeth overloading and contribute partly to the high incidence of fracture after root canal treatment[10]. Evidence suggests that a protective feedback mechanism is present within dental pulp, which leads to interdental nerve activity and a jaw opening reflex in response to mechanical deformation[6]. Controversy exists as to whether endodontic procedures are the primary cause for loss of strength of the abutment tooth. The restoration of severely damaged coronal hard tissue and endodontically treated teeth (ETT) is always a challenge in reconstructive dentistry. As stated by the European Society of Endodontology, the re-emergence of contemporary management strategies like Vital Pulp Therapies for extensive carious lesions[11] and Regenerative endodontic procedures for even a necrotic tooth[12], intentional devitalization of a sound tooth for the sake of FPDs seems undesirable.

Intentional RCT can be done for the following reasons:

Intentional RCT should be planned for supra erupted and tilted teeth, teeth with presumed doubtful pulpal and periapical pathosis scheduled for fixed prosthetic procedures, as well as teeth that cannot be restored without using the pulp chamber and root canals for retention and support, and in teeth with severe attrition.

Aim:

This systematic review was undertaken to understand if the success of fixed partial denture improves with devitalized abutments.

Research question:

Are endodontically treated abutments more successful than vital tooth abutments in FPDs?

Materials and methods:

Protocol registration:

The protocol for this systematic review was recorded in the International Prospective Register of Systematic Reviews PROSPERO with the reference registration number CRD42022358645. The systematic review was done according to the PRISMA guidelines 2020.

Search strategy:

The databases searched were Google scholar, Cochrane Library and PubMed.

Study selection:

Eligibility criteria:

The PICO model was used to formulate the questions for this study:

P- Participants (fixed partial denture, bridge, FPD, Fixed denture, Fixed dental prosthesis);

I- Intervention (non-vital abutment, root canal treated abutment, devitalized abutment, pulp-less abutment);

C- Comparison (vital abutment, vital teeth, sound teeth);

O- Outcomes (longevity, survival, success, failure, clinical evaluation, clinical success, complications)

Inclusion and exclusion criteria:

The literature search was performed according to the following inclusion criteria:

(a) articles published in English,

(b) clinical studies

(c) studies comparing vital and nonvital abutments in fixed prosthetic dentures

The exclusion criteria were:

(a) Invitro studies,

(b) abutments used for removable dentures

(c) systematic or literature reviews,

(d) ex vivo studies

Risk of bias:

New castle Ottawa scale of risk of bias tool was used for assessing the evidence quality. They are divided into 7 domains; Representativeness of study cohort, Ascertainment of Exposure, Outcome not present before the exposure, Comparability between groups, Outcome data source, Follow-up long enough for outcomes to occur, Loss during follow-up.

Certainty of evidence assessment:

According to the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) approach, the strength of evidence was evaluated. Each GRADE criterion, i.e, directness, precision, consistency, study design and risk of bias was assessed individually for the studies and then computed for the certainty of the evidence. The GRADE approach classifies the certainty of evidence in one of the following four grades: high, moderate, low, or very low to achieve transparency and simplicity.

RESULTS:

The search strategy yielded 390 studies, of which 11 were identified as potentially eligible to be included in the current systematic review. (Fig 1)

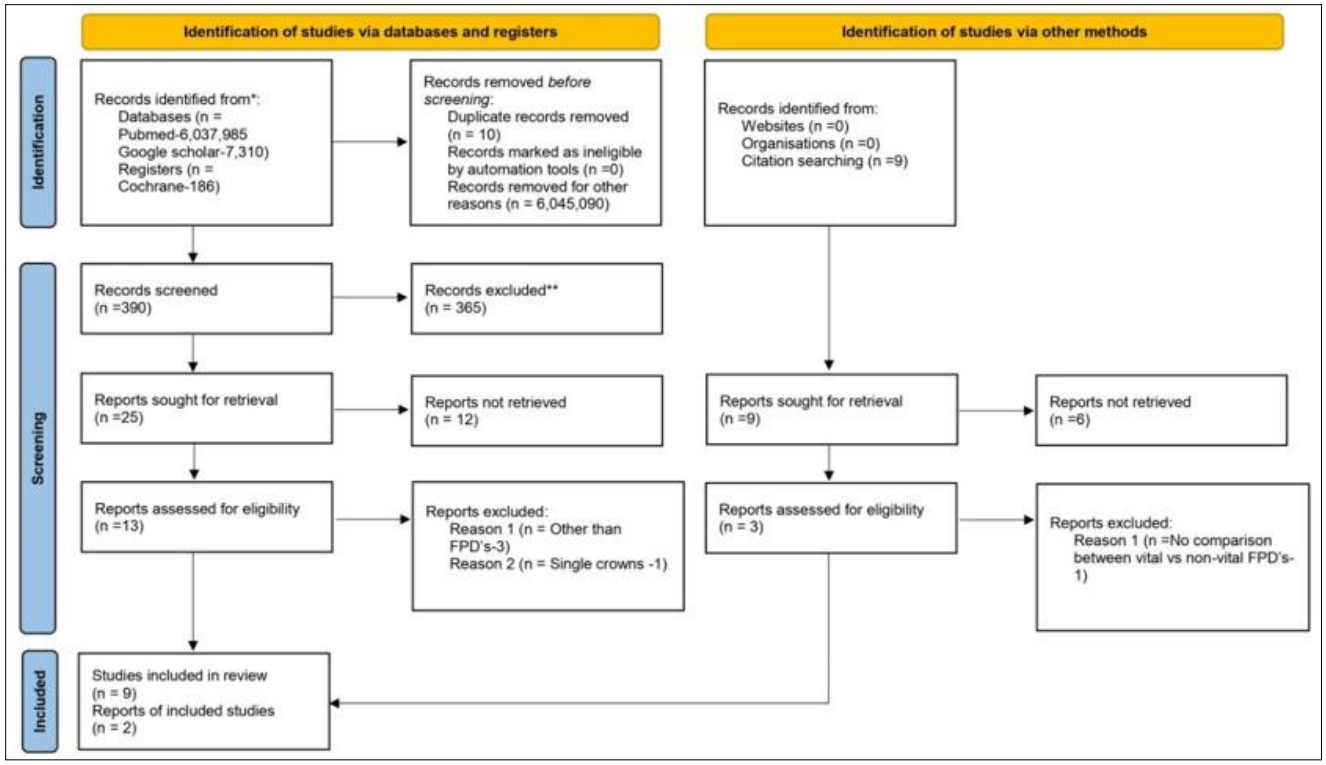

Fig.1 PRISMA flowchart of studies included and excluded in the review

CHARACTERISTICS OF THE INCLUDED STUDIES:

All the 11 studies selected for the systematic review were retrospective and tooth supported FPDs of up-to 7 units were included. The outcome criteria were analyzed based on the longevity, survival, failure, clinical evaluation and success. (Table-1) None of the studies found non vital abutments to be superior to vital abutments in the survival or longevity of FPDs. The shortest follow-up period found was 3 years and longest 25 years.

Most of the studies, found that vital abutments, positively affected the success of FPDs while non-vital abutments increased the failure rate of FPDs. 2 studies found that the success of FPD's affected selected parameters of outcome. De Backer et al. in 2006 found that overall and maxillary FPDs' success was not affected by the vitality of the abutments while mandibular FPDs' success was affected by the vitality of abutments. The other study by the same author in 2007 found that up-to 3 units, vitality does not play a significant role in the success of FPDs, while more than 3 units and cantilever FPDs were more successful only if the abutments were vital.

One study found that vitality of the abutments does not affect the survival / success / complications / failure rate/ longevity of FPDs. All the studies included in the review either concluded that vital abutments improved the longevity/survival of FPDs and decrease the risk of complications or that there was no significant difference between vital and non-vital abutments for the success of FPDs.

Table -1 General characteristics of the included studies

S. No	Study ID	Study design	Total samples	Inclusion criteria	Exclusion criteria	Outcomes	Statistical analysis	Results
1	Hawthan et al 2022[13]	Retrospective	331 FPD's of 827 abutments in 229 patients	Tooth supported FPDs 3-7 units	FPDs larger or smaller than 3-7 units Single crowns Resin bonded and cantilever FPDs	Survival of tooth supported FPDs with vital and non-vital abutments	Hazards ratio and odds ratio	Weak significant difference between bridges with vital and non-vital abutments
2	DeBacker 2006[14]	Retrospective	134 FPDs	3unit FPDs	Cantilever FPDs	Long term efficacy of FPDs and frequency and causes of failures	Log rank test and Kaplan–Meier analysis	Overall and maxillary FPDs- vital vs non-vital abutments- no difference in survival Mandibular FPDs- significant difference
3	DeBacker et al 2007[15]	Retrospective	1,312 complete crowns, 165 three-unit FDPs. 397 FDPs, and 213 C-FDPs	Complete crowns, 3 unit FPDs, C-FPDs, FDPs	-	Survival of post and core on RC treated teeth restored with complete crowns, 3 unit FPDs, C-FPDs, FDPs	Log rank test	For 3 unit FDP's – no significant difference in survival between vital and non-vital abutments For more than 3 unit FDP's and cantilever FDP's- non-vital abutments led to significantly more failures
4	Yoshida et al 2019[16]	Retrospective	306 prostheses (301 patient)	3 unit metal framed 2-retainer(RBFPD) and full coverage FPDs	Prosthesis other than RBFPDs and full coverage FPDs	Survival of comparison of RBFPDs vs conventional FPDs	Log rank test and Kaplan–Meier analysis	Non vital tooth serving as abutment-main risk factor for failure
5	Shetty et al 2020[17]	Not mentioned	86 (41 patient)	3unit FPDs of PFM Abutment teeth with plaque and gingival index less than 10%	Non healthy patients, single crowns. Patients with poor gingival health	Long term effect of PFM FPDs on periodontal health of the abutment tooth	T test	Vital abutments- improved gingival health
6	Brandt et al 2019[18]	Retrospective	1058 full-coverage crowns and fixed partial dentures	Full coverage crowns on FPDs made on IPS emax	-	Survival and success rates of FPDs and full coverage crowns	Log rank test	Significant reductions in survival were seen for non-vitality compared to the vitality of abutment teeth
7	Hochman et al 2003[1]	Retrospective	247 FPDs	FPDs and single crowns	-	Success rates and factors for failure	Chi-square test	The failure rates were higher in teeth that had undergone root canal treatment as compared with vital teeth
8	Randow et al 1986[19]	Not mentioned	316 prostheses	FPDs with distal abutment teeth and single and double cantilever pontics	-	Types of technical failures of FPDs	Chi-square test	Non-vital teeth were used as the distal abutments had higher chances of failure
9	Raustia et al 1998[20]	Not mentioned	82 bridges	FPDs	Single crowns	Complications and failures of FPDs	Not given	Weak significant difference between bridges with vital and non-vital abutments
10	Wegner et al 2006[9]	Not mentioned	864	Single crown or FPDs and cantilever FPDs of both vital and non vital abutments	-	Survival rate of endodontically treated teeth with post and FPDs and RPDs	Kaplan–Meier analysis	No significant difference in survival rates in FPD abutments
11	Nymann 1979[21]	Not mentioned	332 bridges	FPDs	-	Frequency of failures of combined periodontal and prosthetic treatment	-	Fracture of abutment teeth- more frequent in root filled than vital teeth

The full-text articles that were excluded and the reasons for the same are given in Table 2

Table-2 List of excluded articles with reasons

Excluded studies	Reasons
Sorenson et al 1982 [22]	Comparison was done between RPDs and FPDs rather than vital and non-vital
Huettig et al 2016 [23]	Only single crowns were evaluated
Spear et al., 2021 [24]	Comparison was done between vital and non -vital teeth when used as abutments for implant supported prosthesis
Hinz et al., 2019 [25]	Comparison was done between vital and non -vital teeth when used as abutments after restoration with non-precious metal double crowns
Abeer et al.,2010 [26]	Comparison was done between vital and non -vital teeth used as abutments

RISK OF BIAS IN INDIVIDUAL STUDIES:

40% of studies were found to have high risk of bias, 60% had either low risk or moderate risk (Fig 2a). Nymann and Randow had moderate risk, due to comparability differences between the groups. Raustia, Wegener, Brandt and Shetty had serious risk of bias because follow-up (Table 3) was not long enough; the rest of the studies had low-risk of bias (Fig 2b).

Table 3 – Follow-up of the included studies

Author/ Year	Follow-up
Wegner et al, Raustia et al, Brandt et al., Shetty et al., Nymann et al., Randow et al., [9 20 18 17 21 19]	Short (ranging for 3 to 9 years)
Yoshida [16]	Average (ranging from 10 to 17 years)
Backer et al., 2006, Backer et al., 2007, Hawthan et al, Hochman et al., [14 15 13 1]	Long (ranging from 18 to 25 years)

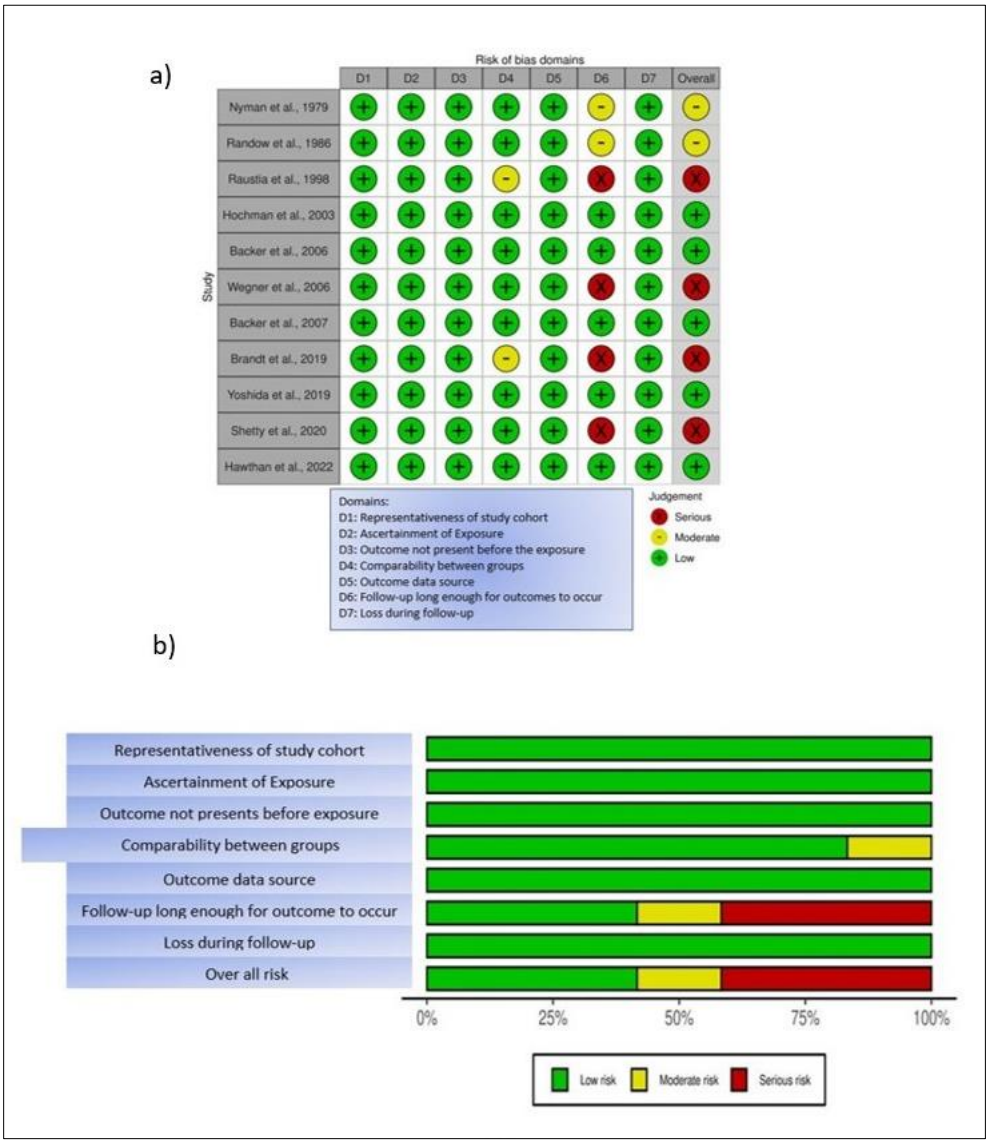

Fig 2- a) Risk of bias for included studies
b) Summary of quality assessment

Certainty of evidence:

The evidence level of this review was assessed by GRADEpro guidelines. Of the 11 studies included in the review, the overall evidence was high for 7 studies, moderate for 2, low for 1 and very low for 1 (Table 4).

Table-4 Certainty of evidence (GRADEpro)

Author name	Study design	Direct answer/ Indirect answer	Risk of bias	Imprecision (CI) and p- value	Inconsistency (Heterogenity)	Overall evidence
Nymann et al, 1979 [21]	-	Indirect	Moderate	Serious issue	Heterogenous	Low ⊕OOO
Randow et al, 1986 [19]	-	Direct	Moderate	Serious issue	Mild Heterogenous	High ⊕⊕⊕O
Raustia et al,1998 [20]	-	Indirect	Serious	Serious issue	Heterogenous	Very low OOOO
Hochman et al, 2003 [1]	-	Direct	Low	Not a Serious issue	Heterogenous	High ⊕⊕⊕O
Backer et al, 2006 [14]	-	Indirect	Low	Not a Serious issue	Moderate Heterogenous	High ⊕⊕⊕O
Wegner et al, 2006 [9]	-	Direct	Serious	Serious issue	Mild Heterogenous	Moderate ⊕⊕OO
Backer et al, 2007 [15]	-	Indirect	Low	Not a Serious issue	Mild Heterogenous	High ⊕⊕⊕O
Brandt et al, 2019 [18]	-	Direct	Serious	Serious issue	Homogenous	Moderate ⊕⊕OO
Yoshida et al, 2019 [16]	-	Indirect	Low	Not a Serious issue	Moderate Heterogenous	High ⊕⊕⊕O
Shetty et al, 2020 [17]	-	indirect	Serious	Not a Serious issue	Homogenous	High ⊕⊕⊕O
Hawthan et al., 2022 [13]	-	direct	Low	Not a Serious issue	Heterogenous	High ⊕⊕⊕O

Sample size and study outcome:

The vitality status of the abutment is one of the key factors for deciding the success or failure of FPDs. Randow et al (316 prostheses), Hochman et al (247 FPDs), Brandt et al (1058 full-coverage crowns and fixed partial dentures) and Nyman et al (332 FPDs) found that the vital tooth abutments positively affected the treatment outcome. Yoshida et al (306 FPDs) and Raustia et al (82 FPDs) found that the complications associated are more with non-vital abutments. Hawthan et al (331 FPDs) and Wegner et al (864 FPDs) stated that there was no difference between the vital and non-vital tooth serving as abutments for FPDs.*

Table-5 Relationship between vitality status of the abutment and the survival rate/ success/ risk factor/failure based on sample size

Does not affect Author/sample size	Reason	Affect	Reason
Hawthan et al[13] 331 FPDs	Survival rates of FPDs retained solely by vital and non-vital abutments or a combination of both are not influenced by factors such as abutment vitality, position of the non-vital abutment, and length of the FPD	Yoshida et al [16] 306 FPDs	Abutment tooth as a non-vital tooth was identified as a significant risk factor for tooth extraction
DeBacker et al 2007[15] 165 3-unit FPDs 397 FPDs	For 3unit FPDs – no significant difference between vital and RCT groups.	Randow et al[19] 316 FPDs	Higher frequencies of technical failures when the reconstructions had a non-vital distal abutment tooth/teeth
		Hochman et al[1] 247 FPDs	The failure rates were higher in teeth that had undergone root canal treatment as compared with vital teeth
DeBacker et al 2006[14] 134 FPDs	No significant difference between overall and maxilla	Raustia et al[20] 82 FPDs	The most frequent complications in failures occur during pre-prosthetic endo treatment and post and core rehabilitation
Wegner et al[9] 864 bridges	No significant difference in survival rates in FPD abutments	DeBacker et al 2007[15] 165 - 3-unit FPDs Total 397 FPDs	Significant difference-for more than 3 unit FPD
		DeBacker et al 2006 [14]	For mandibular FPDs, vital tooth abutments serve better than non-vital abutments
		Brandt et al[18] 1058 full coverage crowns and FPDs	Significant reductions in survival were seen for non-vitality compared to the vitality of abutment. Endodontic complications n=3 (2.21%)
		Shetty et al[17] 86 FPDs	The non-vital abutment teeth receiving PFM material crowns revealed a statistically significant increase in probing depth and reduction in CAL from time of placement to post 2 year follow up period. However, no significant changes were observed in the bone levels seen in the radiographs in the 2 year period.(P>0.05)
		Nymann et al[21] 332 FPDs	Fracture of abutment teeth in the present material was found to occur more frequently in root-filled than in vital teeth

META ANALYSIS:

For final quantitative synthesis, only 8 articles were found to be eligible (Fig 3a). Meta-analysis was interpreted by Forest plot (Fig 3b). Based on it, most of the studies (7) favored vital abutments when compared to non-vital abutments and one found equal results. None found non vital abutments favorable to the success of FPDs.

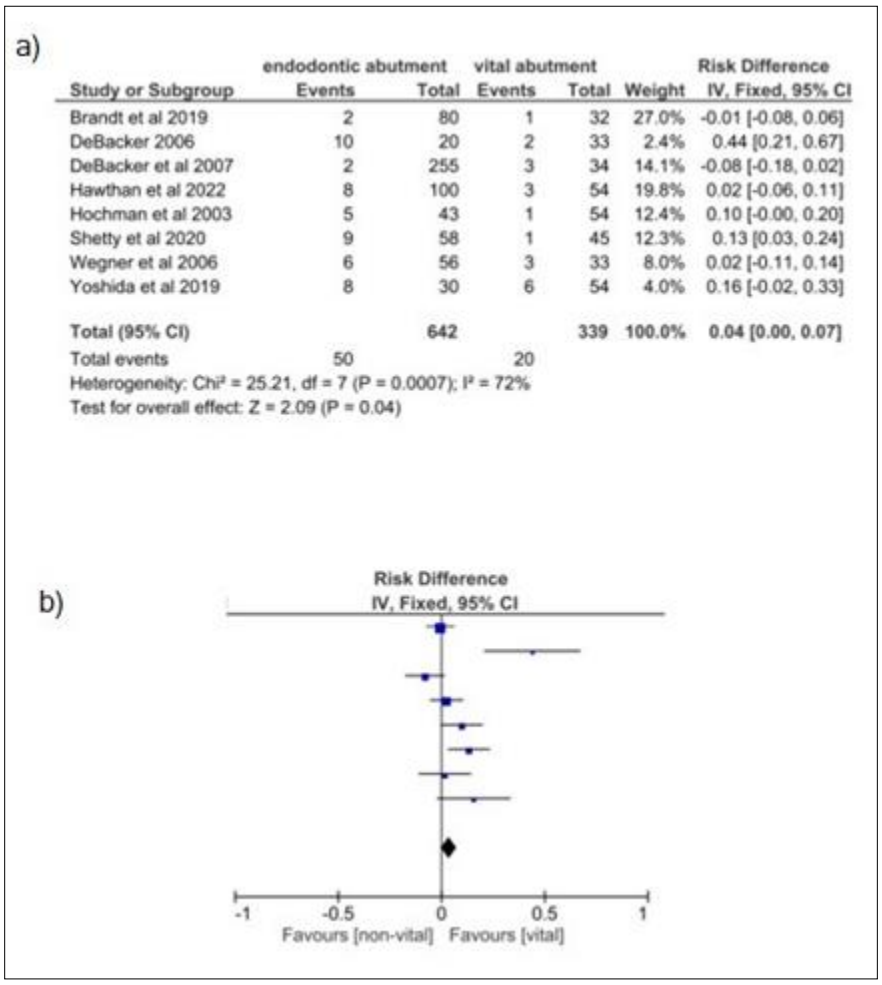

Fig 3- a) Comparative evaluation of the included studies
b) Forest plot analysis

DISCUSSION:

Various authors have put forth the disadvantages of endodontic treatment with respect to the adverse effects on dentin. Non-vital teeth have lower threshold of tactile sensitivity. The mean pain threshold of non-vital teeth is twice as high as vital teeth[19]. Loss of pressoreception and elevated pain threshold makes endodontically treated teeth to take up greater loads without the protective triggering response[6]. However in contrast to the above mentioned study, there is no significant difference in the threshold of tactile sensitivity for both centric and eccentric loading between vital and non-vital teeth as per the study of Schneider et al.[27]. Besides, if endodontic procedures are standard and proper ferrule is given, survival of non-vital abutments increases[28].

The hardness of vital dentin is 3.5% more than non-vital dentin[7]. However, Lewinstein and Grajower reported that VHN was not significantly different between vital and non-vital teeth. Assessment of fracture resistance of nonvital and vital abutments has been studied by various authors. Loss of tooth substance due to caries, pre-procedure trauma, access cavity, instrumentation and post space preparation causes weakening and microcracks[29]. This increases the fracture risk. Apart from this, irrigation, chemicals used in medicaments and obturation techniques alter dentin making it more prone to fractures. Tooth type also plays a significant role in the post-treatment stress. In the present review, DeBacker et al. (2006) found that mandibular FPDs performed better if the abutments were vital as compared to maxillary FPDs in a total of 134 FPDs followed-up. Premolars are considered as critical abutments for FPDs especially when they are sound. Force needed to fracture a BMP completed premolar is 30% less than a premolar without BMP. Whereas for a canine the differential is only 2% (Wu). Endodontically treated teeth are fractured 71% of times. Carter found 14% reduction in punch shear strength and toughness in non-vital teeth. However, Standford reported that MOE and strength are not significantly different between vital and non-vital teeth. Similarly, compressive and tensile strengths were not significantly different between vital and non-vital teeth according to Hwang et al. But collagen cross link content was found to be significantly different between vital and non-vital teeth by Rivera et al. VRF is caused by compaction forces or pin or post placement as stated by Thomsay. Vertical fractures occur with higher frequency after 10 years of endodontic treatment. Fracture of non-vital abutments is twice that of vital abutments. In the present study, Nyman et al. followed up 332 FPDs and found that fractures were more frequent in non-vital abutments than vital ones. Similarly, the incidence of VRF for non-vital abutments used in FPD was twice that of solitary teeth[22]. In the present systematic review also, the study by Randow et al. reviewed the performance of 316 FPDs and found technical failures to be more common among non-vital abutments than vital ones. Even, when endodontically treated teeth are used as RPD abutments they have an increased fracture risk compared to vital abutments[29].

A post can reduce maximal dentin stress by 20% during vertical loading [30]. A non-vital tooth with a tapered custom post fails more frequently when used as abutment than a non-vital tooth without+ post. Among FPD failures 16.7% occur due to non-vital teeth with tapered cast post. Similarly, abutment teeth of distal extension prosthesis have to undergo greater stress than any other abutment tooth. When such teeth are endodontically treated with post space preparation they are more prone to fracture. Cervical fractures are high in endodontically treated tooth without post compared to those with post if both the abutments are of same type (non-vital / with post). The load distribution is better and conservation is good leading to lesser failures when the abutments are of similar type than when they are of dissimilar type (vital/non vital; with post/without post). Generally, FPD abutments are more prone to fractures as they receive large horizontal and torquing forces [30]. In a study by Sorenson and Martinoff, 75% of the

abutment teeth that fractured were endodontically treated with posts and they were serving as terminal abutments. Similarity of the proximal and distal abutments also play a crucial role in their response to loading during functioning of FPD. Fracture of abutment teeth in 322 bridges was found to be more often in nonvital teeth especially when they are used as terminal abutments or when they had post[21]. Placement of post did not significantly improve the success of non-vital abutments [22]. In the current systematic review also, Raustia et al. followed up 82 FPDs and found that pre-prosthetic endodontic treatment and post and core placement caused more failures than other procedures.

Incidence of complications associated with non-vital abutments are studied by various authors. The complication rate was significantly higher at 12% for non-vital teeth at the end of 2 years and this is attributed to their biological inferiority compared to vital teeth. The early adverse events are related to clinical handling and biological impairment[23]. In the present meta analysis also, Shetty et al. reported that the clinical attachment level reduced and probing depth increased significantly more for non vital abutments among the 86 FPDs assessed at 2 year follow-up than for vital abutments. Biological complications occur 11.8% of the times; Of this 4.9% are due to endodontic problems and majority of these (71%) are due to loss of vitality [31] [21]. In the present study, Brandt et al. followed up 1058 restorations and reported 2.2% endodontic complications. Goga et al found that endodontically treated abutments perform worse than vital abutments over a 21-year observation period. Endodontically treated abutments are extracted 24% of times. Non-vital teeth serving as terminal abutments with or without cantilever extensions are more likely to be extracted [32]. Non-vital abutments are more likely to be extracted at 7 years than solitary non-vital teeth in a study by Caplan and Weinetroaub. In the present systematic review, Yoshida et al. analyzed 306 FPDs and reported that non-vitality of abutments was the most frequent reason for extractions.

Vital abutments showed 3% caries development while non-vital abutments showed 13%. Abutment preparation in a tooth with previous caries restoration results in necrosis development 13% of the times whereas teeth without caries development resulted in necrosis only 5% of the time.

The pooled proportion survival rate of endodontically treated teeth at 10 years is 89%[33] in which some of the failures are restorable and hence the overall success rate of non-vital abutments increases to 96%. Loss of retention of vital abutments was 4% whereas non vital abutments was 12%[34]. Loss of retention occurs more frequently in non-vital cantilever abutments (67%) at a 14 years evaluation period of 140 FPD's Failure rate of cantilever FPD's was 37% at 2-18 years follow-up of 137 FPD's, if at-least one of the abutments was non vital. The failure reduced to 12% if the abutment was vital as stated by De cock[35]. In the follow-up of 515 FPDs done by prosthodontists, over 1-21 years, non-vital abutments had 8% failures at 10 years while vital abutments had 2% failures. Similarly, non-vital abutments had 21% failures at 21 years while vital abutments had only 5% failures as reported by Walton et al.[36]. Tunjan concluded that non vital teeth should be used with caution as abutments in FPD's and they should be avoided as cantilever abutments[34]. Spear

reported that the vitality status of an abutment in FPDs is as critical as the sound bone support for an implant denture. However in the present study Hawthan et al. reported that vitality status is not a significant factor affecting the survival of 331 FPDs. FPDs with vital abutments are equivalent to implant supported dentures at 10year follow-up when the surrounding bone quality and clinical performance were considered [24]. Presence of non-vital abutments in FPDs is considered as greater risk factor for prognosis. In the present study also, Brandt et al. reviewed 1058 restorations and found survival of FPDs reduced significantly due to non-vitality of abutments than vital abutments. However, DeBacker et al. (2006) and Wegner found no significant difference in the survival of 134 and 864 FPDs respectively due to the vitality of abutments. The 20 years survival of 3unit FPDs with nonvital abutments was only 60% compared to 83% for vital abutments. However, in the present systematic review and meta analysis, DeBacker et al. (2007) reported that there was no significant difference between vital and non-vital abutments in the survival of 165 three unit FPDs. Survival at a similar period for a 4unit FPDs was 52% for nonvital abutments vs 77% for vital abutments. In the present review, DeBacker et al. (2007) reported that survival of 232 longer span FPDs (>3unit) was higher if the abutments were vital than when they were non-vital. Survival at a similar period for cantilever FPDs with non-vital abutments is 52% vs. 73% for vital abutments[37]. In the current systematic review and meta analysis also, Hochman et al. reported that failure rates were higher in root canal treated abutments among the 247 FPDs assessed.

Factors affecting prognosis of non-vital teeth as abutments depends on the operator experience, tooth type, remaining tooth structure, preoperative pulpal or periapical status, canal complexity, apical extent of obturation, quality of obturation, time of coronal restoration, presence or absence of proximal contacts and occlusal status, according to a study by Ng et al [33]. Other authors have found that intrapulpal status and periapical pathologies affect the periapical success of endodontically treated teeth more.

Considering the crucial parameters for the success of fixed partial dentures, the present systematic review and meta analysis aimed to see if the devitalization of abutments has a positive influence. Of the 11 suitable studies selected, only 2 studies found no significant difference between vital and non-vital status of abutments on the survival of FPDs. The rest 9 studies found that non-vitality of abutments either increases the risk of extraction or health of attachment apparatus or complications or survival of FPDs. Two studies by DeBacker et al. in 2006 and 2007 found tooth position and span length playing a role in the success of vital or non-vital abutments. Thus the present systematic review and meta analysis concludes that endodontically treated abutments do not positively influence the survival of FPDs.

CONCLUSION:

Vital abutments are found to be more favorable for the longevity/survival of FPDs with less risk of hazards/complications. Vitality of the abutment should not be sacrificed unless there is a questionable pulpal and/or periapical diagnosis preoperatively. With resurgence in vital pulp therapies and regenerative endodontics for even non-vital teeth, intentional devitalization of abutments for FPDs seems less prudent.

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Conflicts of Interest:

None

Funding:

None

Acknowledgements:

None

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