



Review

Obturator versus flaps after maxillary oncological ablation: A systematic review and best evidence synthesis

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ABSTRACT

Maxillary defects can be resolved by prosthetic obturation, autologous tissue reconstruction, or a combination of both. However, there is still controversy in the selection of the optimal approach. Therefore, the aim of this study was to systematically review evidences comparing the performance of obturators and flaps in patients after maxillary oncological ablation. Both electronic and manual searching approaches were conducted to identify eligible evidence. Two reviewers independently assessed the risk of bias. In addition, the same reviewers independently extracted the data. Meta-analyses were performed using Revman 5.3, and best evidence synthesis was performed. Sixteen studies were included and a total of 528 participants were analyzed. All studies were assessed at low quality. Results of this meta-analysis showed weak evidence in the difference between obturators and flaps on the outcome regarding word intelligibility ($P = 0.004$) and masticatory efficiency ($P = 0.002$). However, no differences were detected regarding speech intelligibility and nasalance. All studies were compiled into the best evidence synthesis. The sum of 31 evidences was considered. Twelve evidences were evaluated at a moderate level, such as speech, mastication, pain, salivation, taste sensations, and mouth opening. Except the outcomes of word intelligibility, masticatory efficiency, and mouth pain, other moderate evidences showed no difference between obturators and flaps. In conclusion, both obturators and flaps might be effective in patients' rehabilitation functions after maxillary ablation. However, some advantages were observed when using surgical reconstruction over prosthetic rehabilitation. Additional high-quality studies are needed to provide more solid evidence before applying these results into clinical practice.

Introduction

Maxilla and midface defects caused by ablative surgery involve a high level of psychological and physical trauma in patients [1]. Reconstruction of maxillectomy defects is one of the most difficult challenges for the head and neck reconstructive surgeon [2]. Maxillectomy defects can be treated by prosthetic obturation, autologous tissue reconstruction, or a combination of both. However, selection of the optimal approach is still controversial.

Traditionally, ablative maxillary defects were managed almost exclusively with prosthetic obturators. However, over the past 20 years, vascularized free flaps have become increasingly integral to the overall reconstructive approach [3,4]. In several studies, it has been shown that surgical reconstruction may have advantages in terms of function and

aesthetic outcomes [5,6]. However, reports showing no evidence in the quality of life difference between obturation and reconstruction also exist [7,8].

According to Brown's recommendation, obturation is offered for class I–IIa,b defects, whereas a composite free-flap option is preferred for larger alveolar defects (class IIc) and class III–VI defects [9]. Presently, surgeons have not yet reached a consensus when to choose between both options. Therefore, the aim of this systematic review was to compare the performance of obturation and reconstruction in outcomes related to quality of life in patients after maxillary ablation.

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Methods

Search strategy

We conducted systematic searches for comparative studies regarding obturators and flaps using electronic search engines. In our study, the following databases were used: the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE via OVID, EMBASE, ProQuest, Chinese Biomedical Literature Database (CNKI), VIP Database and the Chinese Biomedical Literature Database (CBM). Search strategy using MEDLINE is provided in Supplemental material 1. Search strategies using other databases were similar. We also searched the National Institutes of Health (NIH) Ongoing Trials Register ClinicalTrials.gov (clinicaltrials.gov) for ongoing studies and the System for Information on Grey Literature in Europe (SIGLE) for grey literature. The final search was performed on 4th January 2018. In addition, all references lists of included studies were manually checked and reviewed to identify additional eligible studies.

Study selection and data extraction

Inclusion and exclusion criteria are shown in Table 1. Two reviewers independently reviewed each title and abstract of articles obtained from the searches and any disagreement was resolved by discussion with an arbitrator. Full-texts of potentially eligible records were obtained and were examined in detail to determine whether the study met the eligibility criteria. When necessary, authors were contacted to obtain additional information.

Two reviewers independently extracted the data using an extraction form that was specifically designed for this review. For each study, the following data were extracted: year of publication, country of origin, study type, patients' age and gender, follow-up range, interventions, and outcome measures.

Methodological quality assessment

The methodological quality of included studies was assessed using the Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) [10,11]. Bias domains included bias due to confounding, bias due to participants' selection into the study, bias due to interventions classification, bias due to deviations from intended interventions, bias due to missing data, bias due to outcomes measurement and bias due to selection of the reported result. The overall risk of bias of each study was assessed as low, moderate, serious, critical risk of bias or no information (Supplemental material 2). In this review, studies assessed at low risk of bias were defined as 'high quality', whereas others were considered as 'low quality'.

Meta-analysis

The meta-analysis was performed using RevMan version 5.3 (Cochrane Collaboration) [12]. For continuous data, mean differences (MD) or standard mean differences (SMD) with 95% confidence intervals (CI) were calculated. SMD were used when the calculation of

identical effects differed among studies. $P < 0.05$ was considered statistically significant for pooled MD or SMD determined by two-tailed Z-tests. Statistical heterogeneity between studies was evaluated by Cochran Chi-square test based Q-test and the I^2 static. When $I^2 < 50\%$, a fixed-effects model was applied, and when $I^2 > 50\%$, a random-effects model was applied. Furthermore, a fixed-effects model was applied when only two studies met the inclusion criteria and were sufficient to perform a meta-analysis. If clinical or methodological heterogeneity existed, subgroup analysis was performed. Publication and other reporting bias were assessed using the Begg's test if at least six studies were included in a meta-analysis.

Best evidence synthesis

In this study, a comprehensive summary of all findings comparing outcomes of obturators and flaps in maxillary reconstruction was drafted. However, if the findings were insufficient to be included in a meta-analysis, the best evidence synthesis (BES) system was employed that was introduced by Slavin [13,14]. This system considers the methodological quality, consistency findings with regard to numbers, and outcomes that were generated from the studies included. The rates were as follows:

1. Strong evidence, provided by consistent findings in ≥ 2 high-quality studies;
2. Moderate evidence, provided by consistent findings in 1 high-quality study and ≥ 1 low-quality studies, or in ≥ 2 low-quality studies;
3. Insufficient evidence, when only 1 study was available or findings were inconsistent in ≥ 2 studies.

Results were considered consistent when at least 75% of the studies showed results in the same direction, and was defined based on significance ($P < 0.05$). When a P value was not provided, this was specifically indicated. If ≥ 2 studies were of high methodological quality, we ignored the studies of low methodological quality.

Results

Search results

After electronic and manual searches and after removing duplicates, a total of 253 studies were identified. Of these, 222 were excluded after screening the titles and abstracts. After reading the full texts, 16 studies were included and 15 were excluded with reasons (Supplemental material 3). A flow diagram of this study is presented in Fig. 1.

Characteristics of included studies

This review included 16 prospective or retrospective studies [1,2,5–8,15–24], which were published between 1993 and 2017. Ten studies were conducted in Asia, 3 in Europe, and 3 in North America. In this review, a total of 528 participants were evaluated. The interventions used in the observational group were free flaps or local flaps, with

Table 1
Inclusion and exclusion criteria of this study.

Inclusion criteria	Participants: patients with maxillary defects including palatal defects, after surgery ablation due to neoplasms Interventions and comparison: exclusive obturation versus surgical reconstruction (with local flaps or free flaps, with or without prostheses). Implants can be used in both interventions Outcomes: Speech performance (speech intelligibility, nasalance, speech perception), diet (mastication, swallowing), swallowing performance, pain, appearance, complications and quality of life (speech, diet, pain, appearance, donor site morbidity, oral symptom, sociability, mentality) Study designs: Completed, published or unpublished studies including clinical trials, cohort studies and case series No language restriction was applied
Exclusion criteria	Other surgical methods didn't involve grafts or flaps Case reports or reviews

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