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LETTER TO THE EDITOR

OPERCULECTOMY AND SPONTANEOUS ERUPTION OF IMPACTED SECOND MOLARS: A RETROSPECTIVE STUDY

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To the Editor,

Failure of eruption of permanent second molars is a rare condition that affects 0.06% of the population (1). Andreasen and Kurol classified this failure into three clinical conditions: impaction as a result of a physical obstacle; primary retention, caused by eruption arrest prior to the penetration in the oral cavity; secondary retention referring to the cessation of eruption of a tooth after emergence without a physical barrier or ectopic position of the tooth (2). The etiology of failure of eruption is therefore connected to interference in the physiological growth and tooth development, such as space deficit, ankylosis, systemic factors, soft tissue anomalies and alteration of the eruptive axis, although in some cases the causes are unknown (3, 4).Treatment options for retained second molars are: follow-up evaluations, surgical uncovering with or without orthodontic assisted eruption and extraction. Patients undergo scheduled clinical and radiographic examinations that aim to promptly identify whether the evolution of each patient's condition requires surgical intervention to ensure proper eruption of retained teeth (5, 6).

Surgical uncovering (operculectomy) alone is performed if the tooth presents an adequate position, and an incomplete root, thus remaining potential for spontaneous eruption. Orthodontic-assisted eruption and surgical uprighting are indicated if the impacted tooth position is not likely to allow spontaneous eruption. Third molar extraction may be required. Extraction of a retained element is chosen in complex cases, such as presence of cystic neoformation, root resorption of one or more adjacent teeth or whether the retained tooth is ankylosed (7). Moreover, extraction is indicated if surgical uncovering prognosis is unfavorable, such as in cases with excessive root inclination.

The aim of the present study is to retrospectively evaluate the efficacy of operculectomy in the treatment of patients with primary retention of one or more second molars by comparing the outcome at 12-month follow-up between a group of patients treated with operculectomy and a group of patients' whose parents did not give consent to perform operculectomy, thus serving as controls.

MATERIALS AND METHODS

The present study was conducted in accordance to the Declaration of Helsinki. All patients both in the case and in the control group or their parents gave informed consent

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to all the procedures reported. The sample of this study included 222 subjects with a diagnosis of delayed eruption of a second molar who were treated between January 2018 and March 2019 at the Orthodontic Department of the University of Milan (Ospedale Maggiore Policlinico, Milano, Italy). Clinical examination (tooth not present in the arch) and radiographic examination (orthopantomography and intra-oral radiography) were performed for each subject.

Inclusion criteria were: no previous orthodontic treatment, no other systemic or dental disease but one retained permanent second molar per arch when more than two-thirds of its root was formed and the other one is erupted, absence of interference from third molar and of second molar root anomalies.

Eighty-eight patients, 40 males and 48 females (mean age 15±1.6 years), met the inclusion criteria and were included in the final sample. The total number of impacted/retained second molars considered were 145, 75 in the treatment group and 70 in the control group. The conditions evaluated by comparison with the contralateral side on each radiography were: stage of dental maturity assessed according to the morphological description by Demirijan et al. (8); inclination of the retained second molars measured on the orthopantomograms as described by Evans (9). From the tangent to the tips of the cusps, a perpendicular line was constructed through the middle of the crown and root on the affected second molar and on the adjacent first molar. The angle between these lines was measured. The teeth are considered mesio-tilted when the angle is more than 40 degrees, vertically positioned if the angle is ranged between 40 and 20 degrees and distally inclined if the angle is less than 20 degrees.

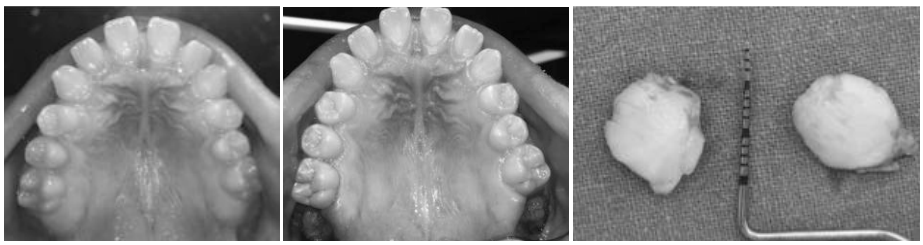
Patients in the case group underwent surgical removal of the mucosa (operculectomy) covering the retained teeth (Fig. 1 a-c); the control group consisted of patients whose parents had refused consent to perform operculectomy. Treatment was defined unsuccessful if the second molar did not erupt within 1 year after surgical intervention. Occlusion was defined successful if the erupted tooth had occlusal surface within 2 mm from the occlusal plane.

RESULTS

Eruption occurred in 93.3% teeth in the treatment group (70/75) after surgical removal of the mucosa, while in the control group only 10% teeth erupted (7/70). In the case group, following operculectomy, the eruption in the upper arches occurred in 95.2% of cases (40 out of 42), while in the lower arches the eruption occurred in 90.9% of cases (30 out of 33). In the control group, the spontaneous eruption of the upper second molars occurred only in 8.5% of cases (3 sites out of 35), while in the lower ones the spontaneous eruption occurred only in 8.5% (3 sites out of 35). Flow chart of clinical outcomes are reported in Fig. 2. Percentages of eruption of the second permanent molars, in the case group and in the control group, divided between the upper and lower arches are shown in Table I. *Chi*-squared test showed a statistically significance difference between the treatment group and the control group $p < 0.05$. In the treatment group the probability of teeth eruption is 10 times higher than the probability in the control group, as reported in Table I. The amount of permanent second molars erupted after surgery, in the upper and lower arch, observed in the case group was 40/42 and 30/33, respectively. By contrast, in the control group,

Table I. *Frequency of eruption in the treatment group in and the control group.*

	Treatment Group	**Control Group**
Second molars that have erupted (mean between upper and lower arch)	93.3%	10%
Upper second molars that have erupted	95.2%	8.5%
Lower second molars that have erupted	90.9%	8.5%
Odds ratio between case and control group	10	1
p-value (*chi*-squared test)	p<0.001	



a b c

Fig. 1. ***a)*** *Pre-surgical occlusal vision.* ***b)*** *Post-surgical occlusal vision.* ***c)*** *Gingival operculum after surgical removal.*

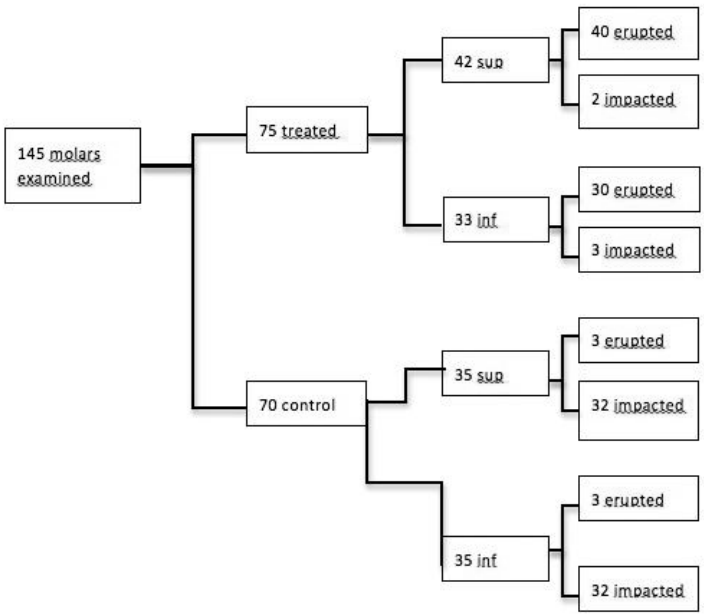


Fig. 2. *Flow chart of clinical outcomes in case group and control group.*

only 3 second molars out of 35 erupted in the oral cavity both in the upper and lower arch.

Of the non-erupted teeth 23 were positioned with a mesial inclination (41%), 13 were positioned vertically (34%), 8 showed a bigger crown compared to the contralateral (13%), and 10 showed an enlarged follicle compared with a normal crown follicle (12%).

DISCUSSION

The results of this study indicate that the retained permanent second molars still have the ability to erupt after surgical removal of the overlying mucosa and could represent a temporary problem and not a failure of eruption. These dental elements may be able to erupt spontaneously after the surgical removal of the overlying mucosa. If the dental element presents a real inclusion able to complicate the following therapy, clinicians should consider an orthodontic, orthodontic-surgical or purely surgical approach (10). In the cases of primary retention, among factors limiting the eruption of the considered element, the relationships between the dental sac and the overlying tissue seem to play an important role: a follicle malfunction or the presence of gingival tissue anomalies within the overlaying soft tissue (like a fibrous formation) can hinder the path of tooth eruption. The success rate in the case group was 93.3% (70/75). Spontaneous eruption in the control group after one year occurred in 10% of

patients (7/70). This value is in accordance with the results obtained by Kenrad et al. (90% success rate) (11). Upper second molars presented a higher rate of success compared to inferior ones, both in the case and in control groups, in particular if the tooth was in a vertical position or with a slight mesial inclination. The major advantages of this therapeutic approach are its conservative nature and its efficacy. Surgical exposure of a retained tooth allows in case of failure to intervene with other therapeutic options, as suggested by Farronato et al. (12). In treated cases, there were no complications following the operation and no periodontal problems occurred on the treated nor on the other dental elements.

At present, there are no guidelines for the treatment of eruptive problems of impacted second molars. For a correct treatment plan, it is advisable to proceed to an early and precise diagnosis, which allows to identify the causes involved. Surgical exposure is a simple, non-invasive and valid method which allows the eruption of second molars in the majority of cases. It does not preclude the possibility of subsequent treatments and aims to facilitate the natural eruption process. There is a statistically significant difference between treatment success in patients where the mucosa was removed and those where it was not removed.

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