

CLINICAL PRACTICE GUIDELINES



MINISTRY OF HEALTH MALAYSIA
ORAL HEALTH PROGRAMME

MANAGEMENT OF UNERUPTED AND IMPACTED THIRD MOLAR TEETH (2nd Edition)

November 2021



Published by:

Oral Health Technology Section
Oral Health Programme
Ministry of Health Malaysia
Level 5, Block E10, Precinct 1
Federal Government Administrative Centre
62590 Putrajaya, Malaysia

Copyright

The copyright owner of this publication is Oral Health Programme (OHP), Ministry of Health Malaysia. Content may be reproduced in any number of copies and in any format or medium provided that a copyright acknowledgement to OHP is included and the content is not changed, not sold, nor used to promote or endorse any product or service and not used inappropriately or misleading context.

ISBN: 978-967-19520-3-0

Available on the following websites:

<http://www.moh.gov.my>

<http://www.ohd.gov.my>

<http://www.acadmed.org.my>

Also available as an app for Android and iOS platform: MyMaHTAS

STATEMENT OF INTENT

These guidelines update and supplant the previous guidelines developed in 2005 and are based on the best available contemporary evidence. They are intended as a guide for the best clinical practice in the management of unerupted and/or impacted third molar teeth presently. However, it must be noted that adherence to these guidelines do not necessarily lead to the best clinical outcome in individual patient care, as every health care provider is responsible for the management of his/her unique patient based on the clinical presentation and management options available locally.

REVIEW OF THE GUIDELINES

These guidelines were issued in November 2021 and will be reviewed in 2026 or earlier if important new evidence becomes available. When it is due for updating, the head of the related specialty will be informed about it. A multidisciplinary team will be formed and discussion will be done on the need for a revision including the scope of the revised CPG. The systematic review methodology used by the Malaysia Health Technology Assessment Section (MaHTAS) will be employed in reviewing the guidelines.

Every care is taken to ensure that this publication is correct in every detail at the time of publication. However, in the event of errors or omissions, corrections will be published in the web version of this document, which is the definitive version at all times.

TABLES OF CONTENTS	Page
LEVELS OF EVIDENCE	i
FORMULATION OF RECOMMENDATION	i
LIST OF KEY MESSAGES	ii
LIST OF RECOMMENDATIONS	ii
GUIDELINES DEVELOPMENT	iv
OBJECTIVES AND CLINICAL QUESTIONS	v
TARGET POPULATION, TARGET GROUP / USER AND SETTINGS	vi
DEVELOPMENT GROUP	vii
REVIEWERS	viii
ALGORITHM: Management of Unerupted and/or Impacted Third Molar	ix
1. INTRODUCTION	1
2. DIAGNOSIS	2
2.1 History Taking & Clinical Examination	2
2.2 Imaging	2
2.2.1 Plain Radiography	2
2.2.2 Cone Beam Computed Tomography (CBCT)	3
3. INDICATIONS	3
3.1 Caries	4
3.2 Periodontal Problems	5
3.3 Crowding	6
3.4 Cyst / Pathology	6
3.5 In the line of Mandibular Fracture	6
3.6 Orthognathic Surgery	6
3.7 Asymptomatic Third Molar	6
4. TREATMENT	7
4.1 Conservative	7
4.2 Surgical	7
4.2.1 Surgical Procedure	7
4.2.2 Coronectomy	8

4.2.2.1 Inferior Alveolar Nerve (IAN) Injury	8
4.2.2.2 Post-Operative Pain	8
4.2.2.3 Post-Operative Infection	8
4.2.2.4 Dry Socket / Alveolar Osteitis	8
4.2.2.5 Root Migration	8
4.2.2.6 Reoperation	9
4.3 Perioperative Treatment	9
4.3.1 Analgesics	9
4.3.2 Antibiotics	10
4.3.3 Corticosteroids	11
4.3.4 Mouthwash	11
4.4 Treatment of Complications	12
4.4.1 Dry Socket / Alveolar Osteitis	12
4.4.2 Wound Infection / Post-Operative Infection	12
4.4.3 Post-Operative Bleeding	12
4.4.4 Inferior Alveolar Nerve (IAN) Injury	13
4.4.5 Platelet-Rich Fibrin (PRF)	13
4.5 Follow-Up	13
5. IMPLEMENTING THE GUIDELINES	14
5.1 Facilitating and Limiting Factors	14
5.2 Potential Resource Implications	14
5.3 Proposed Clinical Audit Indicators	15
REFERENCES	16
APPENDIX 1: Search Strategy	18
APPENDIX 2: Clinical Questions	19
ACKNOWLEDGEMENTS, DISCLOSURE STATEMENT AND SOURCES OF FUNDING	20

LEVELS OF EVIDENCE

LEVEL	STUDY DESIGN
I	Evidence obtained from at least one properly designed randomised controlled trial.
II-1	Evidence obtained from well-designed controlled trials without randomisation.
II-2	Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one centre or research group.
II-3	Evidence obtained from multiple time series studies, with or without intervention. Dramatic results in uncontrolled experiments (such as the results of the introduction of penicillin treatment in the 1940s) could also be regarded as this type of evidence.
III	Opinions or respected authorities, based on clinical experience; descriptive studies and case reports; or reports of expert committees.

Source: Adapted from Harris RP, Helfand M, Woolf SH, Lohr KN, Mulrow CD, Teutsch SM, Atkins D. Current Methods of the U.S. Preventive Services Task Force: A Review of the Process. Am J Prev Med. 2001;20 (suppl 3):21-35.

FORMULATION OF RECOMMENDATION

In line with the current development in CPG methodology, the Grading Recommendations, Assessment, Development and Evaluation (GRADE) was adopted in the work process. The quality of each retrieved evidence and its effect size are carefully assessed and reviewed by the CPG Development Group. In formulating the recommendations, overall balances of the following aspects are considered in determining the strength of the recommendations:

- overall quality of evidence
- balance of benefits versus harms
- values and preferences
- resource implications
- equity, feasibility and acceptability

LIST OF KEY MESSAGES

Key Message 1

- OPG is used when IOPA is unable to show the relationship between IAN and the third molar.

Key Message 2

- In view of limited evidence, CBCT imaging is indicated in cases where conventional (panoramic and/or intraoral) imaging cannot provide satisfactory diagnostic information.

Key Message 3

- The clinical status of second molar is important to determine the need or indication for the removal of third molar.

LIST OF KEY RECOMMENDATIONS

Recommendation 1

- Removal of third molars may be considered to reduce the risk of dental caries in the adjacent second molars.

Recommendation 2

- Removal of third molars may be considered in reducing periodontal problem in adjacent second molars.

Recommendation 3

- Triangular or envelop flap may be used in the surgical removal of impacted mandibular third molars.

Recommendation 4

- Coronectomy may be considered in the management of unerupted and/or impacted mandibular third molar which has close proximity with the IAN to reduce the risk of IAN injury.

Recommendation 5

- Analgesics should be prescribed for removal of third molars.
 - o Non-steroidal anti-inflammatory drugs are the preferred option.

Recommendation 6

- Antibiotics may be considered in third molar surgery when there is significant bone removal and/or prolonged operation time.
 - o Amoxicillin is the preferred option.

Recommendation 7

- Corticosteroids should be used in third molar surgery to reduce post-surgery oedema and trismus when there is no contraindication.

Recommendation 8

- Chlorhexidine mouthwash should be used in third molar surgery to prevent dry socket.

Recommendation 9

- Third molars and post-coronectomy cases should be monitored periodically. Patients should be made aware of the risks that can arise even when it is asymptomatic and be involved in the decision making.

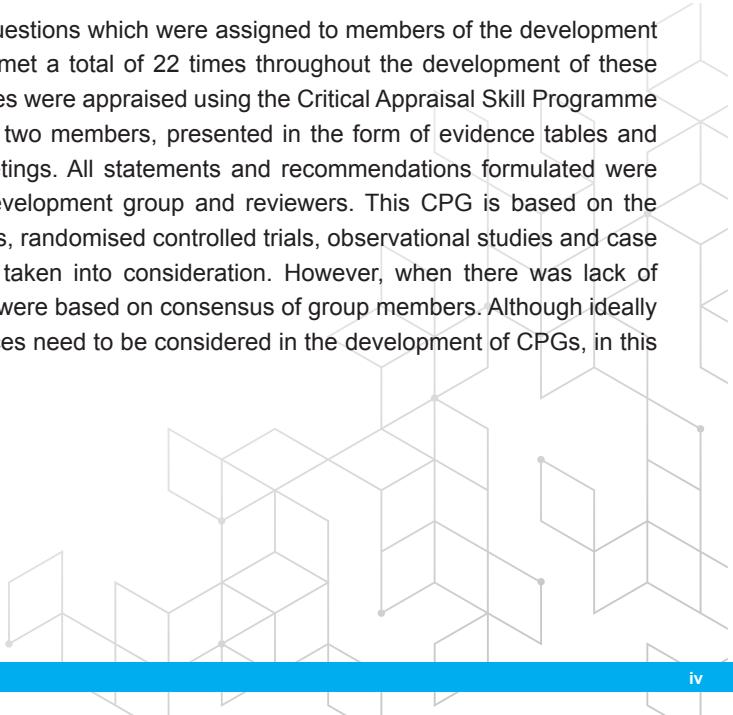
GUIDELINES DEVELOPMENT

These clinical practice guidelines (CPG) were developed by a multidisciplinary expert committee consisting of Oral & Maxillofacial Surgeons, a Paediatric Dental Specialist, a Periodontist, an Orthodontist and a Dental Officer mainly from the Ministry of Health and the Ministry of Higher Education.

The previous edition of the CPG on Management of Unerupted and Impacted Third Molar Teeth (December 2005) was used as the basis for the development of these guidelines. The recommendations were formulated taking into consideration the best available evidence and local practices. Several improvements have been introduced in this edition. The scope has been expanded to include new and updated information. In addition, clinical audit indicators have also been identified for the purpose of monitoring and evaluating outcomes.

Literature search was carried out using the following electronic databases: Medline, Pubmed, Cochrane Database of Systemic Reviews (CDSR) and Embase while full text journal articles were retrieved from these databases. The literature search was limited to human study, English language and published articles from 2006 to September 2021. In addition, the reference lists of all retrieved literature and guidelines were searched to further identify relevant studies. Future CPG updates will consider evidence published after this cut-off date. An example of the search strategy used can be found in Appendix 1. Details of the search strategy can be obtained upon request from the CPG Secretariat.

There were five (5) clinical questions which were assigned to members of the development group. The group members met a total of 22 times throughout the development of these guidelines. All retrieved articles were appraised using the Critical Appraisal Skill Programme (CASP) checklist by at least two members, presented in the form of evidence tables and discussed during group meetings. All statements and recommendations formulated were agreed upon by both the development group and reviewers. This CPG is based on the findings of systematic reviews, randomised controlled trials, observational studies and case reports, with local practices taken into consideration. However, when there was lack of evidence, recommendations were based on consensus of group members. Although ideally patients' views and preferences need to be considered in the development of CPGs, in this instance, it was not feasible.



The literature used in these guidelines were graded using the US / Canadian Preventive Services Task Force Level of Evidence (2001), while the formulation of recommendation was done using the principles of GRADE. The writing of the CPG strictly follows the requirements of Appraisal of Guidelines Research and Evaluation (AGREE II).

The draft was reviewed by a panel of internal and external reviewers. Recommendations were presented to the Technical Advisory Committee for CPGs, and finally to the HTA and CPG Council, Ministry of Health, Malaysia for approval.

GENERAL OBJECTIVE

To provide evidence-based recommendations for the best management practices of unerupted and/or impacted third molar teeth.

SPECIFIC OBJECTIVES

1. To determine indications for removal of unerupted and/or impacted third molar teeth.
2. To determine suitable imaging modalities for diagnosis and assessment of unerupted and/or impacted third molar teeth and their adjacent structures.
3. To determine factors that affect the outcome of removal of unerupted and/or impacted third molar teeth.

CLINICAL QUESTIONS

The clinical questions addressed by these guidelines can be found in Appendix 2.

TARGET POPULATION

These guidelines are to be applied to all patients presenting with unerupted and/or impacted third molar teeth.

Inclusion criteria

Newly diagnosed:

- unerupted third molars
- impacted third molars
- unerupted and impacted third molars

Exclusion criteria

Nil

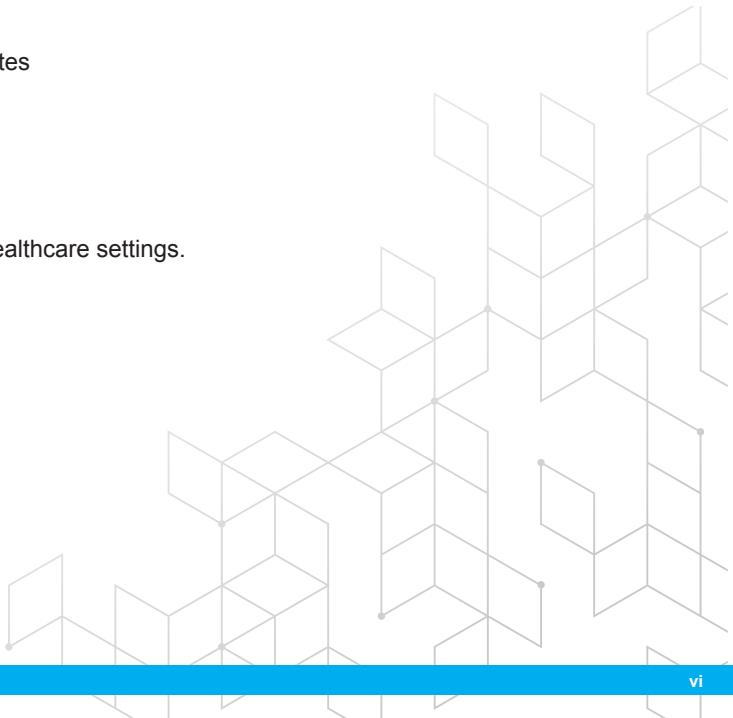
TARGET GROUP / USER

This document is intended to guide those involved in the management of unerupted and/or impacted third molar teeth at any healthcare level including:

- i. Dental specialists
- ii. Dental officers
- iii. General dental practitioners
- iv. Dental students
- v. Patients and their advocates
- vi. Professional societies

SETTINGS

Primary and specialist oral healthcare settings.



DEVELOPMENT GROUP

Chairperson	Secretary
Dr Kok Tuck Choon Senior Consultant Oral & Maxillofacial Surgeon Jabatan Bedah Mulut & Maksilofasial Hospital Queen Elizabeth 88586 Kota Kinabalu, Sabah	Dr. Hafizah binti Mansor Dental Officer Jabatan Bedah Mulut & Maksilofasial Hospital Shah Alam Persiaran Kayangan, Section 7 40000 Shah Alam, Selangor
Members	
Dr Bahruddin bin Saripudin Senior Consultant Paediatric Dental Specialist Jabatan Pergigian Pediatrik Hospital Tunku Azizah Jalan Raja Muda Abdul Aziz 50300 WP Kuala Lumpur	Dr Cri Saiful Jordan Melano Bin Basri Consultant Oral & Maxillofacial Surgeon Jabatan Bedah Mulut & Maksilofasial Hospital Seberang Jaya Jalan Tun Hussien Onn 13700 Seberang Jaya, Pulau Pinang
Dr Sherrie Chong Mei Yee Oral & Maxillofacial Surgeon Jabatan Bedah Mulut & Maksilofasial Hospital Tengku Ampuan Rahimah Jalan Langat 41200 Klang, Selangor	Dr Khairulzaman bin Adnan Oral & Maxillofacial Surgeon Jabatan Bedah Mulut & Maksilofasial Hospital Sultan Ahmad Shah Jalan Maran 28000 Temerloh, Pahang
Dr Izrawatie Mardiana binti Shapeen Periodontist Unit Pakar Periodontik Klinik Pergigian Cahaya Suria Bangunan UTC Pudu Sentral Jalan Pudu 55100 WP Kuala Lumpur	Dr Tan Huann Lan Senior Lecturer and Oral & Maxillofacial Surgeon Jabatan Bedah Mulut dan Maksilofasial Fakulti Pergigian Universiti Kebangsaan Malaysia Jalan Raja Muda Abdul Aziz 50300 WP Kuala Lumpur
Dr Maria Jirom Gere Consultant Orthodontist Klinik Pergigian Cahaya Suria Bangunan UTC Pudu Sentral Jalan Pudu 55100 WP Kuala Lumpur	Dr Ferdinand Jesudian K. Pillai Consultant Oral & Maxillofacial Surgeon Jabatan Bedah Mulut & Maksilofasial Hospital Seberang Jaya, Jalan Tun Hussein Onn, 13700 Seberang Jaya, Pulau Pinang

REVIEWERS (INTERNAL AND EXTERNAL)

These guidelines were reviewed by a panel of independent reviewers from both public and private sectors who were asked to comment primarily on the comprehensiveness and accuracy of interpretation of the evidence supporting the recommendations in this CPG. The following internal and external reviewers provided comments and feedbacks on the proposed draft:

INTERNAL REVIEWERS

Dr Stephen Joseph Royan

Senior Consultant Oral & Maxillofacial Surgeon
Hospital Tuanku Jaafar
Jalan Rasah
70300 Seremban, Negeri Sembilan

Dr Saadah binti Atan

Senior Consultant Paediatric Dental Specialist
Hospital Tunku Azizah
Jalan Raja Muda Abdul Aziz
50300 WP Kuala Lumpur

EXTERNAL REVIEWERS

Prof. Dr Ngeow Wei Cheong

Senior Lecturer and Consultant Oral & Maxillofacial Surgeon
Oral Surgery Department
University of Malaya
Jalan Profesor Diraja Ungku Aziz
50603 WP Kuala Lumpur

Kol. (Dr) Normah binti Samsuri

Colonel of Dental Service
Malaysian Armed Forces
Headquarters of Malaysian Armed Forces
Ministry of Defense
Jalan Tekpi, Off Jalan Padang Tembak
50634 WP Kuala Lumpur

Assoc. Prof. Dr Syed Nabil bin Syed Omar

Oral & Maxillofacial Surgeon
Faculty of Dentistry
National University of Malaysia
Jalan Raja Muda Abdul Aziz
50300 WP Kuala Lumpur

Assoc. Prof. Dr Savithri a/p N. Vengadasalam

Dental Public Health Specialist
Faculty of Dentistry, MAHSA University
Jalan SP2, Bandar Saujana Putra
42610 Kuala Langat, Selangor

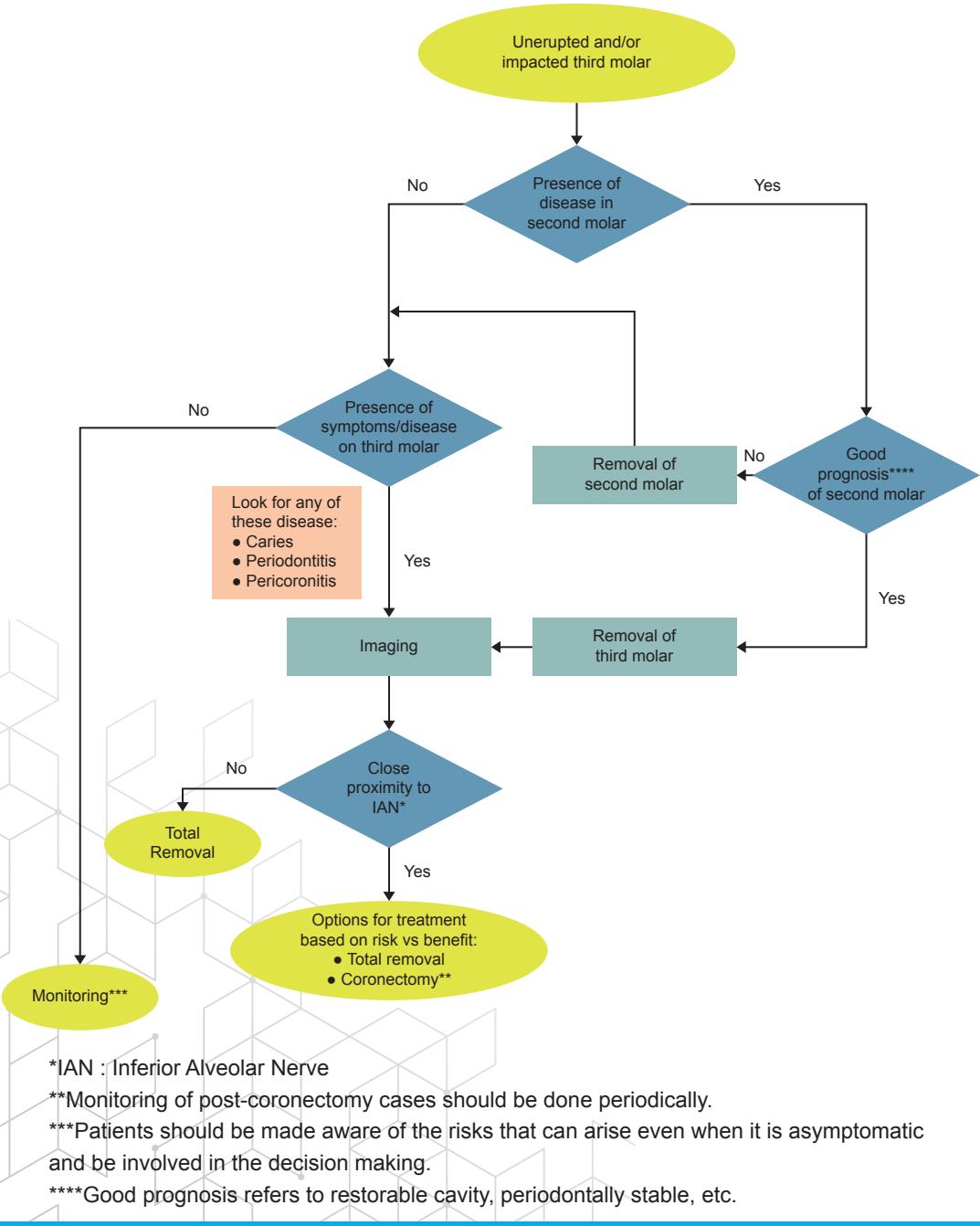
Dr Ong Siew Tin

Oral & Maxillofacial Surgeon
Ong Klinik Pakar Pergigian & Bedah Mulut
41C & 43C Jalan SS21/37
Damansara Utama
47400 Petaling Jaya, Selangor

Pn. Nor Hazlin binti Hassim

Educator
Sekolah Agama Menengah Tinggi
Tengku Ampuan Jemaah
Persiaran Bandaraya Seksyen 11
40000 Shah Alam, Selangor

ALGORITHM
MANAGEMENT OF UNERUPTED AND/OR IMPACTED THIRD MOLAR TEETH



1. INTRODUCTION

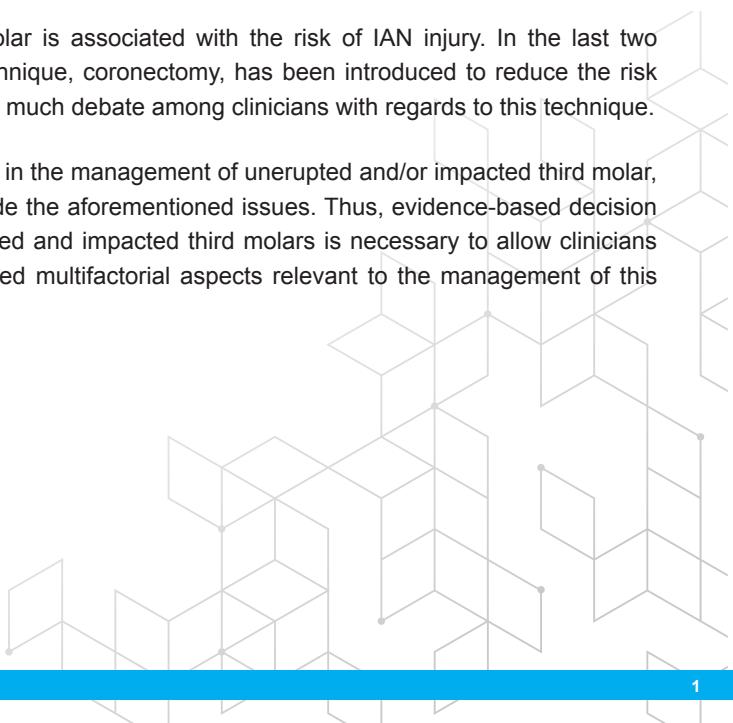
Third molars, also known as wisdom teeth, are generally the last teeth to erupt after the age of seventeen. The position of the teeth is posterior to the second molars, where space can be limited for the eruption to take place. Impaction of third molars can be due to several factors, including lack of space, obstruction by adjacent structures or tooth and abnormal position during tooth development.¹ Impacted third molars can be entirely or partially covered by bone and/or soft tissue. Wisdom teeth that are partially erupted in dental arches are usually visible clinically, but have not achieved the normal functional position.

The average rate of third molar impaction worldwide was 24.4% in adults 17 years and above. The prevalence of mandibular impaction (25.4%) was significantly higher than maxillary impaction (14.2%). Adults with impacted wisdom teeth would commonly have one or two impacted wisdom teeth rather than three or four impacted teeth. There was no significant predilection between genders on the occurrence of impacted third molars. In terms of angle of impaction, clinicians would more likely encounter mesio-angular impaction (41.2%), followed by vertical (25.6%), disto-angular (12.2%) and horizontal impaction (11.1%).²

The introduction of cone beam computed tomography (CBCT) has led clinicians to consider its usage for three-dimensional assessment of third molars and its relationship with adjacent structures, particularly inferior alveolar nerve (IAN). However, there is a need to address its clinical usefulness in these cases.

Surgical removal of third molar is associated with the risk of IAN injury. In the last two decades, a new surgical technique, coronectomy, has been introduced to reduce the risk of IAN injury. There has been much debate among clinicians with regards to this technique.

In view of new developments in the management of unerupted and/or impacted third molar, this CPG is updated to include the aforementioned issues. Thus, evidence-based decision making in managing unerupted and impacted third molars is necessary to allow clinicians to identify and assess updated multifactorial aspects relevant to the management of this specific dental condition.



2. DIAGNOSIS

2.1 History Taking & Clinical Examination

Unerupted and/or impacted third molar is diagnosed clinically by detailed history taking and good clinical examination. Common signs and symptoms for this condition include:

- pain
- swelling
- trismus
- fever

Imaging may be required to confirm the diagnosis and to observe the morphology of the tooth and surrounding structures and associated pathological conditions (e.g. caries, periodontal disease and cyst).

2.2 Imaging

2.2.1 Plain Radiography

The most commonly used plain radiographs in the management of unerupted and/or impacted third molar are orthopantomogram (OPG) and intraoral periapical (IOPA) radiographs. Three meta-analyses studied the predictors of inferior alveolar nerve (IAN) exposure in OPG among patients with impacted mandibular third molars. The number of primary studies ranged from five to nine and of moderate quality. The sensitivities and specificities of the predictors are shown in the following table. ^{3-5, level III}

Table 1. Sensitivities and Specificities of Predictors in IAN Exposure

Predictor	Range of Sensitivity (CI)	Range of Specificity (CI)
Darkening of root	0.49 (95% CI 0.39 to 0.60) to 0.56 (95% CI 0.50 to 0.61)	0.81 (95% CI 0.80 to 0.83) to 0.89 (95% CI 0.87 to 0.90)
Interruption of radiopaque border of mandibular canal	0.39 (95% CI 0.30 to 0.48) to 0.54 (95% CI 0.44 to 0.64)	0.80 (95% CI 0.78 to 0.82) to 0.84 (95% CI 0.82 to 0.85)
Diversion of mandibular canal	0.29 (95% CI 0.21 to 0.97) to 0.294 (95% CI 0.22 to 0.38)	0.95 (95% CI 0.936 to 0.957) to 0.96 (95% CI 0.95 to 0.97)
Narrowing of canal	0.15 (95% CI 0.07 to 0.26)	0.95 (95% CI 0.94 to 0.96)

Darkening of root and interruption of radiopaque border of mandibular canal were better in predicting inferior alveolar nerve injury compared with other predictors. However, it was concluded that more high quality evidence is required before OPG can be recommended in IAN assessment. ^{3-5, level III}

Key Message 1

- OPG is used when IOPA is unable to show the relationship between IAN and the third molar.

2.2.2 Cone Beam Computed Tomography (CBCT)

CBCT is a recent advancement in dental imaging that provides a three-dimensional view of the relationships between orofacial structures. It is widely used in diagnosis and treatment planning of unerupted and/or impacted third molar.

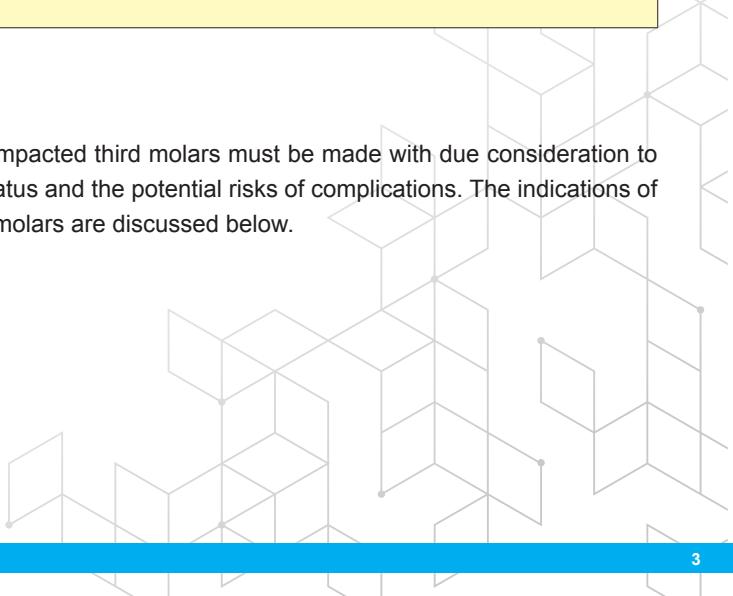
A systematic review studied the diagnostic accuracy of CBCT compared with OPG in predicting exposure of IAN in impacted third molar. Two diagnostic studies showed conflicting results in the comparison. Due to limited evidence in the systematic review, a firm conclusion cannot be made. ^{6, level I}

Key Message 2

- In view of limited evidence, CBCT imaging is indicated in cases where conventional (panoramic and/or intraoral) imaging cannot provide satisfactory diagnostic information.

3. INDICATIONS

The decision to remove the impacted third molars must be made with due consideration to the patient's overall health status and the potential risks of complications. The indications of removing the impacted third molars are discussed below.



3.1 Caries

In a meta-analysis of moderate quality cross-sectional studies, the presence of third molars led to increased risk of caries in adjacent molars: ^{7, level III}

- Third molars in A versus C positions (OR=3.45, 95% CI 2.28 to 5.22) based on Pell & Gregory classification (Figure 1).
- Third molars in horizontal versus vertical (OR=8.12, 95% CI 3.75 to 17.58) and distoangular (OR=9.75, 95% CI 3.49 to 27.25) positions based on Winter's classification (Figure 2).
- Third molars in mesioangular vs vertical (OR=7.25, 95% CI 3.48 to 15.10) and distoangular (OR=9.54, 95% CI 3.47 to 26.21) positions based on Winter's classification.

Figure 1. Pell & Gregory Classification ⁸

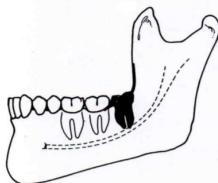
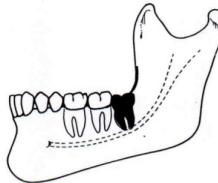
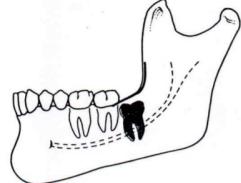
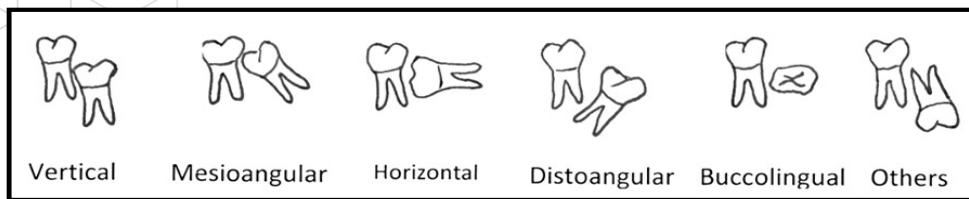
		
Class A impaction. Occlusal plane of impacted as occlusal plane of second molar.	Class B impaction. Occlusal plane of impacted tooth is between occlusal plane and cervical line of second molar.	Class C impaction. Impacted tooth is below cervical line of second molar.

Figure 2. Winter's Classification ⁹



However, in another Cochrane systematic review with moderate risk of bias, a cohort study showed no difference in the prevalence of distal caries associated with the adjacent second molar in the absence compared with the presence of bony impacted wisdom teeth (RR=0.69, 95% CI 0.27 to 1.82). ^{10, level I}

In local setting, removal of third molar should be considered when caries is present in third molar and unlikely to be restored. Removal may also be considered when there is distal caries on the second molar.

Key Message 3

- The clinical status of second molar is important to determine the need or indication for the removal of third molar.

Recommendation 1

- Removal of third molars may be considered to reduce the risk of dental caries in the adjacent second molars.

3.2 Periodontal Problems

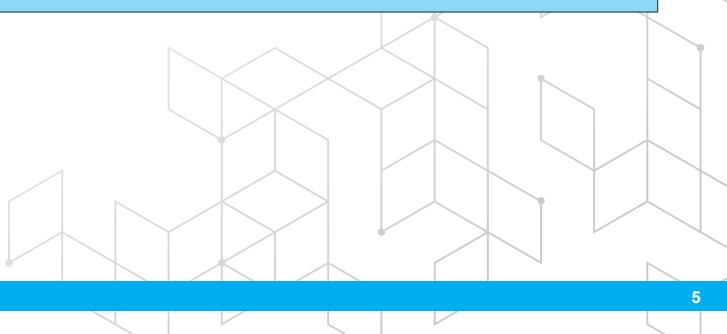
In a Cochrane systematic review, presence of third molar can secondarily lead to greater probing depth ($RR=0.63$, 95% CI 0.37 to 1.04) and alveolar bone loss on the distal surface of second molar ($RR=0.32$, 95% CI 0.19 to 0.54). ^{10, level I}

In the same review, the absence of third molar compared to when it is present showed: ^{10, level I}

- reduced risk of probing depth >4 mm associated with distal of adjacent second molar in the presence of soft tissue impaction ($RR=0.15$, 95% CI 0.07 to 0.34) but not in bony impaction ($RR=0.63$, 95% CI 0.37 to 1.04).
- reduced risk of alveolar bone loss at distal of adjacent second molar in presence of soft tissue or bony impaction with RR of 0.11 (95% CI 0.06 to 0.22) and 0.32 (95% CI 0.19 to 0.54) respectively.

Recommendation 2

- Removal of third molars may be considered in reducing periodontal problem in adjacent second molars.



3.3 Crowding

In a Cochrane systematic review, a randomised clinical trial (RCT) comparing surgical removal and retention of asymptomatic disease-free third molars showed no significant effect on dimensional changes in the dental arch (crowding):^{10, level I}

- Little's irregularity index (mean difference, MD= -0.3 mm, 95% CI -1.3 to 0.7)
- Intercanine width (MD= -0.01 mm, 95% CI -0.37 to 0.35)

Although there were differences in arch length (MD= -1.03 mm, 95% CI -0.56 to -1.50), it was unlikely to be clinically significant.^{10, level I} However, this RCT had high risk of bias. Thus, the systematic review did not provide strong evidence to support or refute the prophylactic removal of disease-free impacted third molars to prevent crowding.

3.4 Cyst / Pathology

Impacted third molars should be removed when it is associated with cyst / tumour.^{11, level III}

3.5 In the line of Mandibular Fracture

Angle of the mandible is a common site for mandibular fracture. Impacted lower third molar can be in the line of the fracture and poses possible complications such as infection if not removed. Generally, removal of an impacted third molar may be considered based on clinical judgment.

3.6 Orthognathic Surgery

One of the complications during bilateral sagittal split osteotomy (BSSO) in orthognathic surgery is bad split, which is an unwanted pattern of fracture. A meta-analysis showed no significant difference in the incidence of bad split between lower third molars removed concomitantly during surgery and at least six months preoperatively (OR=1.16, 95% CI 0.73 to 1.85).^{12, level II-2} However, lower third molars are usually removed prior to surgery in clinical practice.

3.7 Asymptomatic Third Molar

The prophylactic removal of asymptomatic third molars is defined as removal of third molars in the absence of local diseases. Based on a Cochrane systematic review, there was insufficient evidence to determine removal of asymptomatic impacted third molars.^{10, level I} However, consideration needs to be given to the risk to the adjacent second molar or there may be other possible risks to retention of third molar due to patient's medical or surgical condition. The clinician needs to balance the risks and benefits with patient's involvement.

4. TREATMENT

4.1 Conservative

A Cochrane systematic review could not provide sufficient evidence to support the removal or retention of asymptomatic third molars in preventing further problems e.g: crowding and cyst formation.^{10, level I}

4.2 Surgical

4.2.1 Surgical Procedure

The surgical procedure in removal of impacted third molar generally involves:

- raising of soft tissue flaps (triangular or envelope) for exposure with or without lingual flap retraction
- removing bone using either chisel or bur with irrigation
- delivering the whole tooth with or without prior division
- performing wound toilet and suturing

A Cochrane systematic review consisting of low to moderate quality primary studies evaluated the relative benefits and risks of different techniques for undertaking various aspects or stages of the surgical removal of mandibular wisdom teeth. The review concluded that:^{13, level I}

- Triangular flaps were associated with reduction in pain at 24 hours ($MD = -0.21$, 95% CI -0.32 to -0.10) and a 71% reduction in alveolar osteitis at one week ($RR = 0.29$, 95% CI 0.11 to 0.78) compared with envelope flaps. There was no difference in overall infection rates, maximum mouth opening or permanent loss of sensation. However, there was slight increase in residual swelling after one week in the triangular flap ($MD = 0.66$ mm, 95% CI 0.26 to 1.07).
- Lingual flap retraction caused more temporary altered sensation up to one month (Peto $OR = 5.19$, 95% CI 1.38 to 19.49).
- No conclusion could be made on bone removal using bur or chisel in view of small number of studies and heterogeneity in the outcomes.

There is insufficient evidence on the use of lingual flap retraction and bone removal in impacted third molar surgery. However, in local practice, lingual flap retraction is generally not performed because of the possible injury to lingual nerve, while bur is usually used for bone removal.

Recommendation 3

- Triangular or envelope flap may be used in the surgical removal of impacted mandibular third molars.

4.2.2 Coronectomy

Coronectomy is an alternative procedure for surgical removal of impacted mandibular third molars that present with a high risk of inferior alveolar nerve injury. The main aim of coronectomy technique is to prevent inferior alveolar nerve injury by removing the wisdom tooth crown and leaving behind the roots that show signs of proximity with IAN undisturbed. ^{14, level I}

Key criteria for coronectomy include: ^{15, level III}

- high risk of IAN injury
- vital mandibular third molar
- healthy non-immunocompromised patient
- access to care for (and understanding of) related coronectomy risks

4.2.2.1 Inferior Alveolar Nerve (IAN) Injury

In a meta-analysis of moderate quality RCTs and CCTs, coronectomy has lower risk of IAN injury probability ($OR=0.11$, 95% CI 0.03 to 0.36) than total removal of the mandibular third molar. ^{14, level I}

4.2.2.2 Post-Operative Pain

Similar meta-analysis reported that there was no significant difference between total removal of third molars and coronectomy in post-operative pain ($OR=0.8$, 95% CI 0.28 to 2.66). ^{14, level I}

4.2.2.3 Post-Operative Infection

There was no significant difference in the risk of post-operative infection between total removal of third molars and coronectomy ($OR=0.87$, 95% CI 0.41 to 1.84). ^{14, level I}

4.2.2.4 Dry Socket / Alveolar Osteitis

The risk of dry socket occurrence in coronectomy was lower in comparison with total removal of mandibular third molar ($OR=0.44$, 95% CI 0.10 to 0.96). ^{14, level I}

4.2.2.5 Root Migration

There is possibility of root migration in post-coronectomy cases. However, the occurrence of root migration could not be pooled due to lack of homogenous data. ^{14, level I}

4.2.2.6 Reoperation

From a systematic review of moderate quality RCTs and CCTs, the incidence of reoperation for removal of retained root after initial successful coronectomy is infrequent, ranging between 0.6% to 6.9%. ^{16, level I}

Recommendation 4

- Coronectomy may be considered in the management of unerupted and/or impacted mandibular third molar which has close proximity with the IAN to reduce the risk of IAN injury.

4.3 Perioperative Treatment

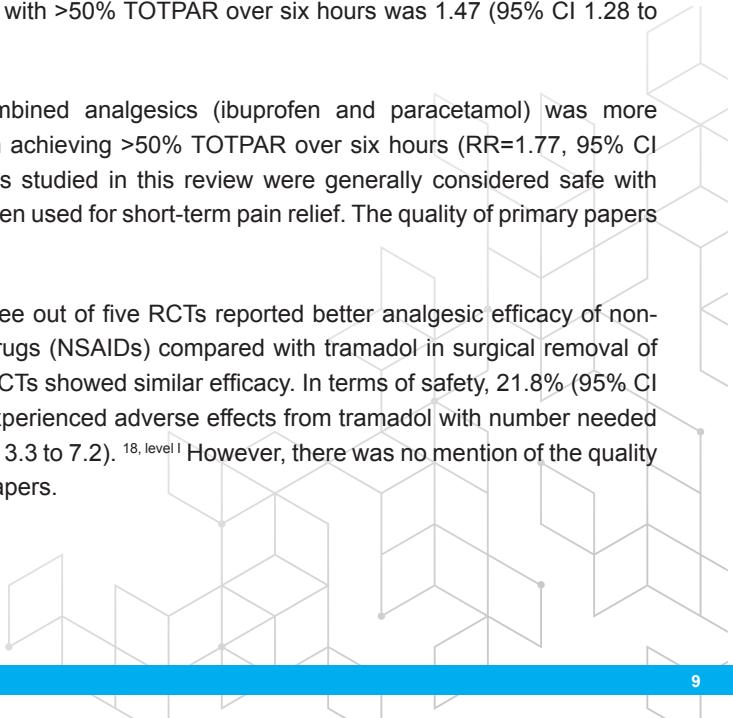
4.3.1 Analgesics

Analgesic is an important component in the management of impacted third molar. In a Cochrane systematic review, ibuprofen 400 mg was reported to be more effective than paracetamol 1000 mg in postoperative pain management following the surgical removal of lower wisdom teeth. ^{17, level I}

- The risk ratio of patient with >50% maximum total pain relief (TOTPAR) over two hours was 1.30 (95% CI 1.09 to 1.55)
- The risk ratio of patient with >50% TOTPAR over six hours was 1.47 (95% CI 1.28 to 1.69)

In another comparison, combined analgesics (ibuprofen and paracetamol) was more effective than single drugs in achieving >50% TOTPAR over six hours (RR=1.77, 95% CI 1.32 to 2.39). ^{17, level I} All drugs studied in this review were generally considered safe with minimal side effects noted when used for short-term pain relief. The quality of primary papers was generally moderate.

In another meta-analysis, three out of five RCTs reported better analgesic efficacy of non-steroidal anti-inflammatory drugs (NSAIDs) compared with tramadol in surgical removal of third molars. The other two RCTs showed similar efficacy. In terms of safety, 21.8% (95% CI 13.81 to 29.86) of patients experienced adverse effects from tramadol with number needed to harm (NNH) of 4.6 (95% CI 3.3 to 7.2). ^{18, level I} However, there was no mention of the quality assessment of the primary papers.



In local setting, NSAIDs such as ibuprofen, diclofenac sodium, celecoxib and etoricoxib are commonly prescribed for removal of third molars. Tramadol is usually used for patients when NSAIDs are contraindicated. Paracetamol is used in combination with NSAIDs or Tramadol for breakthrough pain control.

Recommendation 5

- Analgesics should be prescribed for removal of third molars.
 - Non-steroidal anti-inflammatory drugs are the preferred option.

4.3.2 Antibiotics

Infection is one of the complications in post-operative unerupted impacted third molar. Two meta-analyses addressed the use of antibiotics as prophylaxis for this condition.

In a Cochrane systematic review of 18 RCTs, any regimen of systemic antibiotic prophylaxis administered before or after third molar removal compared with placebo in healthy patients resulted in reduction of:^{19, level I}

- infection (RR=0.29, 95% CI 0.16 to 0.50)
- pain (MD= -8.17, 95% CI -11.90 to -4.45)
- dry socket (RR=0.62, 95% CI 0.41 to 0.95)

A recent good quality meta-analysis of five RCTs showed that prophylactic amoxicillin reduced the risk of infection compared with no treatment / placebo in healthy patients before and after removal of third molar but not significant (OR=0.26, 95% CI 0.06 to 1.17).^{20, level I}

The antibiotics were associated with an increase in mild and transient adverse effects compared with placebo (RR=1.98, 95% CI 1.10 to 3.59).^{19, level I} However, there was no increased risk of adverse effects in the amoxicillin group compared with no treatment / placebo (OR=0.71, 95% CI 0.32 to 1.60).^{20, level I}

In an evidence-based local guidelines on the use of antibiotic prophylaxis in oral surgery for prevention of surgical site infection, antibiotic prophylaxis may be indicated for minor surgery with a high degree of difficulty in which the duration of the surgery is predicted to be long.^{21, level III} In local setting, prophylactic amoxicillin has been given in lower third molar surgery when there is significant bone removal and/or prolonged operation time.

Recommendation 6

- Antibiotics may be considered in third molar surgery when there is significant bone removal and/or prolonged operation time.
 - Amoxicillin is the preferred option.

4.3.3 Corticosteroids

A meta-analysis on 12 clinical trials showed that various types of perioperative corticosteroids significantly reduced early and late oedema and trismus but not pain.^{22, level I} The primary papers used were of moderate quality. The time of administration and dosage of the corticosteroids varied among studies.

In another meta-analysis of 11 moderate quality RCTs, submucosal injection of dexamethasone compared with control (inactive treatment) showed:^{23, level I}

- reduced oedema in early (standard mean difference, SMD=3.28, 95% CI 2.21 to 4.36) and late (SMD=0.56, 95% CI 0.27 to 0.86) period post-surgery
- reduced trismus in early (SMD=5.34, 95% CI 2.44 to 8.24) and late (SMD=1.84, 95% CI 0.38 to 3.29) period post-surgery

The outcome on pain could not be pooled because of heterogeneity.

In the papers that were reviewed, the side effects of corticosteroids used in third molar surgeries were not well addressed.

Recommendation 7

- Corticosteroids should be used in third molar surgery to reduce post-surgery oedema and trismus when there is no contraindication.

4.3.4 Mouthwash

In a Cochrane systematic review, rinsing perioperatively with chlorhexidine (0.12% and 0.2%) was effective in preventing dry socket after the extraction of third molar teeth (RR=0.58, 95% CI 0.43 to 0.78). There were no serious side effects or reactions reported unless there was allergic reaction to chlorhexidine.^{24, level I}

Recommendation 8

- Chlorhexidine mouthwash should be used in third molar surgery to prevent dry socket.

4.4 Treatment of Complications

The complications rate of third molar surgery ranges from 9.1% to 12.6%. The most common complications are:^{25, level III}

- dry socket / alveolar osteitis (0.3% - 35%)
- wound infection / post-operative infection (1% - 16%)
- post-operative bleeding (1.5%)
- lingual and inferior alveolar nerve injuries
 - transient disturbances of the inferior alveolar nerve (0.4 - 0.6%)
 - transient disturbances of the lingual nerve (0.06 - 11.5%)
 - permanent nerve disturbances (0.2 - 1%)

4.4.1 Dry Socket / Alveolar Osteitis

A Cochrane systematic review was unable to provide sufficient evidence to recommend any treatment for dry socket.^{24, level I}

4.4.2 Wound Infection / Post-Operative Infection

Based on clinical judgement, it is suggested that antibiotics should be given to treat established post-operative infection.

4.4.3 Post-Operative Bleeding

Post-operative bleeding from surgical removal of unerupted and/or impacted third molars can originate from local or systemic causes. Due to limited evidence, it is suggested that post-operative bleeding should be treated accordingly.

4.4.4 Inferior Alveolar Nerve (IAN) Injury

The improvement of neurosensory deficit with surgical and non-surgical treatment varies. This was not evaluated in any RCT and thus no firm conclusion can be drawn on it at present.

4.4.5 Platelet-Rich Fibrin (PRF)

Platelet-rich fibrin (PRF) is platelet concentrates that act as a reservoir and release of important growth factors such as vascular endothelial growth factor (VEGF), transforming growth factor (TGF) and platelet derived growth factor (PDGF). In a meta-analysis of low to moderate quality RCTs with moderate risk of bias, the use of PRF in post-operative mandibular third molar removal: ^{26, level I}

- reduced post-operative pain on day-3 (SMD=-0.53, 95% CI -1.02 to -0.05)
- reduced swelling on day-1 (WMD=-0.55, 95% CI -1.08 to -0.01)
- reduced risk of alveolar osteitis (RR=0.35, 95% CI 0.16 to 0.75)
- had no significant improvement on trismus, osteoblastic activity and soft tissue healing.

However, there is limited evidence on the use of PRF in reduction of pain, swelling and alveolar osteitis. Therefore, there is no strong clinical benefit on the use of PRF in post-operative third molar surgeries.

4.5 Follow-Up

There was insufficient evidence to recommend a specific follow-up. The Faculty of Dentistry England 2020 recommended that active surveillance or clinical review may be considered for third molars which are not indicated for removal. ^{15, level III}

The American Association of Oral Maxillofacial Surgeon (AAOMS) recommended that the frequency of follow-up visits be approximately every 24 months and the examination be completed by a specialist or general dentist. Active surveillance as a management strategy is based on expert opinion. ^{15, level III}

In local setting, monitoring of unerupted and/or impacted third molars and post-coronectomy should be done as part of routine dental check-up annually in view of future diseases that may be associated with retained third molars.

Recommendation 9

- Third molars and post-coronectomy cases should be monitored periodically. Patients should be made aware of the risks that can arise even when it is asymptomatic and be involved in the decision making.

5. IMPLEMENTING THE GUIDELINES

It is important to standardise the management of unerupted and/or impacted third molars in an appropriate manner at all healthcare levels in Malaysia using an evidence-based CPG in order to manage it appropriately. Clinicians are required to keep abreast with knowledge through continuing professional education as well as understanding of patients' expectations.

Therefore, it is important for these guidelines to be disseminated to all healthcare professionals in primary and secondary healthcare facilities. This can be facilitated through the development of appropriate training modules and quick references. Several factors may affect the implementation of the recommendations of the CPG.

5.1 Facilitating and Limiting Factors

Existing facilitators for application of the recommendations in the CPG include:

- a) wide dissemination of the CPG to healthcare professionals and teaching institutions via printed and electronic copies
- b) continuing professional education on the management of unerupted and/or impacted third molar teeth for healthcare professionals
- c) adequate facilities at primary and secondary care level for diagnosing and treating unerupted and/or impacted third molar teeth

Existing barriers for application of the recommendations of the CPG include:

- a) lack of understanding or limited knowledge on the management of unerupted and/or impacted third molar teeth
- b) variation in skills and treatment practices
- c) constraints in equipment and facilities

5.2 Potential Resource Implications

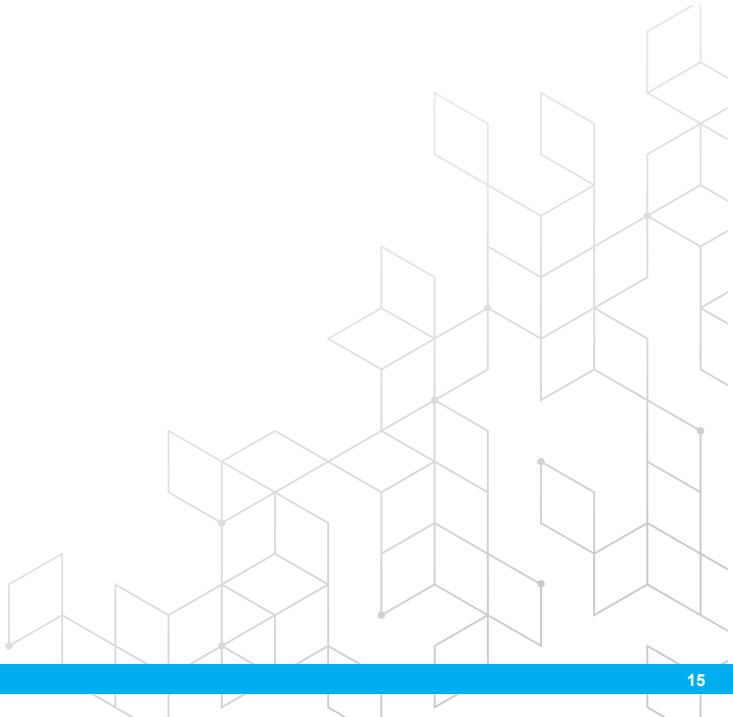
To implement the CPG, there must be strong commitment to:

- a) ensure widespread distribution of the CPG in hard and soft copy to healthcare professionals in primary and secondary healthcare facilities
- b) strengthen training of healthcare professionals to ensure knowledge and information is up to date

5.3 Proposed Clinical Audit Indicators

To assist in the implementation of the CPG, the following are proposed as clinical audit indicators for quality management of unerupted and/or impacted third molars:

Percentage of nerve injury following surgical removal of impacted lower third molar	$= \frac{\text{Number of patients developed nerve injury after surgical removal of impacted lower third molar yearly}}{\text{Number of impacted lower third molar surgery cases done yearly}} \times 100\%$
Percentage of patients given chlorhexidine mouthwash perioperatively for surgical removal of impacted lower third molar developed dry socket.	$= \frac{\text{Number of patients given chlorhexidine mouthwash perioperatively for surgical removal of impacted lower third molar developed dry socket yearly}}{\text{Number of patients given chlorhexidine mouthwash perioperatively for surgical removal of impacted lower third molar done yearly}} \times 100\%$



REFERENCES

1. Mettes TG, Ghaeminia H, Nienhuijs MEL, Perry J, Van Der Sanden WJ, Plasschaert A. Surgical Removal versus Retention for the Management of Asymptomatic Impacted Wisdom Teeth. *Cochrane Database Syst Rev.* 2012; (6): CD003879.
2. Carter K, Worthington S. Predictors of third molar impaction: A systematic review and meta-analysis. *J Dent Res.* 2016; 95: 267-276.
3. Su N, van Wijk A, Berkout E, Sanderink G, De Lange J, Wang H, van der Heijden GJMG. Predictive Value of Panoramic Radiography for Injury of Inferior Alveolar Nerve After Mandibular Third Molar Surgery. *J Oral Maxillofac Surg.* 2017; 75(4): 663-679.
4. Liu W, Yin W, Zhang R, Li J, Zheng Y. Diagnostic value of panoramic radiography in predicting inferior alveolar nerve injury after mandibular third molar extraction: a meta-analysis. *Aust Dent J.* 2015; 60(2): 233-9.
5. Atieh MA. Diagnostic accuracy of panoramic radiography in determining relationship between inferior alveolar nerve and mandibular third molar. *J Oral Maxillofac Surg.* 2010; 68(1): 74-82.
6. Guerrero ME, Shahbazian M, Elsienna Bekkering G, Nackaerts O, Jacobs R, Horner K. The diagnostic efficacy of cone beam CT for impacted teeth and associated features: a systematic review. *J Oral Rehabil.* 2011; 38(3): 208-16.
7. Glória JCR, Martins CC, Armond ACV, Galvão EL, Dos Santos CRR, Falci SGM. Third Molar and Their Relationship with Caries on the Distal Surface of Second Molar: A Meta-analysis. *J Maxillofac Oral Surg.* 2018; 17(2): 129-41.
8. Peterson LJ, Ellis E, Hupp JR, Tucker MR. Contemporary Oral and Maxillofacial Surgery. St Louis: CV Mosby Co. 1988; 229-30.
9. Jadu F, Alhazmi D, Badr F, Jan A. Classification of impacted mandibular third molars in a sample of the Saudi population as assessed by cone beam CT. *J Am Sci.* 2016; 12(11): 24-27.
10. Ghaeminia H, Perry J, Nienhuijs ME, Toedtling V, Tummers M, Hoppenreijts TJ, Van der Sanden WJ, Mettes TG. Surgical removal versus retention for the management of asymptomatic disease-free impacted wisdom teeth. *Cochrane Database Syst Rev.* 2016; (8): CD003879.
11. NICE. Guidance on the Extraction of Wisdom Teeth. National Institute for Health and Care Excellence, 2000 (Accessed 15 August 2019 at <https://www.nice.org.uk/guidance/ta1/resources/guidance-on-the-extraction-of-wisdom-teeth-pdf-63732983749>).
12. Steenen SA, van Wijk AJ, Becking AG. Bad splits in bilateral sagittal split osteotomy: systematic review and meta-analysis of reported risk factors. *Int J Oral Maxillofac Surg.* 2016; 45(8): 971-9.
13. Coulthard P, Bailey E, Esposito M, Furness S, Renton TF, Worthington HV. Surgical techniques for the removal of mandibular wisdom teeth. *Cochrane Database Syst Rev.* 2014; (7): CD004345.
14. Cervera-Espert J, 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; 21(4): e505-13.

15. FDS Parameters of care for patients undergoing mandibular third molar surgery. Faculty of Dental Surgery, The Royal College of Surgeons of England, 2020 (Accessed 19 August 2021 at <https://www.rcseng.ac.uk/dental-faculties/fds/publications-guidelines/clinical-guidelines/>).
16. Martin A, Perinetti G, Costantinides F, Maglione M. Coronectomy as a surgical approach to impacted mandibular third molars: a systematic review. Head Face Med. 2015; 11: 9.
17. Bailey E, Worthington HV, van Wijk A, Yates JM, Coulthard P, Afzal Z. Ibuprofen and/or paracetamol (acetaminophen) for pain relief after surgical removal of lower wisdom teeth. Cochrane Database Syst Rev. 2013; (12): CD004624.
18. Isiordia-Espinoza MA, Pozos-Guillén AJ, Aragon-Martinez OH. Analgesic efficacy and safety of single-dose tramadol and non-steroidal anti-inflammatory drugs in operations on the third molars: a systematic review and meta-analysis. Br J Oral Maxillofac Surg. 2014; 52: 775–783.
19. Lodi G, Figini L, Sardella A, Carrassi A, Del Fabbro M, Furness S. Antibiotics to prevent complications following tooth extractions. Cochrane Database Syst Rev. 2012 Nov 14; 11: CD003811.
20. Isiordia-Espinoza MA, Aragon-Martinez OH, Martínez-Morales JF, Zapata-Morales JR. Risk of wound infection and safety profile of amoxicillin in healthy patients which required third molar surgery: a systematic review and meta-analysis. Br J Oral Maxillofac Surg. 2015; 53(9): 796-804.
21. OHP Clinical Practice Guidelines. Antibiotic Prophylaxis In Oral Surgery For Prevention of Surgical Site Infection. Oral Health Programme, Ministry of Health, Malaysia, 2015.
22. Markiewicz MR, Brady MF, Ding EL, Dodson TB. Corticosteroids reduce postoperative morbidity after third molar surgery: a systematic review and meta-analysis. J Oral Maxillofac Surg. 2008; 66(9): 1881-94.
23. Chen Q, Chen J, Hu B, Feng G, Song J. Submucosal injection of dexamethasone reduces postoperative discomfort after third-molar extraction: A systematic review and meta-analysis. J Am Dent Assoc. 2017; 148(2): 81-91.
24. Daly B, Sharif MO, Newton T, Jones K, Worthington HV. Local interventions for the management of alveolar osteitis (dry socket). Cochrane Database Syst Rev. 2012; 12: CD006968.
25. OHP Clinical Practice Guidelines. Management of Unerupted and Impacted Third Molar Tooth. Oral Health Programme, Ministry of Health, Malaysia, 2005.
26. Xiang X, Shi P, Zhang P, Shen J, Kang J. Impact of platelet-rich fibrin on mandibular third molar surgery recovery: a systematic review and meta-analysis. BMC Oral Health. 2019; 19: 163.

Example of Search Strategy

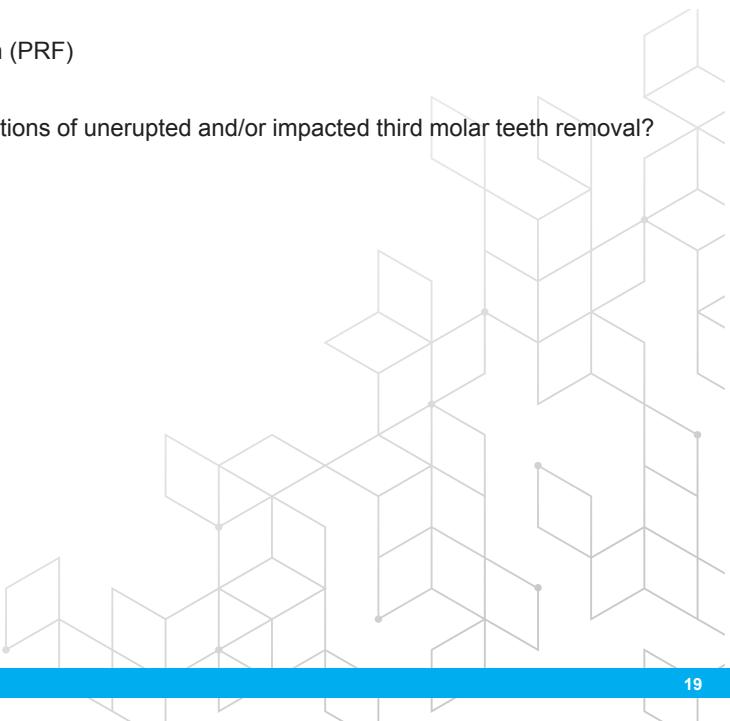
Literature search was carried out using the following electronic databases: Medline, Pubmed, Cochrane Database of Systemic Reviews (CDSR) and Embase while full text journal articles were retrieved from these databases. The following Medical Subject Heading terms of free text terms were used either singly or in combination. The literature search was limited to human study, English language and published articles from inception of databases to September 2021.

Clinical Question: How to diagnose unerupted and impacted third molar teeth?

1. MOLAR, THIRD/ (6807)
2. TOOTH, UNERUPTED/ (1776)
3. TOOTH, IMPACTED/ (7153)
4. Third molar*.tw. (10008)
5. ((unerupted or impacted or wisdom) adj1 teeth).tw. (2370)
6. ((unerupted or impacted or wisdom) adj1 tooth).tw. (1273)
7. 1 or 2 or 3 or 4 or 5 or 6 (18561)
8. DIAGNOSIS/ (17435)
9. diagnose*.tw. (792185)
10. (diagnose* adj1 examination*).tw. (250)
11. 8 or 9 or 10 (808747)
12. 7 and 11 (568)
13. limit 12 to (english language and humans and yr="2006 -Current") (334)

CLINICAL QUESTIONS

- a) How to diagnose unerupted and/or impacted third molar teeth?
- b) What is plain radiograph and CBCT's role in treatment of unerupted and/or impacted third molar teeth?
- c) What are the indications for removal of unerupted and/or impacted third molar teeth?
 - Caries
 - Periodontal problem
 - Cyst / Pathology
 - Crowding
 - In the line of mandibular fracture
 - Asymptomatic / Prophylactic removal
 - Orthognathic surgery
- d) Are the following treatments effective and safe in unerupted and/or impacted third molar teeth removal?
 - Surgical procedure
 - Antibiotic
 - Steroid
 - Analgesic
 - Platelet-Rich Fibrin (PRF)
 - Coronectomy
- e) What are the complications of unerupted and/or impacted third molar teeth removal?



ACKNOWLEDGEMENTS

The members of the development group of these guidelines would like to express their gratitude and appreciation to the following for their contributions:

- Panel of internal and external reviewers
- Technical Advisory Committee for CPG for their valuable input and feedback
- HTA and CPG Council for approval of the CPG
- Dr Mohd Aminuddin bin Mohd Yusof and Dr Ainol Haniza binti Kherul Anuwar, CPG Unit, Malaysian Health Technology Assessment Section, Medical Development Division, Ministry of Health Malaysia
- Dr Maryana binti Musa and Dr Aina Najwa binti Mohd Khairuddin, Oral Health Technology Section, Oral Health Programme, Ministry of Health Malaysia
- All those who have contributed directly or indirectly to the development of the CPG

DISCLOSURE STATEMENT

The panel members had completed disclosure forms. None held shares in pharmaceutical firms or acts as consultants to such firms. (Details are available upon request from the CPG Secretariat)

SOURCES OF FUNDING

The development of the CPG on “**Management of Unerupted and Impacted Third Molar Teeth**” was supported financially in its entirety by the Ministry of Health Malaysia and was developed without any involvement of the pharmaceutical industry.



Oral Health Technology Section
Oral Health Programme
Ministry of Health Malaysia
Level 5, Block E10, Precinct 1
Federal Government Offices Centre
62590 Putrajaya, Malaysia

ISBN 978-967-19520-3-0

A standard linear barcode representing the ISBN number 978-967-19520-3-0.

9 7 8 9 6 7 1 9 5 2 0 3 0