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Evaluate Clinical Effects of Denture Restoration and Dental Implant Restoration in Common Symptom in Clinical Dental Patients: A Systematic Review and Meta-Analysis

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Abstract
Background and aim: The researcher in the present study sought to provide stronger evidence in this regard; therefore the present study was conducted to evaluate clinical effects of denture restoration and dental implant restoration in common symptom in clinical dental patients.
Method: Databases of PubMed, Scopus, Web of Science, EBSCO and Embase were searched for systematic literature between 2016 to August 2021. Newcastle-Ottawa Scale (NOS) used to assess quality of the cohort studies. For Data extraction, two reviewers blind and independently extracted data from abstract and full text of studies that included.95% confidence interval for odds ratio and mean differences withfixed effect model and in-variance method were calculated. To deal with potential heterogeneity, random effects were used and I^2 showed heterogeneity. Meta-analysis was performed using Stata/MP v.16 software (The fastest version of Stata).
Result: In the initial review, duplicate studies were eliminated and abstracts of 485 studies were reviewed, the full text of 104 studies was reviewed by two authors, finally, eleven studies were selected. Odds ratio of dentition defect between intervention and control groupwas 5.93 (OR, 5.93 95% CI 1.87, 10.00). Mean differences of Retention function score between two groups was 1.39 (MD, 1.39 95% CI 1.21, 1.56).
Conclusion: Based on the findings of the present study, the use of dental implant restoration, especially in the age group of less than 60 years, is more effective than denture restoration.
Key words:denture restoration, dental implant restoration, dental defect

Introduction
One of the most common reasons for clinical patients to go to the dentist is a dental defect that makes it difficult for the patient to chew and eat; On the other hand, it may lead to problems with the oral mucosa, worsening of the jaw joints, facial muscles and nerves, and even abnormal wear of

adjacent teeth. Therefore, dental defects can affect the overall health of the mouth(1, 2).According to Guo et al., 2018, about 14% of adults have healthy teeth and about 85% report dental defects, not to mention that about 2% are toothless; Due to the high prevalence of dental defects, tooth restoration is much less and about 40%(3).Prosthetic techniques are one of the methods that are increasingly used to denture restoration(4). In denture restoration, dentures are used to repair lost teeth, which can be divided into fixed dentures, overdentures and removable dentures(5).The implant prosthesis uses the principle of osseointegration to implant an implant made of synthetic material into bone tissue and connects the upper denture through a special way to repair the tooth (5-7).Studies have shown that the use of dental implants in the restoration of dentures shows better clinical effects(8, 9), while there is no consensus between the results of the studies and there is a discrepancy in the findings. The researcher in the present study sought to provide stronger evidence in this regard; therefore the present study was conducted to evaluate clinical effects of denture restoration and dental implant restoration in common symptom in clinical dental patients.

Method

Databases of PubMed, Scopus, Web of Science, EBSCO and Embase were searched for systematic literature between 2016 to August 2021.A review of the results of studies from the last five years can provide newer results.Use the MeSH Database, to build searches in PubMed:
((("Denture, Partial, Fixed, Resin-Bonded"[Mesh]) AND ("Dental Implants"[Mesh] OR "Dental Implantation"[Mesh] OR "Dental Prosthesis, Implant-Supported"[Mesh] OR "Dental Implantation, Endosseous"[Mesh])) AND "Dentition"[Mesh]) AND ("Prostheses and Implants"[Mesh] OR "Prosthesis Retention"[Mesh])) AND "Denture, Complete, Upper"[Mesh].
Key considerations PRISMA was the basis of the present study(10) and PECO strategy to answer theresearch questions showed in Table1.

Selection criteria

*Inclusion criteria: criteria:*denture restoration, dental implant restoration, Clinical controlled trials, randomized controlled trials, and cohort studies, all language. Case studies, case reports, reviewswere excluded from the study.

Table1. PICO strategy

PIECO strategy	Description
P	Population:Patient with dental defects
I	interventions: dental implant restoration
C	Comparison: denture restoration
O	Outcome: effective rate, comprehensive functional restoration scores

Study selection, Data Extraction and method of analysis

Studies data were reported by study, years, study design, age, number ofpatients andDiagnostic method.

Newcastle-Ottawa Scale (NOS) (11) used to assessed quality of the cohort studies and case-control studies, This scale measures three dimensions (selection, comparability of cohorts and outcome) with a total of 9 items. In the analysis, any studies with NOS scores of 1- 3, 4- 6 and 7- 9 were defined as low, medium and high quality, respectively. The quality of the randomized control trial studies included was assessed using the Cochrane Collaboration's tool(12). The scale scores for low risk was 1 and for High and unclear risk was 0. Scale scores range from 0 to 6. A higher score means higher quality.

For Data extraction, two reviewers blind and independently extracted data from abstract and full text of studies that included.Prior to the screening, kappa statistics was carried out in order to verify the agreement level between the reviewers. The kappa values were higher than 0.80.

95% confidence interval for Odds ratio and mean differenceswith fixed effect model andin-variance or Mantel-Haenszelmethodwere calculated. To deal with potential heterogeneity, random effects were used and I^2 showed heterogeneity. I^2 values less than 50% indicate low heterogeneity and above 50% indicate moderate to high heterogeneity. Meta-analysis was performed using Stata/MP v.16 software (The fastest version of Stata).

Result

The review of the existing literature using the studied keywords, 485 studies were found. In the initial review, duplicate studies were eliminated and abstracts of 426studies were reviewed. At this stage, 322 studies did not meet the inclusion criteria, so they were excluded, and in the second stage, the full text of 104 studies was reviewed by two authors. At this stage, 93 studies were excluded from the study due to incomplete data, inconsistency of results in a study, poor studies, lack of access to full text, inconsistent data with the purpose of the study. Finally, elevenstudies were selected (Figure1).

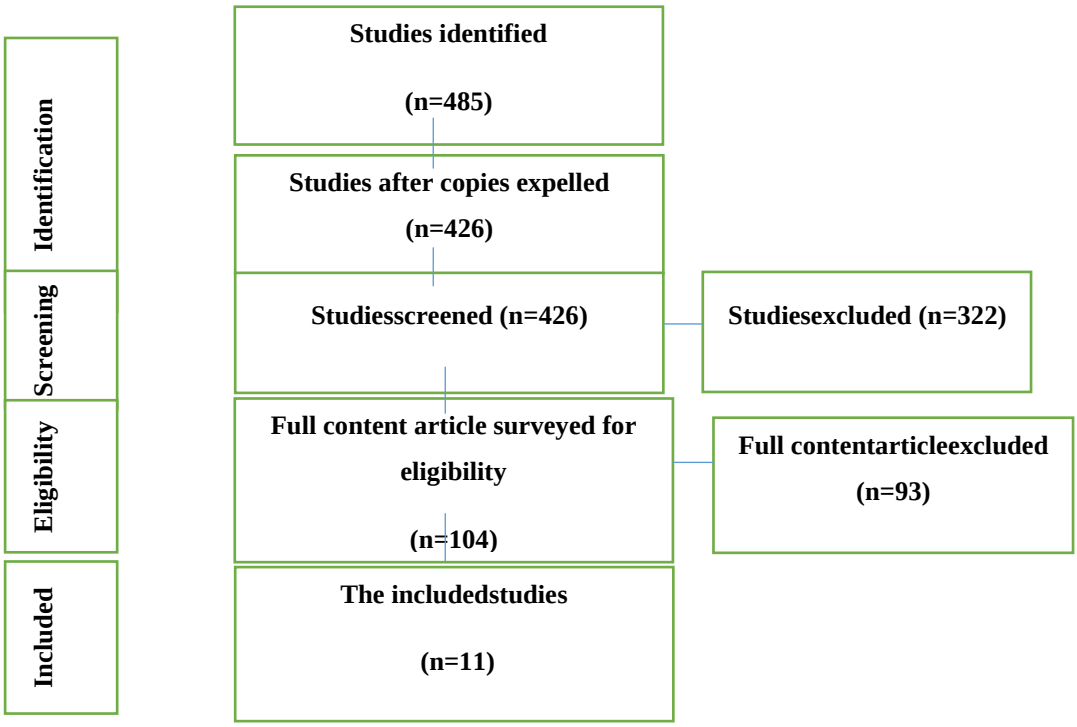

Figure 1. Study Attrition

Characteristics

Elevenstudies (Retrospective cohort studies) have been included in present article. The number of participants in interventiongroup and controlgroup were 469 (male: 250; female: 210) and 469 (male: 259; female: 210), respectively and a total was 938 with meanof age 44.49 years (Table2).

Bias assessment

According to NOS tool, allstudies had moderate risk of bias.

Table2. Studies selected for systematic review and meta-analysis.

Study. years	Study design	Number of participants				mean of age (years)	diagnostic procedure
		Intervention group		Control group			
		male	female	male	female		
Bai et al.,2020 (13)	Retrospective	26	16	25	17	34.1	X-ray
Chen et al.,2020(14)	Retrospective	20	10	19	11	41.2	X-ray
Guo et al.,2020(15)	Retrospective	31	24	29	26	48	X -ray
Sun et al.,2019(16)	Retrospective	23	27	26	24	70.5	X-ray
Wang et al.,2019 (17)	Retrospective	22	24	20	26	38.1	X -ray, computed tomography
Jing et al.,2018 (18)	Retrospective	14	16	15	15	45.1	X -ray
Li et al.,2018 (19)	Retrospective	15	18	19	14	32.2	X-ray
Wang et al.,2018 (20)	Retrospective	39	31	41	29	43.45	X-ray
Yang et al.,2017 (21)	Retrospective	13	17	20	10	46	X-ray, computed tomography
Jia et al.,2017 (22)	Retrospective	17	13	17	13	41.2	X -ray
Zhang et al.,2016 (23)	Retrospective	30	23	28	25	49.6	X -ray

Effective rate

Odds ratio of dentition defect between intervention and control groupwas5.93 (OR, 5.93 95% CI 1.87, 10.00)among eight studies and heterogeneity found (I^2=0.00%; P =0.9); there wasstatistically

significant difference between two groups (p=0.00); effective rate was higher in intervention group (Figure2).

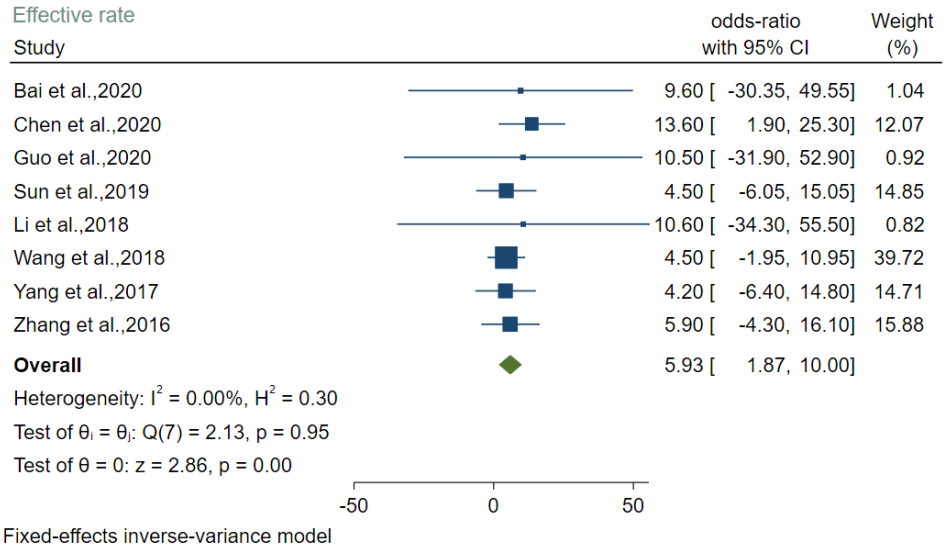

Figure2. Forest plot showed Effective rateof dentition defect between groups

Comprehensive functional restoration scores

Masticatory function score

Mean differences of Masticatory function score between two groups was 1.20 (MD, 1.20 95% CI 1.03, 1.37)among eight studies and heterogeneity found (I^2=88.87%; P =0.00); there wasstatistically significant difference between two groups (p=0.00); Masticatory function score was higher in intervention group (Figure 3).

Retention function score

Mean differences of Retention function score between two groups was 1.39 (MD, 1.39 95% CI 1.21, 1.56)among eight studies and heterogeneity found (I^2=87.94%; P =0.00); there wasstatistically significant difference between two groups (p=0.00); Retention function score was higher in intervention group (Figure4).

Aesthetics

Mean differences of aestheticsscore between two groups was 0.79 (MD, 0.79 95% CI 0.68, 0.91)among nine studies and heterogeneity found (I^2=97%; P =0.00); there wasstatistically significant difference between two groups (p=0.00); aesthetics score was higher in intervention group (Figure 5).

Comfort

Mean differences of comfort between two groups was 1.07 (MD, 1.07 95% CI 0.92, 1.21)among eight studies and heterogeneity found (I^2=93.11%; P =0.00); there wasstatistically significant difference between two groups (p=0.00); comfort score was higher in intervention group (Figure 5).

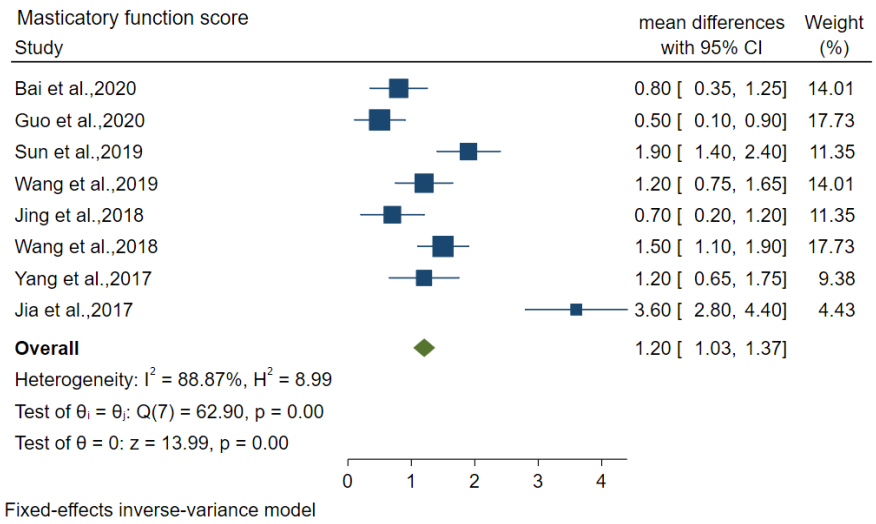

Figure3. Forest plot showed Masticatory function scorebetween groups

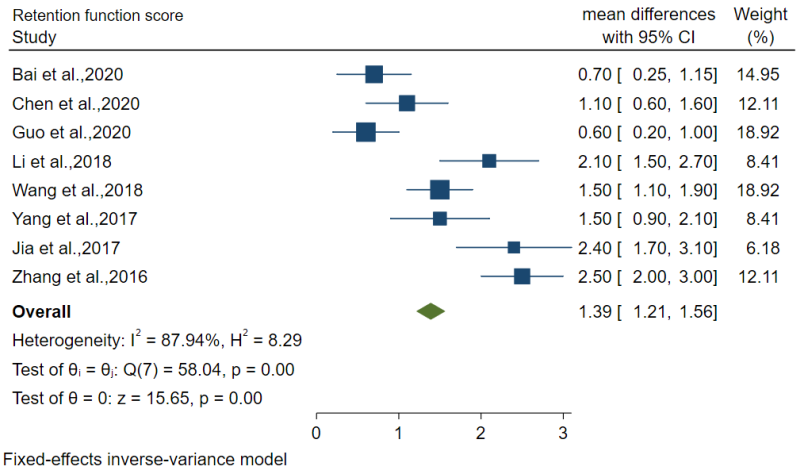

Figure4. Forest plot showed Retention function scorebetween groups

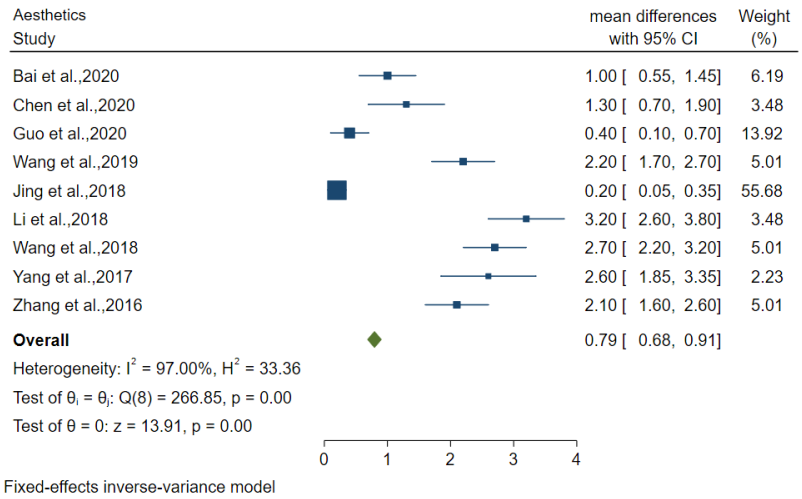

Figure5. Forest plot showed aesthetics score betweengroups

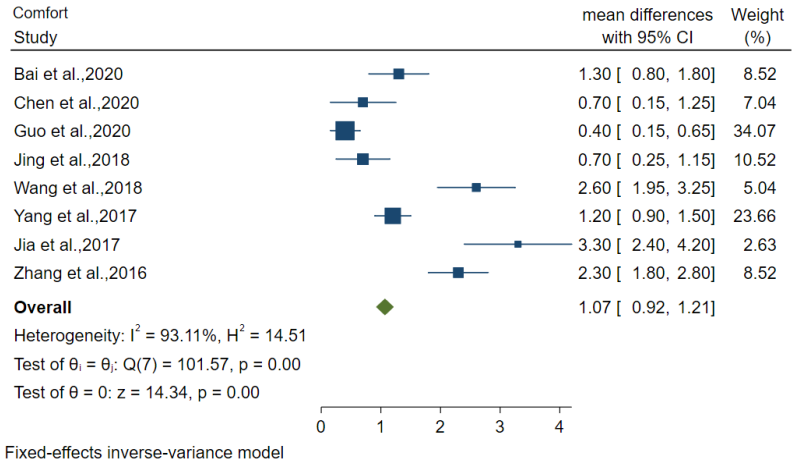

Figure6. Forest plot showed comfort score betweengroups

Discussion

The aim of current Systematic Review and Meta-Analysis was evaluate clinical effects of denture restoration and dental implant restoration in common symptom in clinical dental patients. According to studies, the prevalence of partial or complete tooth loss is very high and this can affect the natural function of teeth and the beauty of teeth(24, 25). Studies have shown that dental defects occur at any age but are more common in the elderly population (26, 27). In the present study, the mean age of the participants was 44.49 years.Different causes for tooth loss have been reported; Accidents, sports, trauma, etc. can be related factors(28). With the advancement of science and technology of dentures, various restorative methods have been reported, the most common of which are dentures and dental implants(29).Dental implant repair is a new and effective way to repair dental defects by drilling holes with the right depth and angle in the dental defect and placing the implant in it. Advanced technology, appropriate equipment and implants are applied during the operation(30). According to the meta-analysis of the present study, the effective rate of restoration in the intervention group (dental implant restoration) was higher than the control group (denture restoration). Studies have shown that it is better to use dental implants in people who have less dental defects(31).It should be noted that the health of the gums and surrounding teeth should be considered during implant placement, so dental implants are not suitable for the elderly(32). Studies have shown that root canals can affect the clinical effectiveness of tooth restoration(33, 34).In a comprehensive review of functional restoration scores in both intervention (implant restoration) and control (denture restoration) groups, meta-analysis showed that the scores of all four subgroups (Masticatory function score, Retention function score, Aesthetics and Comfort) were higher in the implant restoration group. The present study had some limitations, including the degree of heterogeneity between the above studies. Only studies conducted in China were eligible for inclusion in the study, and it is suggested that these parameters be examined in other countries. Although all studies were retrospective, their sample size was small and it is recommended that RCT studies and higher sample sizes be performed. The working method of the studies had a higher risk, which should be emphasized more on the method of the studies.

Conclusion

Based on the findings of the present study, the use of dental implant restoration, especially in the age group of less than 60 years, is more effective than denture restoration. It should be noted that in this age group, the condition of the teeth, the number of lost teeth, the location and specific angle of dental defects, and gums of patients should be considered. Further studies are available to confirm the evidence presented.

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