GLOBAL GUIDELINES FOR THE PREVENTION OF SURGICAL SITE INFECTION

World Health Organization

4.22 Antimicrobial-coated sutures

Recommendation

The panel suggests the use of triclosan-coated sutures for the purpose of reducing the risk of SSI, independent of the type of surgery.
(Conditional recommendation, moderate quality of evidence)

Rationale for the recommendation

Overall low to moderate quality evidence shows that antimicrobial-coated sutures have significant benefits in reducing SSI rates in patients undergoing surgical procedures when compared to non-coated sutures. The effect seems to be independent of the type of suture, procedure or wound contamination classification. In meta-regression analysis, there was no evidence that the effect of antimicrobial-coated sutures differed between braided and monofilament sutures, clean, cardiac or abdominal surgery, and other surgeries. However, the GDG highlighted that the available trials examined triclosan-coated, absorbable sutures only. There were no studies identified that investigated other antimicrobial agents. Considering the low to moderate quality of the evidence and the low quality of comparisons in the subgroups of the RCTs included in the meta-regression analyses, the GDG agreed that the strength of the recommendation should be conditional.

Remarks

- The body of retrieved evidence mostly focused on adult patients and only one study was available in a paediatric population. This recommendation can be applied to paediatric patients, but the manufacturer's instructions should be checked to evaluate any contraindication for paediatric patients.
- The GDG discussed the available evidence and agreed to consider only studies comparing the same type of suture in order to prevent confounding by type of suture (monofilament or braided).
- The overall quality of evidence was moderate for the RCTs due to risk of bias and low for the observational studies. The GDG discussed whether or not to consider indirectness for the overall comparison of antimicrobial-coated vs. non-coated sutures. The agreement was that indirectness does not apply because the PICO question is very broad.
- Included studies were performed in high- and middle-income countries.
- Types of surgical procedures included were colorectal, abdominal, breast, head and neck, lower limb, spinal, cardiac, vascular and other surgery.
- The types of sutures investigated in the included studies were triclosan-coated polydioxanone suture vs. polydioxanone suture featuring a monofilament suture construction (3 RCTs *(1-3)*); triclosan-coated polyglactin 910 suture vs. polyglactin 910 suture featuring a braided (multifilament) suture construction (7 RCTs *(4-10)* and 4 observational studies *(11-14)*); and polyglactin 910 and poliglecaprone 25 (both triclosan-coated) sutures vs. polyglactin 910 and poliglecaprone 25 sutures featuring a braided (polyglactin 910) and a monofilament (poliglecaprone 25) suture construction (3 RCTs *(15-17)* and one observational study *(18)*).
- No adverse events have been associated in the included studies with the use of antimicrobial-coated sutures. However, the GDG pointed out that there is limited evidence that triclosan may have negative effects on wound healing *(19)* or lead to contact allergy *(20)*. Although the development of resistance is mentioned as a concern, the daily absorption of triclosan from consumer products (for example, commercially-available hand soap) is higher than a single triclosan suture *(21-23)*.

Background

Surgical suture material is used to adequately adapt the wound edges and thus it is in direct contact with the wound itself. To prevent microbial colonization of the suture material in operative incisions, sutures with antibacterial activity have been developed. Triclosan (5-chloro-2-[2.4-dichlorophenoxy] phenol) is a broad-spectrum bactericidal agent that has been used for more than 40 years in various products, such as toothpaste and soaps. Higher concentrations of triclosan work as a bactericide by attacking different structures in the bacterial cytoplasm and cell membrane *(24)*. At lower concentrations, triclosan acts as a bacteriostatic agent binding to enoyl-acyl reductase, a product of the Fab I gene and thus inhibiting fatty acid synthesis *(25, 26)*.

Several trials have shown that the use of triclosan-coated sutures leads to a reduction of the number of bacteria in vitro and also of wound infections in animal and clinical studies *(27-29)*. Of note, this effect is not confined to any particular tissue or organ system *(23)*. Apart from triclosan, several novel antimicrobial coatings are now becoming available *(30, 31)*, but there are still no reported clinical studies comparing the efficacy of novel antibacterial sutures with non-coated ones. Triclosan-coated polyglactin 910, triclosan-coated polydioxanone, and triclosan-coated poliglecaprone 25 are commercially-available sutures with antimicrobial properties. Commonly-used non-coated sutures are polyglactin 910, polydioxanone, poliglecaprone 25, polyglycolic acid and polyglyconate sutures.

Few organizations have issued recommendations regarding the use of antimicrobial-coated sutures (Table 4.22.1). The UK-based NICE suggests that antimicrobial-coated sutures may reduce the SSI risk compared to non-coated sutures, although this effect may be specific to particular types of surgery, such as abdominal procedures *(32)*. The SHEA/IDSA guidelines indicate that antiseptic-impregnated sutures should not be used routinely as a strategy to prevent SSI *(33)*.

Table 4.22.1. **Recommendations on the use of antimicrobial-coated sutures according to available guidelines**

Guidelines (year issued)	Recommendations on the use of antimicrobial-coated sutures
SHEA/IDSA practice recommendation (2014) *(33)*	Do not routinely use antiseptic-impregnated sutures as a strategy to prevent SSI.
NICE (2013 update) *(32)*	Antimicrobial-coated sutures may reduce the SSI risk compared to uncoated sutures, although this effect may be specific to particular types of surgery, such as abdominal procedures.

SHEA: Society for Healthcare Epidemiology of America; IDSA: Infectious Diseases Society of America; NICE: National Institute for Health and Care Excellence; SSI: surgical site infection.

Following an in-depth analysis of the sources and strength of evidence in current guidelines, the GDG decided to conduct a systematic review to assess if the use of antimicrobial-coated sutures might be beneficial for surgical patients to prevent SSI.

Summary of the evidence

The purpose of the evidence review (web Appendix 23) was to evaluate whether the use of antimicrobial-coated sutures is more effective in reducing the risk of SSI than the use of non-coated sutures. The target population included patients of all ages undergoing a surgical procedure. The primary outcome was the occurrence of SSI and SSI-attributable mortality.

Eighteen studies (13 RCTs *(1-10, 15-17)* and five cohort studies *(11-14, 18)*) including a total of 7458 patients (RCTs, 5346; observational studies, 2112) and comparing the use of antimicrobial- with non-coated sutures were identified.

Seven studies compared the efficacy of antimicrobial-coated sutures with non-coated sutures in mixed wounds (5 RCTs *(2-5, 8)* and 2 observational studies *(12, 14)*). A further 7 studies (5 RCTs *(6, 10, 15-17)*

and 2 observational studies *(11, 18)*) made the same comparison in clean wounds, mainly cardiac and breast cancer surgery, and 4 studies (3 RCTs *(1, 7, 9)* and one observational study *(13)*) concerned clean-contaminated wounds in abdominal surgery.

Due to heterogeneity among the selected studies regarding the type of suture used, type of surgical procedure or wound contamination class, additional separate meta-analyses were performed for triclosan-coated polydioxanone suture vs. polydioxanone suture, triclosan-coated polyglactin 910 suture vs. polyglactin 910 suture, and polyglactin 910 and poliglecaprone 25 (both triclosan-coated) sutures vs. polyglactin 910 and poliglecaprone 25 sutures, as well as in clean, clean-contaminated and mixed types of wounds (web Appendix 23).

Overall, there is moderate to low quality evidence that antimicrobial-coated sutures have significant benefit in reducing SSI rates in patients undergoing surgical procedures when compared to non-coated sutures (moderate quality for RCTs: OR: 0.72; 95% CI: 0.59–0.88; low quality for observational studies: OR: 0.58; 95% CI: 0.40–0.83).
In meta-regression analysis, there was no evidence that the effect of antimicrobial-coated sutures differed between braided and monofilament sutures (P=0.380), or between clean (P=0.69), cardiac (P=0.900) or abdominal (P=0.832) and other types of surgery. According to these analyses, the effect seems to be independent of the type of suture, procedure or wound contamination classification.

Regarding the comparisons of specific types of sutures (web Appendix 23), only the meta-analyses of the studies comparing triclosan-coated polyglactin 910 suture vs. polyglactin 910 suture featuring a braided suture construction showed that the use of antimicrobial-coated sutures has significant benefit compared to non-coated sutures in reducing SSI rates (OR: 0.62; 95% CI: 0.44–0.88 for RCTs; OR: 0.58; 95% CI: 0.37–0.92 for observational studies).

Some limitations of the included studies should be noted. The quality of the included RCTs was moderate to low. Indeed, some studies had an unclear or high risk of blinding of participants, care-providers and outcome assessors, and/or a high risk of incomplete outcome data. Furthermore, some studies had industrial sponsorship or conflicts of interest with a commercial company.

Additional factors considered when formulating the recommendation

Values and preferences

No study was found on patient values and preferences with regards to this intervention. The GDG is confident that most patients wish to receive this intervention in order to reduce the risk of SSI, but patients must be informed about the small and unconfirmed risk of allergy to triclosan. The GDG emphasized that patients would like to be part of the process by being involved and informed.

Resource use

The GDG emphasized that sutures are expensive in general. Moreover, the availability of antimicrobial-coated sutures is limited in LMICs. In settings where patients have to pay for the material themselves, an increase in costs would represent an additional personal financial burden. At the time of formulating this recommendation, the GDG noted that manufacturers sold the antimicrobial-coated and non-coated sutures for approximately the same price. However, the GDG is not aware of the future pricing policy of manufacturers. The use of antimicrobial-coated sutures could increase the cost per patient, but it might reduce the mean length of hospital stay and reduce potential costs to the health care system due to the avoidance of the risk of SSI *(5, 8, 34)*.

The body of retrieved evidence mostly focused on adult patients and only one study *(4)* was available in a paediatric population. The literature search did not identify any studies that reported on SSI attributable-mortality.

Research gaps

The GDG highlighted the limited evidence available in some areas and the need for further research on the effects of antimicrobial-coated sutures in reducing SSI rates. In particular, studies should be conducted in LMICs and include different surgical procedures. Comparisons between antimicrobial-coated and non-coated sutures should be performed with the same type of suture material, including non-absorbable sutures. In particular, comparisons with an alternative antimicrobial agent to triclosan would be welcome. More research is required to investigate the effectiveness of antimicrobial-coated sutures in the paediatric population and in various types of settings. All studies should be designed as a RCT with the SSI outcome defined according to CDC criteria and sub-specified as superficial, deep and organ space

occupying. Adverse events related to the intervention should be clearly reported, including the need to assess the risk of allergy. Importantly, possible emerging AMR to the antimicrobial agent should be monitored. Moreover, cost-effectiveness studies are also needed. Of note, research investigating the effectiveness of antimicrobial-coated sutures should be independently funded with a limited influence of industry sponsorship.

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