TITLE: Antibacterial Sutures for Wound Closure after Surgery: A Review of the Clinical Effectiveness and Long-Term Adverse Effects

DATE: 17 September 2008

CONTEXT AND POLICY ISSUES:

Surgical site infections complicate recovery for more than half a million patients each year in the United States. The optimal wound closure material (suture) should give minimal tissue reaction, should resist infection, and have good elasticity and plasticity to accommodate wound swelling. Suture classifications include non-absorbable or absorbable, natural or synthetic, and multifilament or monofilament. Although some of the newer materials available have many of these properties, no one material is ideal and compromises must be made.

Antibacterial sutures, which are sutures coated with antibiotics, were developed to help the wound healing by reducing the risk of surgical site infections. The effectiveness of antibacterial sutures is unclear, and complications can occur. It is therefore necessary to examine the evidence regarding the clinical effectiveness and adverse effects of antibacterial sutures.

RESEARCH QUESTIONS:

1. What is the clinical effectiveness of antibacterial sutures for the prevention of surgical site infections?

2. Are there long-term adverse effects associated with antibacterial suture use including development of drug-resistant bacteria?

3. What are the guidelines for using antibacterial sutures for wound closure?
METHODS:

A limited literature search was conducted on key health technology assessment resources, including PubMed, The Cochrane Library (Issue 3, 2008), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI, EuroScan, international health technology agencies, and a focused Internet search. Results include articles published between 2003 and August 2008, and are limited to English language publications only. No filters were applied to limit the retrieval by study type.

SUMMARY OF FINDINGS:

Clinical effectiveness of antibacterial sutures for the prevention of surgical site infections

No health technology assessments, systematic reviews, or meta-analyses on clinical effectiveness of antibacterial sutures were identified. Four studies were identified. An open-label randomized controlled trial (RCT) (published in 2005 but time of trial not reported) was conducted on 147 pediatric patients undergoing various surgical procedures with either polyglactin 910 sutures coated with antibiotic triclosan or polyglactin sutures without triclosan. Endpoints included wound healing characteristics such as infection, pain, and use of antibiotics. Wound healing characteristics were comparable for both sutures, except significantly fewer patients with triclosan sutures reported pain on day one compared with patients without triclosan sutures (p=0.01). Twenty four percent of patients in the triclosan-coated suture group and 31% of patients in the conventional suture group received peri-operative antibiotics. There were no adverse events related to sutures, and there was no difference between treatment groups.

Performance of triclosan-coated sutures for the reduction of sternal wound infections on 479 cardiac surgery patients was also determined in a 2005 non-RCT. Patients were closed with triclosan-coated sutures or with conventional sutures. All 24 patients who developed sternal infections were in the conventional wound closure group during the study period (mean follow-up was 7.6 months).

A 2006 double-blind RCT was conducted on 26 patients undergoing breast reduction surgery to evaluate the dehiscence incidence rate (the premature opening or splitting along surgical suture lines secondary to poor wound healing) between triclosan-coated and non-triclosan coated suture material. The triclosan-coated sutures were used either on the left or right breast, and the contralateral breast was used as the control. Data were not favourable for triclosan sutures, with wound dehiscence found in 16 cases among the triclosan breasts, whereas seven cases of dehiscence were observed in the control breast (p = 0.023).

A 2006 double-blind controlled trial randomly assigned 61 patients requiring central spinal fluid shunt implantation (with a total of 84 shunt procedures) to receive coated polyglactin 910 sutures with triclosan or conventional sutures (polyglactin 910 without triclosan). The shunt infection rate in the triclosan group was 2 of 46 procedures (4.3%) and 8 of 38 procedures (21%) in the control group (p = 0.038). Clinical findings from the above four trials are summarized in the table below.
Table 1: Summary of Findings from the RCTs and Non-RCT on Antibacterial Sutures

<table>
<thead>
<tr>
<th>Studies</th>
<th>Design, number of patients</th>
<th>Conclusion</th>
<th>Sponsored by industry for antibacterial sutures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ford et al⁵</td>
<td>RCT, 147 patients</td>
<td>Favoured triclosan-coated sutures</td>
<td>Yes</td>
</tr>
<tr>
<td>Fleck et al⁷</td>
<td>Non-RCT, 479 patients</td>
<td>Favoured triclosan-coated sutures</td>
<td>Not reported</td>
</tr>
<tr>
<td>Deliaert et al⁸</td>
<td>RCT, 26 patients</td>
<td>Favoured conventional sutures</td>
<td>Not reported</td>
</tr>
<tr>
<td>Rozelle et al⁹</td>
<td>RCT, 61 patients</td>
<td>Favoured triclosan-coated sutures</td>
<td>No</td>
</tr>
</tbody>
</table>

Long-term adverse effects of using antibacterial sutures

There were no long-term adverse effects, such as development of drug-resistant bacteria, reported in the studies on antibacterial sutures.

Guidelines for using antibacterial sutures for wound closure

There were no guidelines identified by the literature search on the use of antibacterial sutures for wound closure.

Economic evaluations

An economic study found the overall cost of a cardiac surgical procedure using conventional sutures was US$11,421, and using triclosan-coated sutures the cost was US$11,430 (the cost of triclosan-coated suture was $30 per patient as compared to $21 per patient for non-triclosan suture).⁷ The total cost to treat a sternal wound infection was calculated as US$11,200. The cost for a patient with a sternal wound infection was therefore $11,200 plus the costs of a normal stay (US$11,400), resulting in a total cost of US$22,600. Calculated on a 12-month period at the study centre, a total of 40 patients sustained a sternal wound infection, resulting in an extra cost of 40 * $11,200, or US$448,000 in total. The increased cost of $9 through the use of the triclosan-coated sutures is negligible if even a small percentage of sternal wound infections can be prevented.

CONCLUSIONS AND IMPLICATIONS FOR DECISION OR POLICY MAKING:

Only four studies were identified on the effectiveness of antibacterial sutures. These studies were small size trials and three of these four studies showed the potential of antibacterial-coated sutures in reducing wound infection rate. Despite the fact that surgical wound infection increased cost, the cost-effectiveness of antibacterial-coated sutures remains uncertain. Higher quality research on the effectiveness of antibacterial sutures is needed. Principles of effective wound repair are still primordial for a healthy wound closure.
REFERENCES:


