Intra-articular morphine after arthroscopic knee operation


Summary
Reports on pain relief with intra-articular morphine after arthroscopic knee operation are conflicting. To assess the long-term antinociceptive effect of intra-articular morphine, we studied pain at rest, pain on standing and ability to walk for 7 days after intra-articular injection of bupivacaine 100 mg (group 1, n = 11), bupivacaine 100 mg and morphine 1 mg (group 2, n = 10) and bupivacaine 100 mg and morphine 3 mg (group 3, n = 10) at the end of operation. Pain and walking were assessed by visual analogue and walking scales, respectively. Pain was treated with morphine i.v. in the recovery room and Tylenol No. 3 after discharge. Assessments were made before operation, and 1, 3, 6 and 12 h after injection and on days 1–7 after operation. There were significant differences between the groups in pain scores (pain at rest, P < 0.05; pain on standing, P < 0.01). The pain scores in group 3 were lower than those in group 1. The differences in pain scores at rest were significant at 12 h and on day 1 after operation and differences in pain scores on standing were significant at 12 h and on days 1 and 2 after operation. The scores in group 2 were intermediate between those in groups 1 and 3. The walking scores in group 3 were significantly better than those in group 1 at 12 h. The amount of analogues received in groups 2 and 3 was significantly less than that in group 1 until day 3 after operation. Intra-articular morphine 3 mg was effective in providing prolonged pain relief after arthroscopic knee operation. (Br. J. Anaesth. 1994; 73: 413–415)

Key words
Analgesics opioid, morphine Anaesthetic techniques, regional, intra-articular. Surgery, orthopaedic.

In humans, most studies have suggested that prolonged pain relief may be obtained after arthroscopic knee operations with a small dose of morphine administered directly into the knee joint [1–5]. The duration of follow-up, however, was relatively short in these studies.

We report the long-term effects of intra-articular morphine on pain and walking after arthroscopic operation of the knee under general anaesthesia. In this study, the intensity of pain at rest, on standing (which may show the effects of intra-articular morphine more clearly) and the ability to walk were studied for 7 days after arthroscopic operations in three groups of patients: those receiving intra-articular bupivacaine 100 mg, those receiving bupivacaine 100 mg and morphine 1 mg, and those receiving bupivacaine 100 mg and morphine 3 mg.

Methods and results
We studied 31 ASA I and II patients undergoing arthroscopy of the knee. Institutionally approved informed consent was obtained from each patient. Only those willing to participate in the study and those who understood the methods of evaluating pain and walking were enrolled. Patients with psychiatric diseases or substance abuse were excluded. The patients were allocated randomly to one of three groups: group 1 = 0.5% bupivacaine 20 ml in the knee joint (n = 11); group 2 = morphine 1 mg (Duramorph, Elkins-Sinn Inc., Cherry Hill, NJ, USA) in 0.5% bupivacaine 20 ml (n = 10); and group 3 = morphine 3 mg in 0.5% bupivacaine 20 ml (n = 10). Patients, examiners and the surgeon were blinded to the identity of the drugs.

Premedication was omitted. When indicated, patients were sedated with midazolam 1–2 mg i.v. Anaesthesia was induced with thiopentone 4–6 mg kg⁻¹. Tracheal intubation was facilitated with suxamethonium. Anaesthesia was maintained with isoflurane and nitrous oxide in oxygen. At the end of the procedure, the study drug was injected into the joint. Anaesthesia was then terminated, the arthroscopy entry wound dressed and the tourniquet deflated.

The intensity of pain was assessed by a visual analogue scale (VAS) consisting of a 10-cm line marked "no pain" at one end and "worst possible pain" at the other (the results were expressed in mm). The intensity of pain was evaluated both at rest (recumbent or sitting) and on standing. The inability to walk was assessed in five categories: (1) normal activities; (2) able to walk with occasional rests; (3) able to move about the house, for example to bathroom, etc.; (4) activity limited to a few steps; and (5) unable to stand because of pain. Pain at rest
and on standing, and degree of disability were assessed before operation. The assessments were repeated 1, 3, 6 and 12 h after intra-articular injection and at the end (in the evening) of days 1–7 after operation. In the 3-h period in the recovery room, pain was treated with morphine increments of 2 mg i.v. At discharge home from the recovery room, patients were given a prescription for Tylenol No. 3 (paracetamol 300 mg with codeine phosphate 30 mg, McNeil Consumer Products, Fort Washington, PA, USA) with instruction to take one or two capsules every 4–6 h for severe pain. Patients were given dated and timed sheets of paper on which there were two VAS, walking scores and spaces to record the number of analgesic capsules used for pain relief and side effects.

Differences between groups and changes over time in the VAS scores for pain were tested by analysis of variance for repeated measures. Walking scores and amount of analgesics were tested using a Kruskal–Wallis test, adjusted further by the Bonferroni step-down method. Differences between groups in patient data and medications on the day of operation were tested by analysis of variance.

There were no significant differences between groups in age, sex, height, weight or duration of anaesthesia. Operative procedures that included partial and total meniscectomy, plica resection, resection of fat pad scarring, removal of loose body and debridement of patella were similar in both groups. There were no significant differences in preoperative pain scores at rest or on standing, or walking scores.

There were significant time and group effects in pain scores at rest (time, \( P < 0.0001 \); group, \( P < 0.05 \)) and on standing (time, \( P < 0.001 \); group, \( P < 0.01 \)). There was no significant group–time interaction in either of the scores. The scores were significantly higher than the preoperative values in group 1 until day 2 after operation \( (P < 0.05) \). The scores in group 3 were lower than those in group 1.

The differences in pain scores at rest were significant at 12 h and on day 1 after operation and the differences in the scores on standing were significant at 12 h and on days 1 and 2 after operation (fig. 1).

The pain scores in group 2 were intermediate between those in groups 1 and 3. The scores in group 2 were not significantly different from those in the other groups. The walking scores in group 3 were significantly lower than those in group 1 at 12 h.

The mean amount of morphine required in the recovery room \( (\text{group } 1, 4.9 (\text{SD } 2.1) \text{ mg}; \text{group } 2, 2.6 (1.4) \text{ mg}; \text{group } 3, 1.6 (1.8) \text{ mg}) \) and the median number \( (\text{range}) \) of Tylenol capsules taken on the day of operation after discharge \( (\text{group } 1, 4.0 (0–7); \text{group } 2, 2.0 (0–4); \text{group } 3, 0.5 (0–6)) \) were less in groups 2 and 3 \( (P < 0.01) \). The number of Tylenol capsules taken for pain in groups 2 and 3 was significantly less than that in group 1 from day 1 to day 3 after operation. Three patients in each group developed nausea, somnolence, or both, in the recovery room. Nausea and somnolence recurred in some of those patients up to day 4 after operation in group 1, to day 6 after operation in group 2 and to day 5 after operation in group 3.

**Comment**

We found that intra-articular morphine 3 mg was effective in reducing postoperative pain both at rest and on weight-bearing after arthroscopic knee surgery. In subjects who received only bupivacaine, the pain scores increased significantly until the second day after operation, whereas in patients who received intra-articular morphine 3 mg there was essentially no increase in the scores in the postoperative period and the scores were significantly lower at the end of the day of operation and on days 1 and 2 after operation. Walking score was significantly better at 12 h. Intra-articular morphine 1 mg resulted in pain and walking scores intermediate between those in the controls and those receiving intra-articular morphine 3 mg, suggesting that the antinociceptive effect may have been dose-dependent. Patients who received intra-articular morphine required significantly less analgesics until day 3 after operation. Our patients did not receive opioid premedication and opioids were not given during operation. Pain scores in our controls were close to those reported in studies in which anaesthesia was managed similarly [3] and they remained at substantial levels for days after surgery. Although the venous uptake of morphine from the relatively vessel-poor knee joint is expected to be a slow process because of its hydrophilicity, the prolonged beneficial effects observed in our patients.
for days after operation may also be explained in part by prevention, secondary to activation of intra-articular opioid receptor, of the development of subsequent sustained pain as a result of sensitization of the central nervous system.

Two recent reports failed to show measurable antinociceptive activity of intra-articular morphine [5, 6]. In one report, Raja, Dickstein and Johnson [5] used extradural anaesthesia in all patients and adrenaline was added to all intra-articular injectates. The intraoperative interruption by extradural block of noxious stimuli and alteration by adrenaline of inflammatory reaction evoked by operative procedures were considered to be confounding factors that may have attenuated postoperative pain. However, Allen and colleagues demonstrated recently that intra-articular injection of solutions containing morphine and adrenaline was effective in providing pain relief for up to 24 h after arthroscopic knee surgery [4]. In the other report that failed to show antinociceptive activity, the anaesthetic technique was not standardized and a variety of analgesics were used after surgery [6].

Joshi and co-workers [3], limiting the type of operation to anterior cruciate ligament repair, demonstrated an antinociceptive effect of intra-articular morphine within a few hours of operation in a study on a small group of patients. Among the confounding factors that may influence postoperative pain, the extent of the arthroscopic procedures of the knee may be more difficult to control than in other operations, for example cholecystectomy, hysterectomy, etc. Although the type of operative procedure was similar in most reports, pathology and its extent, type and extent of operation, intensity and duration of pain suffered before operation, and outcome of operation, for example whether or not the pathology was corrected, varied considerably. In our study, in addition, VAS scores were evaluated by the patients and the individual levels of activity may have varied widely after discharge. We observed marked variation in pain scores within groups. The absence of statistical significance in the pain scores in the immediate postoperative period and after the second day after operation in our patients may have been a reflection of the small group studied.

References