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Intracapsular Partial Tonsillectomy for Tonsillar Hypertrophy in Children

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Objective: **To review our experience with intracapsular tonsillectomy using powered instrumentation in the management of tonsillar hypertrophy causing obstructive sleep-disordered breathing in children. *Study Design:* Retrospective case series. *Methods:* Intracapsular tonsillectomy, a form of partial tonsillectomy performed with an endoscopic microdebrider, preserves the tonsillar capsule as a barrier to exposure of the pharyngeal muscles. Results in 150 children who underwent this procedure were compared with those in 162 children who had standard tonsillectomy. *Results:* Children who underwent intracapsular tonsillectomy had significantly less pain throughout the recovery period than those who had standard tonsillectomy. There was no significant difference between the two groups in intraoperative blood loss, and no episodes of immediate postoperative bleeding occurred in either group. Six patients who had the standard operation and one patient who had the intracapsular procedure had delayed hemorrhage requiring hospital readmission. Five children in the standard group and one in the intracapsular group were readmitted because of dehydration. Thus, in all, 11 readmissions were necessary among children who underwent standard tonsillectomy, whereas 2 were required among those who had intracapsular tonsillectomy. *Conclusion:* Intracapsular tonsillectomy is as effective as standard tonsillectomy in relieving obstructive sleep-disordered breathing but produces less postoperative pain and fewer episodes of delayed hemorrhage and dehydration. *Key Words:* Intracapsular tonsillectomy, microdebrider, tonsillectomy, obstructive sleep apnea, tonsillotomy, tonsillar hypertrophy, pediatric.**

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INTRODUCTION

In 1994, Krespi and Ling[1] described laser-assisted serial tonsillectomy (LAST), an ambulatory procedure performed sequentially using local anesthesia in adults with enlarged cryptic tonsils. They reported that LAST "achieves the functional result of reduction in tonsillar volume. . .without the morbidity of pain and bleeding frequently experienced with conventional excisions." In our experience, however, standard tonsillectomy using a laser resulted in a conventional recovery, an observation indicating that it was the partial nature of the LAST, rather than use of the laser, that reduced the discomfort. Therefore, we began to perform "partial" tonsillectomies for hypertrophy in children under 3 years of age. For this procedure, we selected an endoscopic microdebrider, a device we had been using for transoral power-assisted adenoidectomy.[2] Our patients generally had an easy and rapid recovery, although tonsil regrowth did occur in one child.

In 1998, Linder et al.[3] reported use of a CO_2 laser for "tonsillotomy" (partial tonsillectomy) in 33 children, observing that this procedure relieved the obstruction without bleeding and with minimal pain. Because of this and a follow-up report,[4] we expanded our age range for partial tonsillectomy. In the present report, we describe a retrospective comparison of partial ("intracapsular") tonsillectomy and standard tonsillectomy in 312 children.

PATIENTS AND METHODS

Patients

We reviewed the medical records of all children (n = 150, group 1) who underwent intracapsular tonsillectomy for tonsillar hypertrophy causing obstructive sleep-disordered breathing performed by the same surgeon (P.J.K.) at the same hospital between October 1998 and May 2001. For comparison, we reviewed the records of all children (n = 162, group 2) who underwent standard tonsillectomy performed by the same surgeon during the same period at the same hospital. We also conducted a telephone survey of primary caregivers of the children (132 [88% of caregivers] in group 1 and 137 [84.6%] in group 2) by using a questionnaire that elicited their assessment of their children's postoperative recovery.

Data collected from the records were patient's age, sex, and primary diagnosis; amount of intraoperative blood loss; intraoperative and subsequent complications; days until return to normal activity and diet; number of days of analgesic use; and pain during recovery (on postoperative days 1–3, 4–6, 7–9, after day 9, and overall).

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Surgical Technique

Orotracheal intubation is performed with the child in the Rose position. A mouth gag is used to retract the jaw. The soft palate is retracted with catheters in anticipation of a concurrent adenoidectomy, and this stabilizes the tonsil and pulls the uvula out of the way. Resection begins with the left-side tonsil, with the microdebrider (set to 1500 rpm in oscillating mode) held in the right hand, and moves from the inferior to the superior pole, starting medially and proceeding laterally. When the plane of the pillars has been reached, a Hurd elevator is used to retract the anterior pillar, medialize the remaining tonsil, and allow deeper portions of the tonsillar tissue to be shaved. Care is taken to leave a thin rim of lymphoid tissue on the tonsillar capsule. After resection has been completed, suction cautery is used to control the bleeding from the left-side tonsillar bed. The right-side tonsil is then similarly resected, with the microdebrider held in the left hand. Power-assisted adenoidectomy is performed after the intracapsular tonsillectomy.

Statistical Analysis

Simple associations between categorical variables were assessed with the χ^2 or Fisher's exact test, as appropriate; those between categorical and ordinal variables were analyzed with the Mann-Whitney or Kruskal-Wallis test. Groups 1 and 2 were compared with respect to the ordinal outcomes and the continuous variables of days to return to normal activity and diet by using the Mantel-Haenszel test, with adjustment for any significant categorical predictors. In addition, patients in group 1 were compared with a subset of patients in group 2 who had preoperative tonsillar hypertrophy with obstructive sleep-disordered breathing without chronic tonsillitis (n = 51). Data are reported as means ± SD for continuous variables and medians for ordinal variables. A significance level of P = .05 was used for all hypotheses.

RESULTS

Seventy-eight boys (52%) and 72 girls (48%) had intracapsular tonsillectomy (group 1), and 86 boys (53.1%) and 76 girls (46.9%) had total tonsillectomy (group 2) (P = .85). Age at surgery was 6.0 ± 2.5 years in group 1 and was 8.9 ± 2.9 years in group 2 (P <.001). The median amount of intraoperative blood loss was 25 mL in group 1 and was 30 mL in group 2 (P = .51). No episodes of immediate postoperative bleeding occurred in either group. Six patients who underwent standard tonsillectomy had delayed postoperative hemorrhage requiring hospital readmission, whereas one patient who underwent intracapsular tonsillectomy was readmitted for delayed bleeding (P = .13). Five patients in group 1 and one patient in group 2 required readmission because of dehydration (P = .22). Thus, in all, there were 11 readmissions (7% readmission rate) among children who underwent standard tonsillectomy and 2 readmissions (1%) among children who had intracapsular tonsillectomy. No other tonsillectomy-related complications occurred in either group.

The children in group 1 had less pain at each postoperative assessment time and overall than those in group 2 (P <.01). In addition, children in group 1 had less pain on days 1 to 3 (P = .013) and on days 4 to 6 (P = .036) postoperatively than the 51 children in group 2 with tonsillar hypertrophy with obstructive sleep-disordered breathing without chronic tonsillitis (P <.001). The numbers of days to return to normal activity (P = .028) and of analgesic use (P = .017) were lower in group 1. There was no difference between the groups in the number of days to return to normal diet.

DISCUSSION

In 1930, Fowler[5] described the "modern" tonsillectomy as removing "the tonsil, the whole tonsil, and nothing but the tonsil," a procedure that involved an anatomical dissection in the specific surgical plane between the pharyngeal muscle and the tonsillar capsule. The emphasis on complete tonsillectomy in the era before antibiotics, when tonsillectomies were performed primarily for chronic infections, was based on the observation that after subtotal resection, tonsillar remnants could become reinfected and be a source of persistent disease. However, tonsillectomy continued to frustrate surgeons because of two unresolved problems: prolonged pain and delayed hemorrhage.[6–9] These problems are a consequence of the fundamental design of the standard tonsillectomy and result from infection and inflammation of the exposed swallow musculature attributable to pharyngeal secretions. Pain-free recovery does not occur until the muscles have remucosalized. Similarly, patients remain vulnerable to bleeding until the severed stumps of the primary tonsillar vessels have healed.

In contrast, intracapsular tonsillectomy preserves the tonsillar capsule, avoiding direct surgical violation of pharyngeal muscles and providing a biological "dressing" that keeps the muscles isolated from secretions. This prevents injury and inflammation of the muscles, thereby reducing postoperative pain and recovery time.

The reduction in delayed postoperative hemorrhage with intracapsular tonsillectomy is probably a result of preserving a rim of tonsil tissue on the capsule. Because the tonsil is removed from the outside in, the resection is performed distal to the arborization of the primary tonsillar vessels, thereby exposing only the smaller branched arterioles, which seem to be less prone to delayed hemorrhage. This benefit presents an interesting conundrum, since its mechanism suggests that the decrease in delayed postoperative hemorrhage should be inversely related to the quantity of tonsillar tissue removed. As more tonsil is resected, the exposed vessels become proportionally larger and thus more vulnerable to delayed bleeding. However, leaving more tonsil tissue on the capsule may increase the rate of tonsillar regrowth. Tonsillar regrowth and subsequent chronic tonsillitis are important concerns, which is why we consider chronic tonsillitis a contraindication to intracapsular tonsillectomy. Nevertheless, today, when most tonsillectomies performed in children are for treatment of hypertrophy, intracapsular tonsillectomy relieves obstructive sleep-disordered breathing as effectively as does standard tonsillectomy but with less pain and, perhaps, a greater margin of safety.

The tool we have found most useful for intracapsular tonsillectomy is the endoscopic microdebrider. Although it is not ideal, none of the other instruments or techniques we have tried, including the guillotine,[10] electrocautery, CO_2 laser,[1,3,4] coblation,[11,12] radiofrequency ablation,[12,13] and Harmonic scalpel,[14] have provided as rapid and as complete yet precise control in resecting the tonsil without violating the capsule. The main disadvantage of the microdebrider is the bleeding that results from the resection, which can obscure tissue specificity, especially in the deeper sections of the tonsillar excavation, thereby risking injury to the pharyngeal musculature. This can be prevented by maintaining visualization of the cutting tip of the shaver blade, performing a layered resection, and intermittently using suction cautery to control excessively brisk bleeding vessels.

CONCLUSION

Although our study has the weaknesses associated with a retrospective analysis, the consistency with which we have achieved positive results with intracapsular tonsillectomy in a large number of children gives us confidence in our findings. We are currently conducting a prospective, randomized study of this procedure.

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