

## Comparison of Ketorolac and Opioid Analgesics in Postoperative ACL Reconstruction Outpatient Pain Control

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**Summary:** Pain control is an important postoperative consideration with any surgical procedure. Technological and procedural improvements have contributed to the reduction in both the degree of surgical difficulty and the postsurgical complications associated with intricate surgeries. As a result, certain surgeries have potential for being performed on an outpatient basis, dependent upon appropriate pain-management regimens and the degree of potential for postoperative complications. Arthroscopic anterior cruciate ligament (ACL) reconstruction is a common procedure. Because of the reduction in invasiveness that arthroscopy provides, outpatient surgery is now routinely employed for ACL patients. The arguments against ACL outpatient surgery have included the reluctance to use ambulatory, indwelling, intravenous pain-pump delivery systems for opioid pain medication. The purpose of this study was to determine the efficacy of a ketorolac tromethamine used for the management of the postoperative pain produced as a result of outpatient ACL reconstruction. When the ketorolac pain management regimen is compared in this setting with meperidine or morphine, pain control is as good as, or in some cases better than, either of the opioid drugs. Additionally, the adverse side effects associated with opioid drugs are significantly reduced at a substantially lower direct cost to the patient. **Key Words:** Pain control—Nonsteroidal antiinflammatory drugs—Anterior cruciate ligament.

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As health care costs increase and arthroscopic anterior cruciate ligament (ACL) reconstruction techniques improve, outpatient surgery is becoming an exceptionally good option for ACL reconstruction. A major problem with this approach is finding an effective and safe pain management regimen. Many orthopedic surgeons have successfully used ambulatory pain pumps with meperidine or mor-

phine. These seem to provide effective pain management for the patient and allow for an outpatient procedure, yet their use is complicated by many difficulties. Ketorolac tromethamine, a new, nonsteroidal antiinflammatory drug, provides comparable pain control without the high incidence of side effects and difficulties associated with the use of opioid drugs. It is also much more convenient for use after outpatient surgery because it can be administered in tablet form.

Several studies have been published comparing the use of ketorolac tromethamine to meperidine and morphine in postoperative pain control. In these studies, single doses of ketorolac were at least

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as effective as the opioid drugs. Ketorolac 10, 30, and 90 mg provided significantly better pain relief than morphine 6 mg did and as effective pain relief as morphine 12 mg did when all were administered intramuscularly (i.m.) in the treatment of moderate to severe postoperative pain (1,2). In multiple dose trials, ketorolac 30 mg was reported to be as effective as morphine 12 mg and significantly more effective than morphine 6 mg (3,4). In another study, ketorolac 30 and 90 mg i.m. doses were found to be significantly more effective than meperidine 50 and 100 mg doses during a 6-h period in both single- and multiple-dose trials (5,6). Oral ketorolac 10 mg has also been shown to be as effective as morphine 10 mg i.m. (7). These clinical trials indicate clearly the analgesic efficacy of ketorolac tromethamine as comparable with that of the opioid class of analgesic drugs.

The clinical use of meperidine and morphine are associated with a variety of side effects. Side effects associated with opioid use can make the postoperative period more miserable to the patient than the pain for which the opioid drug is prescribed. In a study by Zylicz and Twycross, ~60% of patients treated with opioid drugs for cancer pain required antiemetic drugs to control nausea and vomiting (8). Many of these patients also required the use of laxatives or suppositories to alleviate constipation. Other studies have found a correlation between these opioid drugs and side effects including nausea, vomiting, respiratory depression, constipation, urinary retention, and others (9). Unfortunately, the use of drugs in these outpatient settings was frequently terminated due to the onset of adverse side effects, specifically, nausea and vomiting. The impact of this termination subsequent to complications prevents many patients from receiving adequate pain relief. Despite the risk of these side effects, which occasionally result in the discontinuation of use, opioid pain management regimens, since the advent of ambulatory infusion pumps, have provided most patients with effective pain relief. This has allowed for some previously deemed "inpatient only" procedures to become outpatient surgeries.

Although it is only a small risk, there is also a possibility of hospitalization because of urinary retention requiring catheterization. From 1990 to 1991, of the 263 consecutive ACL reconstructions performed by the senior author (D.M.) on patients who were prescribed morphine or meperidine pain pumps, 2 required inpatient catheterization. The

risk of this side effect and the others previously reported preclude opioid pumps from being the ideal method for outpatient postoperative pain control. An alternative method of effective pain control with fewer side effects would be beneficial.

Ketorolac tromethamine seems to be relatively free of the more serious side effects common to opioid drugs. It does not bind to opioid receptors (10,11), and accordingly lacks many of the side effects typically associated with opioid use. Additionally, ketorolac has been reported to be free of any respiratory depressant effect and causes less constipation than morphine does (12,13).

Ketorolac is also free of the potential for addiction (10,11) or any psychomotor effects (14). In a study comparing 30 mg i.m. ketorolac followed by 10 mg oral ketorolac to meperidine i.m. followed by acetaminophen and codeine for a median duration of 8 days, the meperidine group experienced more nausea, constipation, and urinary retention than did the ketorolac group (15). Of these patients using meperidine, 66% reported nausea, 24% constipation, and 8% urinary retention compared with 39, 8, and 0%, respectively, with the ketorolac group. Of particular interest is the reported 0% urinary retention. A reduction in this complication can reduce the possibility of hospitalization postsurgically.

As with other nonsteroidal antiinflammatory medications, gastrointestinal (GI) pain and nausea appear as the most conspicuous side effects reported by patients using ketorolac. Ketorolac inhibits prostaglandin synthesis in the upper GI tract as well as in the targeted area of action. Because prostaglandins in the upper GI tract protect the gastric walls from the acidity of the gastric juices, ulceration and GI pain may result from their diminished concentration. This is not of serious concern, because multiple 30-mg doses of ketorolac produced fewer serious GI difficulties than analgesic doses (650 mg) of aspirin did (15). As long as ketorolac is avoided in aspirin-sensitive and ulcer-prone patients, immediate postoperative usage of ketorolac presents little difficulty to patients.

Ketorolac is also believed to inhibit platelet function and consequently may increase surgical blood loss. This effect has been reported to be clinically insignificant in normal individuals (15,18). Overall, ketorolac is reported to cause fewer adverse effects, and therefore discontinuation of its use due to adverse effects occurs less often than with morphine or meperidine (15).

An additional advantage of ketorolac use com-

pared with opioid drugs relates to its convenience of use. Ketorolac is available and effective in tablet form. Meperidine and morphine are most effective when administered intramuscularly or intravenously. This limitation requires the use of i.v. pain pumps. The protocol for this type of surgery requires the patient to maintain an intravenous, indwelling catheter in a vein of the forearm during the immediate (2–5 days) postoperative period. Difficulties at the i.v. site are not uncommon and contribute to the inconvenience of using a pain pump. These complications are generally minor and may include skin irritation, rash, phlebitis, vein thrombosis, and/or site tenderness. They can be completely avoided with the use of ketorolac orally.

### MATERIALS AND METHODS

The study population consisted of 92 patients and the surgeries occurred between December 1991 and July 1992. Each surgery was performed by the senior author (D.M.), and the surgical technique remained consistent for the duration of the study. All patients underwent arthroscopic primary reconstruction of the ACL with fixation by interference screws.

The mean age of all patients was 33.5 years (range: 16–59 years); 38 (41%) female and 54 (59%) male patients. Grafts used for reconstruction consisted of either autogenic ( $n = 78$ ; 85%) or allogenic ( $n = 14$ ; 15%) patellar tendon tissue. The allografts were all freeze-dried, patellar tendons.

There were 40 patients (17 female and 23 male) in the ketorolac group with a mean age of 33 years (range 16–59 years). Surgery was performed on these patients between April and July 1992. The opioid group contained 52 patients (21 female and 31 male) with a mean age of 34 years (range 16–53 years). Surgery was performed on these patients between December 1991 and March 1992. Patients who had their surgeries before April 1992 were in the opioid group and patients thereafter were in the ketorolac group.

Of these 52 patients in the opioid group, 43 were prescribed meperidine and 9 were prescribed morphine. Meperidine was the primary choice for opioid medication. Morphine was prescribed only if there was a noted preexisting allergy to meperidine ( $n = 5$ ) or if an allergic reaction was encountered in response to the meperidine test dose administered in the recovery room ( $n = 4$ ).

General anesthesia was performed on each patient using either thiopental sodium (Pentothal) or propofol (Diprivan). Immediately postoperatively in the operating room, 30 ml of 0.5% bupivacaine (Marcaine) with epinephrine 1:200,000 was administered intra- and extraarticularly.

Every patient in the study used a cryotherapy device that was fitted immediately before the application of their leg brace. The brace and cryotherapy devices were applied in the operating room and each patient was instructed in their use and was monitored for compliance during the immediate postoperative period.

Every patient who did not have a concomitant meniscal repair was prescribed the use of a continuous passive motion (CPM) machine postoperatively for a period of 1 week. Those patients with meniscal sutures began their use of the CPM after 1 week and continued its use for 1 week's duration. Every patient was put on a progressive rehabilitation protocol, which included partial weight bearing for the first week postoperatively progressing towards full weight bearing thereafter. Patients with meniscal repairs were instructed to remain non-weight bearing for the first seven days, begin partial weight bearing for the next week progressing to full weight bearing thereafter.

The opioid group ( $n = 52$ ) received a meperidine or morphine pain pump immediately postoperatively. A test reaction dose was administered before instigation of an i.v. ambulatory pain pump. The meperidine pumps were set to have a continuous flow rate of 10 mg/h and additional patient controlled doses of 10 mg could be administered every 10 min with a maximum of five per hour. The morphine pumps were set at a continuous rate of 1 mg/h and 2-mg doses could be patient administered every 10 min with a maximum of five per hour. The pain pumps were removed within 2–3 days after surgery. At that time, a combination analgesic of acetaminophen (650 mg) and hydrocodone bitartrate (7.5 mg)

TABLE 1. Pain level rating by patients

Pain levels	Time intervals
1. No pain	Postop. day 1 a.m.
2. Slight aching	Postop. day 1 p.m.
3. Mild pain	Day 2
4. Moderate pain	Days 3–5
5. Distressing pain	Days 6–14
6. Severe pain	
7. Overwhelming pain	

TABLE 2. Tourniquet times (in min)

	Morphine	Meperidine	Combined opioid drugs	Ketorolac
Mean time	43.3	47.7	46.9	49.1
Range	33-60	21-87	21-87	29-90
SD	9.8	14.1	13.5	12.5

was substituted for patients requiring additional pain control.

The ketorolac group (n = 40) received a 60-mg i.m. dose of ketorolac intraoperatively. The purpose of this was to act as a loading dose enabling the postoperative use of oral ketorolac to maintain effective drug levels. Patients were instructed to take ketorolac 10 mg orally every 4 h, with a limit of 30 doses. After 1 week, patients requiring additional pain control received a combination analgesic of acetaminophen (650 mg) and hydrocodone bitartrate (7.5 mg).

All patients were interviewed retrospectively by telephone between April and July 1992. None of these patients were informed as to the purpose of the study until the conclusion of the survey to minimize bias. The assessment tool used to evaluate each patient's pain was in the form of a survey (see Appendix).

Every patient was asked to rate their pain level on a scale between 1 (no pain) and 7 (overwhelming pain) for each of the time intervals (Table 1). Next, the degree of adverse reactions was assessed in each individual for the 14-day postoperative period. Every patient was asked if they experienced any redness, swelling, or pain at the i.v. site (for opioid patients) or anywhere else on the body. Each patient was also asked if they experienced any nausea or stomach difficulties, vomiting, respiratory problems such as shortness of breath or difficulty breathing, drowsiness, constipation, urinary retention, or any other complication. If the patient an-

swered yes to any questions regarding these difficulties, information concerning the degree of difficulty, the time of onset, and duration of the event was obtained.

## RESULTS

The length of surgery was based on tourniquet time (Table 2). The ketorolac group mean = 49 min (range 29-90) and the opioid group mean = 47 min (range 21-87). The groups are statistically equivalent ( $p = 0.05$ ) for this comparison. The concomitant surgical procedures performed on each patient were evaluated based on the premise that additional procedures contributed to pain levels. The use of allografts, which are less surgically invasive, as well as the concomitant procedures performed, are presented for comparison in Table 3.

When both opioid drugs were combined and compared with the ketorolac patients, pain control for the ketorolac patients was significantly better for the first morning ( $p = 0.034$ ) after surgery (Table 4). Removing the morphine patients from the opioid group and comparing the ketorolac patients with those receiving meperidine, comparable pain relief occurred for the entire duration from day 1 to day 14 (Table 5). This would indicate, indirectly, that morphine pain control was inferior initially when compared with that of ketorolac. However, the sample size of the morphine group is significantly small enough to consider this comparison as anecdotal. Comparing the groups by gender, the male patients reported significantly lower pain levels with ketorolac during all periods except for days 6-14 (Table 6).

Of interest are the numbers of patients not obtaining adequate relief. Verbal responses to the pain questionnaire at the moderate pain level or lower ( $\leq$  level 4) were considered to be an adequate pain control. The results of these comparisons are dis-

TABLE 3. Surgical procedures

	Morphine (n = 9)		Meperidine (n = 43)		Combined (n = 52)		Ketorolac (n = 40)	
Allografts	1	11%	6	14%	7	14%	7	18%
Meniscal repair	2	22%	5	12%	7	14%	10	25%
Partial meniscectomy	4	44%	21	49%	25	48%	20	50%
Lateral release	1	11%	0	0%	1	2%	3	8%
Chondromalacia	1	11%	4	9%	5	10%	9	23%
Open knee procedure	0	0%	1 LCL	2%	1 LCL	2%	1 MCL	3%

LCL, lateral collateral ligament; MCL, medial collateral ligament.

TABLE 4. Pain relief: ketorolac versus opiates (meperidine and morphine)

	Day 1				Day 2		Days 3-5		Days 6-14	
	a.m.		p.m.		Mean	SD	Mean	SD	Mean	SD
	Mean	SD	Mean	SD						
Ketorolac (n = 40)	2.9	1.6	3.0	1.7	2.7	1.5	2.3	1.2	1.9	1.0
Opiates (n = 52)	3.6	1.6	3.6	1.6	3.2	1.5	2.7	1.2	2.1	1.3
p value	0.034 <sup>a</sup>		0.071		0.096		0.116		0.336	

<sup>a</sup> Statistically significant;  $p < 0.05$ .

played in Fig. 1. One patient using meperidine sought medical attention for severe pain and required an increase in the continuous pump rate on his pain pump. None of the patients required emergency medical treatment for pain.

The total adverse side effects reported are listed in Table 7. Nausea, vomiting, or urinary retention lasting <12 h was believed to be related to general anesthesia. The actual values were corrected for this discrepancy. We computed z scores comparing the proportions of side-effect differences between meperidine and ketorolac. Ketorolac was associated with significantly less nausea, vomiting, constipation, allergic response (incidence of a rash or itching), and drowsiness ( $p < 0.05$ ). In addition, eight patients using meperidine reporting minor i.v. site difficulties including itching, redness, soreness, or swelling. Because of the small sample size for patients using morphine, we did not report any direct comparisons with this group.

## DISCUSSION

Ketorolac is at least equally effective in pain control and presents less difficulty in the outpatient setting than do i.v. pain-pump-delivered opioid drugs. Ketorolac is associated with significantly fewer side effects, is also much more convenient for use in the

outpatient setting, and incurs less financial burden on the patient. Based on this assessment, ketorolac is the most ideal mode of pain control for outpatient ACL surgery to date.

In all modes of comparison, ketorolac is consistently equal to, or slightly better than, meperidine. These results are similar to those of Yee et al. and Frick et al. (5,6), although these studies present a stronger argument for the use of ketorolac with significantly better reduction in pain for those patients. An explanation for this difference may be variations in the type of pain, patient age, or other demographic factors. On the other hand, male patients in the ketorolac group expressed a statistically significant reduction in pain control when compared with the male patients in the opioid group (Table 6). Female patients of both groups were statistically equal. This observation is of interest but offers no finite conclusions, and further studies concerning this relationship are warranted.

The lack of a significant difference in the incidence of urinary retention was unexpected and contrary to studies reporting 0% urinary retention associated with ketorolac (15). This may be due to any of several factors. Tracking the cause of urinary retention is complicated with the use of general anesthesia. The arbitrary cutoff time of 12 h may not have fully corrected for the general anesthesia, and with the two patients complaining of urinary retention while using ketorolac, the symptoms subsided

TABLE 5. Pain relief: ketorolac versus meperidine

	Day 1				Day 2		Days 3-5		Days 6-14	
	a.m.		p.m.		Mean	SD	Mean	SD	Mean	SD
	Mean	SD	Mean	SD						
Ketorolac (n = 40)	2.9	1.6	3.0	1.7	2.7	1.5	2.3	1.2	1.9	1.0
Meperidine (n = 43)	3.5	1.6	3.5	1.6	3.1	1.4	2.7	1.1	2.0	1.2
p value	0.074		0.082		0.118		0.115		0.402	

<sup>a</sup> Statistically significant;  $p < 0.05$ .

TABLE 6. Pain relief: ketorolac versus meperidine—time period by gender

	Day 1									
	a.m.		p.m.		Day 2		Days 3-5		Days 6-14	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Female</b>										
Ketorolac (n = 16)	3.8	1.9	3.9	1.9	3.4	1.7	2.7	1.4	2.2	1.2
Meperidine (n = 15)	4.2	1.8	4.2	1.8	3.3	1.6	2.6	1.0	1.9	0.6
p value	0.563		0.637		0.402		0.897		0.665	
<b>Male</b>										
Ketorolac (n = 24)	2.3	1.1	2.3	1.2	2.3	1.2	2.1	1.0	1.7	0.8
Meperidine (n = 28)	3.1	1.4	3.1	1.3	3.0	1.4	2.7	1.2	2.2	1.4
p value	0.010 <sup>a</sup>		0.015 <sup>a</sup>		0.038 <sup>a</sup>		0.029 <sup>a</sup>		0.105	

<sup>a</sup> Statistically significant; p < 0.05.

within 48 h after surgery, well before finishing their prescription. For the patients using meperidine, three of them reported a notable improvement on removal of the pump. However, of the remaining three patients experiencing urinary retention, two

of the patient's symptoms subsided before removal of the pump and the other's symptoms gradually improved during 2 weeks. This information would support the higher incidence of urinary retention associated with meperidine, but further studies with

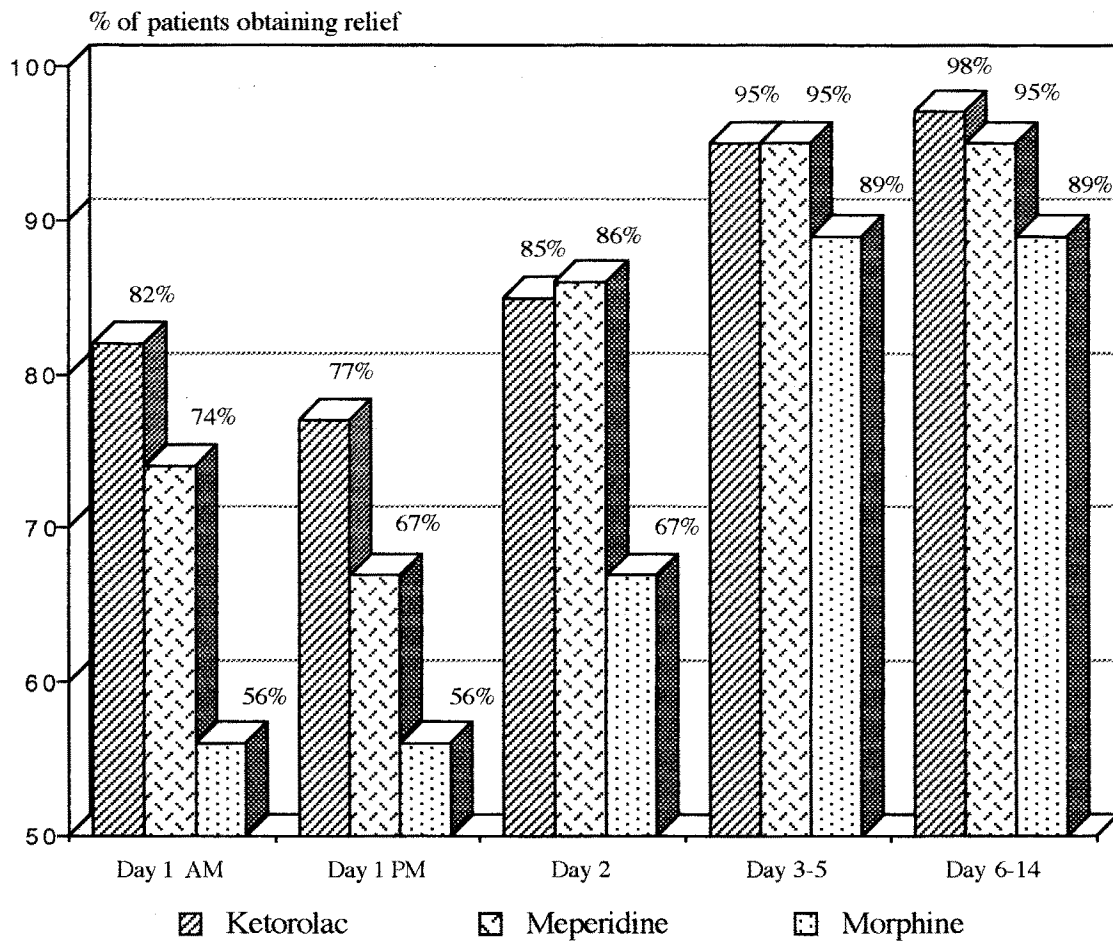


FIG. 1. Pain relief compared over time.

TABLE 7. Side effects

	Morphine (n = 9)			Meperidine (n = 43)			Ketorolac (n = 40)			Ket. vs. mep. p value
	Actual	Corr. <sup>a</sup>	%(corr)	Actual	Corr. <sup>a</sup>	%(corr)	Actual	Corr. <sup>a</sup>	%(corr)	
Nausea	0	0	0%	20	16	37%	6	4	10%	0.002
Vomiting	6	6	67%	7	3	7%	3	0	0%	0.045
Urinary ret.	2	2	22%	7	6	14%	4	2	5%	0.083
Constipation	0	—	0%	4	—	9%	0	—	0%	0.024
Allergic rxn.	0	—	0%	5	—	12%	0	—	0%	0.013
I.V. site	0	—	0%	8	—	19%	N/A	—	N/A	
Drowsiness	3	—	33%	19	—	44%	10	—	25%	0.034
Dizziness	0	—	0%	2	—	5%	0	—	0%	0.086
Hallucinations	0	—	0%	1	—	2%	0	—	0%	>.10
Insomnolence	0	—	0%	1	—	2%	0	—	0%	>.10
"Bad dreams"	0	—	0%	1	—	2%	0	—	0%	>.10
Diarrhea	0	—	0%	0	—	0%	1	—	3%	>.10

<sup>a</sup> Corrected for 12-h postop. anesthesia response.

a larger sample population are needed for confirmation.

Ketorolac can provide a financial savings to the patient. Although the cost of meperidine or morphine per dose is less than ketorolac, the rental fee for the pain pump and associated installation and regulation labor charges result in a significantly greater cost for the opioid protocol. Our patients rented pain pumps at a flat rate of \$200 for the first 2 days and \$100 per day for each additional day. These charges included the medication, patient instruction, device installation, and general informational support. However, if the patient encountered difficulties with the pump, such as a line blockage requiring a nurse visit, the patient was billed an additional fee by the independent home health care agency providing this service. Patients in this study using ketorolac were charged \$8.92 for a 60-mg injection administered before commencement of the surgical procedure. The cost for a 30-tablet prescription ranged from \$40 to \$45 (based on several local pharmacists). During the first 48 h postoperatively at maximum prescribed frequency, only 12 tablets were taken, resulting in a cost of \$16–18. Although patients cannot return any unused portions of this prescription, the amount consumed is used here to calculate comparative costs. Thus, in the first 2 days, the total cost of ketorolac is \$24.92–26.92 compared with \$200 for the ambulatory infusion pumps. As the time required for pain relief increases, the economic difference between these pain management regimens widens.

Previous applications have reported excess bleeding encountered with the use of ketorolac

tromethamine (17,18). In our experience that has not been a problem. There were no identified instances of hemorrhage, hemarthrosis requiring evacuation, or other untoward bleeding events. We did note a slight increase of subcutaneous ecchymosis; however, this has not been of clinically significant proportions. There were no instances requiring hospitalization associated with bleeding complications.

Originally a prospective study was to be initiated subsequent to testing a small number of ketorolac regimen patients during the pilot study phase. However, during the pilot study, it became apparent that ketorolac provided comparable pain relief and almost none of the adverse side effects of morphine or meperidine. The advantages of ketorolac were so dramatic, it was opted to perform a retrospective study, thus providing every new patient with the benefits of ketorolac. If a prospective study were initiated, many patients would have been denied what we believe to be the best available method of ACL outpatient pain management. For those physicians who are currently using i.v. narcotic drugs for outpatient pain control, there remains an opportunity for a prospective study.

In conclusion, arthroscopic ACL reconstruction is a common procedure, and one of the principal arguments against performing this surgery on an outpatient basis is the resistance by some surgeons to using ambulatory i.v. pain pumps. We believe this study demonstrates the efficacy of outpatient ACL reconstructive surgery using ketorolac for pain control. Ketorolac provides adequate or superior pain control, a reduction in side effects, and is economical.

**APPENDIX**

**Ketorolac vs. Opioid Study**  
Post-operative Pain Assessment - Effects

Patient Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. Type of medication used:
- \_\_\_\_\_ Toradol
  - \_\_\_\_\_ Demerol
  - \_\_\_\_\_ Morphine

2. Pain Management: (Scale 1-7; 1=No Pain; 7=Overwhelming Pain)  
(Frequency: C=Continuous, S=Sporadic, M=Motion induced)
- Day 1 AM: \_\_\_\_\_
  - Day 1 PM: \_\_\_\_\_
  - Day 2: \_\_\_\_\_
  - Day 3-5: \_\_\_\_\_
  - Day 6-14: \_\_\_\_\_

3. Did you experience any type of skin reaction? Yes \_\_\_\_\_ No \_\_\_\_\_

**If Yes, go to A. If No, go to 4.**

- A. To what degree?
- \_\_\_\_\_ Redness
  - \_\_\_\_\_ Rash
  - \_\_\_\_\_ Hives
  - \_\_\_\_\_ Itching
  - \_\_\_\_\_ Swelling
- B. Covering what area on the body? How much of the body? \_\_\_\_\_
- C. When? \_\_\_\_\_ D. For what duration?
- \_\_\_\_\_ less than an hour
  - \_\_\_\_\_ 1-3 hours
  - \_\_\_\_\_ 4-12 hours
  - \_\_\_\_\_ 1-2 days
  - \_\_\_\_\_ 3 or more days

4. Did you experience any nausea? Yes \_\_\_\_\_ No \_\_\_\_\_

**If Yes, go to A. If No, go to 5.**

- A. To what degree?
- \_\_\_\_\_ Slight nausea, just mild discomfort.
  - \_\_\_\_\_ Unbearable nausea, difficulty in moving around.
  - \_\_\_\_\_ Vomiting.
  - \_\_\_\_\_ 1-2 times.
  - \_\_\_\_\_ 3-5 times.
  - \_\_\_\_\_ 6-10 times.
  - \_\_\_\_\_ 11 or more.
- B. When (# of days post-op) and was it? \_\_\_\_\_ C. For what duration?
- \_\_\_\_\_ During use of pain medication.
  - \_\_\_\_\_ After use of pain medication.
  - \_\_\_\_\_ less than an hour
  - \_\_\_\_\_ 1-3 hours
  - \_\_\_\_\_ 4-12 hours
  - \_\_\_\_\_ 1-2 days
  - \_\_\_\_\_ 3 or more days

D. If you experienced multiple episodes answer A-C for each.

5. Did you experience any respiratory problems? Yes \_\_\_\_\_ No \_\_\_\_\_

**If Yes, go to A. If No, go to 6.**

- A. To what degree?
- \_\_\_\_\_ Coughing.
  - \_\_\_\_\_ Shortness of breath or difficulty in breathing.
  - \_\_\_\_\_ Chest pains.
  - \_\_\_\_\_ Throat swelling.
- B. Describe the severity of problem.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- C. When? \_\_\_\_\_ D. For what duration?
- \_\_\_\_\_ less than an hour
  - \_\_\_\_\_ 1-3 hours
  - \_\_\_\_\_ 4-12 hours
  - \_\_\_\_\_ 1-2 days
  - \_\_\_\_\_ 3 or more days

E. If you experienced multiple episodes answer A-D for each.

6. Did you experience any out-of-the-ordinary drowsiness? Yes \_\_\_\_\_ No \_\_\_\_\_

**If Yes, go to A. If No, go to 7.**

- A. To what degree?
- \_\_\_\_\_ Slight drowsiness/lethargic.
  - \_\_\_\_\_ Difficulty in staying awake.
  - \_\_\_\_\_ Unable to stay awake.
- C. When? \_\_\_\_\_ D. For what duration?
- \_\_\_\_\_ less than an hour
  - \_\_\_\_\_ 1-3 hours
  - \_\_\_\_\_ 4-12 hours
  - \_\_\_\_\_ 1-2 days
  - \_\_\_\_\_ 3 or more days

D. If you experienced multiple episodes answer A-C for each.

7. Did you experience any urinary retention? Yes \_\_\_\_\_ No \_\_\_\_\_

**If Yes, go to A. If No, go to 8.**

- A. Was a hospital stay required? Yes \_\_\_\_\_ No \_\_\_\_\_
- Length of stay? \_\_\_\_\_
- C. When? \_\_\_\_\_ D. For what duration?
- \_\_\_\_\_ less than an hour
  - \_\_\_\_\_ 1-3 hours
  - \_\_\_\_\_ 4-12 hours
  - \_\_\_\_\_ 1-2 days
  - \_\_\_\_\_ 3 or more days

8. Did you experience any *other* problems in the 14 days following the surgery? Yes \_\_\_\_\_ No \_\_\_\_\_

Explain. Include severity and and duration of complication as well as when it occurred:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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