RESEARCH ARTICLE

Neurosensory disturbances after surgical removal of the mandibular third molar based on either panoramic imaging or cone beam CT scanning: A randomized controlled trial (RCT)

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Objective: Pre-surgical CBCT has been suggested before removal of the mandibular third molar. Currently, the standard-of-care is two-dimensional (2D) panoramic imaging. The aim of this randomized controlled trial was to analyse possible differences in neurosensory disturbances of the inferior alveolar nerve between patients undergoing either panoramic imaging or CBCT before surgical removal of the mandibular third molar. Furthermore, the aim was to perform a sensitivity analysis to assess the statistical significance of different assumptions related to sample size calculations.

Methods: 230 patients were randomized to a scan group and a non-scan group. All patients were referred from practicing dentists in the Copenhagen area. Inclusion criteria were overlap of the root complex and the mandibular canal on a 2D radiographic image. Central allocation of the randomization code and double blind settings were established. The surgical removal was performed in a specialized surgical practice geographically and personally separated from the study practice. Registration of neurosensory anomalies was performed with a Semmes–Weinstein test and a visual analogue scale questionnaire pre- and post-surgically.

Results: In the scan group ($n = 114$), 21 episodes of neurosensory disturbances were registered and in the non-scan group ($n = 116$), 13 episodes of neurosensory disturbances were registered. There was no statistically significant difference between the two groups ($p = 0.14$). Performing a sensitivity analysis confirmed that CBCT was not superior to panoramic imaging in avoiding neurosensory disturbances.

Conclusions: The use of CBCT before removal of the mandibular third molar does not seem to reduce the number of neurosensory disturbances.

Dentomaxillofacial Radiology (2016) **45**, 20150224. doi: [10.1259/dmfr.20150224](https://doi.org/10.1259/dmfr.20150224)

Cite this article as: Petersen LB, Vaeth M, Wenzel A. Neurosensory disturbances after surgical removal of the mandibular third molar based on either panoramic imaging or cone beam CT scanning: A randomized controlled trial (RCT). *Dentomaxillofac Radiol* 2016; **45**: 20150224.

Keywords: mandibular third molar; CBCT scanning; surgical removal; neurosensory disturbances

Introduction

Removal of the mandibular third molar is one of the most common dental surgical procedures.¹ In a recently published “first-world” study, the annual incidence of this procedure has been estimated to 663/100,000 in the

Danish population.² As the relationship between the root complex and the mandibular nerve can be very intimate, the occurrence of iatrogenic injury to the mandibular nerve is a rather common complication. The incidence of permanent neurosensory injuries to the inferior alveolar nerve (IAN) has been reported to be between 0.1% and 1.1%.^{3–6} The total number of

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Received 17 March 2015; revised 25 July 2015; accepted 2 December 2015

neurosensory disturbances including temporary episodes varies in different studies between 4.5% and 22%.⁷⁻⁹ No epidemiological data about the distribution of the severity of the permanent disturbances expressed in common nerve injury classifications^{10,11} have been found. Neither have quantitative studies been identified, which measured the severity distribution of neurosensory disturbances in a patient-related outcome measurement setting. One study¹² has described the overall consequences for the patient's quality of life when suffering from permanent neurosensory disturbances. It was in this patient-related outcome measurement study possible to measure a significant decline in life quality parameters, including a higher tendency to depressions.

Different strategies have been suggested to avoid or minimize iatrogenic neurosensory disturbances. In the last decades, more stringent indications for surgical removal of the mandibular third molar have been implemented in treatment guidelines.^{13,14} This would *per se* reduce the absolute number of neurosensory disturbances. However, it is unclear whether these recommendations have been thoroughly implemented in dental practices.^{15,16} A change in the surgical procedure has further been proposed as a method to minimize neurosensory morbidity. Instead of a complete removal of the mandibular third molar, part of the root complex could be left if the surgeon predicts a high risk for nerve involvement. This procedure is known as coronectomy. Using coronectomy as a surgical approach seems to reduce the number of neurosensory disturbances.¹⁷ Long-term prognosis and the consequences of this surgical method are currently uncertain as most studies have a relatively short follow-up period.¹⁸

To reduce the risk of injury to the IAN, it has also been suggested to perform a CBCT examination pre-surgically.¹⁹ Applying the hierarchical model of Fryback and Thornbury,²⁰ research concerning this topic can be classified as mostly Level 1, 2 or 3 studies.²¹ The underlying assumption for using CBCT seems to be that a three-dimensional visualization could lead to a guided surgical intervention with less risk of inducing damaging mechanical energy to the IAN. However, no studies describing recommendations for a change in surgical procedures based on pre-surgical CBCT imaging could be identified. Very few studies on patient outcome morbidity and societal implications have been published.²¹

The use of radiation imaging procedures implies a stochastic biological risk to the patients. The increase of cancer incidence in the population, if CBCT should turn into diagnostic routine before removal of the mandibular third molar, has been estimated in an epidemiological study² and should not be neglected. Furthermore, the use of CBCT is a more resource intensive procedure than panoramic imaging. A recent Level 6 study²² quantified the resource utilization for CBCT as four times higher than for panoramic imaging. Resources are not unlimited and the increase of resource

utilization in one medical segment often leads to decrease in another. Introducing new technology and new procedures should be based on patient benefits and societal advantages.²³

The randomized controlled trial (RCT) is the most valid design in this kind of quantitative studies; however, methodological challenges exist when planning and conducting an RCT. Multicentre studies and/or sensitivity analyses have been suggested as methods to increase the validity of such studies.²⁴ The aim of this RCT was to analyse possible differences in neurosensory disturbances of the IAN between patients undergoing either panoramic imaging or CBCT before surgical removal of the mandibular third molar. Furthermore, it was the aim to perform a sensitivity analysis to assess the statistical significance of different assumptions related to sample size calculations.

Methods and materials

Study design

The study was designed as a double-blinded RCT (Figure 1). It was conducted in collaboration between the Section for Oral Radiology, Department of Dentistry, Aarhus University, Denmark and the Colosseum Clinic, a private practice in Copenhagen, Denmark. The pre- and post-surgical part of the study was executed in the Colosseum Clinic and removal of third molars was performed in a Copenhagen-based specialized surgical practice geographically and organizationally separated from the study clinic (Figure 2). The clinical data were collected from November 2010 to December 2014. All patients participated with one mandibular third molar. The study was planned and structured according to the principles of the Helsinki Declaration²⁵ and approved by the Ethical Committee of the Capital Region, Denmark (ECCR) (Approval number: H-4- 2010-052).

Invitation to participants

All identified private practices in the Capital Region were contacted by ordinary mail and through an internet-based newsletter from the Danish Dental Organization. Information concerning the aim of the study, inclusion and excluding criteria, ethical considerations and practical procedures were provided with an invitation to refer patients to the study. All referred patients received an ECCR-approved information letter describing the study. The patients were then invited to a meeting with the principal investigator in the study clinic where the implications of the study were clarified and discussed.

Pre-inclusion registrations

Pre-inclusion neurosensory test: A neurosensory screening was performed pre-surgically for each patient. A Semmes-Weinstein (SW) monofilament set consisting of the numbers 1.65, 2.36, 2.44, 2.81 and 3.61 was used

Figure 1 Flow chart of invited and enrolled participants in the study.

to test the neurosensory response in four predefined topographical spots in the innovation area of the IAN. The pressure range was between 0.008g and 0.2g (1.65–6.61, filament code numbers). In addition, the patients marked their perception of “normality” in the test and the control side on a visual analogue scale (VAS) ranging from 0 to 100 mm, where zero was the score describing a normal neurosensory feeling. To meet inclusion criteria, only patients who had a VAS baseline of zero in both test and control side were enrolled in the study.

Pre-inclusion clinical and radiographic assessment of the third molar: All patients received a panoramic examination in a full adult projection (Scanora®; Soredex, Helsinki, Finland). Based on the clinical and radiographical appearance of the referred third molar, the principal investigator determined whether the patient should be invited to enter the study. The inclusion criteria were indication for removal of the mandibular third molar according to the Scottish Intercollegiate Guidelines Network (SIGN) guidelines¹⁴ and contact or overlap between the tooth/root complex and the mandibular canal on the panoramic image. The exclusion criteria were pathology demanding removal of the third molar in a hospital setting. If the patient fulfilled the inclusion criteria and agreed to participate, a document of informed consent was signed, and the patient was enrolled in the study.

Randomization procedure

After inclusion, the participants were allocated randomly to a CBCT group (scan) and a panoramic

imaging group (non-scan) with an allocation ratio of 1 : 1 (Figure 1). In each group, the patients were further randomized to one of two performing surgeons with an allocation ratio of 1 : 1. Block randomization was performed using 20 balls in four different colours in equal numbers. The colours represented the four combinations of imaging modality and surgeon. The randomization of patients to surgeons was interrupted after inclusion of 95 participants, because one of the surgeons left the study, and the block randomization was restricted to imaging modality using 10 × 10 balls in two colours. Two specially trained dental nurses in the study clinic executed the randomization procedure. These two nurses also coded each participant. The codes were centrally stored and were released only after finishing the post-surgical registrations. The principal investigator and the participants were therefore blinded until the end of data collection.

Interventions

Pre-surgical radiographic examination: The radiographic examinations were performed with a CBCT and panoramic integrated unit (Scanora; Soredex). Two specially trained dental nurses in the study practice performed the radiographic examinations. The participants allocated to the scan group received a CBCT examination with a field-of-view of 6 × 6 in an HD setting equalizing a voxel size of 0.133 and 451 single images. The software used for reconstruction of the CBCT images was OnDemand3D™ (Cybermed Inc.,

Figure 2 Study workflow.

Seoul, Korea). The participants allocated to the non-scan group underwent a test procedure where the CBCT unit performed the same mechanical movements without releasing any radiation, thus blinding the patient to group allocation. The sectioning and evaluation of the CBCT volume was performed by the principal investigator and based on coded participant files, thus blinding the investigator to group allocation. The surgeons received four selected sections as analogue print-outs, a CD copy of the full volume including a viewer and a radiological report (made by the principal investigator) of the CBCT findings. The report contained information on the anatomical relationship between the mandibular canal and the root complex and any pathological findings. The panoramic image for participants in the non-scan group was delivered without a report. Panoramic imaging has been the standard procedure in the specialist surgical practice for decades, and this procedure was considered adequate also in the study setting. Both participating surgeons were trained in handling the CBCT software (viewer) and in interpretation of the images. The surgeons were instructed to interpret pre-surgically both the panoramic image and CBCT volume for each patient in the scan group.

Surgical procedure: According to the procedures in the surgical practice, the surgery was performed as a complete removal or a coronectomy based on the operation protocols in the surgical practice. Type of surgery and other relevant findings were reported back to the study clinic, where all post-surgical procedures were performed.

Post-surgical management and registrations

Complication management and post-surgical controls were executed in the study clinic. A week after the surgical intervention, the patient had the sutures removed, and clinical registrations were performed. The neurosensory SW test followed the exact same procedure as described for the pre-inclusion registration. VAS-reported sensory disturbances were defined to overrule any negative SW finding, meaning that no changes in pressure thresholds could be combined with subjective changes in sensitivity. The outcome was registered as one of the three possibilities: no neurosensory changes, temporary changes or permanent changes. Neurosensory disturbances lasting more than 6 months were classified as permanent. The number of full removals and coronectomies was extracted from treatment file information from the surgical practice.

All panoramic images (both from scan and non-scan group) were later evaluated and three well-known markers for an intimate relation between the mandibular canal and the root complex were registered: broken white lines at the canal border, darkening of the root(s) and narrowing of the canal.^{26,27} This was to ensure that basic potential risk parameters for neurosensory

disturbances had been equally distributed in the scan and the non-scan group.

Sample size determination

Prevalence for neurosensory disturbances varies in the literature between 4.5% and 22%.^{7–9,17} In this study, the preliminary protocol defined a proportion of neurosensory episodes of 0.0001 in the scan group and 0.045 in the non-scan group. Assuming the alpha value to 0.05 (two sided) and the power to 0.8, the required sample size in each group was calculated to be 212 (STATA[®] v. 11; StataCorp LP, College Station, TX). The clinical data collection was planned to be finished after 2½ years. The study plan was re-evaluated in March 2012 after inclusion of 95 patients, when one of the surgeons left the study. The preliminary results obtained from the re-evaluation suggested that the initial sample size calculation was based on unrealistic assumptions and that the study was underpowered for scenarios that are more realistic.

Data management and statistical methods

The number of neurosensory disturbances in each group was the primary outcome variable. The surgeon performing the operation was also an outcome variable. These categorical data were assessed using Fisher's exact test. A relative risk with a 95% confidence interval was used to compare the occurrence of neurosensory disturbances in the two groups. Collected data were organized with EpiData[™] v. 3.1 (EpiData Association, Odense, Denmark), and STATA v. 11 (StataCorp LP) was used for calculations.

Results

Participants

When the study was discontinued, 234 patients had participated: 117 were allocated to the scan group and 117 to the non-scan group. Three patients dropped out before surgery in the scan group and one patient in the non-scan group (Figure 1). 144 were females and 86 were males, and the average age was 29.8 years (standard deviation = 9.92 years) (Table 1). The distribution of basic population and pre-operative panoramic radiographic parameters in the scan and the non-scan group are shown in Table 1.

Resource shortcoming was the primary reason for ending data collection. The patient accrual rate had

been lower than anticipated, and to meet the required sample size, the study period would have had to be extended for 3 years. However, a sensitivity analysis indicated that the collected data would allow a meaningful interpretation.

Neurosensory outcome

In the scan group, 20 (17.5%) patients had temporary neurosensory disturbances the week after surgery, and 1 (0.9%) patient had a permanent disturbance while in the non-scan group, 12 (10.5%) patients had temporary and 1 (0.8%) patient had permanent neurosensory disturbances were registered. The risk of neurosensory disturbances was therefore 64% larger in the scan group than in the non-scan group (relative risk = 1.64, 95% confidence interval: 0.87; 3.12), but the difference was not statistically significant ($p = 0.13$) (Table 2). No significant differences between the two surgeons were found. Only three cases of coronectomy were registered in the study corresponding to 1.4%. These coronectomies were performed in the scan group.

Sensitivity analysis

As the number of episodes in the scan group as well as the overall frequency of neurosensory disturbances differed considerably from the protocol assumptions, a new calculation was performed. The calculation was based on the actual observed proportions of neurosensory disturbances. Furthermore, a 50% increase in the occurrence rate between the scan group and the non-scan group was considered clinically relevant. Based on these assumptions, the sample size could be calculated: alpha = 0.05 (two-sided), power = 0.8, $p_1 = 0.15$, $p_2 = 0.075$, $n_2/n_1 = 1$. Required total sample size to meet the criteria: $n_1 = n_2 = 304$. As the number of the participant in the study did not meet the required sample size, a sensitivity analysis was performed. In this analysis, p -values were computed for a simulated increased number of participants following two different assumptions. Scenario 1 simulated up to triple increase of participants without any neurosensory disturbances in the scan group, but with a continuation of the observed outcome in the non-scan group (including the participants in the actual study). In this setting, CBCT scan would be superior to panoramic imaging at $n_1/n_2 = 320/320$. Scenario 2 simulated a continuity of the actual trend in the study. In this setting the panoramic imaging was superior to CBCT with a statistically significant difference at $n_1/n_2 = 230/230$ (Figure 3).

Table 1 Patient data and basic distribution of panoramic radiographic parameters, known to be risk factors for a close relationship between tooth and mandibular canal, in the scan and the non-scan group

Patient data	Scan group	Non-scan group	Total
N analysed	114	116	230
Average age (years)	31.0	28.6	29.8
Males, n (%)	40 (35)	46 (40)	86 (37)
Right side, n (%)	54 (47)	61 (53)	115 (50)
Pan: interruption of white lines	41 (36%)	38 (33%)	79 (34%)
Pan: darkening of the roots	18 (16%)	23 (20%)	41 (18%)
Pan: narrowing of mandibular canal	12 (11%)	13 (11%)	25 (11%)

Discussion

This study can be classified as an interventional study according to Level 1b in the Oxford Classification System²⁸ and targeting a Level 5 study in the classification of Fryback and Thornbury.²⁰ The clinical study was conducted in settings of a private practice similar to the general economical and organizational conditions in Denmark. Recruitment, indications, diagnostic settings and treatment modalities in the study equalize the common daily dental practice in Denmark. Comparing the age distribution of participants in the study sample with data from an epidemiological study² shows similar values. In the present study, the mean age was slightly lower than the national mean value found in a recent study² reflecting that most data were collected from patients living in the central parts of the capital. The mean age in these areas with many university students is lower than the mean age in the total capital region. The surgeons, who performed the intervention, are specialists in dentomaxillofacial surgery and are acting in a private practice. In Denmark, all dentists are allowed to perform surgical removals of lower third molars. There are no available data concerning the distribution between removals executed by surgical specialists compared with general dentists although surgical experience seems to play a role for patient outcome.^{29,30} In the study setting, the third molar surgery was performed by the most trained and experienced operators available in the area. This setup constitutes the highest standard of treatment and care based on reliable surgical protocols and should in our view be the gold standard in this kind of studies. Both ethical and methodological reasons substantiate this choice and based on these considerations about study population and performed surgery, it can be assumed that this RCT has a high external validity. The study could of course host selection bias owing to the fact that patients were referred from general dentists to the study. Maybe the referring dentist more or less intentionally would chose patients expected to be more positive towards participation. As seen in Figure 1, only one of the referred patients refused enrolment and this fact could support the suspicion of some selection bias. Because the primary outcome most certainly is not associated to objective social or educational status, the expected effect of the suggested potential selection bias must, however, be considered to be low. Other biases could be integrated in the study design. The participating surgeons were of course aware of their participation in a study planned to be published and their surgical performance could be

influenced by this fact. More cautious intervention procedures could be the consequence in the hope that this behaviour would minimize patient morbidity and complications. It is not clear if and how surgical awareness will increase or decrease post-surgical complications. If there should be an impact due to changed behaviour, this would influence both study and control group though, thus not interfering with the basic outcome principles of the study, but merely with prevalence of disturbances.

The actual number of neurosensory disturbances should be compared with findings from other studies. This validity criterion requires comparability with studies with a similar study design and comparable measurement methodology. According to a review from 2009, the methods to assess neurosensory disturbances differ tremendously.³¹ The review suggested the use of a combination of patient feedback (VAS) and touch testing (SW monofilaments) as the gold standard. The method cannot be seen as a profound neurosensory test. The procedure only includes simple anaesthetic variations of neurosensory disturbances and must be considered as a screening tool to separate between positive or negative findings. A more advanced test is necessary if an assessment of the character and the severity of the disturbances should be performed.³² Nevertheless, the suggested methods in the review were used in this study. Two other RCTs related to the subject have been published.^{17,24} Both studies used the suggested test methods. One of the studies¹⁷ analysed differences in neurosensory disturbances between a group who underwent total removal of the mandibular third molar and a group where coronectomy was performed. This study found a frequency of 18.6% disturbances in the total removal group. The other study²⁴ compared disturbances between a CBCT and a panoramic group and found a total frequency of neurosensory disturbances of 2.7%. However, the study only included removals categorized as “moderate risky”. This definition remains unclear, and the study sample most probably does not reflect a random population-based patient group. Furthermore, the study did not separate clearly between temporary and permanent disturbances making comparative considerations difficult. Our study found a total of 14.7% disturbances, which seem comparable to the RCT with a similar design.¹⁷ As seen in Table 2, the relative risk of disturbances in the scan group was >50% higher than in the non-scan group. Although not statistical significant, it may reflect changed surgical behaviour towards a feeling of increased (false?) certainty in performing the surgical intervention. It is in this study not possible to verify the true reasons for the observed trend.

Table 2 Neurosensory disturbances in the scan and non-scan group

Group	N participants	Temporary neurosensory disturbances	Permanent neurosensory disturbances	Neurosensory disturbances (%)
Scan	114	20	1	18.4
Non-scan	116	12	1	11.2
Total	230	32	2	14.8

CI, confidence interval.

Risk difference (scan/non-scan) 7.2%; 95% CI (−1.9; 16.4); *p*-value 0.12. Relative risk (scan/non-scan) 1.64; 95% CI (0.87; 3.12); *p*-value 0.13.

Figure 3 Sensitivity analysis.

The validity of our study is challenged on several other methodological levels. It has to be discussed if the primary outcome can be seen as a relevant variable to determine the morbidity of neurosensory disturbances. It has been shown that permanent injuries have a measurable impact on patient's quality of life.¹² However, this study used the overall number of neurosensory disturbances including temporary disturbances. It has apparently not been studied whether temporary disturbances are perceived by the patient as a serious complication. It is furthermore not evident that temporary disturbances follow the same etiological path in the surgical intervention as do permanent disturbances. Nevertheless, it must be assumed that most neurosensory episodes follow mechanical injuries to the structures composing the IAN. In the classical classifications of nerve injuries according to Seddon¹⁰ and Sunderland,¹¹ the impact of a trauma to the nerve tissue can be seen as a progressing damage of the different structures building the functional nerve complex. It is therefore likely that a permanent injury represent a threshold value on a physical scale of surgically originated mechanical energy applied to a biological vulnerable structure. The temporary disturbances represent in this assumption physical impact under a certain threshold. In the literature there seems to be a relatively constant relationship between temporary and permanent disturbances, and permanent disturbances seem to constitute between 5% and

25% of all neurosensory episodes.^{3–9} Because of the mechanical–physical nature of the injuries to the nerve and because of the relative constant relationship between the two types of injuries; it seems likely that temporary disturbances can be considered as a relevant marker in the risk analysis. Temporary disturbances could from a certain point of view be seen as a surrogate variable. However, combining existing knowledge of the nature and classification of injuries with epidemiological observations makes it plausible to interpret the combined disturbances when assessing the distributions within and between the study and control group. This is an important conclusion with respect to the possibility for a statistical analysis. A study from 2011 describes the almost impossible task to conduct an RCT measuring differences in permanent injuries owing to the need of very large samples.³³ Furthermore, the study highlighted that measuring differences in temporary disturbances also requires large samples. Therefore, the sample size has to be addressed and considered as a methodological limitation.

In the protocol of our study, a sample size of 212 in each group was calculated. This calculation was based on the assumption that the use of CBCT could facilitate a surgical technique that would avoid any neurosensory disturbances in the study group, and that the frequency of neurosensory disturbances in the control group would be 4.5%. This frequency reflects the frequencies reported in existing observational and interventional

studies. The observed frequencies differed substantially from those assumed in the protocol. In the study group, a frequency of disturbances of 17.5% was found, and in the control group, the frequency was 10.5%. The overall frequency was 14.7%. To make a meaningful sample size calculation, a clinically important difference proportion should be determined. If a meaningful difference of disturbances between the two groups is considered to be 1%, a sample size calculation will show that each group should include 699,134 patients (proportions: $n_1/n_2 = 0.15/0.1485$). If a difference of 90% is considered important, each group should include 65 patients (proportions: $n_1/n_2 = 0.15/0.015$). Both calculations are based on a power of 0.8 and an alpha value of 0.05 (STATA v. 11; StataCorp LP). So what could be determined as a balanced and meaningful difference? We suggest that a new cost-intensive and potentially risk-full diagnostic procedure (as CBCT) must show a difference of 50% (proportions: $n_1/n_2 = 0.15/0.075$) in favour of the new modality. Applying this principle, the present study should have included 608 patients. This sample size could not be fulfilled in the study. Owing to limitations in resources, the study had to be terminated before the planned number of patients was included. As shown in Figure 3, a sensitivity analysis was performed based on two different assumptions. The first scenario simulated the study to continue without any neurosensory disturbances in the scan group and the same frequency of disturbances in the non-scan group. In this setting, the study fulfils the 50% criterion while concluding that there is no statistically significant difference between the scan and the non-scan group. Even in this very unlikely sensitivity setting, no superiority of CBCT can be shown. The second scenario in the sensitivity analysis was based on a continued frequency of the observed outcome in the two groups. In this setting, there would be a superiority of the panoramic modality in minimizing neurosensory disturbances in the context of the suggested 50% clinical importance limit. Several studies addressing the neurosensory patient outcome related to the use of CBCT pre-surgically could be found. Two studies support the opinion that CBCT could reduce the number of neurosensory disturbances.^{34,35} Both studies were case series without any control group, and owing to this design, the validity of the studies must be considered low. Both studies can be classified as observational Level 4 studies in the Oxford classification. Four studies supporting the opinion that CBCT pre-surgically does

not reduce the number of neurosensory disturbances could be found. One study tried to compare the overall reported neurosensory disturbances before and after the introduction of CBCT in dental practices.³⁶ This register-based epidemiological study did not find any significant differences before and after the introduction of CBCT. The study could formally be classified as an outcome study on Level 2c. Two retrospective cohort studies could be found.^{37,38} Neither study, both categorized as Level 2b studies, found any statistically significant differences in the number of neurosensory differences between different radiographic modalities. One RCT,²⁴ Level 1b, confirmed the findings of the observational studies and could not confirm the superiority of CBCT in preventing neurosensory disturbances. Including the present study, two RCTs and three observational studies support the finding that CBCT pre-surgically may not influence the incidence of neurosensory disturbances after surgical removal of the mandibular third molar. In the SEDENTEXCT guidelines³⁹ the evidence level for using CBCT before surgical removal of the mandibular third molar is reported as C (low evidence) according to the GRADE hierarchy of evidence.⁴⁰ This classification seems surprisingly high considering the non-existing Level 5 studies at the time of the release of these European guidelines in 2011. Probably, the correct classification would have been a level D (very low evidence). The foundation for a new evidence assessment is now more solid and in our opinion, the contemporary knowledge would qualify to a GRADE B classification (moderate evidence). The recommendation that CBCT should not be used routinely before surgical removal of the mandibular third molar could be considered as a part of a revised version of the SEDENTEXCT guidelines.

Conclusions

Performing a CBCT examination before surgical removal of the mandibular third molar does not seem to prevent or reduce the number of post-surgical neurosensory disturbances.

Acknowledgments

We thank the dental practitioners and the patients who made this study possible by referring to and participating in the clinical procedures.

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