Original Article

Treatment of a recalcitrant hip infection with a vastus lateralis muscle flap

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Keywords
Infection; Recalcitrant; Hip; Flap; Vastus lateralis

Abstract
Background: Recalcitrant hip infection after arthroplasty presents a reconstructive challenge to orthopedic surgeons. The aim of this study is to evaluate the results with a vastus lateralis muscle flap used to treat these recalcitrant hip infections in our Department.

Material and methods: A retrospective descriptive study was conducted on five patients with deep hip infections by transposition of the vastus lateralis muscle flap. Average age: 70.5 years. Mean follow-up: 30 months (range, 25–34 months). All patients had previously undergone other major surgical procedures (mean of 3.7 previous procedures). All had multiple microbial infections before surgery. The pathogens involved using cultures of the fistula, the outcome of the wound and laboratory results, including C-reactive protein (CRP), were analysed.

Results: Healing was achieved in the five patients who underwent surgery without requiring any further procedures or inflammatory signs of infection. CRP returned to normal one month after surgery, and there was no morbidity or mortality related to surgical technique.

Conclusion: In our experience, the vastus lateralis muscle flap as a treatment for recalcitrant deep infection after arthroplasty has presented good results, provided there are appropriate antibiotic therapy and surgical debridement, thus achieving wound healing and a return to normal of the CRP.

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Tratamiento de la infección recalcitrante de cadera mediante colgajo de músculo vasto lateral

Resumen

Introducción: La infección recalcitrante de cadera tras artroplastia es una complicación de difícil tratamiento para el cirujano ortopédico. El objetivo de este estudio es evaluar los resultados de estas infecciones de cadera recalcitrantes que hemos tenido en nuestro Servicio tratadas con el colgajo de vasto externo.


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Introduction

Recalcitrant hip infection after arthroplasty is probably one of the most intractable complications for orthopaedic surgeons. Conventional treatment consists of adequate debridement and antibiotics. However, a certain percentage of these infections is not resolved by these methods. The Girdlestone resection arthroplasty technique is the most popular option in patients with deep, recurrent infections,\(^1,2\) but even with this technique 20% of infections are not cured,\(^3,4\) even raising the possibility of disarticulation. In these recalcitrant cases, large dead spaces remain in the acetabular cavity and in the previous femoral neck and greater trochanter areas after the Girdlestone technique. These dead spaces represent an excellent breeding ground for the perpetuation of infection. The purpose of a vascularised vastus lateralis muscle flap is to fill these dead spaces with healthy and well-vascularised muscle tissue, enabling an adequate local supply of blood and, therefore, of antibiotic therapy.\(^5\)

Materials and methods

We performed a retrospective study of 5 patients (3 females and 2 males) who suffered deep and recalcitrant hip infections after total hip arthroplasty or review thereof, and who were operated between July 2008 and March 2009 by radical debridement and transposition of a vastus lateralis muscle flap.

The mean age of patients was 71.6 years (range: 61–78 years).

All patients had undergone prior and different surgical procedures (mean figure of 3.7 prior procedures) before transposition, including extensive debridement and surgical cures, vacuum assisted closure (VAC), withdrawal of prosthetic components and placement of antibiotic cement spacers, without satisfactory results.

We studied comorbidities and local factors of poor prognosis in the surgical wound (Table 1), elevation of C-reactive protein (present in all cases), microbial agents involved, evolution of the surgical wound, presence of phlogotic signs and fistulas, and the comorbidity caused. The surgical histories were as follows:

Case 1: patient with intertrochanteric femoral fracture synthesised with an intramedullary trochanteric nail. He was reintervened by total hip arthroplasty (THA) due to necrosis and cutting phenomenon. He presented deep infection requiring a Girldestone-type resection arthroplasty with cement spacer, which did not resolve the infection.

Case 2: patient with coxarthrosis treated primarily with total hip arthroplasty. She required several replacements due to periprosthetic fracture and dislocation. She presented deep infection requiring a Girldestone-type resection arthroplasty with cement spacer, which did not resolve the infection.

Case 3: patient with subcapital femur fracture who underwent total hip arthroplasty. She suffered deep infection which was treated by a Girldestone technique. At 6 months, she underwent Girldestone salvage, presenting a new deep infection which was not resolved.

Case 4: patient with coxarthrosis treated by total hip arthroplasty. She required arthroplasty review due to disimplantation thereof. She presented deep infection requiring a Girldestone-type resection arthroplasty.

Case 5: patient with coxarthrosis treated by total hip replacement. He presented deep infection requiring a Girldestone-type resection arthroplasty with cement spacer, which did not resolve the infection.

All 5 patients had polymicrobial infections with very difficult antibiotic management. Throughout the natural history of each patient, we found more than 5 microorganisms in surgical wound cultures (Table 2).

Surgical technique (Figs. 1 and 2)

Patients were placed in the lateral position on the operating table and a lateral incision was made on the skin of the thigh. The hip was approached in order to perform...
extensive radical debridement. After debridement, we placed wet dressings on the resulting cavity (Figs. 1 and 2).

Flap dissection usually began on the anterior margin of the rectus femoris muscle. The vascular pedicle was easily located by medially retracting this muscle. Dissection continued distally, with the end of the flap being immediately distal to the muscle–tendon junction. Subsequent dissection between the vastus lateralis and vastus intermedius muscles was performed by separating them carefully and ligating the perforating vessels. The flap was isolated

<table>
<thead>
<tr>
<th>Patient number</th>
<th>Age</th>
<th>Gender</th>
<th>Diagnosis</th>
<th>Concomitant disease</th>
<th>Local factors surgical wound</th>
<th>Previous procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>71</td>
<td>M</td>
<td>THA infection</td>
<td>Myasthenia gravis, Corticosteroids, COPD, BPH</td>
<td>Active wound infection with purulent secretion, Multiple previous incisions and interventions</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>F</td>
<td>THAR infection</td>
<td>Repeated UTI, AHT, COPD</td>
<td>Active wound infection with purulent secretion, Multiple previous incisions and interventions</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>78</td>
<td>F</td>
<td>THAR infection</td>
<td>Pulmonary hypertension, Atrial fibrillation, Morbid obesity, COPD, AHT</td>
<td>Active wound infection with purulent secretion, Multiple previous incisions and interventions, Chronic venous insufficiency</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>61</td>
<td>F</td>
<td>THAR infection</td>
<td>AHT, PE</td>
<td>Active wound infection with purulent secretion, Multiple previous incisions and interventions</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>78</td>
<td>M</td>
<td>THA infection</td>
<td>AHT</td>
<td>Active wound infection with purulent secretion, Multiple previous incisions and interventions</td>
<td>4</td>
</tr>
</tbody>
</table>

AHT: arterial hypertension; BPH: benign prostatic hyperplasia; COPD: chronic obstructive pulmonary disease; F: female; M: male; PE: pulmonary embolism; THA: total hip arthroplasty; THAR: total hip arthroplasty replacement; UTI: urinary tract infection.

<table>
<thead>
<tr>
<th>Pathogen number</th>
<th>Pathogens</th>
<th>Time (weeks) girdlestone vastus lateralis muscle flap</th>
<th>Follow-up (month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ORSA (Escherichia coli, Pseudomonas aeruginosa)</td>
<td>Morganella morgagnii, Klebsiella pneumoniae</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Proteus mirabilis, Escherichia coli, Enterococcus faecium, Enterobacter cloacae</td>
<td>Pseudomonas aeruginosa, Staphylococcus epidermidis, Streptococcus agalactiae</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>Pseudomonas aeruginosa, Acinetobacter baumanii, Enterococcus faecalis, Proteus mirabilis, Sphingomonas paucimobilis, Enterobacter cloacae (ESβL)</td>
<td>Alcaligenes faecalis, Candida parapsilosis, Acinetobacter 1woffi, Staphylococcus hominis</td>
<td>56</td>
</tr>
<tr>
<td>4</td>
<td>Staphylococcus epidermidis, Leuconostoc spp, Enterobacter cloacae</td>
<td>Enterococcus faecalis, Klebsiella pneumoniae, Staphylococcus aureus, Pseudomonas aeruginosa, Candida albicans</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Staphylococcus epidermidis</td>
<td>Candida albicans, Propionibacterium acnes</td>
<td>10</td>
</tr>
</tbody>
</table>
together with its vascular pedicle. Subsequently, once its
distal insertion was released, we rotated the flap 180° and
used it to fill the debrided cavity. The transposition of the
flap was fixed by suture in the periacetabular area.

During the postoperative period, patients remained in
bed for 1–2 weeks, without traction, with local treatment
every 24 h and with periodic repositioning, avoiding the lat-
eral position on the intervened limb for 3 weeks. They also
followed intravenous antibiotic therapy. Thereafter, partial
load with a walking frame or cane was allowed on an outpa-
tient basis.

All patients continued antibiotic treatment, based on
previous cultures, for at least 6 weeks.

Results

The mean follow-up period was 30 months (range: 25–34 months). The mean period between Girdlestone-type
resection arthroplasty and vastus lateralis flap transposition
was 20 weeks (range: 0–56 weeks).

The mean duration of surgery was 180 min (range:
120–210 min), with a mean 3 units of packed erythrocytes
being required during the procedure (range: 1–4 units).

Healing of the deep hip infection was achieved in all
5 intervened patients, without the need for any other
procedure except surgical cures of small defects in the sur-
gical wound. There were no new fistulas or phlogotic signs of
infection, with subsequent cultures being negative. The sur-
gical wound healed within a mean period of 15 days (range:
10–20 days).

C-reactive protein became normalised 1 month after the
intervention.

There was no decrease in knee flexion/extension
strength.

All patients required a walking frame or cane for ambu-
lation.

One patient (case 4) presented pneumonia 9 months after
surgery.

Discussion

Deep infection after hip arthroplasty is a complication
with difficult solution. Conventional treatment consists
of adequate debridement and antibiotic therapy, but a
percentage of these infections are not resolved by such
methods. The Girdlestone resection arthroplasty technique
is the most popular option in patients with recurrent,
deep infections, but even with it, 20% of infections are
not resolved, with the possibility of disarticulation being
considered.
In general, in these recalcitrant cases, after the Girdlestone technique it is possible to observe large dead spaces in the acetabulum cavity, as well as in the previous femoral neck and the greater trochanter areas. These spaces represent an excellent breeding ground for the perpetuation of infection for various reasons: the haematoma located in that area, poor antibiotic penetration and fibrotic tissue surrounding it.

Following extensive debridement, filling these spaces with healthy and well-vascularised muscle tissue may resolve the previously described causes of infection, thus ensuring an adequate, local supply of blood and, therefore, of antibiotic therapy.5

There are various flap possibilities, including free latisimus dorsi flaps, which require microsurgical anastomosis, and locoregional flaps, such as gluteus medius, tensor fascia lata,6 rectus femoris6 and rectus abdominis7 flaps, all with some limitations (inadequate volume, general lesion due to previous approaches, difficulties in their implementation, etc.4,6,7).

Vastus lateralis muscle flaps enable an adequate filling of the dead space. This muscle and its vascularisation are generally well-preserved, even after multiple previous interventions. In addition, it shares a fasciocutaneous region which can be used in the subsequent wound closure, allowing ample resections of devitalised tissue and fistulas.5,7,9 It does not cause functional defects in the donor area, as they are compensated by the rest of the quadriceps muscles; muscular coverage of the femur is maintained by the vastus intermedius and rectus femoris muscles. Partially filling the cotyloid cavity prevents the elevation of the remaining proximal femur, facilitating ambulation and a possible review surgery in a second procedure.

Conclusion

In our experience, vastus lateralis muscle flaps have shown good results as a treatment for recalcitrant deep infections after hip arthroplasties. These results were based on an appropriate antibiotic therapy and surgical debridement, achieving wound healing and normalisation of C-reactive protein levels.

Level of evidence N.

Ethical responsibilities

Protection of people and animals. The authors declare that this investigation did not require experiments on humans or animals.

Confidentiality of data. The authors declare that they have followed the protocols of their workplace on the publication of patient data and that all patients included in the study received sufficient information and gave their written informed consent to participate in the study.

Right to privacy and informed consent. The authors declare having obtained written informed consent from patients and/or subjects referred to in the work. This document is held by the corresponding author.

Conflict of interests

The authors have no conflict of interests to declare.

References