QUESTION 1: Should the knife blade be changed after skin incision for deep dissection?

RECOMMENDATION: Yes. The scalpel should be changed after making the skin incision. There are studies demonstrating that bacteria from the superficial planes of the skin can contaminate the scalpel and potentially transfer this into deeper tissues.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 92%, Disagree: 6%, Abstain: 2% (Super Majority, Strong Consensus)

RATIONALE

Since infections can have such a devastating effects on total joint arthroplasty, it will always be necessary to search for methods to reduce contamination. The main sources of contamination come from skin and particles in the air of the operating room [1,2]. Controversy remains about the use of separate blades for skin incision and internal use, although this practice has been discredited [3–10].

Preoperative preparation of skin with antiseptics can help reduce the number of microorganisms, but cannot completely eradicate them, especially resident flora. Hypothetically, whenever the skin is incised microorganisms that colonize the deeper layers of skin can contaminate the exposed tissues and lead to surgical site infections (SSIs) [11–13].

A systematic review was conducted on this subject following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and the PRISMA statement. A comprehensive search of the literature was carried out in February 2017 using electronic databases PubMed, Medline and the Cochrane Library. The search terms used were “Arthroplasty AND Infection AND Knife OR Blade.” Only English studies were reviewed. This yielded four results after duplicates were removed. Because of the low numbers of studies done on this subject, there was no limitation on the type of the articles that were reviewed. Cross references revealed four more results. One study was not analyzed as it was not comparative, leaving seven reports for analysis.

The contamination rates of skin and deep knives were assessed with the Fisher’s exact test. Seven studies were included in the final analysis (Table 1). None of the studies showed a direct relationship between knife contamination and SSIs. Six studies could not demonstrate a difference in the contamination rates between the skin and deep knives [5,8–12]. In one study, the deep knife was significantly more contaminated than the skin knife [7]. Analysis of all seven studies together shows higher contamination rate for deep knives than skin knives, mostly due to the latter study.

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Total</th>
<th>Contaminated</th>
<th>Same Organism at Skin and Deep Knife</th>
<th>Deep Infection</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Skin knife</td>
<td>Deep knife</td>
<td>Control knife</td>
<td>Skin knife</td>
<td>Deep knife</td>
</tr>
<tr>
<td>Hill [8]</td>
<td>1985</td>
<td>93</td>
<td>93</td>
<td>8</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Grabe [7]</td>
<td>1985</td>
<td>358</td>
<td>358</td>
<td>29</td>
<td>67</td>
<td>11</td>
</tr>
<tr>
<td>Ramón [9]</td>
<td>1994</td>
<td>115</td>
<td>115</td>
<td>6</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>Schindler [12]</td>
<td>2006</td>
<td>203</td>
<td>203</td>
<td>31</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>Ottesen [10]</td>
<td>2014</td>
<td>277</td>
<td>277</td>
<td>8</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Trikha [11]</td>
<td>2016</td>
<td>92</td>
<td>92</td>
<td>6</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>1,325</td>
<td>1,325</td>
<td>572</td>
<td>96</td>
<td>130</td>
</tr>
</tbody>
</table>

*Identified pathogen of wound infection was not identified at either skin or deep knives

**Superficial infection

One recent study by Schindler et al. performed on patients having hip or knee arthroplasty compared the contamination rated of skin blades, inner blades and controls [12]. Even though there were no differences between the groups with regards to contamination rates they found higher incidences
of skin pathogens isolated in the skin knife than the deep or control knives, leading to the assumption that these specimens were not contaminated in the laboratory. The development of deep or superficial infection was not evaluated in this study. Given the scarce literature, even with advanced research technologies, and the difficulty with which researchers are able to define the question, a low level of strength is provided.

Taking into account the low costs of changing blades, the methodology of all the studies discussed above and the potentially devastating consequences of prosthetic joint infection, we find it hard to recommend against changing the knife after skin incision is made. Therefore, we advocate maintaining the old surgical technique of changing the skin scalpel to continue to deeper planes with a new blade.

REFERENCES