

Evaluation of the Treatment Outcomes in Patients with Immediate Fibula Transfer and Dental Hybrid Implant in Oral and Maxillofacial Surgery: A Systematic Review and Meta-analysis

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ABSTRACT

Objective: The first objective of our meta-analysis study and systematic review has been the evaluation of the patients' treatment outcomes with immediate fibula transfer. Hence the second purpose of this study was the evaluation of the treatment outcomes of hybrid implants.

Methods: Using electronic databases like Cochrane Library, PubMed, ISI as well as Embase, we systematically reviewed the related studies conducted from 2015 to August 2020. The mesh terms were used to search for keywords—two reviewers after reading the full text and abstract, blinding, and independently extracted data. Meta-analysis was performed using Stata V16 software, funnel plots and forest plots were shown for the results.

Results: A total of 124 (Immediate fibula transfer) and 114 (hybrid implant) topics, abstracts, as well as full text have been obtained in our electronic searches. Finally, four 124 (Immediate fibula transfer) and five (hybrid implant) investigations matched fulfilled our inclusion criteria for doing a systematic review. The total failure rate and Flap complications were 7.14% and 12.8%, respectively. The survival rate of immediate reconstruction by fibula transfer was RR, 0.03 95% CI -0.01, 0.06. P = 0.11.

Conclusion: Jaw's immediate reconstruction, fibula flap, was affected, and its survival is high. Also, the success rate of hybrid implants has been reported high.

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INTRODUCTION

There is a difference in primary and secondary reconstruction for the treatment of maxillomandibular worldwide, and it is almost always discussed. Advantages and disadvantages have been reported for both treatments. The most important factors for decision making are the risk factors, patient's age, recurrence rate, and size of the tumor.^[1] After surgery, micro-vascular free-tissue transplantation helps replace the surgeons' muscle, skin, and bone.^[2] Studies reported survival rates in fibula flap and dental implants and immediate reconstruction with the fibula flaps and consequent implants.^[3-6] Hence, the first part of the present study evaluates the treatment outcomes in patients with immediate fibula transfer. In recent years, removable partial dentures and fixed prostheses have evolved to replace a missing tooth.^[7] The proposed hybrid implants can overcome the risk of damage to the mandible's anatomical structures and overcome sinus lifting procedures in the maxilla. One of the complications of surgery is the lack of primary stability during implant surgery. In hybrid implants, it is not an issue as the implant is stabilized using screws buccally or palatally in the maxilla and mandible.^[6-8] Hence the second objective of this study has been the evaluation of the treatment outcomes of hybrid implants.

KEYWORDS:

Immediate Dental Implant, Dental Implants, Surgery.

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METHOD

Search approaches

Using electronic databases like Cochrane Library, PubMed, ISI as well as Embase, we systematically reviewed the related studies conducted from 2015 to August 2020. Then, the Endnote X8.2 software program was used to manage electronic titles. The mesh terms were used to search for keywords:

(“Immediate Dental Implant Loading”[Mesh]) AND “Surgical Flaps”[Mesh]) AND “Tooth Loss”[Mesh]) AND “Jaw”[Mesh]) AND “Surgery, Oral”[Mesh]) AND “Prostheses and Implants”[Mesh]) AND “Dental Implants”[Mesh]) AND “Survival” [Mesh]) AND “Microvascular Density”[Mesh]) AND “Fibula”[Mesh]) AND “Diet”[Mesh]) AND “Speech”[Mesh]) AND (“Esthetics”[Mesh] OR “Esthetics, Dental”[Mesh])) AND “Tissue Expansion”[Mesh]) AND (“Jaw Fractures”[Mesh] OR “Jaw Neoplasms”[Mesh])) AND (“Reconstructive Surgical Procedures”[Mesh] OR “Mandibular Reconstruction”[Mesh])) AND (“Mouth”[Mesh] OR “Oral Surgical Procedures”[Mesh])) AND “Patient Satisfaction”[Mesh]) AND “Dental Implantation, Endosseous”[Mesh].

PRISMA^[9] significant considerations, as well as PICO or PECO approach, have been considered for performing our systematic review (Table 1).

Selection Criteria

Inclusion Criteria

1. Controlled clinical trials, retrospective and prospective cohort studies, as well as randomized controlled trial studies.
2. Microvascular fibula flap surgery
3. Jaw reconstruction after surgical operation of tumour
4. Dental implants after bone consolidation
5. Dental implant and immediate fibula transfer
6. In English

Exclusion Criteria

1. Case-Control Studies and Case Reports, In vitro studies, reviews, and animal studies
2. Recurrence of tumour was excluded
3. Incomplete or inconsistent data for the purpose of the present study.

Data Extraction and Meta-analysis Method

Investigations considered for the present review have been employed for data extraction, including years, research design, sample size, the age range and mean, flap failure, flap complications, Pain, Mobility, Infectio, Bone loss follow-up period, and survival. The quality of the studies included was evaluated with the Newcastle-Ottawa Scale (NOS).^[10]

The mentioned scale measures three aspects (comparability of cohorts, outcomes & selection) with nine items. According to these analyses, any investigation with the NOS scores ranging from 1-3 to 4 to 6 and 7 to 9 has been identified as high, medium, and low quality. Two reviewers after reading the full text and abstract, blinding, and independently extracted data.

The risk ratio with the 95% CI, the Mantel-Haenszel method, and the fixed-effect model was computed. A meta-analysis, forest plots, and funnel plots were done with Stata V16 software. I2 reported heterogeneity, and Random effects showed to deal with potential heterogeneity.

RESULTS

As mentioned earlier, we obtained immediate fibula transfer, 124 potentially relevant topics, and abstracts and titles in the electronic searches. Firstly, 73 studies have been obtained regarding the topic and abstract. Then, the full-text sources of the remaining 46 investigations have been evaluated for excluding 42 types of research because of the absence of the given inclusion criteria. Next, four studies have been considered that matched the criteria included in the study (Fig. 1).

Dental hybrid: According to the research design, Dental hybrid, we obtained 114 potentially relevant topics and abstracts in the mentioned electronic sources. Firstly, 73 studies have been obtained regarding the topic and abstract. Then, the full-text sources of the remaining 46 investigations have been evaluated for excluding 42 types of research because of the absence of the given inclusion criteria. Next, four studies have been considered that matched the criteria included in the study (Fig. 1). Selected studies were shown in Tables 2 and 3.

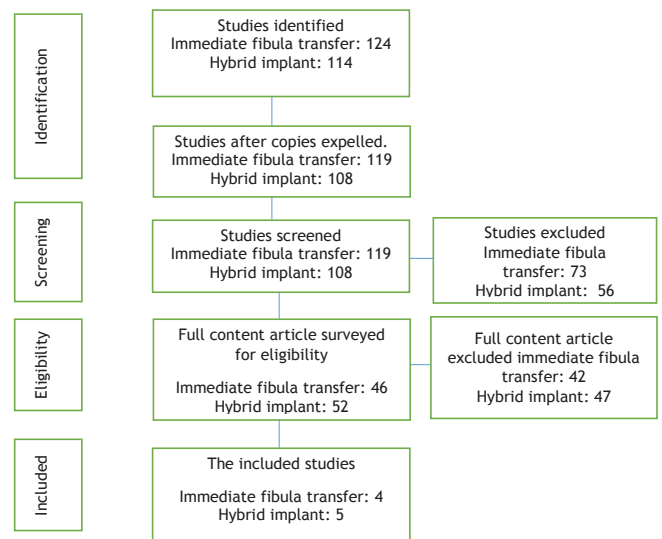


Figure 1: Study Attrition

Table 1: Inclusion criteria based on PECO or PICO strategies.

PECO or PICO strategy	Description of the first aim	Description of the second aim
P	Population/ Patient: patients who underwent maxillary resection or mandibular/reconstruction with the micro-vascular fibula flap	Population/ Patient: cases who underwent maxillary or mandibular reconstruction and resection
E	Exposure/ Intervention: immediate fibula transfer	Exposure/Intervention: hybrid implants
C	Comparison: Baseline and follow-up	Comparison: Baseline and follow-up.
O	Outcome: the survival rate, diet, speech, and aesthetics	Outcome: the survival rate, diet, speech, and aesthetics

The sample size of the first aim

Therefore, four studies (retrospective study) have been included. Totally, 210 participants were included. The mean age was reported in Table 2. The total failure rate and Flap complications were 7.14% and 12.8%, respectively (Table 2).

The sample size of the second aim

Therefore, five studies (4 prospective studies and one retrospective study) have been included. The Number of hybrid implants was 196. The pain, Mobility, infection, and bone loss outcome showed in Table 3.

The survival rate of immediate reconstruction by fibula transfer

Risk ratio equaled (RR, 0.02 95% CI -0.04, 0.08. P=0.49) among four studies. We did not find any significant difference between Baseline and after follow-up survival outcomes; the studies were not heterogeneous (p=0.72) (Figure 2). The funnel plot showed the Survival rate among four studies (Figure 3).

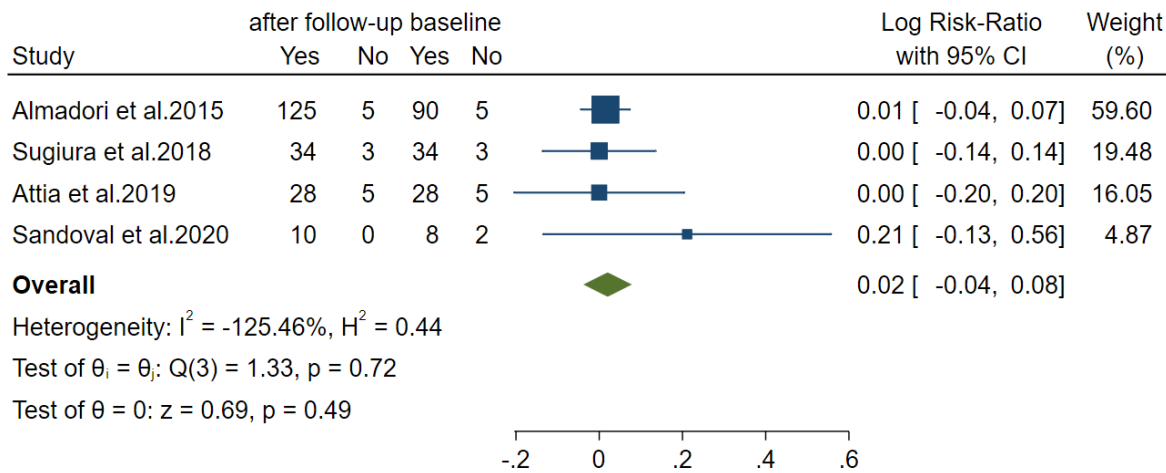
The survival rate of dental hybrid

Risk ratio equaled (RR, 0.03 95% CI -0.01, 0.06. P=0.11) amongst five investigations. We did not find any significant

Table 2: Investigations chosen for the first aim

Research. Years	Design	Size of the sample	Mean/range of the age (years)	Flap failure	Flap complications	Follow-up period	Survival	Bias assessment
Almadori et al. 2015 [11]	R	130 46 84	58 ±12.04	5 (3.8%)	9 (6.9%)	5 y	67.8%	7/9
Sugiura et al. 2018 [12]	R	37 26 11	≥80>	3	15	1 y	34	7/9
Attia et al. 2019 [13]	R	33 NR	NR	5	NR	1y	28	7/9
Sandoval et al. 2020 [14]	R	10 2 8	70	2	3	35 and 42 days	93%	7/9

R: a retrospective. P: a prospective study. NR: not reported.



Fixed-effects Mantel-Haenszel model

Figure 2: Baseline and follow-up (patients with immediate fibula transfer in oral and maxillofacial surgery).

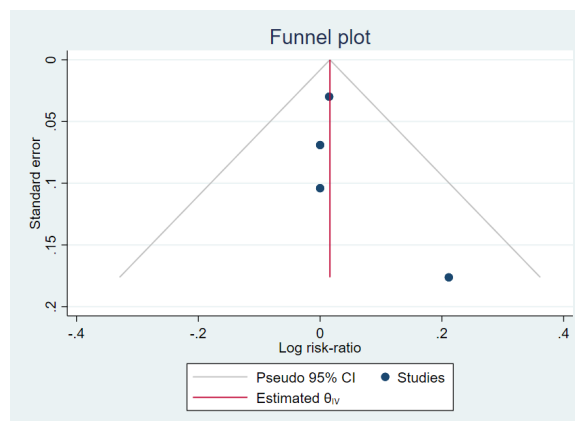
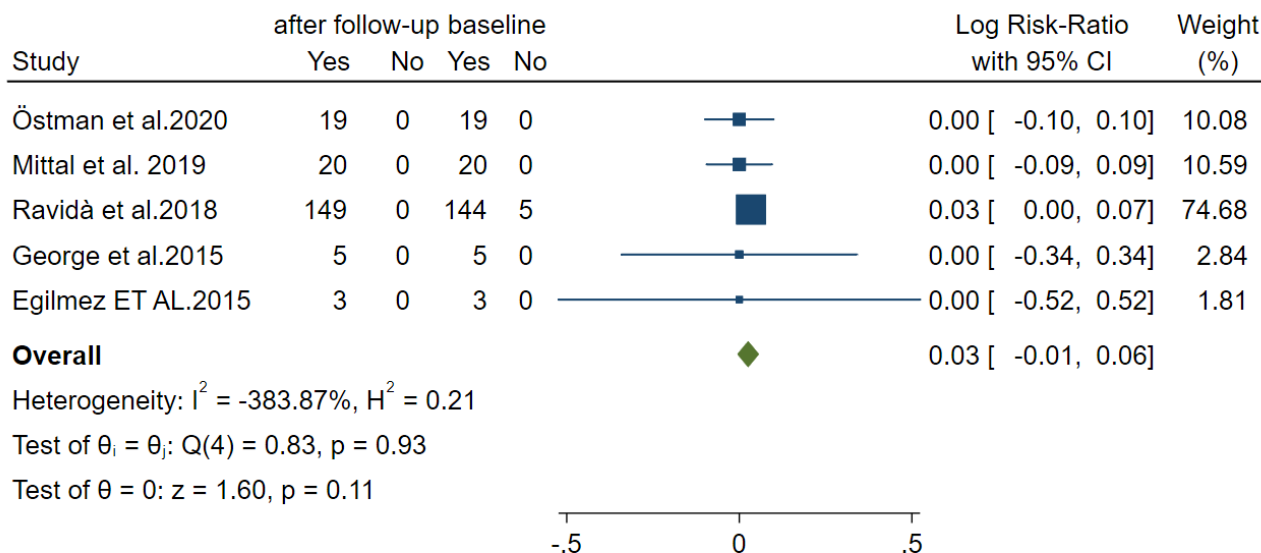


Figure 3: The funnel plot of Baseline and follow-up period of immediate fibula transfer.



Fixed-effects Mantel-Haenszel model

Figure 4. Baseline and follow-up (patients with the dental hybrid implant in oral and maxillofacial surgery).

Table 3: Studies selected for the second aim

Study. Years	Design	Sample size hybrid implants	Pain	Mobility	Infection	Bone loss	Follow-up period	Survival	Bias assessment
Östman et al. 2020 [15]	P	19	NR	NR	NR	NR	18-24 month	100%	7/9
Mittal et al. 2019 [16]	P	20	0	0	0	NR	6m	100%	8/9
Ravidà et al. 2018[17]	R	149	0	0	0	NR	9.6 y	96.7%	7/9
Mani et al. 2015 [7]	P	5	0	0		0	1y	100%	6/9
Egilmez et al. 2015 [18]	P	3	0	0	0	0	3-year	100%	8/9

R: a retrospective. P: a prospective study. NR: not reported.

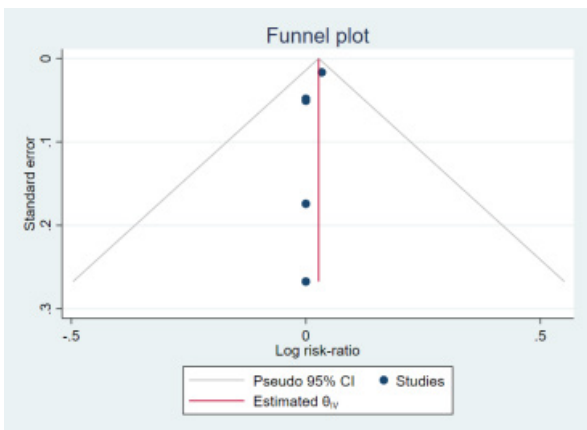


Figure 5: The funnel plot showed no statistically significant difference between the Baseline and follow-up of the dental hybrid implant

difference between Baseline and after follow-up survival outcomes; however, any significant differences did not exist ($p=0.93$) (Figure 4). The funnel plot showed the Survival rate among five studies (Figure 5).

DISCUSSION

The priority of oral tumor treatment is surgery, which may lead to degradation of the patient’s soft tissues as well as the bones’ structure. As a result, it can point to tooth loss. Reconstructing with the fibula graft can affect speech, swallowing, and

aesthetic functions. In this regard, applying implant-supported dentures and dental implants would be essential. The implants can also prevent the fibula graft bone, which avoids atrophy of the transplanted fibula graft[19]. Moreover, micro-vascular fibula flap surgery has been considered a valid and efficient procedure for the jaws’ reconstruction following the tumor surgeries. The above approach allowed placing the dental implants following the bones’ consolidation[13]. The Sandoval et al. [14] study suggests that sudden dental implants in the fibula-free flaps for reconstructing mandible do not enhance risks of consequences from surgical operations or radiation treatments.

In 2014, the Hybrid implant system was introduced. This system was strong enough to support the prosthesis. Various clinical parameters reported their success. There is a good fit for the framework in hybrid implants because all the implant plate components are flexible and can be well adjusted in close contact with the alveolar bone. The current meta-analysis and systematic review at the second objective findings show survival of hybrid implants was high.

CONCLUSIONS

Our analyses showed the jaw’s immediate reconstruction using the fibula flap was affected, and its survival is high. Also, the success rate of hybrid implants has been reported high. Given that there were few articles in this field, further

studies with large sample sizes and long follow-up periods are recommended.

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