Comparing postoperative quality of life in children after microdebrider intracapsular tonsillotomy and tonsillectomy

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ARTICLE INFO

Article history:
Received 23 February 2011
Accepted 24 October 2011
Available online 25 November 2011

Keywords:
Tonsillotomy
Tonsillectomy
Microdebrider
Postoperative quality of life

ABSTRACT

Objective: To evaluate postoperative quality of life in patients undergoing microdebrider intracapsular tonsillotomy and adenoïdectomy (PITA) in comparison with traditional adenotonsillectomy (AT) and to assess PITA’s efficacy in solving upper-airway obstructive symptoms.

Methods: 29 children with adenotonsillar hyperplasia referred for AT were included. Patients were divided into two groups: Group 1 (underwent PITA) included 14 children (age 5.1 ± 1.8 years) affected by night-time airway obstruction without a relevant history of recurrent tonsillitis; Group 2 (underwent AT) included 15 children (age 5.2 ± 1.7 years) with a history of upper-airway obstruction during sleep and recurrent acute tonsillitis. Outcomes measures included the number of administered pain medications, time before returning to a full diet, Obstructive Sleep Apnea survey (OSA-18), parent’s postoperative pain measure questionnaire (PPPM) and Wong–Baker Faces Pain Rating Scale (WBFPRS).

Results: Postoperative pain was significantly lower in the PITA group, as demonstrated by PPPM and WBFPRS scores and by a lower number of pain medications used. PITA group also resumed a regular diet earlier (P < 0.001). OSA-18 scores proved that both PITA and AT were equally effective in curing upper-airway obstructive symptoms.

Conclusion: PITA reduces post-tossil ablation morbidity and can be a valid alternative to AT for treating upper-airway obstruction due to adenotonsillar hyperplasia.

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undergoing traditional AT and to assess PITA’s efficacy in resolving upper-airway obstructive symptoms.

2. Methods

2.1. Patients

This prospective clinical trial included 29 children with adenotonsillar hypertrophy who were referred for AT between January and June 2010, divided into two groups based on their clinical history. The main inclusion criteria for this study were: tonsillar hypertrophy (grades 3–4 according to Brodsky [18]) and respiratory obstruction during sleep. The 2 groups were not statistically different for both criteria. Group 1 consisted of 14 children (age range: 3.5–9.1 years, mean 5.1 ± 1.7) affected by night-time airway obstruction with no relevant history of recurrent tonsillitis. Group 2 included 15 children (3.5–9.4 years old, mean 5.2 ± 1.7) with a history of upper-airway obstruction during sleep and recurrent acute tonsillitis (5–8 episodes in the 12 months preceding surgery). Children in Group 1 underwent PITA, while standard AT was performed for children in Group 2. The choice of tonsillectomy vs tonsillecctomy was influenced by the number of episodes of acute tonsillitis during the previous year, nevertheless the degree of obstruction was comparable in the 2 groups.

Exclusion criteria included prior adenotonsillar surgery, craniofacial syndrome, obesity (BMI > 95th percentile), and neurological impairment.

A signed consent was obtained from the parents of all children. The study was approved by the institutional review board of Fondazione Ca’ Granda Ospedale Maggiore Policlinico.

All children underwent nocturnal polysomnography using an Embletta PDS portable diagnostic system (PDS, Medcare; Reykjavik, Iceland). The Embletta PDS is a digital multichannel recording device that measures airflow through a nasal cannula connected to a pressure transducer, oxygen saturation through an oximeter with finger probe, and both respiratory and abdominal movements via built-in effort and body position sensors. Polysomnography was performed prior to surgery and was repeated 6 months after operation. An apnea–hypopnea index (AHI) was determined based on recording time.

2.2. Surgical technique

All children underwent adenotonsillar surgery under general anesthesia in Rose position, with the mouth held open with a mouth gag. PITA was performed in Group 1 patients using a Gyrus microdebrider (GYRUS ACMI, Southborough, MA, U.S.A.) with an angled 4-mm-diameter blade at a speed of 1,500–2,000 rpm for intracapsular tonsil removal. Careful attention was paid to avoid trauma to the pharyngeal pillars, tonsillar capsule and pharyngeal constrictor muscle. Dissection was performed, leaving a slim, concave rim of tonsil tissue to better preserve the capsule and protect vessels, and terminal nerves. Hemostasis was achieved using bipolar cautery as needed.

Children in Group 2 underwent traditional AT. Blunt dissection was performed in the plane separating the tonsillar capsule from the pharyngeal muscle, and bleeding was controlled via bipolar cautery. In both groups, adenoidecтомy was performed under endoscopic direct vision with a rigid 70° 4-mm endoscope. The soft palate was retracted with two catheters via curette and was completed by microdebrider, if needed.

Intraoperative antibiotic treatment was administered (Ceftriaxone at a dose of 50 mg/kg with a maximum of 1,200 mg). Antibiotic therapy was continued for 6 days postoperatively (Cefixima at a single daily dose of 8 mg/kg with a maximum of 400 mg).

All patients received a codeine/paracetamol suppository intraoperatively at a dosage of 5/200 mg. The pain control medication prescribed for the postoperative days was codeine/paracetamol syrup at a dosage of 1 ml/kg (1.5/25 mg) every 6 h with a maximum of 4 administrations per/day, to be given if the VAS pain score was ≥3.

All operations (both PITA and AT) were performed in a University Hospital (Fondazione Ca’ Granda Ospedale Maggiore Policlinico) in Milan by two of the authors (18 operations by G.C. and 11 by L.P.) with 20 years’ experience in otolaryngological surgery.

2.3. Quality of life assessment

Postoperative quality of life was evaluated as follows:

- Parents were instructed to complete a daily diary for 21 days after surgery, indicating the number of dosages of pain medicines administered to the child and the type of diet consumed.
- The Obstructive Sleep Apnea questionnaire OSA-18 [19] was administered to the parents prior to surgery and 4 weeks after the operation to assess the impact of upper-airway obstruction on the child’s quality of life. This questionnaire consists of 18 questions divided into 5 domains: sleep disturbance, physical symptoms, emotional distress, daytime functions and caregiver concerns. Each question is scored on a 7-point ordinal scale. It is a validated health-related quality of life measure of pediatric sleep-disordered breathing and changes over time. The OSA-18 questionnaire has been shown to correlate with the number of apneas and hypopneas per hour of sleep [20].
- The parents’ postoperative pain measure questionnaire (PPPM) [21] was administered to the children’s parents at postoperative days 1, 7 and 15, at the time of the children’s postoperative follow-up examinations. This instrument measures pain-related behavior. It was validated in Canada by Chambers et al. and highly corresponds to postoperative pain [22]. The parents completed a behavioral checklist by circling “yes” or “no” responses. Scores were calculated by counting the number of “yes” responses to the 29 items.
- The Wong–Baker Faces Pain Rating Scale (WBFPS) [23,24] was used to better analyze postoperative pain with a visual analog scale (VAS) of 1–10. This instrument was used in the first 7 postoperative days by the patients and by caregivers when the patient was too young to comply.

2.4. Statistical analysis

Because of the small number of subjects in each group, nonparametric tests were used. The Friedman and Wilcoxon tests allowed us to compare repeated measures in each group, while the Mann–Whitney test was used to evaluate between-group differences.

To estimate whether the two surgical techniques had a different impact on postoperative quality of life over time, we applied a general linear model (GLM) for the variables “PPM”, “WBFPS”, and “OSA-18” separately, with “time elapsed from surgery” as a within-subject factor, “type of surgical technique” and “gender” as between-subjects factors and “age” as the covariate. A P < 0.05 was considered statistically significant. These data were statistically analyzed using the SPSS program release 17.0 (SPSS Inc., Chicago, IL, USA).

3. Results

Both groups of children were similar for age and gender (P = ns). Polysomnography data were not different in the two groups, confirming that the entire cohort was homogeneous in its degree of
upper-airway obstruction. The mean AHI was similar in both groups \((P = 0.06)\) at 8.46 \(\pm\) 0.73 for Group 1 (PITA) and 9.11 \(\pm\) 0.96 for Group 2 (AT). All children in both groups were affected by mild to moderate OSA, according to Reilly and colleagues [15]. Post-operative polysomnography, obtained 6 months after surgery, showed normal values for AHI in all patients \((0.32 \pm 0.51)\) for the AT group and \(0.43 \pm 0.34)\) for the PITA group, \(P = ns\).

The mean number of dosages of pain medications was significantly lower \((P = 0.006)\) for the PITA group \(1.67 \pm 1.16)\) than for the AT group \(5.0 \pm 4.69)\).

The return to a regular solid diet was achieved in 7.33 \(\pm\) 1.53 days for the PITA group and 10.25 \(\pm\) 3.10 days for the AT group, which represents a significant difference \(P < 0.001)\).

Table 1 reports the mean \(\pm\) standard deviation scores of the outcome measures used to measure postoperative quality of life related to pain and to nighttime upper-airway obstruction, as reported by the patients and parents. Data are reported for each group. \(P\) values were calculated by univariate analysis.

The Wilcoxon rank test indicated that PPPM scores were lower for the PITA group at each of the three evaluations. PPPMs improved significantly during the three postoperative weeks \((P = 0.001)\), but the improvements were different across the two groups \((P = 0.003)\) and similar for gender and age \(P = ns\).

The WBFPRS scores at each of first seven postoperative days were lower in the PITA group and improved significantly over time \((P = 0.035)\), but the improvements were different in the two groups \((P = 0.009)\) and by gender \(P = 0.009)\). The female patients in particular reported pain lower scores during the first days, so their WBFPRS scores reflected less improvement over time.

OSA-18 scores improved significantly after surgery \((P < 0.001)\), regardless of surgical technique used or patient gender \(P = ns\).

No intra- or postoperative complications occurred in either group, and no immediate or delayed bleeding was observed. Mean global intraoperative bleeding was 35 \(\pm\) 11.8 ml in the tonsillectomy group and 30 \(\pm\) 9.4 in PITA group. The surgical time was 20 \(\pm\) 5.6 min for tonsillectomy and 17 \(\pm\) 6.2 for PITA. No statistical difference was found for either variable.

4. Discussion

Our study confirms that PITA has a much lower impact on postoperative quality of life than AT. A low number of pain medications was needed by the children in the PITA group, who were able to return to a regular solid diet within one week and experienced significantly less postoperative pain, as demonstrated by the PPPM questionnaire and the WBFPRS visual rating scale.

This favorable course can be attributed to the preservation of the tonsillar capsule and of a thin layer of tonsilar tissue, which can act as a “biological dressing” [12] to protect the pharyngeal muscle and avoid an inflammatory reaction, which is the main cause of postoperative pain.

The symptoms related to upper-airway obstruction similarly and significantly decreased both in patients undergoing PITA and in those undergoing AT. A postoperative polysomnography was not performed because the main aim of the present study was to evaluate the perioperative quality of life, and the three-week follow-up was not long enough to obtain a definitive and significant polysomnographic result. Nevertheless, the OSA-18 questionnaire, which is considered a reliable indicator of apnea episodes [20], clearly indicated that both groups had similar quality of life improvements related to upper-airway obstruction. Furthermore post-operative middle term results of polysomnography objectively confirmed resolution of apnea–hypopnea episodes in both groups under study.

Our findings are supported by a thorough analysis of postoperative discomfort based on both the patients’ and parents’ perspectives gathered via validated questionnaires, and confirm that microdebridement results in a more favorable recovery with less pain, as previously reported in the initial studies by Koltai [8,25] and by the authors who subsequently adopted the use of microdebrider for intracapsular tonsillectomy [10–12,26,27].

Tonsillectomy is the most common operation performed in the pediatric population. In the past, recurrent tonsillitis was the main indication for AT; however, the obstruction of the upper airway is currently the most frequent clinical condition requiring tonsillar ablative surgery [12]. AT can cause relevant morbidity with a huge impact on the postoperative quality of life, including the economic and social consequences of missed sleep and work hours for the parents taking care of the suffering child. In the days after surgery, oropharyngeal pain can compromise proper hydration and caloric intake.

It is desirable to adopt a minimally invasive surgical technique that minimizes the postoperative morbidity while guaranteeing a satisfying resolution of symptoms. Subtotal tonsillectomy, performed either by microdebrider or other techniques, might expose the child to recurring upper-airway obstruction symptoms [9]. Derky et al. found that patients who underwent PITA were almost 5 times more likely (23%) to have some visible lymphoid tissue in their tonsillar fossa at 4 weeks post-treatment compared to tonsillectomy electrocautery patients (6%) [12]. The study by Celenk et al. [4] showed that 16.6% of children undergoing partial tonsillectomy by radiofrequency experienced tonsillar tissue regrowth, but only 11.9% had a recurrence of obstructive symptoms. The reported risk of tonsillar regrowth after PITA is 3.2% [9].

Based on these data, we might hypothesize a rather low risk of OSAS or simple snoring recurrence in patients who undergo PITA. Nevertheless, it has been shown that children undergoing traditional AT also have a risk of OSAS recurrence [1], probably due to anatomical predisposition. Therefore, although our study lacks of long term results, we can presume that tonsillar regrowth or residue plays a minor role in the recurrence of sleep-disordered breathing or OSAS in children following PITA. Consequently, the choice of traditional AT might be an overtreatment for more than 90% of children with obstructive symptoms due to adenotonsilar hypertrophy. Moreover, in case of recurring obstructive symptoms, a second operation, if required by tonsillar regrowth, might be performed to complete the tonsillar tissue ablation.

5. Conclusion

Our short term data confirm that PITA is an effective treatment for obstructive adenotonsilar hypertrophy and results in almost
no postoperative pain and a faster resumption of a normal diet. This technique can be considered a valid alternative to the traditional one in children affected by adenotonsillar hypertrophy. A wider number of cases and long term follow-up might confirm the efficacy of PITA for the treatment of sleep-disordered breathing due to adenotonsillar mass.

Conflict of interest

None.

References