

# Immediate Implant Post-Extraction of Impacted Maxillary Canine: Systematic Review

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## Review Article

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## Abstract

**Introduction:** When impacted maxillary canines are not amenable to orthodontic traction or reimplantation, extraction is the only option available, followed by implant placement; this is a challenge due to the bone resorption frequently associated with complex tooth extraction that often necessitates bone grafting. Immediate dental implant placement appears to be the adequate strategy to replace missing teeth.

**Objective:** The aim of this systematic review was the evaluation of implant placement immediately after removal of maxillary canine impacted.

**Methods:** Detailed search in PubMed and Cochrane databases to obtain information on all reported cases and postoperative outcomes. There were no restrictions with regard to publication status or language of publication.

**Selection criteria:** Only included all clinical reports of at least 1-year follow up and that treated by immediate implant in maxillary canine impacted extraction.

**Results:** The initial database search produced 135 titles, after careful examination only 11 reports considered to be met the criteria for inclusion. The remaining reports were to be no met the criteria for inclusion. The results indicated a success rate significant for the procedure of immediate implant placement into impacted maxillary canine extraction socket accompanied by guided bone regeneration (GBR). This procedure allowing implant anchorage and primary stability to achieved.

**Conclusion:** Our review suggest that this treatment is viable and with a good outcome, although more works is needed to determine adequate the results and thus determine the potential impact of this treatment alternative.

**Keywords:** Review Dental implants; Maxillary impacted canine; Immediate implant; Immediate placement

## Introduction

Impaction is defined as the failed eruption of a permanent tooth with a completely developed root; maxillary canines are the second most frequently impacted teeth after the third molars, with a prevalence ranging from 0.9 to 5 per cent [1], and the palatal displacement is more frequent than the buccal one [2]. The management of impacted canines is one of the most complicated aspects of dento-alveolar surgery. Impacted canines are problems frequently encountered by the orthodontist, general dentist and oral and maxillofacial surgeon [3]. Have proposed different treatment strategies for impacted maxillary canines, ranging from interceptive approaches to guided forced eruption or extraction and orthodontic space closure [1,2]; however, if traction is not feasible or the patient refuses orthodontic treatment, an alternative solution is to remove the impacted tooth and immediately place an implant [4]. Currently is a common procedure during the same surgery, the placement of an implant immediately after tooth extraction [5,6]. Some recent clinical systematic reviews have indicated it as a very promising approach in selected cases [7,8], including immediate loading of post-extraction implants placed in infected sites [9]. The main advantage being the reduction in surgery and treatment time [8]. In the case of a impacted maxillary canine tooth, the possibility of immediate implant placement after extraction depends on the presence of adequate residual apical bone; this is necessary to allow the implant to be positioned and anchored bicortically with good primary stability [10]. Within the literature have reported cases of implants installed after the removal of a retained canine with 1- to 8-year follow-up [11]. However, there are no studies of systematic reviews or similar.

## Objective

The present review sought to synthesize the most up-to-date publications to evaluate the effectiveness of immediate implant placement into impacted maxillary canine extraction socket.

## Methods

### Search Strategy

Searched the PubMed and Cochrane databases from 1990 to the present (January 2017). The research complemented with a manual search of the reference lists of each selected article.

**Search terms:** The following search terms (keywords) were selected: - Immediate [All Fields] AND implant [All Fields] AND placement [All Fields] AND Extraction [All

Fields] AND removal[All Fields] AND ("maxilla"[MeSH Terms] OR "maxilla"[All Fields] OR "maxillary"[All Fields]) AND ("tooth, impacted"[MeSH Terms] OR ("tooth"[All Fields] AND "impacted"[All Fields]) OR "impacted tooth"[All Fields] OR "impacted"[All Fields]) OR "canine"[All Fields]) unconventional [All Fields].

**Inclusion / Exclusion criteria:** Inclusion criteria included case reports and clinical studies that had:

- Maxillary canine impacted with implant immediate.
- With Guided bone regeneration (GBR)
- Minimum, one year follow-up.
- Exclusion criteria for reports or studies included:
- Procedures that do not include the implant immediately after the removal of the maxillary canine retained.
- Results of the removal technique with a short follow-up period (less than 1 year of control).

### Selection Process

The researcher select in 3 stages. First, 135 articles (PubMed, Cochrane) were found in the search, all titles were selected and then the non-relevant publications deleted. During the second stage, all the publications they analyzed through their summaries removing the duplicates. Independently selecting each of the abstracts to obtain articles that met the inclusion criteria. Finally, after this search, the relevant articles and reference lists analyzed to add more articles that met the criteria. The quality of the studies evaluate according to the classification of the levels of scientific evidence in medicine posed by the Oxford Center Study Analysis.

For the study and a summary of each publication included, the following aspects followed:

- Immediate implant.
- Removal of maxillary canine impacted.

## Results

### Data Extraction

The selection process of the articles summarized in the Figure 1. Our search strategy permitted to identify 135 articles related to the research topic found. 109 articles were excluded when evaluating the titles and did not meet the inclusion criteria. 12 articles were excluded because they were repeated in the results of the search, leaving 14 articles to be analyzed in their totality, of

which 2 items was excluded for installing the Implant without doing the extraction of the impacted canine and 1

article for being a poster. Being 11 articles that met the inclusion criteria.

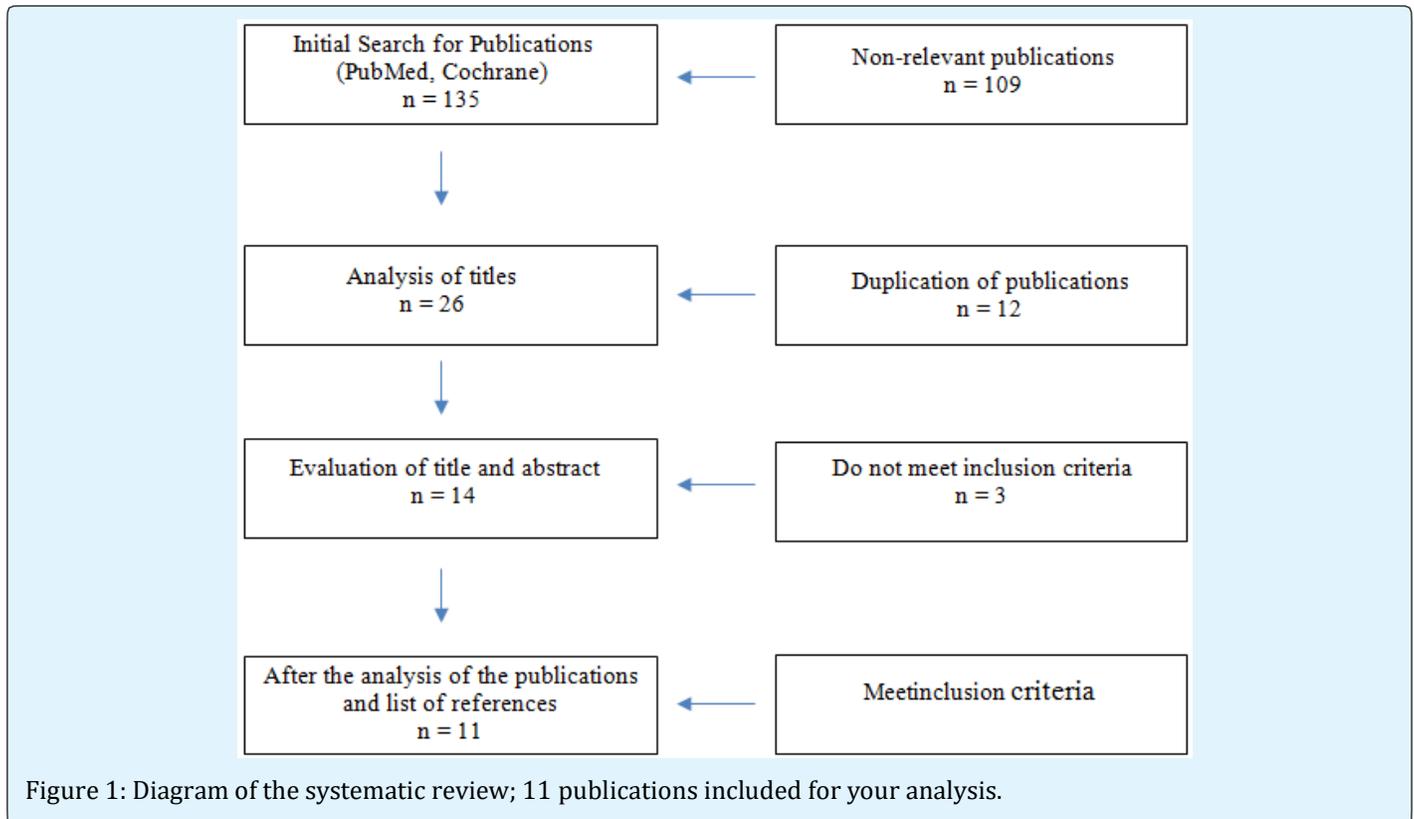


Figure 1: Diagram of the systematic review; 11 publications included for your analysis.

### Evaluation of Validity

The degree of intra observer concordance Kappa was 0.92 for the selection of each report. Obtaining a measure of the consistency, according to the criteria of Landis and Koch, almost perfect. The clinical study reports evaluated according to their methodology and cataloged as individual case studies, case series and case reports.

**Evaluation of implant placement immediately after removal of maxillary canine impacted:** Analyzed 11 publications on the treatment of placing an immediate implant after performing the extraction of an impacted maxillary canine, with a minimum control of 1 year to evaluate the postoperative results (Table 1). Of all the

publications analyzed, 1 prospective study was obtained [12], 3 case series [4,10,11,13] and 7 case reports [14-19]. The impacted canines extracted through a buccal or palatal total flap and osteotomy. Ending with Guided bone regeneration (GBR)-(Alloplastic graft material, autologous bone or the combination of both) [4,10-14,16-19], only one publication does not report whether or not I use GBR [15]. All publications report a success of 100% of the cases presented, with a follow-up ranging from 1 to 8 years [4, 10-19], and 5 of them reported that they installed a provisional crown during the same surgery [4,12,15,16,18].

Study	Type of Study	Treatment	GBR	Sample	Follow-Up	Success %
Demarosi, et al. 2016[4]	Case series	Removing the impacted canine, placing immediate implant, provisional.	Bio-oss (bovine bone mineral), physiograft gel, autogenous bone.	12 implants	5 years	100
Mithridade, et al. 2015[11]	Case series	Removing the impacted canine,	Bio-oss (bovine bone mineral)	5 implants	5-8 years	100

		placing immediate implant				
Zuiderveld, et al. 2015[12]	Case report	Removing the impacted canine, placing immediate implant, provisional.	Autogenous bone, Bio-Oss (bovine bone mineral)	2 implants	1 year	100
Davarpanah, et al. 2015[13]	Case series	Removing the impacted canine, placing immediate implant	Bio-oss (bovine bone mineral)	15 implants	1-8 years	100
Agabiti, et al. 2014 [14]	Case report	Ridge split, Removing the impacted canine, placing immediate implant.	Equine collagen sponge (Gingostat)	1 implant	3 years	100
D'Amato, et al. 2014[15]	Case report	Removing the impacted canine, placing immediate implant, provisional	Does not refer	2 implants	2 years	100
Mahesh, et al. 2012[16]	Case report	Removing the impacted canine, placing immediate implant, provisional	NovaBone (calcium phosphor silicate graft material)	1 implant	1 year	100
García, et al. 2009[17]	Clinical prospective	Removing the impacted canine, placing immediate implant	Autogenous bone	10 implant	1-3.5 years	100
Cardaropoli, et al. 2007[18]	Case report	Removing the impacted canine, placing immediate implant, provisional	Bio-Oss (bovine bone mineral)	1 implant	1 year	100
Peñarrocha, et al. 2007[10]	Case report	Removing the impacted canine, placing immediate implant	Autogenous bone	2 implant	1 year	100
Mazor, et al. 1999[19]	Case report	Removing the impacted canine, placing immediate implant	Demineralized freeze-dried bone allograft	2 implant	1 year	100

Table 1: Studies evaluating the placement of immediate implants from the extraction of an impacted maxillary canine with a minimum follow-up of 1 year postoperative. GBR: Guide bone regeneration.

## Discussion

The clinical management of impacted canine can be challenging and frustrating [3]. When patients are unwilling to accept orthodontic treatment and/or the impacted canines are in a high position precluding

orthodontic traction, the treatment of choice is extraction [18]. In this situation, Mazor, et al. [19], proposes the alternative of installing an implant immediately after the removal of the impacted maxillary canine. The procedure based on the application of the immediate post-extraction implants, which is a procedure that has been widely

documented and has a success rate similar to implants in healed site's placement [5-9]. Anitua, et al. [9], recently reported that it can be performed Immediate implant placement into infected sockets in association with immediate loading, With an average follow-up of 6 years (range 1 to 8 years) and 65% of the implants had a follow-up time > 5 years. No implant failure occurred and the implant success rate was 93%. In the same way, Lang, et al. [20], report to the mean survival of the post-extraction implants with immediate loading has been 98.4% (after 2 years of follow-up) and has decreased to 97.5% with a range of 95.2 to 98.8% (after  $\geq 3$  years follow-up). The publications analyzed in this review are prospective studies, case series and case report, which result in 100% success in all treated cases (53 implants). These installed immediately after the removal of the impacted maxillary canine, both palatal and labial.

In addition, 5 reports made immediate provisionalization, provided there is a good primary stability of the implant installed [4,12,15,16,18], obtaining in some cases an implant stability of > 45 Ncm and a good aesthetic result after the provisionalization [12]. This insertion torque is ideal, because, Benic, et al. [21] and Gallucci, et al. [22] mention that to make immediate loading the implants must be inserted with a torque  $\geq 20$  to 45 Ncm Or an Implant *Stability Quotient* (ISQ)  $\geq 60$  a 65. Coinciding with Morton, et al. [23], who also mentions, that primary stability is an important parameter to yield proper survival of implants for all placement protocols. Qabbani et al [24], concludes that, the insertion of immediate implants in fresh extraction sockets together with grafting the circumferential gap between the bony socket wall and the implant surface with bovine bone granules was able to preserve a greater amount of alveolar ridge volume when compared with an extraction socket that left to heal in a conventional way.

Only one publication does not report the use of GBR [15]. All the others, indicated to perform GBR in the area of the osteotomy of the impacted canine, to improve the stability of the implant and not to leave exposed the apical third of the same, in cavity of the osteotomy. Nevertheless, Mazor, et al. [25], reported an alternative, where with the help of a computerized surgical guide performs the installation of 2 implants without need to remove impacted canines. Mentions that this is especially possible in cases where the canines have a labial position, because there is a good amount of remaining bone tissue. Being very important the selection of the case. Providing a relatively short treatment time, a less invasive procedure, and fewer potential complications compared to the extraction of an impacted canine, massive bone grafting,

and implant placement; although they do not refer to the follow-up time of the 2 implants installed.

Likewise, Davarpahah, et al. [26] described several cases of implants that placed through the impacted teeth, to avoid invasive surgical removal. Of the seven implants placed into four impacted teeth, all healed uneventfully except a short (8.5-mm) implant that became mobile after 4 months. Nevertheless, the canines impacted were removed finally after 6 months the osseointegration. They suggested that implant placement through an impacted tooth might not interfere with implant integration or harm occlusal function, at least in the short term. The small number of publications found in literature may be a good precedent for considering the success of this treatment alternative. Although the outcome characteristic of all publications is a 100 % of successful in cases with at least 1 year of follow-up, more study warranted before this unconventional procedure might be considered as a possible clinical option when we are facing an impacted tooth.

## Conclusion

Our review suggest that this treatment is viable and with a good outcome, although more works is needed to determine adequate the results and thus determine the potential impact of this treatment alternative.

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