Epidural versus intra-articular infusion analgesia following total knee replacement

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ABSTRACT

Purpose. To compare the efficacy of epidural versus intra-articular infusion analgesia following total knee replacement (TKR).

Methods. 25 men and 50 women aged 55 to 75 (mean, 67) years who underwent primary TKR by a single surgeon were randomised and consented to receive either epidural (n=35) or intra-articular (n=40) infusion analgesia for 48 hours at 5 ml/hr. All patients also received intravenous aqueous diclofenac 50 mg twice a day. Patients were assessed 6 hourly for visual analogue score (VAS) for pain to determine the analgesic effect. Complications such as paraesthesia in the lower limbs, hypotension, urinary retention, and abdominal distension were recorded, as was the rehabilitation progress with respect to the time to stand, climb stairs, use of commode chair, and discharge.

Results. The epidural and intra-articular infusion groups were comparable with respect to age, sex, weight, and operating time, as was the analgesic efficacy within 48 hours of TKR. Patients with epidural infusion analgesia had a higher complication rate in terms of hypotension (51.4% vs. 22.5%, p=0.015) and troublesome paraesthesia in the lower limbs (45.7% vs. 12.5%, p=0.028), and a trend of higher abdominal distension rate (20% vs. 5%, p=0.073). Patients with intra-articular infusion analgesia were able to stand/walk earlier (2.08 vs. 2.54 days, p<0.001). The 2 groups did not differ significantly in the time needed to climb stairs, use of commode chair, and discharge.

Conclusion. The efficacy of epidural and intra-articular infusion analgesia was comparable. Intra-articular infusion was associated with fewer complications and earlier rehabilitation.

Key words: analgesia, epidural; arthroplasty, replacement, knee; pain management

INTRODUCTION

Pain immediately following total knee replacement (TKR) can be relieved using various combinations of analgesic drugs, dosages, and techniques. The
optimal analgesia should have maximum efficacy, minimal side effects, and not interfere with rehabilitation. Epidural analgesia is associated with hypotension, paraesthesia, abdominal distension, discomfort, and difficulty in early rehabilitation.\textsuperscript{1–3} Intra-articular analgesia is a viable alternative.\textsuperscript{4–9} This study compared the efficacy of epidural versus intra-articular infusion analgesia following TKR.

**MATERIALS AND METHODS**

Between April 2011 and March 2012, 25 men and 50 women aged 55 to 75 (mean, 67) years with moderate (<10° of varus or flexion) knee deformity underwent primary TKR by a single surgeon under spinal anaesthesia (with 3 ml 0.5% heavy bupivacaine) through a midline skin incision using a cemented metal-backed posterior-stabilised implant, with medial parapatellar arthrotomy. A suction drain was inserted in the lateral gutter and removed 48 hours after surgery. Patients with more severe deformity, bone loss, uncontrolled medical comorbidities, neurologic conditions of the lower limb, previous lower limb surgeries, revision surgery, or postoperative complications (infection, deep vein thrombosis, pulmonary embolism) were excluded.

Patients were randomised and consented to receive either epidural infusion of 300 ml of 0.125% bupivacaine with 300 mcg fentanyl injection (n=35) or intra-articular infusion (in the medial gutter) of 300 ml of 0.125% bupivacaine with 5 ml ketorolac injection (n=40) for 48 hours at 5 ml/hr. Three patients who were randomised to intra-articular infusion opted for epidural infusion. All patients also received intravenous aqueous diclofenac 50 mg twice a day. Tramadol was used as rescue analgesia but was not required by any patient.

Patients were assessed 6 hourly using visual analogue score (VAS) for pain during the first postoperative 48 hours to determine the analgesic effect. Complications such as paraesthesia in the lower limbs, hypotension, urinary retention, and abdominal distension were recorded. Abdominal distension was a subjective feeling of discomfort assessed by daily abdominal girth. An increase in girth by >5 cm with discomfort was considered significant. The rehabilitation progress with respect to the time (days) to stand, climb stairs, use of commode chair, and discharge was recorded. During ambulatory sessions, intra-articular infusion was temporarily stopped.

The 2 groups were compared using the Mann-Whitney \textit{U} test for the VAS score, Chi squared test for proportion of patients with complications, and independent sample \textit{t} test for the days needed for rehabilitation. All these were 2-sided tests. A \textit{p} value of <0.05 was considered statistically significant.

**RESULTS**

The epidural and intra-articular infusion groups were comparable with respect to age, sex, weight, and operating time, as was the analgesic efficacy within 48 hours of TKR. The respective mean VAS for pain improved from 4.11 and 4.35 at 0 to 12 hours to 2.31 and 2.30 at 36 to 48 hours (Table). Patients with epidural infusion analgesia had a higher complication rate in terms of hypotension (51.4% vs. 22.5%, \textit{p}=0.015) and troublesome paraesthesia in the lower limbs (45.7% vs. 12.5%, \textit{p}=0.028), and a trend of higher abdominal distension rate (20% vs. 5%, \textit{p}=0.073). No patient developed any other complications, and no further intervention was required. Patients with intra-

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Epidural infusion (n=35)</th>
<th>Intra-articular infusion (n=40)</th>
<th>\textit{p} Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean visual analogue score for pain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–12 hours</td>
<td>4.11</td>
<td>4.35</td>
<td>0.368</td>
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<tr>
<td>12–24 hours</td>
<td>4.77</td>
<td>4.72</td>
<td>0.965</td>
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<tr>
<td>24–36 hours</td>
<td>3.74</td>
<td>3.45</td>
<td>0.248</td>
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<tr>
<td>36–48 hours</td>
<td>2.31</td>
<td>2.30</td>
<td>0.991</td>
</tr>
<tr>
<td>No. (%) of patients with complication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypotension</td>
<td>18 (51.4)</td>
<td>9 (22.5)</td>
<td>0.015</td>
</tr>
<tr>
<td>Paraesthesia</td>
<td>16 (45.7)</td>
<td>5 (12.5)</td>
<td>0.028</td>
</tr>
<tr>
<td>Abdominal distension</td>
<td>7 (20.0)</td>
<td>2 (5.0)</td>
<td>0.073</td>
</tr>
<tr>
<td>Mean±SD days needed for rehabilitation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stand/walk</td>
<td>2.54±0.35</td>
<td>2.08±0.37</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Climb stairs</td>
<td>4.12±0.41</td>
<td>4.05±0.36</td>
<td>0.402</td>
</tr>
<tr>
<td>Use commode chair</td>
<td>4.41±0.37</td>
<td>4.44±0.21</td>
<td>0.688</td>
</tr>
<tr>
<td>Discharge</td>
<td>5.22±0.44</td>
<td>5.37±0.39</td>
<td>0.754</td>
</tr>
</tbody>
</table>
articul ar infusion analgesia were able to stand/walk earlier (2.08 vs. 2.54 days, p<0.001). The 2 groups did not differ significantly in the time needed to climb stairs, use commode chair, and discharge.

**DISCUSSION**

In terms of analgesic efficacy, local infiltration is reported to be superior to epidural infusion. Bolus intra-articular injection is reported to be superior to continuous epidural infusion. Continuous intra-articular infiltration is reported to be superior to single bolus intra-articular injection. Intra-or extra-articular infiltration or intra-articular bolus or continuous infusion is reported to be more effective. Nonetheless, in our study, analgesic efficacy of intra-articular infusion was comparable with that of epidural infusion. In terms of complications, intra-articular infusion was superior to epidural infusion. Hypotension secondary to epidural infusion can be compounded by postoperative hypovolaemia. Paraesthesia and abdominal distension can cause discomfort in the immediate postoperative period. Early rehabilitation can prevent systemic complications such as deep vein thrombosis or pulmonary complications, particularly in older patients. Patients with local analgesia achieve earlier rehabilitation and discharge. In our study, patients with intra-articular infusion were able to stand earlier, although there was no significant difference in other rehabilitation parameters.

This study had some limitations. The VAS score was subjective. The sample size was too small to compare complications (hypotension, abdominal discomfort, and paraesthesia) of the 2 groups. Patients were not randomised, as the ultimate decision on analgesia was made by the patients.

**CONCLUSION**

The efficacy of epidural and intra-articular infusion analgesia was comparable. Intra-articular infusion was associated with fewer complications and earlier rehabilitation.

**DISCLOSURE**

No conflicts of interest were declared by the authors.

**REFERENCES**


