MINIMALLY INVASIVE SURGERY FOR SLEEP DISORDERED BREATHING

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SO FAR....


“The studies assembled in the review do not provide evidence to support the use of surgery in sleep apnoea/hypopnoea syndrome, as overall significant benefit has not been demonstrated.”

AMERICAN ACADEMY OF SLEEP MEDICINE (AASM)


...upper airway surgery may be offered when conservative treatment fails or rejected or ineffective.

INVASIVE SURGERY


INVASIVE SURGERY

- perioperative morbidity: bleeding, infections, scarring, pain...
- general anaesthesia (high risk patients!)

INVASIVE SURGERY

INTENTION OF SURGERY

CURE!!!

INTENTION OF “SLEEP” SURGERY

- cure the patient
  - by surgery only
  - combination with other treatment modalities
- enable other treatments
  - CPAP
  - oral devices

MINIMALLY INVASIVE SURGERY

- Criteria for minimally invasive surgery:

| perioperative | low perioperative morbidity
| postoperative | procedure under local anaesthesia
| postoperative | low postoperative morbidity
| postoperative | low complication rate

DECISION ACCORDING TO SEVERITY OF OBSTRUCTION

SLEEP RELATED BREATHING DISORDERS

WITHOUT UPPER AIRWAY OBSTRUCTION

- PARTIAL OBSTRUCTION
- COMPLETE OBSTRUCTION

WITH UPPER AIRWAY OBSTRUCTION

- PARTIAL OBSTRUCTION
- COMPLETE OBSTRUCTION

SLEEP RELATED BREATHING DISORDERS

WITHOUT UPPER AIRWAY OBSTRUCTION

- PARTIAL OBSTRUCTION
- COMPLETE OBSTRUCTION

WITH UPPER AIRWAY OBSTRUCTION

- PARTIAL OBSTRUCTION
- COMPLETE OBSTRUCTION
NASAL OBSTRUCTION IS...

- one of the oldest and most common human complaints.
- a considerable handicap for patients and drastically affects quality of life.
- caused by hypertrophy of the inferior turbinates in up to 20% of the population in various European countries.


IMPACT ON SDB

- minimal (<10%) to improve adherence and compliance with nasal CPAP
  - reducing pressure by approximately 2 mbar
  - using CPAP for 2 hours longer per night

HYPERTROPHY CAN BE

- bony
- mucosal
- observed in septal deviation (compensatory hypertrophy) and associated with chronic rhinitis

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TREATMENT OPTIONS

- pharmacological therapy (using intranasal steroids, antihistamines or decongestants)
- surgery (when pharmacotherapy fails)
An ideal procedure for turbinate reduction should produce an improvement of nasal breathing with minimal discomfort or adverse reactions and should preserve the physiological function of the turbinates.
PATIENTS PREFERENCES

- easy to perform
- in local anaesthesia
- in ambulatory facility
- speed recovery

What have we done?

Efficacy and safety of inferior turbinate coblation channeling in treatment of nasal obstruction
Zeljka Roje, Goran Račić, and Goran Kardum
(accepted for publication in Coll Antropol)

OBJECTIVES

- prospectively evaluate the safety and effectiveness of coblation channeling for the treatment of nasal obstruction caused by inferior turbinate hypertrophy

SUBJECTS

- 52 patients
- 27 male
- 25 female
- average age: 28.5 years, ranging from 11 – 71

CRITERIA

INCLUSION
- difficult nose breathing
- hypertrophic inferior turbinates refractory to medical therapy

EXCLUSION
- deviated septum
- nasal polyposis
- allergic rhinitis
- recent nasal surgery

METHODS

- medical history and clinical examination
- VAS (for obstruction)
- questionnaire obtaining symptoms: hyposmia, nasal drainage, postnasal drip
- Active anterior rhinomanometry (Rhinomanometer 200, ATMOS, Germany)
- Coblator plasma surgery sistem ArthtroCare ReFlex Ultra 45 Wand (Arthrocare Corp., Sunnyvale, CA, USA)
Questionnaire

Symptoms to evaluate:
- hyposmia
- nasal drainage
- postnasal drip

0 - without symptoms
1 - mild to moderate
2 - severe

SURGICAL PROCEDURE

- The procedures were performed in an ambulatory facility with patients under local anesthesia by injecting 2% lidocaine, 2ccm in each inferior turbinate by the same surgeon using an ArthroCare ReFlex Ultra 45 wand making three submucousal chanalls per turbinate (power 6 W for each channel).

STUDY DESIGN

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<td>VAS QUESTIONNAIRE</td>
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*CC - coblation channeling

RESULTS (1)

- Patients tolerated the procedure well.
- None of them felt discomfort during coblation due to overheating the tissue.
- No significant epistaxis occurred during and after the procedure.

RESULTS (2)

- Mild crusting was noted in 3 (5.7%) patients at the 2-week follow-up visit.
- It was located in the head of the inferior turbinate corresponding with the puncture places for introducing wand.

RESULTS (3)

- No adverse effects were encountered, including bleeding, crusting, dryness, infection, adhesion, or a worsening of obstruction.
RESULTS (4)
Nasal breathing was improved in all patients significantly decreasing VAS from median 7 (range 2-9) to 1 (range 0-3) (p<0.001)

RESULTS (5)
Total nasal resistance decreased from 0.44±0.497 to 0.24±0.110 (p=0.005)

RESULTS (6)
Patients reported improvement in all three scored symptoms separately after the procedure. Improvement was statistically significant: for hyposmia (p=0.005), for nasal drainage (p=0.003) and for postnasal drip (p<0.001).

IF WE REMEMBER FROM THE BEGINNING OF THE STORY...

An ideal procedure for turbinate reduction should be to obtain an improvement of nasal breathing with minimal discomfort or adverse reactions and should preserve the physiological function of the turbinates.

WE CAN SAY ACCORDING TO OUR RESULTS...

Coblation tissue reduction of the inferior turbinate meets all criteria for an ideal method in treatment of inferior turbinate enlargement.

BUT, LONG TERM RESULTS?

Do it again!!!
MINIMALLY INVASIVE OROPHARYNGEAL SURGERY

- soft palate
  - radiofrequency surgery (COBLATION)
  - Pillar palatal implants
  - injection snoreplasty
- tonsils
  - radiofrequency surgery (COBLATION)
- tongue base
  - radiofrequency surgery (COBLATION)

INJECTION SNOREPLASTY

- easy to perform
- repeatable
- no surgery involved
- success rate as in other soft palate minimally invasive procedures

with sodium tetradysil sulphate as sclerosing agent stiffening of the soft palate

...during the lunch break therapy...

Sleep News
Snoring could be cured by £3 injection
16/11/2009

PALATAL (PILLAR) IMPLANTS
RADIOFREQUENCY (RF)

- interstitially (coagulating tissue)
- superficially (vaporisation or cutting)

for soft palate, tongue base and tonsils

INTERSTITIAL TREATMENT

- interstitial treatment (without tissue removal)
- RF uvulopalatoplasty (with tissue removal)

INDICATIONS:
- snoring and mild OSA
- mild webbing, short uvula
- no, or small tonsils

4-6 lesions
once or twice
RF uvulopalatoplasty

**INDICATIONS:**
- snoring and mild OSA
- AH<15
- extreme webbing and/or long uvula
- no, or small tonsils

**TISSUE REMOVAL**

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RF uvulopalatoplasty

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**TISSUE REMOVAL**

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**What do we do?**

**COBLATION CHANNELING**

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**What do we do?**

**CAUP (coblation assisted upper airway procedure)**

- combination of interstitial treatment and tissue removal treatment

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**What do we do?**

**CAUP**

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**TONSILLS**

- tonsillectomy
- tonsillotomy
- tonsill’s channeling
CHANNELING

- under the local anaesthesia
- efficacy?

ReFlex Ultra 55

TONSILLOTOMY

- in children with no history of infections

TONSILLECTOMY

What have we done?

TONSILLECTOMY

QUESTION 1

- **Known:**
  Coblation causes less thermal damage to the tissue.*

- **Unknown:**
  1. Depth of the thermal damage?
  2. Is there correlation between the depth of the thermal damage and postoperative morbidity?


QUESTION 2

- **Known:**
  Resuming normal physical activity and normal diet is faster after coblation tonsillectomy.*

- **Unknown:**
  Why?
  1. Because of the less thermal damage?
  2. Because of the less intensive systemic inflammatory response?


HYPOTHESIS

Coblation causes less thermal damage of the tissue and subsequently less systemic inflammatory reaction and thus less postoperative morbidity.

OBJECTIVES

- To determine the depth of thermal damage to tonsillar tissue due to radiofrequency ablation, and to compare it with thermal damage to tonsillar tissue following conventional tonsillectomy; to correlate the depth of thermal damage to tonsillar tissue with the parameters of postoperative morbidity.
- To compare systemic immunological reaction, postoperative pain severity, time to resuming normal physical activity, and incidence of postoperative bleeding between two groups of tonsillectomized children aged up to 16 years.
- To correlate the depth of thermal damage to tonsillar tissue with the parameters of systemic inflammatory reaction.
- To correlate parameters of systemic inflammatory reaction with parameters of postoperative morbidity.

MATERIALS AND METHODS

- The prospective, randomized single blind study included 100 children aged 3-16 years scheduled for tonsillectomy at our department for chronic tonsillitis and/or respiratory obstruction. The children were randomly assigned into two groups submitted either to conventional tonsillectomy with bipolar diathermy coagulation or to radiofrequency tonsillectomy, with a 14-day follow up.

OUTCOMES

- Primary outcome was the depth of thermal damage to tonsillar tissue (histopathologic study). Secondary outcomes were: severity and duration of postoperative pain (based on the use of analgesics during the postoperative period); postoperative day of resuming normal physical activity; rate of postoperative hemorrhage; systemic inflammatory reaction on surgery (based on CRP and fibrinogen blood level before and 7 th postop day).

QUESTTIONNAIRES FOR THE PARENTS:

1. ANALGETIC CONSUMPTION:

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2. “GETTING BACK ON THE NORMAL PHYSICAL ACTIVITY”:

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The study was approved by the Split University Hospital Medical Ethics Committee.

**ALL PROCEDURES WERE UNDERTAKEN BY THE SAME SURGEON AND THE SAME ANAESTHETIST IN ATTENDANCE.**

RESULTS (1) – THERMAL DAMAGE

- The mean depth of thermal damage to tonsillar tissue operated by radiofrequency was 440.2 ± 100.91 and by blunt dissection with diathermy coagulation 1036.7 ± 317.13. Statistically significant differences were observed in the depth of thermal damage to tonsillar tissue (t = 12.7; p < 0.001).

RESULTS (2) – POSTOPERATIVE PAIN

- Mean number of analgetic application in radiofrequency group was 4 (0–19), and in classical group 10 (1–28) (Z = -5.3; p < 0.001). Children operated by radiofrequency used analgetics for 2 (0–7) days vs. 4 (1–8) days in classical group which is also statistically significant (Z = -5.6; p < 0.001).

RESULTS (3) – PHYSICAL ACTIVITY

- Children operated on coblation technique faster resumed normal physical activities: in 2 (1–7) vs. 4 (1–9) days which is statistically significant (Z = -4.9; p < 0.001).

RESULTS (4) – POSTOPERATIVE BLEEDING

- There was no statistically significant difference in postoperative haemorrhage between the groups (t = 0.34; p > 0.05).
RESULTS (5) – SYSTEMIC INFLAMMATORY REACTION

- CRP ($t = -4.7; p < 0.001$) and fibrinogen ($t = -4.6; p<0.001$) blood level statistically significant increased in classical group after the procedure.

RESULTS (6) – CORRELATION

- There was statistically significant correlation between postoperative morbidity and thermal tissue damage: less thermal damage is associated with less postoperative morbidity through less analgetic applications ($r =0.48; p<0.001$), less days on analgetic consumption ($r = 0.48; p<0.001$), and faster resuming normal physical activities ($r =0.45; p<0.001$).

RESULTS (7) – CORRELATION

- There was statistically significant correlation between depth of thermal damage to tonsillar tissue and increased CRP blood level after the surgery ($r=0.30 ; p < 0.01$).

RESULTS (8) – CORRELATION

- There was statistically significant correlation between increased CRP blood level after the surgery and postoperative analgetic consumption through increased analgetic application ($r= 0.28; p < 0.01$) and more days on analgetic consumption ($r= 0.26; p < 0.01$). There was correlation between increased CRP blood level and faster resuming normal physical activities ($r=0.30 ; p< 0.01$).

CONCLUSIONS

- In this study we have correlated postoperative morbidity and thermal tissue damage: less thermal damage is associated with less postoperative morbidity. Coblation tonsillectomy induces a statistically significant lower depth of thermal tissue damage than conventional tonsillectomy with bipolar diathermy coagulation and statistically significant less systemic inflammatory reaction on surgery.
- Children operated on coblation technique experienced statistically significant less postoperative pain and faster resumed normal physical activities.

TONGUE BASE

"hot potato" in snoring surgery

PROBLEMS:

- demanding region
- postoperative pain
- postoperative oedema
- nerve injury
- postoperative necrosis
RF treatment of the tongue base

- interstitially – without tissue removal is minimally invasive surgery
- superficially with tissue removal is invasive!!!!

RF is the only minimally invasive treatment of the tongue base till now.

reported success is 20 – 68%

no change in swallowing or speech

What do we do?

COBLATION CHANNELING

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<th>Author</th>
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<td>5.9</td>
<td>37.2</td>
<td>25.7</td>
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COMBINATIONS

- usually: RF for tongue base and UPP
  - slightly better outcome than tongue base procedures alone
  - preferred in OSA patients (not for snorers)

- RF-UPP and snoreplasty*
- RF-UPP and Pillar System#

SHOULD WE USE MINIMALLY INVASIVE SURGERY FOR SDB?

- YES, because it is:
  - safe
  - easy to perform
  - not too expensive
  - a very few side effects
  - repeatable
  - does not exclude other treatment options (CPAP)
  - complementary with CPAP
  - number of papers suggest that it is helpful in mild OSA (Grade B)

References:


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