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ECTOPIC ERUPTION OF THE FIRST PERMANENT MOLARS MANAGED WITH TRANSPALATAL ARCH: TWO CASES REPORT

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ABSTRACT

Aim The ectopic eruption of the first permanent molars is a local disorder characterized by the eruption of these teeth apical to the distal undercut of the second deciduous molars. Two different cases diagnosed with an irreversible ectopic eruption of a maxillary first permanent molar and treated with a trans-palatal arch (TPA) are reported.

Cases presentation The first case of an 8 year-old male presented an irreversible ectopy of the first permanent molar, exacerbated by an hypoplasic maxilla. It was decided to use a TPA to derotate and distalize the first permanent ectopic molar and to perform subsequently serial extractions of the first permanent premolars to recover space in the arch. The second case of another 8 year-old male showed a bilateral ectopy of the maxillarypermanent first molar, with a marked mesial rotation. A similar approach with a TPA to derotate and distalize the two molars was adopted.

Conclusions In both cases the TPA used to derotate and distalize the first permanent ectopic molars proved to be a valid treatment approach due to its simplicity and effectiveness.

KEYWORDS

Ectopic eruption; First permanent molars; Orthodontics; Trans-palatal arch; Pediatric dentistry.

1. INTRODUCTION

The dental eruption is a very complex phenomenon influenced by multiple factors which act at the same time to obtain a normal eruption; [1] however, this process could be modified by genetic, molecular, cellular or tissutal factors, ultimately leading to eruption disorders, also known as ectopic eruption [2]. Most dental eruption disorders develop during the dental transition phase, and the most common involved teeth are the first permanent maxillary molars and canines [3]. The ectopic eruption of the first permanent molars is a disorder characterized by the apical displacement of the tooth bud, that becomes stuck under the equator of the crown of the second deciduous molar, being unable to reach the occlusal plane. As reported by the literature, the constriction of the maxillary arch and the severe crowding are risk factors for the ectopic eruption of the first permanent molar and should be looked at as valid parameters to perform an early diagnosis of this anomaly [4] Radiographically, when an overlap between the crown of the first permanent molar and the root of the second deciduous molar is seen, a diagnosis of ectopic eruption could be made. Therefore, this anomaly can be diagnosed through radiographic examination before the eruption of the tooth and be classified in four grades [3,4]. (Fig. 1)

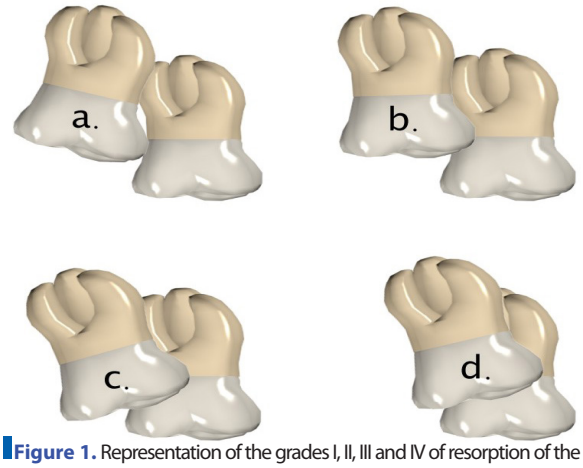

Figure 1. Representation of the grades I, II, III and IV of resorption of the second temporary molar inspired by the article of Barbeira-Lache et al, and modified by MIP.

The incidence of the ectopic eruption of first permanent molars is relatively common: there is a prevalence ranging from 1.8% to 6% according to Bjerklin et al. or of the 3% of the population according

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to Moyers et al. and Young et al. [2,5,6]. There is no distinction of ethnicity, [7] but a gender preference with the majority of patients being males [6,8]. It has been shown that the prevalence increases in subjects with a cleft palate reaching up to 21.8% of children with a cleft palate [9,10]. Moreover, this dental anomaly may occur in both arches even though it is more common in the maxillary arch, [11] and there is a one-to-five ratio between unilateral and bilateral cases [2].

It is known that the ectopic eruption of the permanent first molar can be classified into reversible and irreversible, [2] and the former are called "jump cases", where the molar corrects itself spontaneously resuming its normal eruption pattern; the latter are called "hold cases", where the first permanent molar remains in contact with the distal part of the second deciduous molar in the cervical area and fails to erupt in a normal position, thus requiring orthodontic treatment [6].

There are different treatment options that could be used to treat the ectopic eruption of the first permanent molar, one of these is the use of transpalatal arch (TPA) which could provide different movement of molars and it is very useful because being a biomechanics determinate system it provides a system of forces and angular moments that are more predictable and controlled of the straight wire appliance [12].

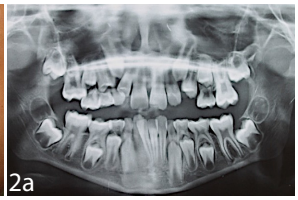
The purpose of this paper was to report two different cases diagnosed with irreversible ectopic eruption of maxillary first permanent molars, both treated with a TPA.

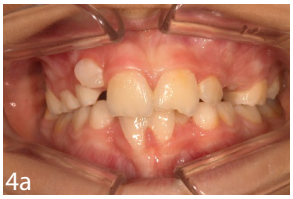
2. CASE PRESENTATION

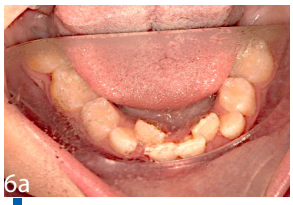
2.1 CASE 1

An eight years and nine months old male patient came to our observation, because the parents were worried about his crooked teeth. A complete orthodontic check-up was carried out: photographic examination, orthopantomography, cephalograms in both lateral and postero-anterior projections, and study models of the dental arches.

The clinical examination revealed that the dental midlines were off because the upper midline was deviated to the left side in regard to the facial midline plane, giving an asymmetrical and disharmonious appearance to the smile. A moderate mandibular crowding was present, along with a maxillary skeletal contraction. Ectopic first molars were clinically appreciable bilaterally in the upper arch.







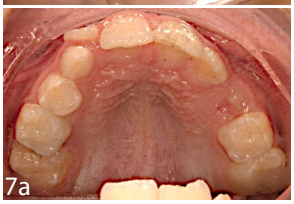
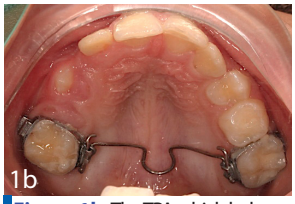


Figure 1a,2a,3a,4a,5a,6a,7a. Initial condition.

The orthopantomography allowed to classify both upper first molar as an irreversible type III because the mesial margin of the first permanent molar was significantly overlapped with the distal undercut of the second deciduous molar and had caused a partial resorption of the crown and root of the deciduous tooth. Arch expansion would not have been sufficient to provide the necessary amount of space to allow all the teeth to erupt properly. Therefore, it was decided to extract the second deciduous molar and use a TPA to derotate and distalize the first permanent ectopic molar and subsequently to perform serial extractions of the first permanent premolars. It was decided to use the TPA because it is a very comfortable appliance for patients and could provide important modifications of the first molar position in a short time. The treatment with TPA lasted eighteen months. In the mandible a lingual arch was used to maintain the arch length during the serial extractions phase. At the end of this phase of treatment the first molars were in a correct class I relationship, the premolars and the canines were correctly erupted, and crowding was relieved.



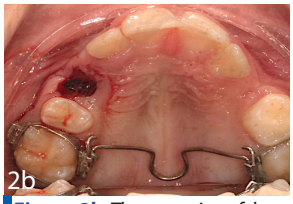
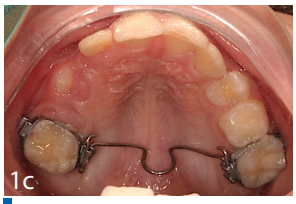


Figure 1b. The TPA which helps to derotate and distalize the ectopic first molar.

Figure 2b. The extraction of the first permanent premolar.



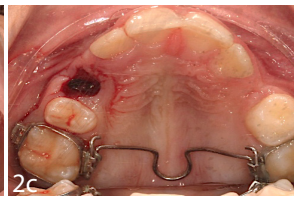


Figure 1c,2c. Intraoral photo 5 months after application of the TPA.

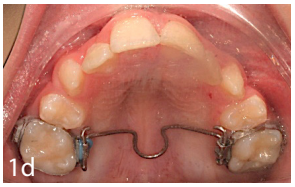


Figure 1d,2d,3d. Result after 14 months of treatment.

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Figure 1e,2e,3e,4e,5e,6e. After 18 months, the patient's TPA and lingual bar were removed.

Finally, the case finalization was done with a fixed appliance and lasted twenty-three months.

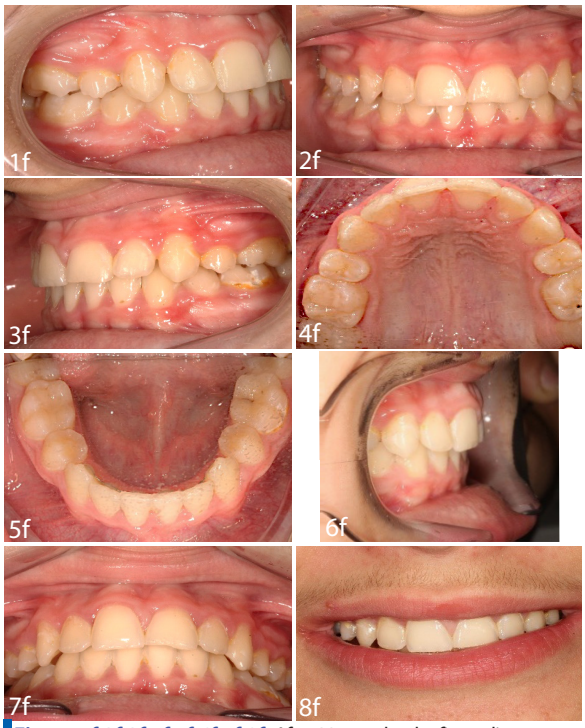

Figure 1f,2f,3f,4f,5f,6f,7f,8f. After 23 months, the fix appliance was removed.

2.2 CASE 2

The second case presented is an eight-year-old male patient. As described for the previous case, a complete orthodontic examination, comprised of photographic examination, orthopantomography, cephalograms in both lateral and postero-anterior projections, and study models of the dental arches, was performed.
Also, in this case the upper first molars were in an ectopic position. Considering the clinical and radiographic records, the position of both molars was considered as irreversible type III.

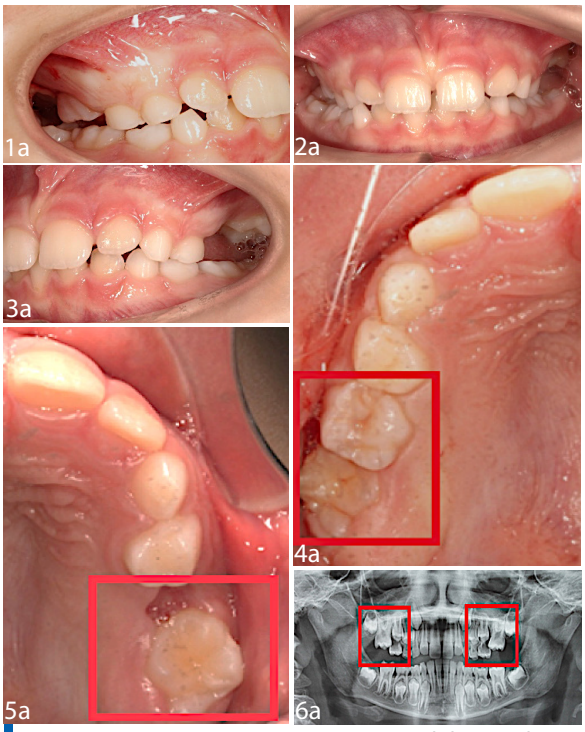

Figure 1a,2a,3a,4a,5a,6a. Pre-treatment intraoral photos and orthopantomography.

Moreover, the upper first molars were severely mesially rotated and in a class II relationship as looked from the buccal aspect, while the mesio-palatal cusps were in a class I relationship.
In this case, as in the previous one, it was decided to use a TPA as it is very effective in derotating and distalizing the mesio-buccal cusp.

Figure 1b,2b,3b,4b,5b. Intraoral photos immediately after the application of TPA.

Periodic checks were carried out to monitor the stages of the treatment. The TPA treatment lasted twelve months, then periodic checks were performed for four years. When the permanent dentition was complete the treatment with fixed appliance began. Brackets self-ligating with MBT prescription were used and the treatment lasted twenty months, until the goal was reached.

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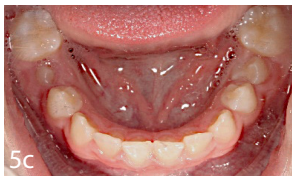
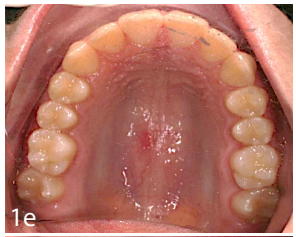


Figure 1c,2c,3c,4c,5c. Intraoral photos after two years and seven months of treatment.

Figure 1d. Orthopantomography after twenty months of treatment with a fixed appliance.



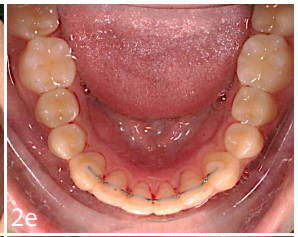


Figure 1e,2e,3e,4e,5e,6e. End of treatment.

3. DISCUSSION

The early correction of permanent molars in ectopic eruption is an integral part of interceptive orthodontics and is crucial for the proper development of a stable occlusion. Pulver et al. suggested many causal factors for the ectopic eruption of the first molar such as: first permanent molar larger than normal, a shorter maxilla than normal, posteriorly positioned maxilla relative to the cranial base, abnormal permanent molar eruption angle, delayed mineralization of the first permanent molars [13].

As soon as the anomaly is diagnosed, it is important to discriminate whether a reversible or an irreversible ectopy is present, because the former does not require treatment while for the latter it is necessary. The optimal treatment timing is around eight years, the age at which it is possible to confidently evaluate the prognosis of the ectopy. If left untreated, many problems could arise, such as reduction of the arch length, mesial tipping and rotation of the permanent molar, premature loss of the second primary molar, and impaction of the second premolar [14]. For these reasons paediatric dentists must learn to diagnose and treat this condition early in order to allow the prevention of future malocclusions and other clinical sequelae [15].

From the results of these two reported cases, it could be said that the use of the TPA is a very useful and good device to reach success in this therapy. According to Lamons et al. 80% of the first permanent ectopic molars are mesially rotated and/or contracted. So, the therapy must be aimed at derotating and possibly distalizing the first ectopic molars [16].

This was assessed also by other authors, according to which the treatment choice for the ectopically eruption of first permanent molars is the distalization of the permanent molar to its normal position in the arch [17].

The TPA can be used both in mixed and permanent dentition, it can be used on the first or second molars to derotate, distalize, give dental torque, extrude or intrude, expand or contract. Therapy with this device is well tolerated by patients. For the purpose of treating ectopy cases, the TPA was used to derotate and distalize the first permanent ectopic molars with the aim of repositioning them in a correct occlusal relationship.

Other techniques have been described in the literature for the treatment of the first permanent molar ectopic eruption. Gonçalves et al. advocated inserting a "twisted" brass wire between the first permanent molar and the deciduous second molar, with activation achieved by wire twisting at the time of insertion and after fifteen and thirty days, or using separator elastics [18].

Another technique to manage the ectopic eruption of the first permanent molar could be the hemisection of the second deciduous molars, as described by some authors in a case report where a seven-year-old girl showed an irreversible ectopy [19]. However, the use of a TPA could provide additional advantages other than the correction of the molar position: in fact, the TPA can preserve the leeway space and in some cases of unilateral ectopic eruption it is used as an anchorage device [20]. Indeed, some authors assessing the long-term stability of treatment with TPA showed that after treatment, a significant increase of maxillary dental arch widths and perimeter was observed along with a significant reduction of crowding without changes in arch length [8].

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4. CONCLUSIONS

Based on this study, it can be stated that this disorder must be managed through early diagnosis with objective examination and orthopantomography. In relation to the methods described by other authors, this is easier to manage and less invasive for the patient. In conclusion, we can define the ectopic eruption of the first permanent molar as an irreversible type that can be successfully corrected using the TPA.

AUTHOR CONTRIBUTIONS

MIP treated the patient and collected the data; RE collected the data and drafted the manuscript; LP and FC revised the manuscript; MT Treated the patient,defined the protocol, revised the manuscript and supervised the study.

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CV

A 1994 Dental Technician graduate from the IPIAS of L'Aquila. A 2002 cum laude Graduated in Dentistry and Dental Prosthesis graduate from the University of L'Aquila. A 2003 attendee of the Second Level Master in Orthognathic and Gnathologic Therapy at the same University.

He defended his Doctoral Thesis in 2007. In 2009/2010 he obtained the Specialization in Orthodontics at the University of L'Aquila. Until 2019 he was a contract professor at the same University with the Master in Orthognathic Therapy as head of teaching and clinic in the teaching module concerning the philosophy of straight wire treatment in the MBT technique. He has participated in courses and congresses in Italy and abroad. He currently works as an external collaborator of the Orthodontics department at the University of L'Aquila (Italy).

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Questions

1. How many grades were enunciated by Barbeira-Lache et. al for the diagnosis of the overlap between the crown of the first permanent molar and the root of the second deciduous molar?

❑a. I;
❑b. II;
❑c. III;
❑d. IV.

2. Which is the prevalence of the ectopic eruption of the first permanent molar in patients with a cleft palate?

❑a. 10,9%;
❑b. 15,6%;
❑c. 21,8%;
❑d. 33,3%.

3. How can you differentiate the type of ectopic eruption of the first permanent molar?

❑a. Reversible or irreversible;
❑b. Jumping or not jumping;
❑c. Included or retained;
❑d. Deciduous or permanent.

4. How are the 80% of the first permanent ectopic molars according to Lamons et al?

❑a. Distally rotated and/or expanded;
❑b. Mesially rotated and/or contracted;
❑c. Extruded;
❑d. Intruded.

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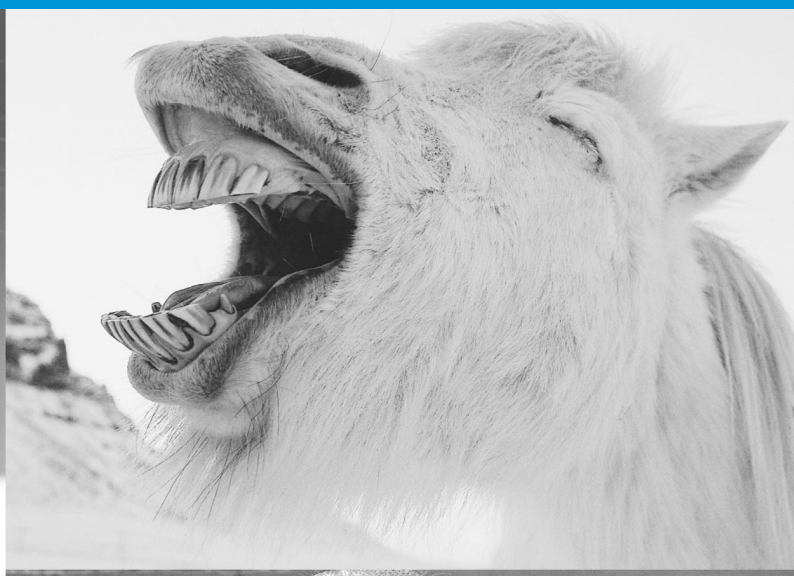

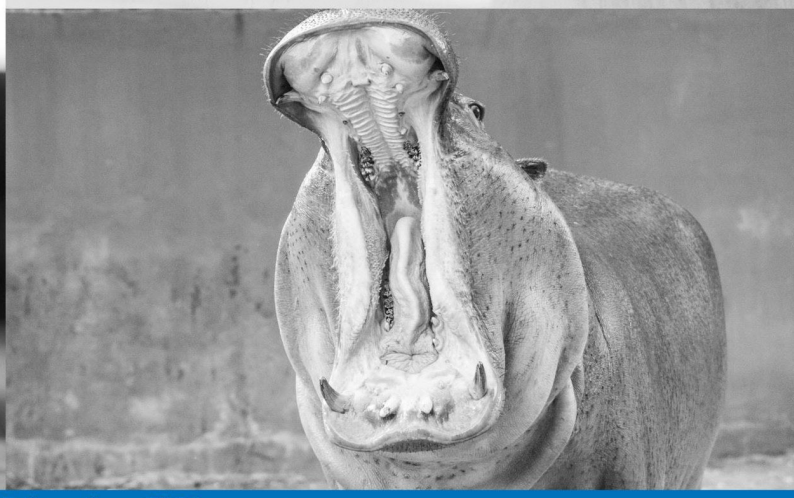

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