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## Post-Operative pain control following Pediatric Otolaryngology Surgery

Richard Grant Muller, Vikrum Thimmappa and Anthony Sheyn\*

Department of Otolaryngology Head and Neck Surgery, University of Tennessee Health Science Center, Memphis, USA

### Article Info

**\*Corresponding author:**

**Anthony Sheyn**

Department of Otolaryngology Head and Neck Surgery

University of Tennessee Health Science Center

910 Madison Ave, Suite 400

Memphis, TN 38103

USA

Tel: 513-225-2288

E-mail: asheyn@uthsc.edu

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### Abstract

**Introduction:** Post-operative pain control in pediatric patients is often difficult to assess. Children often cannot verbalize their level of pain control. Pain control is often accomplished with various combinations of Tylenol, Ibuprofen, and Narcotics. Narcotic medications are commonly prescribed but have a variety of complications. We propose that treating pediatric patients with Tylenol and Motrin combination is a safe and effective way to control pain in most pediatric otolaryngology procedures.

**Methods and Materials:** Study approval was obtained from the IRB 194. patients, between the ages of 6 months and – 17 years, were evaluated. Some of the procedures that were performed were adenotonsillectomy, tympanostomy tubes, tympanoplasty, sinus surgery, congenital neck masses, and thyroidectomy. Patients were all started on Tylenol and Motrin following surgery. No narcotics were prescribed unless families called stating that pain control was inadequate. Parents filled out a validated survey at their first post-operative visit to assess pain control.

**Results:** 140/194 patients had post-operative pain that was adequately controlled by alternating Tylenol and Motrin. 27/137 required no pain medicine at all once arriving home. Nine patients requested additional pain control these include 6 adenotonsillectomies, 2 balloon dilation, and 1 PET/Adenoidectomy.

**Conclusion:** Alternating Tylenol and Motrin provides adequate pain control for commonly performed surgeries in the pediatric population. It is safe to wait and prescribe narcotic medications at a later point if pain control is not adequate. By decreasing reliance on narcotic medication we can reduce rates of complications associated with narcotic use.

**Keywords:** Post Operative; Cognitive abilities; Childrens; NSAIDs Drugs; Ibuprofen and Acetaminophen.

### Introduction

Severe post-operative pain is an under-recognized surgical complication that is associated with increased morbidity and mortality [1]. Previous research has shown that patients with inadequately-controlled pain are more sensitive to subsequent painful stimuli and experience decreased efficacy of future analgesics [2,3]. Further more pain severity has been shown to be correlated with the development of chronic pain in a number of surgical cohorts 4. In otolaryngology, uncontrolled postoperative pain is associated with complications such as restless sleep, behavioral changes, and difficulty taking oral fluids, all of which can potentially compromise the recovery period. Thus, given both the under-recognition of postoperative pain and its impact on patients' physical, emotional, and psychological well-being, it is important for physicians to adequately assess and treat acute pain following surgery.

Post-operative pain in pediatric patients is particularly difficult to assess and manage due to children often lacking the verbal and cognitive abilities necessary to describe their level of pain. As a result, children’s post-operative pain is historically inadequately controlled by both physicians and parents alike [5,6,7]. By relying on self-reporting (e.g. faces scales), behavioral cues (e.g. Parents’ Postoperative Pain Measure and FLACC Pain Assessment Tool), and physiologic reactions, multiple tools have since been developed to assess pain, a subjective feeling, with otherwise objective measures [8,9,10,11].

Narcotics are commonly prescribed to manage post operative pain; however, adverse events do occur. For example, duplication of the gene encoding cytochrome PD4502D6 (CYP2D6) is associated with ultra-rapid metabolism of codeine into morphine, a more potent metabolite. In pediatric patients with CYP2D6 gene duplication undergoing tonsillectomy, the rapid conversion of codeine to morphine has been linked to multiple fatalities due to development of severe respiratory depression [12]. The Food and Drug Administration (FDA) and American Academy of Otolaryngology – Head and Neck Surgery (AAO-HNS) have since recommended against the routine use of codeine post-tonsillectomy through the issuance of a black box warning and clinical practice guidelines, respectively [13,14]. Thus, given the catastrophic risks associated with narcotics, other analgesics, namely acetaminophen and non-steroidal anti-inflammatory drugs (NSAIDs), have become attractive alternatives to adequately control postoperative pain while minimizing adverse effects.

Our study investigates the use of multi-modal analgesia without narcotics to manage postoperative pain. Specifically, we determine the efficacy of a combined regimen of ibuprofen and acetaminophen for analgesia following head and neck surgery in pediatric patients by assessing levels of pain with the Parents’ Postoperative Pain Measure.

## Methods and Materials

We conducted a prospective study of pediatric patients at Le Bonheur Children’s Research Hospital in Memphis, Tennessee from January 1<sup>st</sup>, 2016 to August 1<sup>st</sup>, 2016. The study was approved by the University of Tennessee Health Science Center Institutional Review Board. Statistical analysis was performed using SPSS statistical software.

Patients undergoing Otolaryngologic surgery with no pre-existing conditions and between the ages of 0-17 years were included in the study. Patients with pre-existing co-morbidities which would require extra pain control measures, such as patients with sickle cell disease, were excluded from the study.

All patients were prescribed both Tylenol (acetaminophen) and Motrin (ibuprofen) for post-operative analgesia. Dosing of medication was individualized for each patient based on weight and age. Patients and their caregivers were instructed to alternate between the two medications every 3 hours for optimal pain control. Narcotics were not prescribed unless a family reported inadequate pain control by calling the office or mentioning it at follow-up in clinic.

Pain management was assessed using the Parents’ Postoperative Pain Measure (PPPM [Figure 1]) at follow-up in clinic at approximately 2-6 weeks post-operatively based on the type of surgery. The PPPM is a 15-item questionnaire that is based on identification of behavioral cues by caregivers as indicators of pain (e.g. decreased feeding, decreased energy) 15. It is both a valid and reliable assessment of postoperative pain in pediatric patients that is also highly sensitive (>80%) and specific (>80%) in detecting clinically significant levels of pain [10,11]. In accordance with previously published data, a score  $\geq 6$  indicates clinically significant pain 10. One point was assigned to each positive answer and zero points were assigned to each negative answer. A student t-test was performed for statistical analysis.

**PARENTS’ POSTOPERATIVE PAIN MEASURE (PPPM)**

Children sometimes have changes in behavior when recovering from surgery. The following is a list of behaviors that your child may or may not have exhibited while recovering from surgery between \_\_\_\_\_ and \_\_\_\_\_ today. For each of the behaviors below, circle the appropriate response, yes or no.

**When your child was recovering from surgery between \_\_\_\_\_ and \_\_\_\_\_ today, did s/he . . .**

1) Whine or complain more than usual? .....	Yes	No
2) Cry more easily than usual? .....	Yes	No
3) Play less than usual? .....	Yes	No
4) Not do the things s/he normally does? .....	Yes	No
5) Act more worried than usual? .....	Yes	No
6) Act more quiet than usual? .....	Yes	No
7) Have less energy than usual? .....	Yes	No
8) Refuse to eat? .....	Yes	No
9) Eat less than usual? .....	Yes	No
10) Hold the sore part of his/her body? .....	Yes	No
11) Try not to bump the sore part of his/her body? .....	Yes	No
12) Groan or moan more than usual? .....	Yes	No
13) Look more flushed than usual? .....	Yes	No
14) Want to be close to you more than usual? .....	Yes	No
15) Take medication when s/he normally refuses? .....	Yes	No

Figure 1. Parent’s Postoperative Pain Measure (PPM)

## Results

A total of 194 patients with a mean age of 5.60 ± 4.60 years (range: 7 months – 17 years) were evaluated. Of the participants, 109 (56.19%) were male and 85 (43.81%) were female (Table 1).

Table 1. Patient Demographics

Demographics	Number	Percentage
Total Patients	194	
Male	109	56%
Female	85	44%
Age		
Mean in years	5.6	
Range in years	0.6 - 17	

All participants underwent various otolaryngologic procedures. These included: 52 (26.80%) tonsillectomy and adenoidectomies (T&A); 30 (15.46%) pressure equalization tubes (PET); 9 (4.65%) adenoidectomies; 33 (17.01%) combined adenoidectomy and PETs; 4 (2.06%) combined T&A and PETs; 10 (5.15%) myringoplasties; 6 (3.09%) tonsillectomies; 3 (1.55%) frenulectomies; 3 (1.55%)

septoplasties; 5 (2.06%) tympanoplasties; 2 (1.03%) combined T&A and pharyngoplasties; 3 (1.55%) adenoidectomies; 2 (1.03%) endoscopic sinus surgeries (ESS) ; 2 (1.03%) lymph node biopsies; 3(1.55%) thyroglossal duct cystectomies (TGDC); 2 (1.03%) hemithyroidectomies; 2 (1.03%) combined DLB, ProLarynx injection, and cleft palate repairs. The complete list of procedures can be found in Table 2.

Table 2. Otolaryngologic Procedures

Procedure	Number	Percentage
T&A	52	27%
PET & Adenoids	33	17%
PET	30	15%
Adenoidectomy	12	6%
Myringoplasty	10	5%
Tonsillectomy	6	3%
Tympanoplasty	5	3%
T&A and PET	4	2%
Frenulectomy	3	2%
Septoplasty	3	2%
TGDC	3	2%
T&A and Pharyngoplasty	2	1%
FESS	2	1%
LN Biopsy	2	1%
Hemithyroid	2	1%
DLB, ProLarynx	2	1%
		88%

**Note:** The remaining 12% of cases were singleton other otolaryngology cases 41. total otolaryngologic procedures.

At follow-up in clinic, 140/194 (72.16%) participants' post-operative pain was adequately controlled by alternating Tylenol and Motrin as indicated by a PPPM score <6. In contrast, 54/194 (27.84%) participants still experienced clinically significant pain at follow-up Figure 2). Of these participants 9/54 (16.67%) requested additional pain control with Lortab (acetaminophen-hydrocodone), including 6 adenotonsillectomies and 2 balloon dilations. An additional patient who underwent combined PET and adenoidectomy developed concomitant otitis externa on post-operative day 5 and was given a prescription for Lortab by an emergency department.

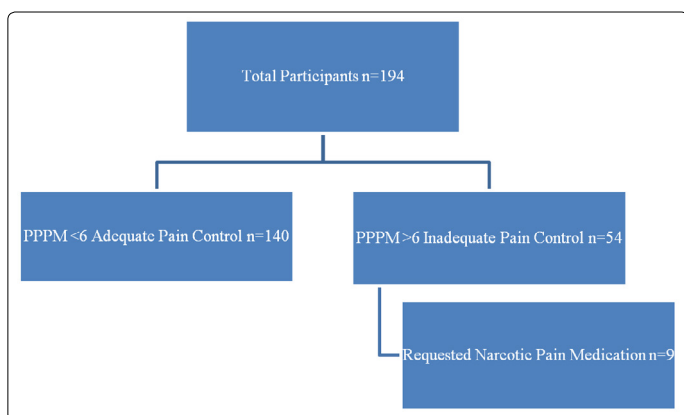


Figure 2. Pain control with Tylenol and Ibuprofen

A total of 36/194 (18.56%) participants did not require any pain medication upon returning home. Of these participants, 34/36 (94.44%) had adequately controlled pain, and 2/36 (5.56%) had inadequately controlled pain as assessed by the PPPM. Patients who did not require pain medication

were a mean age of 4.27 ± 3.96 years; 17/36 (47.22%) and 19/36 (52.78%) were male and female, respectively (Figure 1). These patients do not statistically differ in age or sex in comparison to patients who required analgesia (p>0.05).

## Discussion

Our study contained 194 pediatric patients undergoing 41 different otolaryngologic procedures. The greatest proportion of patients underwent T&A (26.80%) and pressure equalization tubes (15.46%), which are two of the most common pediatric otolaryngologic procedures performed annually in the United States. Thus, given the breadth and distribution of procedures performed, our study is externally valid in regards to pediatric otolaryngology patients.

In the majority of our participants, the use of multimodal analgesia with alternating ibuprofen and acetaminophen adequately controlled pain following head and neck surgery. In our study, 72.16% of participants' pain was controlled with ibuprofen and acetaminophen. These data demonstrate that an alternating regimen of ibuprofen and acetaminophen is efficacious in controlling pain following ambulatory head and neck surgery in pediatric patients.

The most common procedures included Adenotonsillectomy, PET with adenoidectomy, PET alone, Adenoidectomy with or without balloon dilation of the maxillary sinuses, myringoplasty and tympanoplasty. Utilizing alternating Ibuprofen and acetaminophen, the majority of these patients had adequate pain control. The two lowest groups were adenotonsillectomy in which 83% of patients were adequately controlled and tympanoplasty in which only 58% of patients were adequately controlled. The majority of the patients who were not adequately controlled were revision tympanoplasty patients. Of note, these patients did not request additional pain medications at follow-up.

Unfortunately, 27.84% of participants' pain was not controlled with ibuprofen and acetaminophen. Of the patients that underwent tonsillectomy with or without adenoidectomy, 9.83% requested additional analgesia with a narcotic. These data are consistent with previous research in which 2.6% to 13.2% of pediatric patients undergoing tonsillectomy with or without adenoidectomy required an opioid prescription for uncontrolled postoperative pain [10,11,16]. We were unable to identify any risk factors such as age, sex, or procedure performed that could predict development of severe pain unresponsive to ibuprofen and acetaminophen.

A number of participants (18.56%) did not require any medication post-operatively. Most interestingly, this included 2 patients who experienced clinically significant pain as assessed by the PPPM. Multiple plausible explanations exist for this observation. One is that the PPPM is not 100% specific for post-operative pain, and these patients' PPPM scores may represent a type I error [10]. More likely is that previous research has shown that parents do not always administer postoperative analgesia, even if they rate their child's pain as severe [7]. Following ambulatory surgery, parents are frequently the primary caregiver, and our observation may be

related to poor understanding of the risks and benefits of pain management, concerns for addiction, and utility of analgesics [17]. It is possible that these parents would benefit from educational intervention to increase their knowledge and attitudes toward pain medication [18].

In regards to adverse effects, 1 patient experienced hemorrhage on postoperative day 4 following adenotonsillectomy. While the use of NSAIDs post-operatively was originally limited due to a theoretical risk of hemorrhage, subsequent research has shown that NSAIDs do not increase rates of hemorrhage or emergency department visits post-adenotonsillectomy in comparison to opioids [19,20]. Together the use of acetaminophen in combination with an NSAID has been shown to reduce the necessary dose of both medications [19]. Use of NSAIDs reduces opioid consumption by 20-50% and decreases risk of nausea and vomiting and, subsequently, dehydration in the postoperative period in children [20,21]. Thus, the multimodal analgesia with NSAIDs and acetaminophen represent a safe and acceptable alternative to opioids following head and neck surgery.

Our study does have limitations. Our participants ranged from 7 months to 17 years of age, but the PPPM has only been validated in patients 2-12 years of age [19,22,23]. Additionally, the PPPM is a 3<sup>rd</sup> party assessment of a subjective experience, and self-report is a more ideal indicator of post-operative pain. However, since parents typically control administration of pain medication to their children, it remains especially important that they accurately assess their children's pain. Other limitations include the fact that our study was limited to ambulatory procedures without prolonged hospitalizations.

## Conclusion

Post-operative pain control in children is challenging for multiple reasons. The use of narcotics post-operatively has been a common practice in the past; due to national trends of limiting narcotic use in both adults and children alternative methods are currently being investigated. Our study shows that alternating acetaminophen and ibuprofen provides adequate pain control for commonly performed otolaryngologic surgeries in the pediatric population. It is safe to wait and prescribe narcotic medications at a later point if pain control is not adequate. By decreasing reliance on narcotic medication, we can reduce rates of complications associated with narcotic use. Future studies may investigate the use of preoperative administration of analgesics to reduce postoperative consumption and adverse effects of ibuprofen and acetaminophen, a regimen that has been supported in surgical cohorts.

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