Original Article

A Six-year Review of the Third Molar Cases Treated in the Dental Department of Penang Hospital in Malaysia

Naosherwan Anwar*, Abdul Rashid Khan**, KA Narayan***, Azizah Hj Ab Manan****

ABSTRACT

***Background*:** There is a variation of management of third molars, from conservative to surgical management**.** The objective of the study was to determine the prevalence and the factors associated with third molars treated in the dental department of the Penang hospital, Malaysia.

***Methods*:** This was a descriptive case series analysis of all cases reported to Penang hospital, Malaysia from January 2000 to December 2005. A specially designed questionnaire was used. Descriptive statistics and chi square test were used to explore the data. Data were analyzed using SPSS version 13.0. The study was conducted ethically.

***Results*:** The six year prevalence rate was 1.75%. The majority of patients were Malays and Chinese. Most were under the age of 25. There were a total of 261 cases of lower third molars. Mesial presentation was common among the races ($P < 0.05$). The number of cases increased from the year 2000 to 2005 ($P < 0.05$). Most clinical diagnoses of lower third molar presentations were confirmed radiologically ($P < 0.05$). There were many defaulters (those who did not return for definitive treatment or for follow up) and the number of cases treated surgically under anesthesia increased as the years progressed among all age groups ($P < 0.05$). There were a total of 11 cases of upper third molars. Similarly, most clinical diagnoses of the third molar presentations were confirmed radiologically ($P < 0.05$).

***Conclusion*:** The high rate of defaulters indicates the need for pre-treatment counseling. An increasing congruence indicates an improvement in clinical competence of the dentists.

***Keywords*:** Epidemiology, impacted tooth, third molars, tooth extraction.

Received: *July 2008*
Accepted: *September 2008*

Dent Res J 2008; 5(2):53-60

Introduction

Third molars are also known as wisdom teeth. They usually come in from behind the second molars, usually during the late teenage periods or early twenties. Typically, a person will have four wisdom teeth: upper left, upper right, lower left and lower right. Third molars are usually absent in 25% of adults. When present, the age they erupt varies, though they generally erupt between the ages of 18 and 24 years.[1-4] A tooth is called impacted when it is prevented from its normal path of eruption in the dental arch due to lack of space in the arch or obstruction in the eruptive pathway of the tooth.[5] Maxillary and mandibular third molars, maxillary cuspids and maxillary central incisors are the most frequently impacted teeth.[6] Many impacted or unerupted third molars may eventually erupt normally and many impacted molars never cause clinical problems.[7] Guidelines from the Royal College of Surgeons of England Faculty of Dental Surgery[8] and the British Association of Oral and Maxillofacial Surgeons[9] have included definitions of an unerupted tooth as that which is lying in

*Professor, Dental Department, Penang Hospital, Penang, Malaysia.
**Associate Professor, Department of Community Medicine, School of Medicine, AIMST University, Semeling Campus, 08100 Bedong, Kedah, Malaysia.
***Professor, Department of Community Medicine, School of Medicine, AIMST University, Semeling Campus, 08100 Bedong, Kedah, Malaysia.
****Senior Principal Assistant Director of Health (NCDC), Office of the State Health Director, Penang, Malaysia.
Correspondence to: KA Narayan, Department of Community Medicine, School of Medicine, AIMST University, Semeling Campus, 08100 Bedong, Kedah, Malaysia. E-mail: narayan.ka@gmail.com

the jaws, entirely covered by soft tissue, and partially or completely covered by bone. A partially erupted tooth is that which is partially visible or in communication with the oral cavity and an impacted tooth is that tooth which is prevented from completely erupting into a normal functional position, which could be due to lack of space, obstruction by another tooth or an abnormal eruption path. Management of upper third molars is generally much less complex than the lower third molars. The upper third molars cause less discomfort, are more likely to erupt, simpler to remove, cause less post-operative morbidity and general anesthesia is rarely required.[10] There is a variation in management of the third molar, from conservative to surgical management.[11] Removal of the third molars is the most common surgical procedure within the United Kingdom and the cost of surgery is estimated to be millions of pounds to the National Health Services and to the private sector.[12,13] There is little controversy when the removal of impacted third molars is done due to pathological changes and severe symptoms, but the justification of prophylactic removal of impacted third molars is less certain.[14] The Cochrane reviews by Mettes et al. concluded that there was no evidence found to neither support nor refute the prophylactic removal of asymptomatic impacted third molars in adults.[15] However, the Task Force convened by the American Association of Oral and Maxillofacial Surgeons in March 2007 concluded that the removal of impacted third molars can negatively impact the periodontium of adjacent second molars.[16] A meta-analysis by Hanson et al. found that the presence of a lower third molar may double the risk of an angle fracture of the mandible and could have a bearing on any clinical decision on whether to extract the molar.[17] The objective of the current study was to determine the prevalence and the factors associated with third molars treated in the dental department of the Penang hospital, Malaysia.

Materials and Methods

This was a descriptive case series analysis of cases reported to Penang hospital, which is the largest public hospital in Penang, Malaysia. The dental department of this hospital receives referrals from all over the Penang state, both from the government as well as the private sector and is headed by a maxillofacial surgeon. The study subjects included all the cases of third molars treated in the dental department of Penang hospital from January 2000 to December 2005. A questionnaire was designed for data collection. All case files of third molars treated in the dental department from January 2000 to December 2005 were reviewed. The variables that were looked at included age, sex, race, religion, presenting complaints, clinical presentation, X-rays, treatment and post operation progress. Descriptive statistics were used to explore the data and the results were analyzed using SPSS version 13.0. This study was conducted using the case history of patients. Thus, there was neither risk nor discomfort to the patients. The confidentiality of these patients was totally assured. The study has received the approval from the Ethical and Research Committee of the School of Medicine of AIMST University, Malaysia.

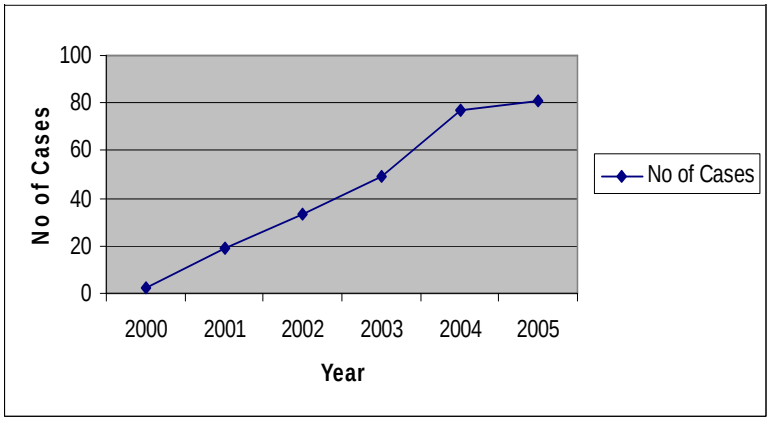

Figure 1. No of cases of 3rd molars attending Penang hospital 2000-2005.

Table 1. Factors associated with lower third molars.

Factors	Mesial (n=179)	Vertical (n=33)	Horizontal (n=21)	Distal (n=4)	Combination (n=24)	Total
Race*						
Chinese	79 (68.1%)	10 (8.6%)	10 (8.6%)	0 (0.0%)	17 (14.7%)	116
Malay	85 (68.5%)	19 (15.3%)	10 (8.1%)	3 (2.4%)	7 (5.6%)	124
Indian	10 (66.7%)	4 (26.7%)	1 (7.1%)	0 (0.0%)	0 (0.0%)	15
Others	5 (83.3%)	0 (0.0%)	0 (0.0%)	1 (16.7%)	0 (0.0%)	6
Sex						
Female	89 (70.6%)	15 (11.5%)	9 (7.1%)	2 (1.6%)	11 (8.7%)	126
Male	90 (66.7%)	18 (13.3%)	12 (8.9%)	2 (1.5%)	13 (9.6)	135
Age						
< 25	91 (66.9%)	13 (9.6%)	14 (10.3%)	3 (2.2%)	15 (11.0%)	136
26 – 35	70 (70.0%)	17 (17.0%)	5 (5.0%)	0 (0.0%)	8 (8.0%)	100
> 35	18 (72%)	3 (12.0%)	2 (8.0%)	1 (4.0%)	1 (4.0%)	25
Clinical presentation*						
Partially erupted	175 (69.7%)	30 (12.0%)	19 (7.6%)	4 (1.6%)	23 (9.2%)	251
Erupted	3 (60.0%)	1 (20.0%)	0 (0.0%)	0 (0.0%)	1 (20.0%)	5
Unerupted	1 (20%)	2 (40.0%)	2 (40.0%)	0 (0.0%)	0 (0.0%)	5
X-ray*						
Mesial	174 (99.4%)	0 (0.0%)	1 (0.6%)	0 (0.0%)	0 (0.0%)	175
Vertical	0 (0.0%)	29 (96.7%)	0 (0.0%)	0 (0.0%)	1 (3.3%)	30
Horizontal	0 (0.0%)	0 (0.0%)	20 (90.9%)	0 (0.0%)	2 (9.1%)	22
Distal	1 (25%)	0 (0.0%)	0 (0.0%)	3 (75%)	0 (0.0%)	4
Combined	0 (0.0%)	1 (4.5%)	0 (0.0%)	0 (0.0%)	21 (95.5%)	22

*P < 0.05

Results

There were a total of 15076 new patients treated in the dental clinic of Penang hospital from January 2000 to December 2005; of these, 264 were third molar cases, giving the proportional morbidity rate of 1.75% for the six years. The number of cases showed a steady increase over the years (see figure 1); in the year 2000 there were 2 (0.8%) cases, in 2001, 20 (7.6%) cases, in 2002, 34 (12.9%) cases, in 2003, 50 (18.9%) cases, in 2004, 77 (29.2%) cases and in 2005, 81 (30.7%) cases. There were 128 (48.5%) females and 136 (51.5%) males; 126 (47.7%) were Malays, 116 (43.9%) Chinese, 15 (5.7%) Indians and 7 (2.7%) of other races including foreigners; 128 (48.5%) were Muslims, 106 (40.2%) Buddhists, 15 (5.7%) Hindus, 10 (3.8%) Christians and 5 (1.9%) were of other religions. A total of 137 (51.9%) were under the age of 25, 102 (38.6%) were between 26 to 35 years, and 25 (9.5%) were above the age of 35. 206 (78%) presented with the complaints of pain, 26 (9.8%) with pain and swelling, and 32 (12.1%) came for other complaints including food impaction and electives for orthodontic purposes. A total of 256 cases were referred from the dental clinics and other departments of the hospital including the outpatient department, and the remainder from the private clinics. The history of the time period before seeking treatment was only available for 244 cases, out of which 78 (29.5%) came within seven days of signs and symptoms, 92 (34.8%) within a week to a month, 55 (20.8%) within one to six months, and 19 (7.2%) in more than six months. One hundred forty-eight (56.1%) cases came with a single third molar, 113 (42.8%) with two and 3 (1.1%) with four third molars. Ninety-seven (36.7%) cases underwent surgical intervention and the remainders were treated conservatively. Among the cases that were treated surgically, 94 (96.9%) had no complications, 2 (2.06%) had temporary nerve injury and 1 (1.03%) had root retention.

Lower Third Molar (table 1)

There were a total of 261 cases of lower third molars. 126 (48.3%) were females and 135 (51.7%) males. Lower third molars were common among the Malays with 124 (47.5%) cases, followed by 116 (44.4%) cases among Chinese, 15 (5.7%) among Indians and 6 (2.3%) among other race groups including foreigners. 179 (68.6%) of the

Table 2. Years associated with upper and lower third molars.

Years	Mesial	Vertical	Horizontal	Distal	Combination	Total
Upper molar						
2000	0 (0.0%)	1 (100%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1
2001	0 (0.0%)	1(100%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1
2002	1 (100%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1
2003	0 (0.0%)	4 (100%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4
2004	0 (0.0%)	2 (66.7%)	1 (33.3%)	0 (0.0%)	0 (0.0%)	3
2005	1 (100%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1
Lower molar*						
2000	2 (100%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2
2001	14 (73.7%)	2 (10.5%)	3 (15.8%)	0 (0.0%)	0 (0.0%)	19
2002	22 (66.7%)	8 (24.2%)	1 (3.0%)	0 (0.0%)	2 (6.1%)	33
2003	44 (89.8%)	1 (2.0%)	2 (4.1%)	0 (0.0%)	2 (4.1%)	49
2004	50 (64.9%)	8 (10.4%)	9 (11.7%)	3 (3.9%)	7 (9.1%)	77
2005	47 (58%)	14 (17.3%)	6 (7.4%)	1 (1.2%)	13 (16%)	81

* $P < 0.05$

third molar cases had mesial presentation, 33 (12.6%) vertical presentation, 21 (8.9%) horizontal presentation, 4 (1.5%) distal presentation and 24 (9.2%) had combined presentation. Two hundred fifty-one (96.2%) cases came with a partially erupted molar, 5 (1.9%) erupted and 5 (1.95%) unerupted third molars. There was a steady increase in the number of cases seen over the years. The majority of those within the age groups < 25, 26 to 35 years old, and above the age of 35 had mesial presentation, with 91 (66.9%) cases, 70 (70.0%) cases and 18 (72%) cases, respectively. Mesial presentation was also the most common presentation among the Chinese, with 79 (68.1%) cases, Indians 10 (66.7%) cases, Malay 85 (68.5%) cases and the other races 5 (83.3%) cases ($P < 0.05$). As shown in table 2, there was an increase in the number of cases from the year 2000 to 2005 and in those years, mesial presentation was the most common. In the year 2000 there were 2 (100%) cases, in 2001 there were 14 (73.7%) cases, in 2002 there were 20 (66.7%) cases, in 2003, 44 (89.8%) cases, in 2004, 50 (64.9%) cases, and in 2005 there were 47 (58%) cases ($P < 0.05$). Mesial presentation was the most common presentation among females and males with 89 (70.6%) and 90 (66.7%) cases, respectively. 175 (69.7%) of those with a partially erupted molar had mesial presentation. Similarly, 3 (60.0%) of those with an erupted molar had mesial presentation and in those with an unerupted molar, 2 (40%) had both horizontal and mesial presentation ($P < 0.05$). X-rays were done. Only 253 case X-ray data where available as 8 had defaulted before the X-rays were taken. Of the 253 available data, 174 (99.4%) of those diagnosed clinically as mesial presentation were confirmed radiologically, 29 (96.7%) vertical presentation, 20 (95.2%) horizontal presentation and 3 (75%) distal presentation of molars were confirmed radiologically ($P < 0.05$). As shown in table 3, 118 (45.2%) cases had defaulted treatment, 56 (21.5%) were treated surgically under general anaesthesia, 36 (13.8%) treated surgically under local anaesthesia and 51 (19.5%) treated conservatively. Sixty-three (46.3%) of those who were less than 25 years old had defaulted treatment, 47 (34.6%) were treated surgically and 26 (19.1%) treated conservatively. Among those within the ages of 26 to 35, 49 (49%) had defaulted, 35 (35%) were treated surgically and 16 (16%) conservatively ($p<0.05$). Forty-six (39.7%) of the Chinese were treated conservatively, 48 (33.3%) surgically and 22 (19.0%) conservatively. Among the Indians, 7 (46.7%) had defaulted treatment, 5 (13.3%) were treated surgically and 3 (20.0%) treated conservatively. Among the Malays, 62 (50%) had defaulted treatment, 38 (30.6%) were treated surgically and 24 (19.4%) conservatively. In the other races, 3 had defaulted, 1 was treated surgically and 2 conservatively. Among the females, 56 (44.4%) had defaulted treatment and 47 (37.3%) were treated surgically and 23 (18.3%) conservatively. Among the males, 62 (45.9%) had defaulted, 45 (33.3%) were treated surgically and 28 (29.7%) conservatively. Only two cases in 2000 were treated surgically. In 2001, 10 (52.6%) cases had defaulted, 8 (42.1%) were treated surgically and 1 (5.3%) conservatively. In 2002, 20 (60.6%) had

Table 3. Management of lower third molars.

Factors	Conservative N = 51	Surgical N = 92	Defaulters N = 118	Total
Age*				
< 25	26 (19.1%)	47 (34.6%)	63 (46.3%)	136
26 – 35	16 (16%)	35 (35%)	49 (49%)	100
> 35	9 (36%)	10 (40%)	6 (24%)	25
Race *				
Chinese	22 (19.0%)	48 (41.4%)	46 (39.7%)	116
Malay	24 (19.4%)	38 (30.6%)	62 (50.0%)	124
Indian	3 (20.0%)	5 (33.3%)	7 (46.7%)	15
Others	2 (33.3%)	1 (16.7%)	3 (50.0%)	6
Sex				
Female	23 (18.3%)	47 (37.3%)	56 (44.4%)	126
Male	28 (20.7%)	45 (33.3%)	62 (45.9%)	135
Years*				
2000	0 (0.0%)	2 (100%)	0 (0.0%)	2
2001	1 (5.3%)	8 (42.1%)	10 (52.6%)	19
2002	1 (3.0%)	12 (36.3%)	20 (60.6%)	33
2003	7 (14.3%)	26 (53.1%)	16 (32.7%)	49
2004	18 (23.4%)	20 (26%)	39 (50.6%)	77
2005	24 (29.6%)	24 (29.6%)	33 (40.7%)	81

* $P < 0.05$

defaulted, 12 (36.3%) were treated surgically and 1 (3.0%) conservatively. In 2003, 16 (32.7%) defaulted, 26 (53.1%) were treated surgically and 7 (14.3%) conservatively. In 2004, 39 (50.6%) defaulted, 20 (26.6%) were treated surgically and 18 (23.4%) conservatively. In 2005, 33 (40.7%) defaulted, 24 (29.6%) were treated surgically and 24 (29.6%) conservatively ($P < 0.05$).

Upper Third Molar (table 4)

There were a total of 11 cases of upper third molars treated in the dental department. Six (54.5%) cases were females and 5 (45.5%) were males. There were 3 (27.3%) Chinese patients, 1 (9.1%) Indian, 6 (54.5%) Malays and 1 (9.1%) of the other races. Two (18.2%) had mesial presentation, 8 (72.7%) vertical presentation and 1 (9.1%) horizontal presentation. Seven (63.6%) cases had a partially erupted molar, 3 (27.3%) had an erupted molar and 1 (9.1%) had an unerupted molar. Among those less than 25 years of age, vertical presentation was the most common with 5 (71.4%) cases; similarly, for those ages 26 to 35, vertical presentation was the most common presentation with 3 (75%) cases. Vertical presentation was the most common presentation among the Chinese with 2 (66.7%) cases, the sole Indian case and 5 (83.3%) Malay cases. Mesial presentation was found in the only case of the other race group. The most common presentation among the females and males was also vertical presentation. Five (71.5%) cases of partially erupted molars had mesial presentation and 2 (25%) of erupted molars presented with vertical presentation; the only unerupted case also had vertical presentation. In X-rays, 2 (100%) cases of mesial presentation were confirmed radiologically and 6 vertical presentations were confirmed radiologically ($P < 0.05$). As shown in table 2, most cases were in the 2003, with 4 cases of upper third molars; all presented with vertical presentation. As shown in table 4, 4 (36.4%) cases had defaulted treatment, whereas 3 (27.3%) were treated surgically under general anaesthesia and 3 (27.3%) were treated surgically under local anaesthesia. One patient with mesial presentation had defaulted and the other was treated conservatively; among those with vertical presentation 3 (37.5%) had defaulted and 5 (62.5%) were treated surgically; the only case with horizontal presentation was treated surgically. There was significant change in the trend of choice of treatment over the years when analyzed after removing the cases that defaulted (table 5). There was an increasing trend of both conservative management and surgical management under general anaesthesia from 2001 to 2005 ($P < 0.05$).

Table 4. Factors associated with upper third molars.

Factors	Mesial (n=2)	Vertical (n=8)	Horizontal (n=1)	Total
Race				
Chinese	1 (33.3%)	2 (66.7%)	0 (0.0%)	3
Malay	0 (0.0%)	5 (83.3%)	1 (0.0%)	6
Indian	0 (0.0%)	1 (100%)	0 (0.0%)	1
Others	1 (100%)	0 (0.0%)	0 (0.0%)	1
Sex				
Female	1 (16.7%)	4 (66.7%)	1 (16.7%)	6
Male	1 (20.0%)	4 (80.0%)	0 (0.0%)	5
Age				
< 25	1 (14.3%)	5 (71.4%)	1 (14.3%)	7
26 – 35	1 (25.0%)	3 (75.0%)	0 (0.0%)	4
Clinical presentation				
Partially Erupted	2 (28.6%)	5 (71.4%)	0 (0.0%)	7
Erupted	0 (0.0%)	2 (66.7%)	1 (33.3%)	3
Unerupted	0 (0.0%)	1 (100%)	0 (0.0%)	1
Management				
Conservative	1 (100.0%)	0 (0.0%)	0 (0.0%)	1
Surgery	0 (0.0%)	5 (83.3%)	1 (16.6%)	6
Defaulted	1 (25.0%)	3 (75.0%)	0 (0.0%)	4
X Ray*				
Mesial	2 (50%)	2 (25%)	0 (0.0%)	4
Vertical	0 (0.0%)	6 (75%)	0 (0.0%)	6
Horizontal	0 (0.0%)	0 (0.0%)	1 (0.0%)	1

* $P < 0.05$

Discussion

There were a total of 264 third molars, which were treated in the department giving a proportional morbidity rate of 1.75%. Most cases treated in this dental department were partially erupted and unerupted molars ($P < 0.05$), which was expected, as the failure of eruption of the third molar is common[2,18,19] and is influenced by age, gender and ethnicity.[10] There was no significant difference between the genders. Malays and Chinese formed the bulk of the patients especially in the lower third molar ($P < 0.05$) and the most common age was among those less than 25 years old ($P < 0.05$). There were an increase in cases treated in the dental department since 2000 to 2005 ($p<0.05$). Most of the third molar cases that came to the dental department of the hospital complained of pain and swelling and others came as elective cases for orthodontic purposes. There were more cases of lower third molars as compared with upper third molars. Most of the lower third molar cases had mesial presentation as compared with those who came with upper third molars, who mostly presented with a vertical presentation. For the diagnosis of third molars to be made, a detailed history followed by radiologycal investigations is advised.[11] Radiological confirmation was done and showed that most clinical diagnoses were accurate. There were 169 cases who defaulted treatment; this number is alarmingly high. There has been an increased number of cases treated conservatively as well as cases treated surgically, which could be due to more cases being seen for elective extraction for orthodontic purposes ($P < 0.05$). Extraction of impacted third molar teeth is the most common surgical procedure carried out in the National Health Services and the waiting list for third molar removal is significant.[10,13,20,21] In this study, 36.7% of the cases underwent surgical intervention and the remainder were treated conservatively. In the United Kingdom, surveys have shown the prophylactic removal rates of third molars from 35% to 40%, the lowest at 4%.[22-25] Pericoronitis is the most common indication for third molar surgery.[22] There was significant change in the trend of choice of treatment over the years when analyzed after removing the cases that defaulted. The increasing trend of both conservative management and surgical management under general anaesthesia from 2001 to 2005 indicates that minor

impactions are increasingly managed conservatively and those requiring surgery have to be done under general anaesthesia. Surgical procedures may be associated with significant morbidity ranging from pain, to swelling with the possibility of temporary or permanent nerve damage, which may result in altered sensation of the lip or tongue.[16,26,27] In this review, we found only two cases (2.05%) with temporary nerve injury, while one (1.03%) had root retention post-surgical intervention. This finding was within the rate of sensory nerve damage from the third molar surgery, which ranges from 0 to 20%.[16,20,26-28]

Conclusion

This study provided several indicators useful for audit. Defaulter rate and an analysis of the reasons for default, the increasing load of cases especially of certain specialized types, the changing pattern in the modality of treatment and an analysis of the reasons and correlation between clinical and radiological findings would help in a medical audit. The high rate of default indicates the need for pre-treatment counseling done by designated health professionals. An increasing congruence will indicate an improvement in clinical competence of the doctors.

References

1. Badawi FJ, Levy JC, Yazbeck C, Cavezian R, Cabanis EA. Eruption of third molars: relationship to inclination of adjacent molars. Am J Orthod Dentofacial Orthop 2004; 125(2): 200-2.
2. Song F, Landes DP, Glenny AM, Sheldon TA. Prophylactic removal of impacted third molars: an assessment of published reviews. Br Dent J 1997; 182(9): 339-46.
3. Von Wowern N, Nielsen HO. The fate of impacted lower third molars after the age of 20. A four-year clinical follow-up. Int J Oral Maxillofac Surg 1989; 18(5): 277-80.
4. Levesque GY, Demirijian A, Tanguay R. Sexual dimorphism in the development, emergence, and agenesis of the mandibular third molar. J Dent Res 1981; 60(10): 1735-41.
5. Shafer WG, Hine MK, Levy BM. A textbook of oral pathology. 4th ed. New York: W.B. Saunders; 1983.
6. Yavuz MS, Aras MH, Buyukkurt MC, Tozoglu S. Impacted mandibular canines. J Contemp Dent Pract 2007; 8(7): 78-85.
7. Ahlqwist M, Grondahl HG. Prevalence of impacted teeth and associated pathology in middle-aged and older Swedish women. Community Dent Oral Epidemiol 1991; 19(2): 116-9.
8. The Royal College of Surgeon of England.Faculty of Dental Surgery. The management of patients with third molar teeth: report of a working party convened by the Faculty of Dental Surgery. London: The Royal College of Surgeons of England; 1997.
9. British Association of Oral and Maxillofacial Surgeons. Pilot clinical guidelines. London: British Association of Oral and Maxillofacial Surgeons; 1995.
10. Scottish Intercollegiate Guidelines Network. Management of Unerupted and Impacted Third Molar Teeth. [cited 14 Dec 2008]. Available from URL: http://www.sign.ac.uk/pdf/sign43.pdf.
11. Ministry of Health Malaysia. Management of unerupted and impacted third molar teeth. [cited 14 Dec 2008]. Available from URL: http://www.moh.gov.my/MohPortal/DownloadServlet?id=1182&type=2.
12. Landes DP. The relationship between dental health and variations in the level of third molar removals experienced by populations. Community Dent Health 1998; 15(2): 67-71.
13. Shepherd JP, Brickley M. Surgical removal of third molars. BMJ 1994; 309(6955): 620-1.
14. NIH consensus development conference for removal of third molars. J Oral Surg 1980; 38(3): 235-6.
15. Mettes TG, Nienhuijs ME, van der Sanden WJ, Verdonschot EH, Plasschaert AJ. Interventions for treating asymptomatic impacted wisdom teeth in adolescents and adults. Cochrane Database Syst Rev 2005; (2): CD003879.
16. White Paper on Third Molar Data. American Association of Oral and Maxillofacial Surgeons. [cited 14 Dec 2008]. Available from URL: http://www.aaoms.org/docs/third_molar_white_paper.pdf
17. Hanson BP, Cummings P, Rivara FP, John MT. The association of third molars with mandibular angle fractures: a meta-analysis. J Can Dent Assoc 2004; 70(1): 39-43.
18. Garcia RI, Chauncey HH. The eruption of third molars in adults: a 10-year longitudinal study. Oral Surg Oral Med Oral Pathol 1989; 68(1): 9-13.
19. Hugoson A, Kugelberg CF. The prevalence of third molars in a Swedish population. An epidemiological study. Community Dent Health 1988; 5(2): 121-38.
20. Brickley M, Kay E, Shepherd JP, Armstrong RA. Decision analysis for lower-third-molar surgery. Med Decis Making 1995; 15(2): 143-51.
21. Sadler A, Davidson M, Houpis C, Watt-Smith S. Specialist practice for minor oral surgery: a comparative audit of third molar surgery. Br Dent J 1993; 174(8): 273-7.
22. Worrall SF, Riden K, Haskell R, Corrigan AM. UK National Third Molar project: the initial report. Br J Oral Maxillofac Surg 1998; 36(1): 14-8.

23. Lopes V, Mumenya R, Feinmann C, Harris M. Third molar surgery: an audit of the indications for surgery, post-operative complaints and patient satisfaction. Br J Oral Maxillofac Surg 1995; 33(1): 33-35.
24. Brickley M, Shepherd J, Mancini G. Comparison of clinical treatment decisions with US National Institutes of Health consensus indications for lower third molar removal. Br Dent J 1993; 175(3): 102-5.
25. Pratt CA, Hekmat M, Barnard JD, Zaki GA. Indications for third molar surgery. J R Coll Surg Edinb 1998; 43(2): 105-8.
26. Carmichael FA, McGowan DA. Incidence of nerve damage following third molar removal: A West of Scotland Oral Surgery Research Group study. Br J Oral Maxillofac Surg 1992; 30(2): 78-82.
27. Mercier P, Precious D. Risks and benefits of removal of impacted third molars. A critical review of the literature. Int J Oral Maxillofac Surg 1992; 21(1): 17-27.
28. Daley TD. Third molar prophylactic extraction: a review and analysis of the literature. Gen Dent 1996; 44(4): 310-20.