Available online at www.sciencedirect.com

ScienceDirect

British Journal of Oral and Maxillofacial Surgery 58 (2020) 348–354

BRITISH Journal of Oral and Maxillofacial Surgery
www.bjoms.com

Current perspectives on the surgical management of mandibular third molars in the United Kingdom: the need for further research

A. Omran [a], I. Hutchison [b], F. Ridout [b], A. Bose [b], R. Maroni [c], J. Dhanda [d], D. Hammond [e], C. Moynihan [f], A. Ciniglio [b], G. Chiu [g,*]

[a] *Department of Oral and Maxillofacial Surgery, Musgrove Park Hospital, Taunton, UK*
[b] *NFORC, Saving Faces – The Facial Surgery Research Foundation, London, UK*
[c] *Centre for Cancer Prevention, Wolfson Institute of Preventive Medicine, Queen Mary University of London, UK*
[d] *Department of Oral and Maxillofacial Surgery, Queen Victoria Hospital NHS Foundation Trust, UK*
[e] *Department of Surgical Sciences, School of Dentistry, University of Central Lancashire, UK*
[f] *Department of Medical Sociology, Institute of Cancer Research, London, UK*
[g] *Department of Oral and Maxillofacial Surgery, Royal Derby Hospital, Derby, UK*

Available online 4 March 2020

Abstract

This survey of expert opinion regarding the management of mandibular third molar (M3M) impaction and its clinical sequelae was circulated to all members of the British Association of Oral and Maxillofacial Surgeons (BAOMS). It was completed by 289 clinicians who reported treating 60 003 patients annually. Respondents included 199 (69%) specialists and 58 (20%) primary care clinicians. Most (99%) of the clinicians treated at least one M3M with complete surgical removal (CSR) annually. Only 69% performed one or more coronectomies (COR). Advocates of coronectomy reported lower rates of inferior alveolar nerve (IAN) injury, but IAN, lingual nerve, and adjacent second molar damage were rare, occurring in less than 0.5% of cases, with small differences between the COR and CSR groups. Although these differences are not statistically significant, they are likely to be clinically important. Also, the COR group would have comprised mainly high-risk teeth, while the CSR group would include many teeth at low risk of complications. This might have skewed the results. Those clinicians performing no coronectomies cited three main reasons for being low adopters of COR: the lack of irrefutable evidence to support its benefit, the increased need for a second operation, and more non-IAN complications. Although COR may prevent permanent IAN damage in high-risk cases, this paper highlights clinicians' views that there is a gap in evidence and knowledge to support COR. As a result, 47% of the clinicians surveyed recommended, and were prepared to participate in, further studies to determine the effectiveness and safety of COR.

Keywords: Mandibular third molar; coronectomy; inferior alveolar nerve injury

Introduction

Complete surgical removal (CSR) of mandibular third molars (M3M) is associated with a number of postoperative complications, the most important being permanent damage to the inferior alveolar nerve (IAN) resulting in either paraesthesia or anaesthesia.[1,2] The incidence of temporary IAN dysaesthesia after CSR is reported to be between 0.35% to 8.4%,[3] whilst permanent impairment lasting more than six months is reported in 0.25–0.91% of cases.[4,5] Although the incidence of neurosensory impairment is relatively low, the absolute number of affected patients is significant, as more than 77 000

* Corresponding author at: Royal Blackburn Hospital, Blackburn, BB2 3HH, UK.
E-mail address: Geoff.chiu@nhs.net (G. Chiu).

https://doi.org/10.1016/j.bjoms.2020.01.007

undergo M3M treatment in England, Wales, and Scotland annually.[6] IAN injury has a deleterious impact on quality of life.[7] Its risk must be considered when planning treatment and discussed during informed consent.

Reported risk factors for IAN injury include operative technique, surgeon's experience, and most importantly the relation of the M3M to the mandibular canal.[3] M3Ms are classified as "high-risk" by radiographic assessment using a list of criteria to predict IAN damage during CSR (Fig. 1).[8] Approximately 12%–16% of M3Ms have a close relation to the IAN[9,10] and the incidence of IAN injury when treating high-risk teeth may be as high as 20%.[11]

Coronectomy (COR) is an alternative technique for treating high-risk M3Ms.[12] It entails removal of the M3M crown leaving all or some of the roots thereby reducing the risk of IAN injury. Some single-centre studies[13,14] and randomised controlled trials (RCT)[15,16] report a reduced risk of IAN injury of up to 89% with COR. However, a 2014 Cochrane review judged both RCTs[15,16] as inadequate, finding no evidence for a change in surgical practice.[17] Reports of other treatment-related adverse events (TRAE) after COR, such as pain, infection, failure, and the need for a second operation, vary widely.[13–16,18,19]

In 2015, the United Kingdom (UK) law on informed consent changed after the Supreme Court Judgement, Montgomery vs Lanarkshire Health Board.[20] Surgeons are now obliged to inform patients of all reasonably expected risks and to take account of their views. A recent survey of members of the British Association of Oral Surgeons (BAOS) reported that 73% recommend COR in high-risk M3Ms identified by cone-beam computed tomography (CBCT).[21]

In 2000, the National Institute for Health and Care Excellence (NICE) generated guidelines for third molar surgery to reduce the removal of symptomless teeth and unnecessary morbidity for patients.[6] Although this resulted in an immediate reduction in the number of procedures, this has now returned to pre-NICE guideline levels with an increase in M3M surgery in older people who often experience greater postoperative morbidity.[6]

This paper reports on current M3M management amongst members of the British Association of Oral and Maxillofacial Surgeons (BAOMS).

Methods

An online questionnaire collecting current views and practices in M3M management was designed by the BAOMS dentoalveolar lead (GC), first author (AO), and staff at the BAOMS clinical trials unit (the National Facial and Oral Research Centre - NFORC), using SurveyMonkey®. During September 2017, BAOMS members, including oral and maxillofacial (OMF) surgeons who selected dentoalveolar surgery as part of their routine practice and general dental practitioners (GDP) with or without a special interest in M3M surgery, were invited to complete the survey. Questions included surgeons' demographics, estimated annual caseload, current surgical practice, complication rates, access to imaging, and willingness to participate in a clinical trial. Data were analysed using IBM SPSS Statistics for Windows Version 21.0 (IBM Corp).

Table 1
Respondents' characteristics.

Question	No.(%) of respondents
Which area do you mainly work in?	
Secondary care	228/286 (80)
Primary care	58/286 (20)
What is your career grade?	
Consultant/ professor	127/289 (44)
Specialist staff grades	72/289 (25)
Speciality trainee OMFS	34/289 (12)
General dental practitioners	27/289 (9)
GDP oral surgery interest	20/289 (7)
Speciality trainee oral surgery	9/289 (3)
Where do you work?	
UK-based	252/286 (88)
1 or more coronectomy done	187/272 (69)
1 or more complete surgical removal done	277/280 (99)
Interested in participating in a trial on the management of mandibular third molars?	
Yes	115/247 (47)
Need more information	84/247 (34)
No	48/247 (19)

Results

A self-selected sample of 289 BAOMS members completed the survey. Respondents' characteristics are shown in Table 1. Percentage calculations are based on the number of responses per question.

Current practice

The overall estimated number of patients treated annually was 60 003, including 2119 (4%) CORs. Eighty out of 272 (29%) respondents, including 51/80 (64%) senior specialist clinicians, performed 10 or more CORs annually. Consultants did 42% of CORs and 50% of the CSRs. Table 2 shows descriptive statistics relating to the number of procedures performed by surgeon grades.

Many respondents, 125/181 (69%), performing CORs only remove the crown leaving all the roots by sectioning just below the enamel-cemental junction, whilst 45/181 (25%) leave as little root as possible in the socket.

In cases with apical pathology, 194/202 (96%) were unwilling to do COR. Other common COR exclusion criteria included non-vital tooth (179/202, 89%), immunosuppressants (92/202, 46%), diabetes (58/201, 29%), and bisphosphonates (55/202, 27%).

Surgeons who offer COR were asked to rate their primary reasons for this choice. Risk of IAN injury was highly rated by 151/199 (76%), followed by patient choice by 112/196

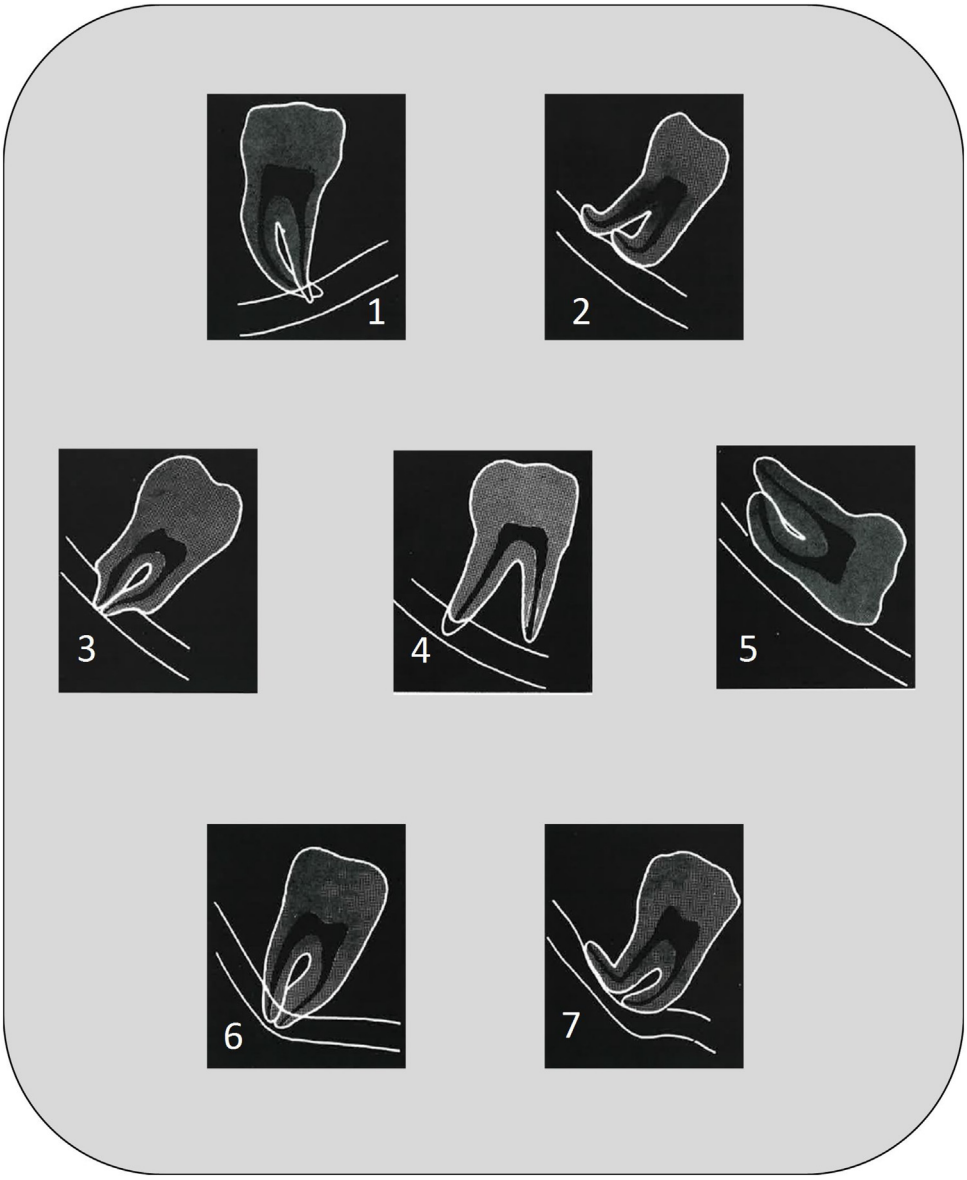

Fig. 1. Radiographic signs of 'high risk' M3Ms in relation to the IAN as classified by Rood and Shebab; 1, Darkening of the root; 2, Deflection of root; 3, Narrowing of root; 4, Dark & Bifid apex of root; 5, Interruption of white line of canal; 6, Diversion of canal; 7, Narrowing of canal. (Reproduced from *British Journal of Oral and Maxillofacial Surgery*, volume 28, Rood J P, Shehab B A., The radiological prediction of inferior alveolar nerve injury during third molar surgery, pages 20–25, copyright (2019), with kind permission from Elsevier).

(57%). Fifty-five surgeons who never offer COR rated their reasons for not using the procedure. The three most important were the lack of an evidence base to support COR's benefit; the increased need for a second operation; and more non-IAN complications (Table 3).

IAN injury

Respondents who offer COR reported a lower incidence of IAN injury amongst all their patients, 132/44,964 (0.29%), than the 55/14,317 (0.38%) who do not offer COR. Surgeons who perform 10 or more CORs annually reported relatively fewer COR-related IAN injuries (7/1753, 0.40%) than those who do 1–9 (2/366, 0.55%). The "10 or more" surgeons also reported a lower CSR-related IAN injury rate (0.25%) than the 1–9 group (0.36%).

Other treatment-related adverse events

Participants were asked how many of their COR and CSR patients had experienced TRAEs in the last year. Postoperative pain was more frequent after COR than CSR (12.5% compared with 3.1%) as were infection (4.7% compared with 1.6%) and dry socket (5.9% compared with 3.9%) (Table 4).

Table 2
Response to the question "Approximately, how many patients who require management of mandibular third molars do you personally treat per year?".

Career grade	Coronectomy			Complete surgical removal		
	Mean (SD)	Median (range)	Proportion of patients treated (%)	Mean (SD)	Median (range)	Proportion of patients treated (%)
Specialist staff grades	12.0 (17.8)	5 (0–100)	39	296.0 (259.8)	235 (10–1500)	36
Speciality trainee oral surgery	10.1 (6.5)	10 (0–20)	3	239.3 (235.3)	150 (25–700)	3
Consultant/professor	7.5 (13.3)	3 (0–100)	42	235.0 (399.8)	150 (0–4000)	50
GDP oral surgery interest	5.5 (6.9)	3 (0–25)	5	163.5 (148.5)	125 (0–600)	6
Speciality trainee OMFS	5.3 (9.2)	2 (0–40)	8	67.7 (50.9)	50 (10–200)	4
Single qualified/dental core trainee	2.6 (6.6)	0 (0–30)	3	40.8 (32.9)	30 (8–150)	2
GDP	1.2 (2.9)	0 (0–7)	0.3	37.7 (57.0)	16 (0–150)	0.4
All respondents	7.8 (13.4)	3 (0–100)	100	206.7 (311.8)	100 (0–4000)	100

GDP: general dental practitioner; OMFS: oral and maxillofacial surgery.

Table 3
Reasons for not offering coronectomy rated as extremely or very important on a 5-point Likert scale by the 55 respondents who do not do the procedure.

Reasons for not doing coronectomy	No.
Lack of evidence base	34/52
Risk of secondary surgical procedure	33/52
Anticipate more postoperative complications with coronectomy	32/52
Patients' preference	29/48
Failure of planned coronectomy (loose root)	26/51
Lack of training with technique of coronectomy	19/50
Lack of support from senior colleagues	12/50
Increased follow up needed	12/51
Need for lingual nerve retraction	9/49
I routinely refer third molars in close approximation to the IAN to secondary care	8/46
Increased difficulty of the coronectomy procedure	6/51
Increased time taken to do coronectomy relative to extraction	5/51

IAN = inferior alveolar nerve.

COR clinician volume and outcomes

A second procedure within 12 months was required in 2.3% of cases treated by surgeons who perform 10 or more CORs annually compared to 9.0% of cases treated by those performing 1–9 CORs. The "10 or more" also reported relatively less lingual nerve damage (0.2% compared with 0.8%), infection (3.4% compared with 10.9%) and pain (11.8% compared with 15.8%) than surgeons who perform fewer CORs.

Imaging

Respondents were asked about access to cross-sectional imaging (CSI), its role regarding M3M treatment decisions and its effectiveness in reducing nerve injury (Table 5). Most respondents had access to CSI and 137/200 (69%) believed that using CSI yields information that reduces IAN injury. A total of 99/191 (52%) considered CSI essential or very important when choosing COR rather than CSR. Free-text comments showed that some respondents consider that CSI should be mandatory whilst others consider it of little benefit.

Patient consent

According to 154/188 respondents (82%), the main reason for patients refusing COR was the possibility of a secondary procedure. Fewer respondents (56/188, 30%) noted a higher risk of infection as the main reason for patients declining. Surgeons who do 10 or more CORs annually reported much higher COR consent rates than colleagues who do them less frequently. For example, 50/81 (62%) compared with 31/81 (38%) reported that their patients always or frequently agree to COR. Free-text comments showed that some surgeons' patients always agree when offered a COR, while others said their patients never or rarely give consent.

Research

Almost half of our respondents (115/247, 47%) recognised the need for, and wanted to participate in, research regarding M3M treatment. An additional 84/247 (34%) requested more information on planned studies.

Discussion

COR was first described in 1984.[12] Published findings suggest that COR may be a reasonably safe and viable alternative to CSRfor high-risk M3Ms. However, our results suggest that COR is not widely used. The prevalence of high-risk M3Ms is thought to be 12%–16%,[9,10] but the number of CORs reported here represents just 4% of operations.

Although our reported rates of IAN injury were similar for COR and CSR, COR is generally used to treat high-risk M3Ms. Assuming the prevalence of high-risk M3Ms to be

Table 4
Estimated total number of patients with complications after coronectomy (COR) or complete surgical removal (CSR). Taken from responses to the question "Approximately, how many of your COR and CSR patients had a complication over the last 12 months?" Data are number (%).

Complication	COR (n = 2119)	CSR (n = 57 884)
Injury to the inferior alveolar nerve	9 (0.4)	180 (0.3)
Injury to the lingual nerve	6 (0.3)	122 (0.2)
Injury to adjacent second molar	4 (0.2)	86 (0.1)
Postoperative pain lasting more than a week	264 (13)*	1811 (3)*
Infection	100 (5)	922 (2)*
Dry socket	124 (6)*	2265 (4)*
Secondary surgical procedure required within 12 months	73 (3)	107 (0.2)
Roots left behind	–	611 (1)
Failed coronectomy: roots had to be removed at time of operation	145 (7)*	–

* The 3 most common complications for each treatment.

Table 5
Questions on imaging.

Question	No. (%) of responders
Do you have access to cross-sectional imaging techniques available at your place of work?	
Yes	210/286 (73)
No	63/286 (22)
I receive referrals with cross-sectional imaging	13/286 (5)
Which cross-sectional imaging technique do you have available at your place of work? (multiple choice)	
Cone-beam CT	165/201 (82)
Conventional CT	102/201 (51)
3D OPG	13/201 (6)
Do you think obtaining cross-sectional imaging of a third molar will affect the outcome of IAN injury?	
Yes	137/200 (69)
Do you think obtaining cross-sectional imaging of a third molar will affect the outcome of lingual nerve injury?	
Yes	17/196 (9)
Do you think cross-sectional imaging is essential in deciding between coronectomy and complete surgical removal?	
Essential	34/191 (18)
Very important	65/191 (34)
Somewhat important	60/191 (31)
Not important	23/191 (12)
Not sure	9/191 (5)
Which factors would influence your decision to request additional cross-sectional imaging? (multiple choice)	
Deflection of root	96/201 (48)
Narrowing of root	83/201 (41)
Dark and bifid apex of root	124/201 (62)
Diversion of mandibular canal	149/201 (74)
Narrowing of mandibular canal	155/201 (77)
The root is superimposed through the ID canal	116/201 (58)
The root tip is in contact with the superior cortical margin of the mandibular canal	35/201 (17)
Medicolegal reasons	66/201 (33)
Providing the patient with more information	73/201 (36)
Other	31/201 (15)

IAN = inferior alveolar nerve.
CT = computed tomography.
3D OPG = Three-dimensional orthopantomogram.

12%–16%,[9,10] we can estimate that the rate of IAN injury for high-risk M3Ms in this survey ranged from 1.94%–2.59% for CSR, compared with just 0.4% for COR. This result is within the range of data reported in the literature, which suggests an overall incidence of IAN injury of 0.35%–8.4% for high-risk cases.[3]

It is worth noting that the 80 surgeons who treat 10 or more M3Ms with COR annually reported less nerve damage, a slightly lower incidence of pain, less infection, and a much lower rate of reoperation for COR than colleagues who perform 1–9 CORs. Results from those who perform more CORs may more accurately reflect the between-procedure differences than those from surgeons who rarely perform this procedure, as experience usually relates to outcome.[22]

An orthopantomogram (OPG) is essential for radiological assessment of M3Ms before surgery.[23] Three-quarters of our respondents also have access to CSI. However, the limitations of this survey did not allow us to find out whether CSI was used in accordance with the guidelines, which state that it should be reserved for clinical situations when the result could influence the treatment approach or change its outcome.[24] Only half of our respondents considered CSI to be essential or very important in deciding between a COR or a CSR, but slightly more believed that CSI could affect the outcome of IAN injury.

Surgeons will discuss the benefits and risks of the procedures, the alternative options, and the possible outcomes if no treatment is delivered, but our results suggest that patient consent is strongly influenced by the way in which the information relating to potential complications is presented. This corresponds with the understanding that the mode of presentation of treatment options, the "framing effect",[25] influences the perception of treatment benefit. M3M surgery is perceived to be unpleasant and patient choice is important in treatment decisions. Therefore, the high consent rate for COR with surgeons who do 10 or more CORs annually suggests that they may present the benefits of COR more positively than their colleagues.

Not all high-risk M3Ms are suitable for a COR. The root remnants may act like foreign bodies and consequently this procedure is contraindicated for M3Ms with acute infection, severe decay with pulpal involvement or apical pathology.[19] Although many studies exclude patients with diabetes and those on immunosuppressive medication, about half of our respondents would perform COR on immunocompromised patients and almost a third on patients who are diabetic.

The relatively low rate of IAN injury is likely to be related to our respondents' experience, as more than half of them are senior specialists. However, it is also possible that IAN injury and other complications have been under-reported. Surgeons in training change posts regularly and may be unaware of any complications or secondary procedures that their patients experience. Additionally, OMF surgeons generally work in large specialist units where any member of a team may review patients. There is also a lack of routine follow up for patients who have M3M surgery. They may return to their referring general practitioner if they experience complications.[21] More importantly, the inaccurate recall of the requested information or respondent bias may contribute to the apparent under-reporting of IAN injury. Surgeons who treat most of their cases which have a high risk of IAN injury with COR would expect to reduce their overall (COR plus CSR) incidence of IAN injury. This survey provides some support regarding the possible effectiveness of this strategy, as respondents who said they do not offer COR reported seeing more cases of IAN injury than all other respondents.

Regarding the unpleasant but less serious sequelae of M3M surgery, this survey provides a comprehensive snapshot of surgeons' views regarding their frequency. They report a higher incidence of these complications with COR than with CSR. This does not reflect other reports in the published literature. This may be because the respondents do not routinely follow up CSR patients postoperatively and would not know about complications if they were managed in primary care, whereas they may follow up their COR patients more assiduously when they hear about their complications first-hand. Also patients' complaints may be more memorable when they relate to the less common operation of COR. However, if their reports are accurate and their non-IAN complications related to COR do indeed occur more frequently, it is not surprising that many surgeons do not offer the procedure more frequently or at all.

Conclusion

This survey of BAOMS members treating third molars shows the impact of the lack of evidence to support coronectomy reported by the Cochrane collaboration. It is clear that the previous literature with variations in complications and outcomes, radiological investigation, and even coronectomy technique has resulted in many surgeons not adopting coronectomy. Therefore Coronectomy's place in the surgical armamentarium for M3M treatment is still not universally accepted despite 34 years having elapsed since its first report and many subsequent papers documenting its value. If coronectomy is to be more widely used, it must be robustly assessed against current best practice of complete surgical removal in a multi-centre study using clinicians of all grades and allowing the follow up of all patients to ensure the generalisability of its value. Three-quarters of our respondents, including those who do coronectomy frequently and those who do not offer the procedure, expressed an interest in this research. Many of them wanted to participate in studies that would finally define the place of coronectomy in M3M surgery.

Funding

Saving Faces–The Facial Surgery Research Foundation funded this study and its analysis through The BAOMS clini-

cal trials unit – The National Facial and Oral Research Centre (NFORC). BAOMS circulated the survey to its membership.

References

1. Leung YY, Cheung LK. Long-term morbidities of coronectomy on lower third molar. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2016;**121**:5–11.
2. Renton T, Al-Haboubi M, Pau A, et al. What has been the United Kingdom's experience with retention of third molars? *J Oral Maxillofac Surg* 2012;**70**(9 Suppl 1):S48–57.
3. Sarikov R, Juodzbalys G. Inferior alveolar nerve injury after mandibular third molar extraction: a literature review. *J Oral Maxillofac Res* 2014;**5**:e1.
4. Valmaseda-Castellón E, Berini-Aytés L, Gay-Escoda C. Inferior alveolar nerve damage after lower third molar surgical extraction: a prospective study of 1117 surgical extractions. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2001;**92**:377–83.
5. Gülicher D, Gerlach KL. Sensory impairment of the lingual and inferior alveolar nerves following removal of impacted mandibular third molars. *Int J Oral Maxillofac Surg* 2001;**30**:306–12.
6. McArdle LW, Renton T. The effects of NICE guidelines on the management of third molar teeth. *Br Dent J* 2012;**213**:E8.
7. Patel N, Ali S, Yates JM. Quality of life following injury to the inferior dental or lingual nerve – a cross-sectional mixed-methods study. *Oral Surg* 2018;**11**:9–16.
8. Rood JP, Shehab BA. The radiological prediction of inferior alveolar nerve injury during third molar surgery. *Br J Oral Maxillofac Surg* 1990;**28**:20–5.
9. Smith WP. The relative risk of neurosensory deficit following removal of mandibular third molar teeth: the influence of radiography and surgical technique. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2013;**115**:18–24.
10. Bell GW. Use of dental panoramic tomographs to predict the relation between mandibular third molar teeth and the inferior alveolar nerve. Radiological and surgical findings, and clinical outcome. *Br J Oral Maxillofac Surg* 2004;**42**:21–7.
11. Patel V, Moore S, Sproat C. Coronectomy - oral surgery's answer to modern day conservative dentistry. *Br Dent J* 2010;**209**:111–4.
12. Ecuyer J, Debien J. Surgical deductions. *Actual Odontostomatol (Paris)* 1984;**38**:695–702 (Article in French).
13. Hatano Y, Kurita K, Kuroiwa Y, et al. Clinical evaluations of coronectomy (intentional partial odontectomy) for mandibular third molars using dental computed tomography: a case-control study. *J Oral Maxillofac Surg* 2009;**67**:1806–14.
14. Cilasun U, Yildirim T, Guzeldemir E, et al. Coronectomy in patients with high risk of inferior alveolar nerve injury diagnosed by computed tomography. *J Oral Maxillofac Surg* 2011;**69**:1557–61.
15. Renton T, Hankins M, Sproate C, et al. 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;**43**:7–12.
16. Leung YY, Cheung LK. Safety of coronectomy versus excision of wisdom teeth: a randomized controlled trial. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2009;**108**:821–7.
17. Coulthard P, Bailey E, Esposito M, et al. Surgical techniques for the removal of mandibular wisdom teeth. *Cochrane Database Syst Rev* 2014;(7):CD004345.
18. Patel V, Sproat C, Samani M, et al. Unerupted teeth associated with dentigerous cysts and treated with coronectomy: mini case series. *Br J Oral Maxillofac Surg* 2013;**51**:644–9.
19. Martin A, Perinetti G, Costantinides F, et al. Coronectomy as a surgical approach to impacted mandibular third molars: a systematic review. *Head Face Med* 2015;**11**:9.
20. Chan SW, Tulloch E, Cooper ES, et al. Montgomery and informed consent: where are we now? *BMJ* 2017;**357**:j2224.
21. Devine M, Gerrard G, Renton T. Current practice in mandibular third molar surgery. A national survey of British Association of Oral Surgeons membership. *Oral Surg* 2017;**10**:11–9.
22. Jerjes W, Upile T, Shah P, et al. Risk factors associated with injury to the inferior alveolar and lingual nerves following third molar surgery-revisited. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2010;**109**:335–45.
23. Matzen LH, Christensen J, Hintze H, et al. Influence of cone beam CT on treatment plan before surgical intervention of mandibular third molars and impact of radiographic factors on deciding on coronectomy vs surgical removal. *Dentomaxillofac Radiol* 2013;**42**:98870341.
24. Flygare L, Ohman A. Preoperative imaging procedures for lower wisdom teeth removal. *Clin Oral Investig* 2008;**12**:291–302.
25. Moxey A, O'Connell D, McGettigan P, et al. Describing treatment effects to patients. *J Gen Intern Med* 2003;**18**:948–59.