FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Snoring and obstructive sleep apnea

Department of Otorhinolaryngology and Head and Neck Surgery, St. Anne's University

Hospital, Brno, Czech Republic

Jan Hanak M.D.

Head of the ENT clinic : Bretislav Gal M.D., PhD.

Pekarska 53, Brno , Czech Republic, 656 91

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Obstructive sleep apnea syndrome (OSAS)

- **Recurrent episods of partial or complete obstruction of the upper airway during the sleep**
- These episodes are associated with recurrent oxyhemoglobin desaturations and arousals from sleep
- Polysomnographic citerias: obstructive sleep apnea (OSA) is presented in ≥ 50% from all apneas and AHI (the avarage sum of apneas et hypopneas per hour) ≥ 5
- **Symptoms:**

- Nocturnal symptoms : snoring, gasping and choking sensations, restless, fragmented, nonrestorative sleep
- Daytime symptoms: daytime sleepiness, cognitive deficits, decreased vigilance, morning confusion, sexual dysfunction, including impotence and decreased libido

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Epidemiology

- **Lifelong occurence of the OSA** in adulthood - 21% of men and 9 % of women .

  Šonka K. a kol. Apnoe a další poruchy dýchání ve spánku , 1. vyd.:

  Grada Publishing 2004

- **Occurence of the snoring** - 25% of men and 15 % of women

  Lugaresi a spol. 1980, Koskenvuo a spol. 1985

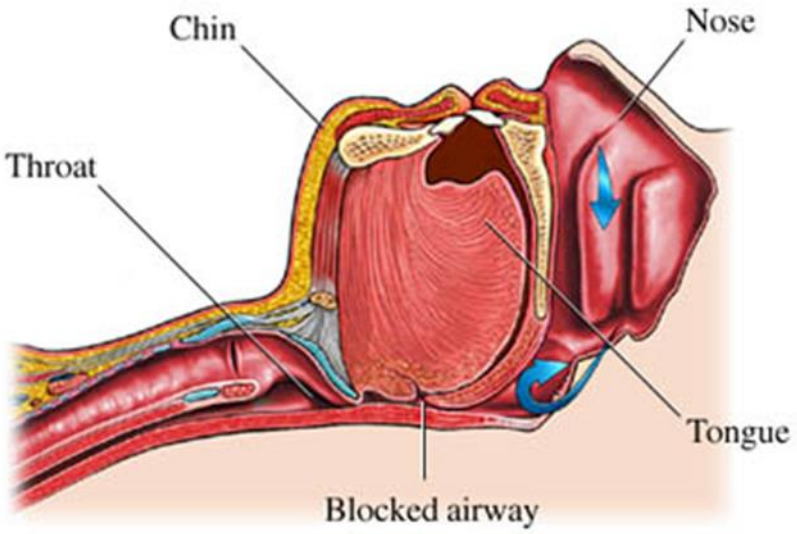
FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Pathophysiology of the OSA

A. Anatomic structures of the ENT region

1. Deviation of the nasal septum
2. Hypertrophy of the inferior nasal turbinates
3. Adenoid
4. **Elongated uvula**
5. **Hypotonia of the soft palate**
6. **Hypertrophy of the palate tonsils**
7. **Hypertrophy of the tongue base**
8. Rertrognacia a mikrognacia
9. Dorsocaudal rotation of the mandible
10. Retroposition of the maxilla

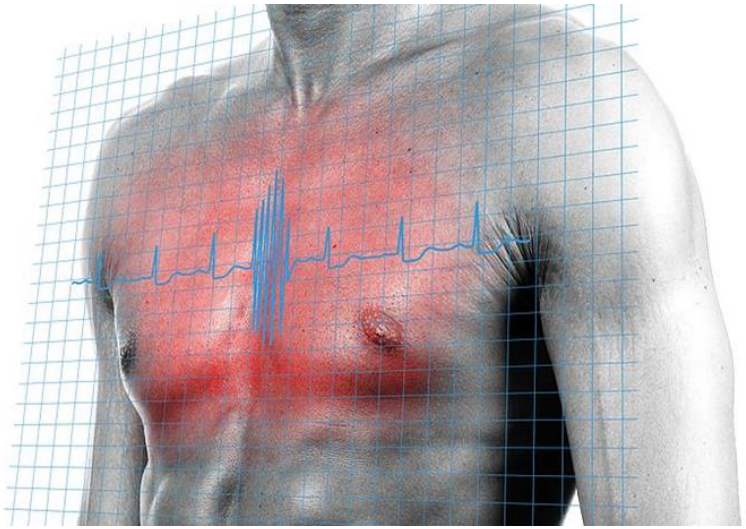
B. Insufficient muscle tone of the upper airway



FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

OSA – risk factor for the following disease

- Hypertension
- Diabetes 2. typ.
- Chronic ischemic heart disease
- Heart arrhythmia
- Heart attacks
- Pulmonary hypertension
- Stroke
- Polycythemia
- Night epistaxis
- Depression
- Higher risk of the accident



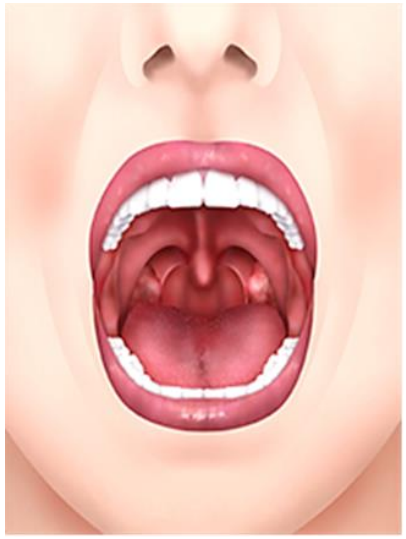
FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Diagnostics

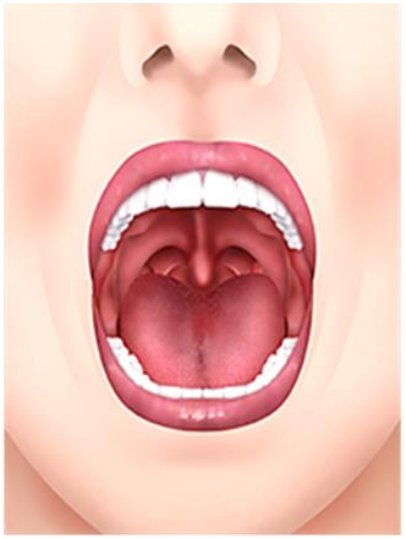
- Anamnesis
- Questionnaires (Epworth sleepiness scale
- ENT examination
- The Mallampati a the Friedman classification
- Müller’s test
- DISE (drug induced sleep endoscopy)
- Night monitoring
- multichannel polygrafy
- polysomnografy

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

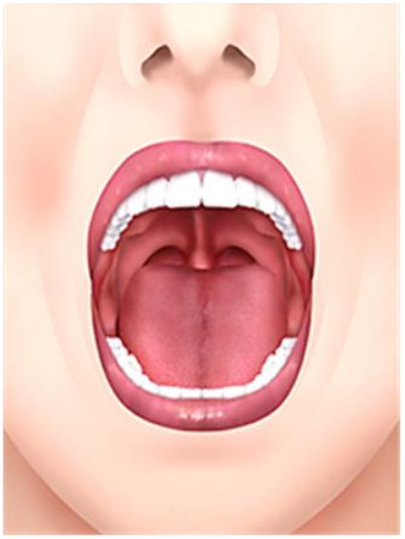
Mallampati classification



Mallampati I



Mallampati II



Mallampati III

Mallampati IV

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Friedman classification

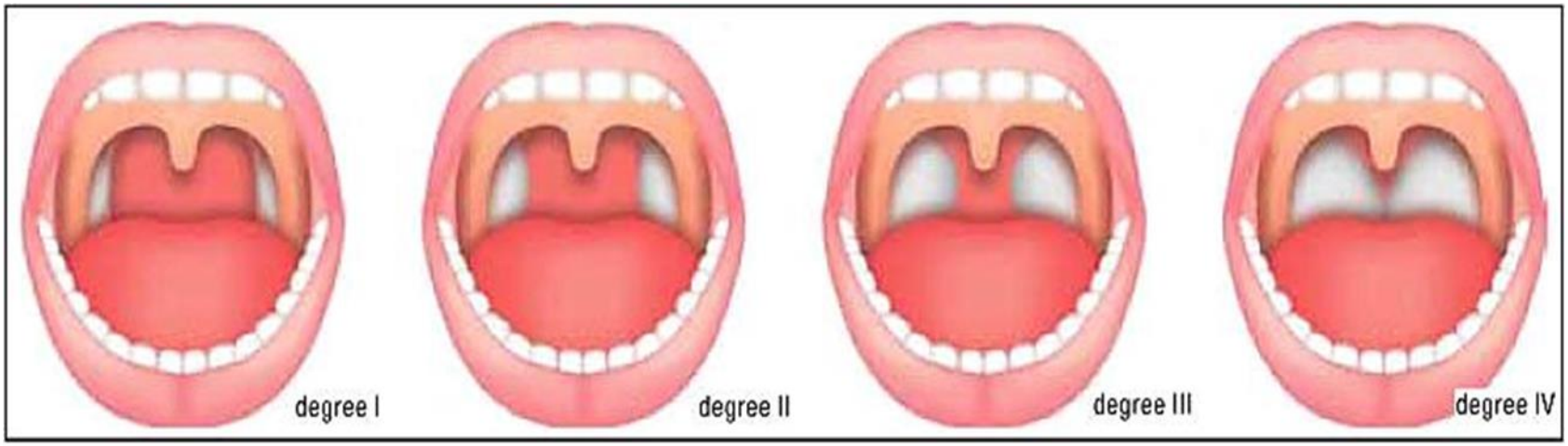


FIGURE 3 - Graduation of palatine tonsils: Degree I, Palatine tonsils occupy up to 25% of the oropharyngeal space; Degree II, Palatine tonsils occupy between 25% and 50% of the oropharyngeal space; Degree III, Palatine tonsils occupy between 50% and 75% of the oropharyngeal space; Degree IV, Palatine tonsils occupy more than 75% of the oropharyngeal space.

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Multichannel polygraph

- EKG
- Heart rate
- SpO2 (pulse oximetry)
- Nasal and oral airflow
- Movement of the thorax and abdomen
- Position of the body

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Polysomnography (PSG)

- ECG - Electrocardiography
- EEG - Electroencephalography
- EOG - Electrooculography
- EMG - Electromyography
- Heart rate
- SpO2 (pulse oximetry)
- Nasal and oral airflow
- Movement of the thorax and abdomen
- Position of the body

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Goal of the sleep study

1. Diagnostics of the simple snoring and apneas
2. Distinction type of the apneas

- obstructive sleep apnea (OSA), central apnea (CSA), mixed apnea

3. Assessment severity of the OSA

AHI = the avarage sum of apneas et hypopneas per hour

- AHI < 5 = without patology
- AHI 5-15 = mild OSA
- AHI 15-30 = moderate OSA
- AHI > 30 = severe OSA

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Therapy of the snoring and OSA

- **Surgical therapy**

- Simple snoring (AHI < 5)
- Mild OSA (AHI 5-15)

+ presence of the anatomical abnormities

- Moderate OSA (AHI 15-30)
- Severe OSA (AHI > 30)

Only in case of the refusel or the intolerance of the positive airway pressure therapy

(cca 40% non compliance)

- **Conservative therapy**

- Moderate OSA (AHI 15-30)
- Severe OSA (AHI > 30)

+ desaturation during the sleep

- **Positive airway pressure therapy:**

CPAP (Continuous positive airway pressure)

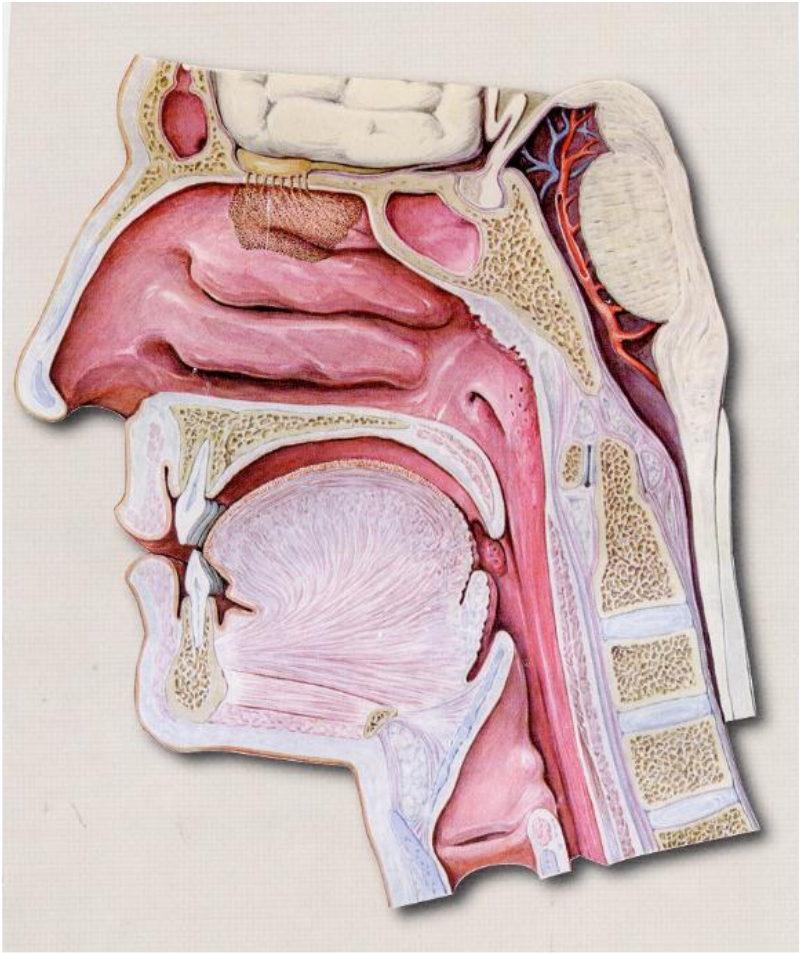
BiPAP (Bilevel positive airway pressure)

ASV (Adaptive servo ventilation)

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Types of the surgery for snoring and OSA

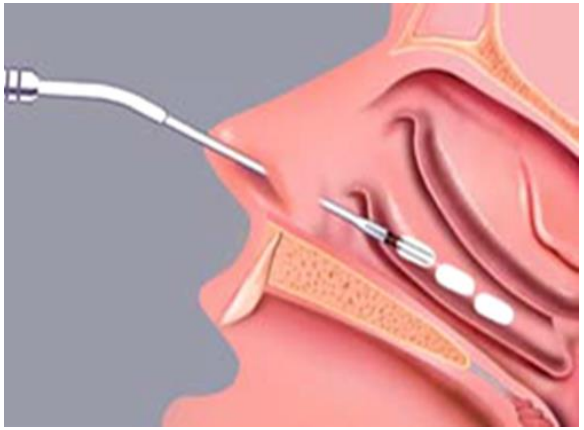
- Nasal surgery
- Surgery of the velopharyngeal region
- Surgery of the retrobasilingual region
- Surgery of the larynx and trachea

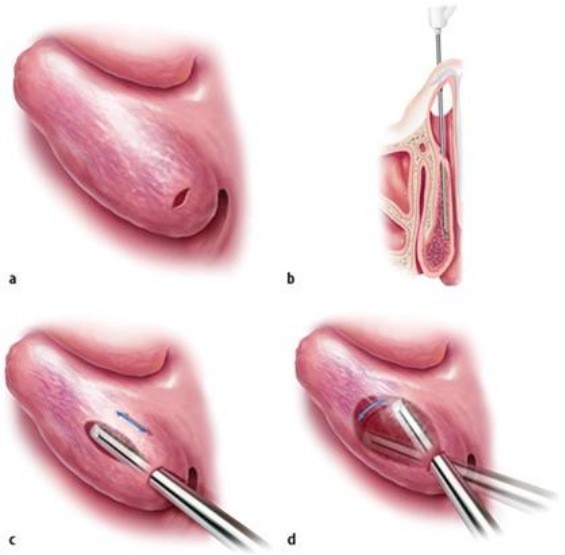


FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Nasal surgery

- indication: nasal obstruction, non compliance nasal CPAP
- adenotomy
- septoplasty
- turbinoplasty
- FESS (functional endoscopic sinus surgery)





FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

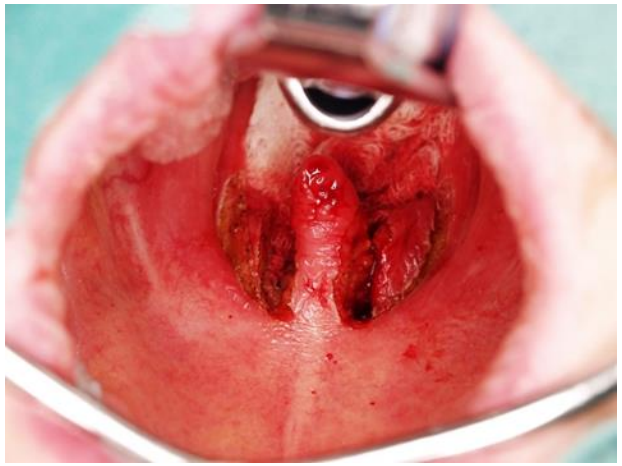
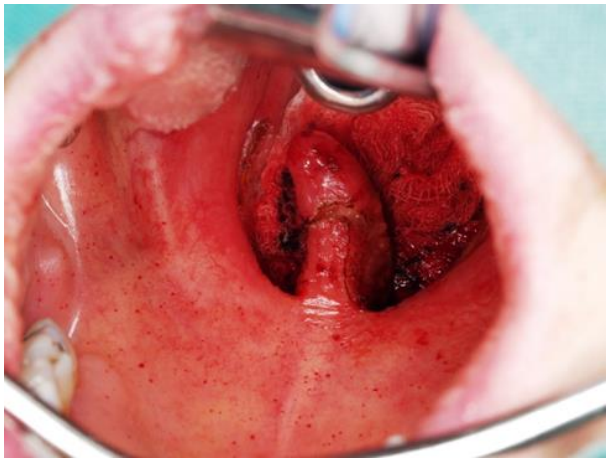
Surgery of the velopharyngeal region

- tonsillectomy, tonsillotomy
- **LAUP –** laser asissted uvuloplasty
- **RAUP –** radiofrequency assisted uvuloplasty
- radiofrequency induced thermoterapy (**RFITT**) of the soft palate and RFITT of the palatine tonsils
- **Pillar® implants**
- **UPPP –** uvulopalatopharyngoplasty
- **Modified UPPP**

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

LAUP, RAUP

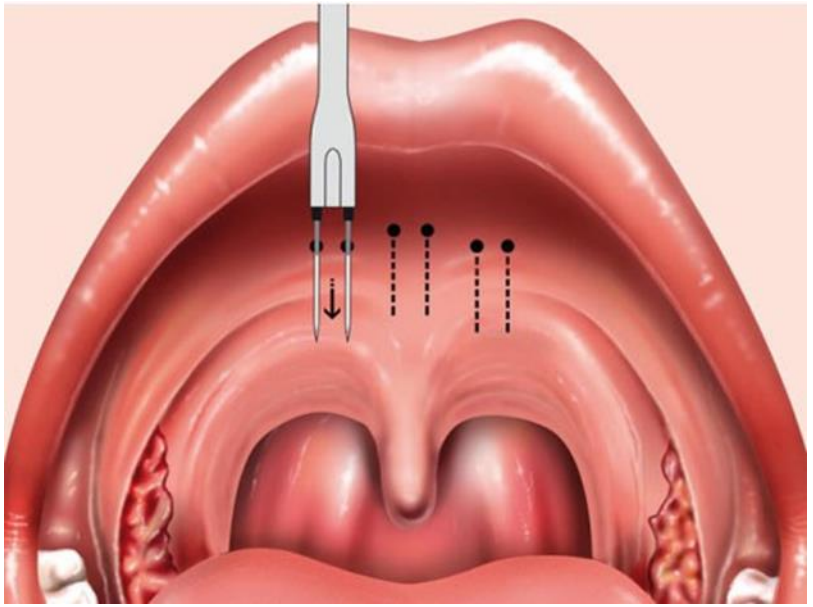
- **LAUP (**laser assisted uvuloplasty**)**
  - CO 2 laser
  - 8 - 10W
  - continual, superpulz
- **RAUP (**radiofrequency assisted uvuloplasty**)**
  - monopolar cut
  - el. impulse 4MHz
  - 12 W
  - AutoRF


FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Radiofrequency induced thermoterapy (RFITT) of the soft palate

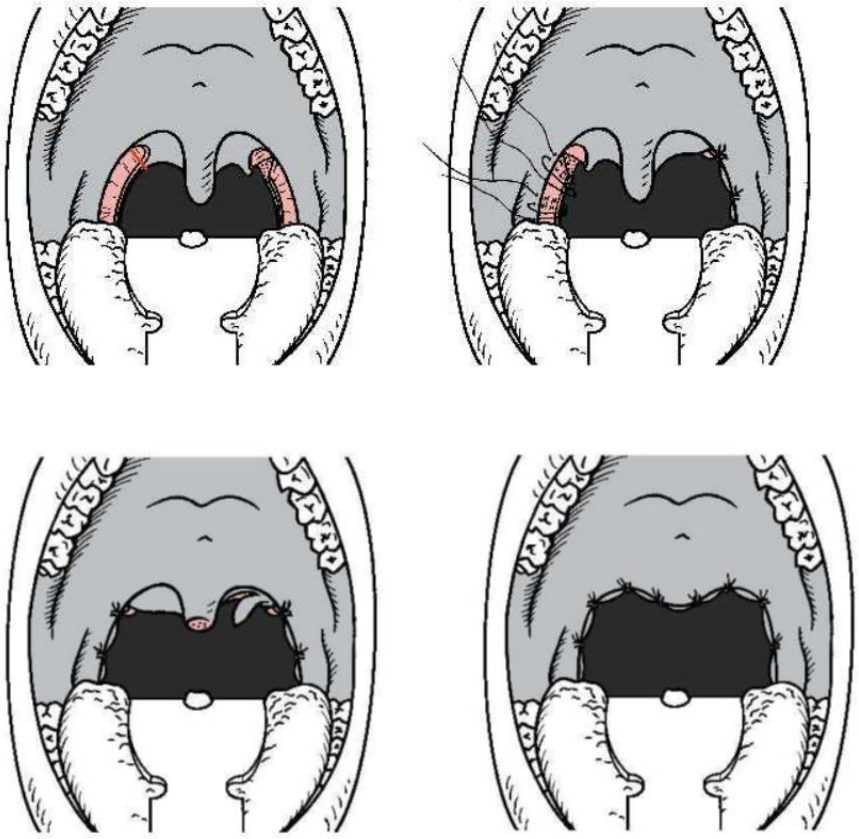
- Bipolar probe
- 3 applications
- first puncture median and 1 application laterally to the right and left side
- 10W
- AUTO STOP
- local anesthesia



FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

UPPP
(Uvulopalatopharyngoplasty)

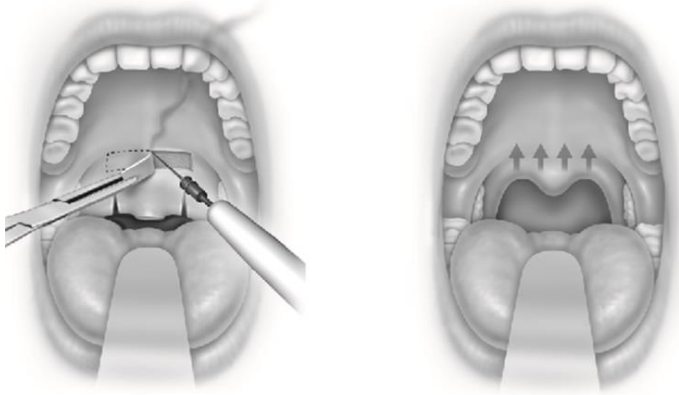
- Fujita 1981
- Indication: enlarged tonsils, elongated uvula, hypotonia of the soft palate in patients with OSA
- Bilateral tonsillectomy
- Resection of the uvula
- Closure and anteriorisation of palatal pillars
- Preservation of palatal and pharyngeal muscules



FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Modified UPPP

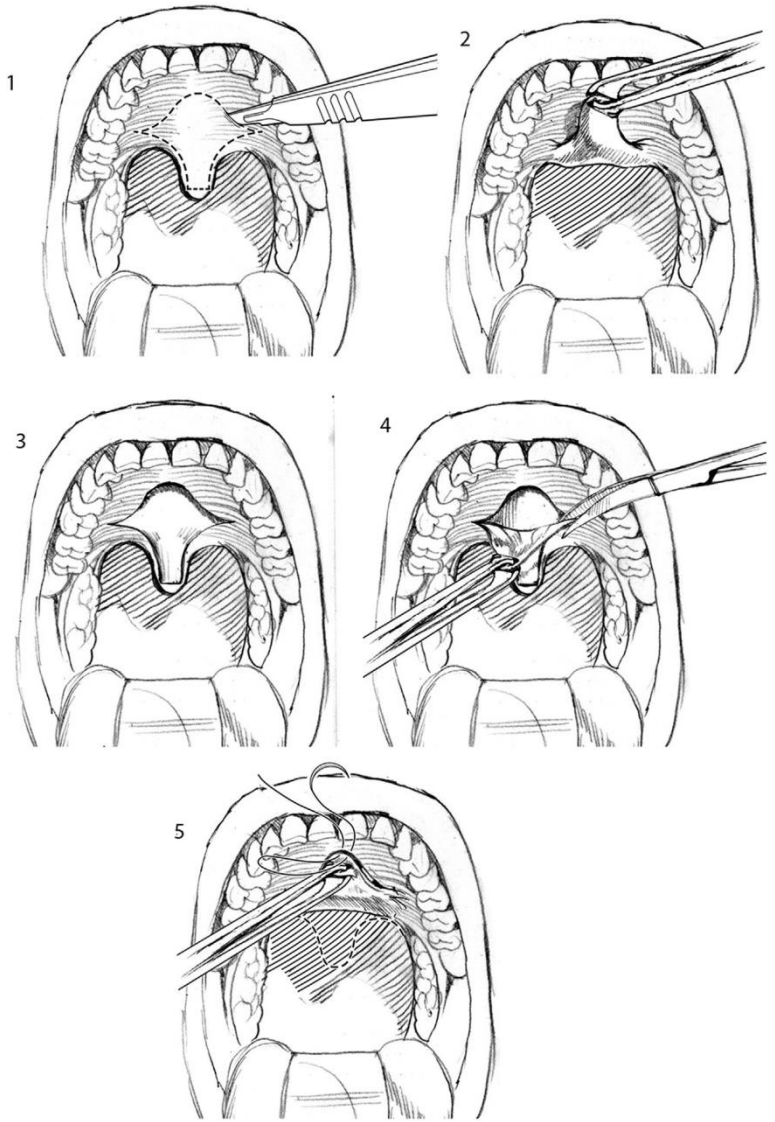
- Uvulaflap
- Lateral pharyngoplasty
- Expansion sphincter pharyngoplasty
- Z –plasty
- Relocation pharyngoplasty
- Anterior palatoplasty
- Palatal advancement



FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Uvula flap

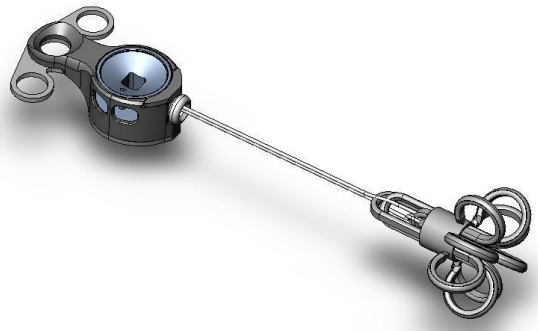
- Powel, 1996
- Indication: enlarged tonsils, elongated uvula, hypotonia of the soft palate in patient with OSA
- tonsillectomy
- Closure and anteriorisation of palatal pillars
- Rhomboid‘s incision and removal of the mucous and submucous tissue of the uvula and soft palate
- Rotation and suture uvulaflap



FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Surgery of the retrobasilingual region

- RFITT – radiofrequency induced thermo therapy of the tongue base
- Coblation endoscopic lingual lightening – CELL
- Tongue base resection (midline glossectomy, lingual tonsillectomy)
- Tongue suspension (Repose, AirVance)
- Hyoid suspension
- Genioglossus advancement



- These procedures improve the posterior airway space and neutralizes retrolingual obstruction

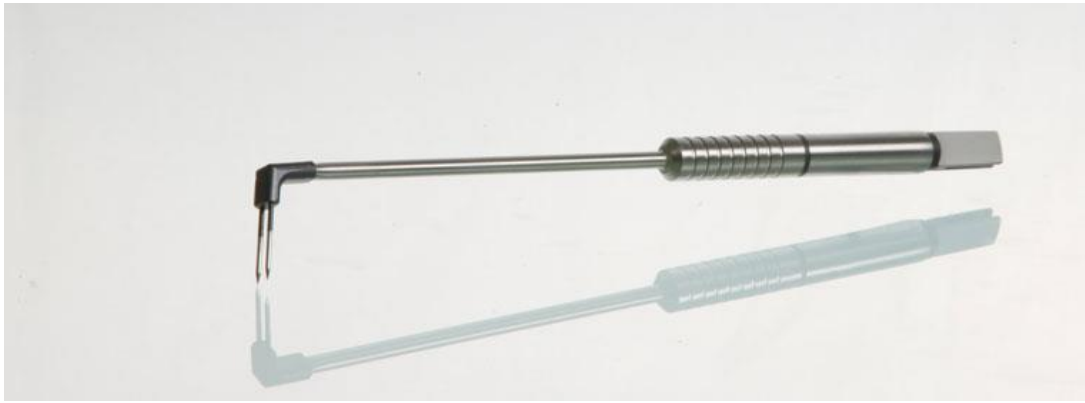
FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

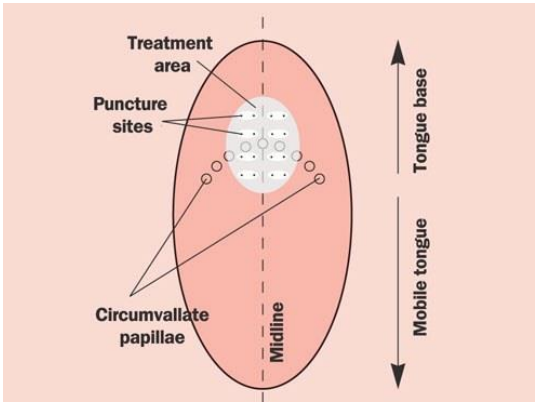
RFITT of the tongue base

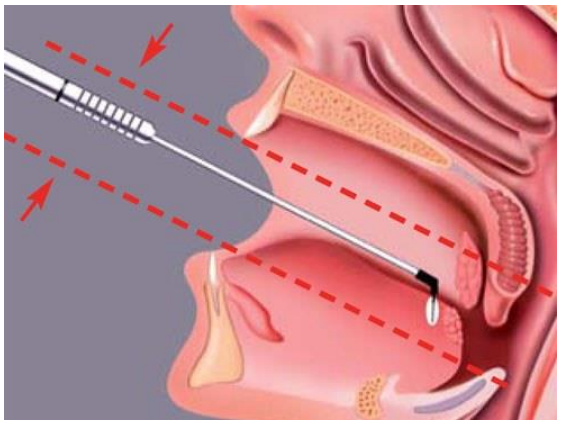
- Bipolar probe
- 12 W
- 4 to 6 applications
- Local anesthesia
- General anesthesia

  (multilevel surgery)
- Antibiotics prophylaxis for five days:

  cephalosporins 2. generation



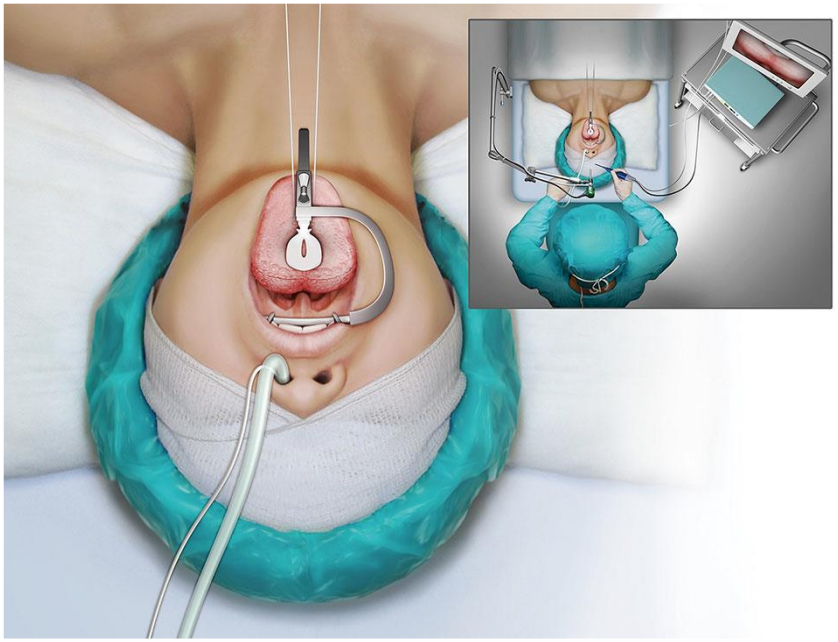


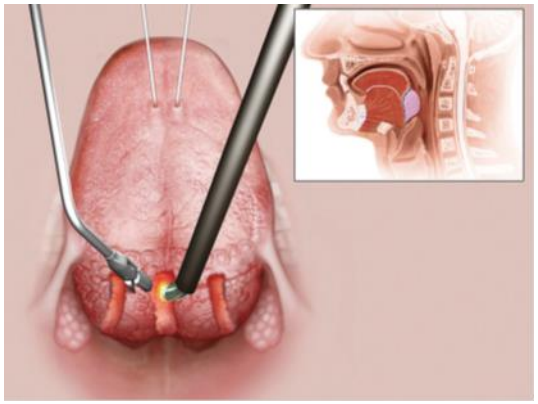


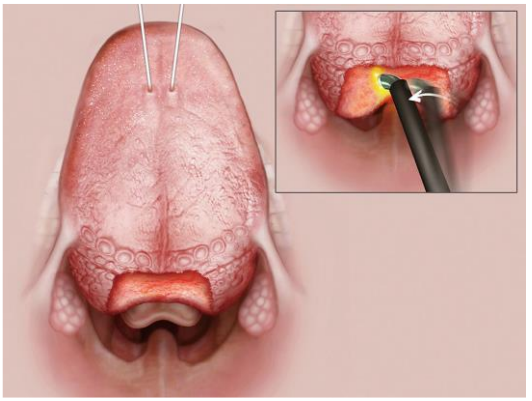
FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Coblation endoscopic lingual lightening (CELL)

- Coblation: the electrod to create a plasma field of highly ionized particles so as to break down intercellular bonds in the tissue that enable tissue removal at lower temperatures
- GA, transnasal intubation
- The 0° and 70° telescope with a mechanical holding system
- The middle and two paramedian trenches from circumvallate papillae to the vallecula
- Tongue base tissue is excised



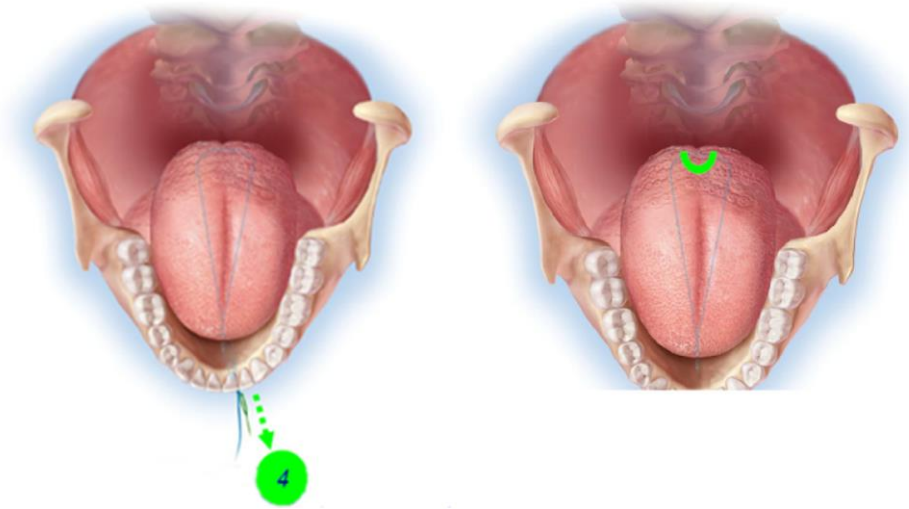


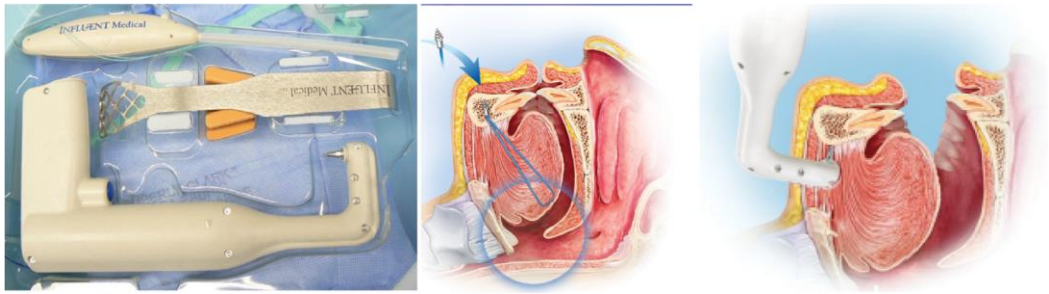


FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Tongue suspension

- One of the possible techniques of the tongue suspension is AIRvance system .
- Screw Inserter is placed through a small submental incision and the screw is inserted in the mandibule.
- Pass the loop polypropylen suture from the incision to the posterior base of the tongue and back to the mandibule

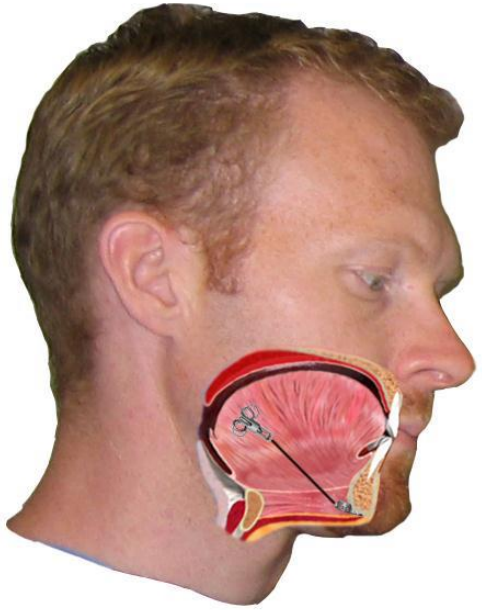


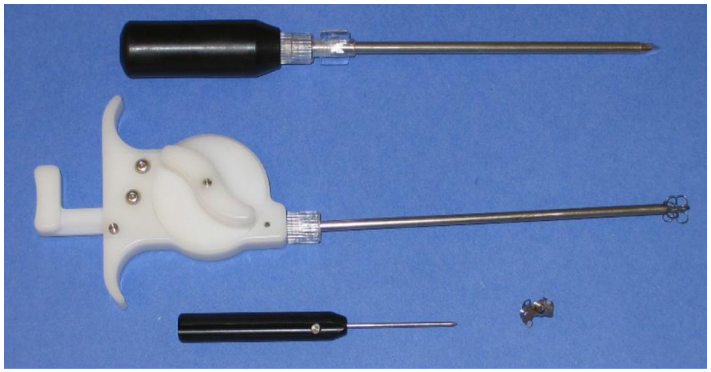


FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Genioglossus advancement

- Submental incision
- The bone anchor with spool is attached to the inferior edge of the mandible with 2 screws
- The tongue base soft tissue anchor is placed through a hollow trocar and the tissue anchor is placed just below the mucosa at the base of the tongue
- After 2-4 weeks, under local anesthesia – titration

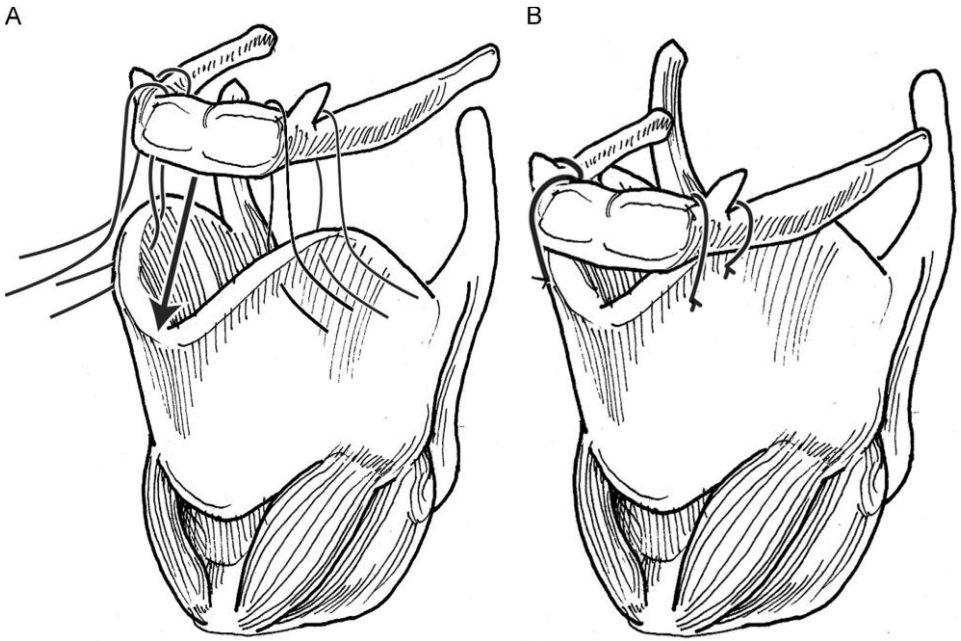




FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Hyoid suspension

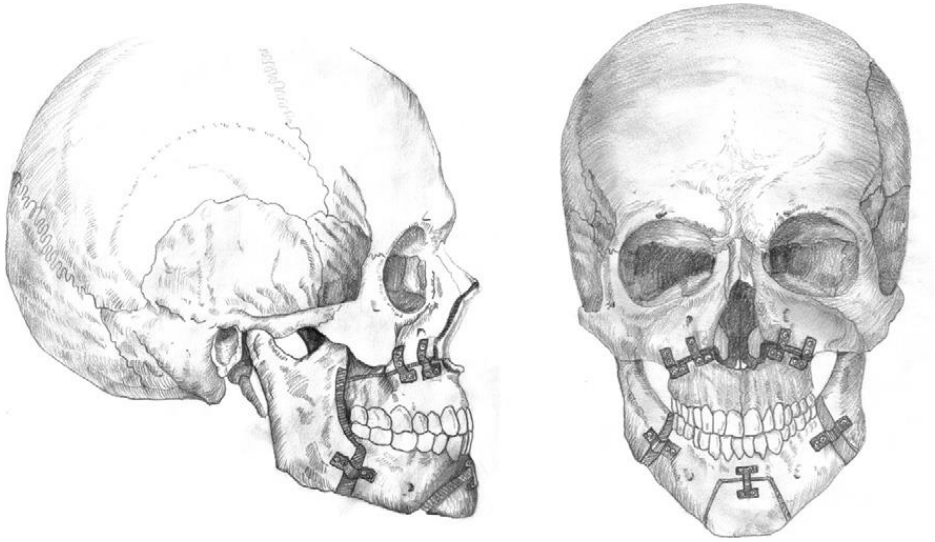
- A horizontal skin incision at the level of the thyrohoid membrane
- The strap muscles (sternohyoid, omohyoid, and thyrohyoid muscles) are divided from the hyoid
- The hyoid bone is then mobilized in anterocaudal direction and permanently fixated to the thyroid cartilage with 2 non resorbable sutures on each side



FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Maxillo-mandibular Advancement (MMA)

- Excluding tracheostomy maxillo-mandibular advancement (MMA) is the most successful, surgical treatment for OSA, with a therapeutic efficacy comparable to CPAP
- High success
- High morbidity
- Maxillofacial dysgenesis or posttraumatic changes
- Cooperation with maxillofacial surgeon



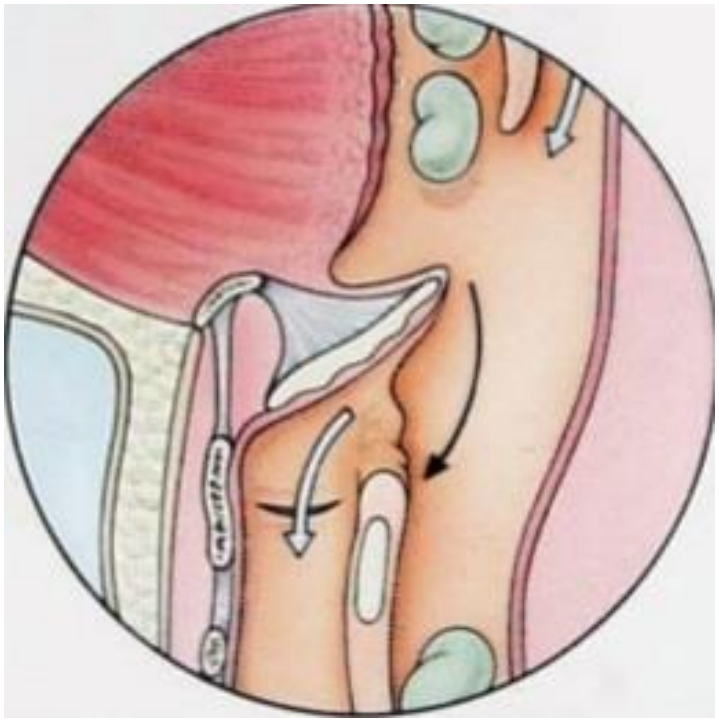
FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Surgery of the larynx

- ,,Floppy epiglottis“

(epiglottis prolapse during inspiration) can cause upper airway obstruction

- Microloryngoscopy (KTR or CO2 laser)
- TORS (transoral robotis surgery) robotic-assisted partial resection of the epiglottis



FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Surgery of the trachea

- The indications for a tracheostomy in treating OSA are those with severe OSA in whom continuous positive airway pressure or other upper airway expansion surgery has failed and continue to remain severely symptomatic or have medical consequences of OSA

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Outcomes upper airway surgeries for the treatment of OSA in adults

Type of surgery	No. of patients	% reduction in AHI	Criterion of success Sher's criteria
TE	4	71%	100%
UPPP	24	45%	58%
UPPP+RFITT	101	51%	62%
UPPP + RFITT + septoplasty	4	61%	75%

Betka J., Klozar J., Kuchar M., Kastner J., Plzak J., : Obstructive Sleep Apnea syndrome – Effectivity of Different Surgical Approaches
Otorinolaryng. A Foniat. /Praque/,632014, č.1,s.3-9

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Conservative therapy of the OSA

Indication : moderate OSA (AHI 15-30), severe OSA (AHI > 30)

- Positive airway pressure therapy:

  CPAP (Continuous positive airway pressure)

  BiPAP (Bilevel positive airway pressure)

  ASV (Adaptive servo ventilation)

FAKULTNÍ NEMOCNICE U SV. ANNY V BRNĚ

Conclusion

- Surgical therapy is indicated for snoring, mild OSA and for patients with moderate and severe OSA and CPAP-failure or CPAP non compliance
- Nasal surgery improves compliance with nasal CPAP
- Minimally invasive surgery (LAUP, RAUP, RFITT) with minimal effect for OSA but very good effect for snoring
- Maxillomandibular advancement with the same effect as CPAP
- Tracheostomy is almost never necessary in pure OSA
- Positive airway pressure therapy is indicated for the moderate OSA (AHI 15-30), severe OSA (AHI > 30)