

Opioid Use After Knee Arthroscopy in Adolescent Patients

A Prospective Evaluation

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Background: There is a relative paucity of literature on how to best treat postoperative pain after knee arthroscopy in the adolescent population.

Purpose: To evaluate the use of opioid medication after knee arthroscopy in adolescent patients.

Study Design: Case series; Level of evidence, 4.

Methods: We prospectively enrolled 50 patients aged 10 to 18 years who underwent 1 of the following procedures: diagnostic arthroscopy; plica excision; loose body removal; debridement; chondroplasty; meniscal repair; and/or partial meniscectomy. Patients already taking chronic pain medication and those undergoing revision knee arthroscopy, ligamentous reconstruction, or bony osteotomy procedures were excluded. Postoperatively, the patients were prescribed 15 tablets of hydrocodone/acetaminophen (5 mg/325 mg) every 6 hours as needed for pain. The patients were given a diary to record the number of postoperative opioid pills taken, days the pills were taken, pain level, and nonopioid pills taken. The data were collected and used to identify the mean number of opioid pills needed as well as the number of days opioid medication was needed postoperatively.

Results: Of the 50 enrolled patients, 35 patients adequately completed the diary and were included in the study. The mean age in this cohort was 14.2 years. The total number of pills taken ranged from 0 to 14, with an overall mean of 5.41. Therefore, on average, patients utilized 36% of their postoperative prescriptions. In our cohort, 74.3% of patients had stopped taking opioids by postoperative day 3, with a mean of 3.8 pills, and 97.1% of patients had stopped taking opioids by postoperative day 5 with a mean of 5.3 pills. No postoperative refills of opioid medication were necessary.

Conclusion: After knee arthroscopy, the adolescents in our study consumed a mean of 5.41 opioid pills postoperatively, and over 97% of patients stopped opioid use by postoperative day 5. The results of this study should help in guiding physicians to avoid overprescribing opioid medication while treating postoperative pain after knee arthroscopy in this vulnerable patient population.

Keywords: adolescent; knee arthroscopy; opioid use; pediatric; postoperative pain

The practice of prescribing opioid medication has been at the forefront of national attention because of the opioid epidemic that affects the United States.^{7,12} Overprescribing opioid medication has led to their nonmedical use.¹⁰ Overprescribing is prevalent in orthopaedic surgery.¹³ The nonmedical use of opioid medication does not just affect the adult population. In 2015, 276,000 adolescents were current nonmedical users of pain relievers, with 122,000

adolescents having an addiction to prescription pain relievers.² Physicians are also prescribing more opioid medication to the adolescent population. From 1997 to 2007, the prescribing rate of opioids to adolescents and young adults nearly doubled.⁴

Knee arthroscopy is one of the most common orthopaedic procedures performed and is being performed in the adolescent population with more frequency.^{1,5} Pain relief after arthroscopic procedures on the knee is an ongoing topic of interest. Studies have shown that the number of opioids prescribed after knee arthroscopy has gone up.¹⁶ In the adolescent population, there is a relative paucity of literature that guides physicians on how to best treat

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postoperative pain after knee arthroscopy.^{15,14,3} Tepolt et al¹⁴ showed that after knee arthroscopic procedures, the mean number of patients taking 5-mg equivalent oxycodone pills was 16.52 for all patients and 14.5 for adolescent patients.¹⁴ Similarly, after knee arthroscopic procedures, Wojahn et al¹⁵ showed that the median number of 5-mg hydrocodone equivalent pills taken was 7 pills and the vast majority of patients stopped taking opioids by postoperative days 5 to 7.

The purpose of this study was to prospectively evaluate the use of opioid medication after knee arthroscopy in adolescent patients aged 10 to 18 years. With this information, we hope to develop an effective dosing regimen after knee arthroscopy in adolescents to help prevent overprescribing for this common procedure.

METHODS

Approval for this study was obtained from our institutional review board. The adolescent patients of the senior surgeon at a single institution were identified preoperatively before undergoing outpatient knee arthroscopy. Included in this study were patients aged 10 to 18 years who had undergone procedures such as diagnostic arthroscopy, plica excision, loose body removal, debridement, chondroplasty, meniscal repair, and/or partial meniscectomy. All meniscal repairs were all-inside, and no ancillary incisions were needed. The exclusion criteria were chronic opioid use, revision knee surgery, and knee arthroscopy with any ligament reconstruction or bony osteotomy. For all included patients in this study, parental consent was obtained as well as patient consent, where appropriate.

During the surgery, general anesthesia was used, and no nerve blocks were utilized. Tourniquets were utilized during all procedures. Because of medication shortages, incision sites were injected with 10 mL of local anesthetic, either 0.5% Marcaine or 0.5% lidocaine, depending on what was available. Patients have been prescribed 15 tablets of hydrocodone/acetaminophen (5 mg/325 mg) every 6 hours as needed. Additionally, they were prescribed 10 promethazine 25 mg every 8 hours as needed for nausea and vomiting. The patients were allowed to take over-the-counter nonopioid medication as necessary instead of their opioid medication. The patient's demographic information, including age, sex, height, weight, and body mass index, was obtained via the electronic medical record.

TABLE 1
Characteristics of the Study Cohort (N = 35)^a

Variable	Value
Female sex	23 (66)
Age, y	14.2 ± 1.97
Age group	
10–12 y	8 (23)
13–15 y	17 (49)
16–18 y	10 (29)
Weight, kg	65.86 ± 19.99
Height, cm	163.78 ± 11.41
BMI, kg/m ²	24.22 ± 5.18

^aData are reported as No. of patients (%) or mean ± SD. BMI, body mass index.

Patients were given a pain diary in which they recorded their daily postoperative pain at the time that they took pain medication, based on a visual analog scale/faces of pain scale (range, 1-10; worst pain = 10). The patients recorded the number of pills taken and the times at which these pills were taken. They also recorded any side effects and any over-the-counter medication that was taken. The data sheets were brought into the patient's first postoperative visit at 1 week postoperatively. While patients were still requiring opioid medication at that time, then they continued documenting the data until they stopped requiring opioid medication, and these data were brought to the 6-week visit. Patients were given written information as to proper opioid medication disposal methods, according to the US Food and Drug Administration recommendations.

Patient characteristics, number of opioid pills taken, number of days pills were taken, and nonopioid analgesic pills taken were recorded. Additionally, the last postoperative day on which patients required opioids was recorded. Categorical data were recorded as frequencies and percentages and continuous data as means and standard deviations.

RESULTS

A total of 50 adolescent patients were enrolled in this prospective study. Of the 50 patients included, 35 (70%) had fully completed their pain diary and were included in the study. Table 1 shows the demographic information for

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Ethical approval for this study was obtained from the University of Oklahoma (reference No. 650530).

TABLE 2
Opioid and Nonopioid Medication Use in the
Study Cohort (N = 35)^a

Variable	Value
Number of opioid pills consumed	5.41 ± 3.91
Opioid pills consumed by group	
0-5	18 (55)
6-10	9 (27)
11-15	6 (18)
Number of nonopioid analgesic pills consumed	10.17 ± 13.66
Nonopioid analgesic pills by group	
0-5	9 (35)
6-10	5 (19)
11-15	5 (19)
16-20	2 (8)
21-30	1 (4)
31-40	3 (12)
≥41	1 (4)

^aData are reported as No. of patients (%) or mean ± SD.

the patient cohort who fully completed their pain diary. The mean age of the patients was 14.2 years, and 23 patients were female (66%) and 12 were male (34%). The procedures included were as follows: diagnostic knee arthroscopy (n = 3); plic excision (n = 14); partial meniscectomy (n = 10); and all-inside meniscal repair (n = 8).

Opioid use in the patient cohort is shown in Table 2. The total number of 5-mg hydrocodone/acetaminophen pills taken ranged from 0 to 14, with 55% of patients taking 0 to 5 pills and 82% taking <10 pills postoperatively. The mean and median number of opioid pills taken were 5.41 and 5, respectively. Therefore, on average, patients used approximately 36% of their prescribed opioid medication.

In our cohort, 74.3% (mean, 3.8 pills) of patients had stopped taking opioids by postoperative day 3, and 97.1% (mean, 5.3 pills) had stopped opioid use by postoperative day 5. All patients had discontinued opioid use by postoperative day 6. Figure 1 shows the postoperative days pills were taken. No postoperative opioid refills were needed.

Nonopioid use was seen in 74.3% of our patient cohort and over-the-counter ibuprofen was most commonly used by patients in isolation or in combination with another nonopioid medication (96.2%). Another nonopioid medication utilized was over-the-counter naproxen and acetaminophen. Acetaminophen was utilized after the opioid medication had been stopped. The mean number of nonopioid pills taken was 15.6, with a range of 0 to 61. The vast majority (97%) of patients had discontinued nonopioid use by postoperative day 6.

DISCUSSION

Our findings show that in our adolescent patient cohort undergoing knee arthroscopy, the mean number of 5-mg hydrocodone/acetaminophen opioid pills taken was 5.41, and 97% of patients had discontinued opioid use by postoperative day 5. This information adds to the growing body of

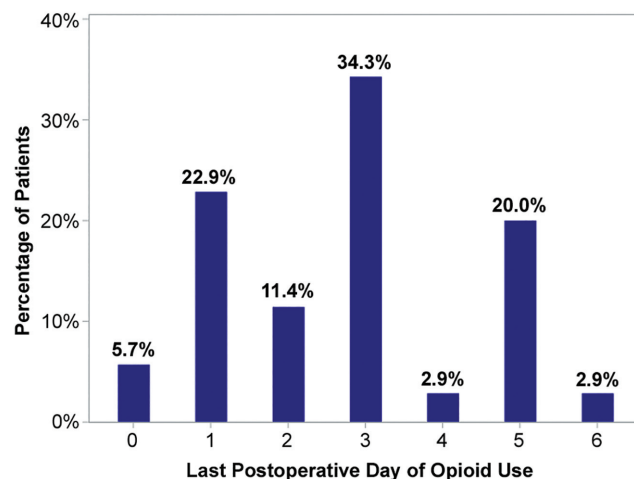


Figure 1. Postoperative days of opioid medication use.

evidence on how to best control postoperative pain in the adolescent population. This is important, as it has been shown that the prescribing rate of opioids to adolescents is high, and 1 study found that this rate doubled over 10 years.^{4,8} Despite this, previous literature has shown that adolescents and young adults use only about 32.4% of their prescribed opioid medication after knee arthroscopy, which is similar to our findings in which patients used, on average, 36% of their prescribed opioid medication.¹⁴ The potential surplus of prescribed medication is concerning, as adolescent patients who misuse opioid medication often obtain the medication from relatives or friends.¹¹ Therefore, the goal of any provider should be limiting the amount of opioid medication prescribed to adolescents, while still maintaining adequate pain control.

Previous studies have evaluated opioid use after knee arthroscopy; however, there is a relative paucity of literature specifically evaluating adolescent patients. Tepolt et al¹⁴ evaluated opioid use in adolescents and young adults after knee arthroscopy and related procedures, with 57% of their patients being adolescents. Their cohort of 100 patients underwent several different procedures, including ligament reconstruction (n = 47), tibial tubercle osteotomy (n = 6), medial patellofemoral reconstruction/medial plication (n = 7), meniscal surgery (n = 18), or other knee arthroscopic procedures (n = 22). They found that the mean number of 5-mg equivalent oxycodone pills was 16.52 in all patients and it was 14.5 pills in adolescent patients. In their study, 11% of patients did not use opioid medication and only 1 patient requested a refill. Risk factors for increased use included increased weight, increased diazepam use, and longer surgery time.¹⁴ Wojahn et al¹⁵ evaluated opioid use after knee arthroscopy in both adult and adolescent patients, with 11 patients aged 14 to 17 years. The procedures performed in their study cohort were similar to ours and included partial meniscectomy, meniscal repair, debridement, chondroplasty, and loose body removal. They found that the median number of 5-mg hydrocodone equivalent pills taken was 7 pills and that,

similar to our findings, the vast majority of patients had stopped taking pills by postoperative days 5 to 7. Similar to our findings in adolescents, in their study of adult patients undergoing knee arthroscopy, Kamdar et al⁹ showed that no patients required more than five 5-mg oxycodone equivalent pills and 92% of patients required no pills after postoperative day 2. Our study differs from the mentioned studies in that our study specifically looks at the adolescent population, whereas other studies included adult patients who did not undergo ligamentous reconstruction or osteotomy type procedures.

Limitations

Our study does have some limitations. Because of the study's design and dependence on the patients' self-reports of their pain medication use, there is potential reporting bias if they did not correctly document the number of pills taken. Our patient cohort was relatively small and the number of logs returned was low, which could have resulted in a selection bias. Additionally, patients utilized anti-inflammatory medications during this study and this was not standardized, which could introduce a potential bias. Also, patients in our study were not blinded to their treatment, which could introduce potential bias. We chose not to include patients undergoing ligament reconstruction, osteotomies, or cartilage restoration procedures, as they are more painful procedures and may result in increased opioid use compared with the procedures included in our study, and thus could confound the results. It has been demonstrated that patients who receive a preoperative block or an intraoperative injection of local anesthetic can manage their pain and use fewer opioids after surgery. However, again, we decided not to include either of these in our cohort to prevent any confounding of the results.⁶ Nerve blocks are not routinely used for routine simple arthroscopic knee procedures in our patient population.

CONCLUSION

After knee arthroscopy in adolescent patients, the mean and median number of postoperative 5-mg hydrocodone/acetaminophen pills required were 5.41 and 5, respectively. The vast majority (82%) of patients required <10 total opioid pills. In our cohort, 97% of patients had discontinued opioid use by postoperative day 5 and all patients had stopped opioid use by postoperative day 6. No patients required refills of pain medication. The results of this

study should help to guide physicians in treating postoperative pain in this vulnerable patient population.

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