The use of a closed-suction drain in total knee arthroplasty

A PROSPECTIVE, RANDOMISED STUDY

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We prospectively randomised 100 patients undergoing cemented total knee replacement to receive either a single deep closed-suction drain or no drain.

The total blood loss was significantly greater in those with a drain (568 ml versus 119 ml, p < 0.01; 95% CI 360 to 520) although those without lost more blood into the dressings (55 ml versus 119 ml, p < 0.01; 95% CI –70 to 10). There was no statistical difference in the postoperative swelling or pain score, or in the incidence of pyrexia, ecchymosis, time at which flexion was regained or the need for manipulation, or in the incidence of infection at a minimum of five years after surgery in the two groups.

We have been unable to provide evidence to support the use of a closed-suction drain in cemented knee arthroplasty. It merely interferes with mobilisation and complicates nursing. Reinfusion drains may, however, prove to be beneficial.

Table I. Details of the 100 patients who had cemented total knee replacements undertaken with or without the use of a closed suction drain

<table>
<thead>
<tr>
<th>Drain</th>
<th>No drain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>50</td>
</tr>
<tr>
<td>Mean age in years (range)</td>
<td>73.1 (50 to 86)</td>
</tr>
<tr>
<td>OA:RA*</td>
<td>45:5</td>
</tr>
<tr>
<td>Lateral release</td>
<td>8</td>
</tr>
</tbody>
</table>

*OA, osteoarthritis; RA, rheumatoid arthritis

Patients and Methods

We undertook a prospective, randomised study involving 100 consecutive patients undergoing primary total knee replacement. The patients gave their informed consent. Randomisation to receive one deep drain (Medinorm 600 System, 1/8, Quierschied, Germany) or no drain was made in theatre immediately before closure of the wound by the selection of a sealed envelope. Table I gives the details of the patients.

Preoperative measurements included the circumference of the knee at the mid-patellar point, the range of movement of the knee and the concentration of haemoglobin. A cemented posterior-cruciate-retaining prosthesis was implanted (PFC; Johnson & Johnson, Bracknell, UK). A tourniquet was used and deflated at the end of surgery when the dressings were in place. Skin closure and dressings were standardised (Melonin, Smith & Nephew, Hull, UK; wool and crepe). Above-knee graduated compression stockings and aspirin (300 mg once daily) were used for antithrombotic prophylaxis. The dressings were left for 48 hours unless they became saturated with blood or caused constriction or discomfort. Mobilisation started within 24 hours and the drain was removed approximately 48 hours after surgery.

Postoperative blood loss was assessed by measuring the increase in the weight of the dressings and the volume of blood drained when a drain was present. The concentration of haemoglobin and the haematocrit were measured on the second and seventh postoperative days. Patients were transfused if the concentration of haemoglobin fell below 10 g/dl. The midpatellar circumference was measured on the third and tenth days. We recorded the time to regaining active
straight-leg raising and the maximum active flexion achieved each day under the supervision of a senior physiotherapist. The area of bruising was also measured. Pain was assessed on the second, sixth and tenth days by a 10 cm visual analogue scale. After five years we reviewed the post-operative records to determine if there had been any late complications. Information was obtained from the general practitioners of those patients who had not recently been reviewed.

**Statistical analysis.** Fisher’s exact test was used to assess differences in the incidence of pyrexia, the extent of bruising and the rate of manipulation and of infection. The Mann-Whitney U test was used to analyse all other results. Values are given as means with 95% confidence intervals (CI).

### Results

Saturation of the dressings by blood led to a change of dressings within 48 hours of the operation in 11 patients with and in 14 without a drain. The volume of blood in the dressings was significantly greater ($p < 0.01$) and the total drainage less in those without a drain ($p < 0.01$) (Table II). There was no significant difference in the mid-patellar circumference on the third and tenth postoperative days between the two groups. The only haematoma developed on the 11th postoperative day in a knee with a drain. This resolved satisfactorily and did not cause loss of movement. Four patients in each group had persistent drainage into the dressings until the fourth postoperative day. There was no significant decrease in concentration of haemoglobin between the groups. A blood transfusion was required for 31 patients with and 19 without a drain.

The presence of a drain increased the time to regaining active straight-leg raising by one day (4.4 days with a drain versus 3.4 days without) which was statistically significant ($p = 0.02$). Analysis of active knee flexion on the third, sixth and tenth days did not show a significant difference in the time to regain flexion or in the amount of active flexion which was achieved (Table III).

There was no difference in the pain scores on the second, sixth and tenth days between the two groups. The absence of a drain did not lead to an increase in the incidence of soft-tissue ecchymosis (Table IV). Patients without a drain were not more likely to develop a pyrexia with one or more readings of 38°C or above. This occurred in nine patients without and in four with a drain ($p = 0.23$) and in none of these was there clinical evidence of a deep-vein thrombosis. Drainage did not significantly affect the length of stay in hospital. Manipulation of the knee under anaesthesia was undertaken if more than 80° of flexion was not obtained despite intensive physiotherapy. No knee with a drain needed a manipulation, but four without a drain were manipulated ($p = 1.0$). There had been no evidence of the formation of a haematoma or significant bruising in any of these knees in the ten days after surgery; flexion, however, remained disappointing in two (75° and 75° versus 110° and 90° before surgery, respectively).

A deep infection was detected 14 months after surgery in one knee without a drain. The diagnosis was confirmed by isotope bone scan and biopsy but the patient died from an unrelated cause before revision was undertaken. The difference in the incidence of infection did not reach statistical significance ($p = 1.0$).

Review of the clinical notes and contact with the patients’ general practitioner at a minimum of five years after operation established that there were no other complications.
Discussion

Although there is no established evidence to support the use of drains in total knee arthroplasty, they are thought to reduce the formation of a haematoma and the incidence of deep infection. Our study suggests that these perceptions are incorrect, in that we were unable to show a statistically significant benefit from the use of a single deep drain in cemented knee arthroplasty. The use of a drain may even be detrimental. Reilly et al found more wound problems in knees which had been drained (5.8% versus 3%), and the drain or its track may act as a portal for bacteria. Holt et al found that in patients without a drain there were more changes of dressing and areas of ecchymosis, but this was not our experience. While there was significantly more bleeding into the dressings in the absence of a drain this did not increase discomfort or the need for changes of dressings. The presence of a drain interferes with mobilisation and complicates nursing. Drainage may be of benefit when uncemented components are implanted since the perioperative blood loss may be greater. Since our study was undertaken, reinfusion drainage systems have become widely available. The opportunity to reinfuse may compensate for the increased blood loss in those with a drain as well as reducing the need for transfusion.

Our study provides further evidence to support the conclusion of the prospective, randomised study of drainage in total hip and knee arthroplasty carried out by Ritter, Keating and Faris. In a study on 60 knee arthroplasties, Jenny, Boeri and Lafare also had similar findings with regard to blood loss and they concluded that lack of drainage does not increase the incidence of complications.

Since surgeons are accustomed to using drains and fearful of the morbidity of deep infection it is understandable that there is resistance to a change of practice. However, no study has established an increased risk of deep infection associated with the use of a drain. Five years after the last arthroplasty in our group had been performed there was deep infection in a knee which had not been drained. Although we were unable to show that the absence of a drain increases the incidence of complications the poor clinical outcomes all occurred in knees without a drain. Results from the Swedish Knee Arthroplasty Register suggest a revision rate of less than 2% for infection at five years. We have been unable to provide evidence to support the use of a single closed-suction drain in cemented knee arthroplasty. A reinfusion drain may, however, have benefits.

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References