

A Study Of Post-Operative Analgesic Usage Following Inpatient Arthroscopic Anterior Cruciate Ligament Hamstring Graft Reconstruction

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Citation

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Abstract

We performed an observational retrospective study to examine the pattern of pain and patient controlled analgesia (PCA) morphine consumption and its inter-patient variability in first 16 to 20 hours post arthroscopic anterior cruciate ligament (ACL) hamstring graft reconstruction. We found no correlation between total PCA morphine usage and the weight or sex of the patient or the tourniquet time. The average pain scores and PCA morphine usage over time followed the same pattern peaking at 1 hour post-operatively.

The inter-patient variability in PCA morphine usage peaked at 4 hours followed by a statistically significant drop. Therefore the maximum post-operative pain, analgesic consumption and its inter-patient variability occurred in the first 4 hours. This is a step forward in the understanding of pain and its analgesic management following ACL reconstruction.

INTRODUCTION

There is a drive towards day surgery for arthroscopic anterior cruciate ligament (ACL) reconstruction. The increasing pressure on beds, incidence of hospital acquired infection, and financial implications are some of the factors fuelling this trend. Despite the increase in the number of outpatient surgical procedures, one of the limiting factors is the adequate understanding and management of post-operative pain.

There are no studies that closely examined the pattern of analgesia consumption and pain in the first 16 to 20 hours after surgery. Furthermore, the considerable inter-patient variability in postoperative analgesic requirements reported in the literature had not been studied (4).

The aims of this observational retrospective study were:

1. To examine the amount and pattern of pain and PCA morphine rate consumption after inpatient arthroscopic ACL hamstring graft reconstructions.
2. To identify times of maximum PCA morphine rate uptake and whether it coincides with the maximum pain scores.

3. To study the considerable inter-patient variability in postoperative analgesic requirements reported in the literature.

MATERIALS & METHODS

PATIENT SELECTION

A retrospective analysis of 50 inpatients undergoing arthroscopic ACL hamstring graft reconstructions by a single surgeon working with the same anaesthetist in 2004 was carried out. The criteria for patient selection were ACL pathology with no additional intra-articular pathologies. The list of the patients was obtained from the theatre database.

Patients were admitted the morning of the planned surgery and were scheduled for an overnight hospital stay with an anticipated discharge to home the day following surgery. Retrieval of demographic data such as age, sex, and weight was carried out from the medical notes.

The surgical, anaesthetic and post-operative pain management were standardised in the 50 patients.

SURGICAL TECHNIQUE

Patients underwent an examination under anaesthesia (EUA) prior to the surgery. After preparation of the knee, the

tourniquet was inflated to a pressure of 250 mmHg and released after application of the dressing at the end of surgery.

Arthroscopic ACL reconstruction was performed using a hamstring tendon autograft. The graft was harvested through an anterior vertical incision which was later closed with an absorbable suture. The knee arthroscopy was started. After preparation of the intercondylar notch, the graft was positioned and fixed in place. The proximal fixation was with a suspensory transfix system and the distal fixation was with an interference screw. After closure, 10 ml of marcaïn was infiltrated at the graft harvest site and into the joint.

The time from inflation to deflation of the tourniquet known as the tourniquet time was retrieved from the notes.

ANAESTHETIC TECHNIQUE

Premedication was omitted. Patients received general endotracheal anaesthesia. Induction was with propofol and maintenance with isoflurane.

POST-OPERATIVE PAIN MANAGEMENT

All patients received a patient controlled analgesia (PCA) pump post-operatively with morphine. The loading bolus dose was 10 mg of morphine. In the PCA, morphine concentration was 1 mg/ml and was set to a bolus size of 1mg, lockout period of 5 minutes and a total dose limit of 30 mg/hr.

Post-operative PCA morphine usage and pain scores were collected retrospectively from the PCA charts. Post-operative pain was documented with a visual analogue scale (VAS). The VAS is a 4-point scale ranging from 0 to 3 (0 = no pain, 1 = mild pain, 2 = moderate pain and 3 = severe pain).

Patients were prescribed a standard post-operative as required regime of paracetamol, codiene phosphate and antiemetics. Any complications such as need for catheterisation, haemarthrosis, and delayed discharge were retrieved.

Statistical analysis using the t test was performed and significance was defined as $P \geq 0.05$.

RESULTS

DEMOGRAPHIC DATA

The average patient's age was 26 ± 7 years and 44 (88%) of the 50 patients were male. The average weight of the patient

was 74 ± 21 kg. Average tourniquet time was 58 minutes.

POST-OPERATIVE PCA MORPHINE CONSUMPTION

Total PCA morphine usage varied considerably between patients, from a minimum of 8 mg to a maximum of 120 mg. The total average PCA morphine used was 24 mg. There was no correlation between the total PCA morphine used and the tourniquet time or the weight or age of the patient.

Chart I shows the average morphine usage rate over time. The three peaks were as follows in declining order: at 1 hour, at 2 hours and at 4 hours. After 6 hours, the rate of PCA morphine usage was low being below 3 mg / hr.

POST-OPERATIVE PAIN MEASUREMENTS

Chart II demonstrates the average VAS score at each defined time. The VAS scores were highest during the first 4 hours post-operative. The peak average VAS score was at 1 hour post-operatively. This coincided with the same pattern of average PCA morphine usage rate.

POST-OPERATIVE COMPLICATIONS

There were no intra-operative or immediate postoperative complications. No patient required re-admission or presented to accident and emergency department complaining of uncontrolled pain post-discharge.

RANGE OF MORPHINE USAGE AND INTER-PATIENT VARIABILITY

The range was high at 1, 2 and 4 hours peaking at 4 hours (Graph III). After 4 hours there is a large drop in the range and this continues to decrease steadily with time. This large drop was statistically significant ($P < 0.002$).

Figure 1

Chart I: Average PCA morphine consumption rate over time. The three peaks were as follows in declining order: at 1 hour, at 2 hours and at 4 hours. After 6 hours, the rate of PCA morphine usage was low being below 3 mg / hr.

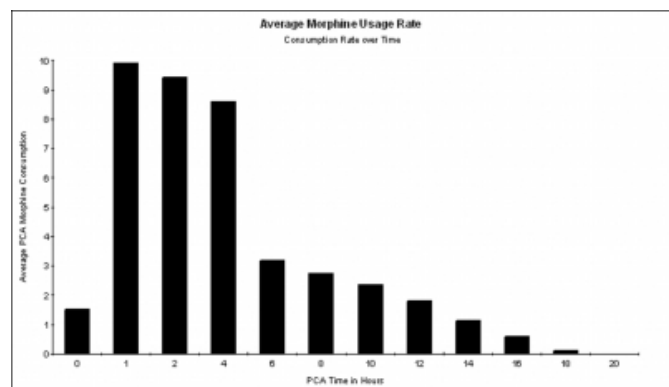


Figure 2

Chart II: Average pain VAS scores over time. The maximum scores were in the first 4 hours. After 4 hours the average VAS score was ≥ 0.5 .

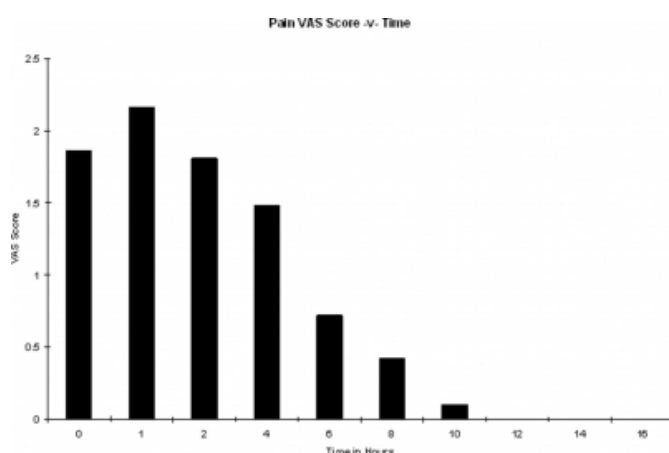
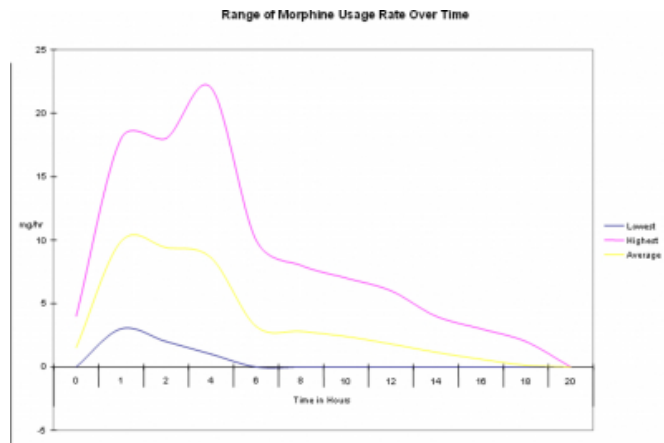


Figure 3

Graph III: Range of PCA morphine usage rate over time (lowest, average and highest graphs). This showed a peak of inter-patient variability in the rate of consumption of PCA morphine at 4 hours followed by a significant drop.



DISCUSSION

There are a few studies looking at post-operative analgesia in the inpatient and outpatient settings after arthroscopic ACL reconstruction. Kao et. al. compared outpatient versus overnight inpatient pain control, narcotic consumption, post-operative complications, recovery time and cost-analysis (1). There found no differences between the groups with respect to severity and frequency of pain for 5 days after surgery. After discharge, the inpatient group was reported to have used less analgesia than the outpatient group. However the amount of analgesic consumption was not documented.

Tierney et al study looked at outpatient ACL reconstruction and found no readmissions or complications due to uncontrolled pain. No pain scores or amount of analgesic consumption at home were documented (2).

Williams et al. prospective study compared outpatient ACL reconstruction with outpatient knee arthroscopy patients and showed higher pain scores and analgesic usage in the first group for 7 days post surgery in the first group (3). The first 24 hours post surgery was not studied closely.

Patient controlled analgesia (PCA) allows each patient to titrate the amount of morphine required to relieve pain, and is ideally suited to the study of analgesic requirements over a period of time without an observer bias. Wu et al study looked at post-operative PCA morphine requirements for 80 inpatients undergoing arthroscopic ACL patellar tendon autograft reconstruction by two different surgeons. They found no correlation between morphine usage and patient

weight, age, surgical or tourniquet time as we found in this study.

Our study is unique as we examined closely the pattern of PCA morphine consumption rate and pain VAS scores in the first 16 to 20 hours after surgery. We found high rate of morphine usage in the first 4 hours and this peaked at 1 hour post-surgery. Pain VAS scores were also high in the first 4 hours and peaked at 1 hour post-surgery. Therefore patients suffer significant pain in the first 4 hours and maximum pain in the first hour post surgery and therefore as expected the consumption of morphine was greatest in this time period.

It is been reported in the literature that the wide inter-patient variability in postoperative analgesic consumption may hinder the progression to arthroscopic ACL reconstruction becoming an outpatient procedure (4). Clinically, patients demonstrate significant differences in their sensitivities to upload, a fact that has been also demonstrated in animals (7). We found this inter-patient variability to follow a pattern of increase to peak at 4 hours post-surgery and thereafter a statistically significant drop.

CONCLUSION

As there were large drops in PCA morphine consumption rate and its inter-patient variability and VAS scores after 4 hours, patients can potentially be discharged home 4 hours after surgery. Therefore, these findings are in support of

performing arthroscopic ACL hamstring graft reconstructions surgery as a day surgery on a morning list. This is a step forward in the understanding of pain and its analgesic management following ACL reconstruction.

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