Severe Infections after Tooth Removal: a Retrospective Cohort Study

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ABSTRACT

Objectives: The purpose of this retrospective cohort study was to determine the characteristics of patients hospitalized with severe infections after tooth removal.
Material and Methods: A retrospective analysis of medical and dental records of patients hospitalized with severe infections after tooth removal from their hospitalization and their dental records preceding their hospital admission. Descriptive statistical methods were applied.
Results: Of 109 patients included in the study, the majority (84%) of patients were above 25 years with a mean age of 42.8 (SD 19.6) years. The extracted teeth were most often surgically removed, and indications for extraction were predominantly a pathological condition in the dental or surrounding tissues. Only one patient had prophylactic antibiotics administered before surgical removal of the tooth. Surgical extraction of a mandibular third molar preceded hospitalization in sixty-three patients (58%) and a distoangular position was the most common (36%). Patients who had a mandibular third molar removed were significantly younger ($P = 0.006$) and had no comorbidities ($P = 0.002$) in contrast to those with any other tooth removed.
Conclusions: Patients developing severe infections after tooth removal are characterized by the extraction of mandibular third molars, pathologic conditions related to the teeth removed, and absence of prophylactic antibiotics during the procedure.

Keywords: dental focal infection; hospitalization; pericoronitis; third molar; tooth extraction.

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INTRODUCTION

Complications after surgical procedures in the oral cavity are common, and among these, the incidence of postoperative infections is reported to range from 2.6 to 8.5% [1]. Most postoperative infections are restricted to the area of tooth extraction and can be predictably handled with measures such as, rinsing, sequestrectomy, or antibiotic therapy. However, the infection may develop and spread to the surrounding tissues to a degree where hospitalization of the patient is required. Failure to intervene in the early phase of infection increases the risk of progression into the deep facial spaces and necrotizing soft tissue infection, cerebral abscess, or other potentially life-threatening conditions if left untreated [2-5]. In addition, from a patient's perspective, hospitalization leads to considerable inconvenience including loss of earnings. Furthermore, it causes a significant burden to the society that could have been avoided by timely preventive measures.

In most cases, postoperative infections originate from mandibular molars [6,7], and especially mandibular third molars (M3) are frequently involved [8]. Surgical removal of M3 is one of the most frequently performed surgical procedures amongst dentists and oral surgeons [9]. The indication for removal can be pathologic conditions within the M3, in the surrounding tissues, or a prophylactic removal based on the anticipation of an elevated risk of future infection or damage to neighbouring tissues/structures [9]. Recent literature indicates that the removal of M3 should preferably be performed before the age of 25, as the risk of postoperative complications such as nerve injury, postoperative bleeding, mandibular fracture, and postoperative infection increases with age [10].

Antibiotic prophylaxis in relation to the removal of M3 can reduce the incidence of postoperative infections after the removal of M3 [11]. On the other hand, any administration of antibiotics increases the risk of microbial resistance. Therefore, it is still controversial whether the routine prescription of systemic antibiotics for minor dentoalveolar surgical procedures, such as removal of M3, is indicated [1,12].

Several studies have attempted to identify risk factors for developing postoperative complications after tooth removal to develop individualized preventive measures. Patient factors such as higher age, comorbidities, smoking, alcohol consumption, deeply impacted third molars, and procedure-related factors such as bone removal and tooth sectioning have been suggested to increase the risk of postoperative complications [6,7,13-15]. However, only a single study has focused on clarifying features and prehospital care in patients with severe infections after tooth removal. Furthermore, no studies have yet characterized the patients and surgical procedures that subsequently lead to the development of severe odontogenic infections after tooth removal [16].

The aim of this retrospective cohort study is, therefore, to characterize patients hospitalized with severe odontogenic infection after tooth removal in terms of general health, dental status, and history of dental treatment to identify prognostic factors and preventive measurement to avoid development and spread of infection. The hypothesis is that patients requiring hospitalization due to infections after tooth extraction are characterized by the presence of comorbidities, pre-existing infection in the tissues surrounding the tooth at the time of removal, complex angulation and/or position of the removed tooth, complicated surgical procedures, and lack of antibiotic prophylaxis.

MATERIAL AND METHODS

Hospital records of 384 patients hospitalized with severe odontogenic infections were retrieved as a part of a prior cross-sectional study [17]. Patients from this study who, immediately prior to hospitalization, underwent tooth removal were identified. The teeth were removed in private practice either by a general dental practitioner (GDP) or an oral and maxillofacial surgeon. All identified patients were contacted through the national digital mailbox - e-Boks® (E-Boks Group; Copenhagen, Denmark), and by phone to obtain informed consent to collect dental records from their GDP. All patients with the International Classification of Diseases, Tenth Revision (ICD-10) diagnosis code DK122 (odontogenic abscess or phlegmone) hospitalized for at least one night and that had a tooth removed immediately before the hospitalization were potentially eligible for the study. Mainly patients with abscess and phlegmone were assigned the ICD-10 code DK122, but also patients with cervicofacial cellulitis and odontogenic necrotizing soft tissue infections were included. Patients under the age of 18 years, patients who had died after the hospitalization, and patients hospitalized because of infection in relation to osteosynthesis materials, infection with an endodontic origin, and pericoronitis were excluded.

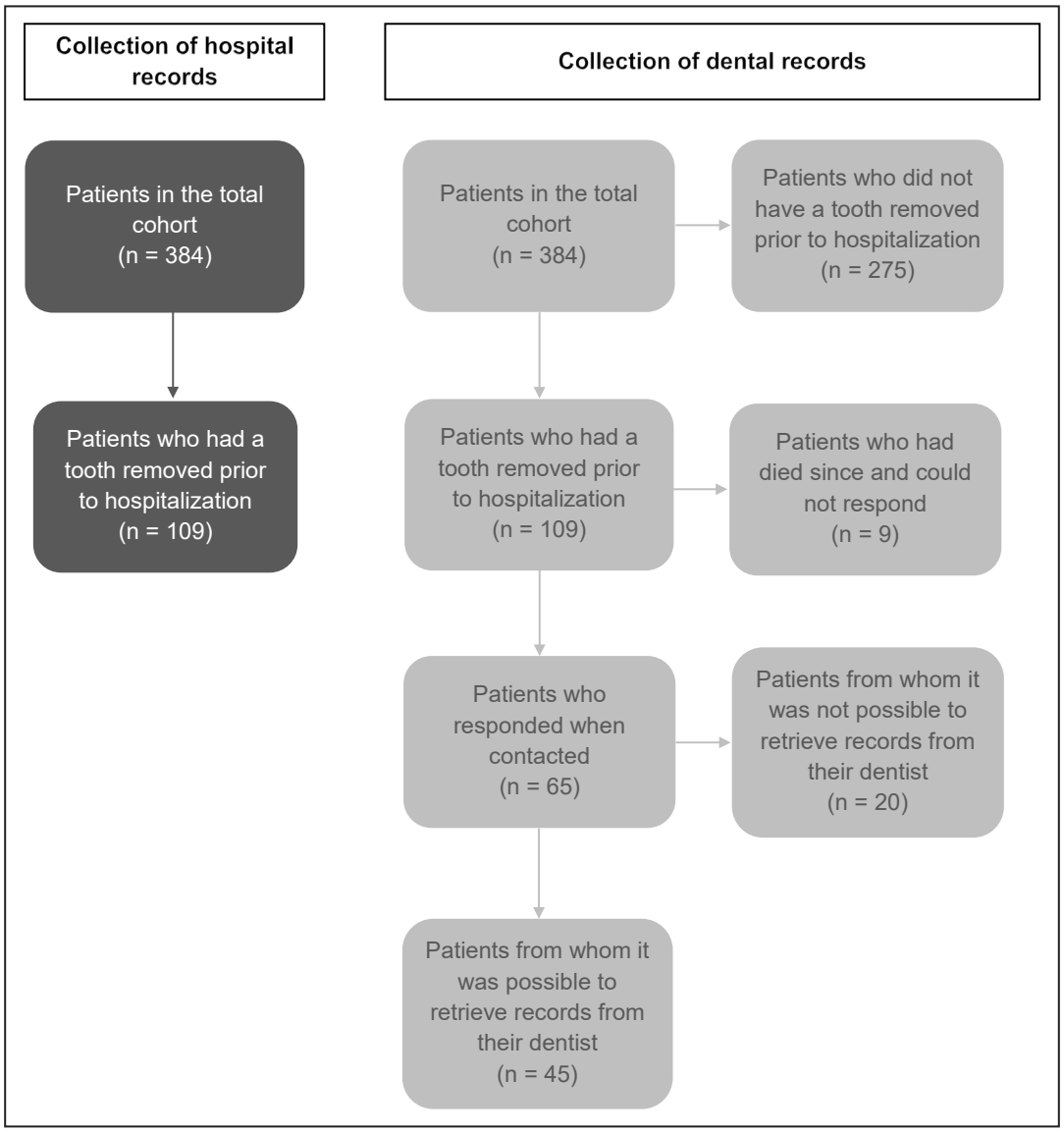

Figure 1. Selection of patients.

The selection of patients is illustrated in Figure 1.

Patients hospitalized at the Department of Oral and Maxillofacial Surgery, Copenhagen University Hospital, Denmark, from November 1st, 2012, until December 31st, 2019 with severe odontogenic infections after tooth removal in private practice. A license to perform the study was granted by The Danish Patient Safety Authority (No. 3-3013-2349/1) and a permission to store and handle the data was provided by the Capital Region at Knowledge Center for Data Reviews (approval no: P-2019-841). All included patients gave their informed consent to collecting data from their dental records.

Data collection from hospital records

All patients hospitalized with severe odontogenic infections after tooth removal in private practice contributed with demographic and anamnestic data as well as data from the course of treatment collected from the hospital records. Demographic data recorded included age and sex assigned at birth. Anamnestic data included comorbidities, medication, allergies, smoking, and alcohol consumption. Preadmission variables included the type of tooth removed and administration of antibiotics before hospitalization. Variables from the course of treatment included level of c-reactive protein (CRP) at admission, white blood cell counts at admission, number of surgeries during hospitalization, year of hospitalization, and length of stay (LOS).

Data collection from dental records

Patients from whom dental records could be obtained contributed with preoperative data including indication for tooth removal (prophylactic/

pathologic condition), subjective symptoms on the day of surgery, history of previous episodes with subjective symptoms, administration of prophylactic antibiotics, and the surgical experience of the surgeon (GDP or certified oral and maxillofacial surgeon). Intraoperative variables included type of intervention (simple extraction/surgical removal), need for osteotomy, and tooth sectioning. A surgical removal was recorded when a minimum of one suture had been placed at the end of the procedure.

Based on the preoperative radiographs the type of tooth was recorded. In the case of M3 removal, the tooth angulation and position were categorized according to the classifications of Pell and Gregory [18] and Winter [19].

Statistical analysis

All data were registered in a standardized web-based case report form using Research Electronic Data Capture (REDCap) v14.1.2 (Vanderbilt University; Nashville, Tennessee, USA). The statistical analysis was conducted in the software package SPSS® Statistics version 28.0 (IBM Corp.; Armonk, New York, USA). Chi-square and Fisher's exact test were used to test differences in the variables between patients with or without a tooth extraction preceding hospitalization and to test a potential difference in the variables between the patients with or without obtained dental records.

Age was grouped into the category < 25 years and ≥ 25 years, year of hospitalization were grouped into before and after August 2016. The LOS was grouped into ≤ 3 or > 3 days, indication for removal was grouped into the categories of prophylactic or therapeutic removal due to a pathologic condition. $P < 0.05$ was considered statistically significant.

RESULTS

From the total cohort of 384 patients [17], a total of 109 patients, 61 females (56%) and 48 males (44%) with a mean age of 42.8 (SD 19.6) years (range 18 to 93) fulfilled the inclusion criteria (Figure 1). The mean LOS was 4.4 nights (SD 5.2 nights) (range 1 to 35 nights) and the average CRP at hospitalization was 141 (SD 109) mg/L (range 1 to 604). A total of 31 patients (30%) had one or more comorbidities such as diabetes, osteoporosis, cardiovascular diseases, pulmonary diseases, or autoimmune diseases, and 45 (41%) were medicated (antibiotics and analgesics excluded), with a mean number of medications 1.7 (SD 3.3) (range 0 to 17). Culture and sensitivity were tested on perioperative pus samples from all patients during incision and drainage of the abscess. From these samples, it was found that 53 patients (67%) showed antibiotic resistance to one or more antibiotic drugs.

A comparison of demographics and data from medical records of patients with and without tooth removal before hospitalization is presented in Table 1. In brief, smoking ($P = 0.009$) and the presence of one or more comorbidities ($P = 0.02$) were significantly more prevalent in the group of patients hospitalized with infections that were not related to tooth removals.

Table 1. Comparison of medical records from patients with or without tooth removal prior to hospitalization

Variables		Patients without a tooth removed (n = 275)		Patients with tooth removed (n = 109)		P-value
		N	%	N	%	
Sex assigned at birth	Female	141	51.3	61	56	0.407
	Male	134	48.7	48	44	
Age, group	< 25 years	40	14.5	17	15.6	0.794
	≥ 25 years	235	85.5	92	84.4	
Comorbidities (n = 370[b])	No	149	56	72	69.2	0.02[a]
	≤ 1	117	44	32	30.8	
Smoking (n = 292[c])	No	106	50.7	56	67.5	0.009[a]
	Yes	103	49.3	27	32.5	
Alcohol consumption (n = 286[d])	No	74	35.7	29	36.7	0.88
	Yes	133	64.3	50	63.3	

[a]Statistically significant difference at $P < 0.05$ (Pearson's chi-squared test).
[b]267 without tooth removal and 103 with tooth removal.
[c]209 without tooth removal and 83 with tooth removal.
[d]207 without tooth removal and 79 with tooth removal.

Table 2. Differences in demographics and anamnestic information from medical records between patients with a mandibular third molar (M3) or another tooth removed prior to hospitalization

	All patients (n = 109)		M3 removed (n = 63)		Another tooth removed (n = 46)		P-value
	N	%	N	%	N	%	
Female	61	56	38	60.3	23	50	0.284
Male	48	44	25	39.7	23	50	0.331
Age ≥ 25 years	92	84.4	48	76.2	44	95.7	0.006[a]
Comorbidity (n = 104)	32	30.8	11	18	21	46.7	0.002[a]
Medication	45	41.3	21	33.3	24	52.2	0.048[a]
Hospitalized after August 31st, 2016	56	51.4	40	63	16	34.8	0.003[a]
Length of stay > 3 days	39	35.8	17	27	22	47.8	0.025[a]

[a]Statistically significant difference at P < 0.05 (Pearson's chi-squared test).

Of the 109 included patients, 92 (84%) had a mandibular molar removed, of which 63 (58%) were M3. Demographics and data from medical records of patients with tooth removal before hospitalization are presented in Table 2, categorized into removal of "M3" and "another tooth", respectively. In general, patients who had a M3 removed were significantly younger (P = 0.006), did not have any comorbidities (P = 0.002), and had a shorter LOS (P = 0.025) compared to the group who had another tooth removed. There was also a significant difference in the year of hospitalization (before and after 2016), showing a significant difference in the number of M3 (Table 2).

It was possible to obtain dental records from 45 (41%) of the 109 included patients (Figure 1). M3 (n = 28, 62%) was the most frequently removed tooth in this group of patients. In 34 patients (75.6%), the indication for tooth removal was pathological conditions, i.e., dental decay, apical periodontitis, pericoronitis, or periodontitis (Table 3). There were 32 out of 45 patients (71%) with a history of symptoms from the removed tooth. One patient (2.2%) received prophylactic preoperative antibiotics. Five patients (11.1%) received postoperative antibiotics targeting pre-existing infections within the designated anatomical area (Table 3).

Pell and Gregory and Winter's classification of the M3 positions is presented in Table 3. Eleven out of 28 (39%) of the M3 were categorized as a combination of impaction Level B and Class 2 related to the mandibular ramus. There were three out of 28 (11%) with an impaction Level C, and two out of 28 (7%) with a ramus relation Class 3, and no dentist or surgeon documented intraoperative complications (Table 3).

A comparison of data from dental records of patients with a M3 and patients with another tooth removed before hospitalization are presented in Table 4.

Table 3. Data from dental records

		N	%
Preoperative information (n = 45)			
Sex assigned at birth	Female	25	55.6
	Male	20	44.4
Age	< 25 years	11	24.4
	≥ 25 years	34	75.6
Indication for removal	Prophylactic	11	24.4
	Pathologic condition	34	75.6
Prophylactic antibiotics one hour before surgery	No	44	97.8
	Yes	1	2.2
Postoperative antibiotic administrated	No	40	88.9
	Yes	5	11.1
Surgical experience	Certified OMFS	9	20
	GDP	36	80
Position of M3 (n = 28)			
Angulation	Distoangular	10	35.7
	Vertical	9	32.1
	Horizontal	5	17.9
	Mesioangular	4	14.3
Impaction level	Level A	9	32.1
	Level B	16	57.1
	Level C	3	10.7
Relation to ramus	Class I	10	35.7
	Class II	13	46.4
	Class III	2	7.1
	Missing information	3	10.7
Treatment at dentist (n = 45)			
Intervention at the dentist	Surgical removal	32	71.1
	Simple extraction	13	28.9
Removal of bone	No	14	31.1
	Yes	29	64.4
	Missing information	2	4.4
Sectioning of tooth	Yes	19	42.2
	No	22	48.9
	Missing information	4	8.9

OMFS = oral and maxillofacial surgeon; GDP = general dental practitioner; M3 = mandibular third molar.

Table 4. Data from dental records grouped according to removal of mandibular third molar (M3) or another tooth

	All patients (n = 45)		M3 removed (n = 28)		Another tooth removed (n = 17)		P-value
	N	%	N	%	N	%	
Female	25	55.6	17	60.7	8	47.1	0.371
Male	20	44.4	11	39.3	9	52.9	0.537
Age ≥ 25 years	34	75.6	19	67.9	15	88.2	0.123
Surgical removal	32	71.1	28	100	4	23.5	< 0.001[a]
Removal of bone (n = 43)	29	67.4	26	96.3	3	18.8	< 0.001[a]
Sectioning of tooth (n = 41)	22	53.7	21	80.8	1	6.7	< 0.001[a]

[a]Statistically significant difference at P < 0.05 (Pearson's chi-squared test).

A statistically significant difference was observed for patients hospitalized after a tooth removing surgery (P < 0.001). This was also the case where osteotomy (P < 0.001) and/or tooth sectioning during the surgery had been performed (P < 0.001) (Table 4).

A drop-out analysis was made between responders and non-responders. Of the 100 patients contacted, 65 patients (65%) responded. The group that did not respond was significantly older (≥ 25 years) (P = 0.042) and were on one or more types of daily medication (P = 0.01).

DISCUSSION

Patients hospitalized with an infection after tooth removal were characterized by an age > 25 years, had M3 removed, and did not receive prophylactic antibiotics in relation to the tooth removal. In addition, it was observed that the majority of teeth were removed therapeutically and not prophylactically.

The mean age of the patients who had a tooth removed was reported to be 42.8 years, and 84% of the patients were over 24 years old. In the year 2000, the National Institute for Health and Clinical Excellence (NICE) in the UK published new guidelines for the extraction of wisdom teeth where it was recommended to discontinue prophylactic removal of pathology-free M3's [20]. This resulted in an immediate drop in the number of third molar extractions. However, after a few years, the number had stabilized at the same level as before the revised guidelines; only the mean age of the patients had increased from 25 years in 2000 to 32 years in 2010 [21]. The dilemma of removing versus retaining asymptomatic M3 is frequently debated in the literature, and there is no clear evidence or consensus as to whether asymptomatic third molars should be retained or removed [22]. Complications can arise due to both approaches; however, the risk of postoperative complications after the removal of M3 has been reported to increase with age [23]. The ability to recover from surgical interventions diminishes with increasing age, and the pathologic conditions within the dental tissue and tissues surrounding the tooth can develop over more years [24,25]. Furthermore, this study showed that 31% (n = 32) of the patients had comorbidities, which accumulate with age and can significantly influence the recovery process from infections. Conditions such as diabetes, cardiovascular disease, immunodeficiency disorders, and chronic respiratory diseases have been shown to impair immune responses and healing and thereby increase the risk of infection [26].

In this study, 33% of the patients were smokers, a prevalence slightly exceeding that of previous studies [7,16]. However, the rate of smokers was lower compared to the remaining cohort of patients hospitalized with odontogenic infections (64%). This is noteworthy considering the widely acknowledged adverse effects of smoking on wound healing and the elevated risk of post-surgical complications [27].

Epidemiological studies document the most common position of retained M3's to be mesioangular which is speculated to be due to natural growth patterns and often limited space in the mandible [9,28]. In the present study, M3's removed from patients who developed a severe infection afterwards had most frequently a distoangular angulation (36%), and only 4 (14%) out of 28 removed M3's had a mesioangular position. It is well documented that distoangular and deep impacted M3's are more complex to remove with an increased risk of complications [29]. It may, therefore, be speculated that the position of the M3 and the difficulty of their removal have an impact on the higher risk of developing severe postoperative infectious complications.

Among the participants in the study, one patient (2%) received prophylactic antibiotics one hour before the removal, and five patients (11%) were prescribed antibiotics immediately after the surgery.

These findings align with the national clinical guidelines for prescription of antibiotics issued by the Health Authorities in Denmark in August 2016 [30]. According to these guidelines, routine administration of prophylactic antibiotics in relation to surgical tooth removal is not recommended. Interestingly, the distribution of patients hospitalized with odontogenic infections differed before and after August 31st, 2016, where a statistically significant larger proportion of patients were hospitalized with infections after M3 removal after August 31st, 2016 (P = 0.003). A plausible explanation for this trend could be that many dentists discontinued the use of prophylactic antibiotics before surgical removals after the introduction of the guidelines, and most of the teeth that need to be surgically removed are M3's. While some studies have shown that a single dose of prophylactic antibiotics can reduce the risk of postoperative infections [31-33], others have presented contrasting results [34-36]. Extensive research on prophylactic antibiotics for surgical tooth removal faces challenges due to heterogeneity between study populations and designs, challenging direct comparison of definite conclusions on the effect of pre-operative prophylactic antibiotics [1]. Furthermore, the studies have primarily focused on antibiotic prophylaxis in association with the removal of M3 [1]. In contrast, in this study, 42% of the patients had another tooth removed before the hospitalization. These findings raise questions about the use of antibiotics during surgical tooth removal, and more research in the area would be beneficial. It may be speculated that a single prophylactic dose of antibiotics before removal of the teeth could have prevented the development of some of the severe infections needing hospitalization in the present cohort of patients.

The retrospective design of this study holds several limitations. Among these was accurate and detailed descriptions, and information from the hospital records and dental records was, in some cases, deficient. Not all variables of interest could be analysed due to a lack of sufficient data. Another limitation was the low patient response rate, causing a potential ascertainment bias because of the possibility of an unintended bias in the size and composition of the patient group. However, the study provided a relatively large consecutive cohort of patients hospitalized with a severe odontogenic infection that could all be accounted for and included in the analysis. However, the collection of dental records depended on response and consent from patients, resulting in less available data on the patients' treatment before hospitalization.

CONCLUSIONS

The findings of the present study indicate that patients developing severe infections after tooth removal, necessitating hospitalization, are characterized by extraction of mandibular third molars, presence of pathologic conditions related to the removed teeth, and no administration of prophylactic antibiotics. Those hospitalized after removal of mandibular third molars are typically aged ≥ 25 years. Future studies should preferably be designed as case-control studies to identify risk factors for the development of severe infections after tooth removal.

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REFERENCES

1. Lodi G, Azzi L, Varoni EM, Pentenero M, Del Fabbro M, Carrassi A, Sardella A, Manfredi M. Antibiotics to prevent complications following tooth extractions. Cochrane Database Syst Rev. 2021 Feb 24;2(2):CD003811. [Medline: 33624847] [PMC free article: 8094158] [doi: 10.1002/14651858.CD003811.pub3]
2. Seppänen L, Rautemaa R, Lindqvist C, Lauhio A. Changing clinical features of odontogenic maxillofacial infections. Clin Oral Investig. 2010 Aug;14(4):459-65. [Medline: 19449042] [doi: 10.1007/s00784-009-0281-5]
3. Gore MR. Odontogenic necrotizing fasciitis: a systematic review of the literature. BMC Ear Nose Throat Disord. 2018 Aug 15;18:14. [Medline: 30127662] [PMC free article: 6094465] [doi: 10.1186/s12901-018-0059-y]
4. Moazzam AA, Rajagopal SM, Sedghizadeh PP, Zada G, Habibian M. Intracranial bacterial infections of oral origin. J Clin Neurosci. 2015 May;22(5):800-6. [Medline: 25800939] [doi: 10.1016/j.jocn.2014.11.015]
5. Jespersen FVB, Hansen SU, Jensen SS, Omland LH, Helweg-Larsen J, Bjarnsholt T, Nielsen CH, Ziebell M, Bodilsen J, Markvart M. Cerebral abscesses with odontogenic origin: a population-based cohort study. Clin Oral Investig. 2023 Jul;27(7):3639-3648. [Medline: 37002439] [PMC free article: 10329578] [doi: 10.1007/s00784-023-04976-6]

6. Pham Dang N, Delbet-Dupas C, Mulliez A, Devoize L, Dallel R, Barthélémy I. Five Predictors Affecting the Prognosis of Patients with Severe Odontogenic Infections. Int J Environ Res Public Health. 2020 Nov 30;17(23):8917. [Medline: 33266250] [PMC free article: 7730806] [doi: 10.3390/ijerph17238917]
7. Furuholm J, Rautaporras N, Uittamo J, Saloniemi M, Snäll J. Health status in patients hospitalised for severe odontogenic infections. Acta Odontol Scand. 2021 Aug;79(6):436-442. [Medline: 33502919] [doi: 10.1080/00016357.2021.1876916]
8. Flynn TR, Shanti RM, Levi MH, Adamo AK, Kraut RA, Trieger N. Severe odontogenic infections, part 1: prospective report. J Oral Maxillofac Surg. 2006 Jul;64(7):1093-103. [Medline: 16781343] [doi: 10.1016/j.joms.2006.03.015]
9. Hounsome J, Pilkington G, Mahon J, Boland A, Beale S, Kotas E, Renton T, Dickson R. Prophylactic removal of impacted mandibular third molars: a systematic review and economic evaluation. Health Technol Assess. 2020 Jun;24(30):1-116. [Medline: 32589125] [PMC free article: 7336222] [doi: 10.3310/hta24300]
10. Vranckx M, Fieuws S, Jacobs R, Politis C. Surgical experience and patient morbidity after third molar removal. J Stomatol Oral Maxillofac Surg. 2022 Jun;123(3):297-302. [Medline: 34260984] [doi: 10.1016/j.jormas.2021.07.004]
11. Ramos E, Santamaría J, Santamaría G, Barbier L, Arteagoitia I. Do systemic antibiotics prevent dry socket and infection after third molar extraction? A systematic review and meta-analysis. Oral Surg Oral Med Oral Pathol Oral Radiol. 2016 Oct;122(4):403-25. [Medline: 27499028] [doi: 10.1016/j.oooo.2016.04.016]
12. Chugh A, Patnana AK, Kumar P, Chugh VK, Khera D, Singh S. Critical analysis of methodological quality of systematic reviews and meta-analysis of antibiotics in third molar surgeries using AMSTAR 2. J Oral Biol Craniofac Res. 2020 Oct-Dec;10(4):441-449. [Medline: 32884898] [PMC free article: 7453117] [doi: 10.1016/j.jobcr.2020.07.011]
13. Blondeau F, Daniel NG. Extraction of impacted mandibular third molars: postoperative complications and their risk factors. J Can Dent Assoc. 2007 May;73(4):325. [Medline: 17484797]
14. Benediktsdóttir IS, Wenzel A, Petersen JK, Hintze H. Mandibular third molar removal: risk indicators for extended operation time, postoperative pain, and complications. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2004 Apr;97(4):438-46. [Medline: 15088029] [doi: 10.1016/j.tripleo.2003.10.018]
15. Bui CH, Seldin EB, Dodson TB. Types, frequencies, and risk factors for complications after third molar extraction. J Oral Maxillofac Surg. 2003 Dec;61(12):1379-89. [Medline: 14663801] [doi: 10.1016/j.joms.2003.04.001]
16. Rautaporras N, Uittamo J, Furuholm J, Snäll J. Severe infections after teeth removal - are we doing enough in preventing them? J Clin Exp Dent. 2022 Mar 1;14(3):e254-e262. [Medline: 35317298] [PMC free article: 8916597] [doi: 10.4317/jced.59314]
17. Søndenbroe R, Markvart M, Cort ID, Fritz BG, Nielsen CH, Bjarnsholt T, Werner Møller Andersen S, Storgård Jensen S. Patients with severe odontogenic infections receive insufficient dental treatment before hospitalization - a retrospective cross-sectional study. Acta Odontol Scand. 2024 Dec 20;83:702-711. [Medline: 39704696] [PMC free article: 11707688] [doi: 10.2340/aos.v83.42371]
18. Pell GJ, Gregory GT. Impacted mandibular third molars: Classification and modified techniques for removal. Dent Digest. 1933 Sep;39(9):330-8.
19. Winter GB. Principles of exodontia as applied to the impacted mandibular third molar; a complete treatise on the operative technic with clinical diagnoses and radiographic interpretations. St. Louis, Mo.: American medical Book Company; 1926.
20. National Institute for Health and Care Excellence (NICE). Guidance on the Extraction of Wisdom Teeth (TA1). 27 March 2000. [URL: www.nice.org.uk/guidance/ta1]
21. McArdle LW, Renton T. The effects of NICE guidelines on the management of third molar teeth. Br Dent J. 2012 Sep;213(5):E8. [Medline: 22955790] [doi: 10.1038/sj.bdj.2012.780]
22. Ghaeminia H, Perry J, Nienhuijs ME, Toedtling V, Tummers M, Hoppenreijs 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 Aug 31;(8):CD003879. Update in: Cochrane Database Syst Rev. 2020 May 4;5:CD003879. [Medline: 27578151] [doi: 10.1002/14651858.CD003879.pub4]
23. Vranckx M, Fieuws S, Jacobs R, Politis C. Prophylactic Vs. Symptomatic Third Molar Removal: Effects On Patient Postoperative Morbidity. J Evid Based Dent Pract. 2021 Sep;21(3):101582. [Medline: 34479679] [doi: 10.1016/j.jebdp.2021.101582]
24. Vandeplas C, Vranckx M, Hekner D, Politis C, Jacobs R. Does Retaining Third Molars Result in the Development of Pathology Over Time? A Systematic Review. J Oral Maxillofac Surg. 2020 Nov;78(11):1892-1908. [Medline: 32681826] [doi: 10.1016/j.joms.2020.06.014]
25. Ventä I, Kylätie E, Hiltunen K. Pathology related to third molars in the elderly persons. Clin Oral Investig. 2015 Nov;19(8):1785-9. [Medline: 25592154] [doi: 10.1007/s00784-014-1395-y]
26. Holmstrup P, Damgaard C, Olsen I, Klinge B, Flyvbjerg A, Nielsen CH, Hansen PR. Comorbidity of periodontal disease: two sides of the same coin? An introduction for the clinician. J Oral Microbiol. 2017 Jun 14;9(1):1332710. [Medline: 28748036] [PMC free article: 5508374] [doi: 10.1080/20002297.2017.1332710]
27. Fan Chiang YH, Lee YW, Lam F, Liao CC, Chang CC, Lin CS. Smoking increases the risk of postoperative wound complications: A propensity score-matched cohort study. Int Wound J. 2023 Feb;20(2):391-402. [Medline: 35808947] [PMC free article: 9885463] [doi: 10.1111/iwj.13887]

28. Deshpande P, V Guledgud M, Patil K. Proximity of impacted mandibular third molars to the inferior alveolar canal and its radiographic predictors: a panoramic radiographic study. J Maxillofac Oral Surg. 2013 Jun;12(2):145-51. [Medline: 24431832] [PMC free article: 3681992] [doi: 10.1007/s12663-012-0409-z]
29. Freudlsperger C, Deiss T, Bodem J, Engel M, Hoffmann J. Influence of lower third molar anatomic position on postoperative inflammatory complications. J Oral Maxillofac Surg. 2012 Jun;70(6):1280-5. [Medline: 22310456] [doi: 10.1016/j.joms.2011.12.014]
30. de Thurah AL, Klausen B, Helm CD, Jepsen JF, Geismar K, Sekretariat (2016). National klinisk retningslinje for brug af antibiotika ved tandlægebehandling. 1.0 ed. Sundhedsstyrelsen, 2016. p. 69. Danish. [URL: https://www.sst.dk/da/udgivelser/2016/~/media/F5344E45B2FC48699B5C9F4D918DAB9B.ashx]
31. Ren YF, Malmstrom HS. Effectiveness of antibiotic prophylaxis in third molar surgery: a meta-analysis of randomized controlled clinical trials. J Oral Maxillofac Surg. 2007 Oct;65(10):1909-21. [Medline: 17884515] [doi: 10.1016/j.joms.2007.03.004]
32. Marcussen KB, Laulund AS, Jørgensen HL, Pinholt EM. A Systematic Review on Effect of Single-Dose Preoperative Antibiotics at Surgical Osteotomy Extraction of Lower Third Molars. J Oral Maxillofac Surg. 2016 Apr;74(4):693-703. [Medline: 26706491] [doi: 10.1016/j.joms.2015.11.017]
33. Falci SGM, Galvão EL, de Souza GM, Fernandes IA, Souza MRF, Al-Moraissi EA. Do antibiotics prevent infection after third molar surgery? A network meta-analysis. Int J Oral Maxillofac Surg. 2022 Sep;51(9):1226-1236. [Medline: 35527115] [doi: 10.1016/j.ijom.2022.04.001]
34. Siddiqi A, Morkel JA, Zafar S. Antibiotic prophylaxis in third molar surgery: A randomized double-blind placebo-controlled clinical trial using split-mouth technique. Int J Oral Maxillofac Surg. 2010 Feb;39(2):107-14. [Medline: 20117915] [doi: 10.1016/j.ijom.2009.12.014]
35. 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 Nov;53(9):796-804. [Medline: 26316017] [doi: 10.1016/j.bjoms.2015.06.013]
36. Milic T, Raidoo P, Gebauer D. Antibiotic prophylaxis in oral and maxillofacial surgery: a systematic review. Br J Oral Maxillofac Surg. 2021 Jul;59(6):633-642. [Medline: 34016464] [doi: 10.1016/j.bjoms.2020.09.020]

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