RESULT OF TREATMENT OF DEEP INFECTION OF 25 TOTAL KNEE REPLACEMENTS BY DEBRIDEMENT AND LOCAL ANTIBIOTICS WITH PROSTHESIS IN SITU.

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Introduction

Deep infection after total knee replacement (TKR) is a rare but destructive complication. In the Netherlands deep infection rate after primary TKR is 0.9% and after revision TKR, 2.5%. Most of these infections occur in the first 2 years after surgery (81%), also known as surgical site infections (SSI).

Because of the poor antibiotic penetration, low bacterial growth and the different bacterial biochemistry in a bacterial biofilm on the surface of the implant, it is impossible to cure a deep TKR infection by intravenous antibiotics alone and a surgical intervention is necessary to remove infected tissue or even to remove the infected implant too.

There is no consensus in literature for a treatment algorithm of TKR infection. The current literature, mainly based on studies of infections after hip prostheses, suggests extraction of the prosthesis in early deep surgical site infections (SSI) when treated more than 3 months after implantation and in haematogenous infections, if symptoms have been present for more than 3 weeks. Such a treatment has a success rate of 86-100%.

Problem

In case of a postoperative deep and a haematogenous infection with a stable implant we always try first to save the prosthesis by debridement in situ. The aim of this study was to evaluate if this policy is justified, furthermore we questioned if the success rate decreases when the postoperative time (delay) in SSI and the duration of symptoms in haematogenous infections increase, and whether and to which extend it’s influenced by the pathogen, patient’s condition and clinical symptoms.

Material and method

All deep infections in stable TKRs with a postoperative interval between implantation and the start of the infection treatment of less than 2 years, and all haematogenous TKR infections, treated in our centre between 1982 and 2009 were included. All infections met the Mayo Clinic criteria for a deep infection.

Patients who got their first infection treatment in another centre and patients who were treated by immediate extraction of the knee prosthesis were excluded.

Data were collected of the pathogen, patient’s condition, wound condition, interventions, preoperative temperature and inflammatory blood markers).

All patients were classified by ASA score, McPherson host-score, McPherson local-score and Cierny-score. All infections were classified according to Zimmerli and according to McPherson in early postoperative infection, late (delayed) postoperative infection or acute haematogenous infection.

Treatments were defined as “failure” when they were not free of infection (clinical + laboratory) or when the prosthesis had to be extracted. Treatments were defined as “success” when the prosthesis remained in situ without signs of infection. Patients were seen at the outpatient clinic, or in case of long follow up if necessary the GP was asked by telephone to assure that there were any signs of TKR infection.

Statistical analyses

To analyse the influence of patient’s characteristics and classifications on the outcome of an in situ treatment we used the Fisher’s exact test. With this test we evaluated significance between the success group and the failure group of all patient’s characteristics and infection classifications.

Results

25 TKR infections were included, 19 infections were deep postoperative SSI and 6 haematogenous. Mean follow-up was 8 years (5 months – 19 years).

In 2 patients (8%) the perioperative cultures showed a negative result. These deep infections were diagnosed by histological examination and preoperative pus at the implant site. Most of the positive cultures showed growth of staphylococcus aureus (28%) or coagulase-negative staphylococci (20%).

All included patients were treated by arthroscopy and debridement with the prosthesis in situ, all but three got local antibiotic treatment: gentamicin PMMA beads (mean 120, range 50-240 beads) or gentamicin collagen fleece (mean 2, range 1-3 fleeces) in combination with high dose systemic antibiotics (for a mean period of 18 weeks, range 1-37).

Some patients got a pre-treatment of intravenous antibiotics, because the attending physician diagnosed these infections as superficial at first.

Twenty infections (80%) could be cured with retention of the primary prosthesis. In 3 patients (12%) the prosthesis needed to be extracted yet to cure the infection, 2 patients (8%) never became infection free and died during the treatment, at 2 and 8 months after start of the infection treatment.

Statistical analysis showed no significant difference regarding the pathogen, patient’s condition, wound condition, number of interventions, preoperative body temperature or laboratory by the ‘success’ group and the ‘failure’ group.

The 6 haematogenous infections had a duration of symptoms before start of our treatment up to 10 days, and the length of this delay did not influence the result of the in situ treatment. 5 patients (83%) healed without extraction of the prosthesis and 1 patient (17%) died, with a duration of symptoms of one day.

The success rate of in situ treatment in the SSI’s was significant lower if the delay was more than 77 days (43%) as compared with 60 days or less postoperative (100%), p=0.009 (see table 1).

In the group of 7 SSI patients with a delay of more than 77 days, one patient died (after extraction). The remaining six patients of this group became infection free with (3) or without (3) extraction, despite the delay. This is as good as when immediate extraction would have been performed (86-100%).

Table 1- Delay SSI

<table>
<thead>
<tr>
<th>Success</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure</td>
<td>14</td>
<td>16</td>
<td>16</td>
<td>18</td>
<td>18</td>
<td>28</td>
<td>30</td>
<td>42</td>
<td>47</td>
</tr>
<tr>
<td>Interval (days)</td>
<td>67</td>
<td>59</td>
<td>70</td>
<td>67</td>
<td>85</td>
<td>115</td>
<td>145</td>
<td>157</td>
<td>273</td>
</tr>
</tbody>
</table>

Significance between 60-77 days. P=0.011

Discussion

In the current literature most authors use the algorithm according to Zimmerli. In this algorithm the postoperative cut-off period for a successfully in situ treatment in exogenous knee prosthesis infections is 3 months. Our study does not show a significant difference in outcome for our treatment of the TKR infection when treated before or after this cut-off value of 3 months (p=0,64), but shows a significant difference in outcome before and after a cut-off value of 2 months (between 60-77 days).

Patients who were treated directly with a surgical debridement do not have a significant higher success rate of in situ treatment compare to patients who were pre-treated with intravenous antibiotics (p=0,15) because the infection was first thought to be superficial. Although in these pre-treated patients a lower success rate could be expected, since the delay to the start of the effective surgical intervention was increased, these infections could also be less virulent, and therefore initially regarded as superficial.

Conclusion

Treatment of primary TKR deep postoperative infection with retaining the prosthesis in situ must be tried, and extraction can be avoided in many patients, irrespective of the length of the period after the primary implantation.

In contrast with the current literature we advise therefore to treat all TKP infections (early, delayed SSI’s and HI’s) first with the intention to retain the prosthesis in situ. This will not decrease the final success rate and is worthwhile.

Literature


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