CASE REPORT

Aseptic arthritis after ACL reconstruction by Tape Locking Screw (TLS®): Report of two cases

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Accepted: 23 August 2011

KEYWORDS
Anterior cruciate ligament reconstruction; Polyethylene terephthalate; Aseptic arthritis; Artificial ligament; Knee

Summary In Tape Locking Screw (TLS\textsuperscript{®}) ligamentoplasty, transplant bone fixation uses polyethylene terephthalate (PET). We report two cases of aseptic arthritis following anterior cruciate ligament (ACL) reconstruction using this material. Diagnosis was founded on negative sampling and complete cure following arthroscopic lavage and synovectomy without curative antibiotherapy. This complication was also described with other synthetic materials used in this indication (Dacron, PFTE, carbon), and with PET as transplant material but never as bone fixation material. The physiopathological hypothesis is in terms of PET particle release in the suprapatellar bursa; sinking the strips into the bone as fully as possible on implantation could avoid impingement. Longer TLS\textsuperscript{®} ligamentoplasty series with adequate follow-up will be needed in order to estimate the true incidence of this complication.

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Introduction

The Tape Locking Screw (TLS\textsuperscript{®}, FH Orthopaedics) system is an all-inside ligamentoplasty technique using a 4-strand semitendinosus graft fixed by interference screws with polyethylene terephthalate (PET) strips [1]. PET was discovered by Roy J. Plunkett in 1938 and is a polymer textile like polytetrafluoroethylene (PFTE) or Dacron. A literature review of the incidence of complications related to PET and other polymers in anterior cruciate ligament (ACL) found a synovitis rate of up to 21.55% [2,3]. In the TLS literature, Collette and Cassard reported a 2.2\% infection rate [1], while Robert et al. found no infections [4]; neither series reported any cases of aseptic arthritis. The present study reports two cases of aseptic arthritis among 307 patients operated on since 2004. The physiopathological hypothesis is of reactive synovitis with PET microparticle release.

Case n° 1

The patient was a 41-year-old male bus driver. ACL reconstruction by TLS\textsuperscript{®} was indicated for instability. Asepsis was strictly respected, with preoperative antibiotherapy

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using cefuroxime 1.5 g [5]. Postoperative course was complication-free. At 4 weeks postoperatively, the patient spontaneously consulted in emergency. Clinical examination found 39 °C fever, an inflammatory scar, joint effusion and flexion limited to 90°. There was a firm endpoint on the Lachman test. Biological analysis found: leukocytes, 11,550 (7,565 polymonuclear neutrophils [PNN]); and C Reactive Protein (CRP), 182 micromol/L. Knee puncture in theater found 60cc of pus. Arthroscopic lavage was performed immediately, with anterior synovectomy for an aspect of localized Gächter grade-2 synovitis of the suprapatellar bursa. Two joint fluid samples and one synovial sample were taken for bacteriology and culture to detect slow-growth bacteria. The transplant and screws were left and the scars were not excised. Empiric antibiotic therapy associated vancomycin and gentamicin. Cytopathology found 56,000 nucleated elements per mL, including 700 erythrocytes, 83% PNN, 10% macrophages and 7% lymphocytes. Standard and specific staining found no bacteria. The patient was afebrile as of postoperative day 1. Reactive aseptic arthritis was diagnosed and antibiotic therapy was interrupted given the absence of bacterial growth after 2 weeks’ culture. At 3 months’ follow-up, the patient was pain-free, the knee was dry, and the Lachman maneuver showed hard stops, with complete range of motion and CRP at 2 micromol/L. X-ray found non-enlarged tunnels, well positioned. The situation was stable at last follow-up (7 months).

Case no 2

A 25-year-old man suffered severe sprain to the right knee. Ligament reconstruction was indicated for instability.

Surgery proceeded as in case 1. The patient presented on day 30 with a 39 °C fever of 1 week’s evolution. Clinical examination found joint effusion and flexion limited to 40°. Biological analysis found: CRP, 163 micromol/L; and leukocytes, 8240 (5850 PNN). Emergency joint puncture found pus. Arthroscopic lavage was associated to partial synovectomy for Gächter grade-2 synovitis. The transplant and screws were left. Two joint fluid samples and one synovial sample were sent for bacteriological analysis. Two weeks’ orbenin was associated to 48 hrs gentamicin. The patient was afebrile as of postoperative day 1. At day 15, all bacteriological samples were sterile, and antibiotic therapy was terminated. At 3 months’ follow-up, the patient was pain-free and the knee was dry and stable, with 120° flexion and CRP at 4 micromol/L. The situation was stable at last follow-up (8 months).

Discussion

There are no reported series of presumed aseptic arthritis following ACL reconstruction with PET fixation. Synthetic ligaments for ACL reconstruction were described in the 1970s, the advantages being absence of harvesting morbidity, conservation of tendon stock and reduced skin incision. However, elevated rates of synovitis [6], long-term osteoarthritis [7], osteolysis [8], and secondary rupture (as high as 60% in Dacron ligamentoplasty) [9] gradually cast doubt on this attitude. During the 1980s, other polymers such as PFTE and PET were introduced. Ahlfield et al. [10] reported encouraging findings at 2 years’ follow-up, with only one tear in a series of 30 patients; more long-term series, however, found a mean 14% rate of secondary rupture. Indelicato et al. [11] reported a 34% rate of synovitis (Table 1). Depending on the team, synovitis was managed by puncture evacuation or arthroscopic lavage, associated to short-term non-steroid anti-inflammatory [3]. PFTE and PET, like Dacron, are no longer used as isolated transplant materials. PET has recently been associated to a biological transplant as fixation material in ACL [17] or posterior cruciate ligament [20] reconstruction, with encouraging results and no reported associated synovitis. The other line of research concerns synthetic ligaments composed of bioactive polymers, to limit fibroblastic response [21]. The TLS system uses PET for transplant bone fixation. In theory, the fact that there is no PET within the joint itself should reduce the risk of microparticle release due to PET contact with the synovial, and thus of foreign-body reaction and synovitis. Even so, drilling the femoral tunnel through the lateral condyle from its anterolateral side risks creating a connection from the fixation chamber containing

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**Table 1** Review of the literature on the polytetrafluoroethylene complications and polyethylene terephthalate synthetic ligaments (numbers and %).

<table>
<thead>
<tr>
<th>Author</th>
<th>Patients</th>
<th>Revision</th>
<th>Synovitis</th>
<th>Aseptic arthritis</th>
<th>Infection</th>
<th>Rupture</th>
<th>Type of polymer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krudwig [12]</td>
<td>217</td>
<td>Nc</td>
<td>5 (2.3%)</td>
<td>Nc</td>
<td>3</td>
<td>7</td>
<td>PET</td>
</tr>
<tr>
<td>Paulos [4]</td>
<td>188</td>
<td>Nc</td>
<td>Nc</td>
<td>Nc</td>
<td>5</td>
<td>23</td>
<td>PFTE</td>
</tr>
<tr>
<td>Ventura [13]</td>
<td>126</td>
<td>Nc</td>
<td>Nc</td>
<td>Nc</td>
<td>6</td>
<td>3</td>
<td>PET</td>
</tr>
<tr>
<td>Friedman [14]</td>
<td>103</td>
<td>Nc</td>
<td>Nc</td>
<td>6 (5.83%)</td>
<td>4</td>
<td>1</td>
<td>PFTE</td>
</tr>
<tr>
<td>Glousman [15]</td>
<td>82</td>
<td>14 (17.07%)</td>
<td>Nc</td>
<td>4 (4.88%)</td>
<td>1</td>
<td>4</td>
<td>PET</td>
</tr>
<tr>
<td>Kock [16]</td>
<td>56</td>
<td>5 (8.93%)</td>
<td>0</td>
<td>Nc</td>
<td>9</td>
<td>5</td>
<td>PET</td>
</tr>
<tr>
<td>Lavole [17]</td>
<td>47</td>
<td>4 (8.51%)</td>
<td>0</td>
<td>Nc</td>
<td>19 (21.95%)</td>
<td>1</td>
<td>PFTE</td>
</tr>
<tr>
<td>Indelicato [11]</td>
<td>41</td>
<td>Nc</td>
<td>14 (34.15%)</td>
<td>Nc</td>
<td>9</td>
<td>1</td>
<td>PFTE</td>
</tr>
<tr>
<td>Woods [3]</td>
<td>39</td>
<td>6 (15.38%)</td>
<td>11 (28.21%)</td>
<td>Nc</td>
<td>1</td>
<td>1</td>
<td>PFTE</td>
</tr>
<tr>
<td>Ahlfield [10]</td>
<td>30</td>
<td>2 (6.67%)</td>
<td>Nc</td>
<td>Nc</td>
<td>1</td>
<td>1</td>
<td>PFTE</td>
</tr>
<tr>
<td>Ferkel [18]</td>
<td>21</td>
<td>21 (100%)</td>
<td>Nc</td>
<td>Nc</td>
<td>10</td>
<td>10</td>
<td>PFTE</td>
</tr>
<tr>
<td>MacNicol [19]</td>
<td>20</td>
<td>16 (80%)</td>
<td>Nc</td>
<td>Nc</td>
<td>5</td>
<td>5</td>
<td>PET</td>
</tr>
</tbody>
</table>

NC: not communicated; PET: polyethylene terephthalate; PFTE: polytetrafluoroethylene.
the proximal extremity of the PET strip to the synovial: if the tunnel is drilled too distally and anteriorly, it may cross the superolateral suprapatellar bursa. It is probably necessary to follow the designers’ instructions and cut the femoral strip flush under arthroscopic control at the extracortical end of the femoral tunnel. However, while this precaution would seem to be necessary, it is not sure that it is sufficient, as this is only a physiopathological hypothesis. Anatomopathologic sampling to explore for PET particles and studies with sufficient follow-up will be needed to determine the diagnostic approach assess the incidence, evolution and management of this complication.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References