Research

Decreasing Surgical Site Infections in Plastic Surgery: A Systematic Review and Meta-analysis of Level 1 Evidence

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Abstract

Background: Although many interventions are implemented to prevent surgical site infections (SSIs) in plastic surgery, their supporting evidence is inconsistent.

Objectives: The goal of this study was to assess the efficacy of methods for decreasing SSIs in plastic surgery.

Methods: A systematic review and meta-analysis were performed to compare the effects of SSI prevention methods. All the studies were assessed for quality of evidence according to the GRADE assessment.

Results: Fifty Level 1 randomized controlled trials were included. The most common interventions for preventing SSIs were antibiotic prophylaxis, showering, prepping, draping, and the use of dressings. Current evidence suggests that antibiotic prophylaxis is largely unnecessary and overused in many plastic surgical procedures, with the exception of head and neck oncologic, oral craniofacial, and traumatic hand surgeries.

Conclusions: Efficacy of antibiotic prophylaxis in plastic surgery is dependent on surgery type. There is a lack evidence that showering and prepping with chlorohexidine and povidone reduces SSIs.

Level of Evidence: 1

Risk

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Postoperative surgical site infections (SSIs) are defined as infections related to an operative procedure that occur at or near the surgical incision within 30 days of the procedure.[1] SSIs are a significant predictor of hospital readmissions and a major source of patient morbidity and mortality.[2-4] Moreover, SSIs can increase the length of hospital stays, contributing to patient burden and resulting in significant financial and resource costs to the healthcare system.[5-7] Reducing the incidence of SSIs may be particularly relevant in plastic surgery, due to the importance of the aesthetic surgical outcome.[8,9] Previous literature has shown that the development of SSIs in patients who had undergone elective plastic surgery is associated with an increased risk of psychological complications, such as depression and anxiety.[10] Moreover, SSIs resulting in localized deformity, scar, and/or asymmetry represented the most common reason for taking legal action against a plastic surgeon.[11]

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Many interventions have been proposed to help prevent SSIs following plastic surgery, but studies of their efficacy have yielded inconsistent results. For example, the use of prophylactic antibiotics has been widely debated in the literature.[12] Although frequently used, some experts question the true benefit of antibiotic prophylaxis across procedures in plastic surgery.[13,14] To further complicate manners, previous reviews on this subject reached contradicting conclusions, possibly due to their inclusion of studies with varying levels of evidence.[15,16] Because of the broad spectrum of practices to reduce SSIs and the large volume of studies with varying levels of evidence to support the use of these practices, there is a need for an updated and more comprehensive review of high-level evidence for reducing SSIs in plastic surgery.

The objectives of the current review were to qualitatively analyze evidence-based methods to prevent SSIs in plastic surgery and to quantitatively assess their respective pooled efficacy through meta-analyses. Due to the varying levels of evidence that different studies presented, we only included Level 1 evidence randomized controlled trials (RCTs) to inform their best-practice guidelines on the prevention of SSIs. Given the widespread use of antibiotic prophylaxis in plastic surgery to prevent SSIs, we hypothesize that antibiotic use is not justified in some of these contexts. We also hypothesize a paucity of high-level evidence to support most of the current practices. These guidelines will hopefully improve patient outcomes and lessen the risk of health and aesthetic complications in plastic surgery.

METHODS

Search Strategy and Study Quality Assessment

A systematic search of PubMed (National Library of Medicine, Bethesda, MD), Embase (Elsevier, Amsterdam, the Netherlands), and Cochrane Library databases (Wiley, Hoboken, NJ) was conducted from January 1975 up until February 2020 to retrieve evidence-based methods of SSI prevention and control. The initial search was conducted in February 2020 by one of the authors (H.E.). The search strategy used in PubMed was the following: ((“Infection Control”[Mesh]) OR (“Surgical Wound Infection”[Mesh]) OR (infection control)) AND ((“Surgery, Plastic”[Mesh]) OR (plastic surgery)) AND ((prevention) OR (reduction) OR (Control)). Other databases were searched for equivalent keywords following the same Boolean structure.

The current systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Appendix A). All search results were reviewed by 2 independent authors (H.E. and M.A.H.). Titles and abstracts of all nonduplicated articles were read and assessed for relevance based on the predefined inclusion and exclusion criteria stated below. The remaining articles underwent a full-text review. Any discrepancies between the 2 authors were resolved through a third author.

The inclusion criteria for this review were any peer-reviewed RCT on SSI prevention or control methods. Exclusion criteria included retrospective case control, cohort, case series/report, studies with fewer than 10 participants, studies that did not measure SSI as an outcome, studies on non–plastic surgery procedures, and basic science and animal studies. Moreover, this review excluded studies on burns and skin grafts due to the fact that the majority of such literature is retrospective in nature. Furthermore, studies that assessed protocols that involved more than 1 SSI control method without performing subanalysis were excluded. Articles not available in English or French were excluded. Finally, abstracts and non–full-text articles were also excluded.

Studies selected for the current systematic review and meta-analysis were critically appraised in accordance with the Grading of Recommendation, Assessment, Development, and Evaluation (GRADE) criteria.[17] To apply GRADE to the literature assessed in the current review, we utilized a validated checklist developed by Guyatt and colleagues that assesses the quality of evidence based on a numeric scale of 1 to 4, where 1 represents the lowest quality of evidence and 4 the highest.[17]

Data Collection and Data Synthesis

Data extracted from each study included country and year of study, SSI control method, number of patients in each group, average age of participants, surgical site and type, mean follow-up time, SSI rate, and other reported complications. Given the large publication date range in the studies identified, baseline SSI rates were determined between studies as a function of time. Additionally, given that baseline SSIs are shown to vary as a function of surgery type, this variable was also examined.[18] A qualitative review of all Level 1 evidence studies was conducted to help generate evidence-based recommendations and guidelines. Furthermore, when applicable, quantitative meta-analyses were performed to provide stronger evidence regarding the efficacy of the methods to reduce SSIs.

Statistical Analyses

The analysis of means between studies was conducted utilizing univariate analysis of variance (ANOVA) with rates of individual studies weighted according to sample size with a weighted least-squares regression model. To identify specific effects within the data, Tukey least-significant difference (LSD) post hoc tests were conducted. For all analyses, the mean was used as a measure of central tendency and standard deviation (SD) was used to represent the spread of data, with statistical significance reached at $P < 0.05$. Furthermore, we meta-analyzed studies according to their anatomic region, and performed subgroup analyses by treatment protocol to compare the effect of preoperative antibiotics vs placebo, postoperative antibiotics vs placebo, and combined preoperative and postoperative antibiotics vs placebo. The primary outcome was SSI. Estimates were pooled according to the DerSimonian and Laird random-effects models with inverse variance weighting to take into account the heterogeneity of the different populations.[19] Heterogeneity was quantitatively assessed with the I^2 statistic. The main outcome was reported as relative risk (RR) with its respective 95% CI and presented in forest plots. ANOVAs and post hoc tests were conducted with SPSS version 22 (IBM, Armonk, NY) and the meta-analyses were performed with Stata version 15.[20]

RESULTS

The initial search yielded 1965 articles, of which 120 were identified as duplicates. The remaining 1845 articles were screened against the inclusion/exclusion criteria based on titles and abstracts. In total, 237 articles were selected for full-text review, of which 50 Level 1 evidence randomized and prospective controlled trials dating from 1970 to 2020 assessing methods of SSI reduction were included in this review, the majority of which have high-level quality of evidence as per GRADE assessment (Figure 1; Supplemental Table 1).

Antibiotics

A total of 34 RCTs assessed the efficacy of antibiotic prophylaxis for preventing SSIs.[21-54] The year of publication of these studies ranged from 1973 to 2019 (within our study range of 1970 to 2020). The average SSI rate in individuals not treated with any antibiotics across all studies was 9.5%. The SSI rate in control groups varied as a function of decade of publication ($P = 0.004$). Tukey LSD post hoc analysis revealed that studies published in the 1970s possessed a higher baseline SSI rate across all surgery types ($P < 0.01$) (Figure 2A). The SSI rates in control participants also significantly varied as a function of the surgery type ($P < 0.01$), with head and neck oncologic surgeries being associated with the highest SSI rates compared with all other types ($P < 0.01$) (Figure 2B). There was no significant interaction between publication decade and surgery type ($P = 0.066$). In subsequent analyses, articles were not excluded based on publication date because this is not justified based on our exclusion criteria determined a priori. Analysis of heterogeneity is subsequently described in our statistical meta-analyses based on the relative risk reduction of SSI.

Hand Surgery

Twelve studies assessed the efficacy of antibiotic prophylaxis on upper extremity plastic surgery.[22,30,31,33,36,37,41,43-45,48,49] The most commonly used preoperative antibiotic was a β-lactamase penicillin-like antibiotic, given intravenously (IV) or orally, followed by a first-generation cephalosporin. Out of the 12 studies, only 2 studies showed a significant effect of antibiotic prophylaxis on SSIs for hand and upper extremity plastic surgery. Sloan et al demonstrated that preoperative and postoperative cephradine (a first-generation cephalosporin), or a 5-day course of postoperative cephradine alone, significantly reduced rates of SSIs in open fracture of the distal phalanx repairs from 30.0% to 0% ($P = 0.02$).[48] Of note, there was no significant difference between the group that received the postoperative cephradine alone and the group that received the preoperative and postoperative antibiotic, indicating that a single 5-day course of postoperative cephalosporin was sufficient to reduce SSI rates in this study. It is important to note that this study was limited by its small sample size of 83 (divided over 4 groups of participants).[48] Similarly, Platt et al demonstrated that preoperative flucloxacillin significantly reduced SSI rates in trauma/emergency hand laceration repair from 18.5% to 8.2% ($P = 0.0014$), but was not effective in elective hand surgery ($P = 0.5$).[44] The remaining 10 studies that assessed the efficacy of antibiotic prophylaxis in hand surgery showed similar results, demonstrating no significant effects of antibiotics, whether pre- or postoperative, on SSI rates (Supplemental Table 2).

Ten studies were included in the quantitative meta-analysis for hand surgery. Two studies were excluded from the meta-analysis because the RR could not be calculated due to 1 or more groups containing a frequency of 0. The overall heterogeneity for the hand and upper extremity surgery subset analysis was 2.6% ($I^2 = 21.9\%$, $P = 0.22$) (Figure 3). None of preoperative, postoperative, or combined pre- and postoperative antibiotics demonstrated a significant effect on rate of SSIs compared with placebo (RR: 0.78, 95% CI: 0.52-1.18; RR: 0.91, 95% CI: 0.60-1.38; RR: 0.58, 95% CI: 0.11-2.92, respectively).

Craniofacial Surgery

Seven RCTs assessed the efficacy of antibiotic prophylaxis on craniofacial surgery.[24,34,39,40,42,52,54] The most commonly used preoperative and postoperative antibiotics were cephalosporins and penicillin-like β-lactamase

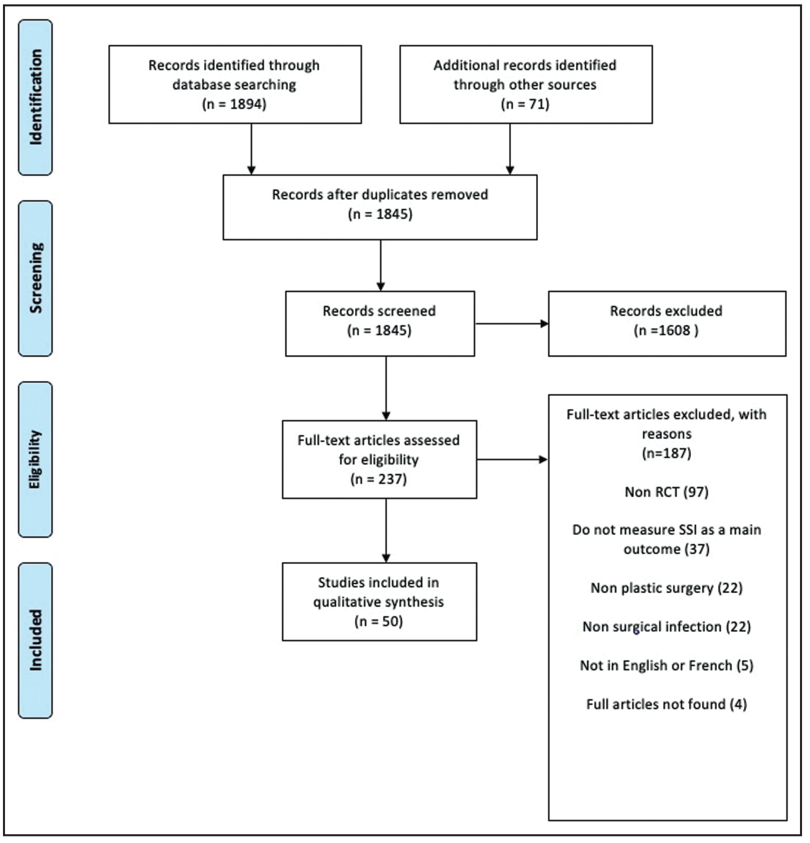

Figure 1. Search and screening process.

antibiotics, respectively. Three studies found a significant effect of antibiotics on rates of SSIs.[34,40,52] Specifically, 2 RCTs, with a small total sample size of 46 patients, demonstrated that preoperative antibiotics, regardless of the type (pheneticillin, amoxicillin, or cefuroxime), significantly decreased rates of SSIs in maxillofacial surgery (P < 0.05).[40,52] In contrast, only 1 RCT assessing the efficacy of preoperative antibiotics (cefuroxime) showed no significant difference in SSI in craniofacial surgery (elective septoplasty).[39] Three studies assessing the efficacy of postoperative antibiotics in multiple craniofacial elective and trauma surgeries with a total sample size of 1412 showed no significant effect of antibiotics on craniofacial surgery.[24,42,54] Finally, Chloe et al demonstrated a significant reduction in SSI rates in post–facial fracture repair when patients received a dose of IV cephalosporin pre- and postoperatively together (compared with no antibiotics) (Supplemental Table 3).[34] A meta-analysis of studies on SSI in craniofacial surgery was not feasible due to the low number of comparable studies.

Breast Surgery

Five RCTs assessed the efficacy of antibiotic prophylaxis on breast plastic surgery.[26,27,29,51,53] The most commonly used class of antibiotic pre- and postoperatively were cephalosporins. Although Vieira et al (n = 145) showed that preoperative cefazolin significantly reduced the incidence of SSIs from 13.9% to 4.1% (P = 0.039) in reduction mammoplasty,[29] Lewin et al (n = 325) showed no significant differences between patients who received preoperative antibiotics and controls (P = 0.54).[26] Moreover, 2 RCTs assessed the efficacy of pre- and postoperative antibiotic prophylaxis on reduction mammoplasty. Ahmadi et al showed, for a limited sample size of 50, that pre- and postoperative antibiotics combined demonstrated no significant reduction in rates of SSI compared with no antibiotics.[53] In contrast, Veiga-Filho et al showed a significant reduction is SSI rates in patients undergoing reduction mammoplasty who received pre- and postoperative antibiotics compared with patients who received no antibiotics (14.0% vs 2.0%; P = 0.03).[51] It is important to note that Viega-Filho et al extended the duration of postoperative antibiotics to 6 days whereas Ahmadi et al gave them for only 3 days. Finally, 1 RCT showed that there was no difference in rates of SSI between stopping antibiotics after 24 hours postoperatively compared with continuing them until drains are removed (19.4% vs 22.0%; P = 0.82) (Supplemental Table 4).[55] A meta-analysis of studies on SSI in breast surgery was not feasible due to the low number of comparable studies.

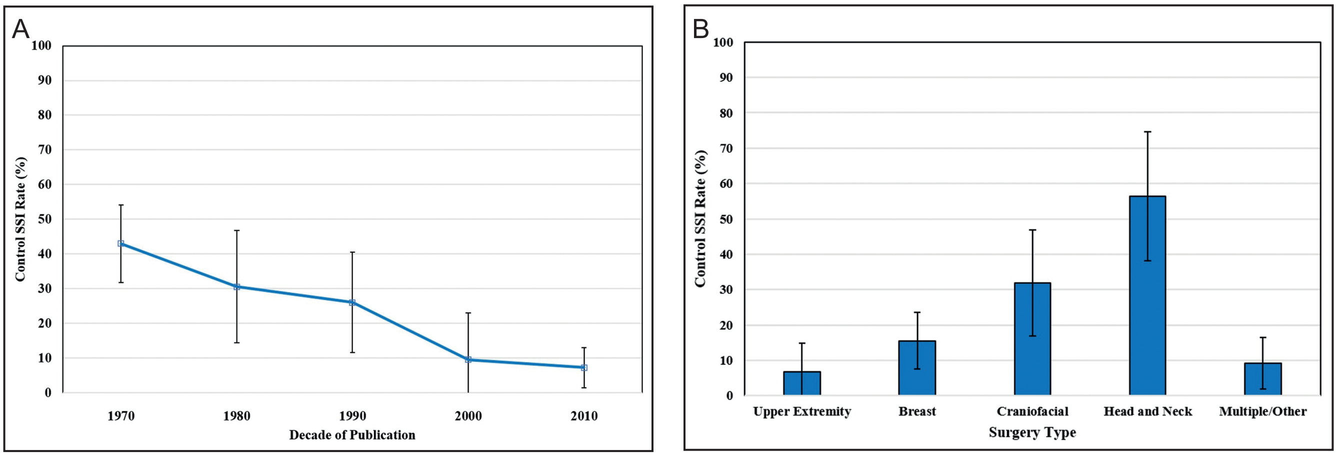

Figure 2. (A) Average SSI rate in control subjects stratified based on year of publication. Data values were pooled within each decade (1970s, 1980s, 1990s, 2000s, and 2010s) and averages were computed. Error bars represent SD. **$P < 0.01$. (B) Average SSI rate in control subjects stratified based on surgery type. Numbers on top of the bar represent the number of control participants in each category. Error bars represent SD. ***$P < 0.001$. SD, standard deviation; SSI, surgical site infection.

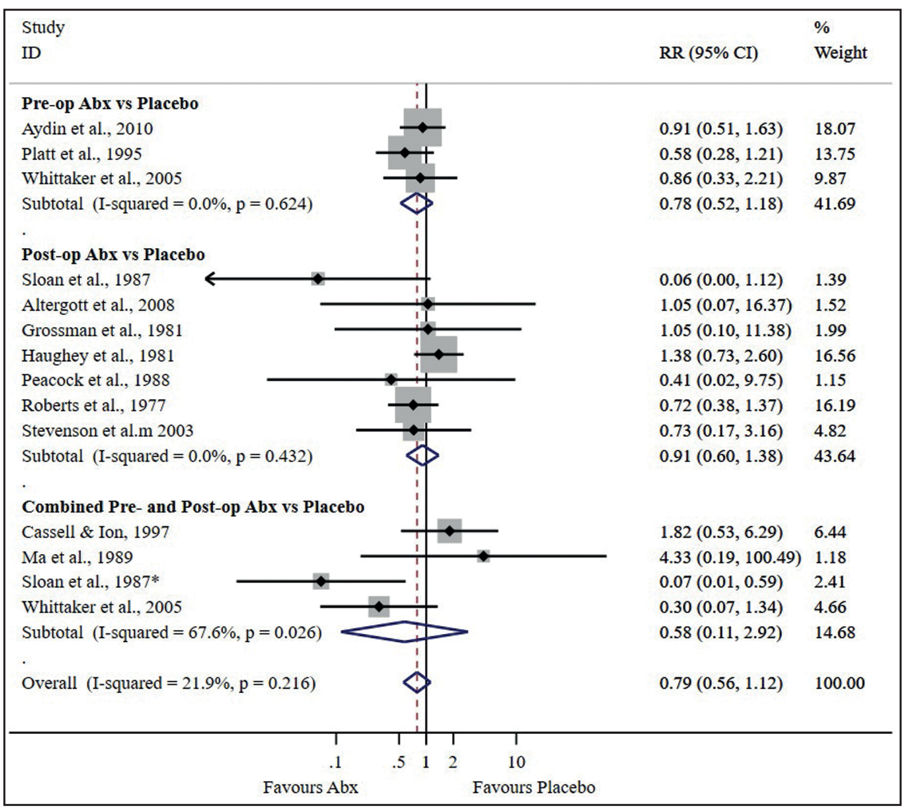

Figure 3. Forest plot of the efficacy of different antibiotic prophylaxis protocols in hand and upper extremity surgery. RR, relative risk; Pre-op, preoperative; Post-op, postoperative; Abx, antibiotics.

Head and Neck

Five RCTs assessing the efficacy of pre- and postoperative antibiotic prophylaxis were included in this review.[32,35,38,46,47] Four studies demonstrated that preoperative antibiotics alone, postoperative antibiotics alone, and combined preoperative and postoperative antibiotics significantly reduced rates of SSI.[32,35,38,47] Only 1 smaller study (n = 20) did not demonstrate a significant decrease between patients who received postoperative antibiotics and their counterparts who did not (55% vs 33%; $P > 0.05$).[46] It is important to note that all but 1 of these

Table 1. Summary of Recommendations Regarding Antibiotic Prophylaxis on SSI

Site	Demonstrated benefit in SSI reduction		Recommendation
	Preoperative	Postoperative	
Hand (nontraumatic)	No	No	Antibiotic prophylaxis not recommended
Hand (traumatic)	Yes	No	Antibiotic prophylaxis recommended in emergency trauma or open-fracture repair
Maxillofacial (facial fractures and oral surgery)	Yes	No	Preoperative antibiotic prophylaxis recommended
Craniofacial (septal and ear)	No	No	Antibiotic prophylaxis not recommended
Breast[a]	Mixed	Mixed	Preoperative antibiotic prophylaxis recommended
Head and neck (oncologic)	Yes	Yes	Preoperative and postoperative antibiotic recommended

SSI, surgical site infection. [a]Exception: for implant-based breast reconstructions, postoperative antibiotic prophylaxis is recommended but discontinued after 24 hours. Autologous reconstruction not sufficiently assessed.

studies focused primarily on oncologic resections. Finally, as previously mentioned, head and neck oncologic resection and reconstruction surgeries were associated with considerably higher rates of SSI regardless of antibiotic prophylaxis (Table 1; Supplemental Table 5)

All 5 studies were included in a quantitative meta-analysis for head and neck oncologic reconstruction surgery. The overall heterogeneity for the head and neck surgery subset analysis was 58.3% (I^2 = 58.3%, P = 0.05) (Figure 4). The meta-analysis clearly favored administering both pre- and postoperative antibiotics together to decrease the risk of SSI (RR: 0.36, 95% CI: 0.21-0.60] (Figure 4).

Unspecified/Multiple Surgical Sites

Four RCTs with a combined sample size of 2593 participants assessed antibiotic prophylaxis in multiple/unspecified plastic surgeries.[21,23,25,28,50] Baran et al showed that participants who received 2 g of ampicillin/sulbactam IV preoperatively did not significantly differ in rates of SSI compared with controls (5.0% vs 5.4%; P > 0.05).[23] In contrast, Almand et al showed a significant decrease in SSI rates in participants who received 1 dose of azithromycin the night before surgery (20.5% vs 5.1%; P < 0.001).[21] Upon subanalyzing their results, it was evidenced that preoperative antibiotic prophylaxis was only effective in reducing rates of SSI in breast and free flap surgery, but not cleft lip and palate repairs. Furthermore, Thirbly et al demonstrated that participants undergoing minor laceration repair did not benefit from a 3-day course of postoperative antibiotics compared with controls (7.0% vs 6.3%; P > 0.05).[50] Finally, 2 studies on abdominoplasties and multiple elective plastic surgeries showed no difference between receiving a single dose of preoperative antibiotics or a 3-day course of postoperative antibiotics (Table 1; Supplemental Table 6).[25,28]

Showering, Prepping, and Draping

Two RCTs assessed the efficacy of preoperative showers on elective and cosmetic plastic surgeries.[56,57] One study assessed the efficacy of a 10% povidone solution whereas the other used a chlorohexidine solution for its interventional group. Both povidone and chlorohexidine significantly decreased skin bacterial count (assessed 5 minutes after the start of the operation), but only povidone significantly decreased *Staphylococcus aureus* skin colonization (assessed immediately before the surgical scrub).[56,57] However, neither povidone nor chlorohexidine showers had a significant effect on SSI at 4-week follow-up.

Kosutic et al assessed the efficacy of 4 types of mouthwash before elective and trauma maxillofacial surgery.[58] Four groups of 30 participants were preoperatively prepped with a mouthwash of 1% cetrimide solution, povidone, chlorohexidine, or normal saline (control). The 3 experimental groups showed significant decreases in bacterial count at the end of the operation compared with the control participants. The rate of infection was highest in the control group (10%) whereas no infections were detected in both the chlorohexidine and the povidone conditions. Although this difference was not statistically significant, it could be clinically significant. In a larger RCT of 1810 participants undergoing elective skin lesion excision, preoperative povidone scrubbing showed no difference in SSI rates compared with normal saline scrub.[59] Finally, only 1 RCT assessed the efficacy of different surgical drapes on breast reconstruction surgeries and showed a significantly

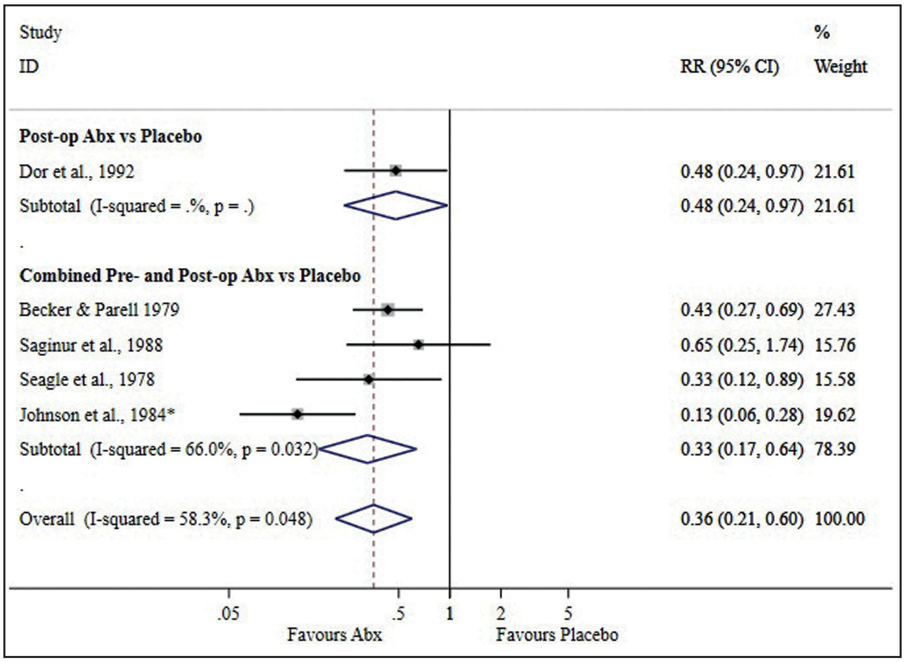

Figure 4. Forest plot of the efficacy of different antibiotic prophylaxis protocols in head and neck oncologic reconstruction extremity surgery. RR, relative risk; Pre-op, preoperative; Post-op, postoperative; Abx, antibiotics.

reduced SSI rate associated with disposable drapes compared with their reusable counterparts (12% vs 0%, respectively) (Supplemental Table 7).[60]

Dressing

Seven RCTs assessed the efficacy of different types and durations of dressings on rates of SSI.[61-67] Three studies assessed the efficacy of incisional negative-pressure wound therapy (NPWT) dressing on patients undergoing multiple wound closure/reconstruction and breast reconstruction.[61,63,64] All 3 studies showed no significant difference in SSI rates with up to 16 weeks follow-up between patients who received the NPWT dressing and controls (dry/adhesive dressing). However, 2 out of the 3 studies showed a significant decrease in total complications, such as length of stay, pain control, and wound dehiscence, in patients who received NPWT dressing.

Dressing duration was assessed in 3 RCTs on patients undergoing breast reconstruction and cosmetic breast surgery.[62,65,66] All 3 studies showed no significant difference in rates of SSI whether the initial surgical dressing was removed 1 or 6 days postoperation. Finally, 1 RCT assessed the effect of antibiotic dressing on elective skin lesion excision, finding no significant difference in SSI or other complications between patients who received mupirocin dressing, paraffin ointment dressing, and regular dry dressing (Supplemental Table 8).[67]

Other

Two RCTs assessed the impact of placing drains in breast reduction surgeries.[68,69] With a combined sample of 407, both studies showed no significant difference in SSI or complication rates between patients who received closed-suction drains and their controls (no drains). Only 1 RCT studied the efficacy of antimicrobial sutures (triclosan-coated vicryl) on patients undergoing oncologic head and neck reconstruction.[70] The results showed no significant difference in SSI rates in patients who received the triclosan-coated vicryl compared with their controls (regular vicryl) for skin closure. Finally, Silverstri et al showed that adhesive skin closure with octyl-2-cyanoacrylate on multiple types of breast and abdomen cosmetic surgery leads to lower rates of SSI compared with regular suture skin closure (3.4% vs 0.4%, respectively) (Table 2; Supplemental Table 9).[71]

DISCUSSION

This systematic review and meta-analysis evaluated the efficacy of interventions to prevent/reduce rates of SSI specifically in plastic surgery procedures. By exclusively evaluating Level 1 RCTs, we are able to provide evidence-based recommendation regarding the use of antibiotic prophylaxis, prepping techniques, draping, and dressings.

Table 2. Summary of Recommendations Regarding Other Interventions on SSI

Site	Intervention	Demonstrated benefit in SSI reduction	Recommendation
Skin	Preoperative showering (providone or chlorohexidine)	No	Not recommended
Oral	Preoperative mouthwash (providone or chlorohexidine)	Yes	Recommended
Multiple	Dressings (antibiotic, infused)	No	No specific dressing type recommended
Wound reconstruction/closure	Incisional NPWT	No	NPWT recommended despite no demonstrated benefit in reducing SSI rates
Breast[a]	Closed-suction drains	No	Not recommended; does not decrease rates of SSI or complications
Skin	Preoperative providone scrubbing	No	Recommended to decrease skin colonization but no evidence in decreasing SSI

NPWT, negative-pressure wound therapy; SSI, surgical site infection. [a]Reduction mammoplasty only.

The evidence for any benefit from antibiotic prophylaxis in plastic surgery is mixed and dependent on the type of surgery. For hand and upper extremity surgery, neither preoperative nor postoperative antibiotic prophylaxis affect rates of SSI, as shown by the present meta-analysis. However, subgroup analysis revealed an important exception which pertains to emergency hand trauma surgery and specifically open fractures repairs where there is a clear benefit to antibiotic prophylaxis. There is no evidence that the use of both pre- and postoperative prophylaxis together leads to a further decrease in rates of SSI.

Moreover, for both elective and trauma oral/maxillofacial surgery there is qualitative evidence that preoperative antibiotic prophylaxis decreases rates of SSI; however, there is a lack of evidence for the use of postoperative antibiotics.

The evidence for any benefit of preoperative antibiotics in breast surgery is mixed, but due to the serious issues that infections could cause in breast surgeries,[72] we recommend the use of preoperative antibiotics, although more RCTs are warranted to validate the efficacy of this approach. There is no evidence concerning postoperative antibiotics in breast surgeries except in implant-based breast reconstruction. However, previous studies recommend discontinuing them 24 hours postreconstruction in keeping with antibiotics stewardship standards. Due to a lack of sufficient evidence, we are not providing recommendations regarding autologous breast reconstruction.

Finally, there is evidence for the use of both pre- and postoperative antibiotics in head and neck oncologic surgeries which is supported by our quantitative meta-analysis. Postoperative antibiotics should be prescribed for 3 to 5 days because there is no evidence supporting further decrease in rates of SSI with longer postoperative courses. Future RCTs are needed to better assess antibiotic prophylaxis in nononcologic head and neck surgeries.

Although there is some evidence that preoperative showering with povidone and chlorohexidine solutions decreases skin colonization, there is no evidence that this decreases SSI rates. Similarly, another paper failed to show sufficient evidence that prepping with chlorohexidine or povidone solutions decreases rates of SSI in clean elective surgeries, serving more as an additional protective adjunct than actual prevention of SSI. There are no differences in SSI rates between different types of dressings, and therefore we recommend utilizing what is available and preferred by the patients. Finally, we recommend not placing closed suction drains in reduction mammoplasty because they do not decrease rates of SSI or complications such as hematoma and could cause some discomfort and pain to patients.

There are several limitations to this systematic review. This review included RCTs that ranged in publication date from 1975 to 2020, a 45-year date range. It is reasonable to presume that significant changes to healthcare practices over this time would contribute to a reduction in SSI rates in general. As such, a lower baseline SSI rate due to advances in aseptic techniques in surgery and increased knowledge of nosocomial infection prevention might have made it more difficult to detect a significant reduction in SSI rates in the more recent studies. Furthermore, due to the lack of studies comparing preoperative antibiotics to postoperative antibiotics in many of the surgeries, we are unable to make comparative conclusions regarding whether or not one treatment regimen is superior to the other. Moreover, a large proportion of the studies included in this analysis were relatively outdated. However, because only Level 1 evidence was included, we believe it was beneficial to include all studies for the interest of completeness and to provide stronger aggregate recommendations. We suggest future randomized controlled studies to assess the specified SSI prevention methods with more contemporary data to strengthen the conclusions of this systematic review. Moreover, future studies should be conducted to compare the efficacy of different treatment regimens more rigorously within a given surgery type so that the postoperative care of patients can be optimized. Subsequent systematic reviews and meta-analyses will incorporate future research to provide recommendations that evolve alongside changes in surgical and aseptic techniques and protocols. Furthermore, future studies should analyze the correlation between SSI prevention method and wound classification. Finally, the current review excluded retrospective and in vitro studies that would have added additional interventions to our review. For example, normothermia and glycemic index control—2 methods recommended by the Centers for Disease Control (CDC) to diminish rates of SSI in surgery—were only assessed in retrospective studies and therefore excluded.[6,73,74] Similarly, surgical site irrigation, an important practice in reducing the incidence of SSIs in plastic surgery, was only assessed in non–Level 1 evidence studies and was therefore excluded from this study.[75,76]

CONCLUSIONS

The current systematic review and meta-analysis supports the recommendation of preoperative antibiotic prophylaxis in traumatic hand and oral craniofacial surgeries. Both pre- and postoperative antibiotics are warranted for head and neck oncologic surgeries. We recommend the use of either povidone or chlorohexidine preoperative mouthwash in oral surgeries. There is a lack of evidence supporting the use of different dressings. Finally, there is a lack of strong evidence to support the use of closed suction drains in decreasing SSI in reduction mammoplasties. The use of evidence-based recommendations will hopefully reduce rates of SSI, decrease unwarranted antibiotic use and resistance, and improve aesthetic and overall patient outcomes in plastic surgery.

Supplemental Material

This article contains supplemental material located online at www.aestheticsurgeryjournal.com.

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Dr ElHawary and Mr Hintermayer made an equal contribution to this work as co-first authors.

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