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Coronectomy of mandibular third molars: A clinical protocol to avoid inferior alveolar nerve injury☆

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ABSTRACT

Coronectomy is a surgical procedure for the treatment of mandibular third molars in close proximity to the mandibular canal. Unfortunately, often the surgical protocol is not described step by step and it is difficult for the clinician to assess the key factors that are important for the success of this procedure. The aim of this paper is to propose and describe a standardized surgical protocol to improve the success of the technique. The treatment approach, for the most common types of third molars impaction is analysed. Each step of the surgical procedure is described in details and a new type of crown section is proposed. The presented protocol is proposed in order to define a clinical practitioner's guide that could help the surgeon who approaches coronectomy for the first times.

1. Introduction

Coronectomy is a surgical procedure indicated when, as estimated from radiographs, the roots of the third molars are close to or violate the canal of the inferior alveolar nerve (IAN) (Long et al., 2012).

This technique was first proposed in 1984 (Ecuyer and Debien, 1984) as an alternative surgical procedure to complete third molars extraction. Since then, several papers have been published on this technique (Long et al., 2012; Freedman, 1997; Knutsson et al., 1989; Pogrel et al., 2004; O'Riordan, 2004; Renton et al., 2005; Leung and Cheung, 2009; Hatano et al., 2009; Cilasun et al., 2011; Dolanmaz et al., 2009; Monaco et al., 2012; Sencimen et al., 2010; Goto et al., 2012; Leung and Cheung, 2012; Gleeson et al., 2012).

A systematic review based on randomized clinical trials concluded that coronectomy could be used for the treatment of high neurological risk third molars and the authors suggested how the risk of failure may be reduced by an improvement of the surgical procedures (Long et al., 2012).

Unfortunately, often the surgical protocol is not described step by step and so it is difficult for the clinician to assess the key factors that are important for the success of this procedure (Renton et al., 2005; Hatano et al., 2009; Cilasun et al., 2001).

In the present paper, we evaluated the results obtained in 100 cases of coronectomy where the same surgical protocol, with indications for the treatment of different patterns of molar inclusion, was employed. In addition, we propose a specific section of the crown, in order to avoid the risk of one of the most potential dangerous complications: intra-operative root mobilization (Long et al., 2012; Renton et al., 2005; Leung and Cheung, 2009; Hatano et al., 2009; Cilasun et al., 2001; Gleeson et al., 2012).

The following protocol is an attempt to define a clinical practitioner's guide that can be useful to the surgeon who approaches coronectomy for the first time (Fig. 1).

The operative steps evaluated were radiographic diagnosis, flap design, osseous surgery, crown section, suturing, postoperative root migration, and management of postoperative complications.

2. Material and methods

The study population was composed of 98 healthy patients referred to the Department of Oral and Maxillofacial Surgery of the Dental Clinic, Alma Mater Studiorum, University of Bologna, Italy for mandibular third molars evaluation.

☆ The work is attributed at the Department of Oral and Maxillofacial Surgery, University of Bologna, Via San Vitale 59, 40125, Bologna, Italy.

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Study inclusion criteria were: age between 18 and 70 years old; the presence of at least one high neurological risk third mandibular molars that needed extraction for previous episodes of pericoronitis or periodontal disease distal to the second molar (Monaco et al., 2012).

The exclusions criteria were: patients with systemic condition that preclude surgical treatment, the use of antibiotics or anti-inflammatory agents for 14 days before surgery and third molar with caries, endodontic disease or premature apexes.

The variables evaluated were

- Neurological damage evaluated at sutures removal as the presence of hypoesthesia, hyperaesthesia or dysaesthesia of the lower lip and mental region on the operated side. The presence of any alteration of lingual sensitivity was also evaluated.
- Failed coronectomy considered as any intra-operative root mobilization
- Re-operation rate evaluated as the need of the second surgery to treat the retained roots. The reason and the type of second surgery were also recorded.

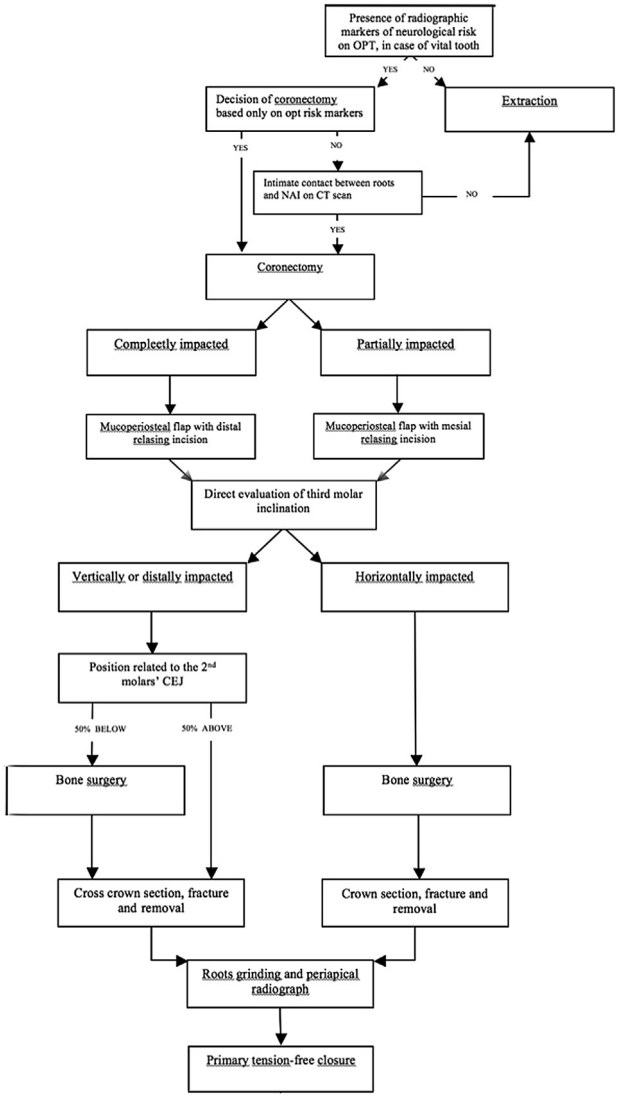

Fig. 1. Decision flow-chart (NAI: Inferior Alveolar Nerve).

2.1. Surgical technique

2.1.1. Indications and contraindications

Coronectomy treats vital high-risk mandibular molars (Leung and Cheung, 2009; Dolanmaz et al., 2009; Monaco et al., 2012). Most of the criticisms of this technique concern the fate of the sectioned roots and the possibility of the development of pulpal diseases (Assael, 2004). The key factors to avoid these complications are the maintenance, before and during the procedure, of the vitality and immobility of the roots (Renton et al., 2005; Leung and Cheung, 2009; Monaco et al., 2012; Johnson et al., 1974; Plata and Kelln, 1976; Whithaker and Shankle., 1974.)

For these reasons, this technique is not indicated for the treatment of high-risk third molars affected by caries, endodontic disease, premature roots or mobility.

On the other side coronectomy is indicated for the treatment of high-risk third molars affected by pericoronitis or causing periodontal disease on the adjacent mesial tooth.

2.1.2. Radiographic diagnosis

In most reports, the diagnosis of a close relationship between the IAN and third molar roots was made based only on panoramic X-ray examination (Freedman, 1997; Pogrel et al., 2004; Renton et al., 2005; Leung and Cheung, 2009; Dolanmaz et al., 2009; Leung and Cheung, 2012). The criteria selected for coronectomy were the presence of some radiographic markers (darkening of the root, diversion of the canal, narrowing and interruption of the radiopaque border) that are considered highly predictive of close contact between IAN and third molar roots.

In some studies (Hatano et al., 2009; Cilasun et al., 2001; Monaco et al., 2012; Goto et al., 2012), after assessment of these markers on panoramic X-rays, a more accurate topographic diagnosis was made by using cone-beam computed tomography (CT). These cases showed the best results in terms of avoidance of intra-operative root mobilization with a rate ranging from 0 to 5% (Hatano et al., 2009; Cilasun et al., 2001; Monaco et al., 2012). However, in case of root mobilization root removal was recommended (Renton et al., 2005; Leung and Cheung, 2009; Gleeson et al., 2012).

In this regard coronectomy can be executed based on the information obtained by panoramic X-ray, however a CT scans examinations allows the clinician with less surgical experience a more accurate diagnosis and appropriate choice of therapy, although it does expose the patient to radiation and is associated with increased cost (Monaco et al., 2004). Moreover, in case of intra-operative root mobilization, a CT scan offers a three-dimensional evaluation of the root morphology and the relationship between roots and mandibular canal that could help the clinicians to perform roots removal with a reduced risk.

2.1.3. Flap design

The flap design should be related to the type of inclusion. Some studies reported the use of a buccal mucoperiosteal flap without specifying whether this flap presents a buccal-releasing incision (Leung and Cheung, 2009; Cilasun et al., 2011; Dolanmaz et al., 2009). In other studies, the authors reported the execution of a lingual flap to facilitate crown sectioning, although in some cases was associated with lingual nerve injury (Pogrel et al., 2004; Renton et al., 2005).

Pogrel (Pogrel et al., 2004) suggested to perform the flap design according to the crow section technique. He proposed the execution of both buccal and lingual flaps in case of crown section with