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Possibilities of OMFS Infections and its Implications- An update

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ABSTRACT

Oral and maxillofacial surgical site infection (SSI) is a prevalent healthcare-associated illness (HCAI) that may add significant time and money to the recovery process for up to 10 percent of surgeries. New research and results should be evaluated for inclusion in recommendations to prevent SSIs. Antibiotic prophylaxis for clean surgery, pre-operative bathing/showering, and peri-operative oxygen supplementation to prevent SSIs are controversial. Antiseptic surgical dressings, post-operative negative pressure wound care and using chlorhexidine in alcohol as a skin preservative show promising results in preventing SSIs. Independent meta-analyses found that antimicrobial sutures lowered the incidence of SSI after most oral and maxillofacial surgeries, but wound guards had no effect. Oral and maxillofacial SSI is the most preventable HCAI, yet the rate at which it is occurring is increasing. It is important to include certain innovations in care bundles, while the additional study is needed for others, and compliance with care bundles must also be strengthened.

Keywords
Surgical sites; oral and maxillofacial surgery; surgical site infections; wound guards; pre-operative parameters.

INTRODUCTION

A surgical specialty known as oral and maxillofacial surgery focuses on facial reconstruction, facial trauma surgery, oral surgery, head and neck surgery, jaw surgery, facial aesthetic surgery, including cleft lip and cleft palate repair, and facial plastic surgery[1–3]. Oral and maxillofacial surgical site infections (SSIs) are the most prevalent kind of healthcare-associated infection (HCAI), with an estimated 6.4% (confidence interval [CI] 4.7-8.7) of patients affected (Health Protection Agency [HPA])[4]. The numbers are likely low, but infections caused by methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* (MRCD) are increasing[5]. Although SSIs are the most preventable HCAI , their prevalence is increasing, making them the most prevalent HCAI[6].

Care packages for preventing and treating SSIs, known as High Impact Interventions (HIIs), were provided by the UK Department of Health[7] based on a recommendation from the National Institute for Health and Care Excellence (NICE)[8]. Antibiotic prophylaxis, proper pre-operative hair removal, avoiding peri-operative hypothermia, and peri-operative blood glucose management in patients with diabetes are only a few of the HII bundle's recommendations supported by less than level-IA evidence. These guidelines were issued over five years ago; however, there is yet to be a public assessment of either compliance or success with them[9].

Surveillance is required following oral and maxillofacial surgery, although SSI data from 17 types of surgeries are used by the national SSI surveillance system (HPA)[10]. However, the real frequency of SSI is underestimated, and it varies widely by surgical specialization, recognized and validated classifications, and the breadth of post-operative monitoring[11,12]. 10-20% of surgical procedures have complications due to an SSI when careful post-discharge observation is performed[13–15]. Over a third of post-operative fatalities are linked to SSIs, varying in severity from a little wound discharge to death[16]. Extra hospital days, additional treatments, potential legal action, and other factors may significantly increase the overall cost to healthcare systems when an SSI is involved[17,18]. NICE evidence updates considering the studies released after the guidelines were issued that offer new data and technologies (NICE, 2013). Not all of these data have contributed to the existing body of evidence; some are appropriate for inclusion in guidelines and high-impact actions.

PRE-OPERATIVE WASHING AND BATHING

The importance of pre-operative washing and bathing with antiseptics in preventing oral and maxillofacial SSIs is debatable, but maintaining the surgical teams' and patients' personal cleanliness is important. The research, this database is based on, is on average more than 20 years old; thus, further new trials are required to shed light on the importance of pre-operative washing and bathing in preventing SSIs. Webster and Osborne (2012) meta-analyzed seven

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randomized controlled trials (RCTs) with 10,157 patients and concluded that pre-operative chlorhexidine showers or baths were no more beneficial than placebo, soap, or no cleaning[19]. No firm conclusions could be drawn on the ideal number of pre-operative showers, according to a comprehensive analysis of 10 research and 7,351 participants[20].

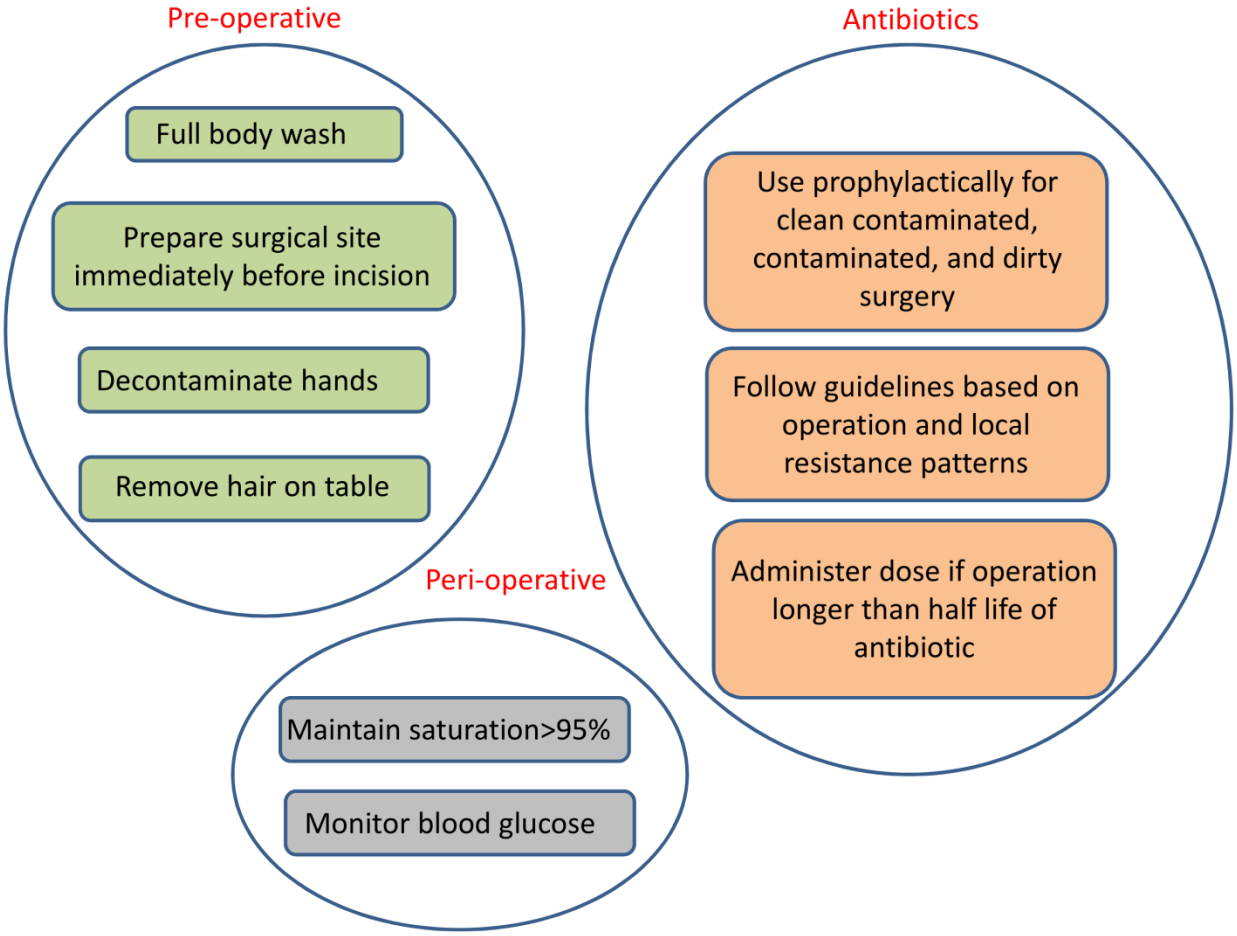

Figure 1. A schematic representation of guidelines in preventing oral and maxillofacial surgical site infections.

Another inconclusive systematic review looked at the effects of three different skin antiseptics (povidone-iodine, alcohol, and chlorhexidine) on patients, and the use of antiseptic-impregnated incise drapes, with a total of 9,520 patients[21]. There were methodological problems with these researches, and even while skin bioburden decreased, this did not correlate with the incidence of oral and maxillofacial SSI (inconsistencies in the formulation, potency, and use of antiseptics). Due to methodological diversity, small sample numbers, and inconsistent results, several studies did not qualify for inclusion in the meta-analysis.

PATIENT ANTISEPTIC SKIN PREPARATION

Pre-operative skin preparation with an antimicrobial is a standard practice. Five randomized, quasi-randomized, and cluster-randomized studies comprising 1,462 patients were included in a

Cochrane review[22] that examined various pre-operative skin preparations for reducing SSI following Caesarean surgery. The studies' heterogeneity and low patient numbers prevented additional conclusions, which is consistent with the findings of another analysis[23]. An RCT (n=849) comparing alcoholic 2% chlorhexidine to aqueous povidone-iodine skin preparation (Darouiche et al, 2010) was one example[24]. The chlorhexidine group considerably decreased SSIs (16.1% to 9.1%) compared to the aqueous antiseptic group (10% to 5.5%)[25]. It is presently unknown which antiseptic is best for preparing the skin before oral and maxillofacial surgical incision.

ANTIBIOTIC PROPHYLAXIS AFTER CLEAN ORAL AND MAXILLOFACIAL SURGERY

Lack of specific guidelines to use antibiotics for SSIs prevention lets dentists prescribe oral antibiotics most commonly to treat SSIs based on their personal experience and consideration[26,27]. This excessive prescription, more than 25% of the time, increases the risk of antimicrobial resistance (AMR) in the patients[26]. Antibiotic premedication for sterile procedures is still up for debate. There was a significant increase in oral and maxillofacial SSIs when antibiotic prophylaxis was used, from 3.1% to 4.5%, according to a Cochrane analysis of 17 RCTs including 7,843 patients who had open inguinal or femoral hernia surgery. However, there was no discernible difference in the infection rate after herniorrhaphy (mesh vs. no mesh)[28]. Prophylactic antibiotics considerably decreased the incidence of SSI (by nearly a quarter) in another Cochrane review[29], which looked at seven RCTs, including 1,945 patients after surgery. Some trials were too old, while others utilized antibiotics that were not appropriate for human use. In contrast, a recent RCT[30] with blinded participants revealed no significant difference. The usefulness of prophylactic antibiotics in sterile surgery is still unclear. Therefore, prophylactic antibiotics should be prescribed reasonably and weighted on the basis of a risk–benefit analysis[26]; and the danger of AMR and its accompanying costs must be considered.

NEGATIVE PRESSURE WOUND THERAPY

Healing, debridement, reduced exudates and odor, and enhanced quality of life are only some of the goals of negative pressure wound therapy (NPWT), a treatment modality utilized for chronic wounds[31,32]. Preventing oral and maxillofacial SSIs after high-risk surgery has also been successful. There is also some evidence that it is effective in treating complicated wounds[33]. Multiple research groups performed a retrospective study on patients who had surgery for intra-abdominal malignancies and found that patients with incisional NPWT had a lower incidence of SSIs than those who had conventional dressings[34–36]. NPWT decreased from 16% to 4% in a prospective study of obese individuals (Body mass index (BMI) ≥30) after median sternotomy for heart surgery[35].

Matatov *et al.* (2013) found that using portable NPWT devices reduced the rate of oral and maxillofacial SSIs after vascular surgery from 30% to 6%[34]. By using incisional NPWT, the rate of SSIs in patients following open colectomy was observed to be reduced by half, from 27.2% to

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12.5%, in another retrospective study[37]. Standard dressings were compared to NPWT in randomized multicenter research[37], and both were shown to reduce SSIs in patients with blunt, high-energy fractures of the lower leg. A study of ventral hernia surgery[38] indicated that NPWT did not reduce SSI following the repair of potentially contaminated and infected hernias or wound complications at a 12-month follow-up. Due to the low sample sizes in these first investigations, more robust RCTs and systematic reviews are required before NPWT may be suggested for lowering SSI risk.

PERI-OPERATIVE OXYGEN SUPPLEMENTATION

Having a hemoglobin saturation of more than 95% during surgery is a goal of optimal oxygenation procedures. The effectiveness of peri-operative oxygen supplementation in preventing SSIs was evaluated in a meta-analysis based on seven RCTs, including 2,728 participants[39]. Supplemental oxygen groups had a lower incidence of SSIs (15.5%) than the control group (17.5%). Further investigation is warranted, however, results from two subgroup studies indicated that there could be some advantages. Trial shortcomings included variations in antibiotic use, SSI definition, patient populations, and peri-operative oxygen supplementation duration.

ANTISEPTIC SURGICAL DRESSINGS

It is still being determined whether a transparent polyurethane or absorptive island dressing is preferable for incisional dressings following surgery or whether they are even essential. No evidence was found that dressings lowered SSI rates in a Cochrane review of 16 RCTs, including 2,578 patients[40]. These trials suffered from various methodological issues, including inconsistency, limited sample sizes, and shaky scientific rigor. However, research on the efficacy of antiseptic dressings in preventing oral and maxillofacial SSIs is scant. Despite this, a small RCT comprising 110 patients following colorectal surgery[41] demonstrated that silver nylon dressings reduced SSIs from 33% in controls to 13% in the silver nylon group. There were problems with the research like requirement of repeated medical visits of patients, and further proof is required before antiseptic dressings may be recommended.

WOUND GUARDS

A comprehensive evaluation and meta-analysis of wound protectors to prevent SSIs after open abdominal surgery was conducted[42]. The majority of the researches (10 RCTs, two controlled trials [CTs], 1,933 patients) were outdated, low-quality, and prone to bias. The same authors recently reported a RCT called ROSSINI that found wound edge protection devices were ineffective in preventing SSIs[43]. Another intriguing systematic investigation assessed the agreement of four popular definitions of SSI: (a) the Centers for Disease Control (CDC) 1992 definition, (b) the nosocomial infection national surveillance scheme (NINSS) modified version of the CDC definition, (c) the presence of pus, and (d) the ASEPSIS scoring technique, applied

to the same set of surgical wounds. After providing feedback to surgeons, the research saw a drop in infection rates in their own programme[44].

ANTIMICROBIAL SUTURES

The antiseptic triclosan may be efficiently delivered into tissues using synthetic absorbable sutures that have been impregnated or coated with an antibacterial agent, as demonstrated in the laboratory. Although initial clinical trials were faulty and underpowered, three independent systematic reviews and meta-analyses have shown sufficient evidence to support level 1A clinical usage. Antimicrobial sutures dramatically decreased SSIs by 30%, according to the first study[45], which included 17 RCTs comprising 3720 patients (CI 0.57 to 0.85). It has been shown that several researches needed to be more adequate because of their small sample sizes, inconsistent definitions, and inappropriate comparisons. A second study revealed a 27% decrease in SSIs after identifying 13 high-quality RCTs, including 3,568 patients (CI 0.59 to 0.91)[46]. In the third study, a meta-analysis by Daoud *et al.*, 2014, found that antimicrobial sutures reduced SSIs by 33%, and that the effect was significant in subsets of clean, clean-contaminated, and contaminated surgery[47].

NON-ANTIBIOTIC THERAPY

It has always been controversial to use antibiotic therapy for most oral surgical procedures. Therefore, using non-antibiotic measures to prevent, reduce or treat SSIs will be more beneficial. There are several such measures available[48]. There are reports that unidirectional vertical laminar airflow decreased the SSI rate by 50% in total hip arthroplasty (THA) and total knee arthroplasty (TKA)[48]. However, other studies have shown increased early SSI rate in others cases[49,50]. Preparation of the patient, staff and the surgical-site in the operation room contributes to SSI prevention[48,51].

DISCUSSION

Evidence-based medicine, which is based on systematic reviews and meta-analyses, is the source of information that is most trustworthy for the development of recommendations. When there are holes in knowledge, they need to be filled with recommendations that take into account things like operator experience, patient preferences, and evidence from less compelling cohort and non-comparative research. Even if many of the RCTs that are included in meta-analyses are of dubious scientific quality, this should still be taken into account when making recommendations.

It has been noted before[52] that much of the current research into SSI prevention involves a return to the use of antiseptics; this is timely considering the worldwide concern of rising antibiotic resistance and the lack of new antibiotic groups entering research trials[18]. Incorporating a number of treatments that have been shown to be effective into a single care package offers great potential because if they are administered with a high degree of adherence, they may have a synergistic effect and greatly reduce the incidence of oral and maxillofacial SSIs. A reduction in the occurrence of this potentially preventable HCAI, which is widespread, expensive, and causes considerable interruptions in healthcare, might be achieved via compliance with guidelines. On

the other hand, a poor degree of compliance with care packages could explain why SSI rates have remained unchanged.

Because antimicrobial sutures have been shown to minimize the risk of SSIs after a variety of surgical procedures, they need to be included in post-operative care packages. However, further research is required before it can be concluded that care packages should include antimicrobial wound dressings, post-operative negative pressure incisional wound therapy, and alcoholic skin preparation with a concentration of 2%. It was not shown that utilizing wound protectors lowered the risk of SSI. On the other hand, there is still some debate over the efficacy of pre-operative washing or bathing, antibacterial prophylaxis for clean, non-prosthetic surgery, and peri-operative oxygen supplementation. Several studies on non-antibiotic therapy to prevent or treat SSIs show a promising approach in SSTs prevention and treatment while simultaneously combating AMR.

In conclusion, SSIs prevention and treatment by several methods remain debatable, where some methods show decrease in SSIs on the other hand there is no effect on SSIs. Therefore, robust techniques are required to overcome SSIs.

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