JOURNAL OF HEALTHCARE SCIENCES
Volume 2 Issue 8 2022, Article ID: JOHS2022000477
http://dx.doi.org/10.52533/JOHS.2022.2803
e-ISSN: 1658-8967

Review

Types, Causes and Complication Rates of Surgical Site Infection Post Maxillofacial Surgery

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Received: 26 July 2022, Accepted: 31 July 2022, Published: 3 August 2022

Abstract

Surgical site infection is a common post-operative complication that is encountered by surgeons and is associated with notable morbidity and mortality. Oral cavity due to the presence of bacteria is more prone to infection and diseases. Even performance under complete sterilization cannot prevent the infection in oral surgeries and the prevalence of infection rate accounts to approximately 10%-15%. Post-operatively oral and maxillofacial surgeries have increased chances of infection due to bacterial load and access to incision site during healing time. The purpose of this research is to review the available information about the types, causes and complication rates of surgical site infection post maxillofacial surgery. Various procedure and patient related factors in oral and maxillofacial surgery contribute to surgical site infections. Procedure's duration and invasiveness as well as bone equipment, biomaterial use, surgical technique, and sterilization practices are some of determinants of surgical site infection. Cellulitis, abscess, maxillary sinusitis, and osteomyelitis are all common postoperative infections. Surgical site infections often result in requirement of additional treatment procedures, prolongs the hospital stay and also negatively affects health of the patient. Efficient interventions by the oral and maxillofacial surgery teams can play a vital role in prevention of such infections. Although surgical site infection is an area of concern for oral and maxillofacial surgeons' literature on this aspect is quite scarce and very limited studies are available. In future, more clinical and comprehensive research can be beneficial.

Keywords: *surgical, site, infection, oral, maxillofacial, maxillofacial surgery*

Introduction

A surgical site infection develops in a wound caused by a surgical or post-operative procedure involving any cavity, bone, joint, tissue, or prosthetic. The organisms responsible are usually endemic to the patients and originate from the epidermis or any opening viscera. It is the most prevalent surgical complication, with high rates of morbidity and mortality, accounting for 17% of all healthcare-associated infections. Patients who acquire surgical site infections are five times more likely to be readmitted within 30 days and two times more likely to die as compared to the patients who do not acquire it. The duration of development of surgical site infection is within 30 days of the surgery, or 90 days in case of prosthesis implantation (1).

The clinical and financial burden of surgery increases dramatically when a surgical site infection develops. The immediate costs of the patient's lengthy hospitalization, diagnostic tests, and therapy add to the financial load of surgery. After contracting a surgical site infection, some patients may require reoperation, which is linked with significant additional costs. Surgical site infections have a significant negative impact on the physical and mental health of patients. Indirect costs linked with infection include higher patient morbidity, mortality, and lost earnings during recovery (2). The oral cavity has a significant bacterial load and is home to a variety of diseases. Despite the use of strict sterility measures, procedures that require immersion of the oral mucosa are considered clean contaminated surgeries with an infection rate of 10% to 15%. Surgical site infections can have a detrimental impact on treatment outcomes and necessitate further procedures to address (3, 4).

Surgical site infection prevalence might also be influenced by surgical characteristics. Since the mandible is less vascular than the maxilla and has a pooling of saliva and food debris that might occur around the incisions in the mandibular vestibule, bilateral sagittal split osteotomy and intraoral vertical ramus osteotomies are considered more prone to surgical site infections than Le Fort procedures. Bacteria in saliva can freely enter the incision sites within less time after surgery since the incisions take about 3 days to heal. Surgical site infection is also more likely to occur with longer procedures and multiple jaw surgeries (5). Due to the number of dense bacteria present in the oral cavity, as well as the high risk of bacterial infection in and after surgery, oral and maxillofacial surgical procedures and also head and neck surgeries are considered to be different from many other surgical features related to surgical infection and microbiological flora presence. In addition, due to the wide range of procedures and the management of soft and hard tissue, migration of the microorganism and penetration of the antibiotic agent into the affected area varies depending on the area of surgery and the pathology involved (6). Despite the importance of surgical site infection in field of maxillofacial surgery very limited studies are conducted and published in literature. The purpose of this research is to review the available information about the types, causes and complication rates of surgical site infection post maxillofacial surgery.

Methodology

This study is based on a comprehensive literature search conducted on May 19,2022, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about the types, causes and complication rates of surgical site infection post maxillofacial surgery. There were no restrictions on date, language, participant age, or type of publication.

Discussion

The high risk of surgical site infection can be associated to a variety of factors, including process and patient-related features. The procedural related factors include the procedure's duration and invasiveness and as well as bone equipment, biomaterial use, surgical technique, and sterilization practices. Age, nutritional condition, diabetes, smoking, obesity, concurrent infections or contaminations, and impaired immunological responses are all factors that affect patients. As a result, clinicians may become confused by the variety of surgical procedures and circumstances that may need the use of an antibiotic prophylaxis. As a general rule, prophylactic antibiotic prescriptions should be appropriate and weighted based on risk-benefit analysis, with the repercussions of unnecessary administrations on antimicrobial resistance increases in the general population taken into account (7).

http://dx.doi.org/10.52533/JOHS.2022.2803

Incidence of surgical site infection and complication rate

Dan reported that between 2007 and 2017, the incidence of surgical site infections in patients undergoing oral and maxillofacial surgery ranged from 0.33% to 0.93%, with a mean average of 0.71%; patients with high scores of the American Society of Anaesthesiologists, type of cut, duration of operation, and risk of surgery had a higher incidence and risk of site infection; the lowest incidence of surgical infection was in 2009. The incidence of surgical infections in patients with the American Society of Anaesthesiologists P1 points and the risk of grade 1 surgery dropped by more than 41% from 0.72% and 2.79% in 2011 to 0.42% and 1.54 % in 2017 (8). Ahn reported that following orthognathic surgery, postoperative sequelae such as open bite, infections, temporomandibular disorders, and recurrence have been noted. The risk of complications was 8.6% in the case of utilization of titanium plates, while in case of use of resorbable plates, it was 18.3% as per the assessment of complication rates according to the type of materials utilized in bone-fracture fixing. When resorbable plates were utilized, the incidence of complications was greater, especially for open bites (9). Findings of a systemic review in 2015 reported that nerve injury was the most common complication, with 50% of patients experiencing it, followed by temporomandibular disorder (14%), bleeding (9%), hearing problems (7%), infections accounted for 7% and relapse was observed in 4% (10). The results of a retrospective study in 2020 reported the incidence of surgical site infection after oral and maxillofacial surgery with vascularized fibular bone graft was 47.6%. Physical status grade II of the American Society of Anaesthesiologists and oral contamination were both significant risk factors for surgical infection (p-value = 0.004 and p-value = 0.031, respectively). The recipient surgical site infection group had a considerably longer hospital stay (p-value 0.001) (11).

Results of another retrospective study in 2016 revealed that a surgical site infection was diagnosed in 8% of patients. The mandible was the site of the majority of initial infections (62 %) and recurrent infections (78 %). After antibiotic treatment, 26% of patients who had surgical site infections had recurring infections. For 14% of patients, surgical site infections prompted hardware removal. Antibiotic side effects were observed in 4.2 %. Infection was most commonly detected 11 to 15 days after surgery. The average operation time for patients without a surgical site infection was 136 minutes, compared to 157 minutes for patients with a surgical site infection (odds ratio = 1.0051; 95 % confidence interval, 1.0026 to 1.0076; P.001). In 49.6% , wisdom teeth were removed. The rate of surgical site infections for multiple jaw surgeries (9.2%) was substantially greater than for single surgical procedures (5.3%) (P =.0013). Isolated Le Fort procedures, whether single piece or segmented (3.5 and 4.3 %, respectively; P =.98), had a considerably lower prevalence of infection than the overall prevalence (3.9%; P =.02). In comparison to the penicillin (14.3%; P.0001) and clindamycin (10.4 %; P.02) groups, the cefazolin group had a significantly reduced infection rate (6.2 %) (12). Posnick reported that overall, 0.5% of the osteotomy sites were infected, including 1 chin and 4 ramus surgical site infections. There were no complications with bone repair. Any subject who acquired an infection did not need their fixation hardware removed, 8% of the patients who received clindamycin prophylaxis had a surgical site infection, compared to 1% who received cefazolin. Three of the four sagittal ramus osteotomies, surgical site infections had an erupted and partially erupted mandibular third molar removed at the same time ($p<0.05$) (13).

Complications

Cellulitis, abscess, maxillary sinusitis, and osteomyelitis are all common postoperative infections. Aseptic methods, surgeons' great abilities, antibiotics, and a healthy blood flow into the oral and maxillofacial area all contribute to low rates of postoperative infections. Even if infections do arise, they can be completely healed with prompt detection and treatment (14). Postoperative hygiene is recommended for patients who have difficulty cleaning their mouths due to surgical injury, as the microflora in the oral cavity may contain germs that cause infection at the surgical site. Oral health care has recently been recognized as essential in reducing postoperative complications in patients with head and neck cancer, as well as in other cancer patients. In cases of oral surgery, competent oral health care can reduce the risk of complications after surgery (15).

The most common oral and maxillofacial surgical procedure is the surgical excision of lower third molars. It is frequently linked to significant postoperative problems with biological and social consequences. Dysesthesia, severe infection, fracture, dry socket, discomfort, edema, trismus, bleeding, oroantral communication, harm to adjacent teeth, and displaced teeth are among the complications. Longer surgical times, flaps with vertical incisions, extractions requiring removal of the bone, and extraction processes

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without tooth sectioning may all contribute to making the procedure more stressful and difficult, thus increasing the likelihood of postoperative problems (16). Alveolitis, bleeding, wound dehiscence, and fracturing of the bone cortices are some of the issues that might arise after a tooth extraction. Patients have reported problems ranging from 1% to 30.9 % despite the surgery being common. Alveolitis is the most common post-extraction complication, occurring in anywhere from 0% to 35% of all dental extractions. Other typical consequences include mandibular nerve paraesthesia, discomfort, and infections (17).

Karthik states that mandibulectomy is the most significant and also unique independent risk factor for surgical site infection. Both marginal and segmental mandibulectomy preserve individual and independent risk variables, according to intragroup analysis. In order to eradicate illness in close to or entering bone, mandibulectomy was recommended for a considerable number of buccal and to a lower extent tongue primary tumour. As a result, mandibulectomy should be designated a specific subset of oral cavity surgical resection that frequently covers many subsites (18). Surgical infection is one of the most serious complications following head and neck surgery of the tumour free-flap reconstructive, which accounts for more than 40% of all cases. This may be due to the fact that the surgery was performed in a surgical setting where oropharyngeal bacteria are easily found on the skin, mouth, and pharynx, classified as a phase II, and the site of a clean wound as per centre for disease control guidelines. Surgical site infection not only creates physical and mental distress for patient but deteriorates the health of the patient as well. Oral health care provided by dentists has been shown to reduce the incidence of oral infections, and is beneficial in reducing the incidence of surgical infection in patients following postoperative cancer and head and neck surgery. (19).

Orthognathic surgery is a frequent procedure of oral and maxillofacial surgery that comes with its own set of risks. Surgical site infections occur in 1.4% to 33.4% of orthognathic surgery patients. Surgical teams are concerned about them. Antibiotic use should be restricted to a bare minimum to avoid bacterial resistance, according to widely accepted good practice guidelines. Furthermore, no data on the severity and long-term effects of surgical site infection in orthognathic surgery can be found in the literature. Extensive cellulitis, osteomyelitis, pseudarthrosis, and interruptive mandibulectomy rates, in particular, are unclear (20). Literature is quite scarce regarding the studies of surgical site infection in post maxillofacial surgery. More comprehensive and clinical research in future can aid in highlighting the significance of topic and can contribute to establishment of better prevention strategies and guideline in this aspect.

Conclusion

Surgical site infections are an area of concern in oral maxillofacial surgery due to their hazardous effects in patients' health and hospital burden. An effective and competent team of oral and maxillofacial surgeons with early diagnosis and prompt treatment can significantly reduce the risk of infection at the surgical site and intervention at the preoperative level can also help prevent the incidence of infection. Research in future however can help in generating recommendations and guidelines for prevention and control of these infections.

Disclosure

Statement

The authors declare no conflict of interest.

Funding

No funding.

Ethical consideration

Non-applicable.

Data availability

Data that support the findings of this study are embedded within the manuscript.

Authors' contribution

All authors contributed equally to the drafting, writing, sourcing, article screening and final proofreading of the manuscript.

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