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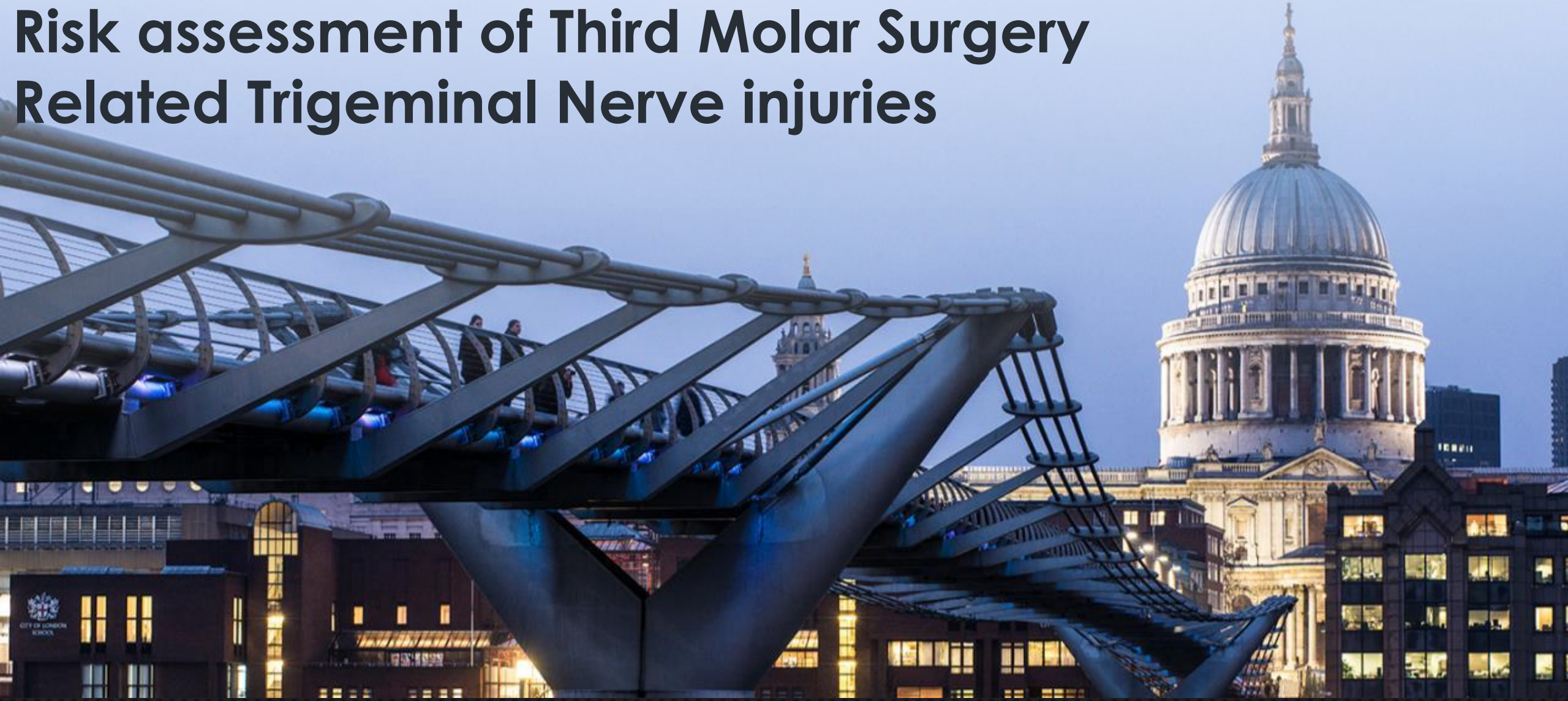
Risk assessment of Third Molar Surgery Related Trigeminal Nerve injuries



FACULTY OF DENTISTRY, ORAL & CRANIOFACIAL SCIENCES

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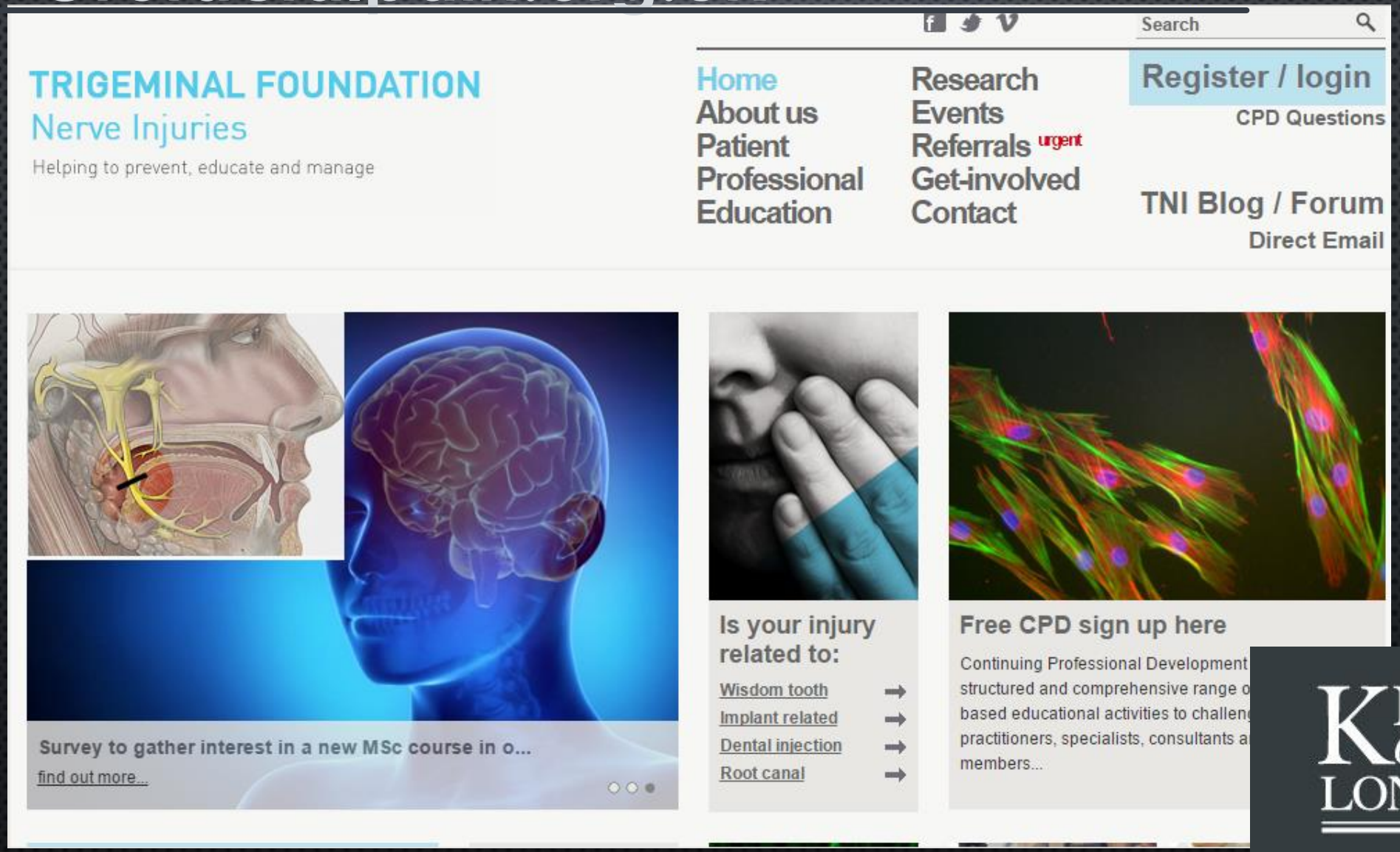
PROFESSOR ORAL SURGERY KINGS COLLEGE LONDON PAST PRESIDENT BRITISH ASSOCIATION OF ORAL SURGEONS

Trigeminalnerve.org.uk
Orofacialpain.org.uk



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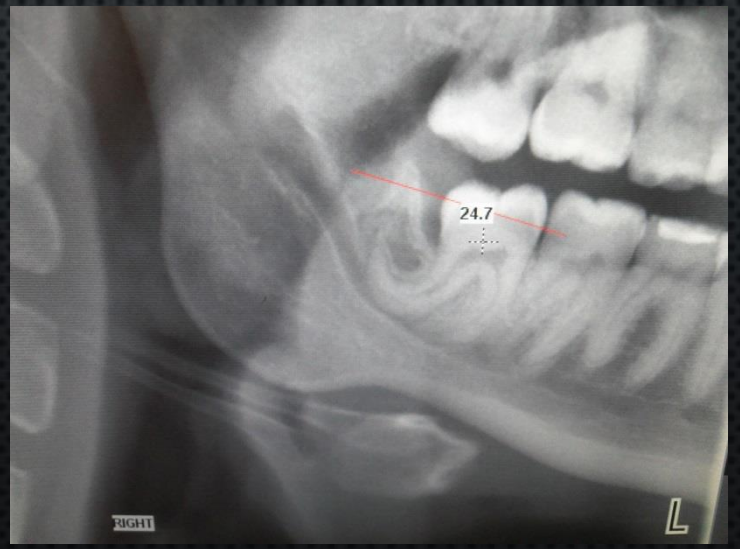
OBJECTIVES

-Be familiar with recognising and minimising risk to the trigeminal nerve when undertaking La and M3M surgery
-Understand the importance of preventing nerve injuries and the impact on those patients affected;
-Understand how to improve patient consent
-Be able to develop a better strategy for assessing and identifying patients at high risk
-Know When to refer or treat.



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OVERVIEW

- **Patient risk factors**
- Indications for surgery
- Prevention of lingual nerve injury
- Prevention of Inferior alveolar nerve injury
  - Risk Assessment
    - Coronectomy indicated
    - Coronectomy NOT indicated or contraindicated
  - Surgical technique
  - Limitations and complications?

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- An error is defined as an inadvertent divergence from your intended course of action.
- Faults or violations are defined as a deliberate deviation from the guidelines and rules of a given system.
- It is accepted that every clinician may commit an error, but as responsible clinicians, we would never consider deliberately deviating from the guidelines, unless there is a robust valid reason.

National Board for human factors in dentistry Position document 2018

risk

/rɪsk/

noun

1. a situation involving exposure to danger.
   "flouting the law was too much of a risk"
   synonyms: possibility, chance, probability, likelihood, danger, peril, threat, menace, fear, prospect
   "do not use the stove inside a tent because of the risk of fire"

verb

1. expose (someone or something valued) to danger, harm, or loss.
   "he risked his life to save his dog"
   synonyms: endanger, put at risk, put in danger, expose to danger, put on the line, take a chance with, imperil, jeopardize, put in jeopardy, hazard, gamble (with), bet, wager, chance, venture
   "a father risked his life to save his twin babies from a fire"

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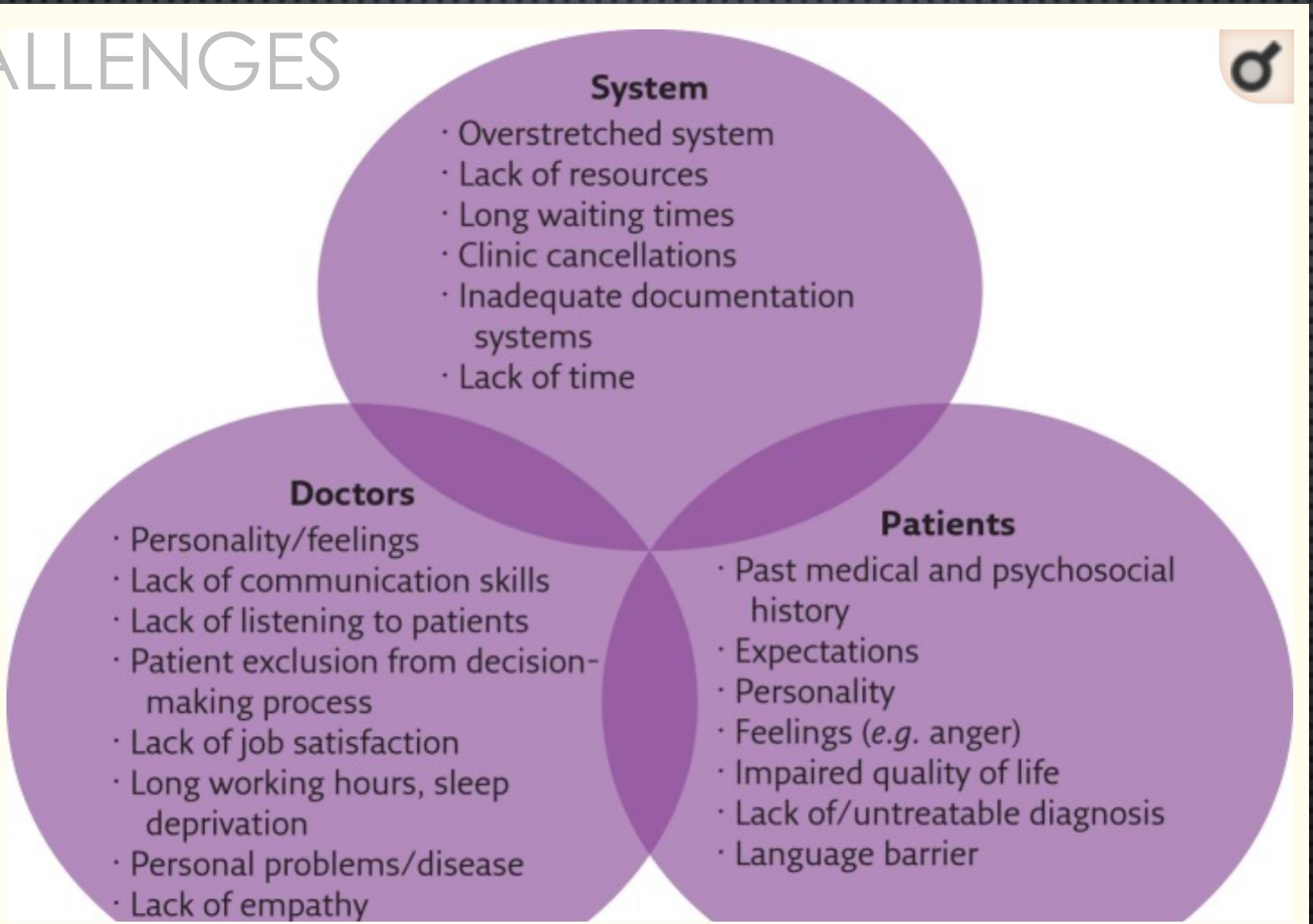
HEALTH CARE IS A HIGH RISK BUSINESS

- Are we aware of the high risk nature?
- Are we supported in mitigating these risks?
- Corporates recognise this and apply appropriate risk strategies
  - **'Acceptable' risk –** it is not feasible to eliminate or avoid all risks . Where the 'cost' to the organisation to reduce the level of risk outweighs the adverse consequences of the risk occurring, the risk would be considered 'acceptable' to the CCG.
  - **'Manageable' risk –** some risks identified can be realistically managed, or reduced, within a reasonable, acceptable timescale through cost-effective measures; these are considered 'manageable' risk.
  - **'High' risk –** these are risks which if they occur will have a serious impact

THE CHALLENGES



Breathe (Sheff). 2017 Jun; 13(2): 129–135.
Top tips to deal with challenging situations: doctor–patient interactions
Georgia Hardavella, Ane Aamli-Gaagnat, Armin Frille, Neil Saad, Alexandra Niculescu, Pippa Powell

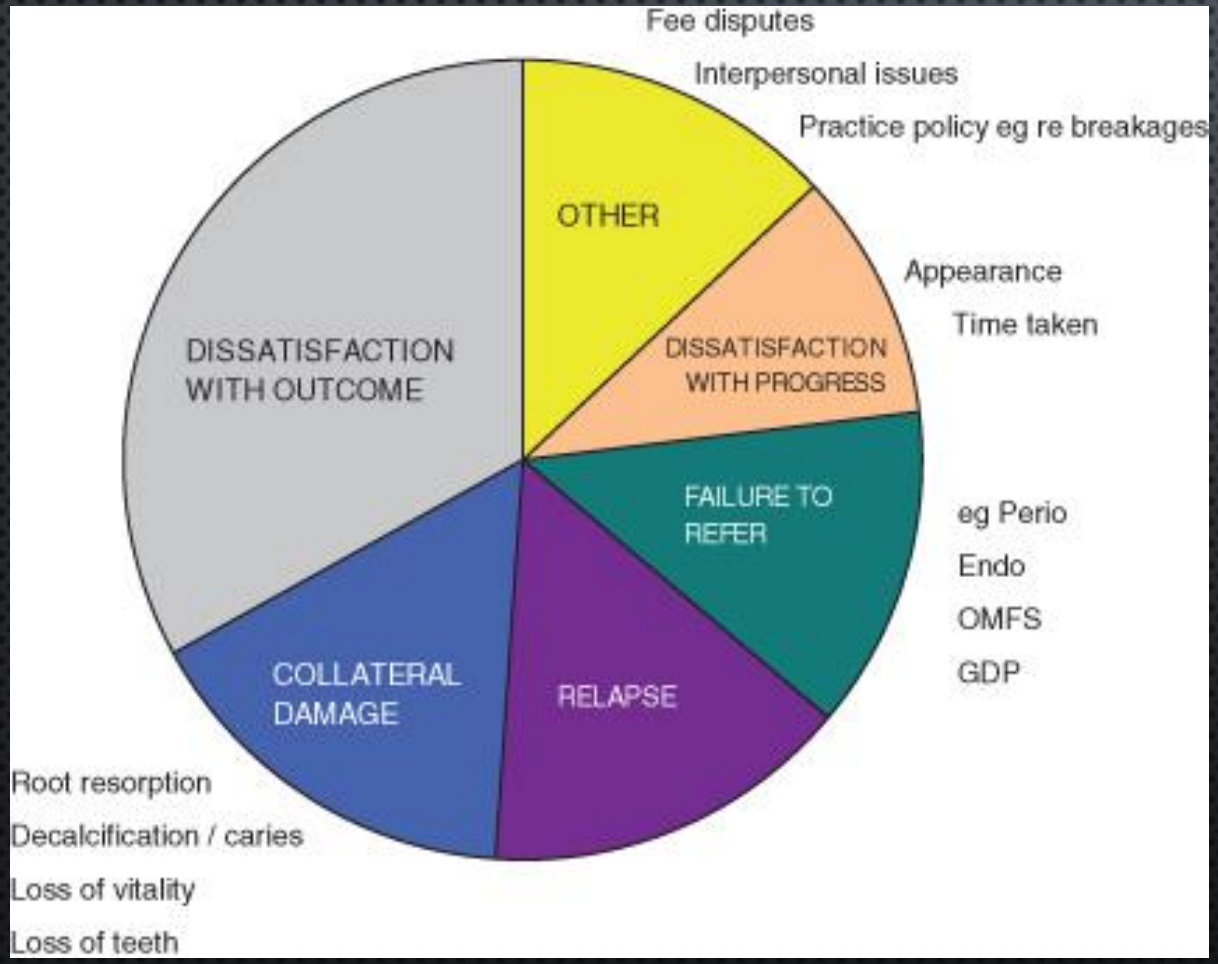
But to look on the bright side!

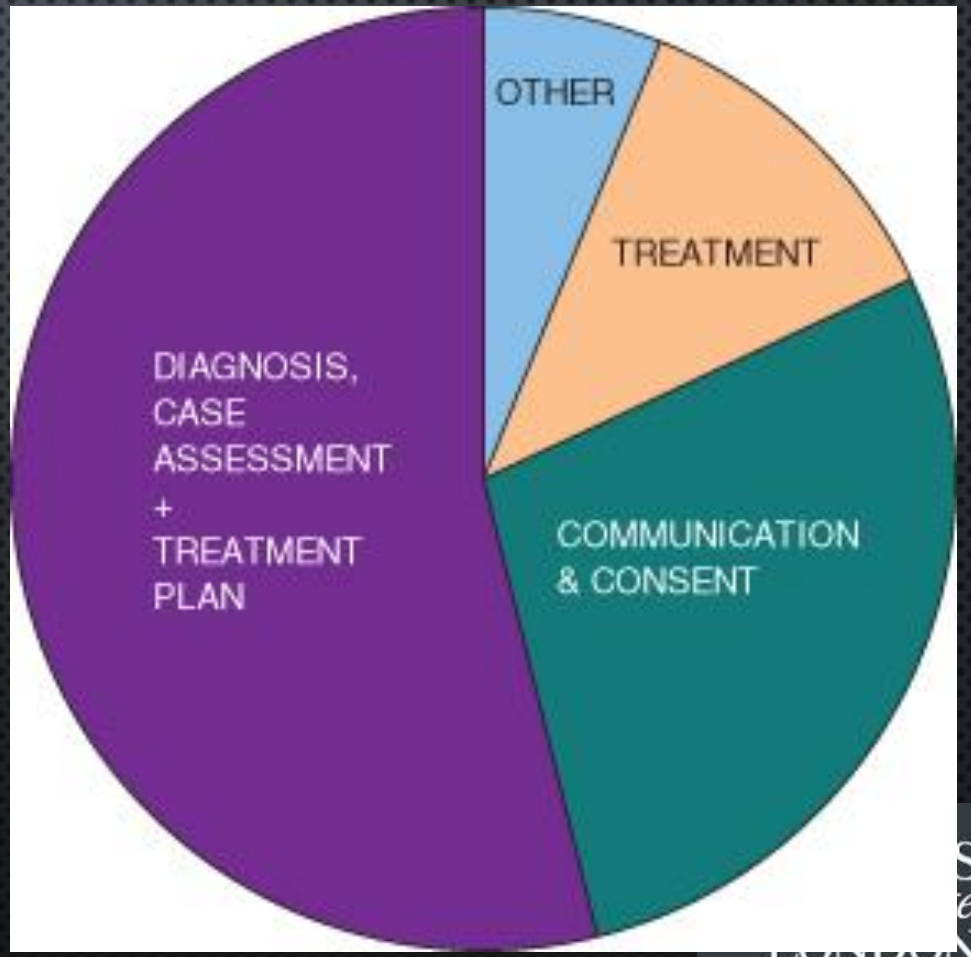
- Medicine is an imprecise science, influenced by the vagaries and unpredictable nature of biologic systems and the art of interpersonal relationships.
- Human illnesses are, from the outset, adverse outcomes of life, and it is often difficult for physicians to correct or mitigate these illnesses. Furthermore, the techniques, tools, and technology available to aid in this task often have associated inadequacies or risks.
- Therefore, restoring biologic function to its former healthy state is oftentimes incomplete, sometimes unsuccessful, and occasionally complicated by iatrogenic injury.

MEDICOLEGAL CONSEQUENCES

Related to....

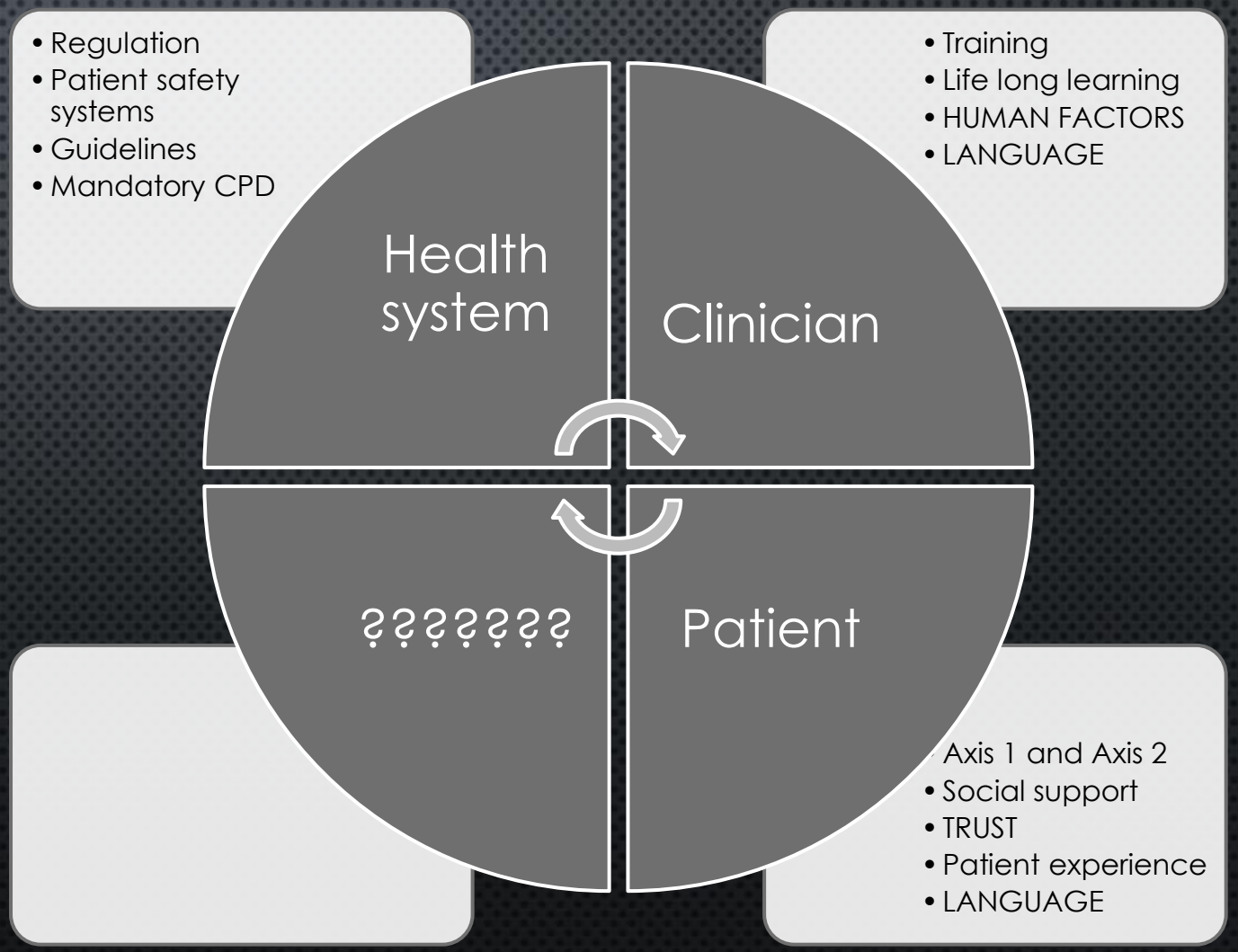
Why?





WHERE IS THAT RISK?

Human factors in healthcare is concerned with ensuring patient safety through promoting efficiency, safety and effectiveness by improving the design of technologies, processes and work systems. Essentially it embraces standardisation and involves examining and designing out error.



PATIENT ASSESSMENT
ASK THE SAME QUESTIONS AS THE LAWYERS

TAKING A GOOD HISTORY ENSURES MEDICAL ISSUES AVOIDED

- WAS THERE A GOOD INDICATION TO REMOVE THE TOOTH?
- WAS THE PATIENT WARNED/ CONSENTED?
- WAS THERE AN ELEVATED RISK?
- WAS ADDITIONAL ASSESSMENT UNDERTAKEN TO ASSESS HEIGHTENED RISK?
- WAS THE PATIENT WARNED AND FURTHER ASSESSED WITH ELEVATED RISK?
- WAS ALTERNATIVE TREATMENT OFFERED IN LIGHT OF ELEVATED RISK?
- WAS THE PATIENT FOLLOWED UP IN 24 HOURS?
- WAS COMPLICATION /NERVE INJURY RECOGNISED?
- WAS PATIENT REFERRED EARLY FOR SPECIALIST CARE?

PATIENT RISKS HEALTH ISSUES

- **AGEING POPULATION=MORE……**
  - CANCER
  - HEART DISEASE
  - STROKE
  - DEMENTIA
  - DIABETES MELLITUS
  - MOBILITY DISABILITY AND ACCESS OSTEOARTHRITIS
  - POOR NUTRITION = LOW IMMUNITY
  - **DRUGS**
    - **ANTICOAGULANTS**
    - **BISPHOSPHONATES**
    - **IMMUNO SUPPRESSANTS**
- **YOUNGER POPULATION EMERGING ISSUES**
  - OBESITY
  - NEW ALLERGIES

PATIENT RISK
COMPROMISED WOUND HEALING

- Age (poorer outcomes in M3M surgery after 25 years!)
- Smoking
- DM
- Steroids
- MRONJ
- Chronic medical comorbidity
  - Cancer
  - DM
  - Connective tissue disorders

PATIENTS AT RISK OF INFECTION
IMMUNO-COMPROMISE = POOR WOUND HEALING MRONJ

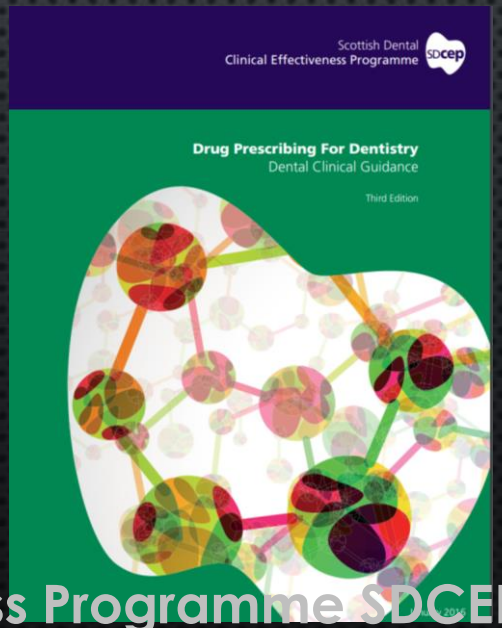
Immature immunity infants
Malnutrition older population

Disease

Diabetes Mellitis (type 1 and 2)
Alcoholism
Cirrhosis
Renal failure
Splenectomy
Malignant tumours
Leukaemia Lymphoma Myeloma
Collagen disease
HIV AIDS
Pagets

Medication

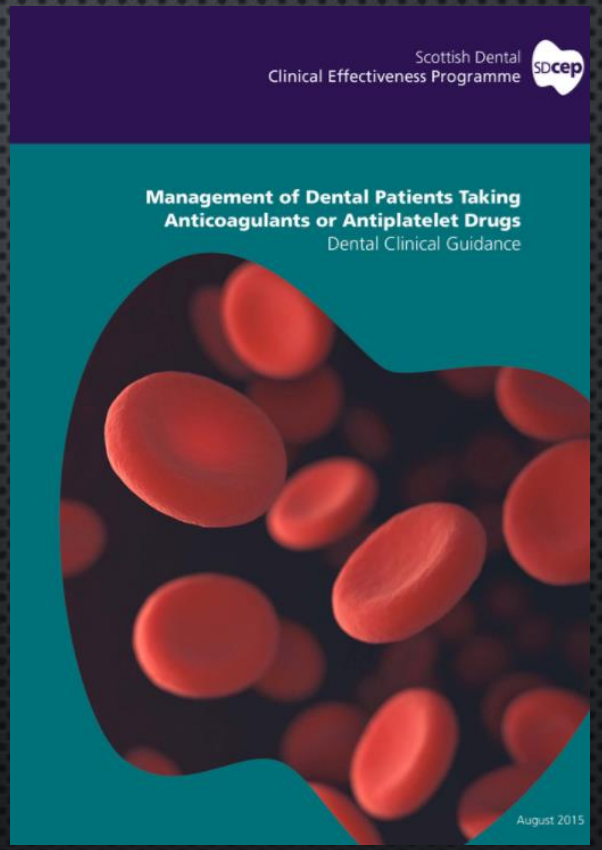
Steroids
Immunosuppressants / chemotherapy
organ transplant
Bisphosphonates
Radiation therapy



www.Scottish Dental Clinical Effectiveness Programme SDCEP

PATIENT RISK BLEEDERS

- Local
  - Trismus
  - Spreading infection difficult LA
  - Heavily restored adjacent teeth
  - Dental factors increasing surgical difficulty
  - Associated pathology
- Systemic factors
  - Prolonged bleeding
    - Acquired Factor 10a inhibitors
    - Congenital
  - Immune suppression
  - Medications bisphosphonates
  - Previous radiotherapy
  - Anxiety need for sedation



www.Scottish Dental Clinical Effectiveness Programme SDCEP

PATIENT RISK
ADJUNCTIVE CARE – ANXIETY LEVEL SEDATION NEED

Medications commonly utilized for M3M surgery

Local anaesthesia / sedation Algorithm for selection of appropriate anaesthesia and sedation
Analgesics?

Rarely
Antibiotics?
Steroids?
Chlorhexidine?
Other medicaments Section ?

OVERVIEW

- **Indications for surgery**
- Prevention of lingual nerve injury
- Prevention of Inferior alveolar nerve injury
  - Risk Assessment
    - Coronectomy indicated
    - Coronectomy NOT indicated or contraindicated
  - Surgical technique
  - Limitations and complications?

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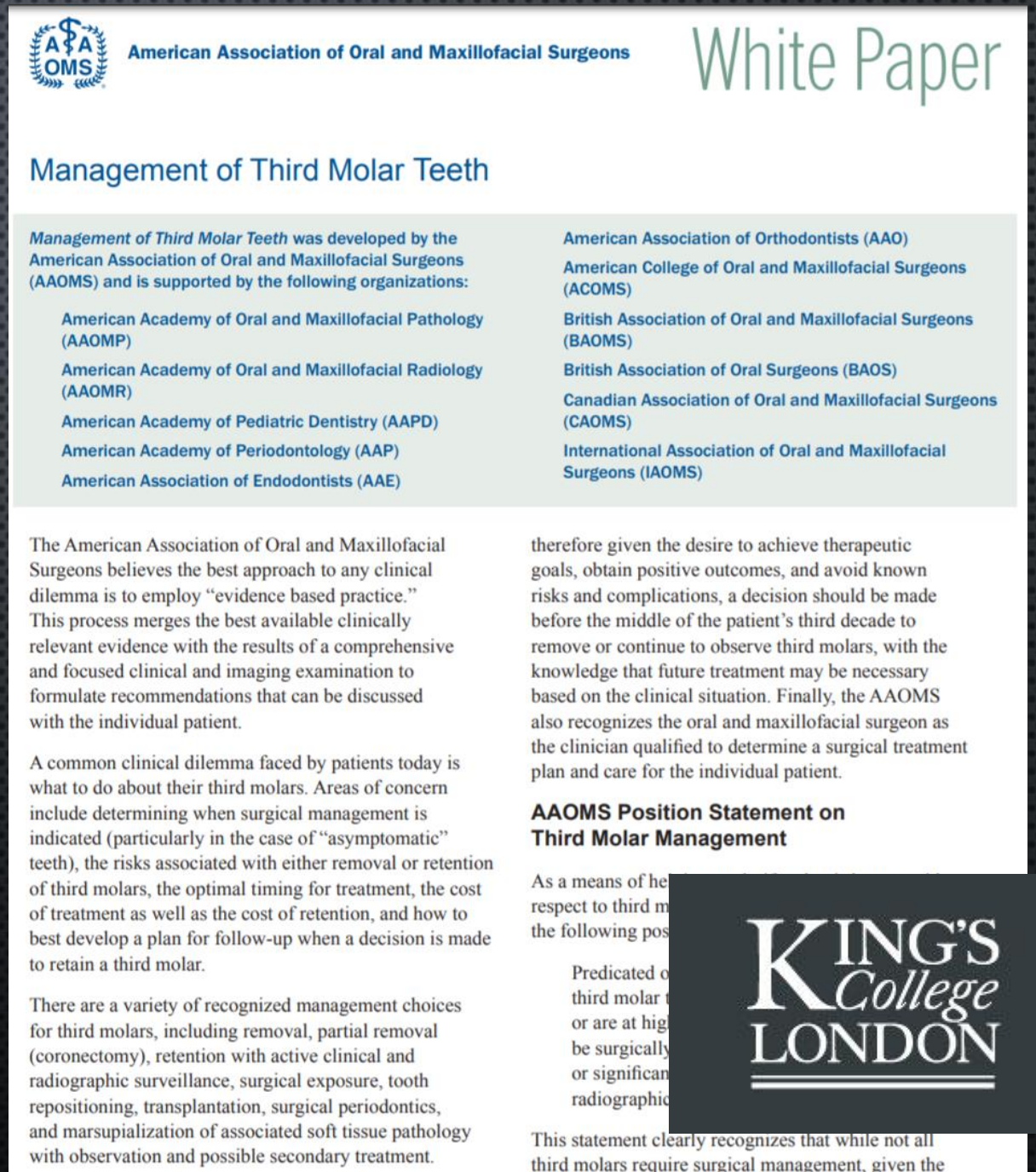
There must be in an indication to remove the M3M



American Association of Oral and Maxillofacial Surgeons

White Paper

Management of Third Molar Teeth

Management of Third Molar Teeth was developed by the American Association of Oral and Maxillofacial Surgeons (AAOMS) and is supported by the following organizations:

- American Academy of Oral and Maxillofacial Pathology (AAOMP)
- American Academy of Oral and Maxillofacial Radiology (AAOMR)
- American Academy of Pediatric Dentistry (AAPD)
- American Academy of Periodontology (AAP)
- American Association of Endodontists (AAE)
- American Association of Orthodontists (AAO)
- American College of Oral and Maxillofacial Surgeons (ACOMS)
- British Association of Oral and Maxillofacial Surgeons (BAOMS)
- British Association of Oral Surgeons (BAOS)
- Canadian Association of Oral and Maxillofacial Surgeons (CAOMS)
- International Association of Oral and Maxillofacial Surgeons (IAOMS)

The American Association of Oral and Maxillofacial Surgeons believes the best approach to any clinical dilemma is to employ "evidence based practice." This process merges the best available clinically relevant evidence with the results of a comprehensive and focused clinical and imaging examination to formulate recommendations that can be discussed with the individual patient.

A common clinical dilemma faced by patients today is what to do about their third molars. Areas of concern include determining when surgical management is indicated (particularly in the case of "asymptomatic" teeth), the risks associated with either removal or retention of third molars, the optimal timing for treatment, the cost of treatment as well as the cost of retention, and how to best develop a plan for follow-up when a decision is made to retain a third molar.

There are a variety of recognized management choices for third molars, including removal, partial removal (coronectomy), retention with active clinical and radiographic surveillance, surgical exposure, tooth repositioning, transplantation, surgical periodontics, and marsupialization of associated soft tissue pathology with observation and possible secondary treatment.

therefore given the desire to achieve therapeutic goals, obtain positive outcomes, and avoid known risks and complications, a decision should be made before the middle of the patient's third decade to remove or continue to observe third molars, with the knowledge that future treatment may be necessary based on the clinical situation. Finally, the AAOMS also recognizes the oral and maxillofacial surgeon as the clinician qualified to determine a surgical treatment plan and care for the individual patient.

AAOMS Position Statement on Third Molar Management

As a means of he
respect to third m
the following pos

> Predicated o
> third molar t
> or are at hig
> be surgically
> or significan
> radiographic

This statement clearly recognizes that while not all third molars require surgical management, given the

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DIAGNOSIS? GET IT RIGHT!

- LISTEN
- PATIENT FACTORS
- SYSTEMIC RISKS

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4 POSSIBLE CLINICAL M3M PRESENTATION SCENARIOS

Possible treatment and diagnostic indications	**<u>Interventional removal of M3M communicating with the mouth</u>** **Earlier age -less morbidity** Quiescent pathology may include; Periodontal disease, caries, resorption, tooth fracture, jaw fracture, cysts or other pathology	**<u>Leave M3M OR Prophylactic removal of M3M</u> indications include;** Pre radiotherapy Pre medication for osteoporosis or metastatic bone disease (Bisphosphonates, antiangiogenics M3M removal in line of surgery for jaw fracture, orthognathic or cancer surgery
Asymptomatic	**Diseased**	**Non Diseased**
Symptomatic	**Diseased**	**Non Diseased** **M3M healthy but disease in adjacent tissues causing pain**
Possible Treatment and diagnostic indications	**<u>Therapeutic removal of M3M</u>** **Treat pathology may include**; pathology may include; Periodontal disease, caries, resorption, tooth fracture, cysts or other pathology	**<u>No removal of M3M</u>** **Treat pathology may include;** TMD, mucosal disease, adjacent tooth pathology, salivary gland disease

CONSENT
WHY NOT ASK THE SAME QUESTIONS AS THE LAWYERS?

TAKING A GOOD HISTORY ENSURES MEDICAL ISSUES AVOIDED

- WAS THERE A GOOD INDICATION TO REMOVE THE TOOTH?
- DID THESE INDICATIONS CONCUR WITH NATIONAL GUIDANCE?
- WAS THE PATIENT WARNED/ CONSENTED?
- WAS THERE AN ELEVATED RISK?
- WAS ADDITIONAL ASSESSMENT UNDERTAKEN TO ASSESS HEIGHTENED RISK?
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- WAS PATIENT REFERRED EARLY FOR SPECIALIST CARE?

OVERVIEW

- Indications for surgery and patient risk
- **Prevention of lingual nerve injury**
- Prevention of Inferior alveolar nerve injury
  - Risk Assessment
    - Coronectomy indicated
    - Coronectomy NOT indicated or contraindicated
  - Surgical technique
  - Limitations and complications?

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Patient factors associated with higher M3M surgery morbidity?

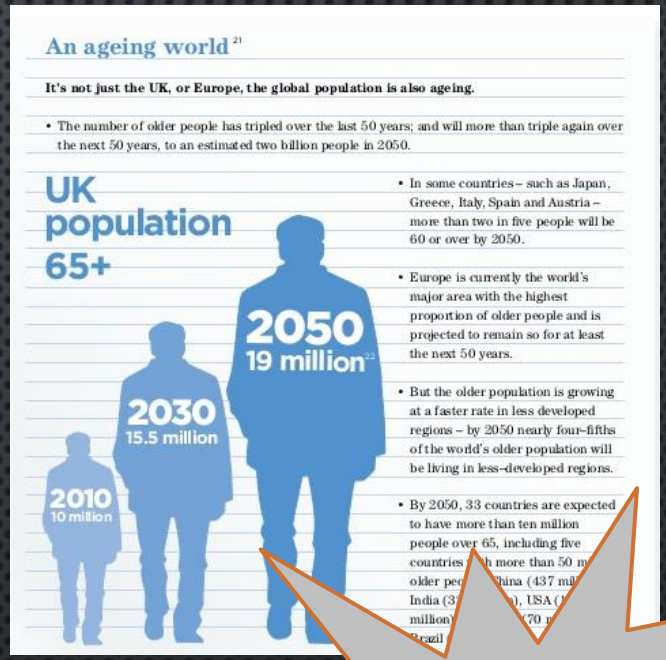
- **ALL COMPLICATIONS RELATED TO**

Age of the patient > 25 years

- DURATION OF SURGERY
- INTRA-OPERATORY EXPOSURE OF THE NERVE
- UN-ERUPTED TOOTH

- LNI
- TECHNIQUE ACCESS FOR THE LOWER THIRD MOLAR EXTRACTION
- THE SURGEON'S INEXPERIENCE.

- IANI
- L TECHNIQUE



Relevant studies have been identified and are reported for the following complications and their relationship to the patient's age:

- **time to recovery**
- **incidence of fractures**
- **rates of infection**
- **periodontal complications**
- **temporomandibular joint complications**
- **nerve injury**
- **sinus-related complications.**

Pogrel MA. What is the effect of timing of removal on the incidence and severity of complications? J Oral Maxillof Surg. 2012 Sep;70(9 Suppl 1):S37-40. doi: 10.1016/j.joms.2012.04.028. Epub 2012 Jun 16.

High evidence level

Acta Odontol Scand. 2013 Jul 4.The importance of a good evaluation in order to prevent oral nerve injuries: A review.Céspedes-Sánchez JM, Ayuso-Montero R, Marí-Roig A, Arranz-Obispo C, López-López J. 662 were obtained from the search, from which 25 were selected accomplishing the inclusion criteria. Moreover, seven important articles were selected from the references of the ones mentioned, obtaining a total of 32 articles for the review.

What are the risk factors for nerve injury?

LNI & IANI

- Age of the patient > 25 years
- Time of surgery
- Intra-operatory exposure of the nerve
- Un-erupted tooth

LNI

- Technique access for the lower third molar extraction
- the surgeon's inexperience.

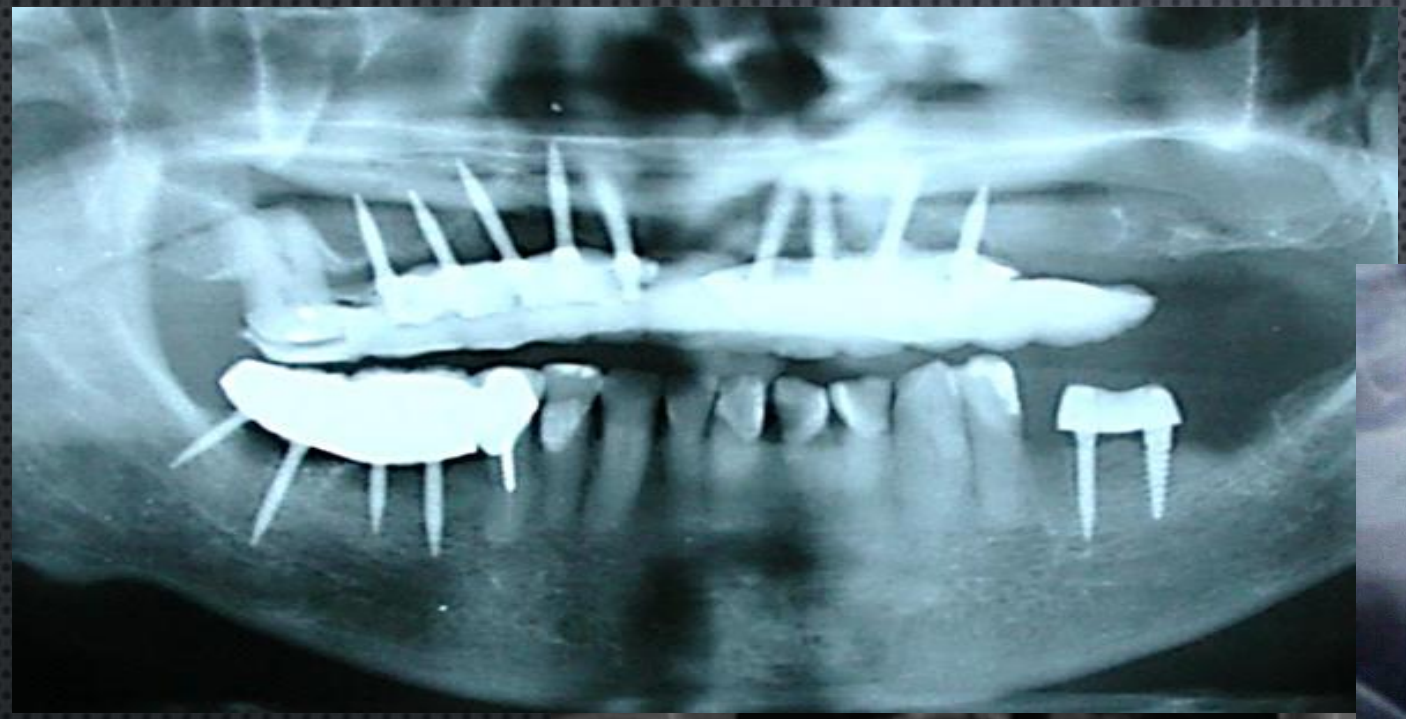
IANI

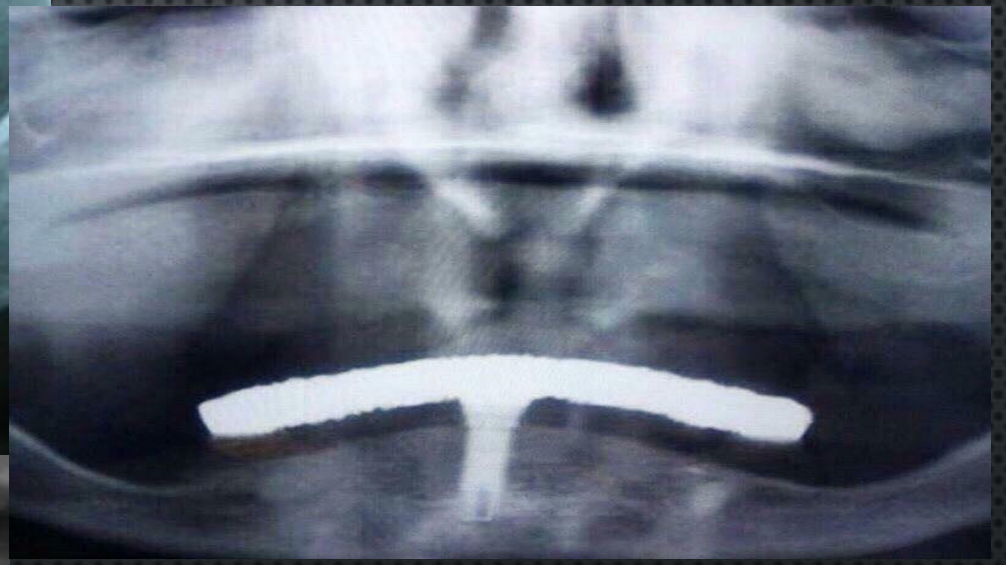
- The radiological examination is useful to evaluate the nerve damage and to decide on the surgical technique

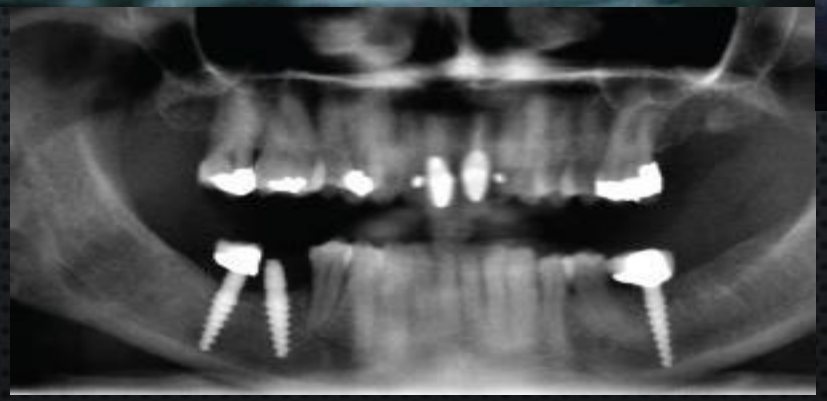
Acta Odontol Scand. 2013 Jul 4. The importance of a good evaluation in order to prevent oral nerve injuries: A review.Céspedes-Sánchez JM, Ayuso-Montero R, Marí-Roig A, Arranz-Obispo C, López-López J.

MINIMISING NERVE INJURY RELATED TO M3M SURGERY THERE ARE THREE KINDS OF DENTISTS

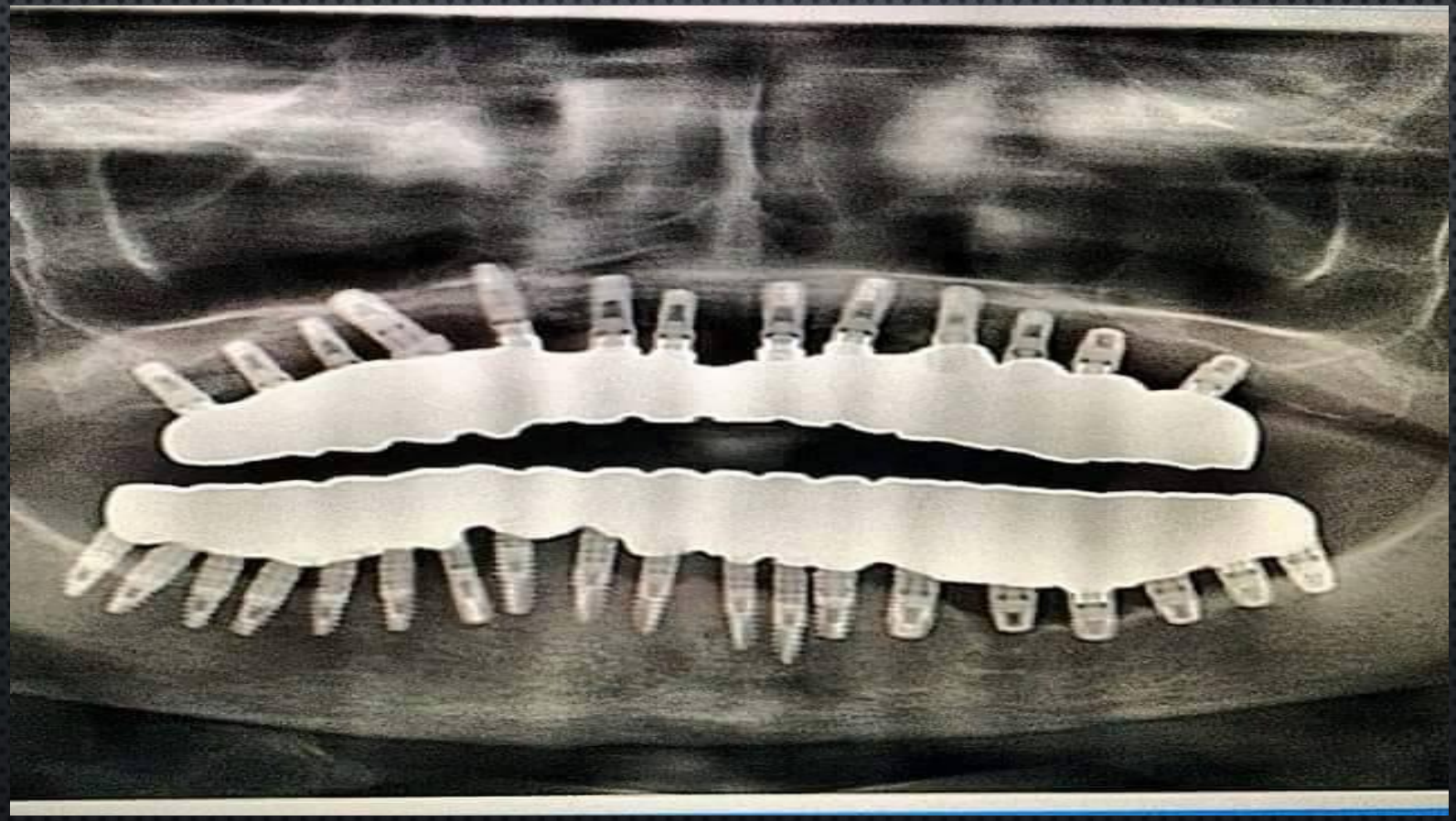
THE OPTIMISTS



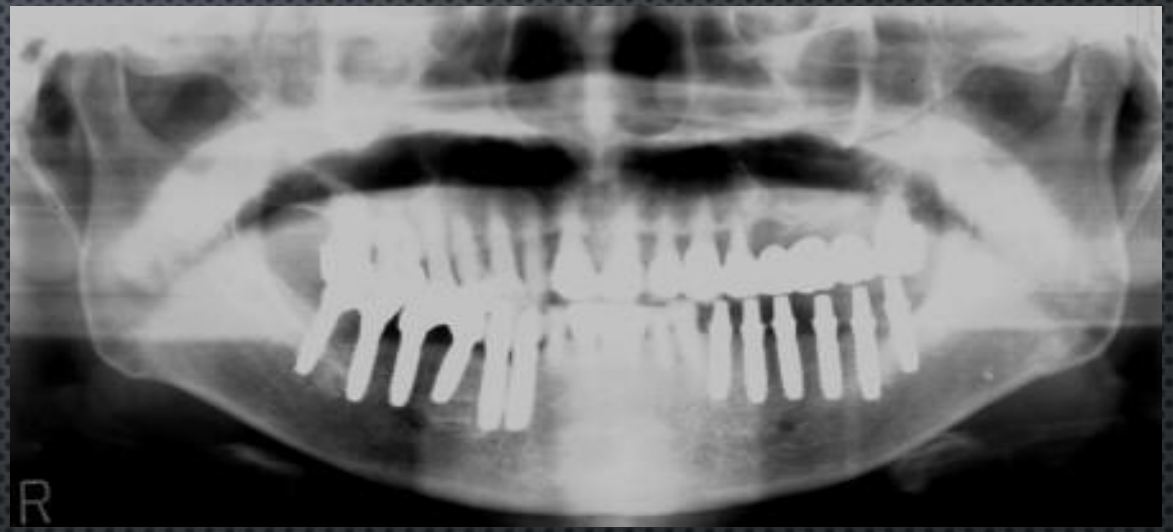


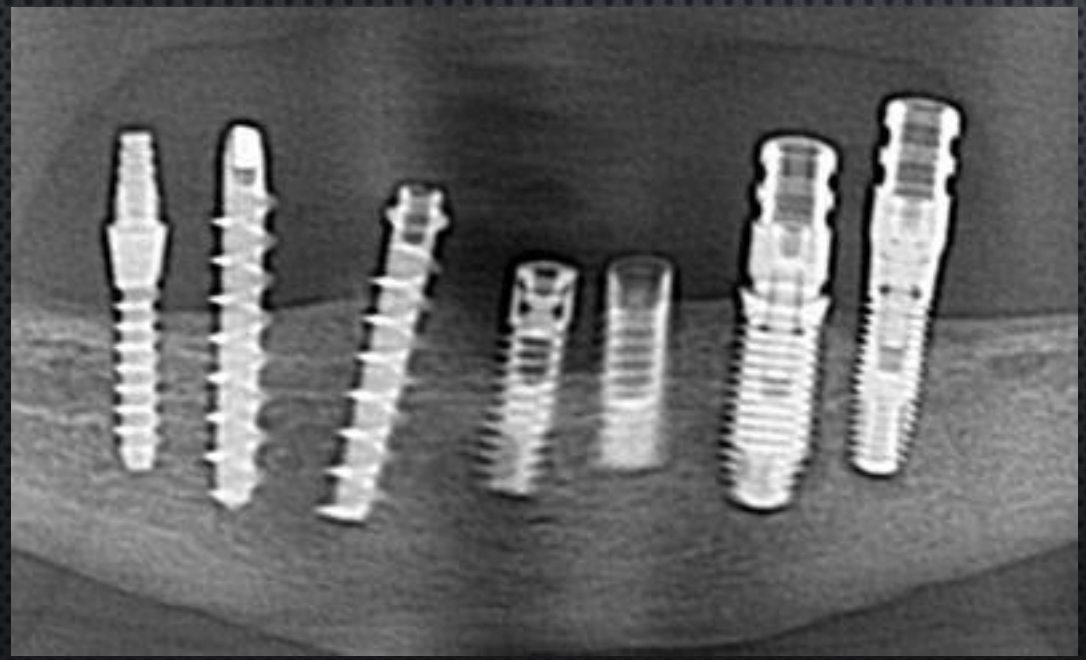


THE PESSIMISTS



AND THE UNDECIDED……





NERVE DAMAGE RELATED TO DENTAL PROCEDURES ARE RARE BUT HAVE A SIGNIFICANT IMPACT ON THE PATIENTS INVOLVED

Nerve damage in dentistry

M. Anthony Pogrel, DDS, MD

Many forms of dental treatment have the potential to cause injury to the oral branches of the trigeminal nerve, including local anesthetic injections, root canal therapy, implant insertion, bone grafting, and dentoalveolar surgery. Based on the records of a referral center with more than 30 years' experience in managing 3200 of these injuries, this article reviews etiology and prevention; suggests criteria for referral of patients; and discusses treatment for the various types of injury and the results of such treatment.

Received: September 7, 2016
Accepted: October 31, 2016

A number of dental procedures, including local anesthetic injections, endodontic treatment, implant insertion, bone grafting, and dentoalveolar surgery, have the ability to damage nerves (usually sensory nerves). Fortunately, most cases of nerve injury are temporary, but permanent cases of anesthesia, paresthesia (abnormal sensations), or dysesthesia (unpleasant sensations) do occur. This article looks at one regional referral center's experience, gained over 30 years of managing these problems, and observes emerging trends.

Setting

The Department of Oral and Maxillofacial Surgery (DOMS) at the University of California, San Francisco (UCSF), has acted as a regional referral center for patient swith nerve injuries associated with dental treatment for mor ethan 30 years. Since 1985, the department has seen more th an 3200 patients with iatrogenic injuries to the sensory nerves of the maxillofacial areas.[1] This experience has presented the opportunity to make a number of observations and evaluate different management protocols.

The vast majority of referrals are for nerve injuries related to 5 types of dental procedure: local anesthetic injections; root canal therapy; osseointegrated implant therapy; bone grafting, including injuries from bone products and bone graft harvesting; and dentoalveolar surgery, primarily third molar removal. The discussion in the present article will be restricted to these 5 areas. A similar range of etiologies for nerve damage has been reported elsewhere.[2] The majority of injuries are related to the inferior alveolar and/or lingual nerves; there is only occasional involvement of the long buccal, mylohyoid, infraorbital, and maxillary nerve branches.

Causes of nerve damage

Local anesthetic injections

Since 1985, clinicians in the department have seen and examined 324 patients in whom the nerve injury could only have resulted from a dental injection. These experiences allowed a number of observations, including the facts that the lingual nerve is affected approximately twice as often as the inferior alveolar nerve and approximately one-third of patients suffered from dysesthesia (painful sensations) instead of pure anesthesia or paresthesia.[3] If recovery did occur, it normally occurred over a period of about 3 months, and late recoveries were rare.[4,5]

The vast majority of these injuries were associated with inferior alveolar nerve blocks.[6,7] Among the cases of permanent nerve damage from local anesthetics that have been observed over the last 30 years, only 5 of 324 resulted from any other type

Pogrel MA. Nerve damage in dentistry. Gen Dent. 2017 Mar-Apr;65(2):34-41

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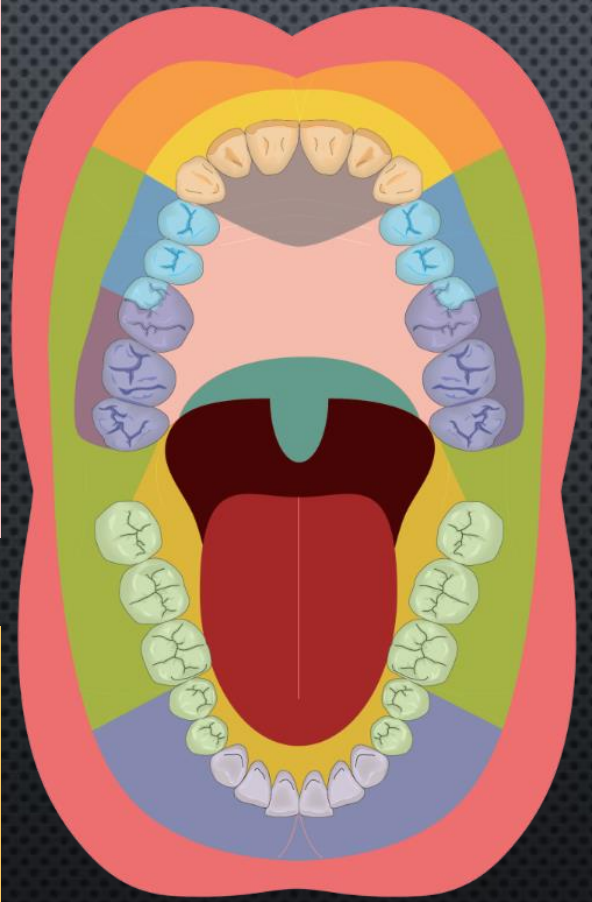
INFILTRATION DENTISTRY IS DEPENDANT UPON THE SITE AND PROCEDURE

Maxillary dentistry can be performed entirely using Lidocaine 2% with adrenaline for all procedures
Buccal infiltration with intra-septal injections
No additional benefit using 4% Articaine No palatal or incisal blocks are indicated

Posterior mandibular molar Endodontic procedures may require IDBs or higher techniques (Gow Gates or Akinosi)



Mandibular 7s and 8s for **perio, restorations or implants**
Articaine 4% buccal infiltration and Lidocaine 2% lingual infiltrations OR for **extractions** intraligamental
If fails may need lidocaine IDB

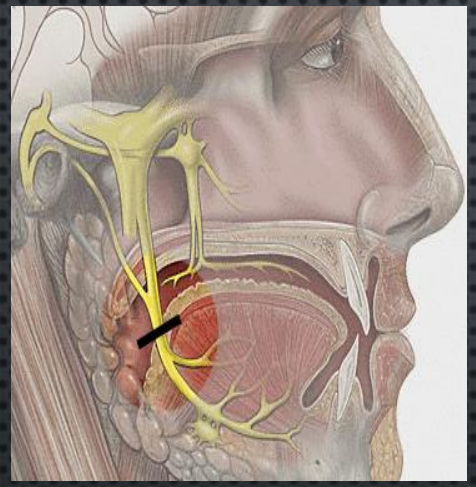
Mandibular 1st molars for **perio, restorations or implants**
Articaine 4% buccal +/- Lidocaine 2% crestal or lingual infiltration s OR for **extractions** add lidocaine lingual **of** intra-ligamental

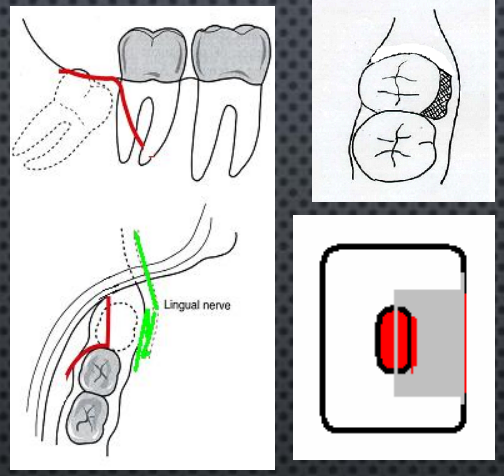
Mandibular premolars, canines incisors for **perio, restorations or implants**
Articaine buccal infiltration (incisal nerve block using 30% cartridge) adjacent not in the mental foramen and massage over region. If fails repeat or add crestal or lingual infiltration OR for **extractions,** intra-ligamental

Illustration modified from figure courtesy of Andrew Mason University

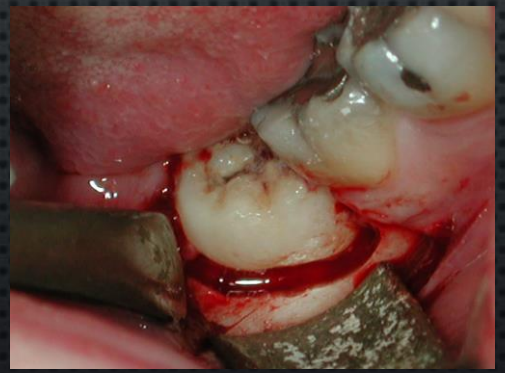
PREVENTION OF LINGUAL NERVE
BUCCAL APPROACH -MINIMAL ACCESS PREVENTS LNI

Old Technique ‘Explode the patient’





New technique minimal access



Evaluation of trigeminal nerve injuries in relation to third molar surgery in a prospective patient cohort. Recommendations for prevention. **Renton T**, Yilmaz Z, Gaballah K. Int J Oral Maxillofac Surg. 2012 Dec;41(12):1509-18.

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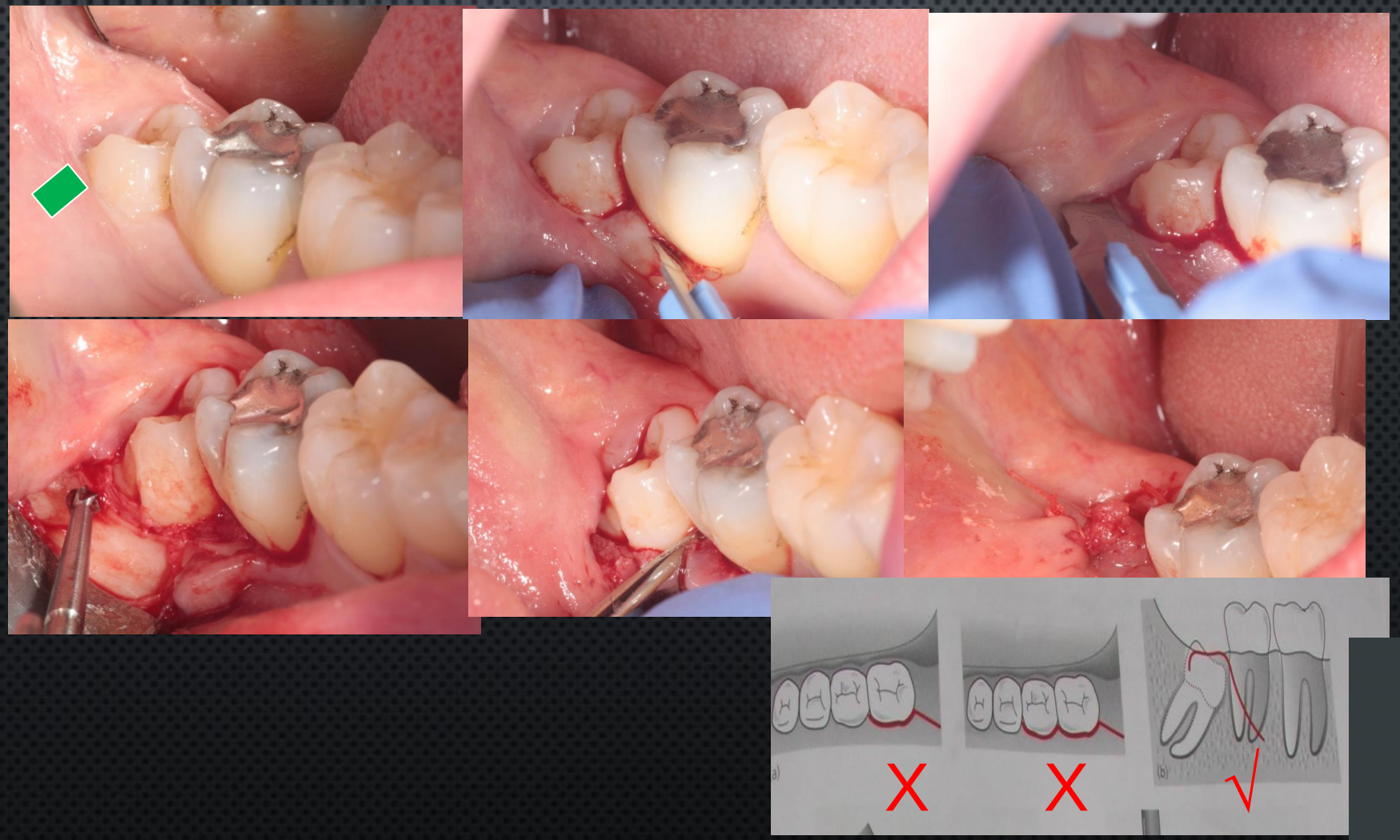
PREVENTION LNI RELATED TO M3M SURGERY
BUCCAL MINIMAL ACCESS SURGERY



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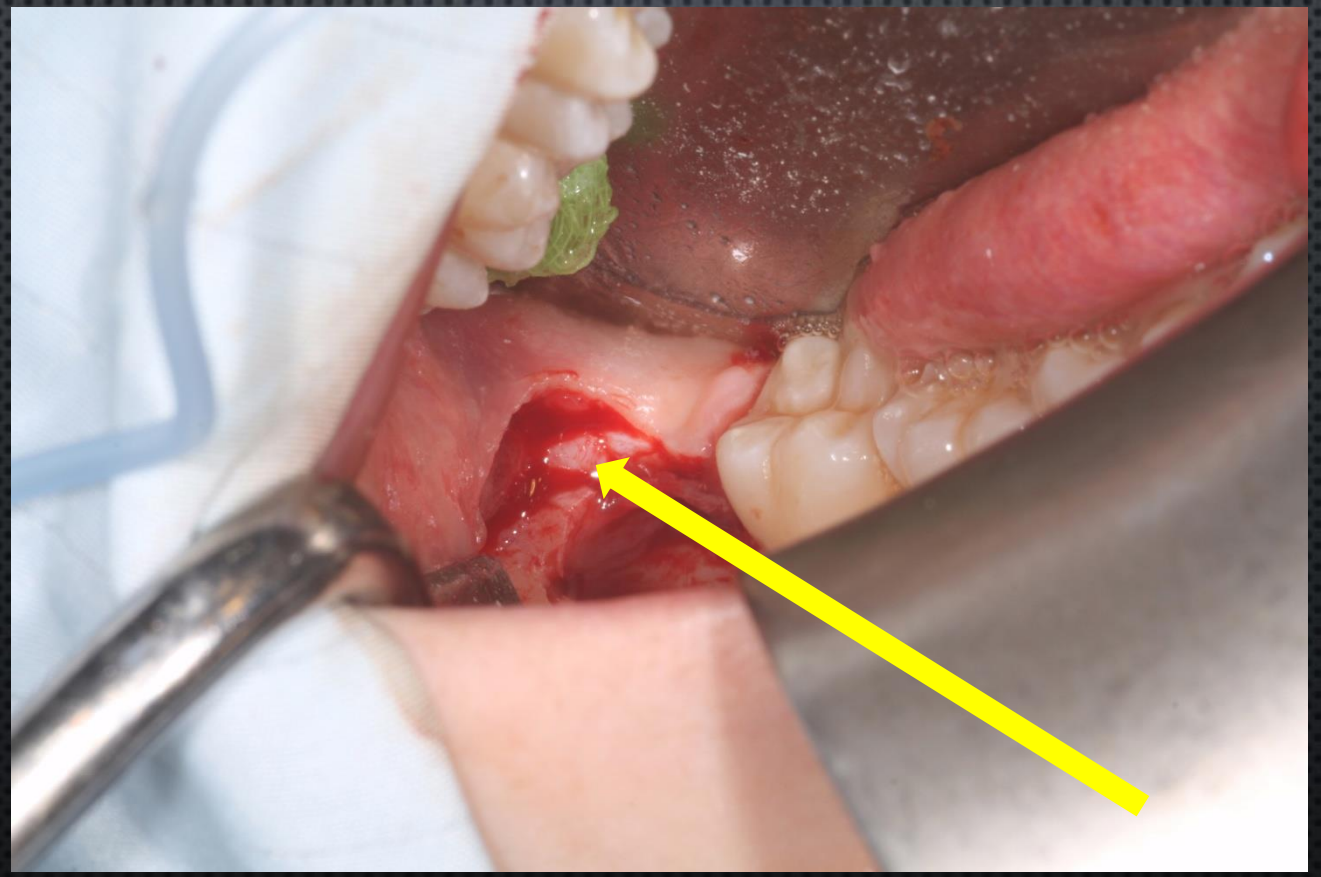
PREVENTION OF NERVE INJURY

AVOID DISTAL BONE REMOVAL
SPOT THE LINGUAL NERVE!



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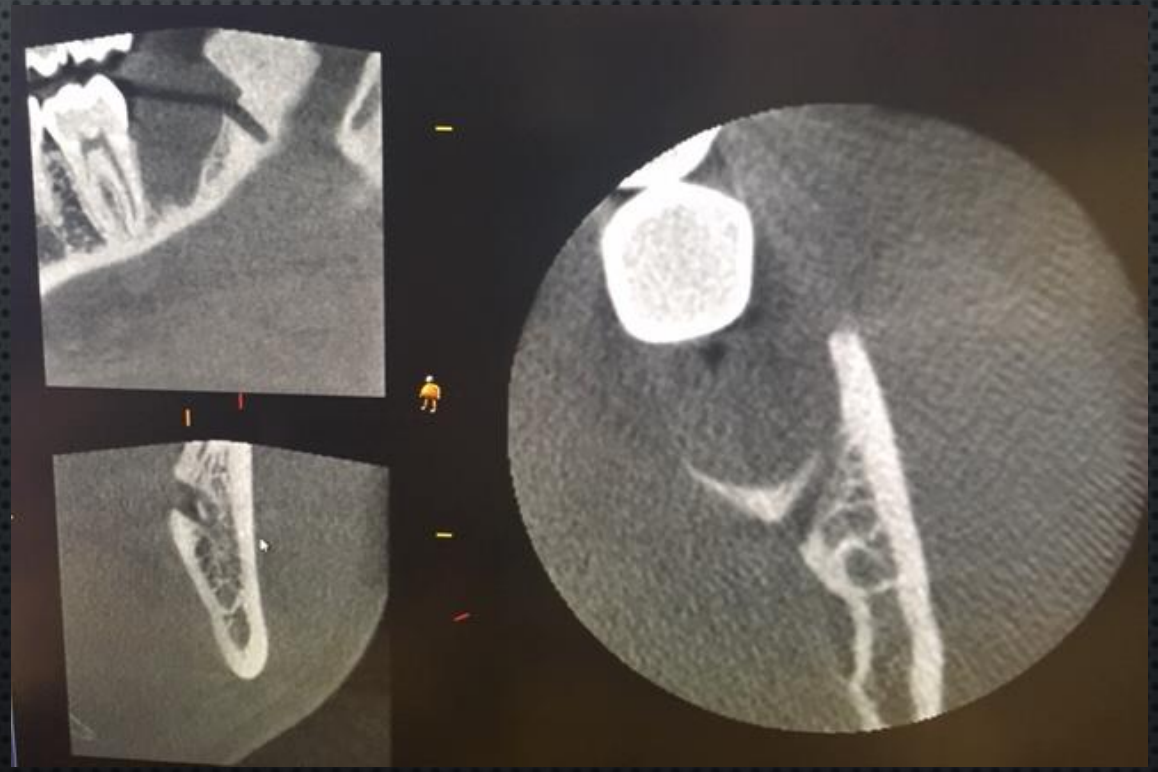
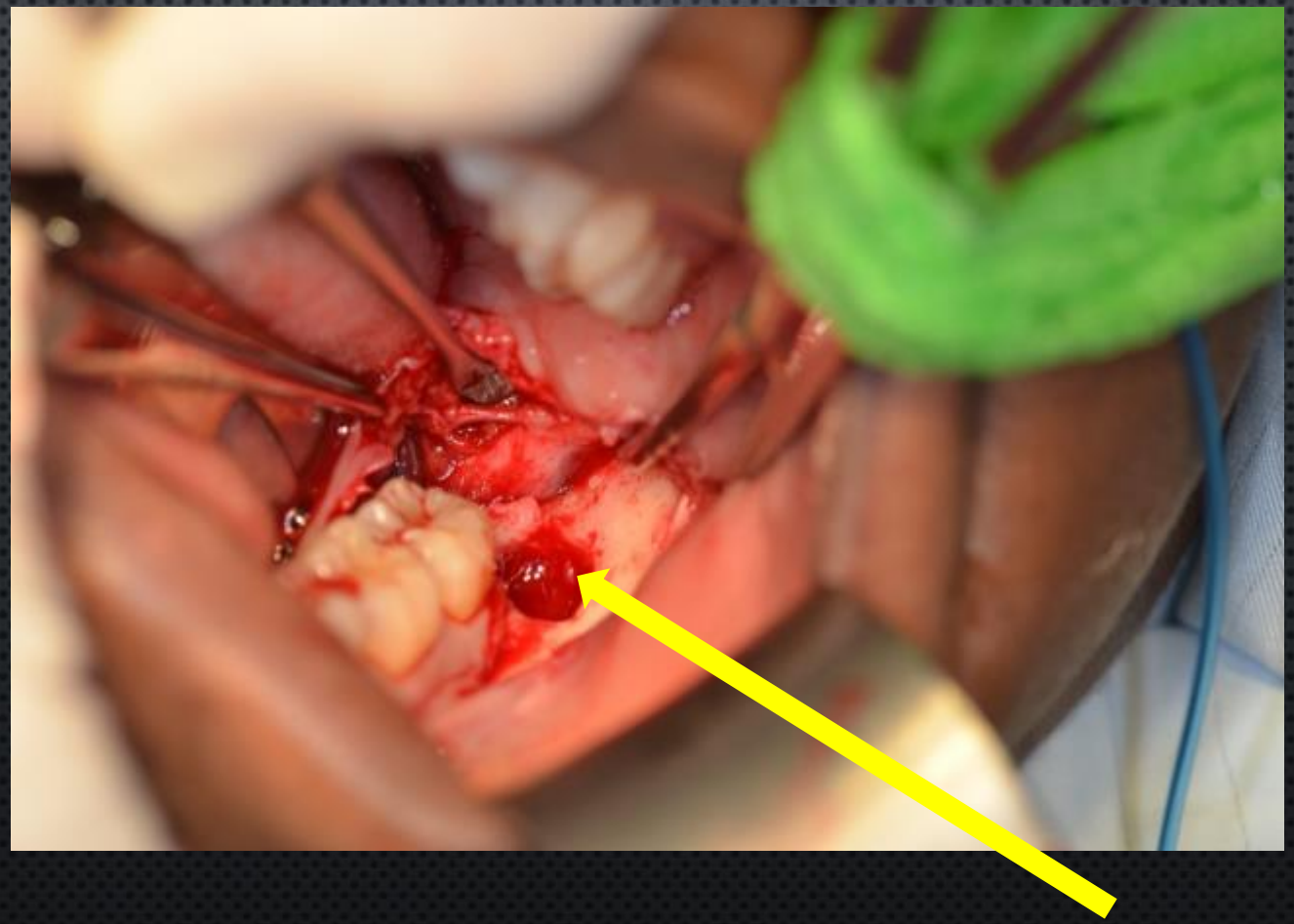
EARLY ASSESSMENT OF POTENTIAL LINGUAL NERVE INJURY USING CBCT

Spot the toller bur mark in the lingual cortex!



PREVENTION OF NERVE INJURY

LINGUAL NERVE DAMAGE DUE TO DISTAL BONE REMOVAL



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PREVENTION OF LINGUAL NERVE INJURY
The Buccal approach

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PREVENTION OF LINGUAL NERVE INJURY
The Buccal approach

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Prevention of Lingual Nerve Injury in Third Molar Surgery: Literature Review

Roberto Pippi, MD, DDS, Andrea Spota, MD, DDS,† and Marcello Santoro, DDS‡*

Purpose: To identify any factors that could aid the surgeon in preventing or minimizing the risk of lingual nerve injury during third molar surgery.

Materials and Methods: Electronic research was carried out on the correlation between lingual nerve damage and lower third molar surgery (topographic anatomy, surgical technique, and regional anesthesia) using PubMed, Scopus, and Cochrane central databases. The research included only articles published in English up to February 2016.

Results: Lingual nerve anatomy varied greatly: direct contact between the lingual nerve and the third molar alveolar wall was reported in a wide range of cases (0 to 62%) and the nerve was located at the same level or above the top of the ridge in 0 to 17.6% of cases. No detailed data were found on the actual incidence of lingual nerve injury resulting from local anesthesia by injection. Permanent lingual nerve damage did not show statistically relevant differences between the simple buccal approach and the buccal approach plus lingual flap retraction, although the latter was statistically associated with an increased risk of temporary damage. Lingual spit technique was statistically associated with an increased risk of temporary nerve damage than the buccal approach with or without lingual flap retraction. For permanent damage, no statistically relevant differences were found between the lingual split technique and the buccal approach with lingual flap retraction. Compared with tooth sectioning, the ostectomy was strongly statistically associated with permanent lingual nerve damage.

Conclusions: Results should be interpreted with extreme caution because of the considerable heterogeneity of the data and the considerable influence of several anatomic and surgical variables that were closely related, but difficult to analyze independently. It seems preferable to avoid lingual flap elevation, except in selected cases in which the presence of more than 1 unfavorable surgical variable predicts a high risk of nerve injury. Tooth sectioning could decrease the extent of the ostectomy or even, in some cases, prevent it, potentially acting as a protective factor against lingual nerve injury.

J Oral Maxillofac Surg 75:890-900, 2017

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†Researcher.

‡PhD Student.

Conflict of Interest Disclosures: None of the authors have any relevant financial relationship(s) with a commercial interest.

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http://dx.doi.org/10.1016/j.joms.2016.12.040

OVERVIEW

- Indications for surgery
- Prevention of lingual nerve injury
- **Prevention of Inferior alveolar nerve injury**
  - Risk Assessment
    - Coronectomy indicated
    - Coronectomy NOT indicated or contraindicated
  - Surgical technique
  - Limitations and complications?

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EASY TOOTH ON A DIFFICULT PATIENT OR A DIFFICULT TOOTH ON AN EASY PATIENT?

- **Clinical examination**
  - Exra Oral
    - TMD
    - Lymph nodes
    - Mouth opening
  - Intraoral
    - Mucosa pericoronitis/pathology
    - Condition of dentition
    - Oral hygiene
    - Adjacent tooth
- **Is your diagnosis confirmed?**
- **Likely need for tooth removal?**
- **Radiographic assessment**
- **Pathology –biopsy report needed**
- **Additional medical interventions?**

MANAGE YOUR PATIENTS EXPECTATIONS

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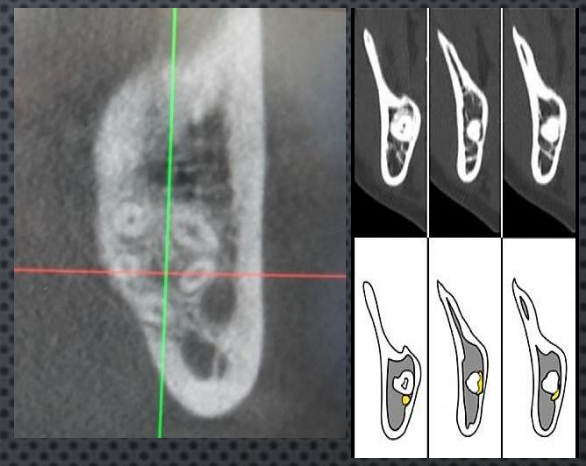
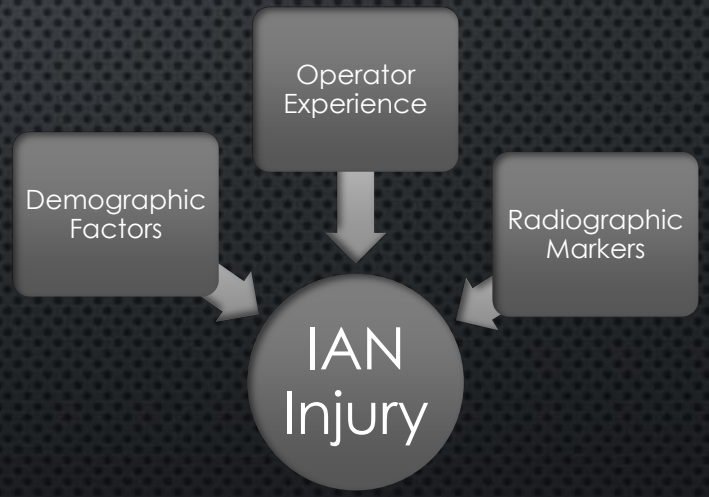
RISK IANI GENERAL RISK FACTORS

- **AGE OF THE PATIENT**
- **INTRA-OPERATORY EXPOSITION OF THE NERVE**
- **INTRAOPERATIVE REPORTED PAIN DURING SURGERY**
- **SURGEON'S INEXPERIENCE.**
- **DENTAL FACTORS PROXIMITY TO NERVE**
- **RADIOGRAPHIC MARKERS (CBCT):**
  - CORTICAL PERFORATION OF THE IAC BY THE ROOT OR CROWN OF THE 3RD MOLAR CORRELATED WITH DARKENING OF THE ROOT SEEN ON THE PANORAMIC RADIOGRAPH.
  - A CORTICAL DEFECT 3MM LONG OR MORE IN THE IAC WAS ASSOCIATED WITH AN INCREASED RISK OF OPERATIVE EXPOSURE OF THE IAN.





Céspedes-Sánchez JM, Ayuso-Montero R, Marí-Roig A, Arranz-Obispo C, López-López J **The importance of a good evaluation in order to prevent oral nerve injuries: A review.** Acta Odontol Scand.2013 Jul 4.

Factors that are associated with injury to the IAN in high-risk patients after removal of third Molars. Selvi, Dodson, Nattestad, Robertson, Tolstunov. BJOMS 51 (2013) 868–873. with permission.

HOW DO WE PREVENT INFERIOR ALVEOLAR NERVE INJURIES? **BY RISK ASSESSMENT AND MODIFIED TECHNIQUE**

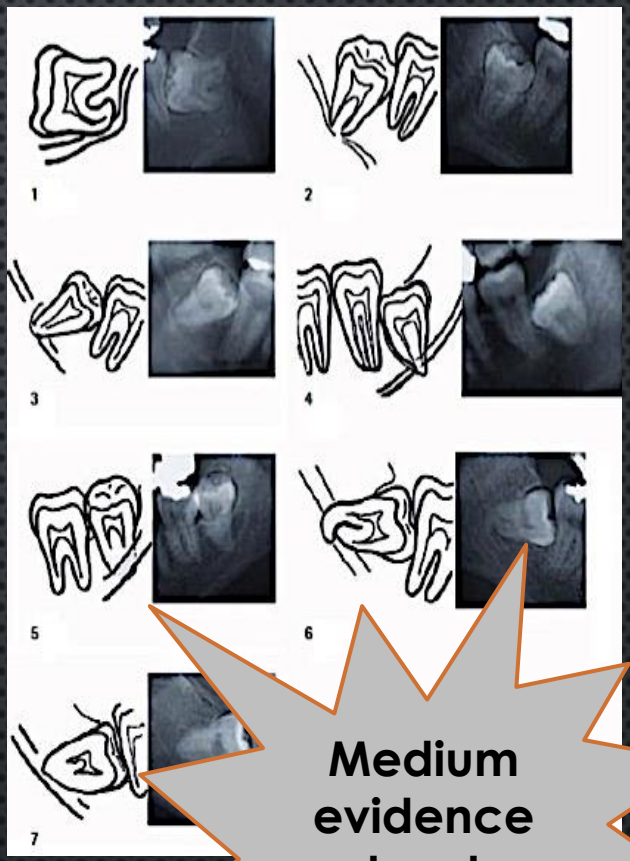
M3M ROOT INTO IDC

Céspedes-Sánchez JM, Ayuso-Montero R, Marí-Roig A, Arranz-Obispo C, López-López J The importance of a good evaluation in order to prevent oral nerve injuries: A review. Acta Odontol Scand.2013 Jul 4. Factors that are associated with injury to the IAN in high-risk patients after removal of third Molars. Selvi, Dodson, Nattestad, Robertson, Tolstunov. BJOMS 51 (2013) 868–873. with permission.

RADIOGRAPHIC ASSESSMENT FOR INCREASED RISK OF IANI- PLAIN FILM SIGNS

What are the plain film indicators of IAN risk?

- IAN plain film risk factors include:
  - Diversion of the canal
  - Darkening of the root
  - Narrowing of the root/canal
  - Interruption of the canal lamina dura.
  - Interruption of the juxta-apical area.



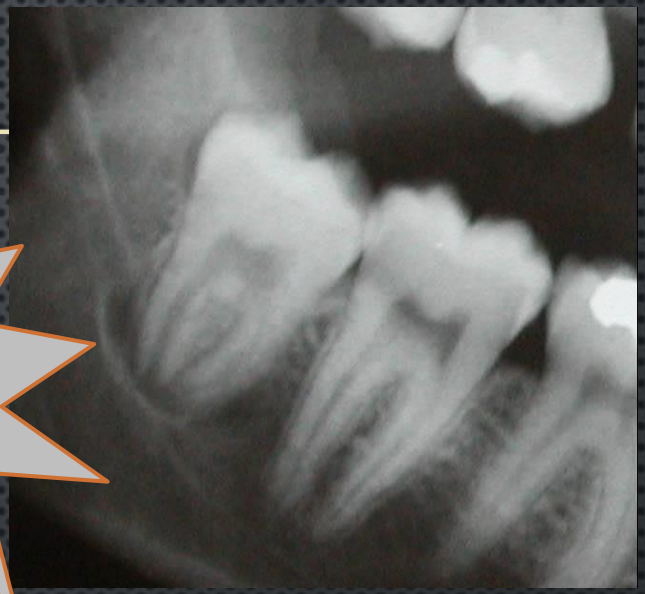
Medium evidence level

Y. Hatano, K. Kurita, Y.Kuroiwa, H. Yu[illegible] 67, 1806-14.Clinical evaluations of coronect[illegible] partial odontectomy) for mandibular third [illegible] computed tomography: a case-control study, c[illegible] with permission from Elsevier)

Howe J. et Poyton H: Prevention of damage to the inferior alveolar dental nerve during the extraction of mandibular third molars. Br. Dent J. 1960; 109:355 Rud J. The split-bone technique for removal of impacted mandibular third molars. J Oral Surg 1970; 28:416-421. Kipp D et al.: Dysesthesia after mandibular third molar surgery: A retrospective study and analysis o 1,377 surgical procedures. J Am Dent Assoc. 1980; 100: 185. Rood JP. Lingual Split Technique: Damage to Inferior Alveolar and Lingual Nerves during Removal of Impacted Mandibular Third Molars. Br Dent J 1983; 154: 402-403. Rud J. Re-evaluation of the lingual split bone technique for the removal of impacted

WHAT'S THE RISK OF NERVE INJURY?

WHEN TOOTH ROOTS ARE PROXIMAL TO INFERIOR DENTAL CANAL (IDC)



Low risk extraction

- **2% of temporary**
- **0.2% of permanent**

High risk extraction

(teeth are superimposed on the IAN canal)

- **20% temporary**
- **2% permanent**

Risk factors

- increased age
- difficulty of surgery
- proximity to the IAN canal

10 x

Medium evidence level

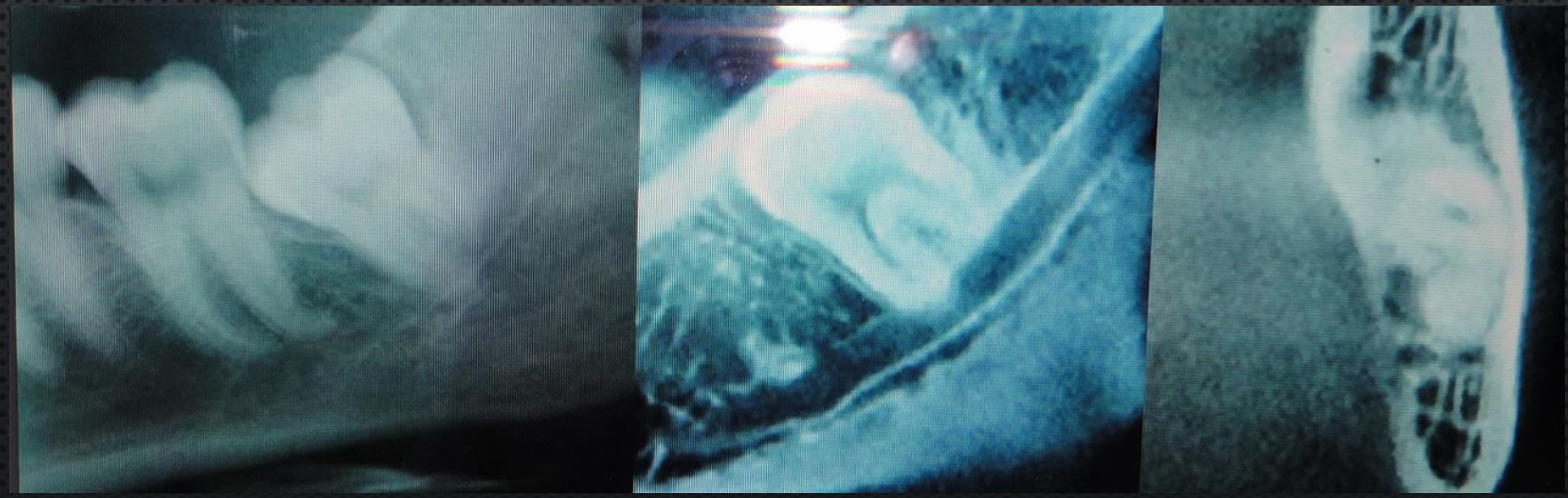
- Renton T, Hankins M, Sproate C, McGurk M.A randomised controlled clinical trial to compare the incidence of injury to the inferior alveolar nerve as a result of coronectomy and removal of mandibular third molars. Br J Oral Maxillofac Surg. 2005 Feb;43(1):7-12
- Rood JP, Shehab BA.The radiological prediction of inferior alveolar nerve injury during third molar surgery.Br J Oral Maxillofac Surg. 1990 Feb;28(1):20-5
- Rud J.Third molar surgery: perforation of the inferior dental nerve through the root. Tandlaegebladet.

HOW MANY M3MS ARE AT HIGH RISK?

Fate	M3Ms	% of sub group of M3Ms	% of all M3Ms high risk	Reference
Missing	8/100	8 (0.15% and 16.2%)	8	Rakhshan V Congenitally missing teeth (hypodontia): A review of the literature concerning the etiology, prevalence, risk factors, patterns and treatment Dent Res J (Isfahan). 2015 Jan-Feb; 12(1): 1–13.
Impacted non communicating with mouth= retain	8-18/92	7-13%	6 15	Jung JH Cho BH. Prevalence of missing and impacted third molars in adults aged 25 years and above Imaging Sci Dent 2013 Dec; 43(4): 219–225. Dodson T Impacted wisdom teeth BMJ Clin Evid 2010; 2010: 1302.
Requiring removal or coronectomy at some stage			2 11	No evidence but 2% risk of permanent IANI Howe J, Poyton H. Prevention of damage to the inferior alveolar dental nerve during the extraction of mandibular third molars. Br. Dent J. 1960; 109:355
High risk based upon panoral radiography	35/80	(7.5% /80) 36% 32.1% 29&	**11** **39** **35**	Howe J, Poyton H. Prevention of damage to the inferior alveolar dental nerve during the extraction of mandibular third molars. Br. Dent J. 1960; 109:355 Sedaghatfar M, August MA, Dodson T. Panoramic Radiographic Findings as Predictors of Inferior Alveolar Nerve Exposure Following Third Molar Extraction. American Association of Oral and Maxillofacial Surgeons J Oral Maxillofac Surg 63:3-7, 2005 Smith Aus Dent J 2012
High risk based upon CBCT	30/35	46.7% direct contact IDC	**42**	Schneider T et al Variations in the anatomical positioning of impacted mandibular wisdom teeth and their practical implications. Swiss dental Journal. 124: 520–529 (2014)

ASSESSMENT NERVE 'AT RISK'. IS THE M3M HIGH RISK? WHEN DO WE ORDER A CBCT?

- CROSSING LAMINA DURA OF IAN CANAL ON PLAIN FILM?
- WITH ASSOCIATED RADIOGRAPHIC SIGNS?



USING CBCT WE CAN ASSESS THE POSITION OF M3M ROOTS RELATED TO IDC?

- ASSOCIATED RADIOGRAPHIC SIGNS?

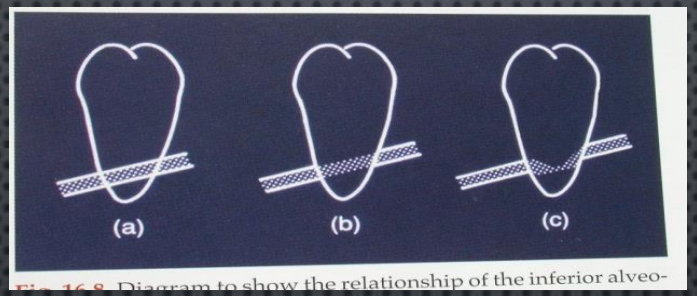
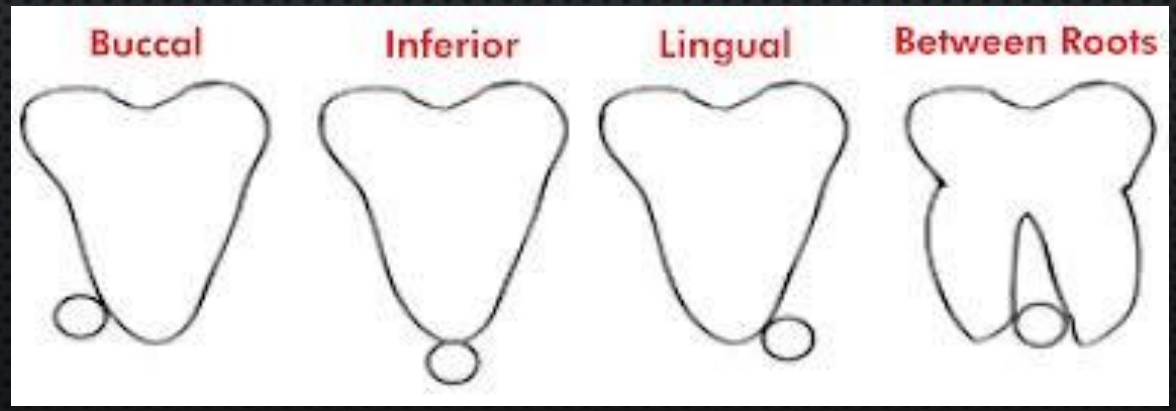


Fig. 16.8 Diagram to show the relationship of the inferior alveo-

- CONSIDER CBCT TO CLARIFY RELATIONSHIP



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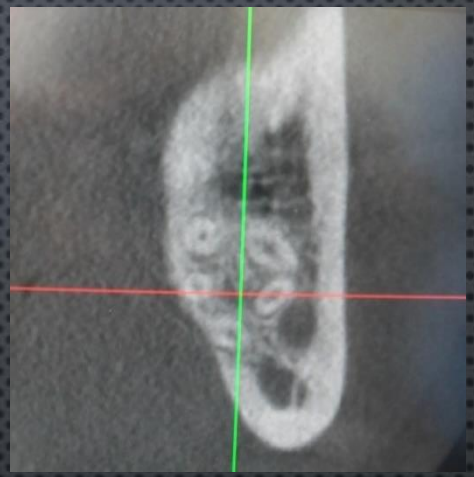
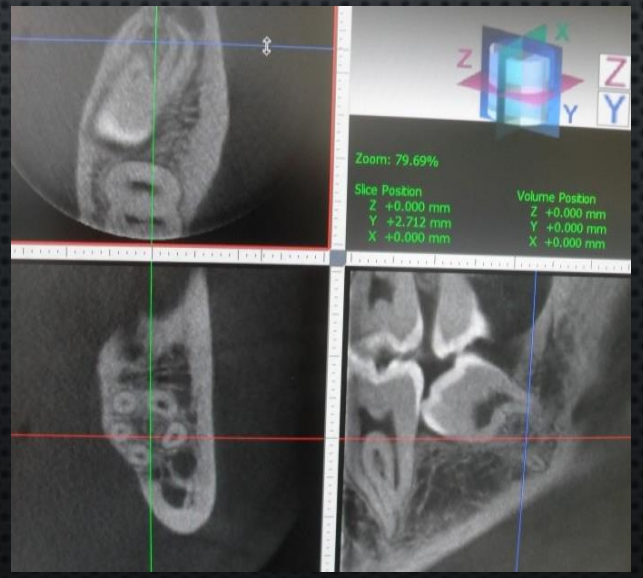
RISK IANI
ASSESSING WITH CBCT M3M ROOT RELATIONSHIP

- Between 20-48% of M3Ms are at high risk based upon panoral assessment

- Removal or coronectomy?





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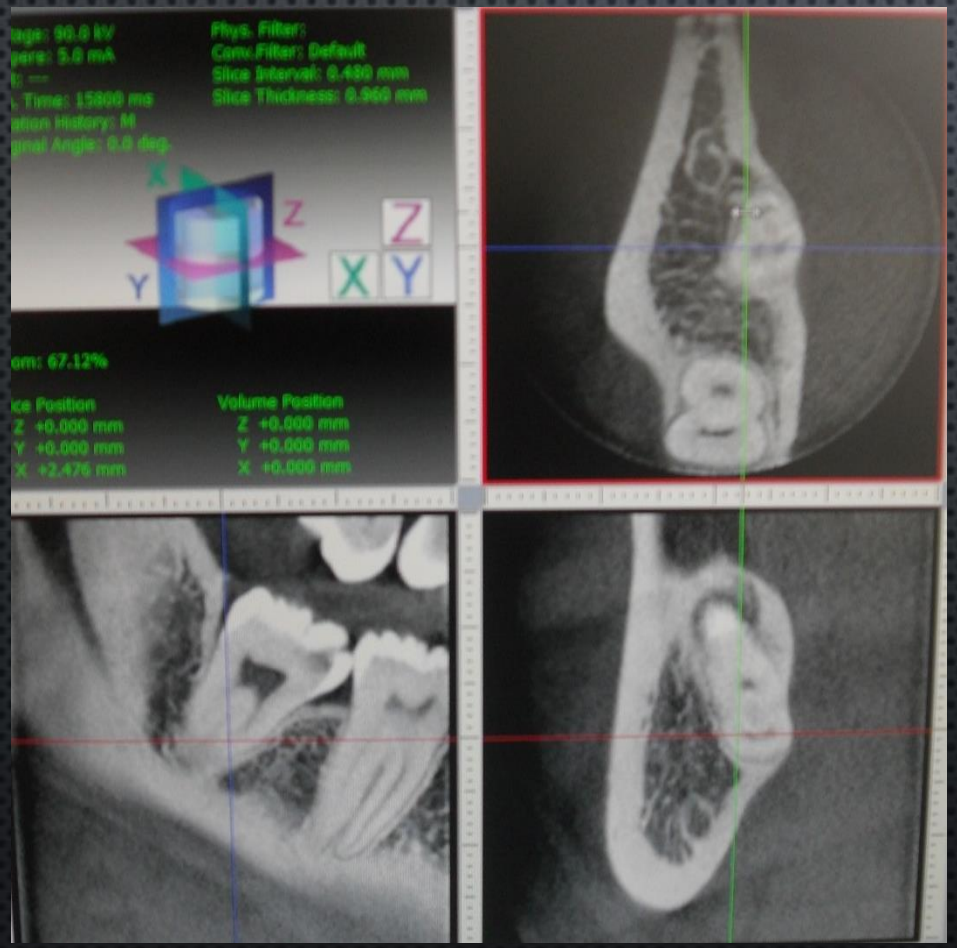
DECISION ON RISK ASSESSMENT
LOW RISK - REMOVAL



- ~~IAN~~ IDC DISTANT
- IDC BUCCAL TO M3M ROOTS
- IDC INFERIOR TO ROOTS

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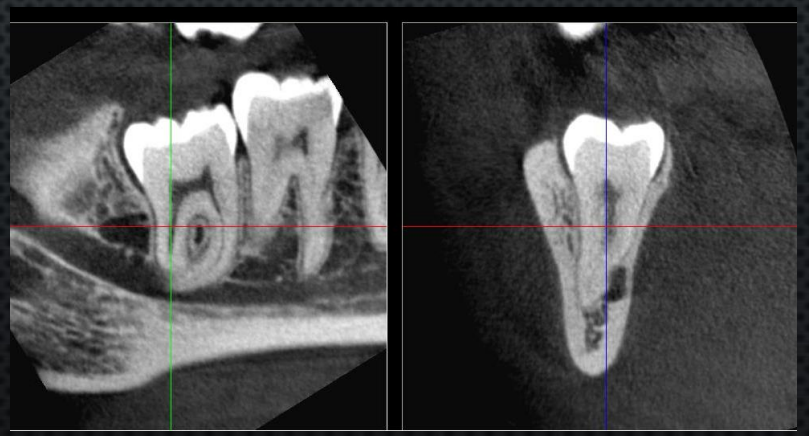
Decision on risk assessment
Low risk - coronectomy

- Risk factors
  - Decortication of canal > 3mm
  - Distortion of the IDC – dumbbell shape
  - IDC lingual to roots
  - Bifid nerve
  - Roots sandwiched between lack of lingual plate and IDC

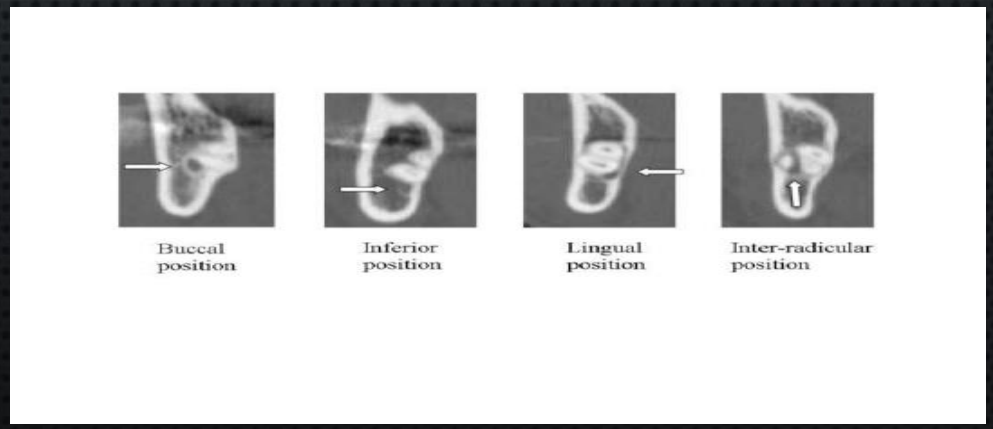


DECISION
PERFORATION IS THE ONLY ‘ABSOLUTE’ INDICATION FOR CORONECTOMY

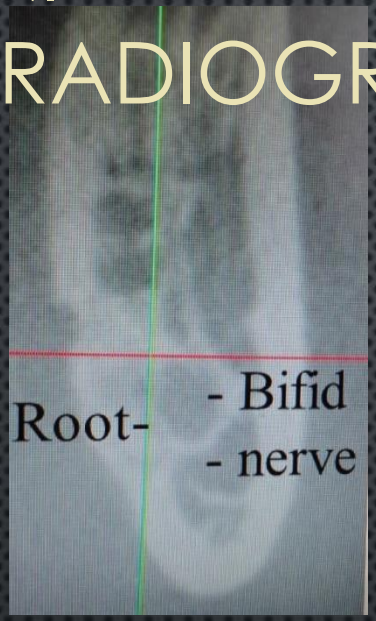
Roberto Pippi. Inferior Alveolar Nerve Entrapment. J Oral Maxillofac Surg 68:1173-1178, 2010

Perforation is rare more likely ‘intimately’ associated

Reference	cases	Buccal	Inferior	Lingual	Inter radicular
Kaeppler et al 2000	345	53.6	6	13	26.8
Mahasantipiy 2000	202	15.3	42.6	30.2	12.4
Ito et al1994	47	55.3	36.2	2.1	6.4
Tanaka et al 2000	209	39.2	47.4	10	3.3
Hashizum et al 2004	68	23.5	33.8	39.7	2.9
Maegawe et al 2003	47	51.1	19.1	25.5	4.3



RISK IANI
OTHER RADIOGRAPHIC FACTORS CBCT



- IAN CANAL CORTICATION LOSS
- DISTORTION OF IDC

30%

- LINGUAL IDC TO M3M ROOTS
- BIFID IDC
- LOSS OF LINGUAL PLATE

Loss of lingual plate
Tooth root
Inf Alveolar nerve

. Notes on coronectomy. **Renton T**. Br Dent J. 2012 Apr 13;212(7):323-6

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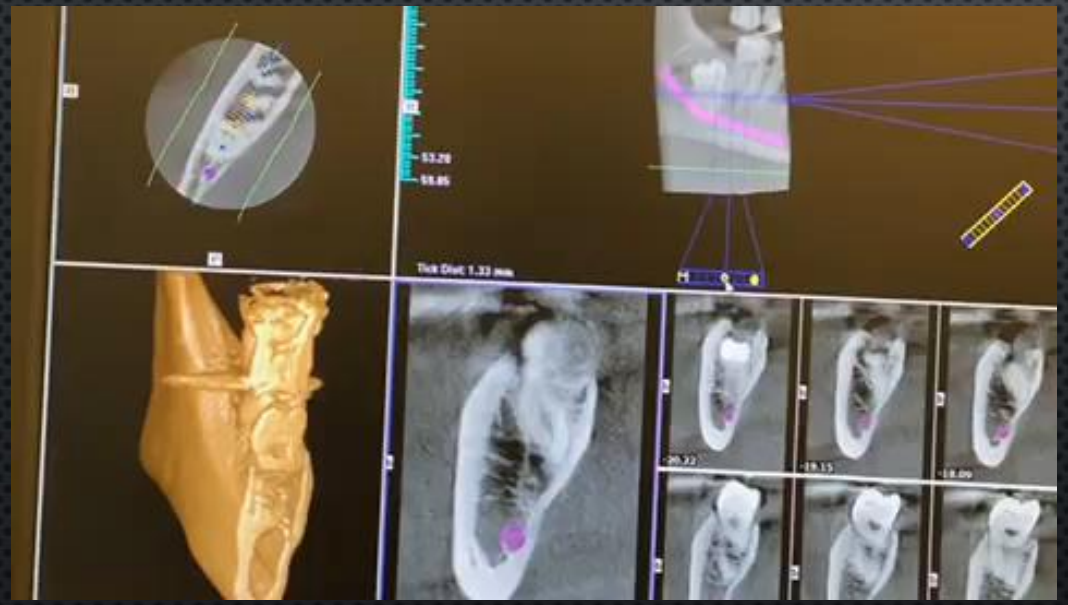
RISK IANI
PROXIMITY OF M3M ROOTS TO IDC

REMOVE THE TOOTH OR CORONECTOMY?

DISTANT- REMOVE 'SNAKE LIKE' OR PERF-CORONECTOMY

DOUBLE JEOPARDY! FRIEND AND DENTIST



- Risks
  - IDC lingual to tooth
  - Compression of IDC
  - Decortication IDC
- Mitigation
  - IDC whole and independent
  - IDC not winding between multiple roots of M3M
  - Will use buccal access and not pressurise in lingual direction

OVERVIEW

- Indications for surgery
- Risk Assessment
  - Patient expectations and consent
  - **Assessment**
    - **Coronectomy indicated**
    - **Coronectomy NOT indicated or contraindicated**
- Surgical technique
- Limitations and complications?

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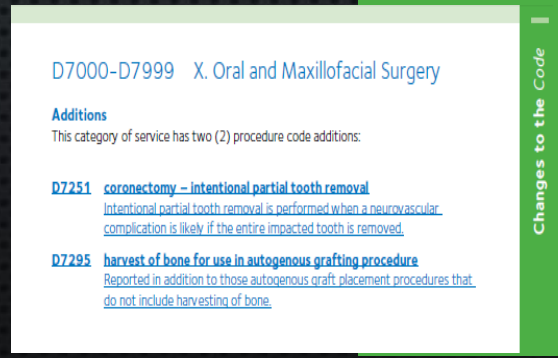
WHAT IS A CORONECTOMY?

- Coronectomy has been defined as a method of removing the crown of a tooth but leaving the roots untouched, which may be intimately related with the IAN, so that the possibility of nerve injury is reduced.
- Alternative Terminology:
  - Partial root removal
  - Deliberate vital root retention
  - Partial odontectomy


D7000-D7999 X. Oral and Maxillofacial Surgery

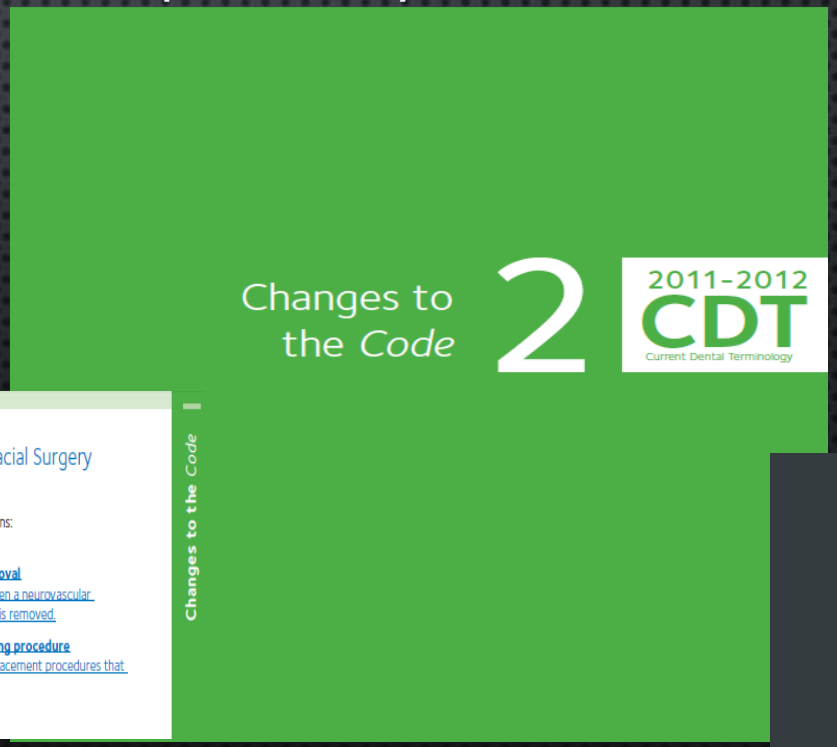
Additions

This category of service has two (2) procedure code additions:

D7251 **coronectomy – intentional partial tooth removal**
Intentional partial tooth removal is performed when a neurovascular complication is likely if the entire impacted tooth is removed.

D7295 **harvest of bone for use in autogenous grafting procedure**
Reported in addition to those autogenous graft placement procedures that do not include harvesting of bone.

Changes to the *Code* | 2



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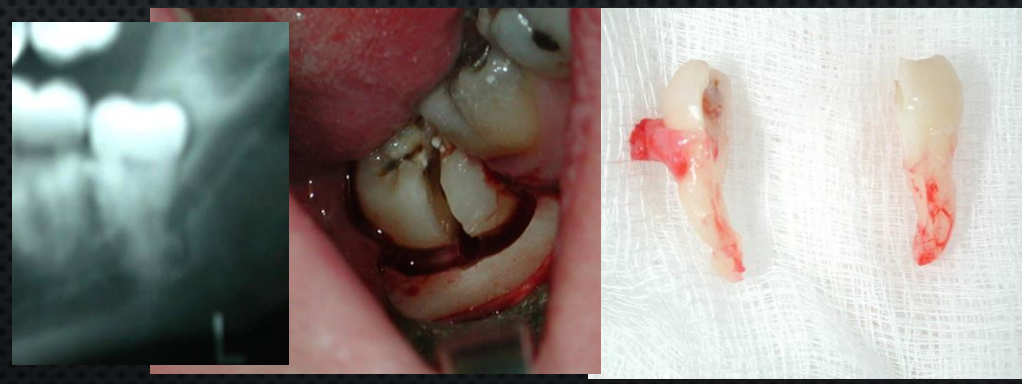
CONTRAINDICATIONS

When should we NOT consider undertaking a coronectomy?

- Dental factors
  - **TOOTH NOT AT HIGH RISK of IANI**
  - Non vital tooth
  - Active caries into the pulp, or demonstrating periapical abnormality.
  - Teeth that are mobile should be excluded as they act as a mobile foreign body and become a nidus for infection or migration.
  - Teeth associated with tumors **
  - Horizontally impacted teeth more difficult
- Medical history
  - Immunocompromised patients (chemo- therapy, AIDS, radiation therapy, immunomodulating drug therapy, poorly controlled diabetics). Bisphosphonate medication
- Social psychological
  - Patient understanding is compromised
  - Travelling / difficult access to healthcare
- Other planned treatment
  - Patients scheduled for an osteotomy in the future.
  - Patients who are to undergo radiation therapy.

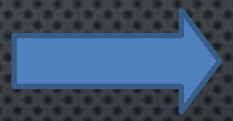
Still undertake CBCT and section roots to minimise damage to nerve



M3M REMOVAL OR CORONECTOMY?

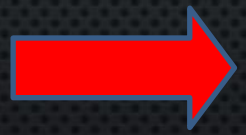
- Patient healthy?
- Patient reliable?
- Tooth vital?
- Tooth high risk- confirmed on CBCT inter radicular IAN?

- Yes to all



Coronectomy

- No to any?



Removal

THE EVIDENCE

CORONECTOMY PREVENTS IA NERVE INJURY

3 SYSTEMATIC REVIEWS

4 PROSPECTIVE RANDOMISED STUDIES *GRADE A EVIDENCE

- JULY 2014 COCHRANE SYSTEMATIC REVIEW STATED THAT LIKELY THAT CORONECTOMIES REDUCE THE RISK OF IANI

COULTHARD P[1], BAILEY E, ESPOSITO M, FURNESS S, RENTON TF, WORTHINGTON HV. SURGICAL TECHNIQUES FOR THE REMOVAL OF MANDIBULAR WISDOM TEETH. COCHRANE DATABASE SYST REV. 2014 JUL 29;(7):CD004345. DOI: 10.1002/14651858.CD004345.PUB2

- EFFICACY OF CORONECTOMY IN REDUCING NERVE INJURY

Long H, Zhou Y, Liao L, Pyakurel U, Wang Y, Lai W. Coronectomy vs. Total Removal for Third Molar Extraction: A Systematic Review. J Dent Res. 2012 May 23*Cervera-Espert J[1], Pérez-Martínez S, Cervera-Ballester J, Peñarrocha-Oltra D, Peñarrocha-Diago M. Coronectomy of impacted mandibular third molars: A meta-analysis and systematic review of the literature. Med Oral Patol Oral Cir Bucal. 2016 Jul 1;21(4):e505-13.*

Szalma J[1], Lempel E[2]. Protecting the inferior alveolar nerve: coronectomy of lower third molars. Review. Orv Hetil. 2017 Nov;158(45):1787-1793. doi: 10.1556/650.2017.30913.

Ali AS[1], Benton JA[1], Yates JM[1]. Risk of inferior alveolar nerve injury with coronectomy vs surgical extraction of mandibular third molars-A comparison of two techniques and review of the literature. J Oral Rehabil. 2018 Mar;45(3):250-257. doi: 10.1111/joor.12589. Epub 2017 Dec 11.

There is a case NHS Legal Authority admitted th
patient with high risk M3M a coronectomy if ass


Martin et al. Head & Face Medicine (2015) 11:9
DOI 10.1186/s13005-015-0068-7

HEAD & FACE MEDICINE

REVIEW Open Access

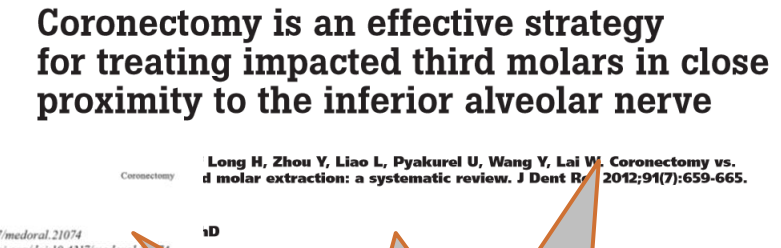
Coronectomy as a surgical approach to impacted mandibular third molars: a systematic review

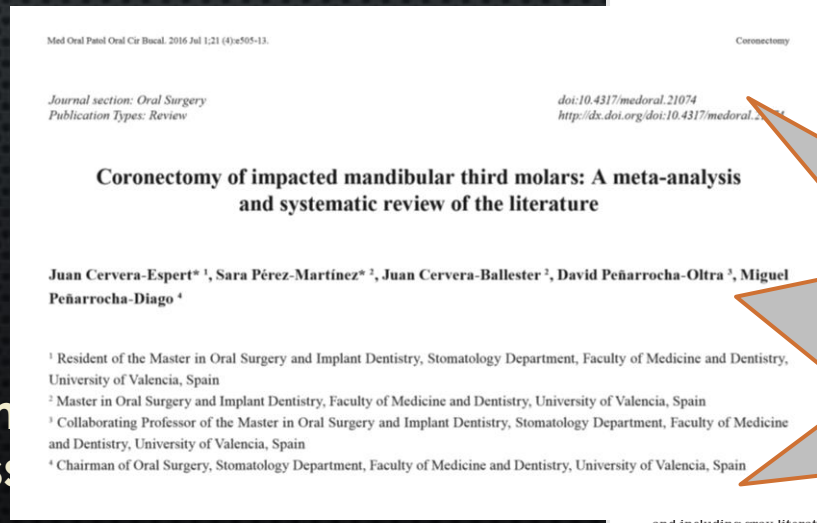
Andrea Martin, Giuseppe Perinetti, Fulvia Costantinides* and Michele Maglione


Can Coronectomy of Wisdom Teeth Reduce the Incidence of Inferior Dental Nerve Injury?

Annals of the Royal Australasian College of Dental Surgeons
Volume 19 (Jun 2008)


RESEARCH | CRITICAL SUMMARIES


Coronectomy is an effective strategy for treating impacted third molars in close proximity to the inferior alveolar nerve


Med Oral Patol Oral Cir Bucal. 2016 Jul 1;21 (4):e505-13. Coronectomy

Journal section: Oral Surgery
Publication Types: Review

doi:10.4317/medoral.21074
http://dx.doi.org/doi:10.4317/medoral.

Coronectomy of impacted mandibular third molars: A meta-analysis and systematic review of the literature

Juan Cervera-Espert* [1], Sara Pérez-Martínez* [2], Juan Cervera-Ballester [2], David Peñarrocha-Oltra [3], Miguel Peñarrocha-Diago [4]

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GRADE A
High evidence level
4 Prospective randomised trials

SHOULD WE UNDERTAKE A CORONECTOMY BASED UPON PLAIN FILMS ONLY AND NOT PROGRESS TO CBCT?

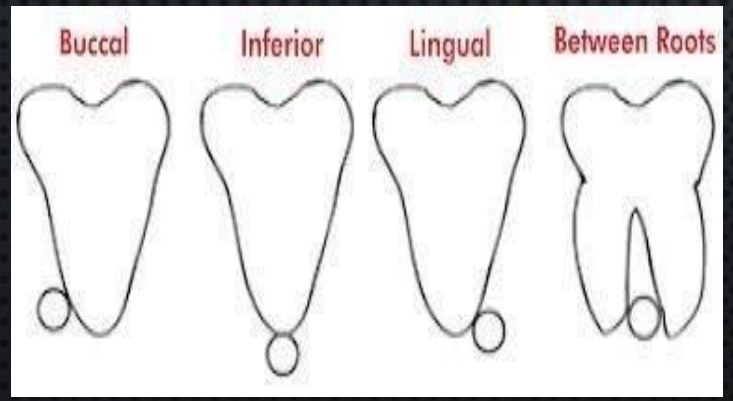
NO

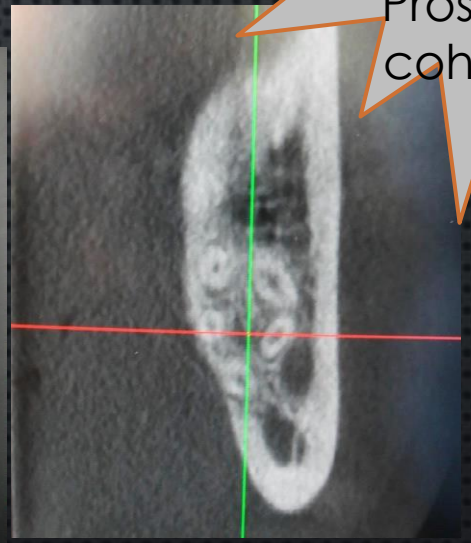
BECAUSE 96-98% OF PATIENTS CAN HAVE REMOVAL OF THEIR M3MS WITH CBCT RISK ASSESSMENT (IF YOU PROCEED WITH CORONECTOMY FOR ALL CASES 96-98% OF PATIENTS GET THE WRONG SURGERY AND ARE EXPOSED TO ADDITIONAL COMPLICATIONS)

ONLY 2% OF PATIENTS WITH HIGH RISK M3MS NEED CORONECTOMY

DOES CBCT PROVIDE NECESSARY ADDITIONAL INFORMATION TO ENHANCE DECISION FOR CORONECTOMY AND PROTECTION OF THE IAN?

- What about radiation exposure?
- Reduction of exposure
  - high speed
  - half rotation
  - Reduced field of view





Low -Mod evidence level
4
Prospective cohort trials

TECHNIQUE

QUESTION 5 How to undertake coronectomy?

- Consent
- Stages of technique
  - LA
  - Flap
  - Bone removal
  - Tooth section
  - Lavage
  - Closure
- Follow up

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CONSENT (SHARED DECISION MAKING)

- Complications Patient needs to understand potential complications including;
  - Mobilisation of roots intraoperatively
    - Remove roots
  - Early post operative infection >2 episodes of ‘dry socket’
    - Treat as dry socket
    - ABs if spreading infection likley paraesthesia and neuropathy Remove roots
  - Late eruption <3% 3 years (Leung et al 2013; < 25 @ 5 years (Renton et al 2011)

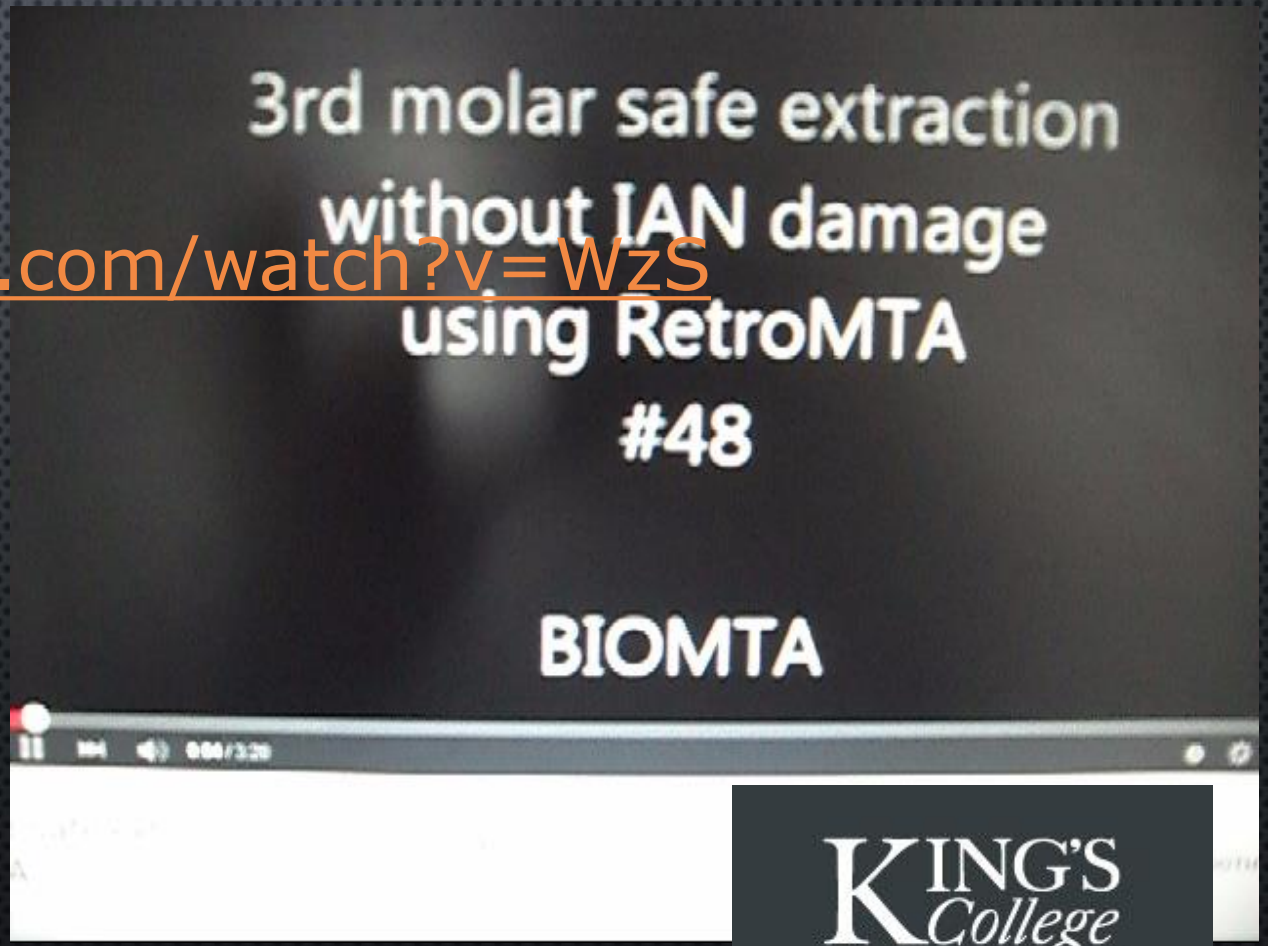
  Access consent sheet from Trigeminalnerve.org.uk
- Consent for coronectomy is complicated and difficult for the patient to understand
  - *Link to leaflet*

Effect of explaining radiographic information to the patient before third molar surgery. J Christensen, Louise Hauge Matzen, A Wenzel Dentomaxillofacial Radiology (Impact Factor: 1.27). 03/2010; 39(3):176-8. DOI: 10.1259/bjr/31553484

TECHNIQUE
HOW NOT TO UNDERTAKE CORONECTOMY?

VIDEOS OF HOW TO AND HOW NOT TO UNDERTAKE CORONECTOMY

- https://www.youtube.com/watch?v=WzSbL5KJfrM



Surgical emphysema and pneumomediastinum after coronectomy

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DOI: http://dx.doi.org/10.1016/j.bjoms.2015.05.008

Abstract

We report a case of surgical emphysema and pneumomediastinum after coronectomy of the lower right third molar. Surgical emphysema related to dental extractions is well- reported, but not after coronectomy. This case emphasises the importance of avoiding the use of air turbine drills during oral surgery

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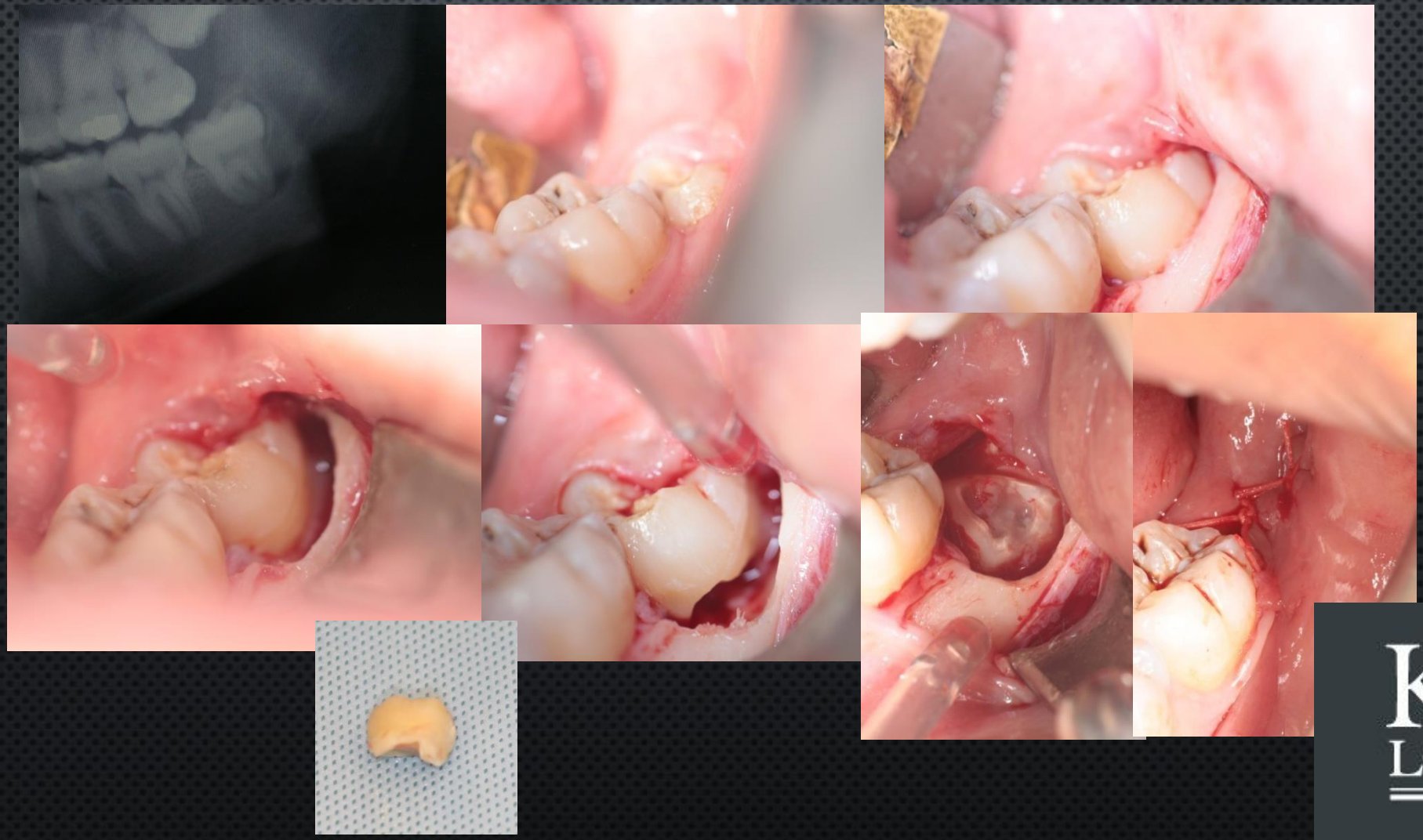
LESS THAN 2% OF HIGH RISK M3MS NEED A CORONECTOMY



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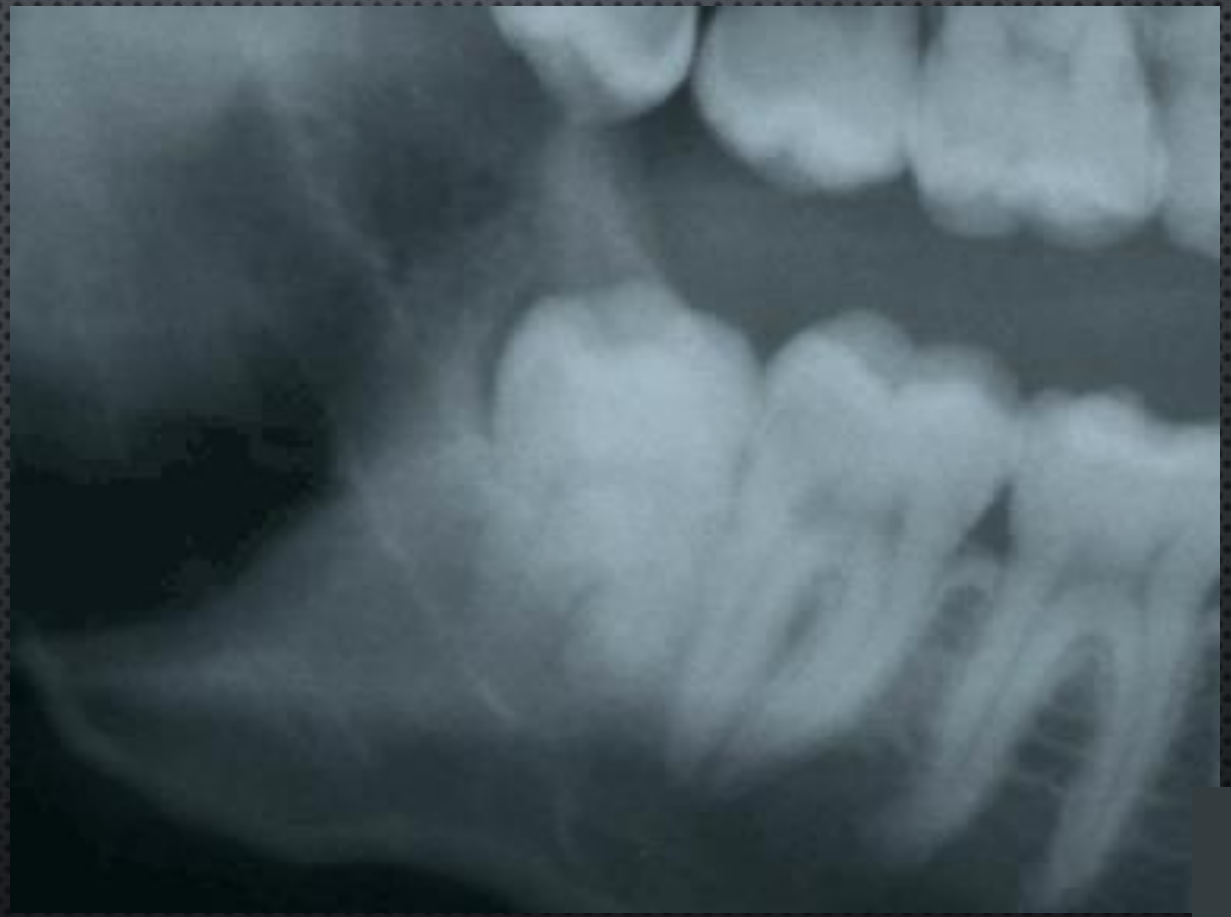
CORONECTOMY SURGICAL TECHNIQUE



Notes on coronectomy. **Renton T**. Br Dent J. 2012 Apr 13;212(7):323-6

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FOLLOW UP

- **Home check essential**
  - Quality outcome assessment
  - Surgical audit
  - Patient satisfaction improved
  - Proactivity in picking up complications less complaints and claims

  - **NO radiographic follow up required**

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ADJUNCTIVE NEEDS?

- Antibiotic cover?
- Bone Graft?
- Pulp treatment?
- Closure?
- Repeat coronectomy with enamel retention?

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Case Reports in Dentistry
Volume 2013, Article ID 914173, 7 pages
http://dx.doi.org/10.1155/2013/914173

Hindawi

Case Report

Modified and Grafted Coronectomy: A New Technique and a Case Report with Two-Year Followup

Michael Leizerovitz and Olga Leizerovitz

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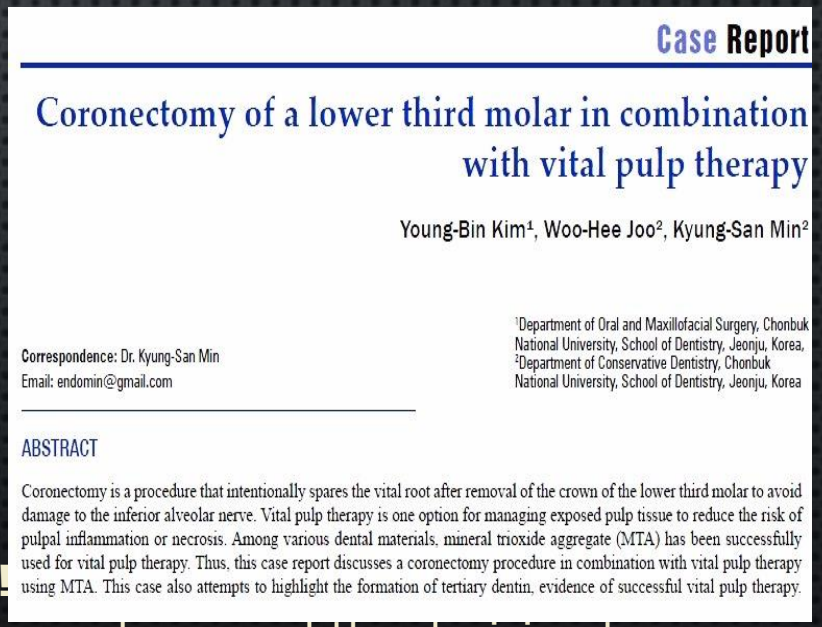

Case Report

Coronectomy of a lower third molar in combination with vital pulp therapy

Young-Bin Kim[1], Woo-Hee Joo[2], Kyung-San Min[2]

[1]Department of Oral and Maxillofacial Surgery, Chonbuk National University, School of Dentistry, Jeonju, Korea, [2]Department of Conservative Dentistry, Chonbuk National University, School of Dentistry, Jeonju, Korea

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ABSTRACT

Coronectomy is a procedure that intentionally spares the vital root after removal of the crown of the lower third molar to avoid damage to the inferior alveolar nerve. Vital pulp therapy is one option for managing exposed pulp tissue to reduce the risk of pulpal inflammation or necrosis. Among various dental materials, mineral trioxide aggregate (MTA) has been successfully used for vital pulp therapy. Thus, this case report discusses a coronectomy procedure in combination with vital pulp therapy using MTA. This case also attempts to highlight the formation of tertiary dentin, evidence of successful vital pulp therapy.

Early repeat coronectomy for 10 of 185 cases successful

Should NOT be necessary if technique is correct in first instance!!!

Coronectomy of the mandibular third molar: a retrospective study of 185 procedures and the decision to repeat the coronectomy in cases of failure. J Oral Maxillofac Surg 2015 Apr 22;73(4):587-94. Epub 2014 Oct 22. Boaz Frenkel, Navot Givol Yitzhak Shoshani

CORONECTOMY DOES PREVENT NERVE INJURY IN SELECTED CASES

UNFORTUNATE CASE:
BOOKED FOR CORONECTOMY BUT HAD M3M REMOVAL
NOW PATIENT HAS A PERMANENT PAINFUL IANI

SUCCESS OF CORONECTOMY

- ONLY do coronectomy on appropriate cases
- Thorough consent
- Minimal access **no lingual retraction or distal bone removal**
- Accessible review
- Always remove all of enamel
- No pulpal treatments necessary
- The success of coronectomy depends on the survival of the retained root fragments with the successful formation of osteocementum and bone over the root

Vol. 121 No. 1 January 2016

Long-term morbidities of coronectomy on lower third molar

Yiu Yan Leung, BDS, MDS, PhD,[a] and Lim Kwong Cheung, BDS, PhD[b]

Objective. To monitor the long-term morbidity of retained roots up to 5 years following lower third molars coronectomy with close proximity to the inferior alveolar nerve (IAN).
Study Design. A prospective study on long-term morbidities after lower third molar coronectomy.
Results. This study included 612 lower third molar coronectomies in 458 patients. The prevalence of IAN injury was 0.16% (1/612) and was temporary. Long-term postoperative infection occurred in 1 case at 6 months following surgery and another at 12 months. No infection was found after 12 months. The incidence rates of pain at 6 months, 12 months, 24 months after surgery were 0.50% (3/596), 0.38% (2/529), 0.49% (2/411), respectively. Root exposure was noted in 2.3% of cases (14/612). Reoperation to remove the exposed root did not cause any IAN deficit.
Conclusions. Lower third molar coronectomy is safe in the long term. (Oral Surg Oral Med Oral Pathol Oral Radiol 2016;121: 5-11)

Lower third molar impaction is a common finding in the population, and pericoronitis and dental caries are commonly associated with impacted third molars. Lower third molar surgery is therefore the most common surgical procedure performed in the oral cavity. A rare but significant risk from lower third molar surgery is injury to the inferior alveolar nerve (IAN), leading to paresthesia or even anesthesia of the lower lip and chin region on the affected side. The incidence of IAN deficit ranges from 0.3% to 8.4%, and a significant proportion could be permanent.[1] Injury to the IAN has been found by an evidence-based review to be associated with increased age, deep impaction, and proximity of the root to the inferior dental canal associated with specific radiographic signs and intraoperative IAN exposure.[2] Since the risks are mostly inherent to third molar impaction, this may not be totally avoidable even in the hands of experienced surgeons.[2]

Coronectomy of the lower third molar is a new surgical option to manage symptomatic lower third molar impaction. It is a surgical procedure that intentionally removes only the crown of an impacted mandibular third molar, leaving the root undisturbed, thus avoiding possible direct or indirect damage to the IAN.[3] Our center has published the finding of a phase 3 randomized controlled trial (RCT) comparing coronectomy and total removal of the mandibular third molar in close proximity to IAN and confirmed that coronectomy was superior to traditional third molar surgery, with a much smaller risk of postoperative IAN deficit.[4] However, reports of well-designed, prospective, phase 4 long-term studies of coronectomy are lacking in the literature. The long-term safety of coronectomy and the behavior of the retained roots following of lower impacted wisdom teeth following surgery are unknown. We published the pilot data of 135 coronectomies and showed that the technique is safe within the first 3 years.[5] This study serves to present the complete longitudinal data of a large sample of coronectomized teeth up to 5 postoperative years.

The aim of this study was to monitor the long-term morbidities of retained roots following coronectomy of impacted lower third molars up to 5 postoperative years.

MATERIALS AND METHODS

This was a prospective study on the long-term safety of coronectomy and the behavior of the retained roots of the impacted lower third molars following surgery. The study followed the guideline of the Helsinki Declaration. Ethic approval was granted by the local institutional review board (HKU/HA HKW IRB UW 10-001). This study provides further evidence from a phase 3 RCT on the long-term safety of coronectomy with

Statement of Clinical Relevance

This study is, by far, the largest prospective long-term study on coronectomy of lower third molar with high inferior alveolar nerve risk and showed that the technique carried very low morbidity in 5 years.

The study was presented as oral presentation in the 11th Asian Congress in Oral and Maxillofacial Surgery, 2014, in Xi'an, China. This study was based on a thesis submitted to the University of Hong Kong, in partial fulfillment of the requirements for the PhD degree. A preliminary report was published in the *Journal of Oral and Maxillofacial Surgery* (Leung YY, Cheung LK. Coronectomy of lower third molar is safe within the first 3 years. *J Oral Maxillofac Surg.* 2012;70:1515-1522).

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[b]Honorary Professor, Oral and Maxillofacial Surgery, Faculty of Dentistry, The University of Hong Kong, Hong Kong, China.

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2212-4403/$ - see front matter
http://dx.doi.org/10.1016/j.oooo.2015.07.012

Gady and Fletcher 2013.Vignudelli E, Monaco G, Mazzoni A, Marchetti C. Root Fragment Vitality After Coronectomy: Histological Evidence in a Case. J Oral Maxillofac Surg. 2015 Jul 11. pii: S0278-2391(15)00916-7. doi: 10.1016/j.joms.2015.06.179; Patel V, Sproat C, Kwok J, Beneng K, Thavaraj S, McGurk M. Histological evaluation of mandibular third molar roots retrieved after coronectomy. Br J Oral Maxillofac Surg. 2014 May;52(5):415-9.

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CORONECTOMY COMPLICATIONS

Recent case complications

- Mobilisation of roots intraoperatively
  - Remove roots
- Early post operative infection >2 episodes of ‘dry socket’
  - Treat as dry socket
  - ABs if spreading infection likley paraesthesia and neuropathy
    Remove roots
- Late eruption <3% 3 years (Leung et al 2013; < 25 @ 5 years (Renton et al 2011)

Increased likelihood of eruption in younger patients

Leung YY, Cheung LK **Coronectomy of the Lower Third Molar Is Safe Within the First 3 Years** J Oral Maxillofac Surg. 2012 Apr 9. **98 pts 3 years 3% eruotion rate:**

Renton T, Thexton A, Hankins M, Sproate C, McGurk M. A prospective randomised study assessing coronectomy versus removal in third molar surgery. BJOMS 2005;43:7-12

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British Journal of Oral and Maxillofacial Surgery 55 (2017) 892–898

BRITISH Journal of Oral and Maxillofacial Surgery

www.bjoms.com

Systematic review

Injury to the inferior alveolar and lingual nerves in successful and failed coronectomies: systematic review

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Accepted 15 September 2017
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Abstract

The aim of this systematic review was to evaluate the incidence of damage to the inferior alveolar (IAN) and dental nerves in successful coronectomies, and to compare the results with coronectomies that failed. To the best of our knowledge no such analyses have been reported. Between January 1990 and October 2016 we surveyed published papers to find those that examined clinical outcomes after coronectomy. Fourteen met the criteria for final inclusion. Of 2087 coronectomies, 152 failed (7%). Successful procedures were associated with a low overall incidence of injury to the IAN (0.5%) and lingual nerve (0.05%). The incidence of injury to the IAN in failed coronectomies was 2.6%. The incidence of permanent paraesthesia was 0.05% in successful coronectomies and 1.3% in those that failed. No permanent injury to the lingual nerve was reported. Mobility (36%, 55/152) and migration or exposure (33%, 50/152) of roots were the most common underlying causes of failure. Coronectomy seems to be safe, but it depends on the patient and the technique used. To ensure adequate assessment of postoperative

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ing damage to the IAN.[7] Pogrel et al[9] and Gleeson et al[8] described two approaches that aimed to section the crown either completely or partially.

http://dx.doi.org/10.1016/j.bjoms.2017.09.006

LINGUAL NERVE INJURY RISK RELATED TO CORONECTOMY

- Attempted coronectomy
- Low risk M3M no need for a coronectomy!!!!
- CBCT provided additional confirmation of retained enamel and lingual plate perforation by drill
- Allowing for earlier exploration

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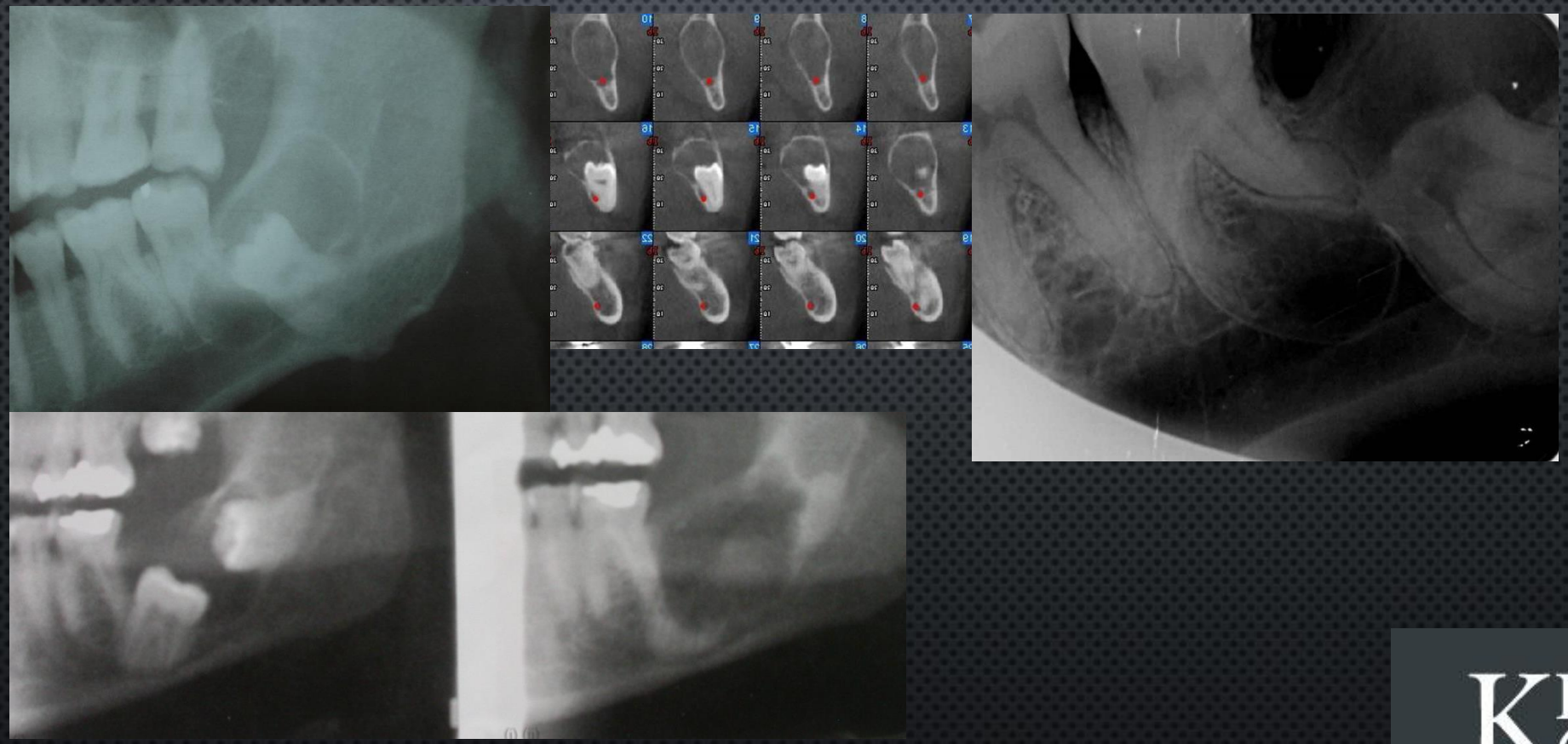
CORONECTOMY OTHER APPLICATIONS – BENIGN CYSTS



Patel V, **Sproat** C, Samani M, **Kwok** J, McGurk M. Unerupted teeth associated with dentigerous cysts and treated with coronectomy: mini case series. Br J Oral Maxillofac Surg. 2013 Oct;51(7):644-9

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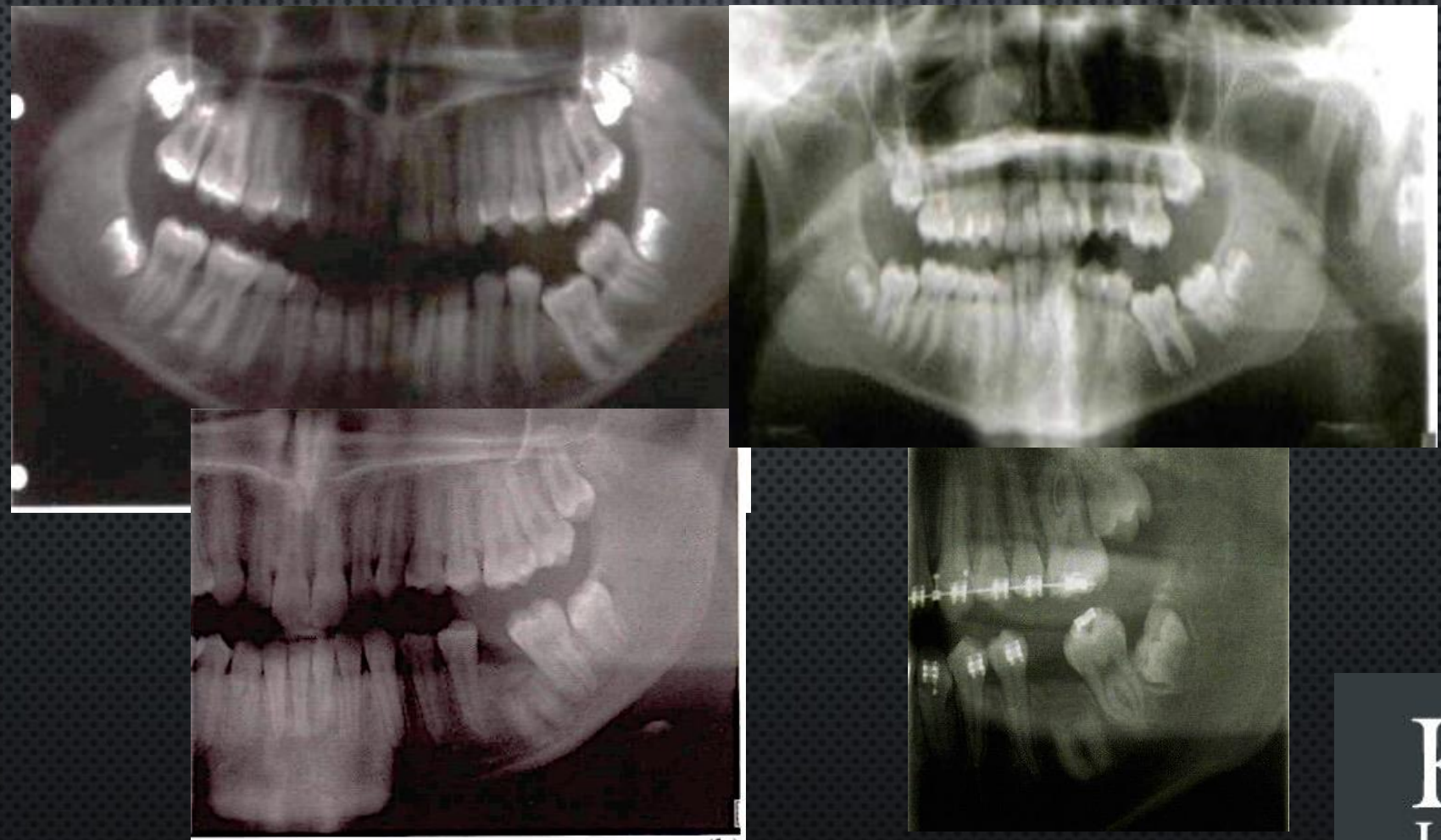
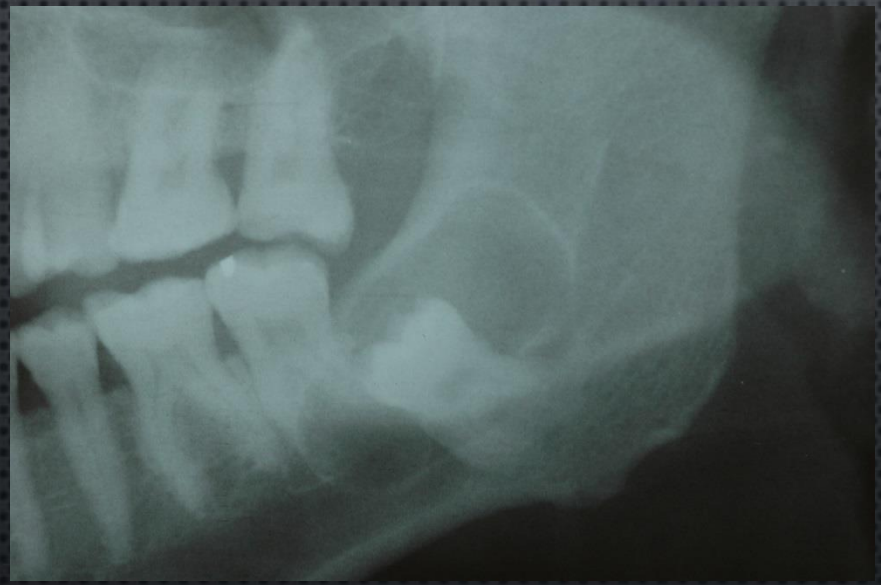
CORONECTOMY OTHER APPLICATIONS – ANKYLOSIS

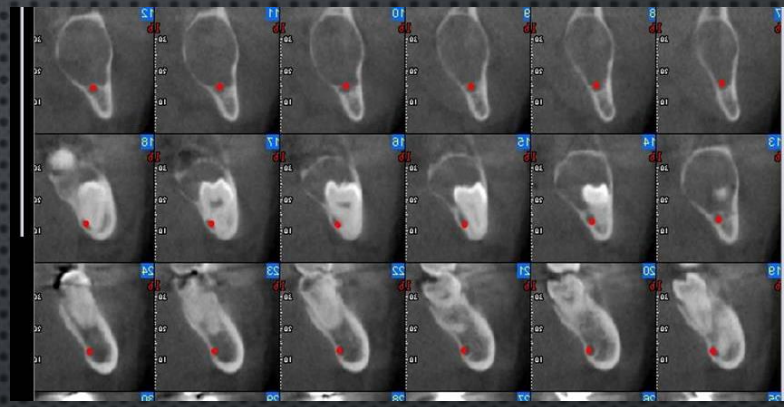


Chalmers E, Goodall C, Gardner A. **Coronectomy for infraoccluded lower first permanent molars: a report of two cases.** J Orthod. 2012 Jun;39(2):117-21.

Tailor your surgery minimise harm!

CORONECTOMY





SWELLING

- SWELLING CAUSED BY SURGICALLY INDUCED INFLAMMATION IS COMMON SEQUELAE AND USUALLY CORRELATES WITH THE DEGREE OF DIFFICULTY OF SURGERY AND LENGTH OF OPERATION. THE PATIENT MUST BE WARNED OF THIS RISK AND ADVISED THAT IT SHOULD RESOLVE WITHIN 24-36 HOURS.

Corticosteroids decrease postoperative trismus and oedema; however, the role of steroids in decreasing pain is not proven.

Piecuch JF. What strategies are helpful in the operative management of third molars? J Oral Maxillofac Surg. 2012 Sep;70(9 Suppl 1):S25-32. doi: 10.1016/j.joms.2012.04.027

Risk Factors
Time surgery
Depth impaction
Surgeons exp
Patient factors
Mimimise
Dexamethasone pre/peri surgical injection
Minimal access surgery

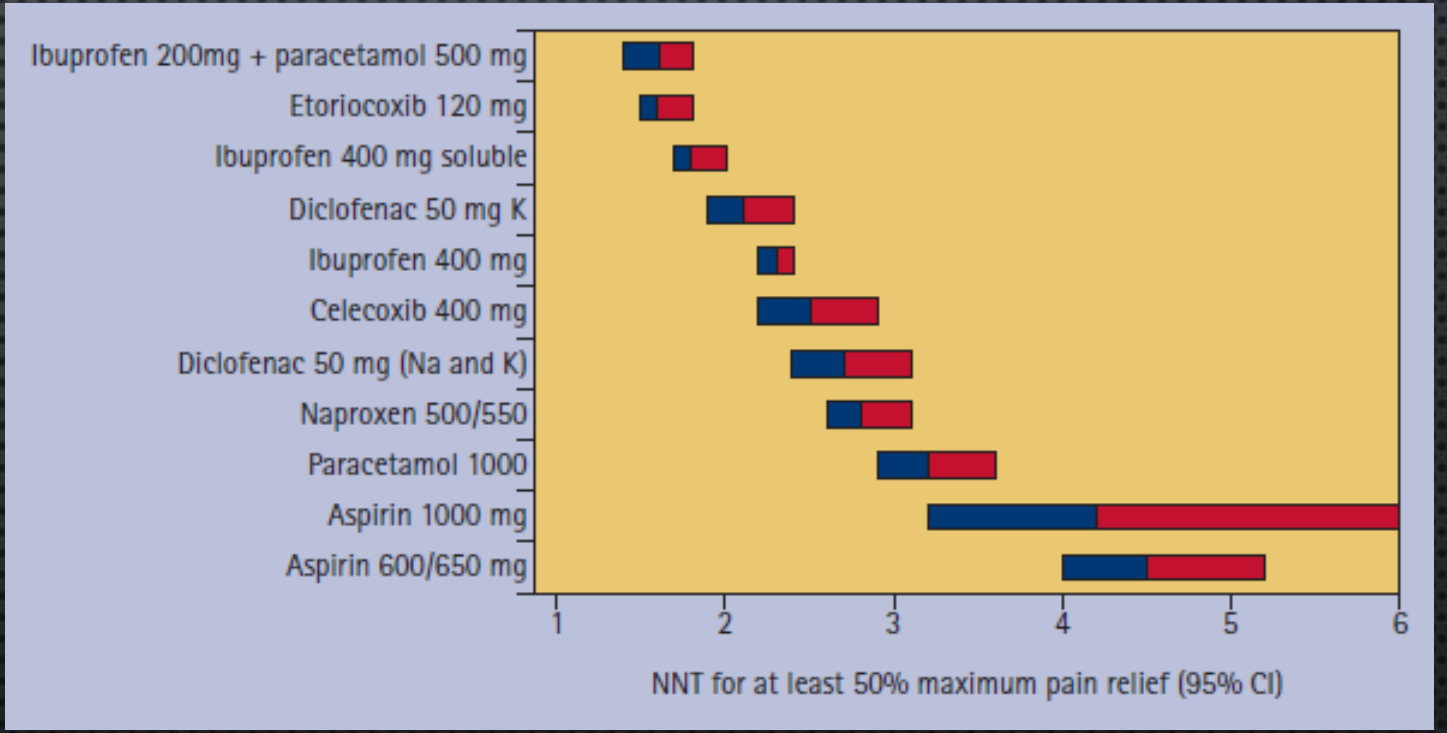
Successful Management of Acute Dental Pain

Ken M. Hargreaves, DDS, PhD

Ibuprofen (600mg or 400-800mg) + Paracetamol (500-1000mg) QDS PO = SYNERGISM
NO OPIOIDS!!!

Risk Factors
Time surgery
Depth impaction
Surgeons experience

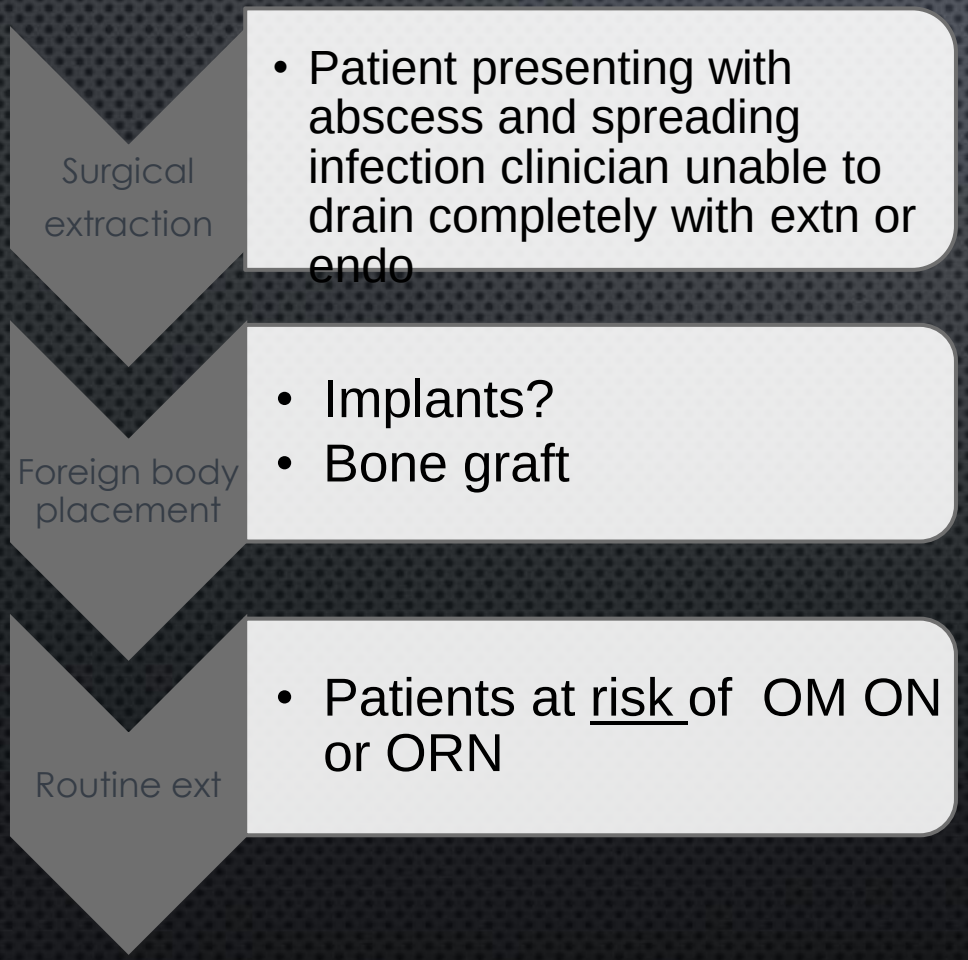
Minimise
Min access
Information
LA
?Aggressive early post surgical analgesia



The inflammation induced by surgical trauma results in pain, of which the patient must be forewarned. This will be worst in the first 24 hours post-operatively and should be resolved within three to four days.

Derry S, Wiffen PJ, Moore RA. **Relative efficacy of oral analgesics after third molar extraction--a 2011 update.** Br Dent J. 2011 Nov 11;211(9):419-20. doi: 10.1038/sj.bdj.2011.905.

NO INDICATION FOR ROUTINE ANTIBIOTIC ORAL SURGERY



- **Pre operative risk ON OM ORN**
  - **low evidence Implants**

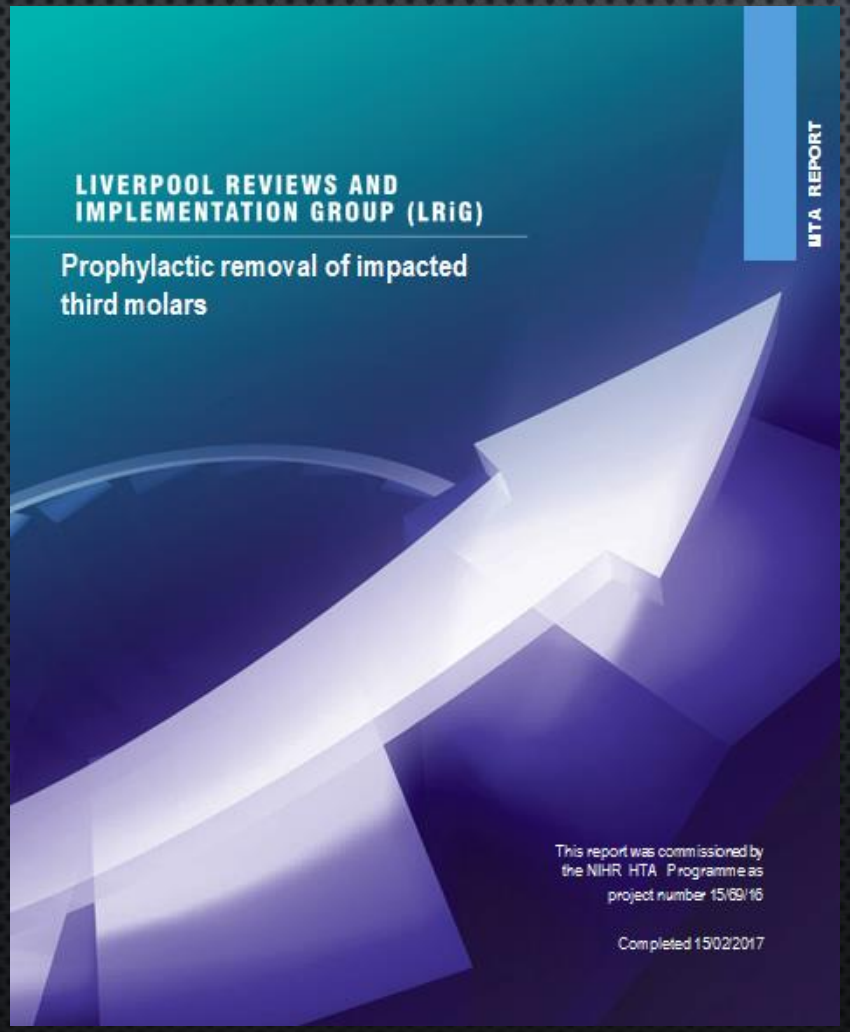
    Amoxycillin Oral 2g
  - OR

    Clindamycin Oral 600mg
- **Spreading infection unable to drain abscess**

  3 days Metronidazole 200mg TDS
  - OR

    3 days Amoxycillin 250mg TDS
- **Additional if recent Abs included above**
  - Clindimycin 600 mg TDS for 5 days -warn pt pseudo membraneous collitis

NICE UPDATE DRAFT 2018 COMING SOON



FDS RCS Coming soon

Appendix X (Figure 1) Considerations for the treatment of patients with M3Ms

The principles are about risk management of the patient, both patient and clinician must be reminded that symptom free does not necessarily mean disease free

History (Medical Social and dental), clinical examination, Confirm diagnosis
Radiological investigations

Is there a there an indication for extraction?

NO

YES

Clinical review
Disease free asymptomatic impacted unerupted M3M with no current associated pathology
or
Partially erupted and high risk of IANI (excluding prophylactic and therapeutic other indications for surgery)

Consideration should be given to prophylactic extractions when;
Patients undergoing planned medical treatments that may complicate likely surgery of M3M including;
- Pharmaceutical (Bisphosphonates, antiangiogenics or chemotherapy)
- Radiotherapy of head and neck

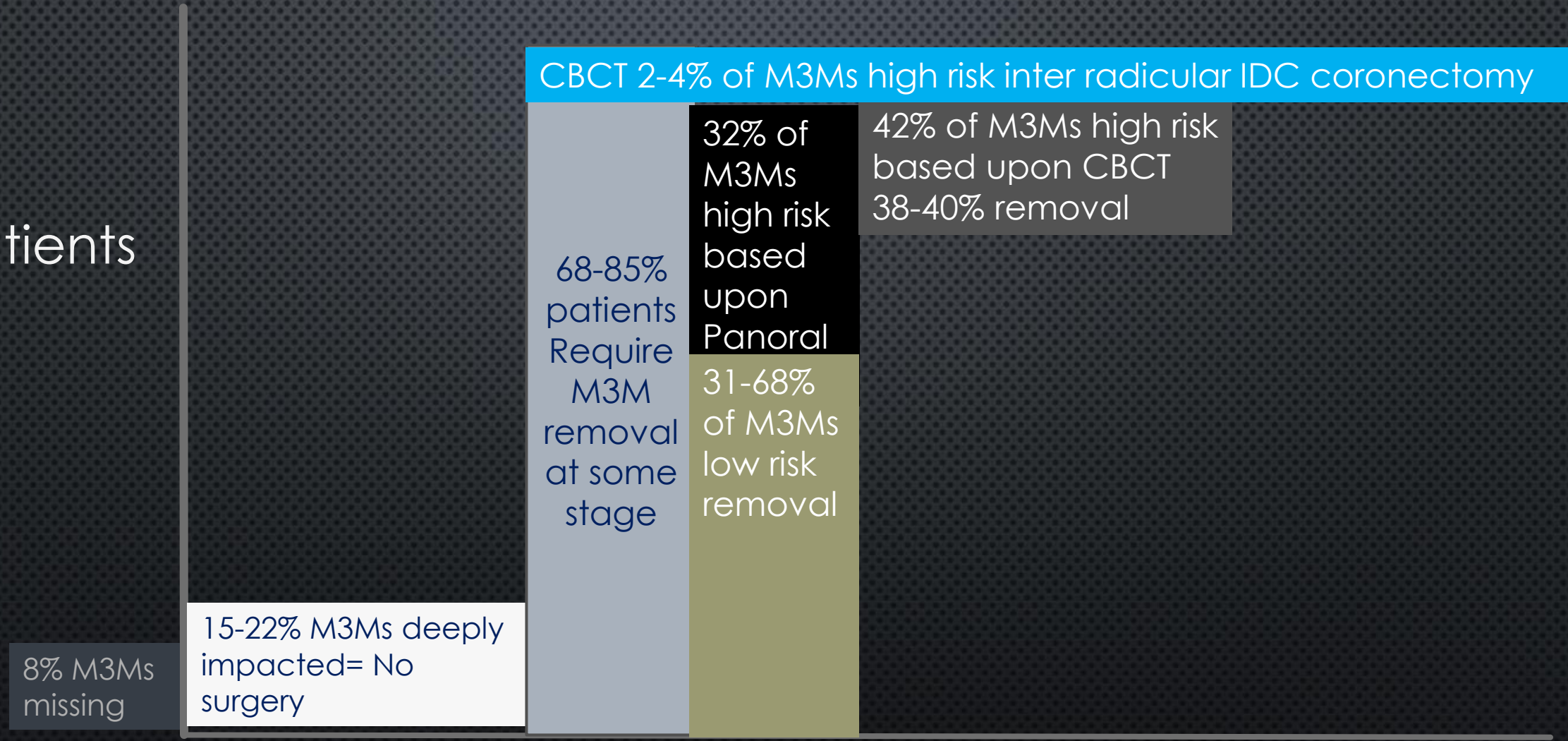
OR the patient is undergoing surgery in the M3M site for;
- Mandibular fractures
- Orthognathic surgery or
- Excision of disease includes; neoplasia (both benign and

Consideration for therapeutic extractions for;
- Acute or subacute (recurrent) Pericoronitis
- Non restorable caries of M3M or to assist restoration of M2M
- Periodontal disease compromising prognosis of M2M or M3M
- Resorption of M2M by M3M or M3M
- Fractured M3M
- Pathology associated with M3M (for example cyst)

Considerations for Interventional extractions
Based on the current best available evidence, M3M associated with disease (symptomatic or asymptomatic) or are at high risk of developing disease, should be considered for surgical management. In the absence of disease or significant risk of disease clinical surveillance is indicated, supplemented with radiographic assessment where appropriate

SHOULD THIS BE THE FATE OF M3MS?

ONLY VERY FEW PATIENTS SHOULD UNDERGO CORONECTOMY



Thank you

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MANAGEMENT·OF·TRIGEMINAL·NERVE·INJURIESRELTED·TO·DENTAL·PROCEDURES¶

Timeline·····During·surgery·····Post·surgery···2·-6·weeks·····12·weeks·····>·12·weeks¶

Psychological·intervention··¶

Medical·intervention··¶

High·risk·nerve·injury/·or·patient· high·risk·of·developing·neuropathic· pain·consider·pre-emptive· Amitriptyline·or·Pregabalin·····¶ ·····¶ ¶	Reported·neuropathy·immediate·post-surgery·¶ • → NSAIDs·Ibuprofen·6—mg·TDS·5·days·(MH· permitting)¶ • → step·down·Prednisolone·50-10mg·over·5·days· (exclude·known·risk·of·DU·and·or·PU)¶ • → ·Vitamin·B·complex·(long·term·during·recovery)¶	If·required:·Psychological·support·(for·PTSD·and·sleep·disorders)· and·Therapeutic·management·of·neuropathic·pain·(NICE· Guidance·Ne·Pain·in·adults)·¶ • → Step·1·Amitriptyline·or·Nortriptyline¶ • → Adjunctive·topical·agents·(Lidocaine,·Capsaicin)¶ • → Step·II·Gabapentin·or·Pregabalin¶

Surgical·intervention¶

Known·or· suspected· nerve·Inferior· alveolar·or· lingual·injury¶ **Duty·of· candour· inform·patient· immediately¶** **Repair·nerve· immediately· Or·refer·for· immediate· repair**·to·a· specialist· centre·¶	Post·Local· anaesthesia·or· orthognathic· surgery·or· trauma¶ **Duty·of· candour· inform·patient· immediately¶** **Surgery·not· indicated¶** **Medical·and· psychological· therapies**·¶	Post·Implant·or·endodontic· surgery¶ Patient·presents·with·nerve· injury·early·postoperatively¶ Confirm·extensive· dermatome·affected,· anaesthesia,·+/-· paraesthesia,·+/-· neuropathic·pain¶ **Within·30·hours¶** **Remove·implant·or· endodontically·treated· tooth**·and·reassess·patient· combined·with·medical· intervention·above¶	Post·M3M·surgery¶ Patient·presents·with·nerve·injury· early·postoperatively¶ Confirm·extensive·dermatome· affected,·anaesthesia,·+/-· paraesthesia,·+/-·neuropathic·pain¶ **Inferior·alveolar·nerve**·DPT·confirms· retained·roots·or·bony·defect·of·IDC¶ **Lingual·nerve·(buccal·approach)**·DPT· confirms·retained·roots·CBCT· confirms·lingual·plate·defect·due·to· M3M·surgery·→ → ····· **Consider·early·exploration·(IAN·via· M3M·socket)·+/-·nerve·repair· dependent·upon·surgical·findings¶**	Patient·presents·with· persistent·non-resolving·**LINGUAL· nerve·injury**·after· lingual·access·(lingual· retraction·+/-·lingual· split)·surgery¶ Confirm·extensive· dermatome·affected,· anaesthesia,·+/-· paraesthesia,·+/-· neuropathic·pain¶ **Consider·exploration· @·12·weeks·+/-·nerve· repair·dependent·upon· surgical·findings¶**	Patient·presents·with· persistent·non-resolving· **Inferior·alveolar·nerve· injury**·OR·**LINGUAL·nerve· injury**·after·M3M·surgery·¶ Confirm·extensive· dermatome·affected,· anaesthesia,·+/-· paraesthesia,·+/-· neuropathic·pain¶ Consider·medical·and· psychological·therapeutic· measures.¶ **N.B·Surgical·repair·DOES· NOT·IMPROVE·neuropathic· pain¶**

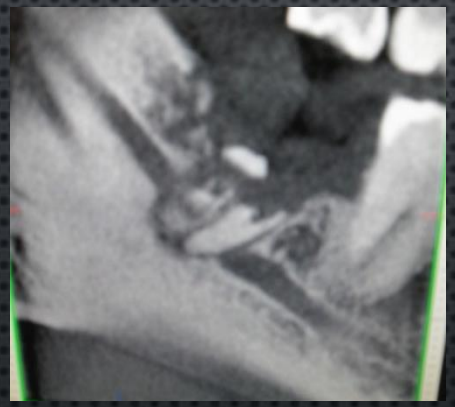
- → *New·developments¶*
- → *MRI·micro·neurography·may·assist·in·confirmation·of·damage·to·IAN·and·LN·(currently·available·in·US·under·development·London,·Belgium).·¶*
- → *Larger·IAN·defects·can·be·optimally·repaired·using·Axogen·cadaveric·nerve·graft·(currently·NICE·approved·for·hand·surgery·in·UK)¶*

You cannot ‘see’ nerves on radiographs just the canals and foramina……

but CBCT may be useful for post wisdom tooth surgery and confirmed nerve injury

ADDITIONAL INVESTIGATIONS POSSIBLE BIOMARKERS?

Radiology Post surgical radiographs (panoral for wisdom teeth and LCPA for endo Nis) are required to confirm causality though mainly a clinical diagnosis



Use plain film only
CBCT -unnecessary irradiation of the patient
Provides no further information and does not change treatment unless M3M nerve injury to exclude roots displaced into submandibular or sublingual space

POST SURGICAL CBCTS ONLY REQUIRED
FOR M3M INFERIOR ALVEOLAR NERVE INJURY

Additional tests
Neurosensory
- **Mechanosensory**
- **QST**
- **Blink reflex**

Diagnostic Lidocaine blo
Psychological

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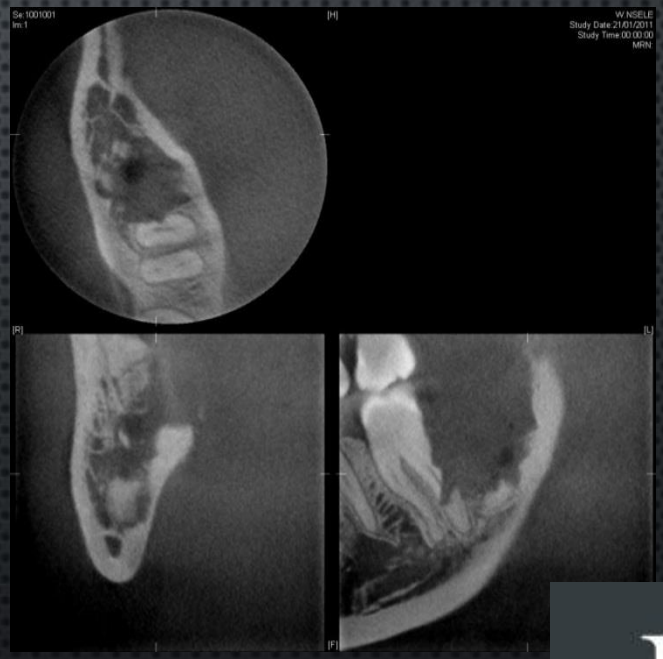
IMAGING Inferior alveolar nerve injury (IANI)

WHEN IS CBCT INIDICATED POST NERVE INJURY?

RETAINED ROOTS? IN SUBMANDIBULAR SPACE?

CBCT MAY BE USEFUL FOR POST WISDOM TOOTH INJURY



MRI NEURORADIOGRAPHY>>>>>>>>>>>>>>>>>>

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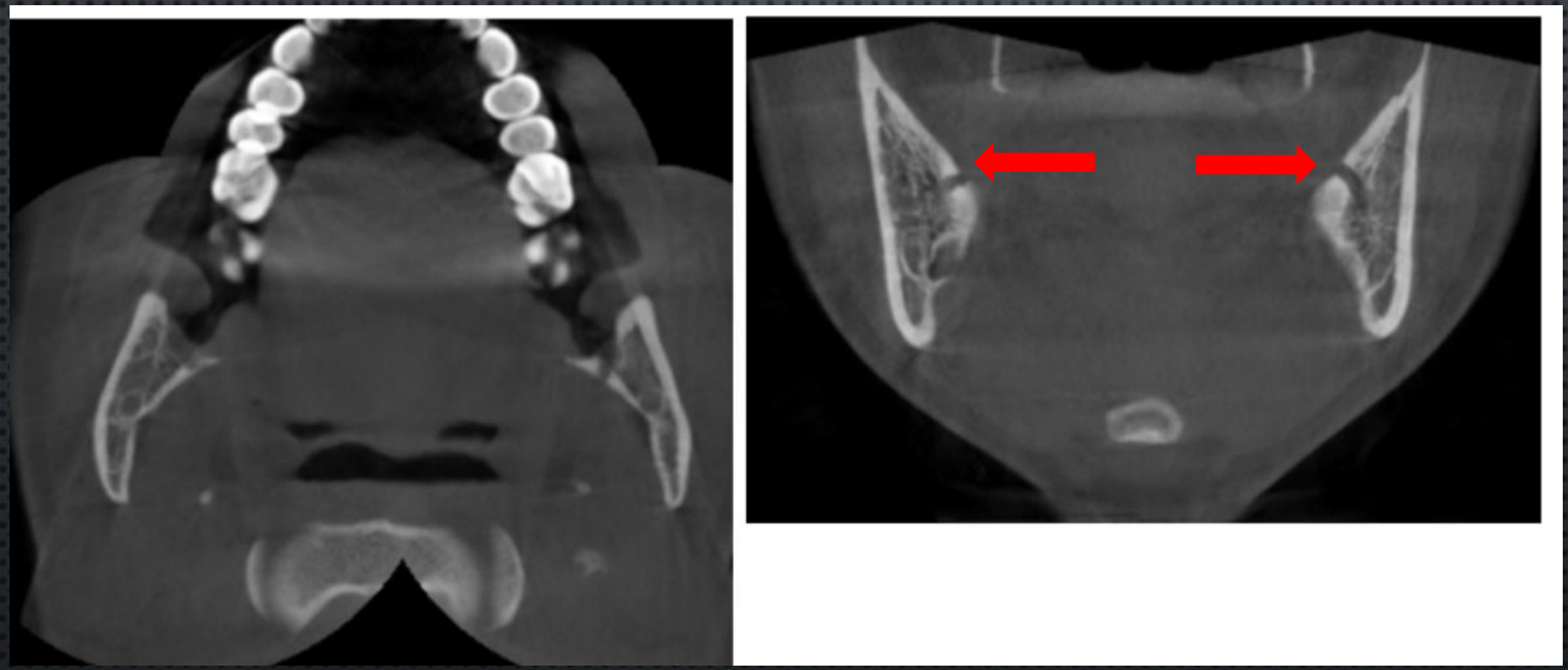
IMAGING LINGUAL NERVE INJURY (LNI)
CBCT EARLY POST OP DETECTION OF LINGUAL PLATE DAMAGE



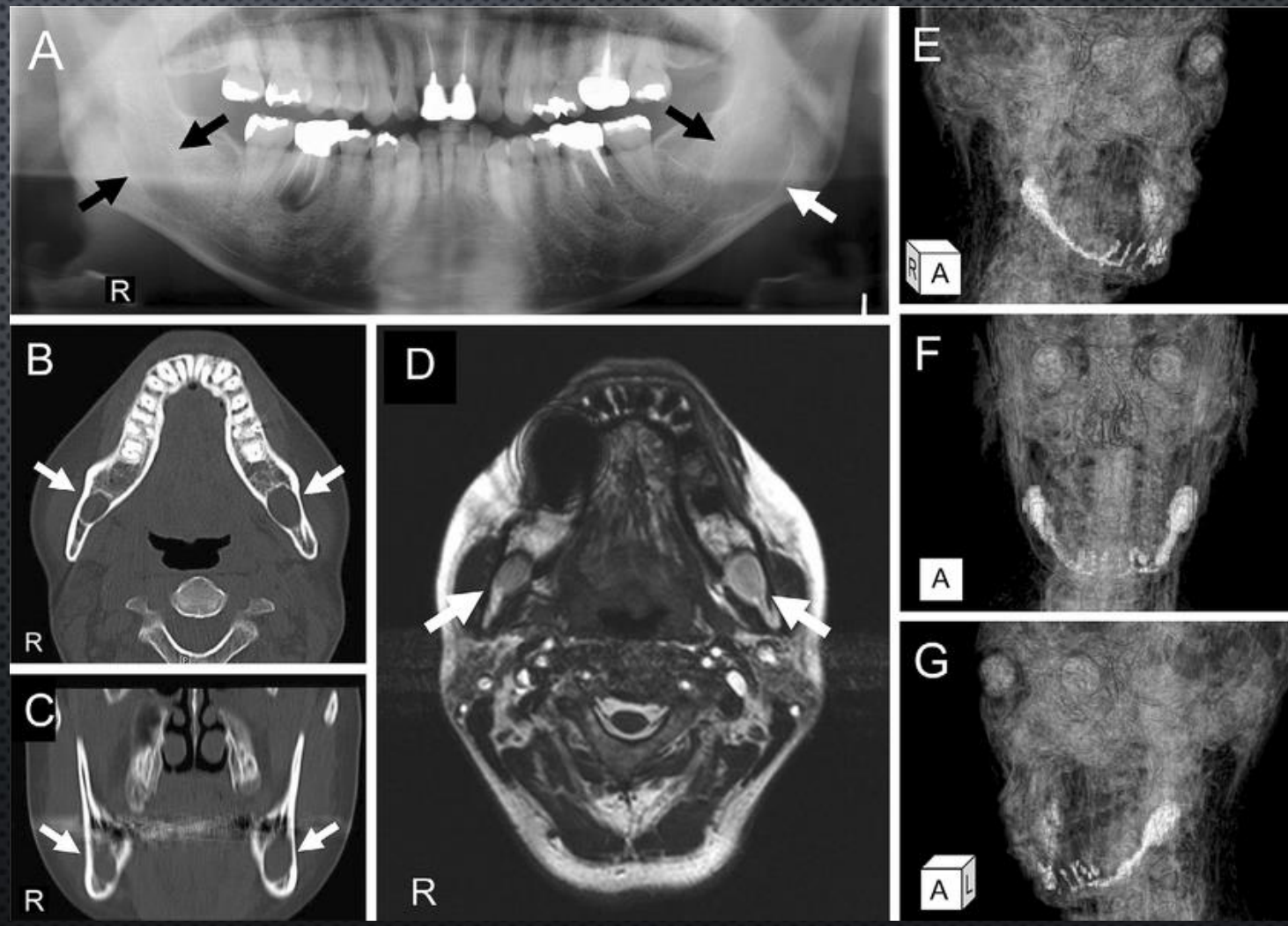
CBCT MAY BE USEFUL WITH CLINICAL CONFIRMATION OF LINGUAL NEUROPATHY USEFUL TO ESTABLISH IF LINGUAL PLATE DAMAGE INDICATES URGENT NEED FOR LINGUAL NERVE EXPLORATION AND REPAIR
CBCT DEMONSTRATING BILATERAL BUR PERFORATION OF LINGUAL PLATE POST TMS (COURTESY OF TONY POGREL)

NEW DEVELOPMENTS

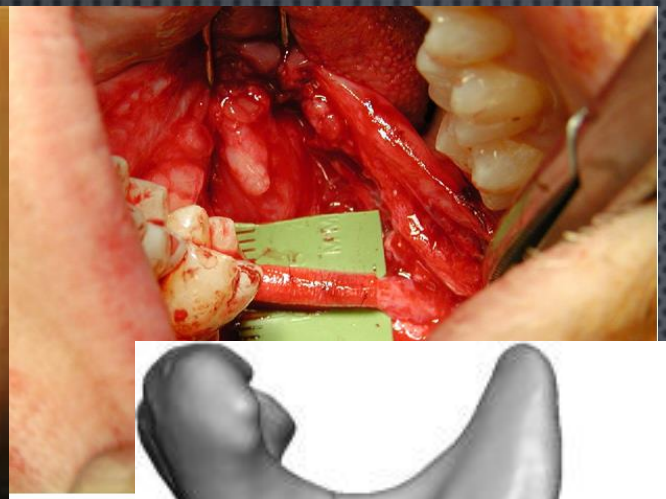
Zuniga JR, Mistry C, Tikhonov I, Dessouky R, **Chhabra** A Magnetic Resonance Neurography of Traumatic and Nontraumatic Peripheral Trigeminal Neuropathies. J Oral Maxillofac Surg. 2018 Apr;76(4):725-736. doi: 10.1016/j.joms.2017.11.007. Epub 2017 Nov 16.

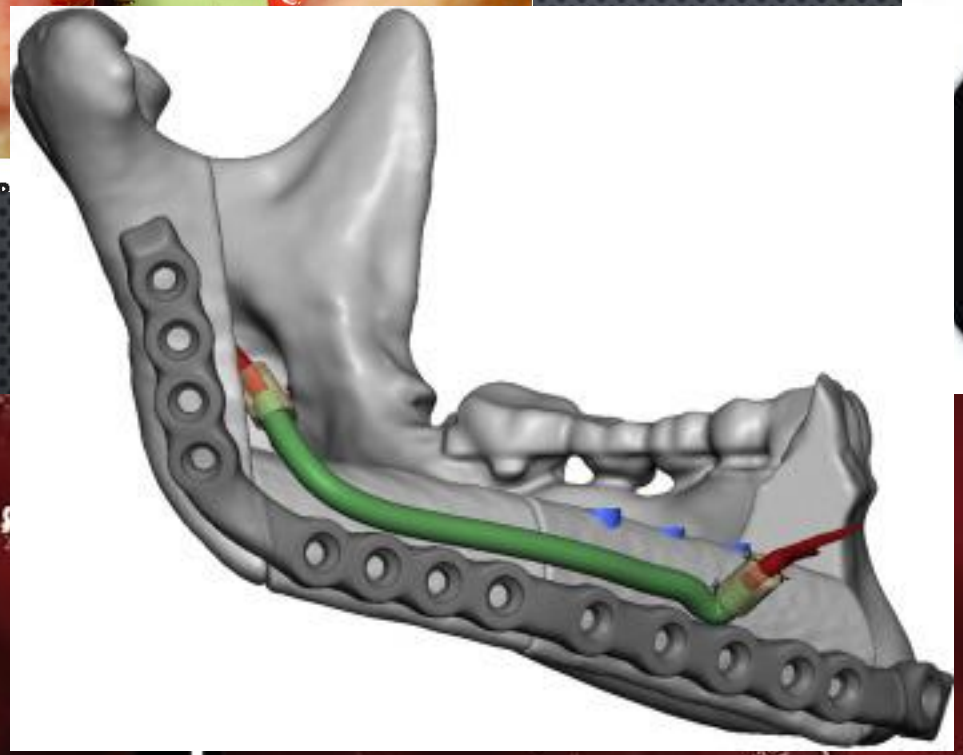
Dessouky R, Xi Y, **Zuniga J**, **Chhabra** A. Role of MR Neurography for the Diagnosis of Peripheral Trigeminal Nerve Injuries in Patients with Prior Molar Tooth Extraction. AJNR Am J Neuroradiol. 2018 Jan;39(1):162-169.

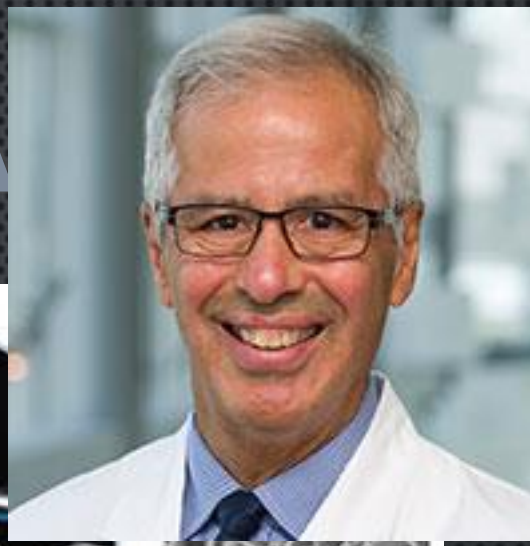
Cox B, Zuniga JR, Panchal N, Cheng J, **Chhabra** A. Magnetic resonance neurography in the management of peripheral trigeminal neuropathy: experience in a tertiary care centre. Eur Radiol. 2016 Oct;26(10):3392-400. doi: 10.1007/s00330-015-4182-5. Epub 2016 Jan 21



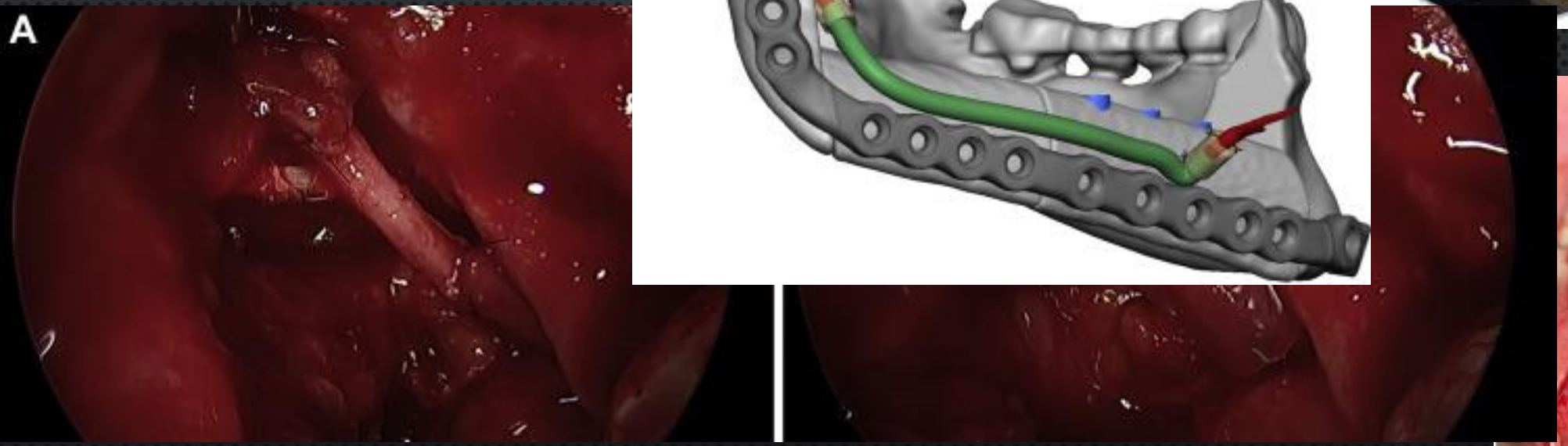
JOHN ZUNIGA



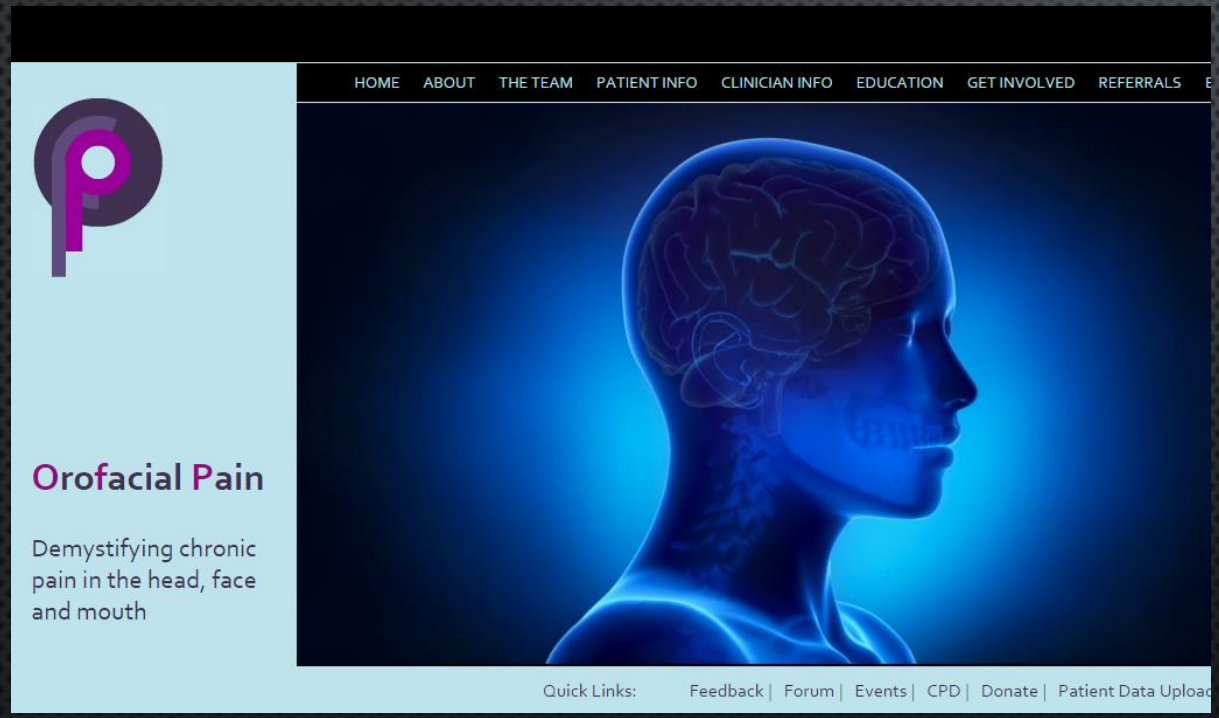




Axons grow through multi-tubular structure of Avance® Nerve Graft.



Orofacialpain.org.uk



Trigeminalnerve.org.uk