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Case Report

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Autotransplantation of Impacted Maxillary Canines: A Conservative Surgical-Orthodontic Strategy – A Case Report

Sarfi D*, Bouchghel L, Traore A, Khazana M, Bourzgui F and Ben Yahya I

N8, lotissement lalla zhira, Ain Sebaa, Casablanca, Morocco

ABSTRACT

The inclusion of maxillary canines is a common anomaly. Its management is multidisciplinary and requires surgical and orthodontic expertise, as well as a reasonable and well-thought-out treatment plan. The aim of this work is to report the management of an impacted canine within the Department of Surgical Dentistry at the Consultation and Dental Treatment Center of Casablanca, Morocco.

Case presentation

This report describes the surgical and orthodontic management of a 17-year-old Moroccan female patient presenting with an impaction and complete transposition of tooth 23, associated with tooth 21. Several treatment options were considered, among which autotransplantation of tooth 23 was deemed the most appropriate, with the goal of improving facial aesthetics and restoring functional occlusion.

Discussion

Ortho-surgical repositioning of the impacted tooth is the most commonly desired and adopted therapeutic approach; however, other options such as autotransplantation can be salvaging solutions in certain clinical scenarios. Given the complexity of the case and the socio-economic context, autotransplantation was the most efficient solution for our patient to restore aesthetics and establish functional occlusion.

Conclusion

A proper assessment of all aspects of the anomaly at the beginning of treatment provides valuable guidance for decision-making among the various therapeutic options. Autotransplantation techniques aim to preserve as much bone volume as possible in order to allow for optimal implant placement if needed in the future.

***Corresponding author**

Sarfi D, N8, lotissement lalla zhira, Ain Sebaa, Casablanca, Morocco.

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Introduction

The correct positioning of teeth on the dental arches determines both the aesthetics of the smile and the orofacial functions. This alignment results from a physiological process: tooth eruption. When disrupted, some teeth may fail to emerge at the expected time, leading to retention or impaction.

A tooth is considered *impacted* when it remains enclosed in the bone tissue beyond its normal eruption age, surrounded by its pericoronal sac, and without communication with the oral cavity [1]. This condition can affect several teeth, with a predilection for third molars and maxillary canines, the latter being impacted in 0.9 to 2.2% of cases [2]. Canine impaction shows a clear female predominance, with a unilateral palatal location observed in over half the cases [3]. In Morocco, a study conducted by Bourzgui F. and collaborators at the Ibn Rochd University Hospital of Casablanca reported that the maxillary canine is the most frequently impacted tooth (66%) [4].

The clinical consequences of this anomaly can be multiple: infectious, cystic, neurological complications, or even root resorptions of adjacent teeth, the latter being the most frequently observed [5]. Several etiological factors may be involved, whether systemic (genetic, hormonal, nutritional), local (lateral incisor agenesis, supernumerary teeth), or iatrogenic (poor timing of orthodontic retraction) [6-10].

The clinical diagnosis relies on well-described signs, notably *Quintero's sign*, which is pathognomonic, as well as the palpation of a hard, painless bulge in the area of concern (Figures 1 and 2) [11]. However, definitive diagnosis and treatment planning require three-dimensional imaging. *Cone Beam Computed Tomography* (CBCT) is an essential tool in this context, as it allows precise evaluation of the impacted tooth's position, bone quality, root development, proximity to adjacent structures, and possible resorptions [12,13].

Management relies on an informed therapeutic decision, which may include: simple monitoring, orthodontic traction, surgical extraction, or dental autotransplantation. The latter represents an interesting therapeutic alternative at the intersection of surgical

and orthodontic disciplines. It is defined as the transplantation of a tooth—whether impacted or not—from one site to another recipient site (either post-extraction or surgically prepared) within the same individual [14].

When conducted in accordance with biological and surgical principles, autotransplantation allows the restoration of a functional and aesthetic dentition, while preserving alveolar bone volume through stimulation of the periodontal ligament. It also represents a valuable transitional solution while awaiting implant rehabilitation in young patients [15].

Through this work, we present a clinical case illustrating the use of autotransplantation of an impacted maxillary canine, within an integrated approach where surgery plays a central role in the success of orthodontic treatment.

Case Report

We present the case of a 17-year-old Moroccan female patient who was referred to the Department of Surgical Dentistry with an aesthetic concern due to the visible absence of an anterior tooth, which significantly compromised the harmony of her smile.
The Extraoral Examination revealed a well-balanced facial profile: an oval and symmetrical face with mildly defined nasolabial folds. The profile was flat, featuring a prominent nose, a harmonious nasolabial angle, satisfactory lip projection, and a chin well-aligned with the ortho frontal plane. Smile analysis highlighted a marked disharmony related to the missing anterior tooth.

On Intraoral Examination, the patient displayed moderate oral hygiene and a thick periodontal biotype. A vestibular bulge was observed in the region of tooth 21, suggesting a possible impaction. Occlusal analysis revealed a bilateral Class I molar relationship, a Class II canine relationship on the right side, and an undetermined canine relationship on the left side due to the clinical absence of tooth 23. The maxillary arch was broad and ovoid in shape, with the absence of tooth 21 and the persistence of the primary tooth 65.

Clinical photographs illustrating both extraoral and intraoral findings are presented in Figure 1.

Figure 1: Pre-Treatment Photographs showing the Intraoral Aspects.

Radiographic Assessment

The panoramic radiograph confirmed the absence of tooth 21 on the arch and revealed a radiolucent image in its region, suggestive of an impaction. The presence of an impacted tooth 23 was also suspected. No pathological signs were observed in the surrounding bony structures. The lateral cephalometric radiograph showed a minimally rotated mandible and clear upper airways (Figure 2).

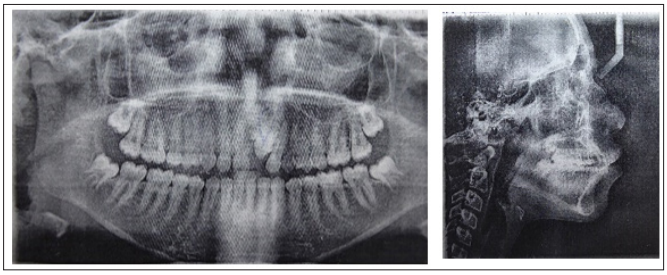

Figure 2: Pre-Treatment Panoramic Radiograph and Lateral Cephalogram showing the Absence of Tooth 21 and Suspected Impaction of Tooth 23.

Diagnosis and Treatment Strategy

Clinical and radiographic analysis led to the diagnosis of a dento-maxillary disharmony of dental origin, in a normodivergent skeletal pattern, associated with the impaction of teeth 21 and 23. Following multidisciplinary evaluation, the chosen treatment strategy aimed to bring both impacted teeth into the arch, while restoring facial aesthetics and functional occlusion.

Given the clinical complexity (impaction associated with partial transposition) and socio-economic considerations, autotransplantation of the impacted tooth 23 was selected as a combined surgical and orthodontic solution—a procedure well-documented in the literature for its success.

Orthodontic treatment using a fixed multibracket appliance was initiated, with space opening for tooth 21. Once adequate space was achieved, the surgical procedure was performed in the Oral Pathology Unit. It involved the **atraumatic extraction** of the primary tooth 65, followed by the **preparation of the recipient site** using a drill mounted on a handpiece. The impacted tooth 23 was then carefully extracted, followed by an **apicoectomy** to adjust root length and ensure optimal morphological adaptation to the recipient socket. The tooth was immediately repositioned into the prepared alveolus and stabilized using a splint (Figure 3).

Figure 3: Photographs Illustrating the Surgical Steps involved in the Autotransplantation of Tooth 23.

Postoperative Follow-up

Postoperative radiographic follow-up showed progressive integration of the transplanted tooth, with periapical bone densification. However, widening of the periodontal ligament space and apical narrowing of the canal lumen were observed, indicating the need for additional endodontic treatment to ensure medium-term stability (Figure 4).

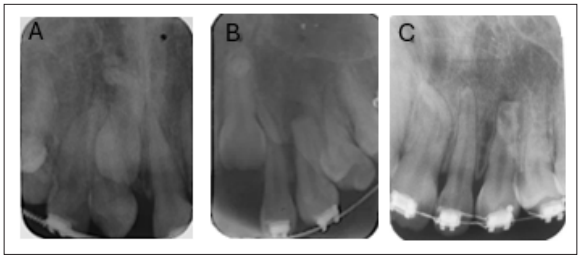

Figure 4: Radiological Follow-up up to 18 Months showing Progressive Bone Healing and Integration of the Transplanted Tooth. A. Preoperative Radiograph B. Radiographic Control after Transplantation C. 18 Months Follow-up.

Follow-up Outcome

After 24 months of follow-up, the clinical outcome was favorable. Teeth 21 and 23 were successfully integrated into the dental arch. The arches were well aligned, occlusal relationships were functional, and facial aesthetics had significantly improved, resulting in a more harmonious and balanced smile.

Figure 5: Intraoral Photographs at 24-Month Follow-up Showing Successful Integration and Positioning of Teeth 21 and 23 within the Dental Arch.

Discussion

The diversity of therapeutic approaches adopted to manage the inclusion of maxillary canines is widely described in the literature. While orthodontic-surgical treatment of the impacted tooth is the most commonly desired and adopted therapy, therapeutic abstention, auto-transplantation, or even extraction of the canine can be life-saving options in certain situations.

Auto-transplantation of the impacted canine is a technique that can be considered when traction is not possible (root deformation, patient's age, patient refusal, etc.). It is defined as the transplantation of embedded, impacted, or erupting teeth from one site to another surgically prepared site in the same individual. This procedure involves extracting the impacted tooth, preserving it in a saline solution to protect the collagen fibers of the ligament, and then creating a new alveolus with a bone drill where the tooth will be ideally positioned [15]. The tooth is placed in the therapeutic alveolus, the flap is sutured, and a semi-rigid splint is applied for six to eight weeks. Subsequently, endodontic treatment of the replanted tooth may be considered, as was the case with our young patient. Bouchghel L et al. in a systematic review on dental auto-transplantations, found that endodontic treatment and its indications were discussed in all studies. However, in a study conducted by et al [16]. endodontic treatment was only indicated in cases of signs of periapical infection or inflammatory root resorption [17].

Auto-transplantation inevitably leads to ankylosis followed by root resorption (rhizolysis), which typically appears about ten years after placement on the dental arch. Although the tooth will eventually be lost, this technique allows the tooth to be maintained throughout the child's growth and serves as a temporary measure before implant placement [18]. Claudia A.A. et al. in a systematic review, found a success rate of 89.68% and a survival rate of 98.21% for dental auto-transplantations over an average follow-up period of 6 years and 3 months [19]. According to this author, success is defined as the presence of the tooth in the mouth without ankylosis or inflammatory root resorption, with normal mobility and a minimum follow-up period of 12 months. This success depends on several factors, including the anatomy and stage of root formation of the transplanted tooth, the type of tooth, the surgical technique used, the presence of adequate bone support, as well as the method and duration of stabilization [20].

Our patient, aged 17 years, showed good root development of the canine with an appropriate shape and a fully closed apex. We performed the most atraumatic surgical extraction possible and carried out an apicoectomy since the root was very long before reimplanting it into the pre-drilled recipient site corresponding to the position of tooth 63. Several authors agree that the optimal timing to perform this therapy is when the tooth is not fully developed. Increased survival and success rates with auto-transplanted teeth with open apices compared to teeth with closed apices have been reported by D Denys et al. [21].

In the same vein, Andreasen et al. [22], in earlier reports, support this thesis and state that periodontal healing without root resorption is closely related to the stage of root development and decreases as root development progresses. However, in our patient, although the apex of the canine was already closed, we did not have a plethora of therapeutic options due to the complexity of the clinical situation, which involved the complete transposition of the impacted canine with the lateral incisor, preventing any attempt at traction and orthodontic-surgical placement, as well as its position relative to the central incisor blocking its eruption. Therefore, the canine was destined for extraction, and under these conditions, auto-transplantation represented a rather beneficial alternative for the young patient.

This aligns with the results found by Chung et al. [23] in their systematic review of teeth reimplanted with closed apices, where survival rates as high as those for teeth with open apices were observed, around 98%. Several factors must be considered for the success of this management approach, including the surgical technique. A poorly mastered or poorly performed surgical technique can lead to serious complications such as root resorption or ankylosis of the reimplanted tooth [24]. Bishara et al. state in their study that the atraumatic nature of the surgical technique helps preserve the bone and periodontal support, thereby protecting Hertwig's root sheath and the pulp tissue [25]. According to this author, ankylosis may also be related to the root length at the time of transplantation.

Our young patient had a root length that was too long relative to the recipient site, which was the position of tooth 63 on the arch, which is why an apicoectomy was performed to better adjust this length. D Denys et al. in a systematic review, observed an association between intervention success and the presence of deciduous teeth at the implantation site, as well as subsequent orthodontic treatment. Socio-economic considerations also play a role in decision-making for managing maxillary canine impactions [21].

In our context, within the dentofacial orthopedics department at the Dental Consultation and Treatment Center of Casablanca, the cost and duration of orthodontic treatment involving traction and positioning of the impacted tooth, or that of implant rehabilitation,

can be inaccessible for many low-income families. The goal is to provide the patient with a solution by replacing the missing tooth unit in the short to medium term, thereby restoring the aesthetic and functional damage caused by the absence of the canine. Autotransplantation thus represents an efficient option in this case for our young patient to restore aesthetics and establish a functional occlusion.

Conclusion

A thorough and early analysis of the clinical situation, both surgically and orthodontically, is a fundamental prerequisite to guide the therapeutic strategy for dental positional or inclusion anomalies. In the present case, the surgical option of dental autotransplantation, integrated with orthodontic treatment, proved to be an effective and conservative solution.

This surgical approach aims not only to restore the continuity of the dental arch and reestablish a functional occlusion but also to preserve the alveolar bone capital as much as possible, thus ensuring better conditions for a potential future implant rehabilitation if necessary.

In the medium term, this combined therapy allowed us to satisfactorily address the patient's main aesthetic concern while avoiding more invasive and costly prosthetic solutions. The successful integration of the transplanted tooth and the placement of the included tooth resulted in a harmonious, functional, and aesthetically pleasing clinical outcome, confirming the relevance and value of transplantation surgery in complex cases.

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