Short Report

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Title:

A single centre change of practice audit of pain after coblation intracapsular tonsillectomy compared to standard dissection tonsillectomy in a discrete paediatric population.

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Short title: Pain after coblation intracapsular tonsillectomy

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Background:

The gold standard method of tonsillectomy is “cold steel” dissection (DT). A dissector is used to separate the tonsil and capsule from the underlying muscle layer, with diathermy / surgical ties to achieve hemostasis. It causes significant postoperative pain and risk of bleeding (return to theatre rate 1.6%).

Tonsillectomy techniques using low temperatures and avoiding dissection deep to the tonsillar capsule (intracapsular as against extracapsular) 1 are associated with reduced postoperative hemorrhage, but severity of postoperative pain is unclear. Use of radiofrequency energy at low temperature to ablate tonsillar lymphoid tissue leaving the posterior capsule intact is called Coblation intracapsular tonsillectomy (CIT). A series of 500 CIT operations reported no cases needing to return to theatre for bleeding but no prospective information on pain2.

CIT is being marketed as a painless method of tonsillectomy. **The Children’s Hospital of Orange County blog describes the procedure under the headline “*Goodbye popsicles and painkillers. How painless tonsillectomies are changing choc patients recoveries”* – accessed 11/3/20).**

**Two surgeons within South Tees Hospitals proposed to convert from DT to CIT as their primary method of tonsillectomy in children. The change was considered and approved by the hospital Clinical Standards Committee.** We report the results of a sequential change of practice audit assessing pain after DT and CIT in a discrete paediatric population.

Method:

The audit population was pre-school aged children undergoing adenotonsillectomy for Sleep Disordered Breathing. Initial patients (September 2018 – March 2019) underwent standard DT. Patients (March to September 2019) underwent CIT2. All children received a standardized anesthetic technique, and went home the morning after surgery if they met discharge criteria. All had the same postoperative analgesic regime (paracetamol 15mg/kg, ibuprofen 5mg/kg both six hourly for seven days; morphine sulphate solution100mcg/kg for breakthrough pain as required). Pain was assessed by the primary care giver using a validated eleven point Numeric Pain Rating Scale (NRS) anchored at 0 and 10. They scored the child’s worst and usual pain in three twelve-hour periods; on the morning after surgery on the ward (Day 1) and three (Day 3) and seven (Day 7) days after operation. The child’s level of activity and of eating / drinking at the each time point was prospectively assessed.

**Non-parametric analyses (two-sided Mann Whitney with Bonferroni correction for multiple comparisons) were used in the main, as data were not normally distributed (IBM SPSS v25.02).**

Results:

Worst pain (U = 346.0. z = 3.29, p = 0.003, d = 0.81), usual pain (U = 384.5. z = 2.96, p = 0.009, d = 0.69) and percentage normal eating/drinking (U = 361.5. z = 3.21, p = 0.003, d = 0.76) significantly differed between operative techniques on Day 1 but not thereafter. There was no significant difference between operative techniques in morphine doses administered or activity at all time intervals.  
A series of Friedman’s non-parametric ANOVAs were performed to examine change across time in each group for each variable. Each demonstrated a significant trend across time in the expected direction for post-operative recovery with the sole exception of a significant increase in worst pain from day 1 to day 3 in the Coblation group (T = 201,5, z = 2.47, p = 0.026, d = 0.77) compared to no significant change in the cold steel group (T = 138.0, z = 0.35, p = 0.99, d = 0.01).

Discussion:

We have found that CIT caused statistically significant less pain on the first day after surgery than DT, but the difference was not sustained on Days 3 and 7. Pain increased from Day 1 to Day 3 after CIT. More than 60% of children reported worst pain of at least 3/10 (moderately severe range) at all time periods after CIT. The pain experienced was not due to any difference in analgesia received. The difference in pain on Day 1 following coblation was associated with improved oral intake initially but no other functional improvement and no change in percentage of children discharged on time.

**Pain after coblation versus other methods of tonsillectomy has been considered in three recent meta-analyses. All comment on the lack of published pain data available. A Cochrane review3 concluded “with a very high level of uncertainty” that coblation may cause less pain on Day 1 than other techniques. A meta-analysis4 of pediatric studies considering pain after Coblation tonsillectomy versus DT identified only two studies with adequate pain data both of which are extracapsular rather than intracapsular coblation procedures. A meta-analysis of adult tonsillectomy studies5 compared multiple different cold techniques (including coblation) with hot techniques (cautery) unsurprisingly found more pain with hot techniques.**

In summary, we report information not previously available on severity of pain in children after CIT. We believe that CIT results in less pain than DT on the first day after surgery but not thereafter. Children still require multi-modal take home analgesia. CIT should not be regarded as “painless tonsillectomy.”

References:

1. Odhagen E, Stalfors J, Sunnergren O. Morbidity after pediatric tonsillotomy versus tonsillectomy: a population-based cohort study. *Laryngoscope* 2019;129:2619-2626.

2. Hoey AW, Foden NM et al. Coblation intracapsular tonsillectomy (tonsillotomy) in children: a prospective study of 500 consecutive cases with long term follow up. *Clin Otolaryngol* 2017;42:1211-1217

**3. Pynnonen M, Brinkmeier JV, Thorne MC et al. Coblation versus other surgical techniques for tonsillectomy. Cochrane Database Sys Rev. 2017 August 22:8(8):CD004619**

**4. Ahmad MU, Wardak AN, Hampton T et al. Coblation versus cold dissection in paediatric tonsillectomy: a systemic review and meta-analysis of randomized controlled trails. *J Laryngol Otol.* 2020; 134:197-204**

**5. Lee YC, Hsin LJ, Lin WN et al. Adolescent and adults undergoing temperature-controlled surgical instruments versus electrocautery in tonsillectomy: a systematic review and meta-analysis of randomized clinical trials. *JAMA Otolaryngol Head Neck Surgery* 2020; 146:339-346.**

Results:

|  |  |  |  |
| --- | --- | --- | --- |
| Operation: | Cold Steel Dissection | Coblation  Intracapsular | Corrected P value: |
| Number | 27 | 47 |  |
| Age/ months  Mean  (95% confidence interval) | 40.8  (36.4-44.0) | 41.5  (38.8-44.0) |  |
| Weight / kg  Mean  (95% confidence interval) | 16.0  (15.3-16.7) | 16.3  (15.3-17.3) |  |
| Height / cm  Mean  (95% confidence interval) | 97.1  (92.7-100.6) | 98.8  (97.0-100.6) |  |
| Gender (male / female) | 17/10 | 32/15 |  |
| Ethnicity  (Cauc / mixed / black) | 27/0/0 | 44/2/1 |  |
| ASA (1/2/3) | 23/4/0 | 37/9/1 |  |
| Number also having grommet insertion | 3 | 12 |  |
| Outcome Data :  Median (95% Confidence interval) |  |  |  |
| Day 1  Worst Pain score | 8 (6-8) | 4 (2-6) | **0.003** |
| Day 3  Worst Pain score | 7 (6-8) | 6 (5-6) | 0.35 |
| Day 7  Worst Pain score | 5 (4-8) | 4 (2-5) | 0.13 |
| Day 1  Usual level of Pain score | 2 (2-2) | 2 (0-2) | **0.009** |
| Day 3  Usual level of Pain score | 2 (2-4) | 2 (2-2) | 0.45 |
| Day 7  Usual level of Pain score | 2 (0-2) | 0 (0-2) | 0.77 |
| Morphine doses:  From operation to first morning after operation | 2 (2-2) | 1 (1-2) | 0.2 |
| Morphine doses:  From first morning after operation to Day 3 after surgery | 3 (2-3) | 2 (2-3) | 0.99 |
| Morphine doses:  From Day 3 to Day 7 after surgery | 2 (1.5-3) | 1 (1-2) | 0.72 |
| Activity day 1  % of normal | 80 (40-80) | 90 (70-100) | 0.23 |
| Activity day 3  % of normal | 70 (60-80) | 80 (75-100) | 0.27 |
| Activity day 7  % of normal | 90 (70-100) | 100 (90-100) | 0.23 |
| Eating and drinking Day 1  % of normal | 80 (40-80) | 100 (80-100) | **0.003** |
| Eating and drinking Day 3  % of normal | 60 (50-70) | 80 (60-80) | 0.17 |
| Eating and drinking Day 7  % of normal | 80 (70-80) | 90 (80-100) | 0.38 |
| Number of children failing to meet discharge criteria. | 6  (All = inadequate oral intake) | 9  (1 = inadequate oral intake, 8 poor overnight SaO2) | 0.75 |
| Number of children seeking advice following discharge  (Predominately from GPs) | 6 | 9 | 0.75 |