SELECTED READINGS

IN

ORAL AND

MAXILLOFACIAL SURGERY

THE ART AND SCIENCE
OF CORONECTOMY

Kyriaki C. Marti, DMD, MD, PhD
Christos A. Skouteris, DMD, PhD
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INTRODUCTION

The method of coronectomy (partial odontectomy, or intentional third molar root retention) has gained popularity in the last few years, and evidence-based research on this method is continually growing. The term coronectomy was introduced as “partial lower third molar odontectomy with crown removal and deliberate vital root retention”. The intention of the technique has been defined as “avoidance of nerve injury in cases of intimate relationship of the roots with the inferior alveolar nerve” (IAN) as per the Hippocratic concept of “first, do not harm” (primum nil nocere). The first publications on coronectomy appeared in 1984. A number of publications followed in which detailed techniques, potential complications and short-term outcomes were presented. The primary benefit of coronectomy was avoiding IAN injury during third mandibular molar removal, a complication that, although relatively rare, may have serious medico-legal implications.

Damage to the inferior alveolar nerve associated with third molar removal is primarily related to intraoperative mechanical injury. According to the literature the IAN is the most commonly injured nerve (61.1%) followed by the lingual nerve (LN) (38.8%). Although more than half (69%) if IAN injuries are related to third molar surgery, the incidence of IAN injury still remains high (42.9%-52.5%) when all types of oral surgical procedures (e.g., orthognathic, implant surgery, and local anesthesia) are considered.

The IAN is frequently in very close proximity to the roots of the mandibular third molar and this possibility has to be carefully assessed before surgery. The rationale for coronectomy is based on the fact that the crown of a fully or partially impacted third mandibular molar is primarily responsible for the periodontal health and root resorption of the second molar, the formation of odontogenic cysts and tumors from the retained dental follicle, and pericoronitis. Thus, removing the dental crown while leaving the roots addresses these problems while avoiding potential injury of the IAN.

Vital root retention, done either intentionally for alveolar bone preservation or for IAN injury prevention has been successful as long as the roots remain isolated from the oral environment and normal soft tissue and osseous healing occurs over the coronal surface. The purpose of this paper is to review the recent literature on coronectomy and present a step-by-step surgical technique of coronectomy we use.

OBJECTIVES

1. Present the radiographic criteria demonstrating an intimate association of the roots of mandibular third molars with the IAN.

2. Underscore the need for further detailed imaging with cone-beam CT
(CBCT) that could assist the surgeon in more clearly identifying high-risk patients in whom coronectomy may be indicated.

3. Present the surgical technique of coronectomy in cases where there is high risk of IAN injury and the rationale behind each step of the procedure.

4. Discuss the pertinent literature and the appropriate management of complications of coronectomy.

**METHOD**

According to the literature, identification of the high-risk patient is a crucial part of treatment planning for a coronectomy procedure. Depth of impaction, horizontal tooth position and proximity to the IAN canal (>2 mm) are predictive factors for IAN damage. Additionally, patient’s age and root development are related to IAN sensory deficits. (Table 1)

**Imaging**

The panoramic radiograph is the standard imaging most often used for patient screening and as an essential diagnostic tool. CBCT is generally reserved for more detailed imaging when indicated. The specificity and sensitivity of the panoramic radiograph to predict IAN injury is controversial with reported ranges of 30% to 98% for specificity and 24% to 66% for sensitivity.

For patients identified as high-risk a CBCT is the imaging modality of choice. When CBCT is compared to panoramic radiography for assessing the proximity of the IAN to the impacted mandibular molar, the specificity and sensitivity are 93% and 77% for CBCT and 70% and 63% for panoramic images.

According to recent literature, CBCT imaging is an excellent tool for assessment of impacted tooth location, actual size, and tooth relations to other anatomical structures (e.g., IAN and the lingual plate of the mandible) in three dimensions. The radiation exposure is equivalent or slightly higher than traditional imaging. A benefit-to-risk assessment and financial costs should be taken in consideration.

In order to ensure the appropriate use of CBCT for third molar surgery, the specific panoramic radiograph criteria for LD-CBCT are:

**TABLE 2: SPECIFIC PANORAMIC RADIOGRAPHIC CRITERIA FOR LD-CBCT**

<table>
<thead>
<tr>
<th>Criteria</th>
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<tbody>
<tr>
<td>Diversion of the inferior alveolar canal</td>
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<tr>
<td>Darkening of the roots</td>
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<tr>
<td>Interruption of the white line of the canal</td>
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<tr>
<td>Narrowing of the canal</td>
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<tr>
<td>Deflection of the roots</td>
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<td>Juxta apical area</td>
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Figure 1. Specific panoramic radiographic criteria for LD-CBCT. **A.** Diversion of canal; **B.** Interruption of white line; **C.** Darkening of the roots; **D.** Narrowing of canal; **E.** Deflection of the roots; **F.** Juxta apical area
CBCT (Low Dose-Cone Beam-CT) have been determined by previous authors, and are listed in Table 2 and Figure 1 on the previous pages.

Juxta apical area, a new radiographic sign, is a well-circumscribed radiolucent area lateral to the root rather than at the apex. MRI and CT studies have elicited that this is likely to be a continuity of the IAN lamella with the periodontal lamina dura of the adjacent tooth. (Fig. 1F) Darkening of the root or the presence of two or more radiographic signs were positive predictors of a postoperative IAN deficit. As far as risk assessment for IAN injury is concerned, Gaeminia, et al. showed that CBCT contributes to optimal risk assessment and, as a consequence, to more adequate surgical planning, compared with panoramic radiography.

Recently Renton, et al. identified another group of patients that may benefit from preoperative CBCT assessment and a coronectomy procedure. In this group of patients the lingual plate of the mandible is completely absent and the IAN is actually situated between the lingual aspect of the tooth and the mucosa.

CBCT imaging can further help in the selection of the best surgical approach. (Fig. 2 on P. 5) CBCT can be a useful tool to exclude from the coronectomy group cases associated with pathology as well as cases in which a coronectomy is not really needed. Surgical extraction of teeth associated with osseous pathology has an increased risk of iatrogenic injury to the IAN.

**Patient Selection and Informed Consent**

Patient selection also excludes cases of active infection, mobile or non-vital teeth, teeth with incomplete root formation, and cyst associated teeth. However, a recent publication reports that teeth associated with dentigerous cysts may also benefit from a coronectomy procedure. Immunocompromised patients and patients scheduled for radiation therapy are not candidates for this procedure. Age does not seem to affect the outcome. A recent paper proposes the use of coronectomy as a favorable technique for patients over 40 years of age, presenting for third molar surgery with a high probability of IAN injury.

Informed consent should be completed in detail. The rationale for the procedure, potential intra-operative complications, post-operative sequelae, appropriate management of complications, and possible second stage intervention will also have to be discussed. CBCT is an excellent educational tool for the patient, allowing for a better understanding of the rationale behind the procedure.

**Surgical Technique**

Coronectomy is a technique requiring meticulous preoperative preparation of the surgeon, assistants, and the patient. The technique has a long learning curve and should not be considered as a “less invasive third molar removal” but as a new approach with specific technical demands and indications.
Figure 2. CBCT images that help selection of the best surgical approach. 

**A.** Narrowing and deflection of the IAN canal; 

**B.** Intimate association of IAN with the root apex; 

**C.** Significant narrowing of the IAN canal; 

**D.** A horizontally impacted third molar. Coronectomy in this case can be challenging; 

**E.** Close association of the crown of the third molar with the IAN. Coronectomy in this case is contraindicated.
The surgical technique of coronectomy has some similarities with a conventional odontectomy for third molar removal. Essential steps of the procedure include: adequate exposure of the third molar, meticulous technique, and precision in the completion of the partial odontectomy with minimal application of force.

There seems to be no consensus regarding the administration of antibiotics in the preoperative and postoperative period following coronectomy. We routinely prescribed postoperative antibiotics only for partially impacted third molars with an indication for coronectomy. The concern of possible infection from the root remnant secondary to pulp necrosis is not substantiated by recent studies. It has been showed that endodontic treatment does not prevent the possibility of infection and therefore is not required as part of the procedure.

Coronectomy can be performed under local anesthesia or under local anesthesia with IV sedation. Due to the precision required for the procedure, patient compliance, cooperation and comfort are a prerequisite for the successful completion of the coronectomy.

A conventional mucoperiosteal flap is reflected. It is critical that wide exposure of the area be achieved, because adequate removal of buccal and minimal distal alveolar bone should be performed. The crown of the tooth should be exposed, extending 2 mm below the cemento-enamel junction. Complete, unobstructed visualization of the anatomical crown of the third molar is required before sectioning.

Figure 3. 45-degree beveling of crown sections. A. Schematic representation of crown sectioning; B. Intraoperative view of completed crown sectioning; C. View of the crown showing the 45-degree bevel.
Crown sectioning should be done in such a manner to optimize the outcome of the coronectomy. We prefer to carry out the procedure under loop magnification (x 2.5) for more accuracy and precision. With the use of a fissure bur, the crown sectioning should be performed at a $45^\circ$ bevel, starting 2 mm below the cemento-enamel junction through the pulpal cavity until a thin layer of enamel is left lingually.(Fig. 3, on P. 6) This is essential for protection of the lingual nerve that may be situated between the lingual mucosa and the lingual enamel wall of the crown. The $45^\circ$ beveled sectioning of the crown ensures that the level of the odontectomy is below the course of the lingual nerve, thus minimizing the possibility of injury. The crown is then separated from the roots with minimal force. If the cut is not deep enough it may result in unintentional mobilization of the root or in unfavorable sectioning of the crown thus increasing the difficulty of the procedure.44-46

If a thin lingual enamel wall remains attached to the root, it can be carefully removed with the use of the bur. At the end of the sectioning, the root surface should be adequately below the buccal crest of the socket. If this has not been accomplished, further root surface reduction, 2 mm to 3 mm below the buccal crest needs to be performed. Root reduction below the buccal crest of the socket seems to facilitate bone healing over the root remnant.9

Figure 4. T-sectioning of a crown. A. Third molar in space restriction; B. T-sectioning of the crown; C. The sectioned crown with the dental follicle; D. Root remnant after crown removal.
In cases where the sectioning of the crown is difficult due to space restrictions, multi-sectioning of the crown can be performed, allowing removal of the crown in two separate pieces. Our preferred method of sectioning in this instance is T-sectioning of the crown. (Fig. 4 on P. 7)

As a means of preventing possible infection due to pulp necrosis, we proceed with ablation of the exposed pulp and subsequent spot welding at the orifices of the root canals with a diode contact fiberoptic laser-probe (Wavelength= 980 +/- 10 nm). The settings that we use for the procedure are: Power: 1.5 W CW, 400 μm fiber, exposure time for spot welding: 5 seconds of radiation followed by 5 seconds of rest period. This very short exposure of the coronal part of the root remnant to the laser beam ensures a minimal change of the root temperature, which is lower than the safe exposure temperature for the soft and hard tissues around the root remnant. (Fig. 5)

The wound is then irrigated with copious amounts of normal saline solution. Wound irrigation is always an important step of the surgical wound care. It is particularly important in coronectomy to irrigate the socket with normal saline. Thus pulp remnants, bone, and tooth debris are removed before wound closure. The wound is closed in a watertight fashion with interrupted vertical mattress sutures (4-0 Vicryl Rapide®). This type of wound closure provides adequate isolation of the root remnant from the oral environment. (Fig. 6 on P. 9)

Figure 5. Laser pulpotomy. A. Laser ablation of the exposed pulp; B. Intraoperative view after pulp ablation and; C. After spot welding at the orifices of the root canals.
Figure 6. Soft tissue closure with interrupted vertical mattress sutures

**Postoperative management**

Analgesics and chlorexidine gluconate 0.12% oral rinse should be prescribed. The patient has to be aware of the importance of the next follow-up visits including a panoramic radiograph in 12 months. Re-evaluation of the patient is advised in case of symptoms or root eruption.

Some authors use antibiotics postoperatively to reduce risk of infection. Other authors consider that there is no need for routine antibiotic use for this procedure, unless pericoronal infection is present. As previously mentioned, we routinely administer antibiotics only in cases of partially impacted third molars with an indication for coronectomy.

All the important steps of the procedure are recorded, in a detailed operative note. It is advisable that a letter be sent to the referring dentist with information about the surgical procedure, its rationale, the follow-up schedule, and all possible early and late complications including possible second stage intervention.

**MANAGEMENT OF COMPLICATIONS**

**Intraoperative and immediate postoperative complications**

A technique-specific complication is the mobilization of the root segment during coronectomy, which can result in failure (immediate or delayed) of the procedure. In order to prevent this complication, crown-root separation after sectioning should be performed with the application of minimal force. Excessive force may result in mobility of the root remnant especially in cases of cone-shaped roots. This will lead to removal of the root during the procedure and consequently to coronectomy failure and possible IAN injury.

According to Gady and Fletcher, root mobilization may initiate fast migration and eruption of the root. Renton, et al. showed that small conical roots in female patients are prone to mobilization and utmost care is required to avoid this complication. However, Leung and Cheung reported that no significant risk factors were found to be associated with coronectomy failure (in terms of age, sex, root shape, pattern and depth of impaction). The overall failure rate for coronectomy has been reported to range from 2.3% to 38.3%.

One of the most common early complications of coronectomy is dry socket. This can result in delayed healing, infection, and need for root extraction. The reported incidence of dry socket ranges from 10% to 12.1%. Treatment of this complication includes the use of chlorexidine oral rinse and application of resorbable dressings.
Other contributors to delayed healing are retention of enamel, root mobilization, and wound dehiscence. Isolation of the root remnant from the oral cavity is very important. Experimental data from a study on submerged roots showed that roots need to remain totally covered by soft tissue in order to be eventually covered by bone.

There are conflicting data relative to patient perception of postoperative pain. Some studies comparing the conventional extraction techniques with coronectomy have reported less pain for the coronectomy group compared with the control group. This was attributed to removal of a smaller amount of bone. In one study the postoperative pain was of higher intensity in comparison to the control group. In a case of prolonged intermittent pain the root remnant had to be removed. The second stage procedure was safely performed because the root had moved away from the IAN.

Reported incidence of infection after coronectomy ranges from 0.98% to 5.2%. This is usually treated with broad-spectrum antibiotics, anti-inflammatory medications, and socket irrigation. If the infection resolves in a few days, no further treatment is required. If the patient returns with persistent or recurrent infection consideration should be given to removing the roots.

**Late Complications**

Root migration is considered a late complication of coronectomy with prevalence estimates varying from 13.2% to 85.29%. Upward root migration occurs primarily during the first year, particularly during the first 6 months, and is generally completed after 2 to 3 years as the bone remolds.

Leung and Cheung reported that in more than half of their cases there was migration of the root remnant. This occurred rapidly during the first 3 months and then gradually subsided after 12 to 24 months (mean distance of migration 3.06 mm).

In a more recent study with a 3-year follow-up, the same authors reported a mean root migration distance of 2.8 mm. No further root migration occurred between the 24th and the 36th month, with the exception of four roots that erupted and were removed. There was a statistically higher mean migration distance in women than in men (3.4 mm vs. 2.4 mm).

In a group of 102 coronectomies with a mean follow-up of 13.5 months, Hatano, et al. reported root migration of 85.3%. Dolanmaz, et al. reported that the movement of the root remnants reached its maximum in the first postoperative 6 months (mean, 3.4 mm), while they recorded a high migration rate (85%). Pogrel reported a 30% prevalence (150 cases) of root migration within a year. Nine roots erupted and needed to be secondarily removed.

In our group of patients bone healing over the retained root was complete 12 months postoperatively. The incidence of root migration was 4.1%. The asymptomatic migration did not lead to removal of the root remnant. (Fig. 7 on P. 11)

Leung and Cheung, in a 3-year follow-up study, reported that root eruption caus-
ing symptoms and leading to removal of the remnant occurred in 3% of the cases. There is a general consensus that roots should be removed either when they erupt or when they are symptomatic. The important issue about this migration is that the root remnant is moving away from the IAN canal, allowing for a “safer” delayed removal of the root.

Figure 7. Asymptomatic root migration does not require removal of the remnant. A. Preoperative and B. postoperative view of uneventful bone healing over the retained root; C. Root remnant showing no migration 12 months after coronectomy; D. Preoperative view of an impacted third molar with a juxta apical area; E. Postoperative view showing the root migration 12 months after coronectomy.
with a simple procedure usually under local anesthesia. There is one report in the literature about a very unusual case where a root remnant erupted entraining along with it the IAN canal.\textsuperscript{60}

No pathology associated with the root remnant has been reported so far and no osteomyelitis or mandibular fractures have been associated with this type of surgery. Nerve injury due to coronectomy is considered a very rare complication. Renton et al.\textsuperscript{10} and Cilasun et al.\textsuperscript{39} report no IAN injury, while Leung and Cheung\textsuperscript{54} and Hatano, et al.\textsuperscript{33} reported IAN impairment in 1 out of 155 and 102 cases, respectively.

The lingual nerve is less commonly injured during conventional third molar surgery, but when that occurs the damage to the nerve is more severe.\textsuperscript{17} There are no reports of lingual nerve (LN) injury during coronectomy, except for one case of transient impairment of the LN reported by Pogrel et al, which was attributed to lingual retraction.\textsuperscript{59}

An interesting radiographic finding associated with coronectomy has been the asymptomatic “apical radiolucency” which presents under the apical part of a migrating root, especially in the first three months.\textsuperscript{64} This radiographic feature while it may give the impression of apical pathology is considered benign and is believed to be due to delayed regeneration of bone.

O’Riordan followed-up radiographically two cases with this finding and reported that the apical radiolucency remained evident 2 years after coronectomy.\textsuperscript{11} The lamina dura was visible around the apex of the remnant.

**DISCUSSION**

In view of the recent advances in imaging, avoidance of nerve damage is feasible. According to Renton, litigation is often based on inadequate consent procedure, inadequate planning and assessment, causation of avoidable nerve injury, and poor management of the patient once nerve injury has occurred.\textsuperscript{61} Transient involvement of the IAN as a complication after third molar surgery ranges from 1\% to 5\%, and permanent deficit ranges from 0.04\% to 25\%.\textsuperscript{15} A self-reported rate of nerve injury (temporary and permanent) by oral surgeons was 4 per 1,000 lower third molar extractions for the IAN and 1 per 1,000 extractions for the LN. Self-reported rates of permanent injury were 1 per 2,500 lower third molar extractions for the IAN and 1 per 10,000 lower third molar extractions for the LN.\textsuperscript{62}

When imaging risk factors are present, incidence of nerve involvement has been reported as high as 12\%. The most common cause of IAN injury (requiring intervention) is third molar surgery (52\%) according to Tay and Zuniga.\textsuperscript{17} Patients present with paresthesia as the most common symptom. Dysesthesia and allodynia have also been reported and are very debilitating.\textsuperscript{63}

Bataineh reported higher incidence of nerve injury in the under 20-year-old group of patients and that injury was significantly related to the operators’ experience.\textsuperscript{24} Cheung et al. associated nerve impairment with the depth of impaction and lack of experience.\textsuperscript{25} Factors found to be associated with a significantly higher incidence of IAN paresthesia include patients in the 26- to 30-year age group.
group, horizontal impactions, root development, close proximity to the inferior alveolar canal and operator experience.26,27

Some authors discuss the potential difficulty of properly sectioning horizontally impacted teeth, without jeopardizing the IAN that may lie in close proximity to the mesial aspect of the horizontally impacted tooth. These cases should be carefully evaluated before surgery with the use of a CBCT.

Gady and Fletcher argued that a horizontal impaction is a contraindication for coronectomy.38 Pogrel also considered these cases as being unsuitable for coronectomy.46 Hatano, et al. included horizontally impacted third molars in their series of cases, stating that crown section can often be complicated.33 We do not feel that horizontally impacted molars are always unsuitable for coronectomy. However, “safe” sectioning of the crown of a horizontally impacted tooth may be technically very challenging.

Competence in a surgical procedure is a combination of training and experience. A learning curve is needed for a procedure that has been relatively recently introduced to the oral surgery practice. Coronectomy remains a technique-sensitive procedure.1,64

On the issue of endodontic treatment of the exposed pulp, our rationale for the use of a diode laser for pulpotomy and spot welding of the orifices of the root canals was to prevent infection secondary to pulp necrosis. Laser pulp ablation is a procedure performed routinely by endodontists mainly in primary teeth, and it is considered a safe technique. It allows complete sealing of the orifices of the root canals, thus preventing any contact of the oral cavity with the radicular dental pulp.51-53 Our experience with a group of 24 cases of coronectomy with laser ablation, showed that within a 12-month follow-up there was no incidence of infection or other complications.

There is strong evidence in the literature that treatment of the exposed pulp is not required.31,46 Sencimen, et al. in a study comparing the endodontically treated root remnants to non-treated retained roots after coronectomy showed that endodontic treatment of the tooth remnant does not affect the success of the method.43

An important late sequela of coronectomy is root migration. Maintaining the occlusal surface of the root remnant 2 mm to 3 mm inferior to the crest of bone appears to prevent eruption of the root into the oral cavity. This 3 mm distance also appears to facilitate bone formation over the retained root fragment.1,9

According to Whitaker, et al. submerged root segments remain vital and the majority of them sustain coronal bridging. Coronal bridging refers to circumferential closure of the coronal rim of the pulp canal by calcified tissue, without any sign of inflammation.58

“Enamel lipping” is a term that describes the retention of a fragment of enamel on the root remnant, due to technical difficulty. It occurs commonly in disto-angular impacted third molars with close proximity to the second molar. The enamel lip can be seen in a postoperative radiograph and it seems to jeopardize the long-term retention of the root, because the avascular enamel acts as a
foreign body for the surrounding tissues and may lead to a non-healing dry socket.\textsuperscript{65}

Finally the most important question to be answered is whether coronectomy offers any benefit in terms of preventing IAN injury. There are a few studies that compare the coronectomy group outcomes to a control group of totally extracted teeth. Results from these studies seem to be encouraging, for avoidance of IAN injury.\textsuperscript{55} Cilasun, et al, as well as Renton, et al, reported no IAN injury in the coronectomy group. Leung and Cheung reported one case in the coronectomy group (0.06\%) and Hatano, et al. presented one case of temporary impairment (1\%). In the extraction group (43 patients out of 521 third molars) 8.3\% were diagnosed with IAN injury. The injury resolved in 35 patients within one month after extraction. Eight patients (1.5\%) were diagnosed with permanent injury. The pooled risk ratio for IAN injury indicates that patients in the total-removal group would be ten times as likely as those in the coronectomy group to suffer from IAN injury.\textsuperscript{10,33,39,54,56}

Relative to complications such as dry socket, infection, and postoperative pain, a meta-analysis by Long, et al. of four studies showed that the risk ratio for dry socket and postoperative infection was similar between coronectomy and total removal.\textsuperscript{58} Moreover there was no difference in postoperative pain at one week following coronectomy compared to total removal. The limitations reported in their study were: small number of studies, no high-quality studies, heterogeneity among studies, and short length of follow-up.\textsuperscript{56}

Recently a number of different approaches have been proposed for treatment of high-risk third molars, with a proximity to the IAN. These include: orthodontic extraction,\textsuperscript{66-68} pericoronal ostectomy,\textsuperscript{69} and removal of the mesial portion of the anatomic crown.\textsuperscript{70} It seems that more studies are needed to determine whether these approaches offer any significant advantages.

CONCLUSION

Coronectomy has been employed in an effort to reduce the incidence of iatrogenic damage to the inferior alveolar nerve, in cases of anatomic proximity of the roots of a third molar to the mandibular canal. After careful patient selection and when performed in a meticulous manner, the technique is safe and effective in reducing the risk of IAN injury. Complications, other than IAN injury, associated with the method are similar to those associated with impacted third molar removal. Coronectomy failure and root migration requiring re-operation are the main technique-specific complications. Meticulous planning of the procedure, documentation, and a detailed informed consent are mandatory for legal considerations. There is no doubt that further randomized controlled clinical trials with long term follow-up are needed to evaluate the adverse effects of coronectomy.
Kyriaki C. Marti, DMD, MD, PhD, FEBOMFS, received her dental and PhD Degree from the University of Thessaloniki School of Dentistry, and her medical degree from the University of Athens School of Medicine, in Greece. She completed her residency in oral and maxillofacial surgery at the University of Athens School of Dentistry. Dr. Marti is a Fellow of the European Board of Oral and Maxillofacial Surgery. She has served as Assistant Professor, Department of Oral and Maxillofacial Surgery, University of Athens School of Dentistry, and as Visiting Professor, Department of Oral and Maxillofacial Surgery, School of Dentistry, Medical College of Virginia, Virginia Commonwealth University. Dr. Marti is currently Adjunct Clinical Assistant Professor, at the Department of Oral and Maxillofacial Surgery, University of Michigan School of Dentistry. Her main clinical interests are dentoalveolar surgery, lasers, implants, and minimally invasive cosmetic procedures. She is member of many professional associations and she has many publications (scientific papers, book chapters and books) and numerous presentations in national and international meetings. Dr. Marti has a strong interest in medical and dental education and she has extensive experience in basic and clinical teaching and instruction of dental students, medical students and residents. Dr. Marti has been accepted in the MHPES Program of the Department of Medical Education, University of Michigan Medical School, to pursue a Masters Degree in Health Professions Education.

Christos A. Skouteris, DMD, PhD, is a graduate of the University of Athens School of Dentistry. He completed a three-year training program in oral pathology at the same university that led to a PhD degree and a six-year residency in oral and maxillofacial surgery at the University of Pittsburgh School of Medicine-Presbyterian University Hospital in the USA. He served as teaching fellow at the University of Pittsburgh School of Dental Medicine, as Visiting Assistant Professor with the Department of Plastic, Reconstructive, and Maxillofacial Surgery at the University of Pittsburgh School of Medicine, as Visiting Professor, Department of Oral and Maxillofacial Surgery, School of Dentistry, Medical College of Virginia, Virginia Commonwealth University, as Assistant Professor of Oral and Maxillofacial Surgery at the University of Crete School of Medicine, and as Associate Professor of Oral and Maxillofacial Surgery at the University of Athens School of Dentistry. Currently, Dr. Skouteris is Clinical Assistant Professor, Department of Surgery, Section of Oral and Maxillofacial Surgery, University of Michigan Medical School and Undergraduate Clinic Director, Department of Oral and Maxillofacial Surgery University of Michigan School of Dentistry. He is member of many professional associations and has numerous publications (scientific papers, book chapters and books) and presentations in national and international meetings. Dr. Skouteris has considerable experience in clinical teaching and instruction of dental students, medical students, and residents. His clinical interests include oral oncology, TMJ disorders, orthognathic surgery, trauma, secondary alveolar cleft repair, and minimally invasive cosmetic maxillofacial surgery.
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