Enhanced Recovery After Tonsillectomy

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Abstract

Objectives Investigation of whether the duration of fasting preoperatively has an impact on pain and return to normal function after tonsillectomy To investigate the impact of the duration of preoperative fasting on pain and return to normal function after tonsillectomy. Design Retrospective study with surgeon blinded to the participants undergoing tonsillectomy with or without adenoidectomy Setting University teaching hospital, Sydney, Australia Participants A total of 174 children (n=174) ages 4-12 years old between February 2017 to April 2020 were enrolled. The children were randomised to receive instructions either from the staff at the hospital (n=90) or by the anaesthetist (n=84) in terms of exact pre-operative fasting. Main Outcome measures Fasting times, clear liquid caloric intake 2 hours prior to surgery and Parents Postoperative Pain Measures (PPPM) were documented and analysed. Secondary measures of analgesia usage, number of postoperative nausea or vomiting events were also analysed. Results Observed difference were noted between the instructed fasting period and the actual fasting period. Significant difference in PPPM scores was noted between the Hospital group and the juice group ($p<0.001$). No significant difference was noted at first to 3rd day ($p=0.11$) or by the 8th to 10th postoperative day ($p=0.93$). There was no difference in oxycodone usage between the two groups ($p=0.52$), or in postoperative nausea and vomiting ($p=0.43$) Conclusions Significantly lower PPPM scores were noted on day of surgery in the group that had fasting minimised. The effects appeared to trend in a positive manner but larger number of cases need to be performed for results to be of greater significance. Further research is required into the impact of caloric nutrition to enhance recovery after tonsillectomy.

Enhanced Recovery After Tonsillectomy

Summary: Approximately 100 million tonsillectomies have been performed worldwide in the century since the procedure was popularised. In Australia, tonsillectomy is one of the most common surgical procedures, with over 16,500 operations occurring at public hospitals annually. In the United States, about 186,000 procedures are performed on an outpatient basis every year(1). In spite of the fact that tonsillectomy remains a very common surgical procedure, there is little evidence to support traditional perioperative practices. Currently, some patients are given fasting instructions by the hospital/nursing staff and some patients are given fasting instructions by the anaesthetists per standard international guidelines.

This study is the first of its kind that investigates perioperative fasting for patients undergoing tonsillectomy with or without adenoidectomy.

Abstract:

Objectives: To determine if varying fasting times play a role in post-tonsillectomy paediatric patient outcomes

Design: Quasi-experimental, prospective, surgeon-blinded, single-centre study

Settings: <blinded for review> in Sydney, Australia

Participants: Children 4—12 years old(n=180), admitted for tonsillectomy or adenotonsillectomy. Randomised into Hospital Group(HG) and Anaesthetic Group(AG).

Main outcome measures: The primary measure is the difference in patient pain and return to normal function as measured by the Parents' Postoperative Pain Measure(PPPM). The secondary measures are differences in adverse complications such as postoperative analgesia requirements, nausea and vomiting.

Results: AG had significantly reduced Day 0 PPPM score compared to HG. No significant difference in medium term (Day 1-8) PPPM scores or secondary outcomes.

Conclusions: Shorter fasting times correlate with improved Day 0 post-operative pain scores.

Keywords: fasting, tonsils, perioperative, pain, adenoids, anaesthesia, evidence based medicine, outcomes

Key Learning Points:

1. Shorter fasting times significantly improved PPPM scores on post-operative day 1.
2. Even in the shorter fasting time group, patients' fasting times were on average 1.5 hours longer than instructed.
3. There were lower pain scores in the shorter fasting time group on post-operative days 1-3, however this was not statistically significant.
4. There were slightly higher rates of post-operative nausea/vomiting in the shorter fasting time group, however not statistically significant.
5. There was less use of oxycodone post-operatively in the shorter fasting time group, although not statistically significant.

1. Introduction: In the mid-1990's a gap in understanding prompted a group of surgeons, led by Dr Henrik Kehlet from Copenhagen, to devise and implement early recovery efforts for certain surgeries. Building upon Dr Kehlet's work, a multinational group of surgeons and anaesthetists started the Enhanced Recovery After Surgery(ERAS) research group. Interest in perioperative protocols has become increasingly used for colorectal surgery and gynaecologic surgery(2).

In the past two decades, protocols have been developed that have been found to reduce hospital length of stay, decrease infections and lower readmission rates(3). These protocols have been developed most notably for colorectal surgery and have taken hold across the United Kingdom, the United States and the European continent.

Tonsillectomy is a common operation associated with a high incidence of postoperative pain and significant postoperative nausea and vomiting. We seek to investigate a whether the length of fasting is associated with pain and return to normal function after tonsillectomy.

2. Materials and Methods:

2.1. Patients

A quasi-experimental study was designed with the approval of the joint Ethical Committee of <blinded for review> and the Medical Advisory Committee of <blinded for review>.

We administered PPPM questionnaires to parents of patients that investigated pain ratings, behaviour and medication use. PPPM was utilised as it is a validated tool for assessment of pain by parents following their child's surgery(4). The data was collected between February 2017-April 2020. Children 4—12 years old(n=180), admitted for tonsillectomy or adenotonsillectomy were invited to participate in the study. Children with diabetes, gastrooesophageal problems, involvement in another study, sensitivity to any trial drug, morbid obesity, cognitive impairment or other severe disease were excluded. Informed consent was obtained in writing from the parents and verbally from the children where possible.

2.2. Grouping

Prior to each full operating day, half of the patients were randomly assigned to receive fasting instructions from the hospital and the other half received fasting instructions from the anaesthetist.

Hospital Group(HG) had fasting guidelines as normally recommended by the hospital nursing staff. These patients were told to fast for 6 hours(solids) and 2 hours(water) prior to surgery.

Anaesthetic Group(AG) had fasting guidelines as recommended in preoperative anaesthetic telephone consultation. This involved similar fasting guidelines(fast for 6 hours prior to surgery for solids and 2 hours for clear liquids) with additional instruction to consume 2 mL/kg of clear apple juice 2 hours prior to their scheduled surgical time.

The sample size(180) was determined with power analysis with the t-test at a power of 80%(at 5% significance level) to detect a significant difference between a mean PPPM value of 10 in the Hospital Group and a mean PPPM value of 8 in Anaesthetic Group, assuming a standard deviation of 4. The above sample size estimation has incorporated a drop out rate of 15%.

2.3. Surgery and perioperative setting

There was a single specialist surgeon and specialist anaesthetist for both groups and the surgical technique did not differ between the study groups. The surgeon was blinded to the fasting status of the patients.

No sedative premedication was administered, and the patients underwent inhalational induction with sevoflurane. Fentanyl 1mg/kg was used for anaesthesia induction, and the patients were not paralyzed for endotracheal intubation. In addition, the patients received Dexamethasone 0.1 mg/kg, Paracetamol 12.5mg/kg, Clonidine 1mcg/kg and intravenous antibiotics. The fluid deficit was calculated using the Holliday–Segar formula(100ml/kg/day for the first 10kg of weight, 50ml/kg/day for the next 10kg and 20ml/kg/day for the weight over 20kg). Intravenous fluid(Lactated Ringers) was given as a bolus intraoperatively to correct for the calculated fluid deficit.

Anaesthesia was maintained with 1—2 MAC of sevoflurane in air, depending on the required level of anaesthesia.

During the surgery, preemptive analgesia-administration of local anaesthetic was given prior to excision of tonsils. Bupivicaine with epinephrine 0.25% or Ropivacaine 1% was administered to the lesser palatine nerves at the junction of the hard and soft palate. During the operation, the specialist surgeon focused on minimal tissue damage to key areas – anterior and posterior tonsillar pillars, the uvula, the underlying constrictor muscles, the posterior oropharyngeal mucosa, the buccal and labial tissues and the tongue.

The adenoids were removed under direct vision with a nasally introduced zero-degree telescope, using an appropriate sized Barnhill adenoid curette technique, along with or without the suction diathermy at settings of Cutting Blend 30 and Coagulation Spray 30. Complete haemostasis was achieved with temporary nasopharyngeal gauze swabs and/or the use of diathermy with these settings.

To remove the palatine tonsils, the diathermy device generally used the following parameters “cutting blend” setting of 10; “coagulation spray” setting of 7; and bipolar coagulation standard setting of 6. To avoid injury to remaining tonsillar area tissues, the surgeon aimed to perform firm tonsil tissue retraction to allow precise dissection of the palatine tonsils from the underlying mucosal surfaces of the anterior and posterior pillars which carry the neuronal fibres of the lesser palatine nerve and the branches of the glossopharyngeal nerve fibres respectively.

Prophylactic control of bleeding points were performed at the tonsillar branch of the facial artery, the tonsillar branches of the ascending pharyngeal artery, the dorsal branch of the lingual artery and the descending palatine artery.

The surgeon minimised additional soft tissue trauma by taking care to minimise blunt dissection of the underlying constrictor muscles, circumvent the use of catheters for retraction of the soft palate and avoided finger palpation of the adenoid bed. The surgeon utilised telescopic identification through the nose to

ensure good adenoidal clearance without causing velopharyngeal incompetence or leaving substantial residual adenoid tissue at the posterior nasal choana. The operated area would then be checked to ensure no significant residual clots or retained swabs, and the surgical count with the scrub nurse would be performed.

At the end of surgery, the child was extubated when spontaneous respiration was regular and adequate. After extubation, the child was transferred to the postanaesthesia care unit(PACU) for continuous monitoring of vital signs and assessment of pain, as well as nausea and vomiting. No patients had postoperative intravenous fluids routinely given, but were encouraged to return to normal oral intake of fluids and food. The patients were transferred to the ward when they were fully awake and their cardiovascular and respiratory status was stable.

2.4 Outcomes

The primary outcome variable is the PPPM score. The PPPM score is determined with a 15-item questionnaire with each item corresponding to a 1 if positive. Scores may range from 0-15; lower scores are associated with less pain and a closer approximation to normal activities.

Secondary outcomes include oxycodone usage(mg/kg in the first 24 hours) and number of episodes of nausea/vomiting. Oxycodone usage was recorded on the medication record by the nurse that administered it. Nausea was recorded if the child was able to express it. Vomiting was the forcible ejection of gastric contents through the mouth. This was reported by the parents as part of the interview on postoperative day 0(POD 0), days 1-3(POD 1-3)and days 8-10(POD 8-10)(Appendix1).

2.5 Data collection

The parents were asked to complete the PPPM Parent questionnaire(Appendix 1) on postoperative day 0, days 1-3 and days 8-10 based on parent availability. On the day of surgery(POD 0) the PPPM was completed by the anaesthetist on the paediatric ward or via telephone call if the patient had been discharged. The following PPPM on POD 1-3 and POD 8-10 was done via a telephone call by an anaesthetist. Oxycodone usage(mg/kg) were recorded over the 24 hours immediately following surgery as well as number of episodes of nausea or vomiting. This was recorded by the nursing staff as part of the medication record and nursing notes

3 Results

Data from 174 patients was registered on postoperative day(POD) zero, POD 1-3 and POD 8-10 via PPPM questionnaire given to the parents. Patient characteristics are shown in Table 1 and a summary of survey results are shown in Table 3. Six families were lost to follow-up and were not contactable after they were discharged from hospital. The children that were given fasting instructions by the hospital(HG) did not differ significantly from the children that were given fasting instructions by the anaesthetist. The patients did not have statistically significant differences in gender distribution. They were also similar in age and weight(see Table 1).

3.1. Fasting

Children's preoperative fasting time for liquids differed significantly between groups(see Table 2). The children in the Anaesthetic Group(AG) were told to consume 2mL/kg of clear apple juice 2 hours prior to their scheduled surgical start time. Even with these instructions, the average time from apple juice to surgical start time was 3.5 hours.

Even with clear instructions given to both groups, the patients remained fasting for much longer than instructed. The hospital group had the longest time in between when they had their last fluid intake and when surgery actually started.

3.2 PPPM scores

The mean PPPM scores are shown in Figure 1. On the first postoperative day, the parents of the children in the hospital group reported significantly higher PPPM scores than the juice group($p<0.001$).

The parents of the patients were contacted again at home(POD 1-3) to provide a response for the PPPM. The group that had been minimally fasted still had a slightly lower PPPM score but this was not statistically significant(p=0.115). No significant difference was seen on POD 8-10. All surgeries were associated with functional limitations on the evening following surgery(POD 0), which persisted for the first week.

Discussion

Previous studies have shown that paediatric patients who have undergone adenotonsillectomy/tonsillectomy can experience significant functional limitation and pain(5). Few studies have focused on the interaction between perioperative factors and functional limitations that occur post-tonsillectomy. Perioperative factors such as prolonged periods of fasting for all patients and especially children may result in dehydration and discomfort(6). In fact, many studies have shown that minimising fasting may enhance recovery in multiple types of surgeries(7,8). Shorter fasting guidelines have been advocated by the European, Canadian and American anaesthetic societies(9,10,11). With current fasting guidelines, there has been no increase in the incidence of aspiration(12).

The children in both groups of our study were similar in gender, age and weight. Fasting was prolonged in both groups, but fasting times for clear liquids were reduced in the group that had been given anaesthetic instructions by the anaesthetic team by almost 10 hours. The fasting times were unexpectedly prolonged in both groups. A major impetus for this project, was the need to quantify the duration of fasting.

The PPPM has been used as a measure of pain in paediatric populations and previous research has identified that a PPPM of >6 correlated with significant pain(13). Lower PPPM scores on the day of surgery were associated with the group that had fasting minimised. The difference was not seen in the following days after surgery and PPPM scores were similar in both groups. Causation cannot be established, but the results suggest that further investigation may be warranted. Other literature suggests that a possible mechanism may be the blunting of the catabolic response to surgical trauma may make patients less vulnerable to post-operative complications(15). Enhanced recovery after surgery protocols have emphasised the consumption of carbohydrate drinks 2 hours before surgery to retain anabolic homeostasis(16). These protocols are currently used in major head and neck surgery, colorectal surgery, breast reconstruction, total joint replacement and cardiac surgery(17,18,19). Carbohydrate loading has been shown to reduce insulin resistance in orthopaedic surgery(20,21). In total hip replacement some small studies have been shown to show positive effects on pain and nausea(22).

There were several limitations to this study. Firstly, the patient, parent/caregiver and the anaesthetist were not blinded to the administration of juice. Like any other non-blinded study, this trial also suffers from the same concerns of investigator(anaesthetist) bias. Complete blinding of the patient and anaesthetist would have been impossible due to the nature of the intervention and safety of the anaesthetic induction including appropriate pre-operative history taking by the anaesthetist.

The consultant anaesthetist performed the PPPM interview. This may have created a reporting bias. However, this was minimised by ensuring that all PPPM interviews abided to the specific questionnaire provided.

In addition, the PPPM is a 3rd party assessment of a subjective experience, and self-report is the ideal measure of post-operative pain. However, since parents and caregivers are the advocates for the patients in hospital and they control administration of pain medication to their children at home, it remains especially important that they accurately assess their children's pain. Other limitations include the fact that our study was limited to tonsillectomies(+/-adenoidectomy)without prolonged hospitalisations. The findings may not translate to other types or surgeries and patient populations.

Knowledge translation of current evidence is needed to reduce fasting times in children undergoing surgical procedures. The effort to minimise unnecessary preoperative fasting in paediatric anaesthesia is in evolution. This project showed that there may be improved return to normal activity for patients following tonsillectomy with closer adherence to international guidelines of fasting. Study results revealed inconsistencies between

practice and guideline recommendations, as well as opportunities for improvement to minimise fasting in paediatric patients prior to surgery.

Data availability statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Appendix 1

Parent Questionnaire(PPPM)

Does your child...

1. Whine or complain more than usual?
2. Cry more easily than usual?
3. Play less than usual?
4. Not do the things s/he normally does?
5. Act more worried than usual?
6. Act more quiet than usual?
7. Have less energy than usual?
8. Refuse to eat?
9. Eat less than usual?
10. Hold the sore part of his/her body?
11. Try not to bump the sore part of his/her body?
12. Groan or moan more than usual?
13. Look more flushed than usual?
14. Want to be close to you more than usual?
15. Take medication when s/he normally refuses?

How much does your child weigh?

How long did your child fast before surgery?

Does your child have any preexisting medical conditions?

How many doses of paracetamol and/or endone has your child needed in the past 24 hours?

How many times has your child vomited in the past 24 hours?

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