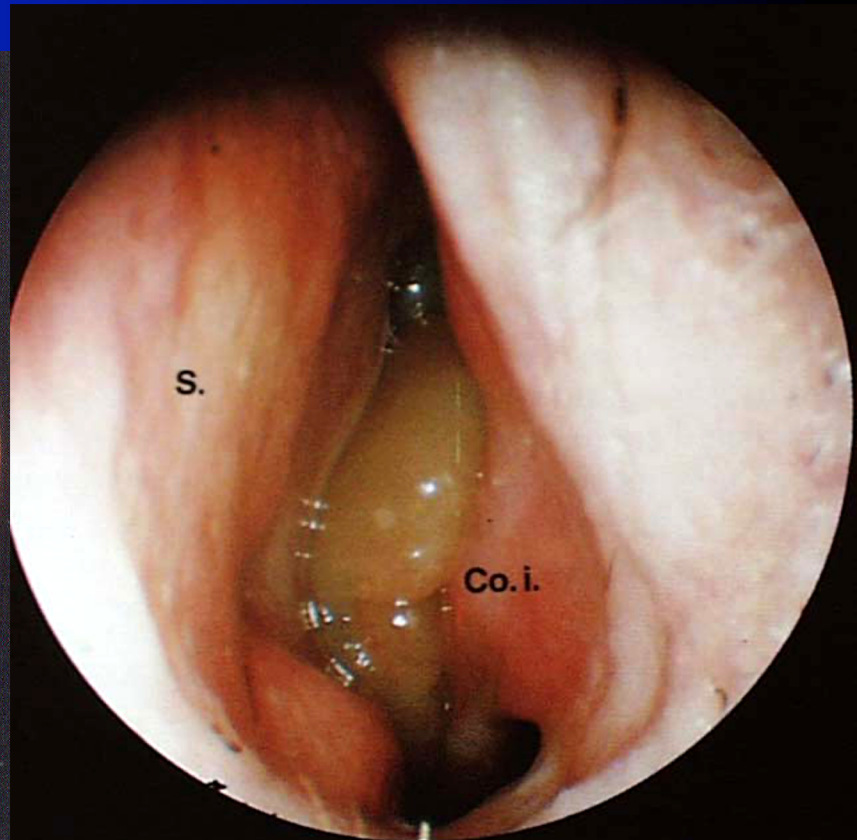
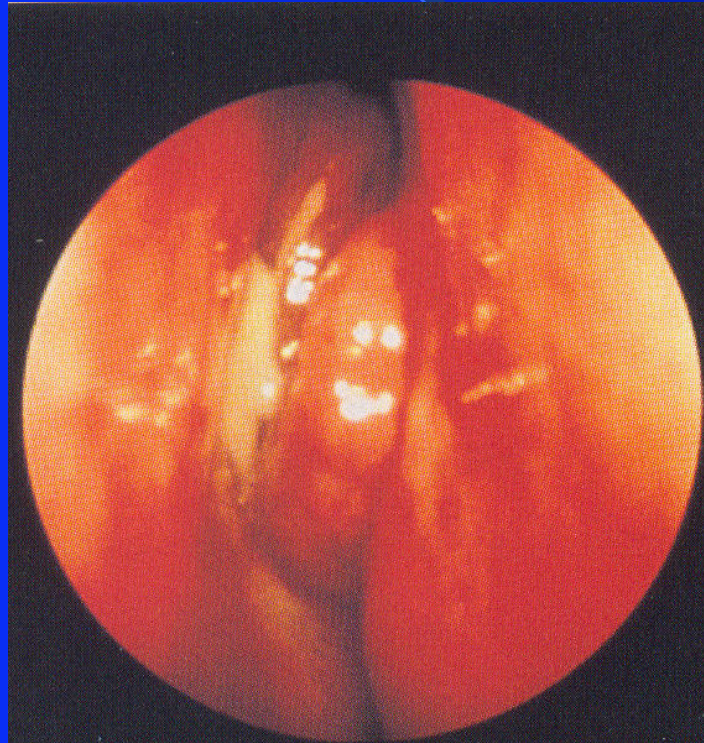
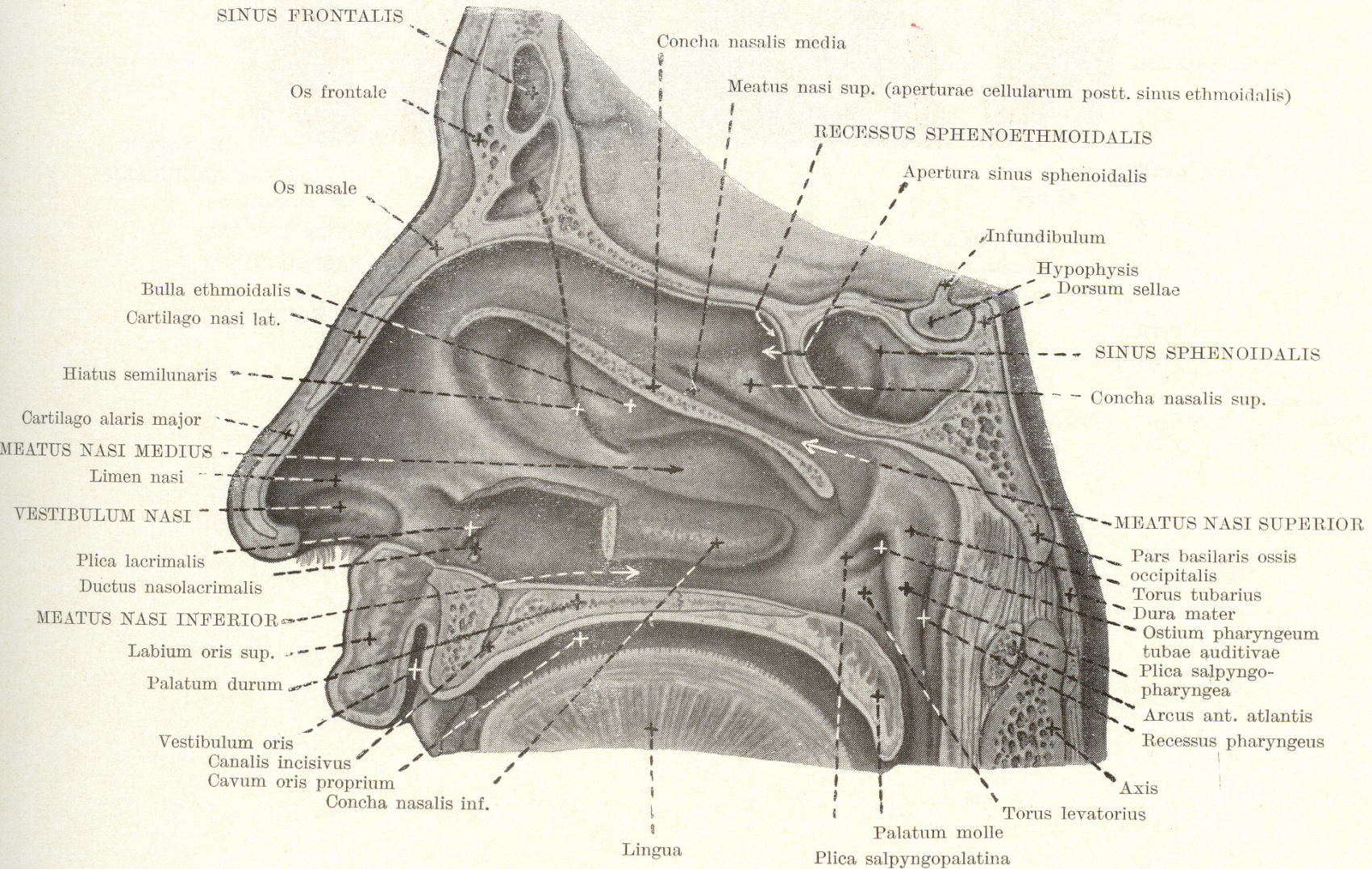




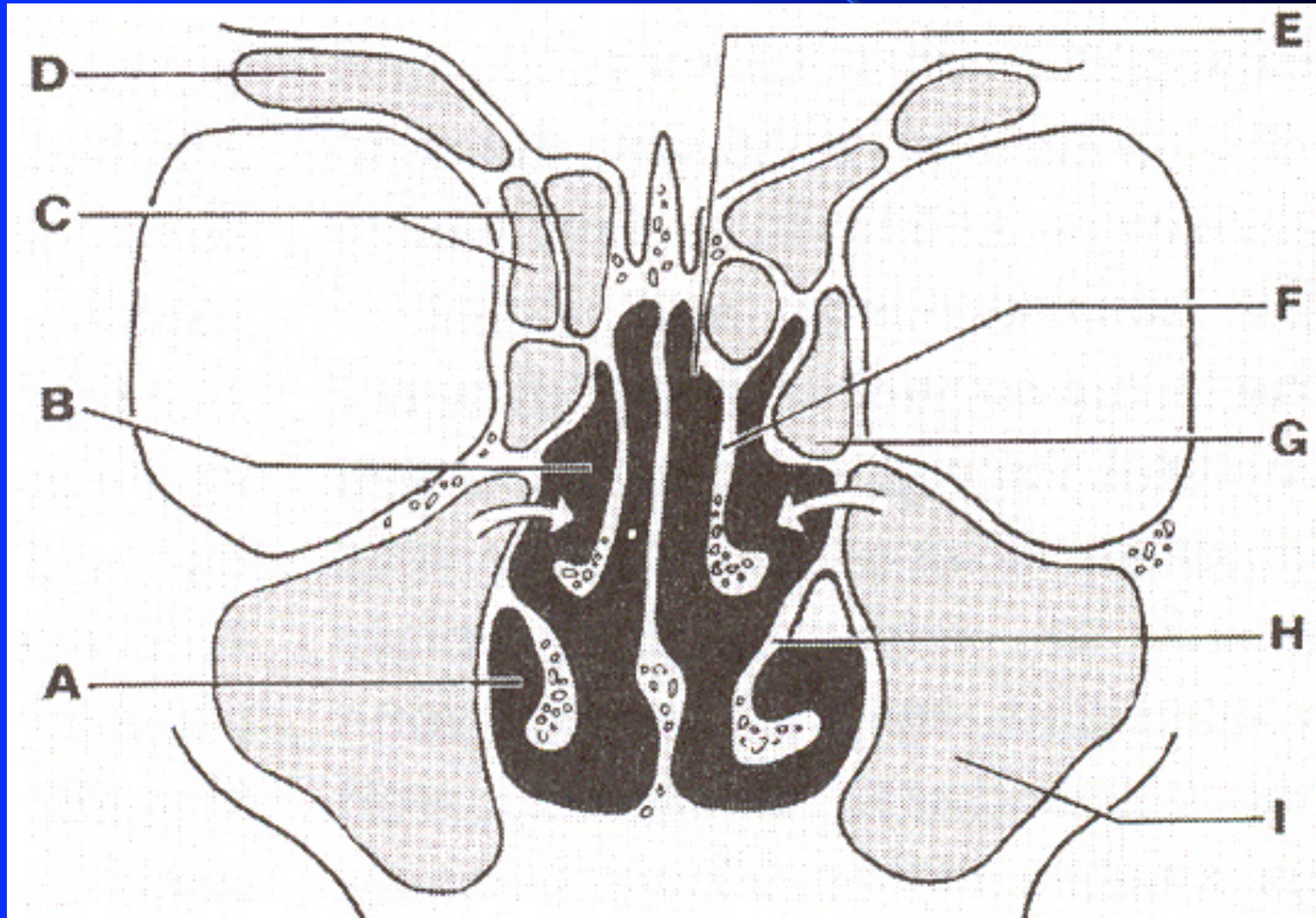
Nose and paranasal sinuses



Lateral wall of nasal cavity



Paranasal sinuses

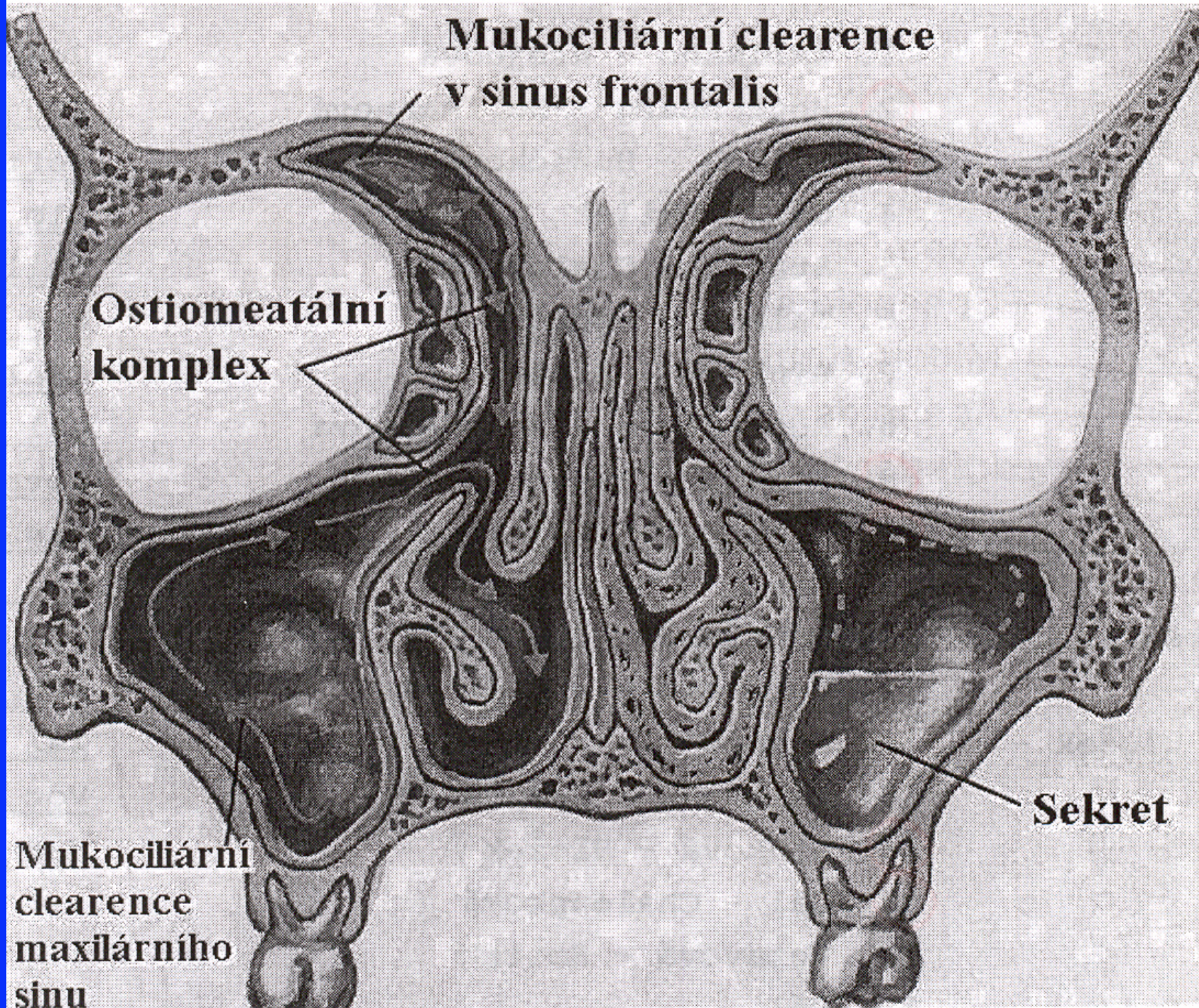


Mukociliární clearance v sinus frontalis

Ostiomeatální
komplex

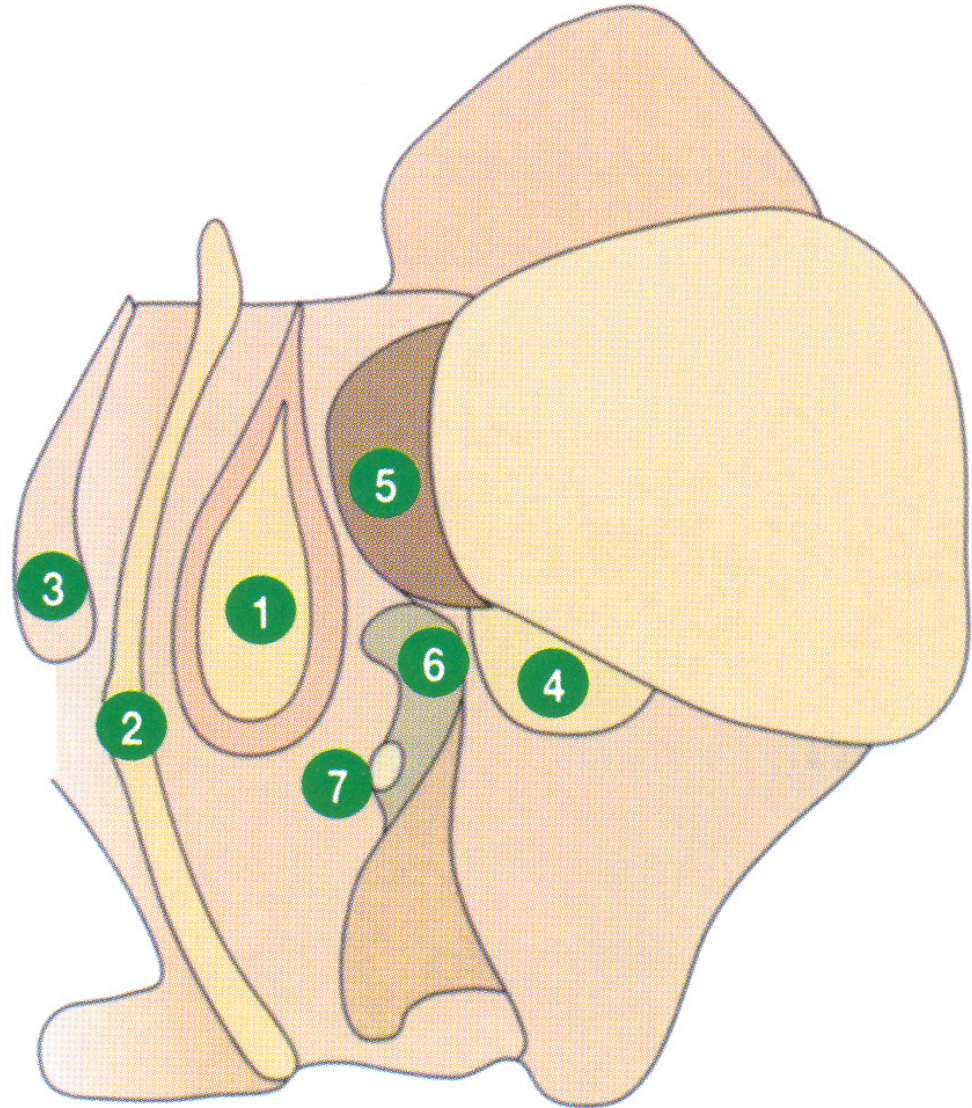
Sekret

Mukociliární
clearance
maxilárního
sinu



Anatomical variations causing dysfunction of ostiomeatal complex

- 1 Concha bullosa
- 2 Deviace septa
- 3 Paradoxně zakřivená střední skořepa
- 4 Hallerovy buňky
- 5 Prominující etmoidální bula
- 6 Deviace processus uncinatus
- 7 Akcesorní ostium maxilární dutiny



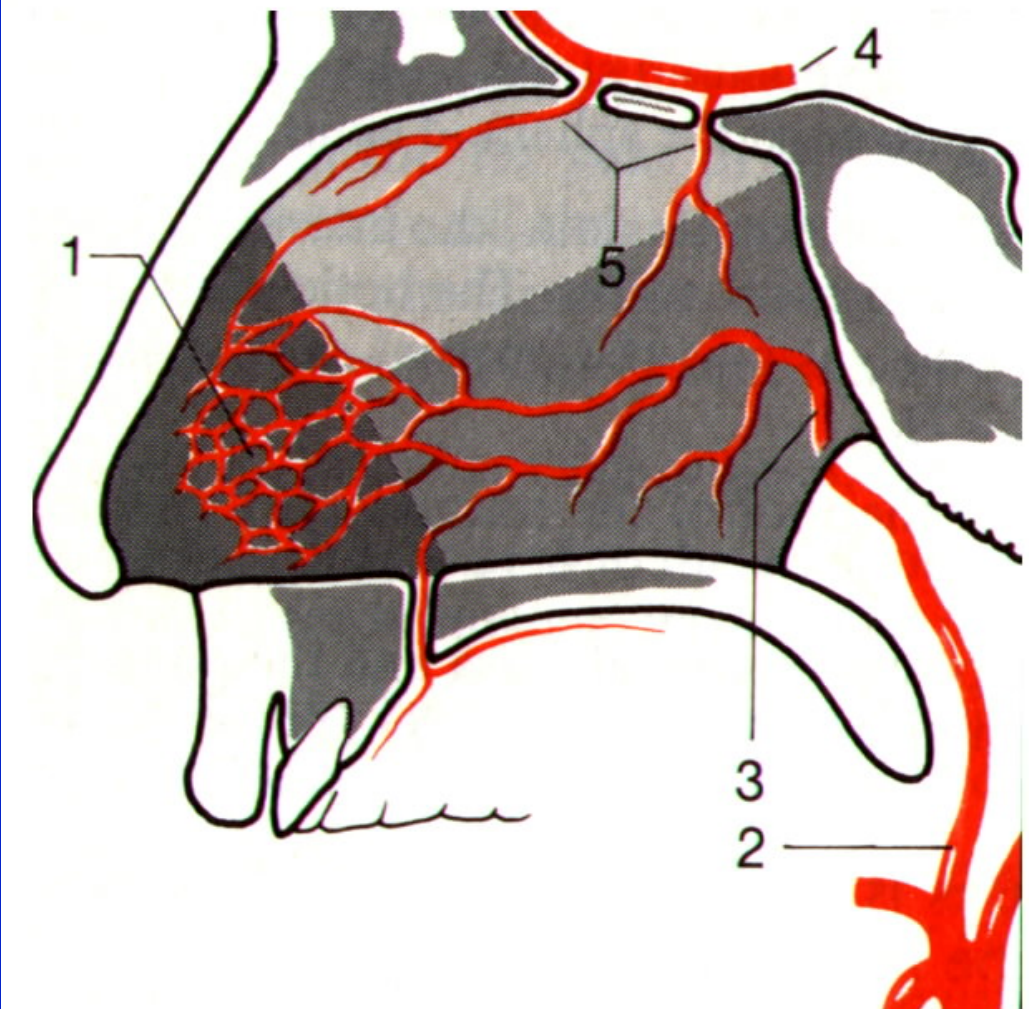
Upper third nasal cavity blood supply from **a. carotis interna**- **a. ophthalmica**-**a. ethmoidalis anterior** **a posterior**.

Posterior end inferior nasal cavity **a. carotis externa** via **a. maxillaris** and **a. sphenopalatina** - **a.a. nasales posteriores lat. et septi**;

A. carotis externa - **a. maxillaris** - **a. palatina descendens** - **a. palatina maior**- **a. nasopalatina**.

Locus Kiesselbachi (plexus)
Nasopharyngeal Woodrof plexus

- 1-Locus Kiesselbachi
- 2-a.maxillaris
- 3-a.sphenopalatina
- 4-a.ophthalmica
- 5-a.ethmoidalis ant. et post.

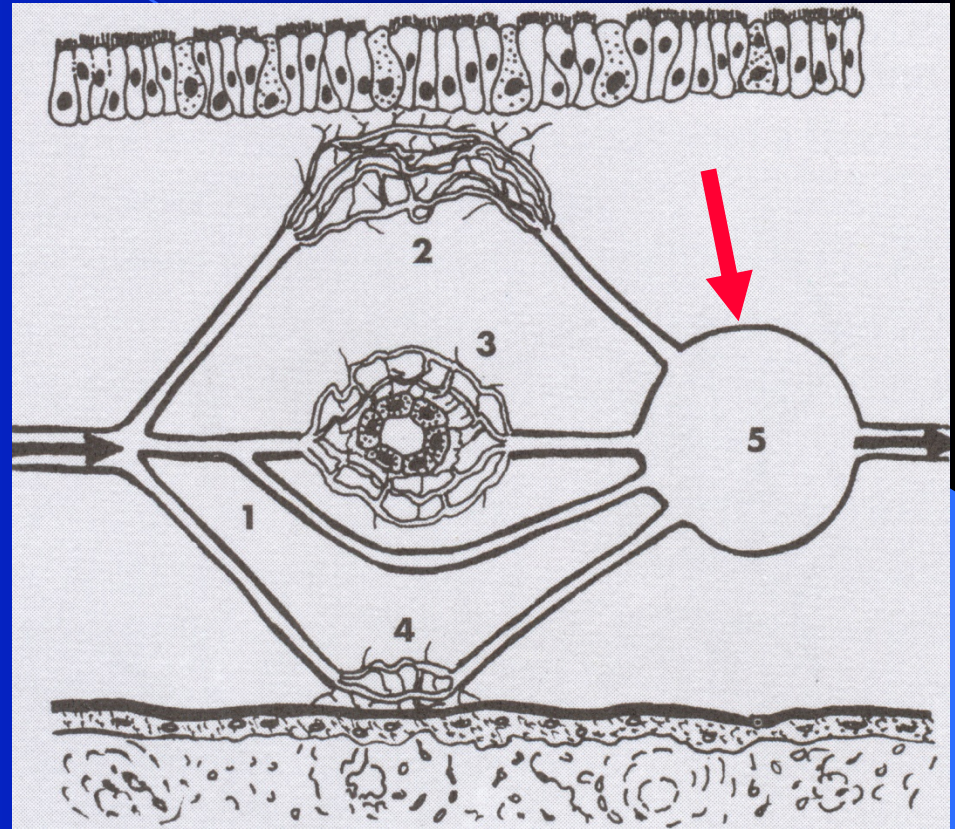


Venous sinusoids (cavernous venous plexus)

Localised between capilars and venules – surrounded by smooth muscles, which causes their vasodilatation and vasoconstriction

■ ■ ■

1.Arterioloventózní zkrat 2.subepiteliální kapilární síť 3. kapiláry kolem žlázek 4. periostální kapiláry 5. kavernózní žilní pleteň



Fibres of smooth muscles of arteriols and venous plexus supplied by autonomic nervous system.

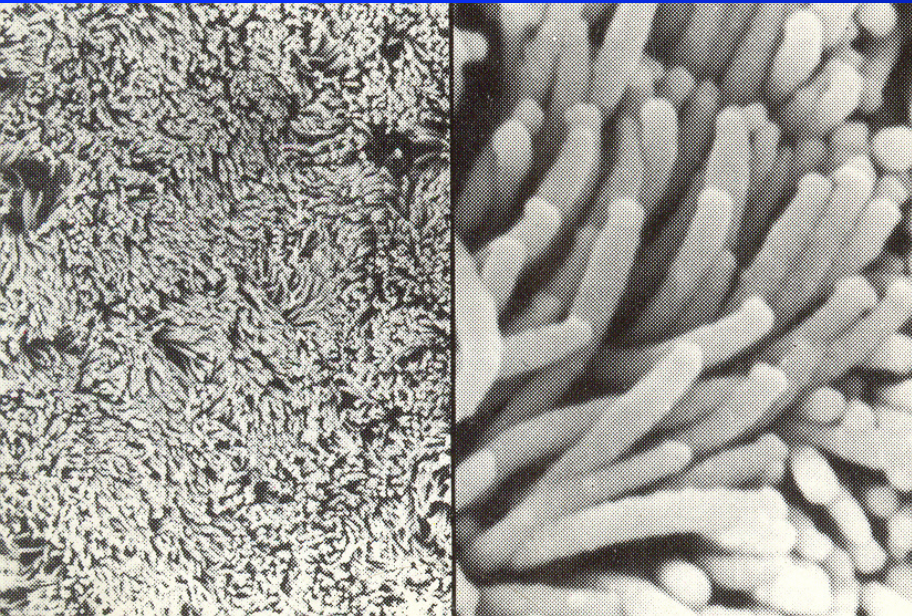
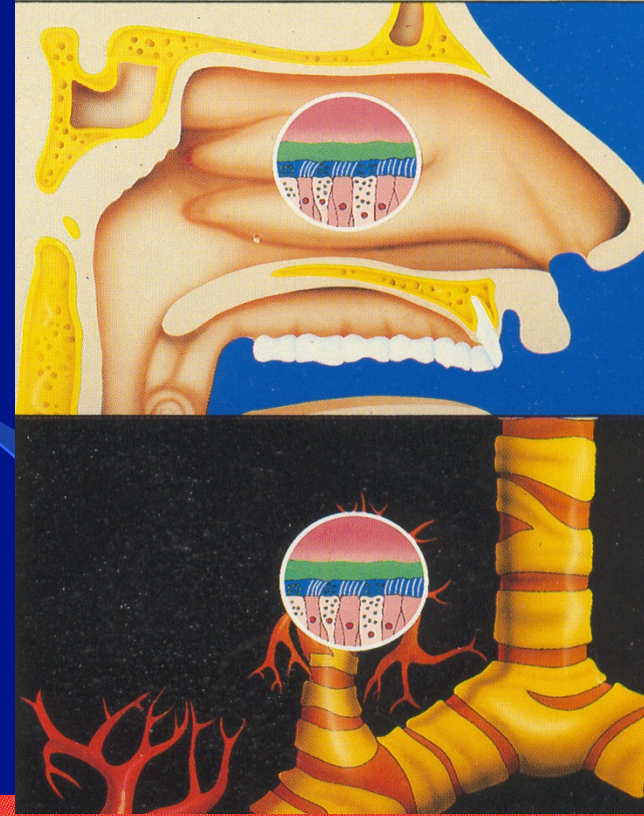
Parasympathetic stimulation

- vasodilatation, filling of venous plexus with blood – congestion and discharge.

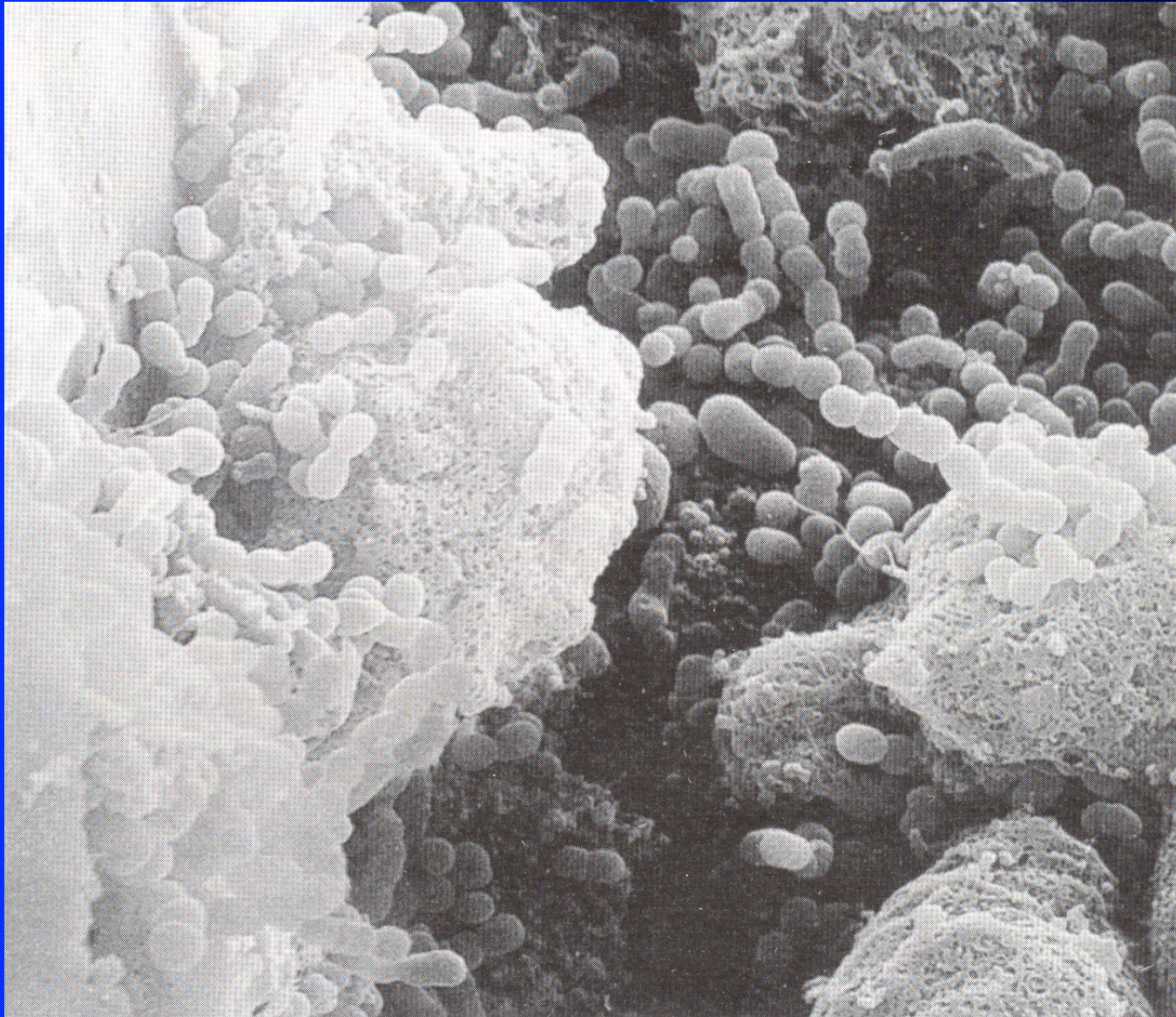
Sympathetic stimulation

- vasoconstriction, leading to empty venous plexus with blood – not blocked nose and lower discharge.

**Mucous membrane of
the nose: multirow
cylindric epithelium with
ciliias**
„Mucociliar escalator“



Microbs on mucose membrane



Evaluation of nose and paranasal sinuses

- **inspection, palpation**
- **rhinoscopy**
- **diaphanoscopy**
- **ultrasound**
- **radiology (X-ray examination)**
- **lavage of the sinuses**
- **sinoscopy**

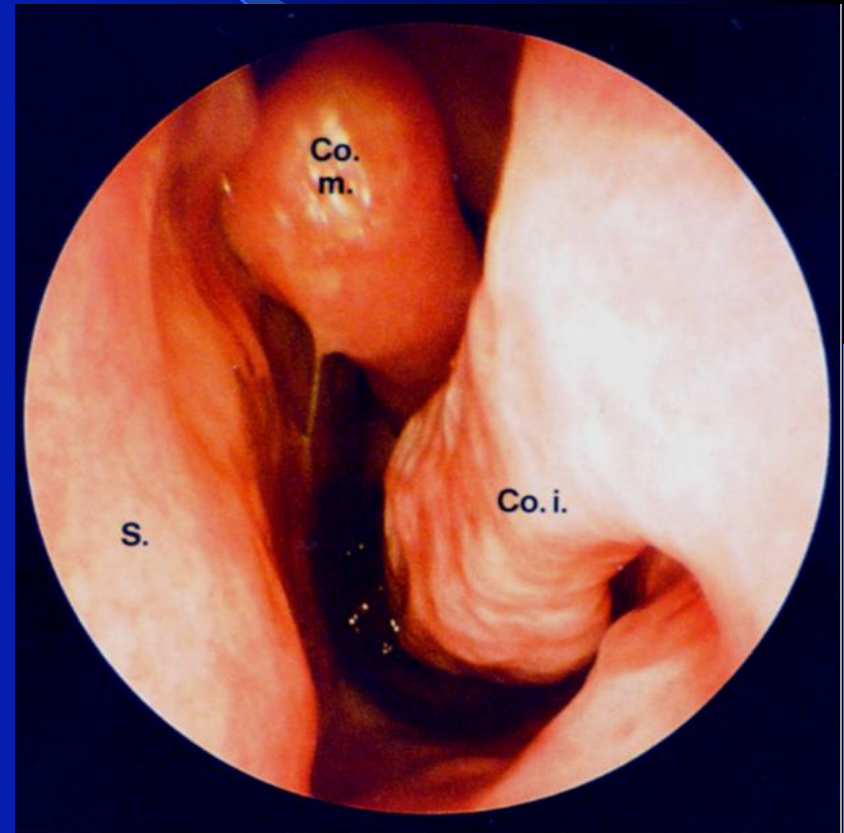
Evaluation of nose function

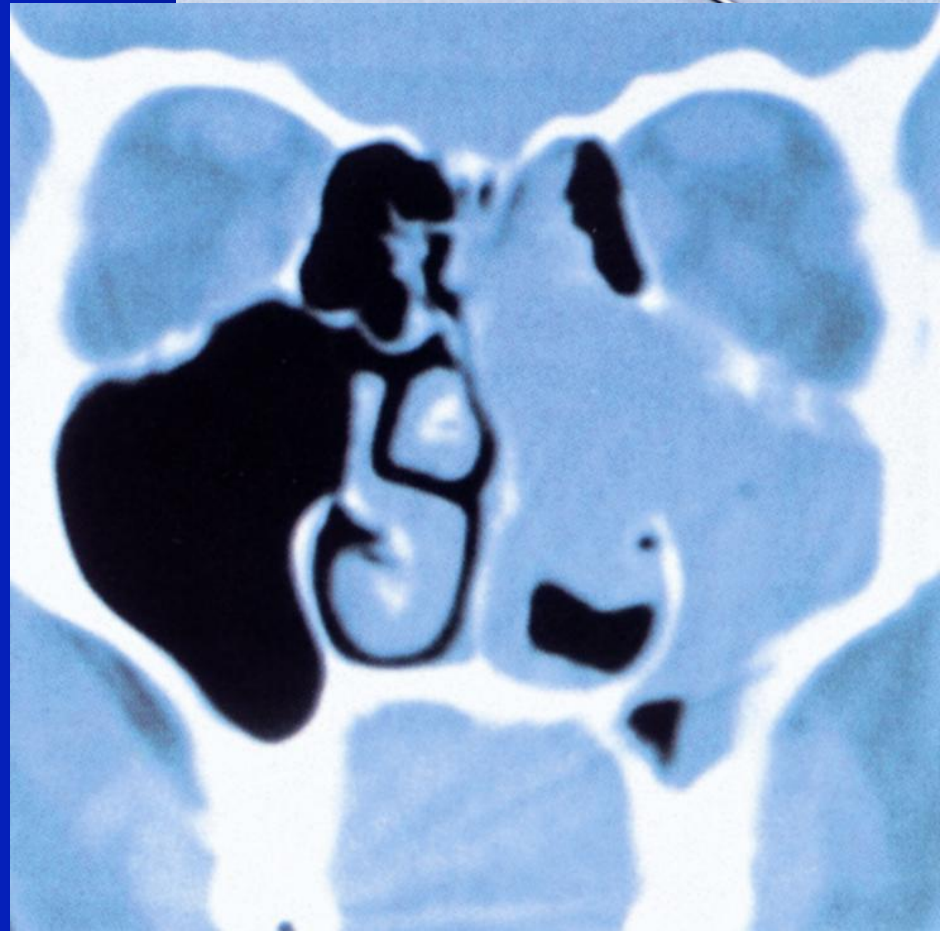
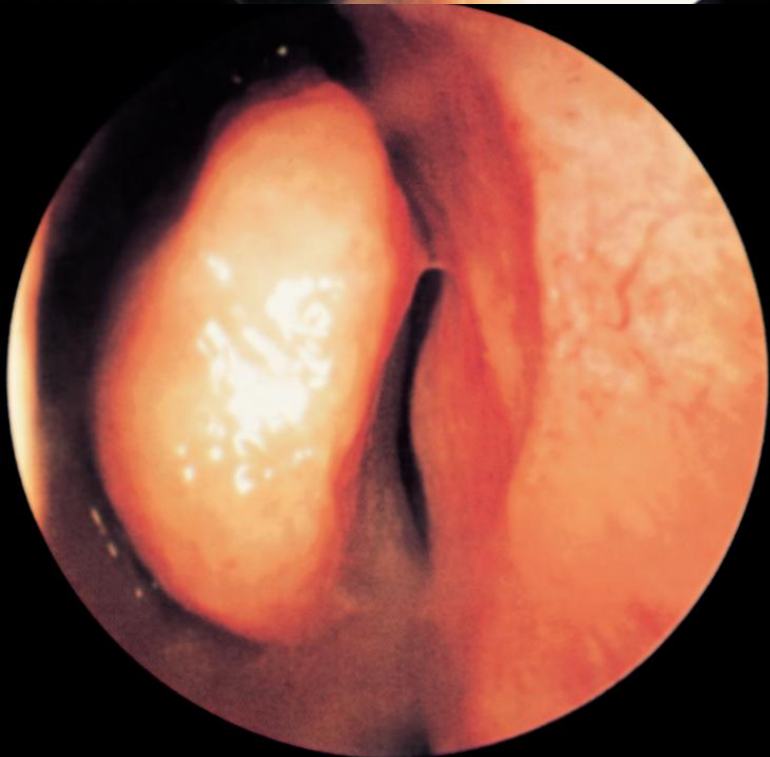
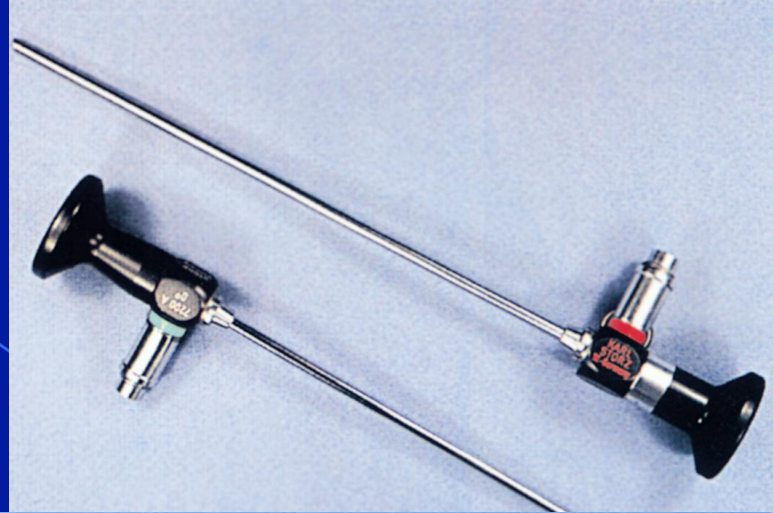
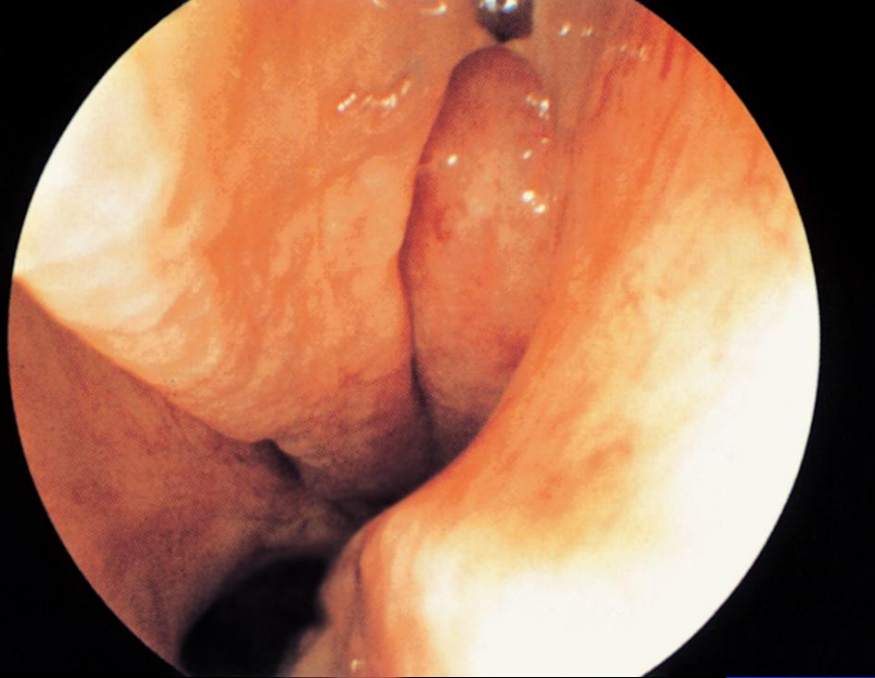
- **Mucociliar transport – sacharin test**
- **Smell – olfaktometry**
 - Smell=vanilka, kafr, dehet
 - Smell + n. V =ocet, čpavek, mentol
 - Smell and taste – éter, chloroform
- **Patency**
 - Glatzell desk
 - Rinomanometrie

Smell disorder:

- Kvantitative – perifery, central
- Kvalitative – parosmie, kakosmie

Endoscopy



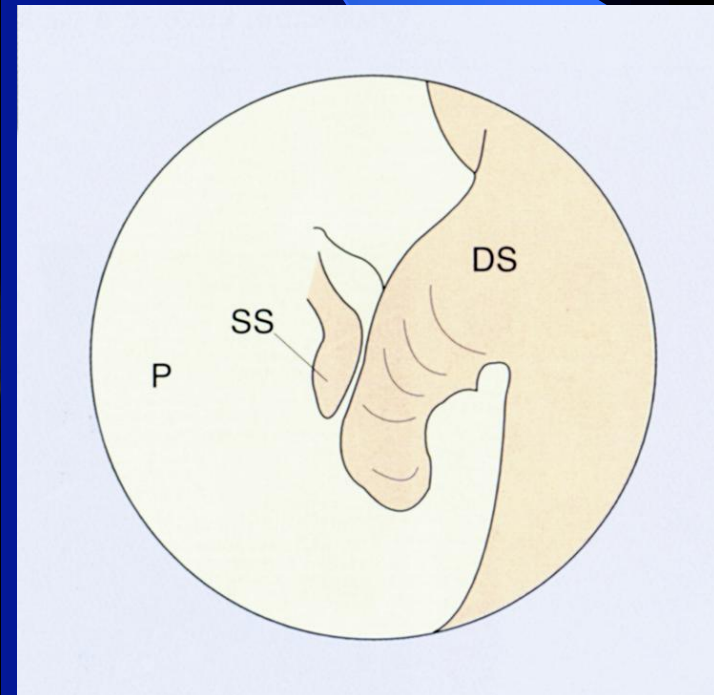
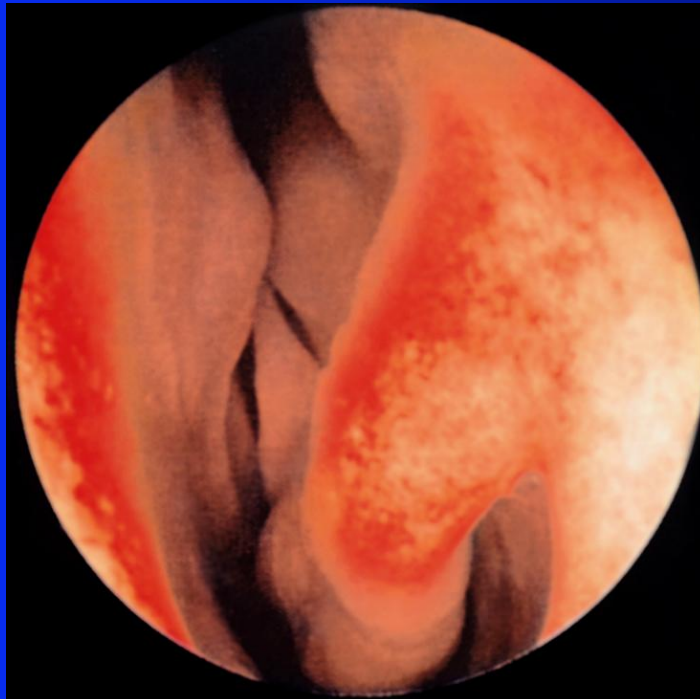


Physiologic endoscopic view

DS – inferior turbinate

SS - middle turbinate

P - septum

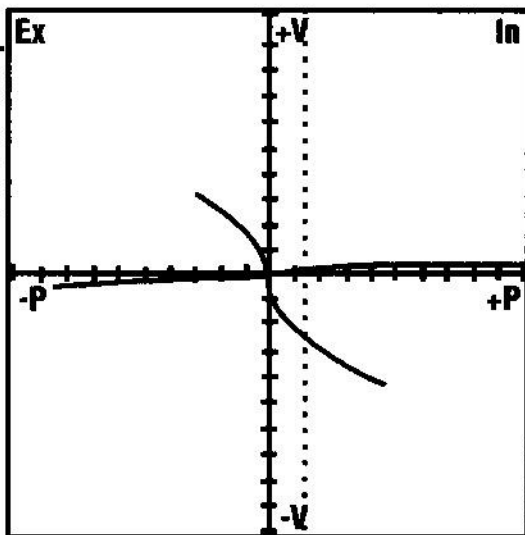


Rinogram deviate septa doprava se zúžením nosní chlopně

Press.	75	150	300
Fl, .L	156	240	328
Fl, .R	8	4	12
Fl, .L+R	164	244	340
Fl, .L/R	19.5060.00	27.33	
Fl, IncL	53	36	%
Fl, IncR	-50	200	%
Res L	0.48	0.62	0.91
Res R	9.3737.50	25.00	
ResL+R	0.45	0.61	0.88

Flow: ccm/s
Press: Pa

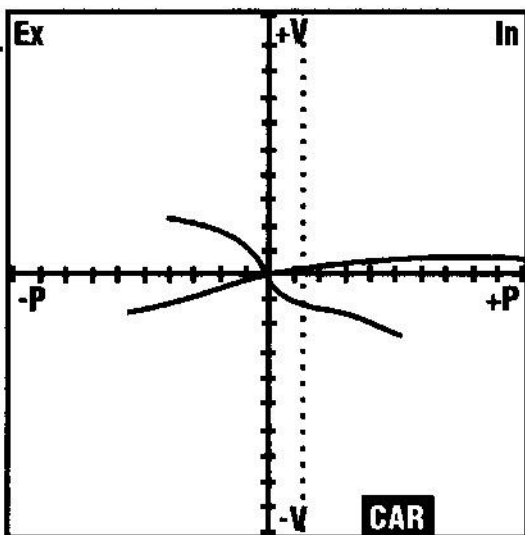
⊞ ± 1000 Pa, ccm/s
⊕ ± 100 Pa, ccm/s



Press.	75	150	300
Fl, .L	96	116	156
Fl, .R	16	36	68
Fl, .L+R	112	152	224
Fl, .L/R	6.00	3.22	2.29
Fl, IncL	20	34	%
Fl, IncR	125	88	%
Res L	0.78	1.29	1.92
Res R	4.68	4.18	4.41
ResL+R	0.66	0.98	1.33

Flow: ccm/s
Press: Pa

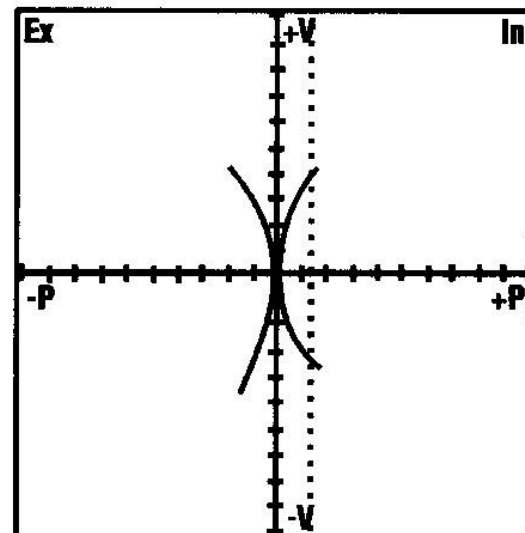
⊞ ± 1000 Pa, ccm/s
⊕ ± 100 Pa, ccm/s



Press.	75	150	300
Fl, .L	232	324	0
Fl, .R	264	488	0
Fl, .L+R	496	732	0
Fl, .L/R	0.87	0.79	
Fl, IncL	39	100	%
Fl, IncR	54	100	%
Res L	0.32	0.46	
Res R	0.28	0.38	
ResL+R	0.15	0.20	

Flow: ccm/s
Press: Pa

⊞ ± 1000 Pa, ccm/s
⊕ ± 100 Pa, ccm/s

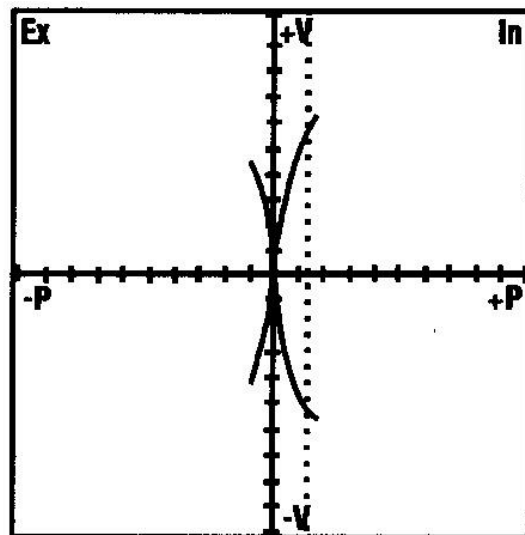


Rinogram s normálními hodnotami R.

Press.	75	150	300
Fl, .L	484	536	0
Fl, .R	404	612	0
Fl, .L+R	808	1148	0
Fl, .L/R	1.08	0.87	
Fl, IncL	32	100	%
Fl, IncR	51	100	%
Res L	0.18	0.27	
Res R	0.18	0.24	
ResL+R	0.09	0.13	

Flow: ccm/s
Press: Pa

⊞ ± 1000 Pa, ccm/s
⊕ ± 100 Pa, ccm/s



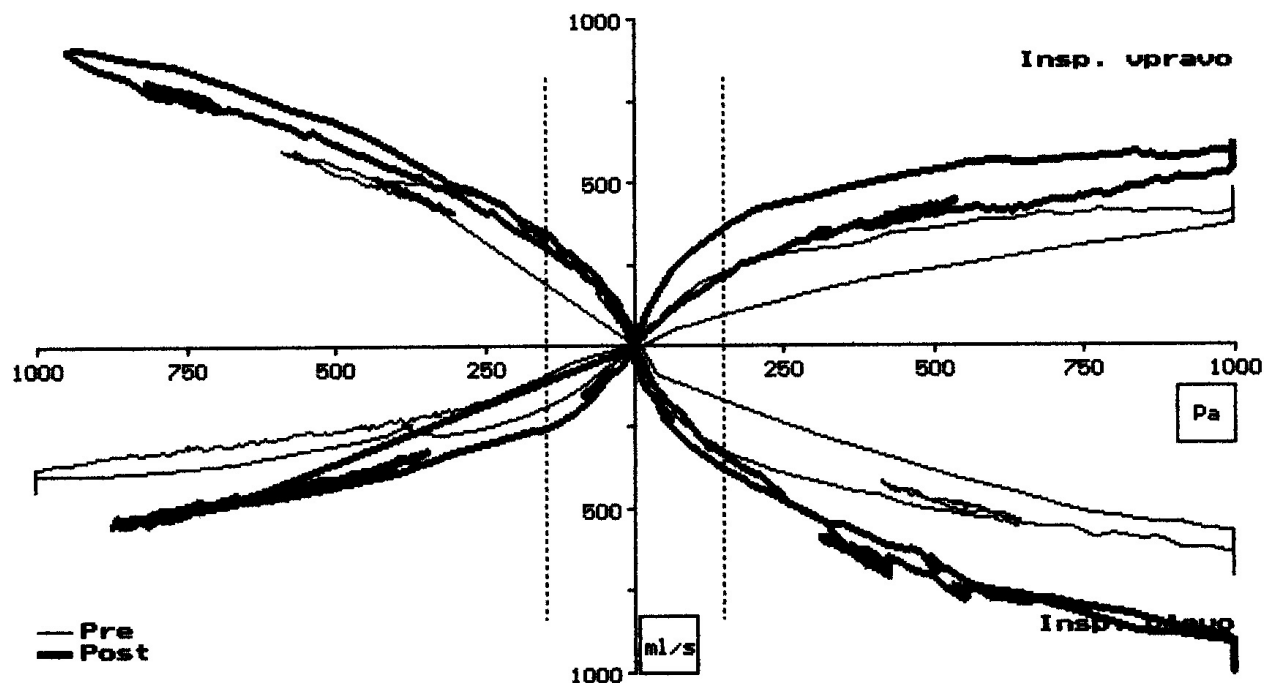
Rinogram s normálními hodnotami R po anemizaci.

FN U sv. Anny
 Pekarska 53, klinika pracovniho lekarstvi
 prednosta Doc. MUDr. Petr BRHEL CSc.
 tel. 05/43182886

Protokol mereni Rhinomanometrie

07.11.2000

ID-cislo... SimPet100173 Vyska...[cm]. 175 Dat.naroz.. 10.01.1973 - 27r
 Prijmeni... Simon Vaha....[kg]. 65 Pohlavi. muz
 Jmeno... Petr Poznamka..... Koureni:10/d,riziko:0,leky:0



Mereni hodnoty		Na1.hodn	Pre-hodn	Pre/Na1.[%]	Hodn. Post	Post/Na1.[%]	Post/Pre[%]
Parametr		07.11.2000		07.11.2000			
		10:01		10:31			
L150	ml/s	450	250	56	351	78	+41
R150	ml/s	450	171	38	292	65	+71
SUM150	ml/s	900	421	47	644	72	+53
RES-L150	Pa/ml*s		0.60		0.43		-29
RES-R150	Pa/ml*s		0.88		0.51		-42







4271-3688/04
2004/3/22
13:07:00

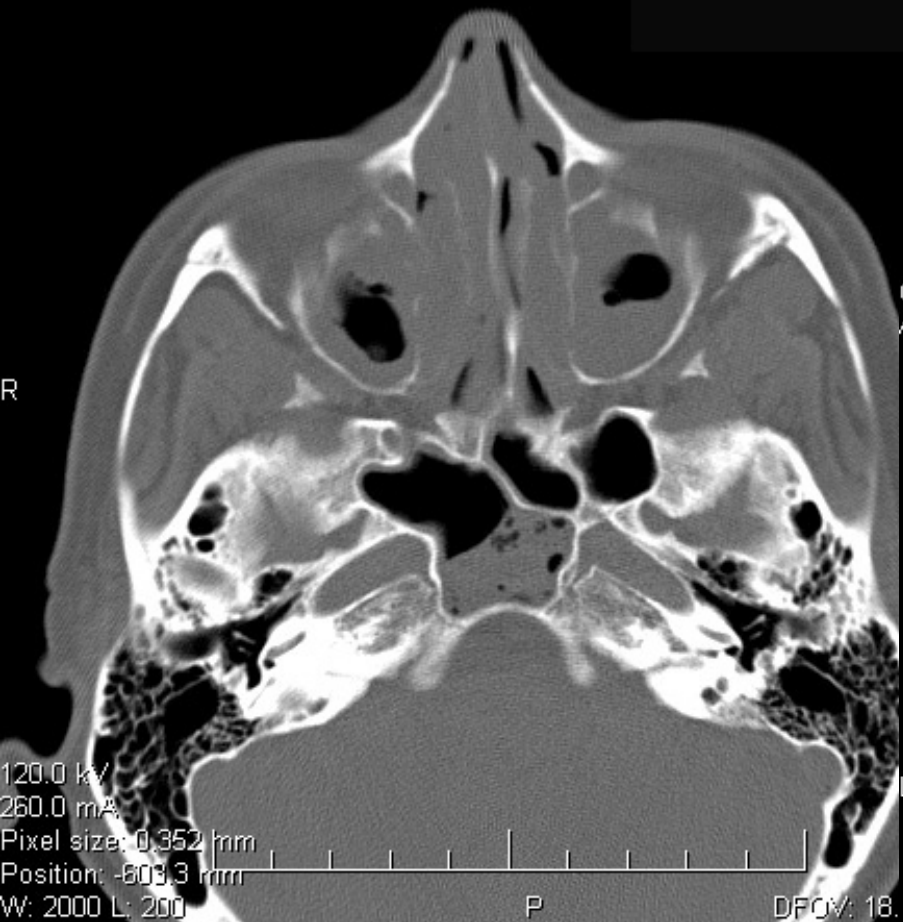
70.0 kV
250.0 mA
Pixel size: 0.167 mm
W: 4095 L: 2048



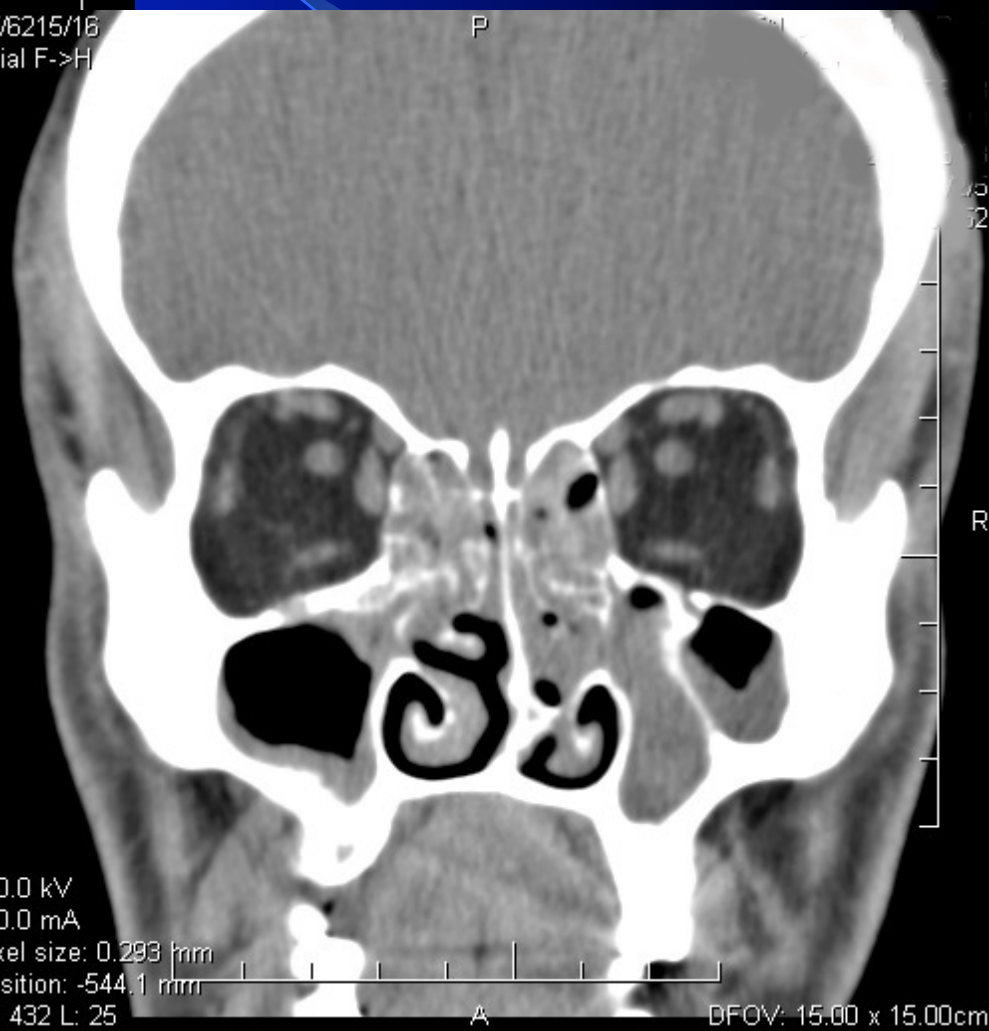


CT/4805/14
Axial F->H

A



Computed tomography



CT/5155/19
Axial F->H

A

12:06:12

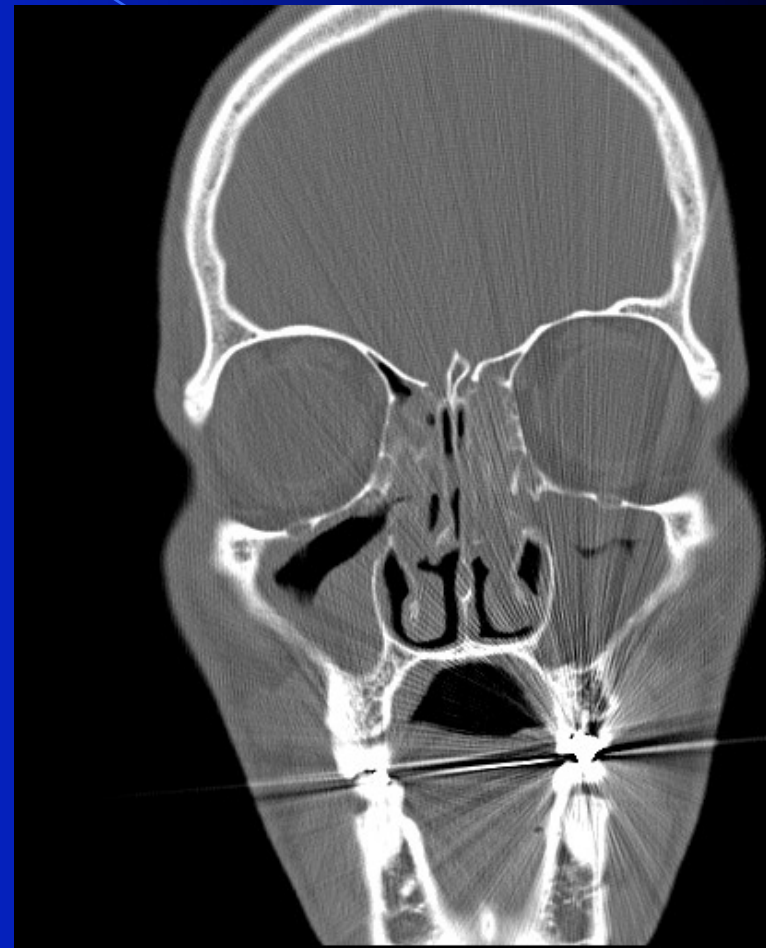
R

L

120.0 kV
260.0 mA
Pixel size: 0.404 mm
Position: -574.9 mm
W: 2000 L: 200

P

DFOV: 20.70 x 20.70cm



Definition of rhinitis

Inflammation of nasal mucosa membrane, characterized by at least two of following symptoms:

- **Congestion of nasal mucosa membrane (impaired nasal patency)**
- **Discharge from the nose**
- **Sneezing**
- **Itching in the nose**

Symptoms should last at least 1 hour daily. Until 12 weeks – in acute rhinitis, longer than 12 weeks in chronic rhinitis..

Lund J., et al. Report About International Consensus regarding diagnosis and treatment of rhinitis, Allergy,1994; 49, Supl.19:34
s

European Position Paper on Rhinosinusitis and Nasal Polyps (EP3 OS). Rhinology , Supplement 18, 2006, 88 s.

Rhinosinusitis chronica

Inflammation of nasal mucosa membrane, characterized by :

- **nasal obstruction**
- **pain, pressure in face or**
- **water discharge from the nose, postnasal drip or**
- **smell disorder**

Symptoms should last at least 12 weeks in chronic rhinitis.

European Position Paper on Rhinosinusitis and Nasal Polyps (EP3 OS). *Rhinology* , Supplement 18, 2006, 88 s.

Classification of rhinitis

1. Allergic

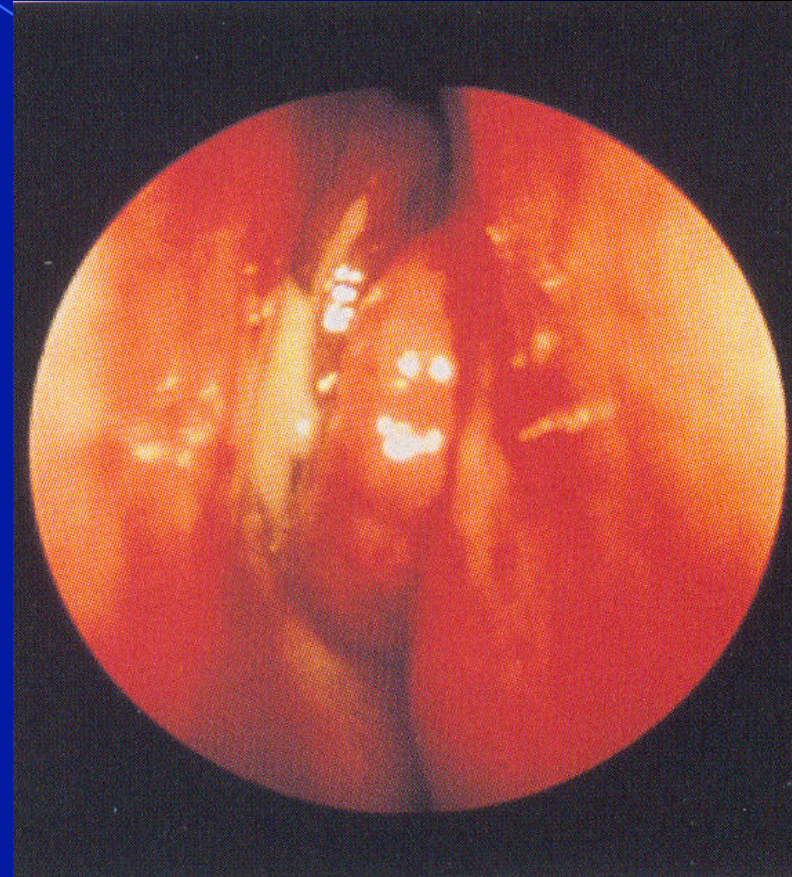
- Intermittent
- Persistent

2. Infectious

- acute
- chronic
 - specific
 - nonspecific

3. Other

- Vasomotor (professional, hormonal, drug induced, irritant, Alimentáry, psychogenic, NARES (non allergic rhinitis with eosinofilia syndrome)
- Atrophic
- Idiopathic



Epidemiologie chronické rýmy

- **alergická a chronická nealergická rýma patří k civilizačním chorobám**
- **postihuje asi 25 % populace**
- **výskyt je vyšší u obyvatel měst**
- **okolo 50 % chronické neinfekční rýmy tvoří alergická rýma**

Degree

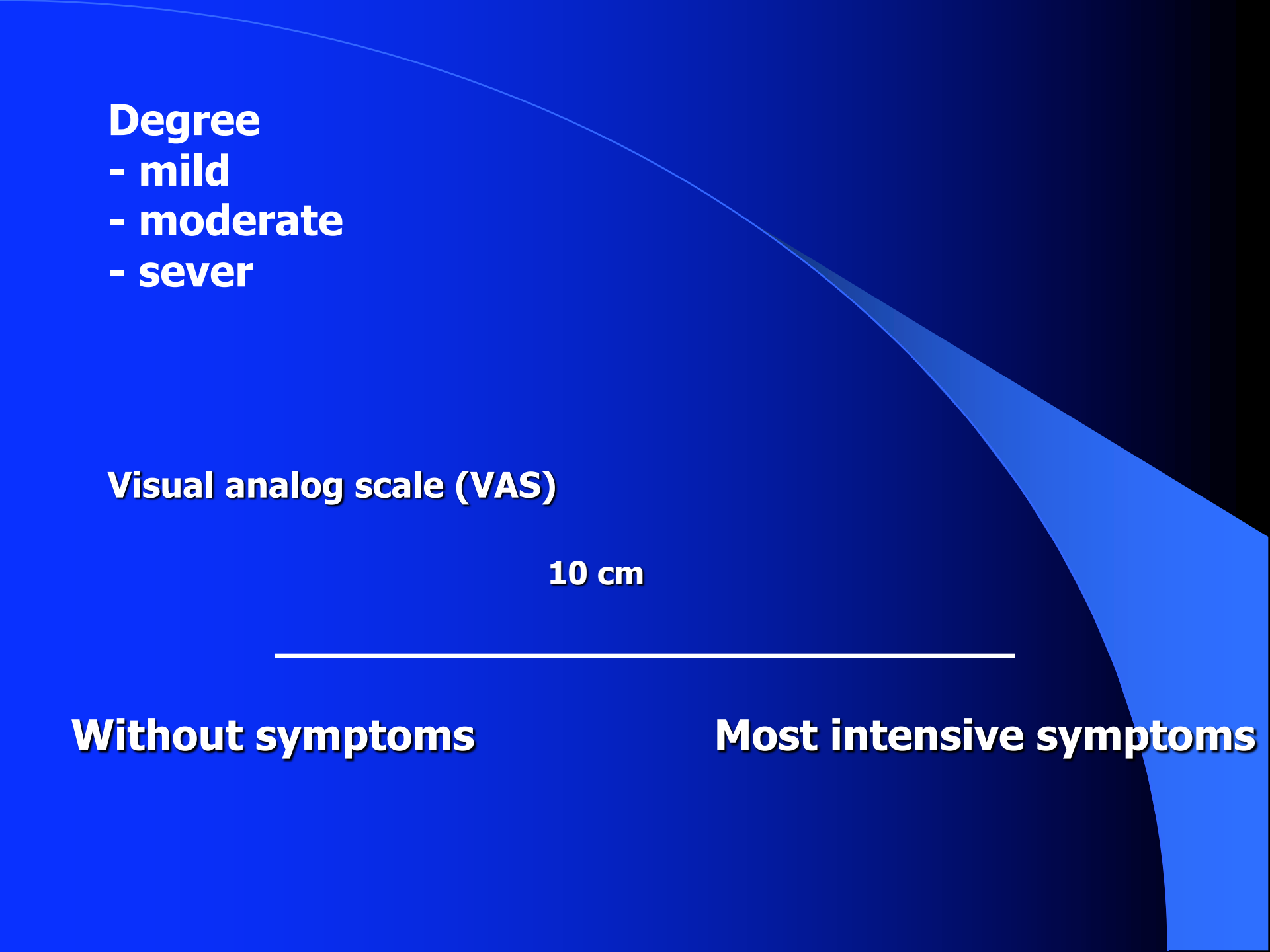
- mild
- moderate
- sever

Visual analog scale (VAS)

10 cm

Without symptoms

Most intensive symptoms

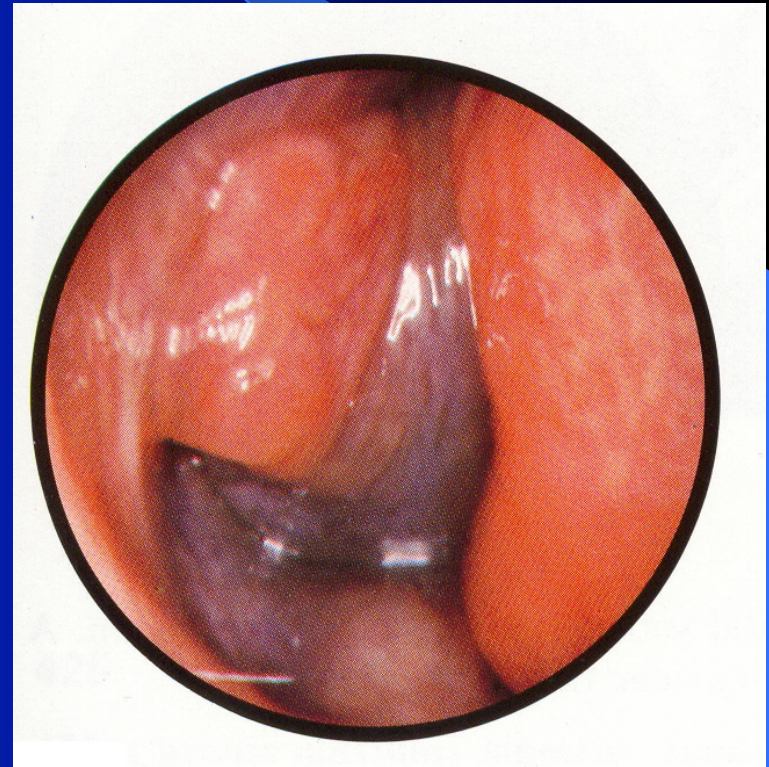


Allergic rhinitis

Persistens
Intermitens

Degree

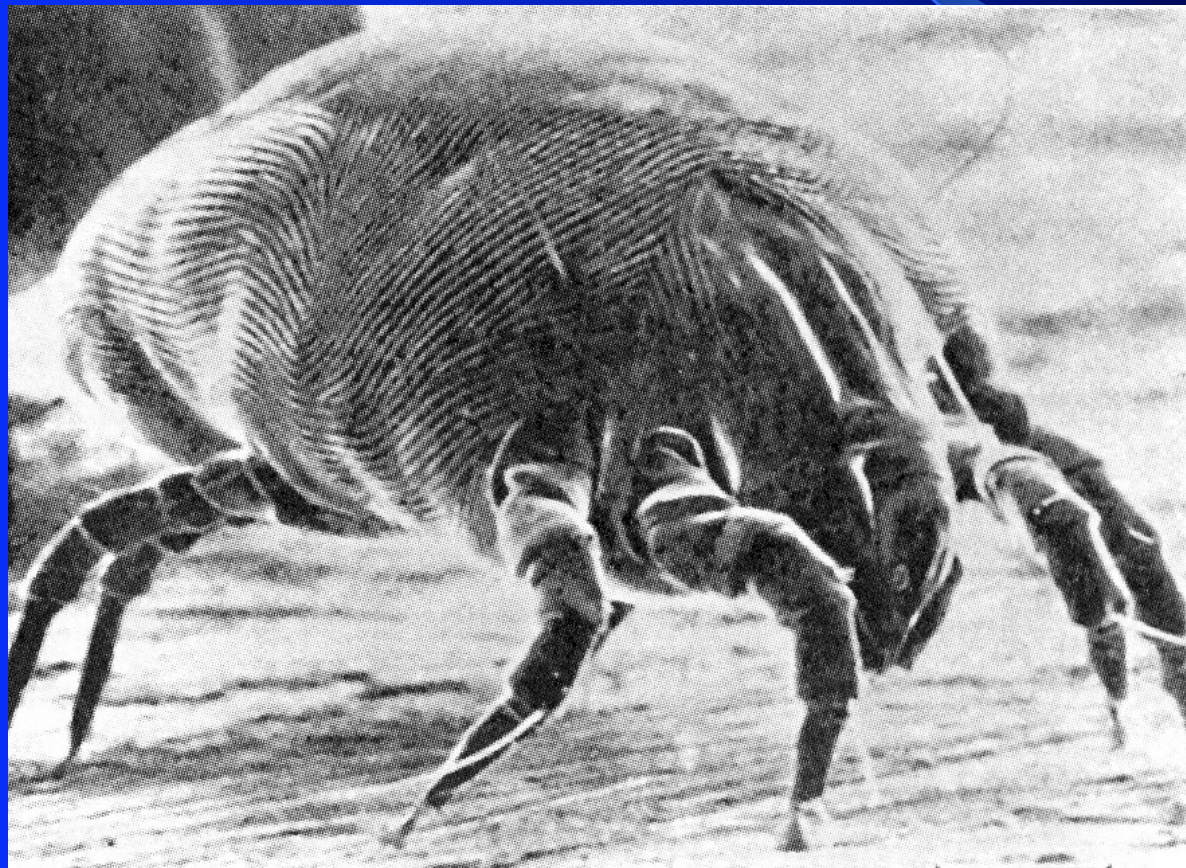
- mild
- moderate
- sever



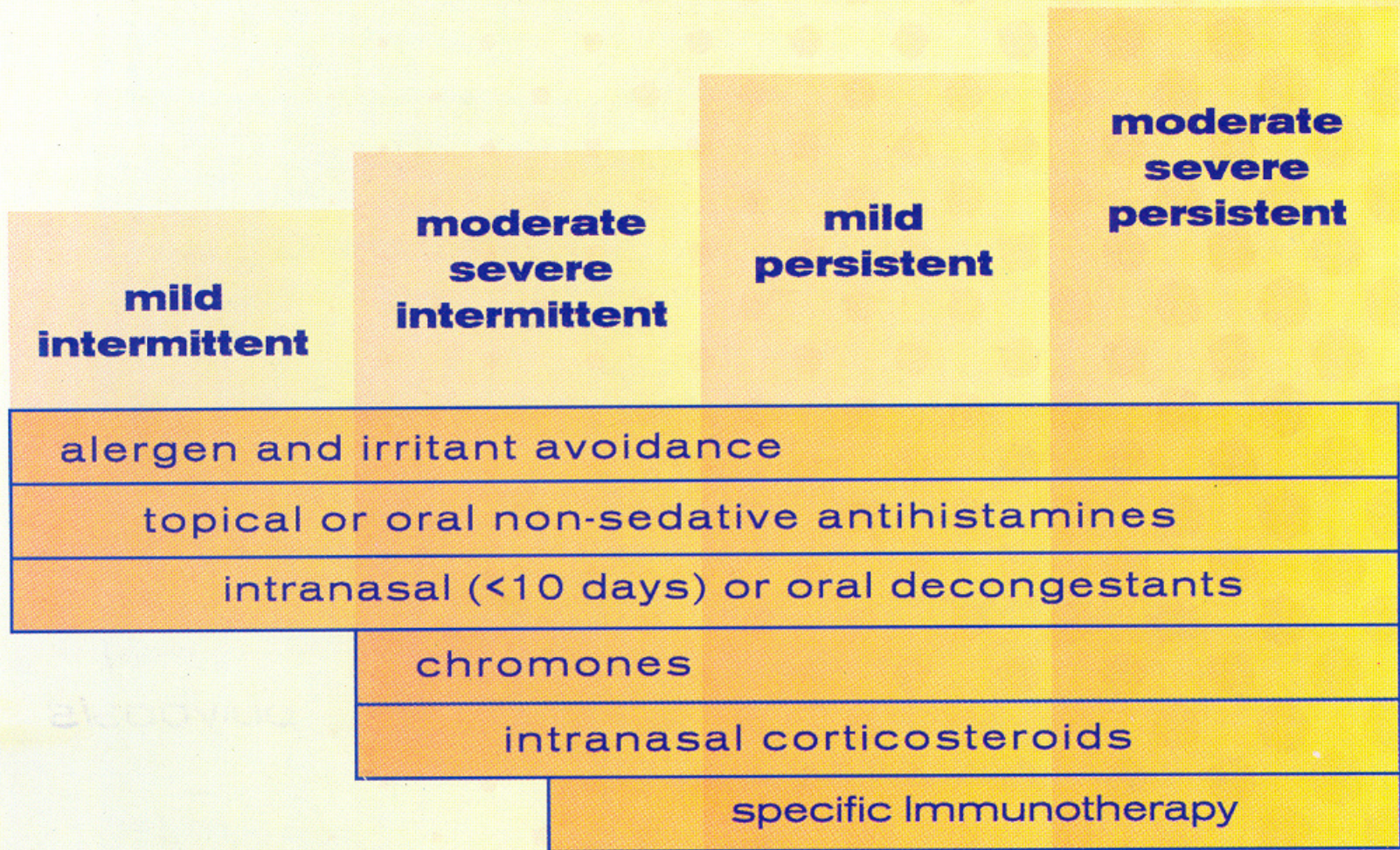
Allergic rhinitis- diagnosis

- **Proof of IgE – mediated mechanism**
- **Symptoms as a result of immune reaction mediated by specific. IgE antibodies**
- **Cellular inflammation of mucose membrane (T-lymfocyty, eozinofily)**
- **Cause of production of IgE antibodies - atopic genetic predisposition (HLA antigens of atopic patient)**

Part of „home dust“ - Dermatophagoides pteronyssinus in electron microscop)



Rhinitis allergica - treatment



adapted from: Management of Allergic Rhinitis and its Impact on Asthma 2001. ⁽¹⁾

Management of Allergic Rhinitis and its Impact on Asthma. Based on: Bousquet J. ARIA workshop report. J Allergy Clin Immunol 2001; 108 (5): 147-333.

Comparison of local decongestant

Remedy	Time of onset (min.)	Duration of action(hod.)	Undesirable side effects
Efedrin	10	3-4	+++
Fenylefrin	15	1-2	+++
Nafazolin	15	2-6	++
Xylometazolin	20	10-11	++
Oxymetazolin	20	10-12	++
Tramazolin	5	11-12	+

Rhinitis vasomotorica

- **Disorder of mucos membrane without structural backround, not infectious, autoimmune neither allergic in traditional sense.**
- **The same symptomatology as persistans allergic rhinitis.**
- **Cause- faktors of none-immune character.**

**(Charles W. Cummings, et al. Otolaryngology—
Head & Neck Surgery,, Mosby)**

Rhinitis vasomotorica

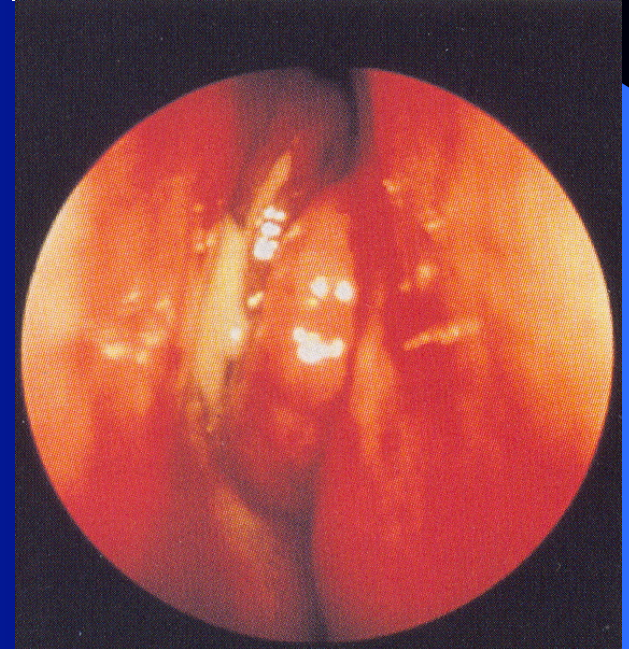
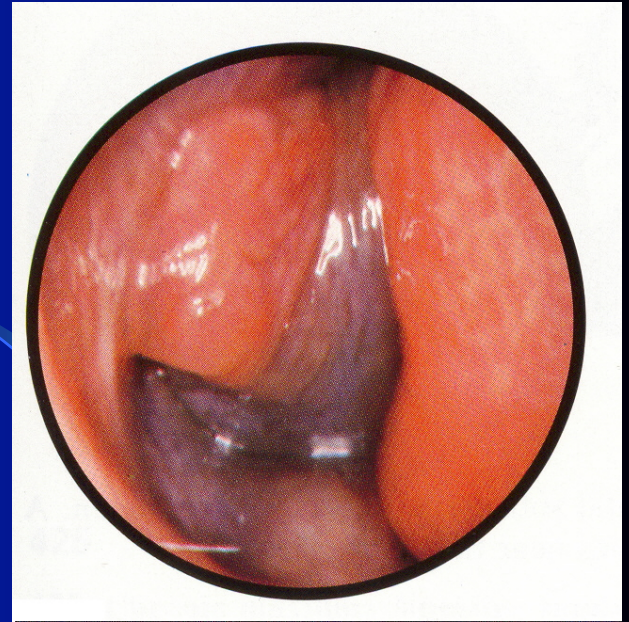
- **Neurovascular reaction on various stimulus: mechanical, chemical, psychic stress.**
- **Manifestation of**
sympathic-parasympathic
neurovascular disbalance

Symptoms of vasomotor rhinitis

- „blocked nose“
- **Watery discharge - rhinorrhea –**
 - **Výtěr z nosu s velkým množstvím eozinofilů typický pro alergii nebo NARES**
 - **Žlutý hnisavý – bakteriální infekce (neutrofily)**
 - **Krvavý nebo krustózní a ulcerace typické pro bakteriální infekci, nádor nebo granulomatózu**
- **Itching in nose, sneezing**
- **Smell disorder**
- **Feeling of dryness in nose**
- **Eye symptoms**
- **Headache**
- **General symptoms**

Anterior rhinoscopy

- **Allergic and vasomotor rhinitis** livid or pale, diffus swollen mucose
- **Irritation or abuse** nebo of nasal spray– red mucose
- **sinusitis** red mucose with pus



Rhinitis vasomotorica – diagnosis

- **X-ray evaluation is normal**
- **Higher amount of inflammatory mediators and cells**
 - **Histamins, leukotriens, prostaglandins, neuropeptids aj.**
- **Negative skin allergen tests**
- **In nasal secretion not present eosinofils**
- **Positive answer on histamin skin test**

Rhinitis vasomotorica - causes

1. Rinitida drug inducted
 - a. Antihypertensiva
 - b. Nadužívání nosních kapek/sprejů
 - c. Kokain
 - d. Hormony
2. Pregnancy and "premenstrual rhinitis"
3. Hypothyroidismus
4. Emotional causes
5. Temperature changes
6. Rhinitis from irritation and external influences
7. Rinitida z chuťových podnětů
8. Konečná fáze vaskulární atonie u chronické alergické nebo zánětlivé rinitidy
9. Rinitida from position
10. Paradoxní nosní obstrukce a nosní cyklus
11. Rinitida neventilovaného nosu (laryngektomie, choanální atrézie, adenoidní hyperplázie)
12. Kompenzatorní hypertrofická rhinitis
13. Eosinophilic and basophilic nonallergic rinitida
14. Ostatní systémové příčiny: syndrom vena cava sup., Hornerův syndrom, cirrhosis, uremia
15. Idiopathická rinitida

Rhinitis drug induced

- **Antihypertensiv drugs** - Reserpin, Hydralazin, Guanethidin, Methyldopa, Prazosin, Beta-blokátory, Propranolol, Nadolol
- **Antidepressiv drugs** a antipsychotika - Thioridazin, Chlordiazepoxid and Amitriptyline, Perfenazin
- **Hormons** - Ovariální hormony, orální kontraceptiva
- **Abuse of nasal decongestants** – i když jde o dekonjestiva - rebound fenomén ~~vasodilatace~~ **kongesce**. Prodloužení užití topický vazokonstriktorů vede ke ztrátě cévního tonu. Dekongesční nosní kapky a spreje by neměly být používány déle jak 3 po sobě následující dny. (rhinitis medicamentosa = rebound rhinitis)
- **Kokain** - vasokonstriktor

Pregnancy and “premenstrual rhinitis”

- Higher level of **endogenous progesterone** –congestion not only in uterus but also in the nose
- From the some reason – immediately before menstruation

Psychogenic and emotional reasons

- Anxiety, hostility, feeling of frustration and anger – it could disturb **autonomic neurovascular balance** – nasal congestion and watery discharge
- migraine - **dysfunction in carotid system**

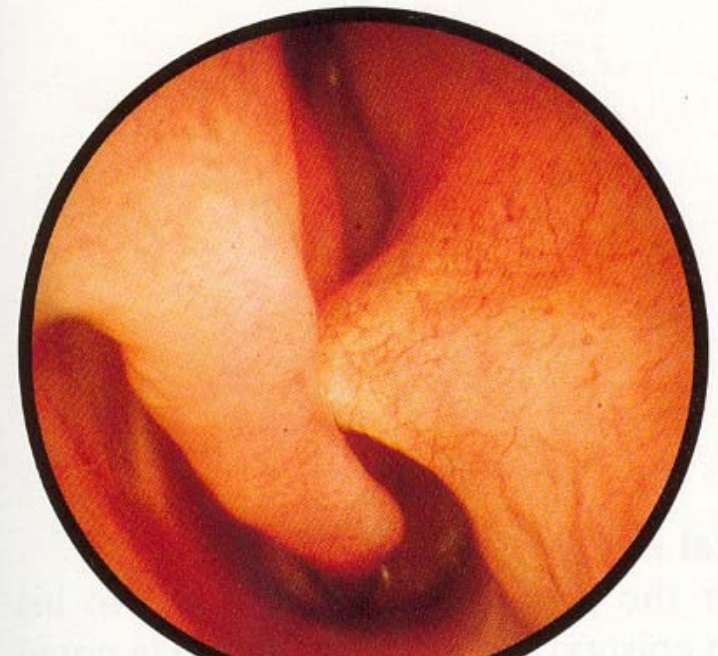
Rhinosinusitis -Diagnosis

History	family, external factors
ENT clinical investigation	Rinoscopy, endoscopy,
X-ray, ultrasound	Semioxial rtg, CT of paranasal sinuses
Alergologic tests	Skin test, serology - IgE,
Cultivation	Bacteriology
Cytology	Inflammatory cellulisation
Evaluation of mucociliar transport	mukociliar clearance
Nose patency	Rinomanometry
Evaluation of smell	Sniffing` s test, odour perfumed test

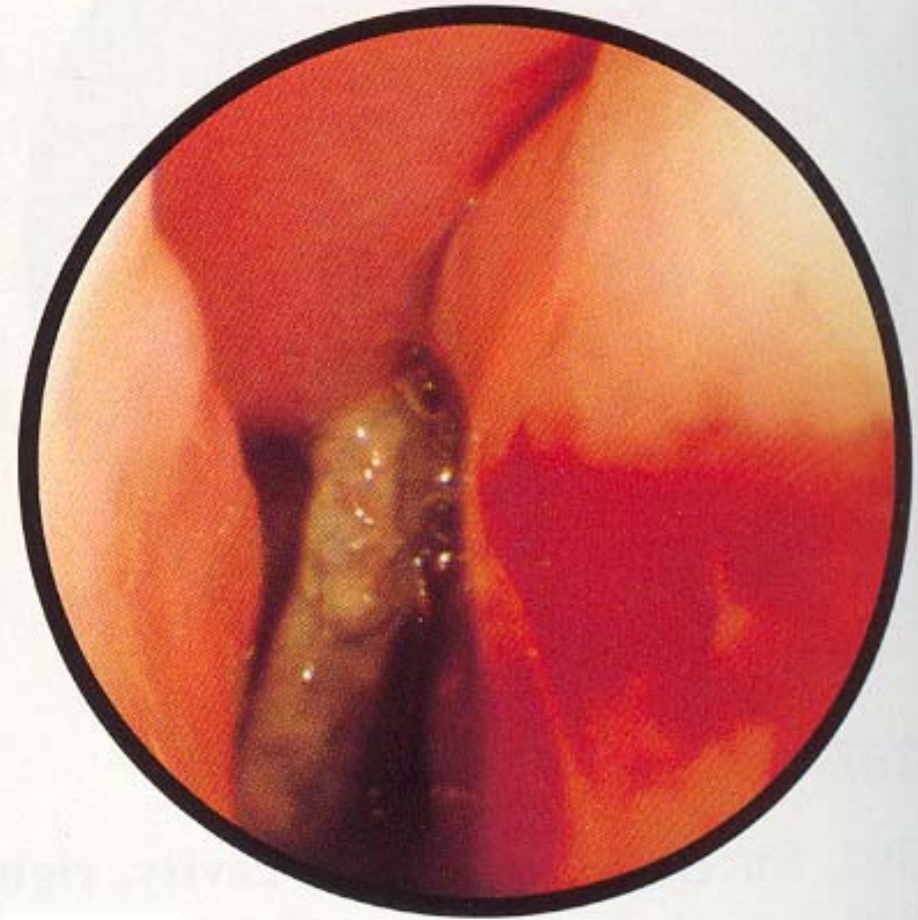
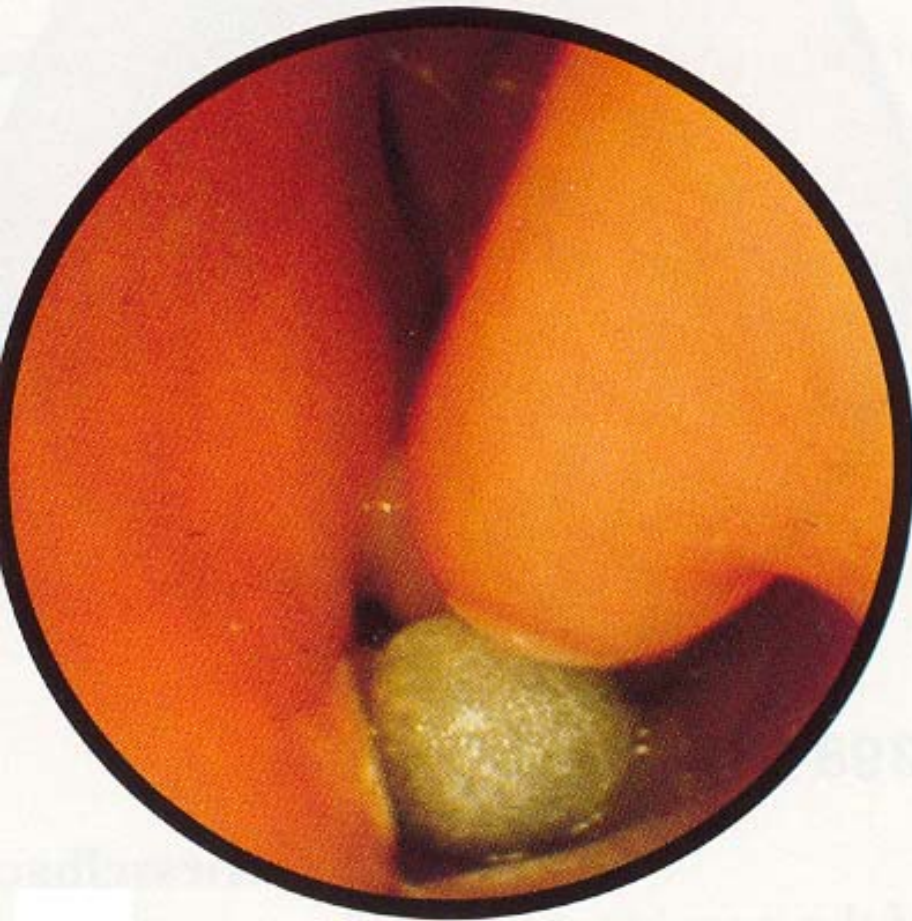
Morphologic causes of nasal obstruction

crista septi nasi

**papilloma
invertens**



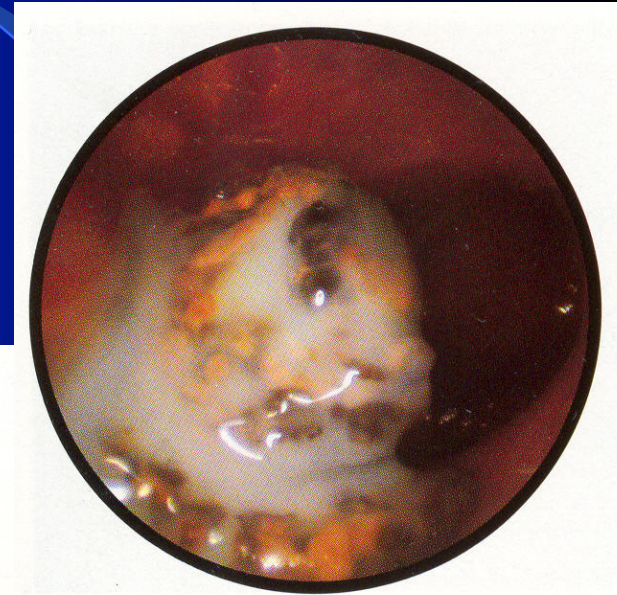
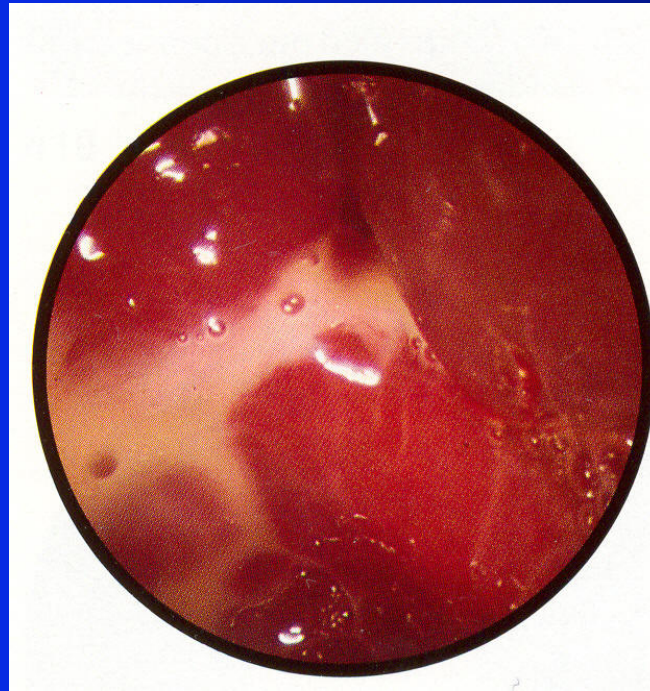
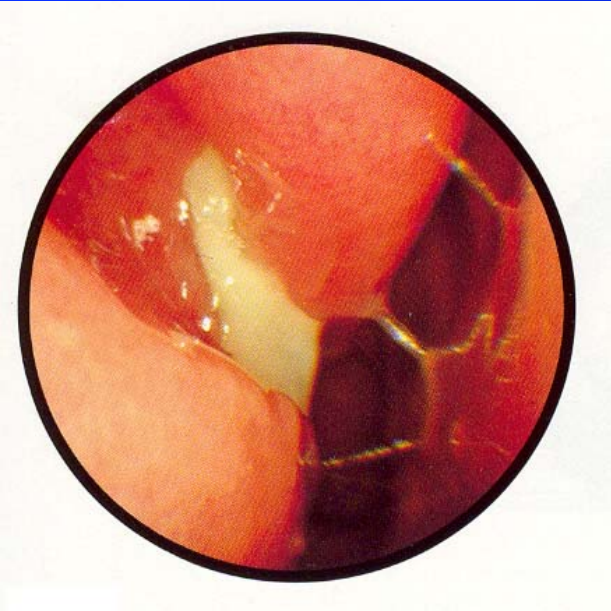
Intranasal foreign boddies



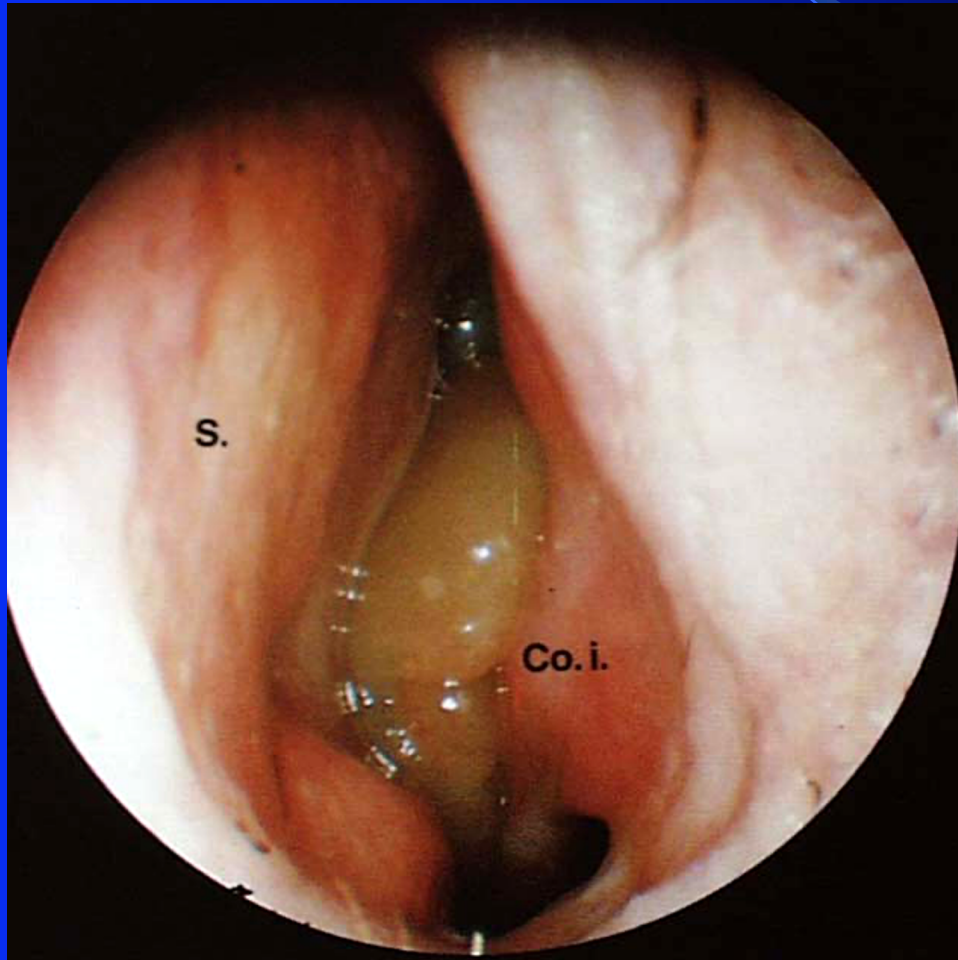
Inflammations

Acute rhinosinusitis

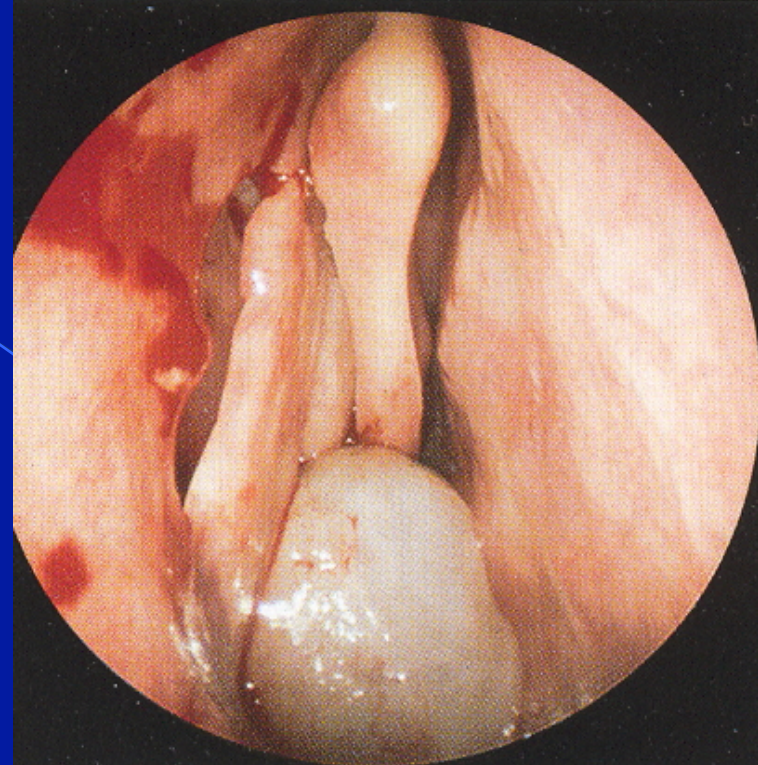
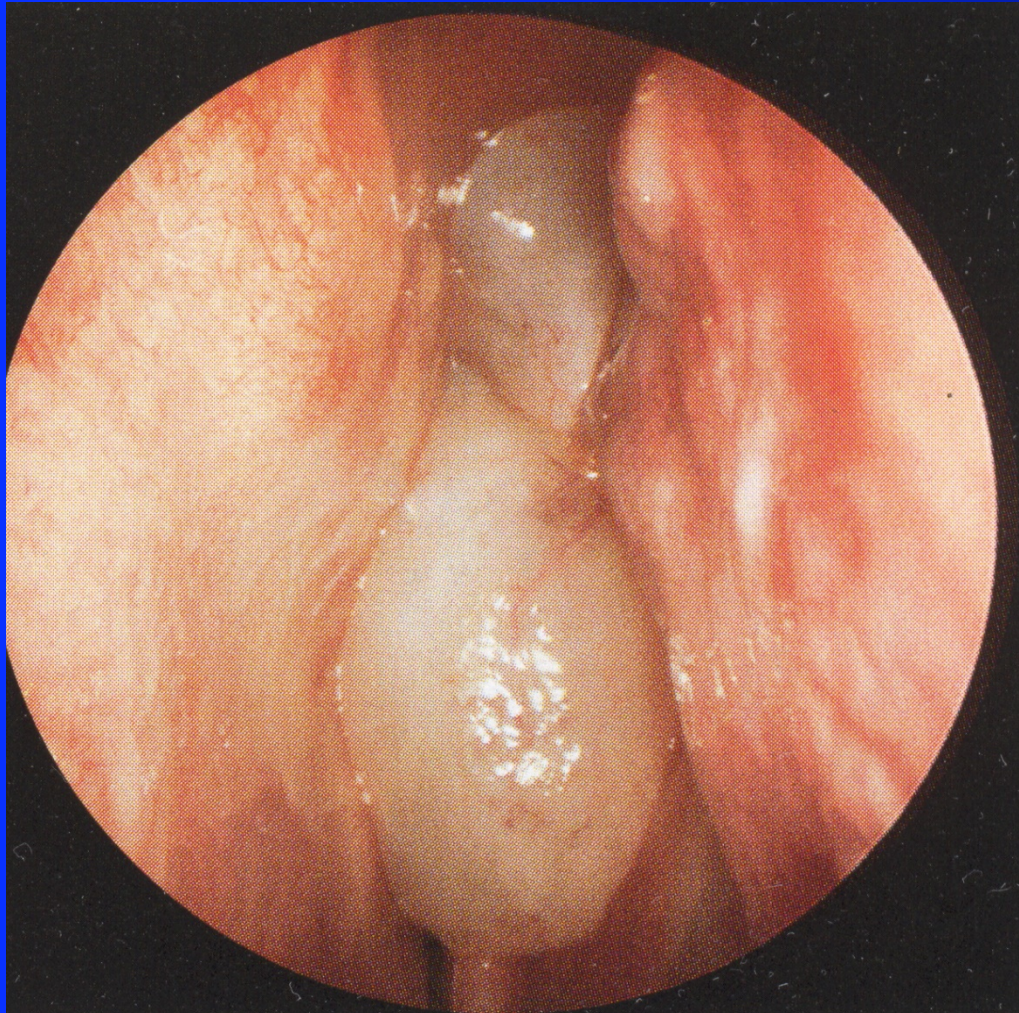
Mycotic sinusitis



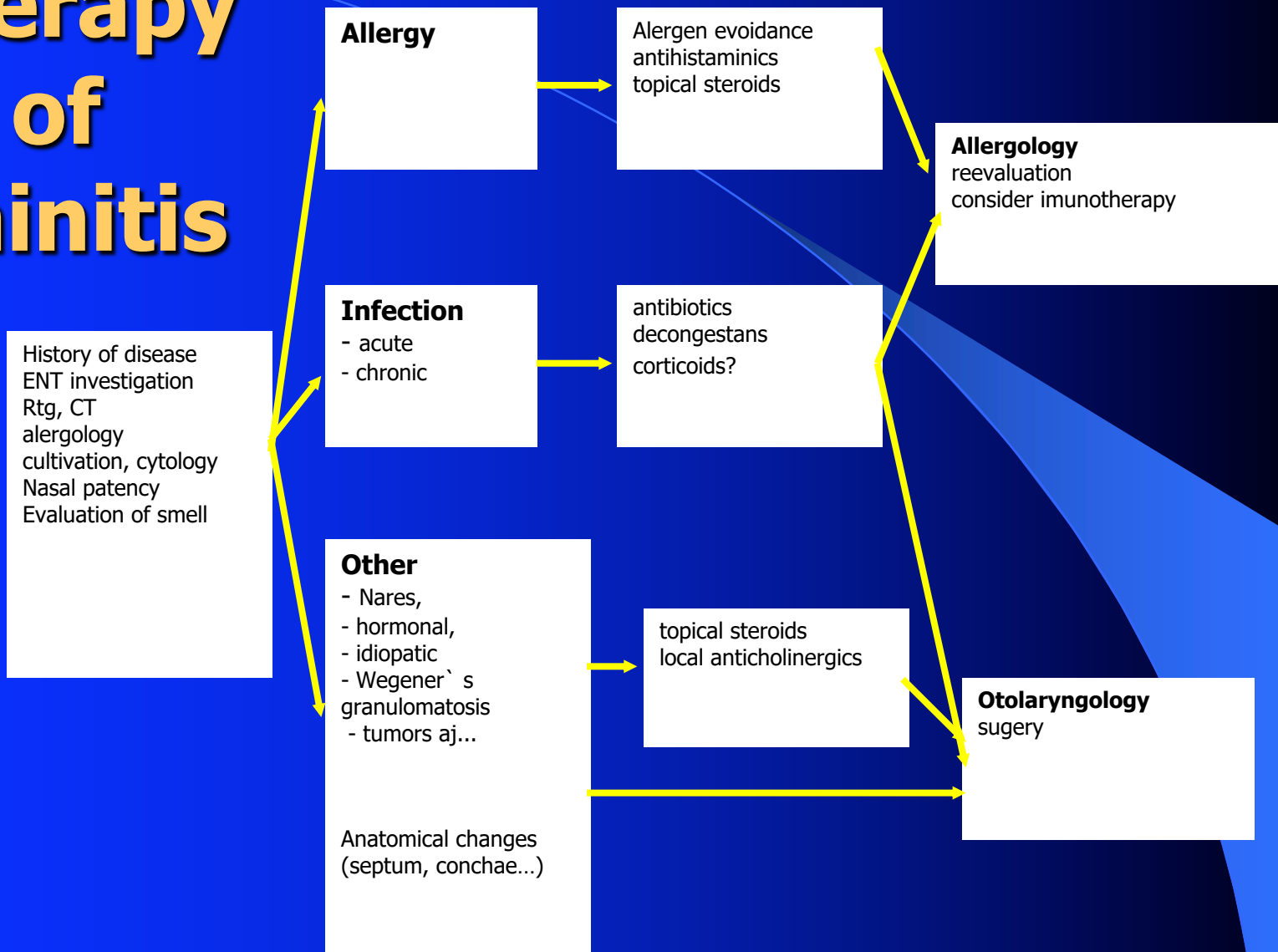
Nosal polyps



Antrochoanal polyp



Therapy of rhinitis



Surgical therapy of chronic rhinosinusitis

- **Medicamentous, conservative – topical steroids**
- **Surgery**
 - „classical“ rhino-surgery
 - **Functional endonasal sinus surgery (FESS)**

„Classical“ rhino-surgery

- Approach through healthy tissue
- All mucose is removed
- Mostly non-physiologic communication into the nose

Maxillar sinus – sec. **Caldwell-Luc**

Ethmoidal labyrinth – sec. **Moure**

Frontal sinus – sec. **Jansen-Ritter**

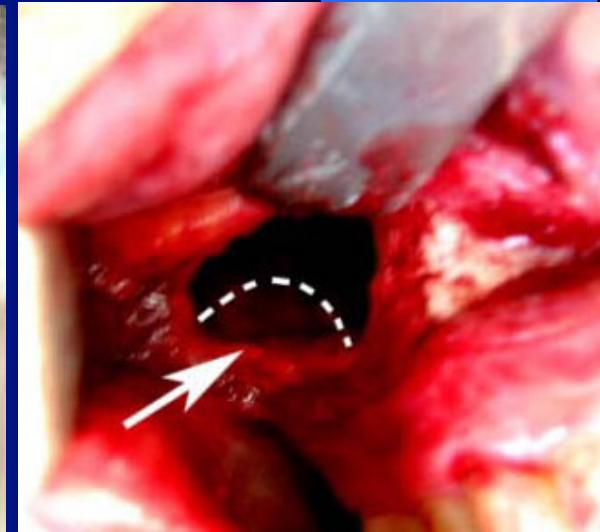
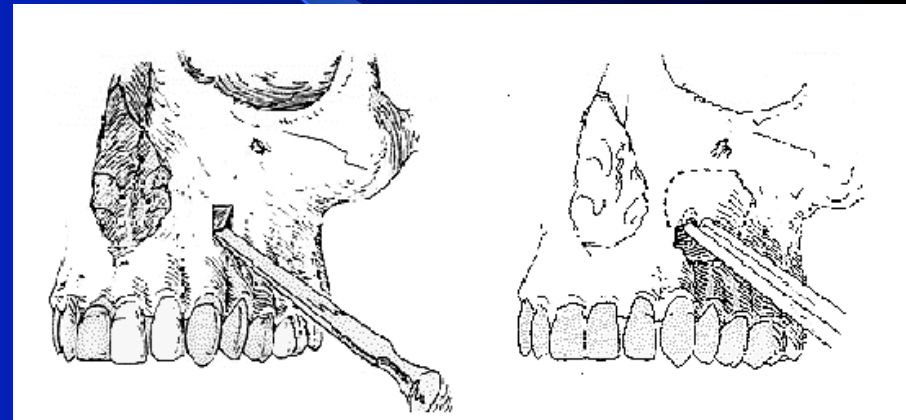
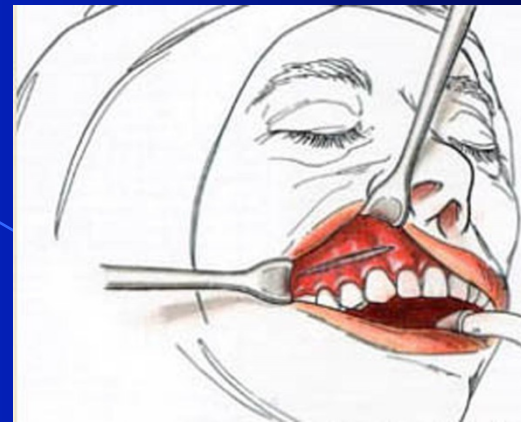
Caldwell-Luc

George Walter Caldwell
1866-1946

Henri Luc 1855-1925

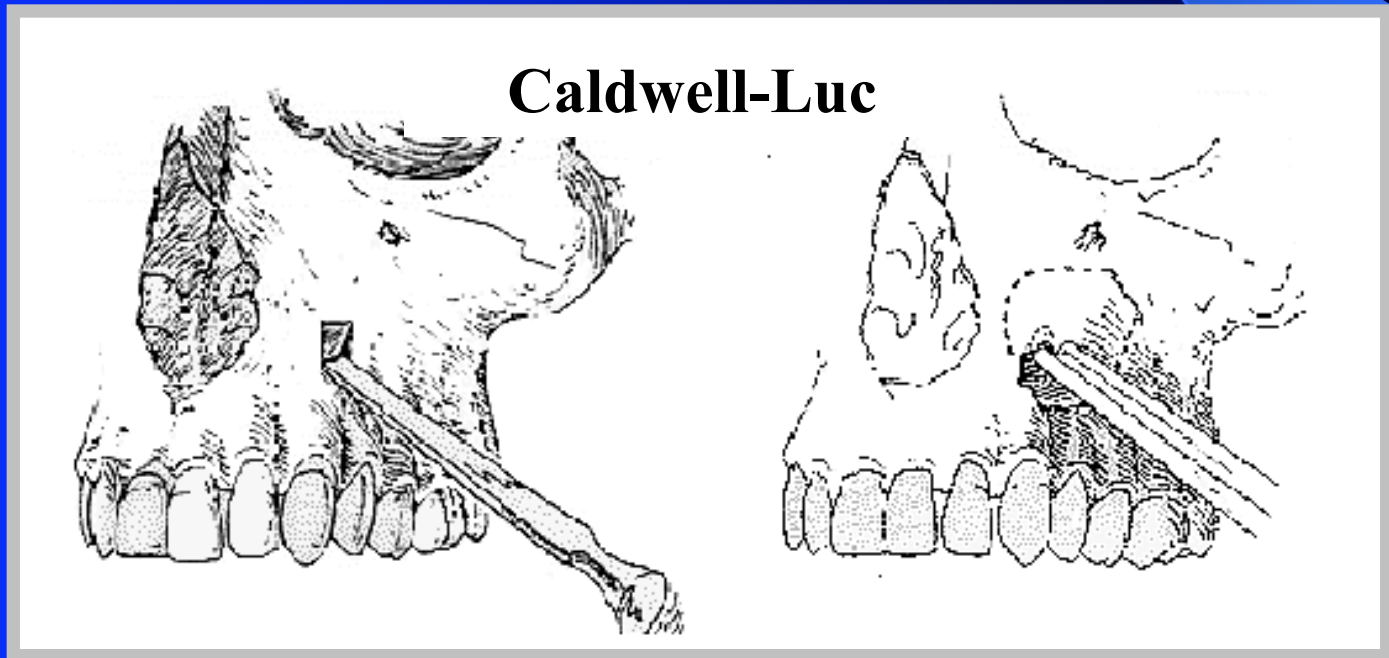
1889

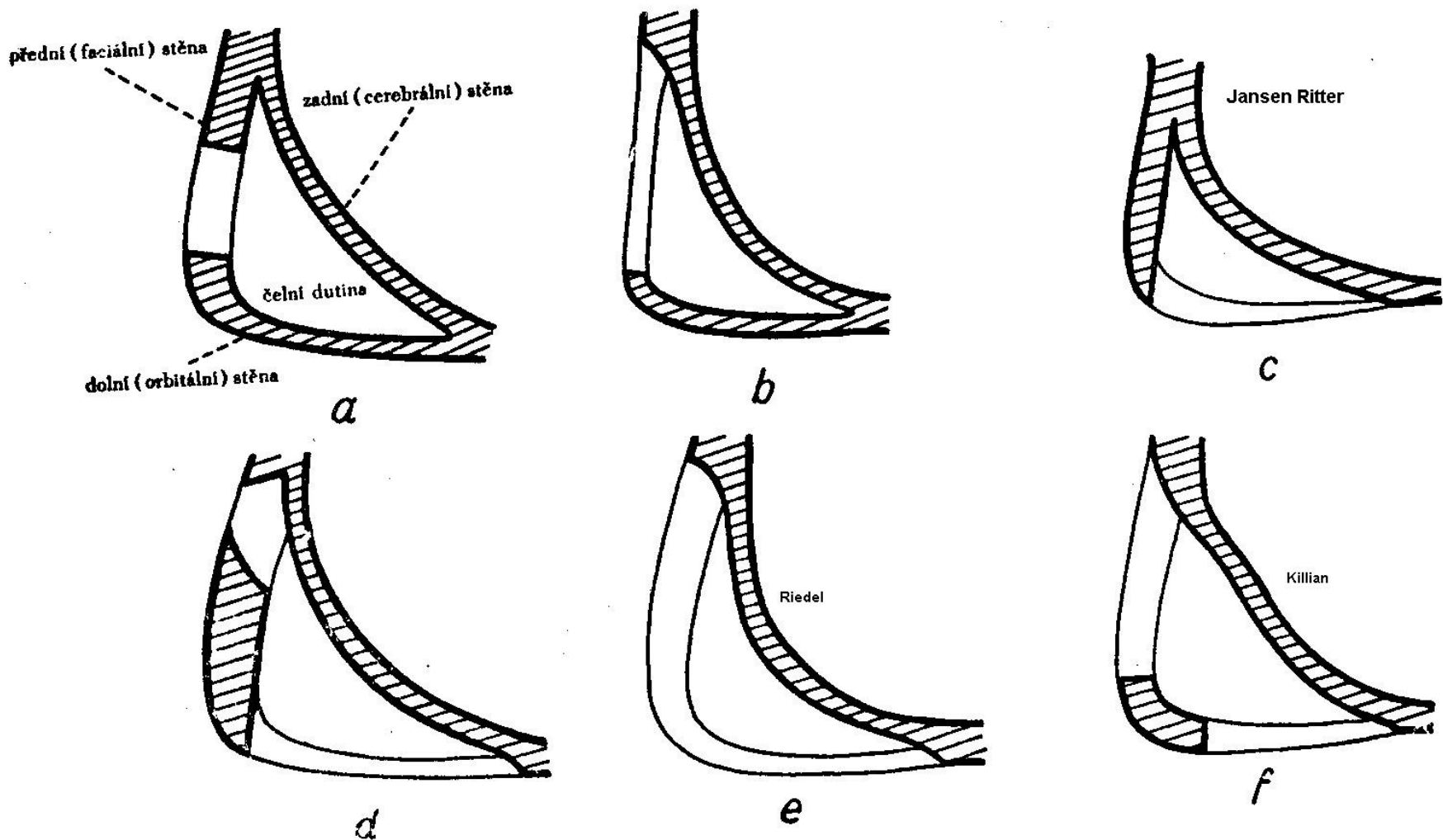
1893



Classic rhinosurgery

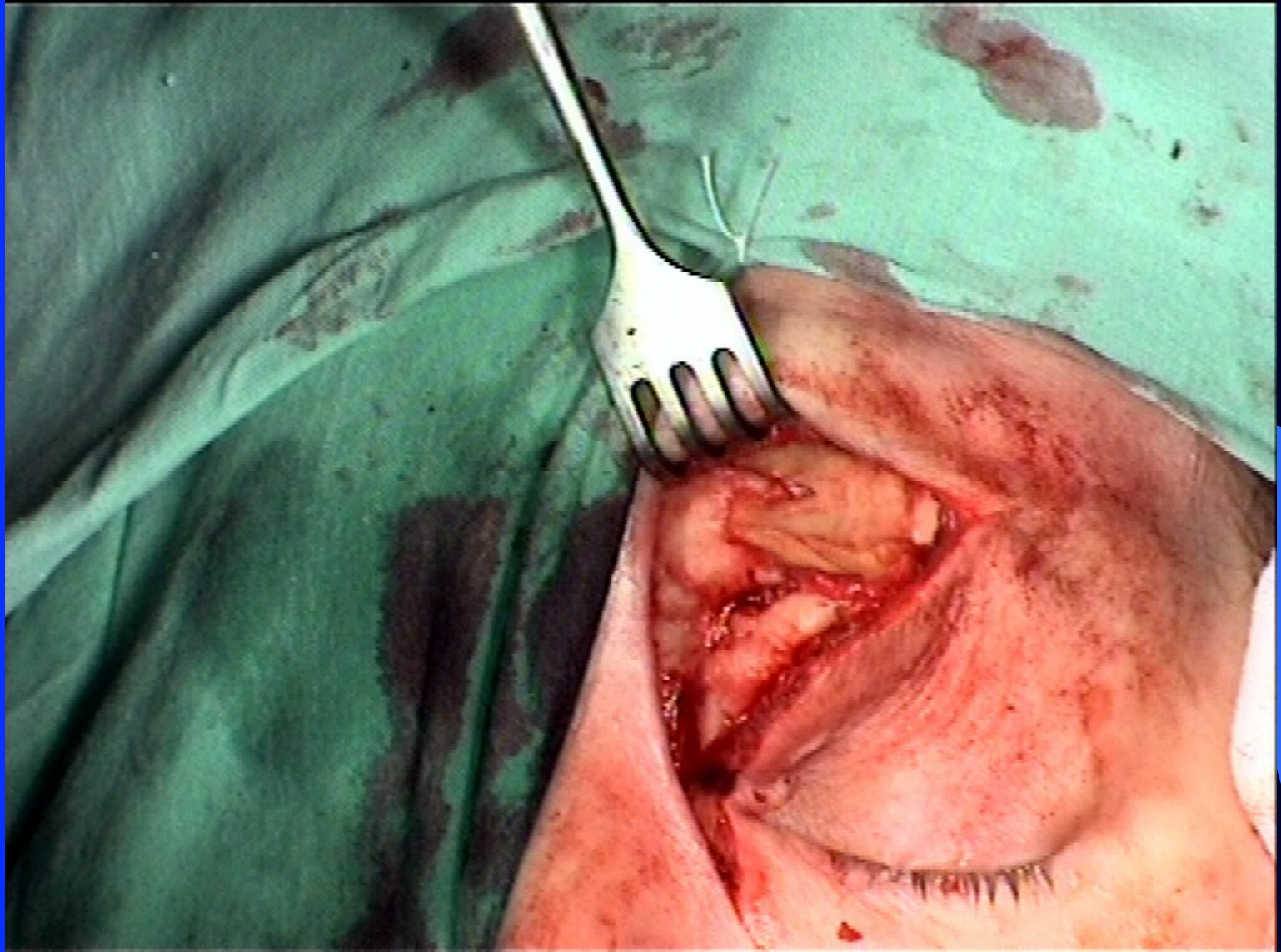
- Too high radicality
- many iatrogenic complications (swelling, pain, innervation disorder)



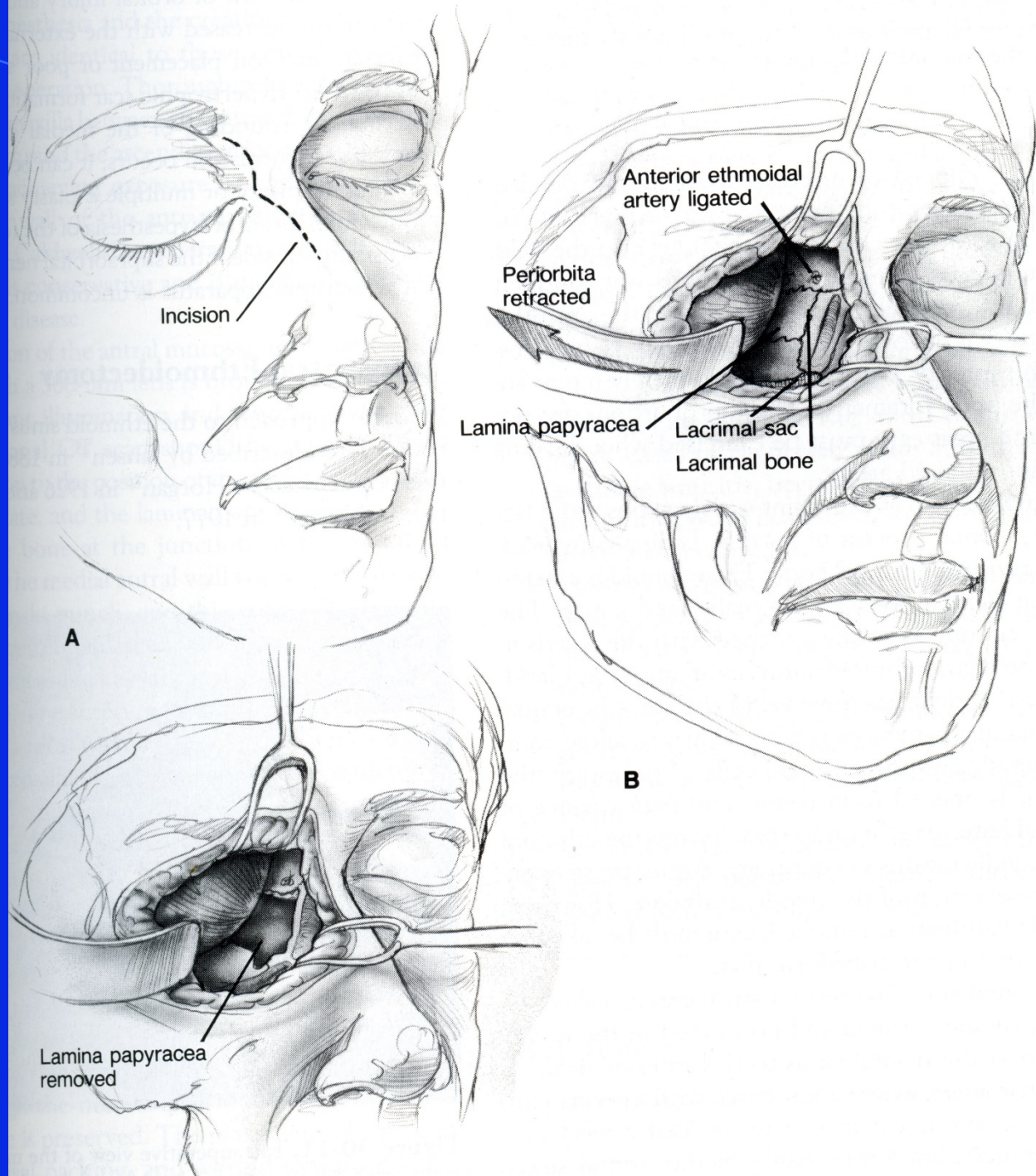


Různé typy operací čelních dutin (podle Denkera-Kahlera) II. str. 787

a) Ogston-Luc - b) Kuhnt - c) Jansen-Ritter při nízké čelní dutině
 d) Jansen-Ritter při vysoké čelní dutině - e) Riedel - f) Killian



external ethmoidectomy



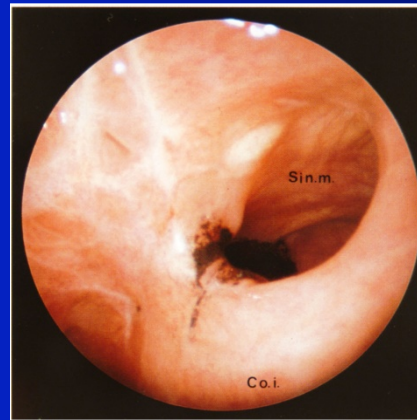
„classical“ rhino-surgery - indication

- **Repeated FESS lege artis failed**
- **some atypical forms of sinusitis - mycotic sinusitis (aspergilom)**
- **Inflammatory complications of sinusitis**
- **Tumors of paranas. sinuses**
- **Some injuries**
- **Immunocompromised persons, congenital diseases**

Functional endonasal sinus surgery (FESS)

Basic considerations

- Pathologically changed mucosa is able to restitution and should be preserved as more as possible
- For restitution it is necessary to create ventilation and drainage
- Epicentrum of rhinogenic sinusitis is in ethmoidal labyrinth



Pathogenesis of chronic rhinosinusitis – „circulus vitiosus“



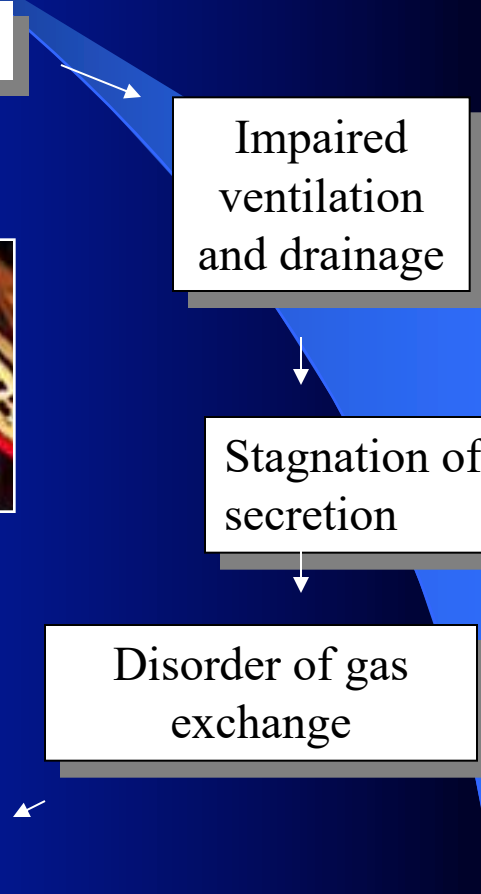
Blocked ostium

Impaired ventilation and drainage

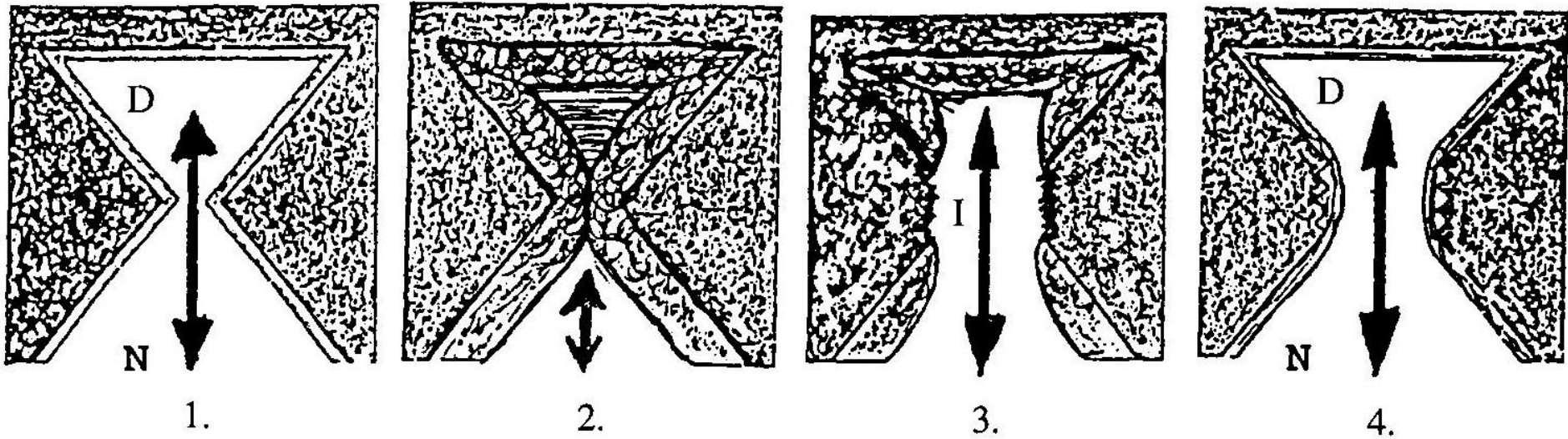
Stagnation of secretion

Disorder of gas exchange

Disorder of mukociliar transportation



Isthmus surgery



D paranas. sinus connected with nasal cavity **N**.

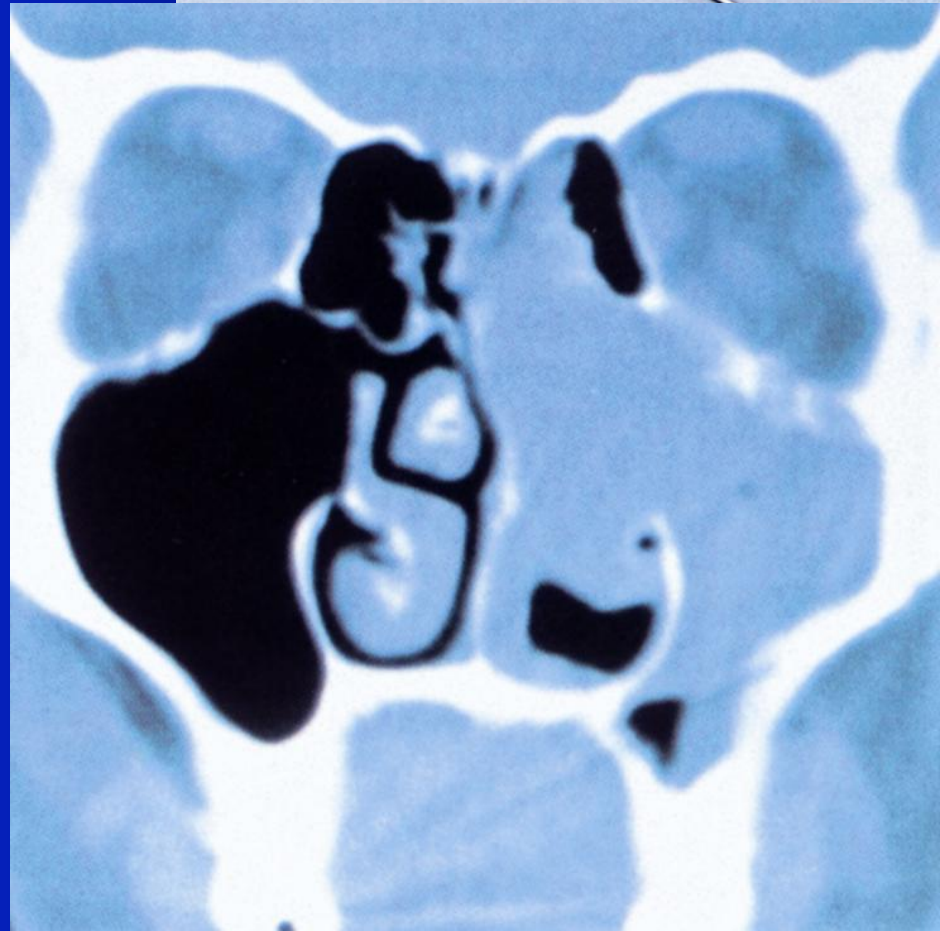
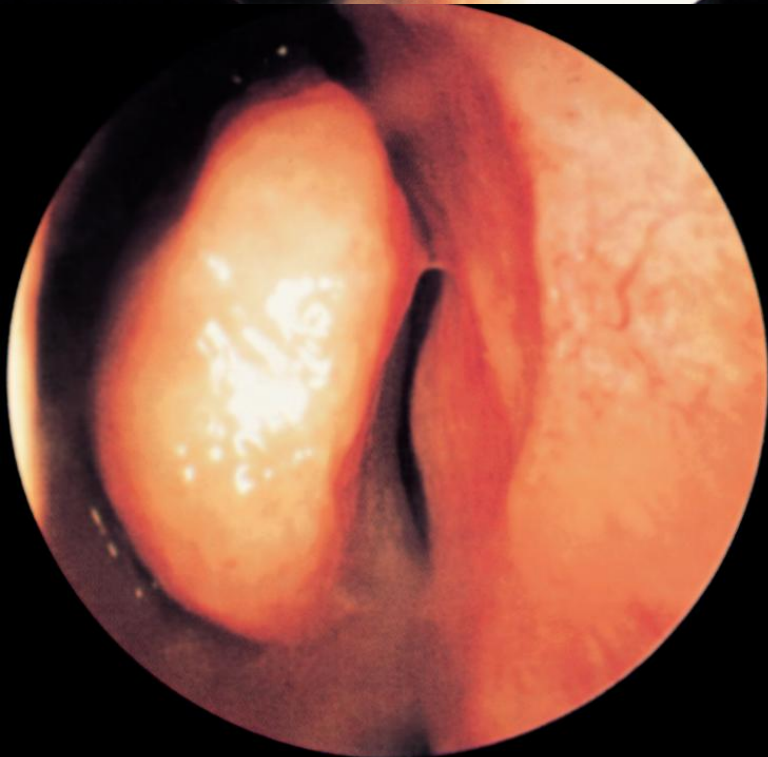
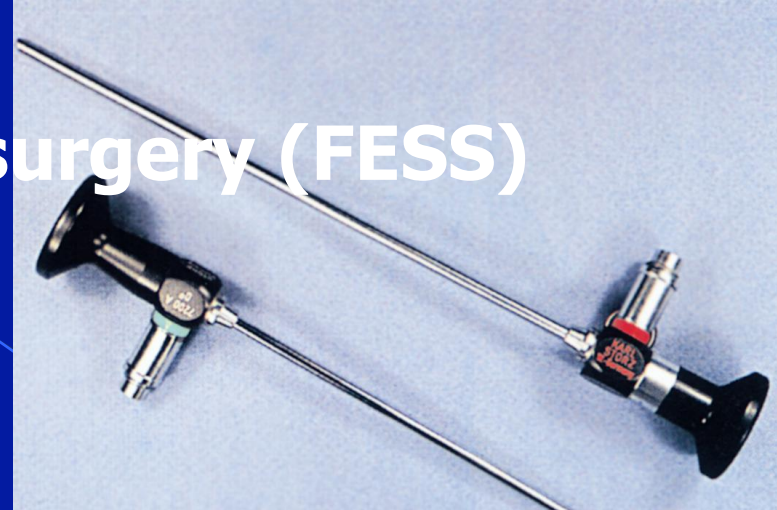
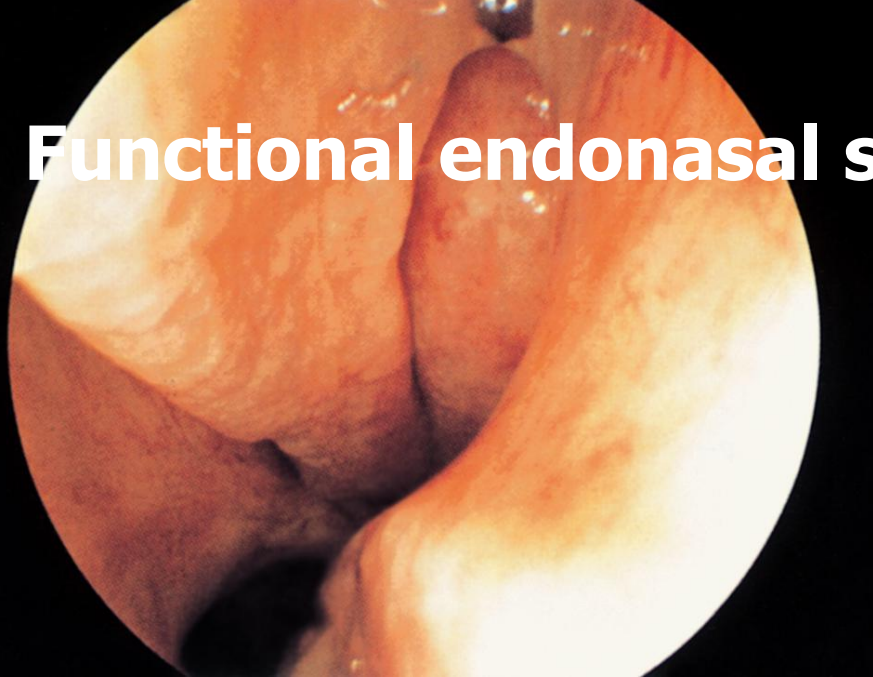
1. – normal situation

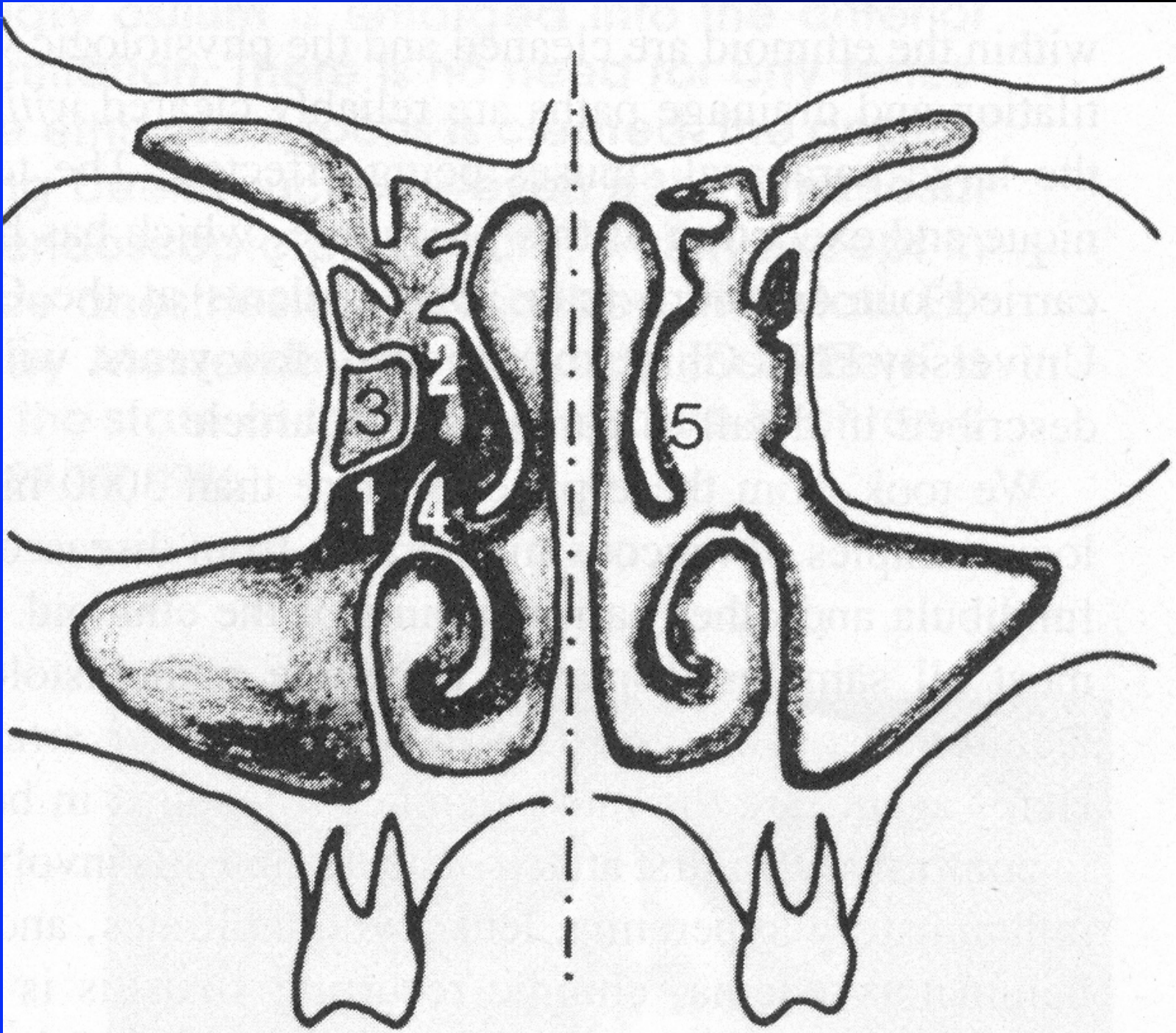
2. – closed ostium

3. – weidened ostium

4. – heald ostium with renewed communication **D-N**.

Functional endonasal sinus surgery (FESS)





Indications, limits of FESS

- Only some surgeries are **treating the cause** – some chronic infectious inflamm., cysts and various structural changes disabling nasal ventilation (deviation of nasal septum, hyperpneumatized middle nasal concha et al.)
- Nasalization and enabling conservative treatment - **symptomatic** surgery as a part of **complex treatment**

Indication of FESS

- History of disease
- Imaginating methods
(CT)
- Rhinoadoskopy

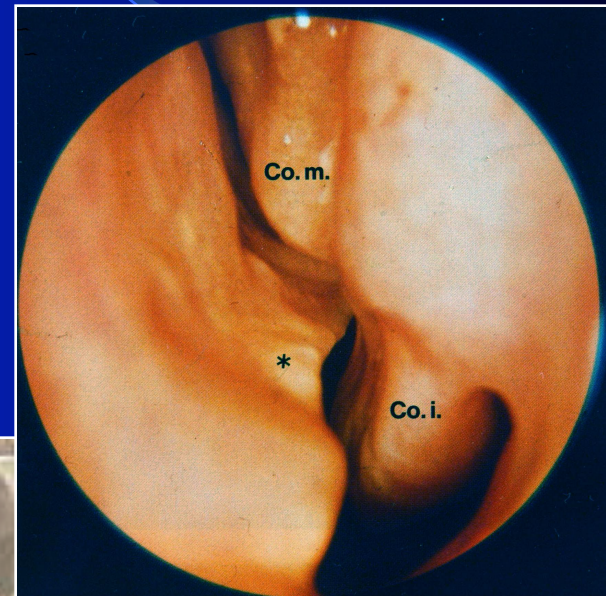


Surgery

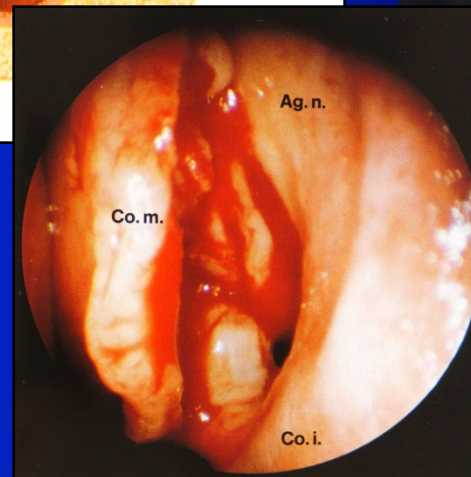
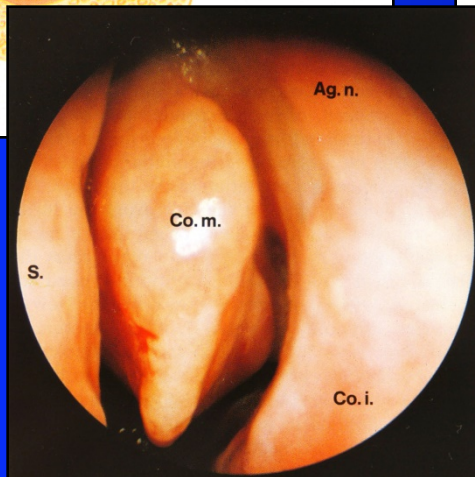
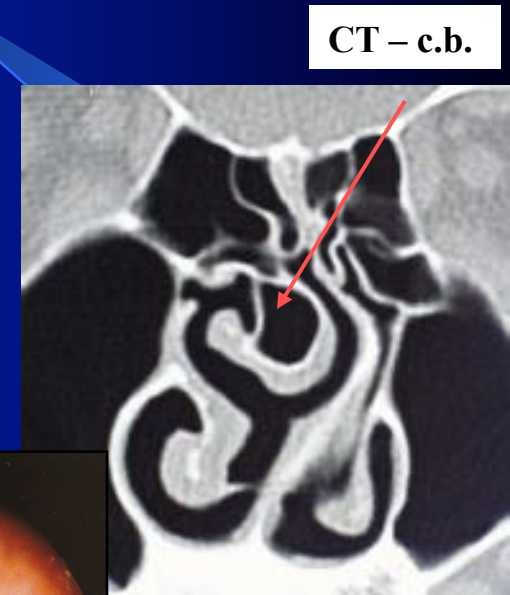
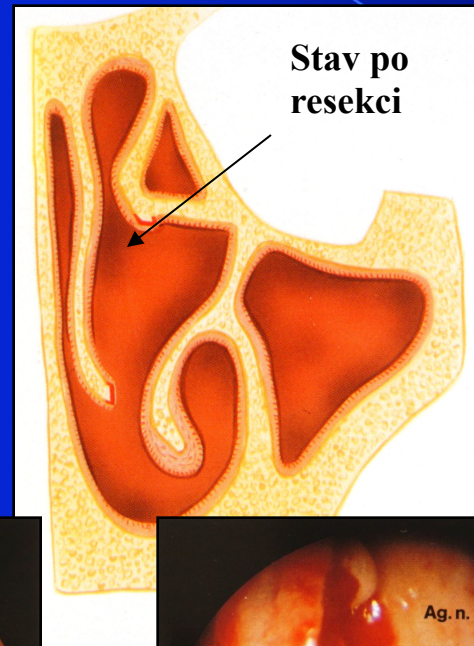
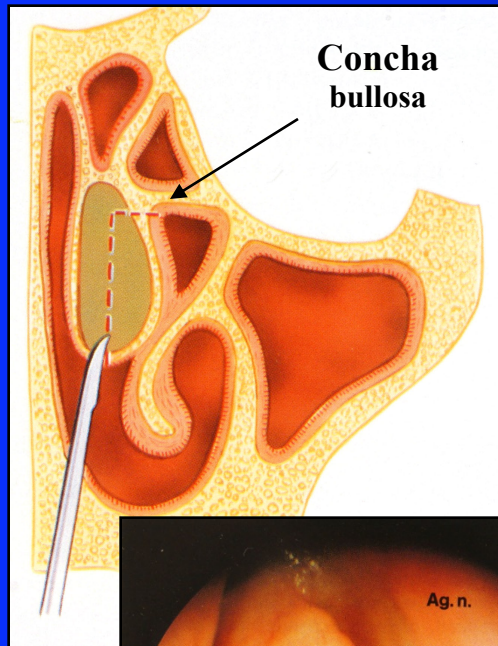
- **Structural changes** in nasal cavity (deviace přepážky nosní, concha bullosa)
- **One sinus** (supraturbinal antrostomy, sphenoidotomy, frontal sinotomy, ethmoidektomy)
- **Pansinus surgery** („Wigand complet“)

Surgery of nasal septum

- endoscopic resection (cristae, spurs)

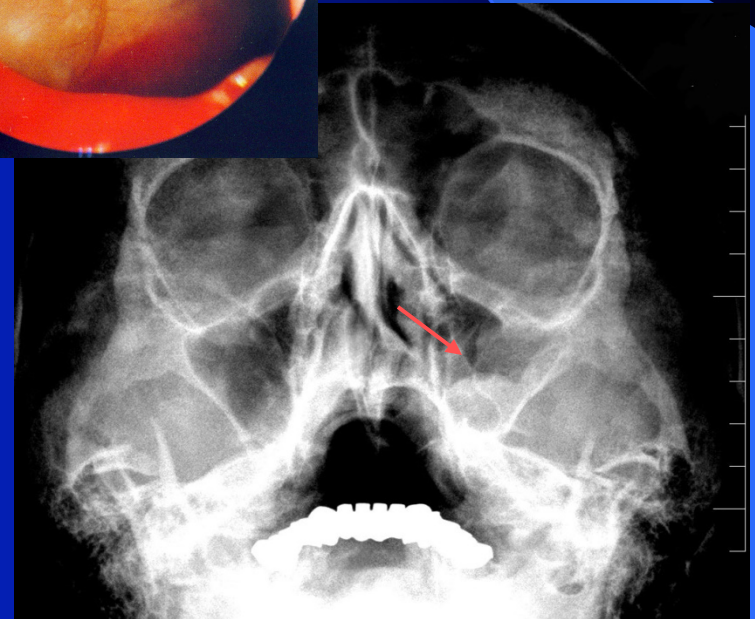
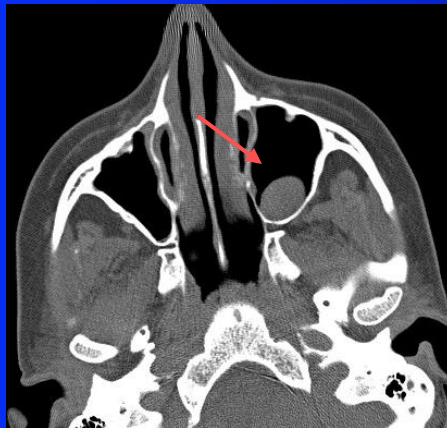
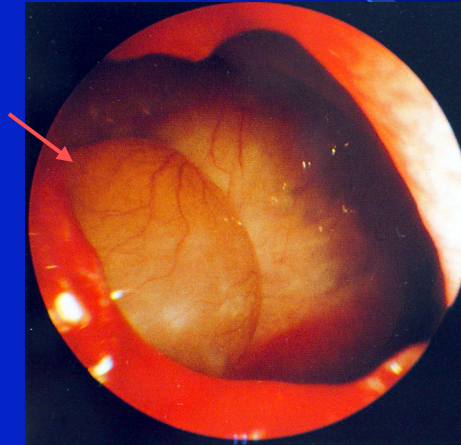
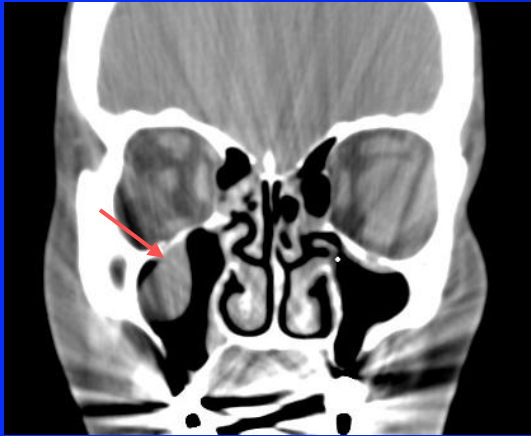


Resectio concha bullosa



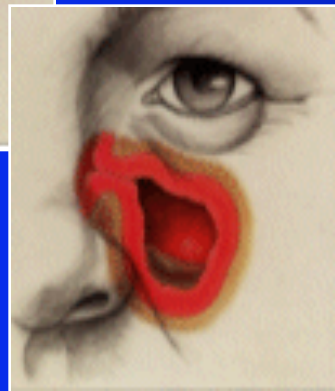
Maxillary sinoscopy

Mucosal cyst in antrum



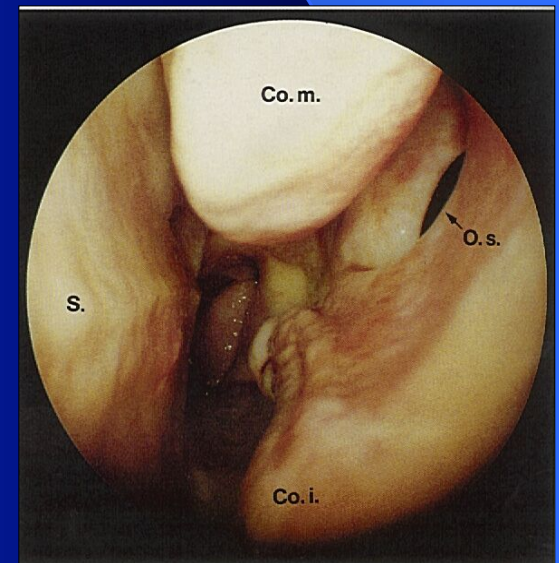
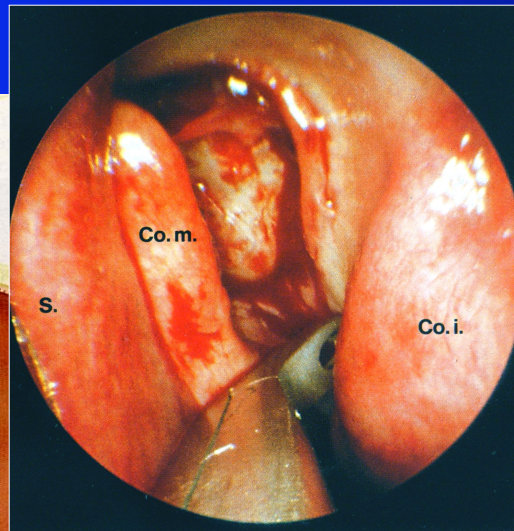
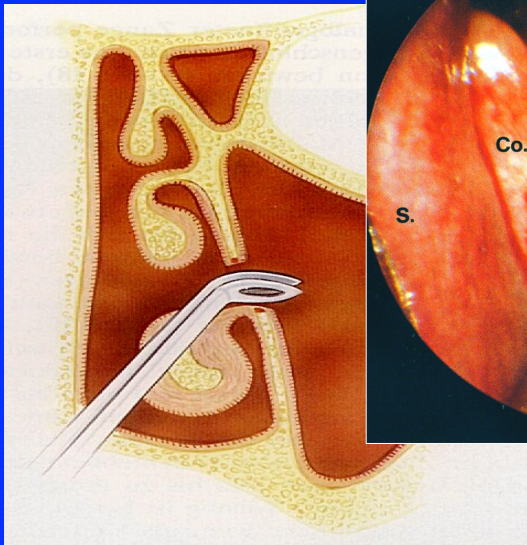
Supraturbinal antrostomy

Indication - chronic inflamm.chaneges of maxillary sinus caused by blocked OMU



Supraturbinal antrostomy

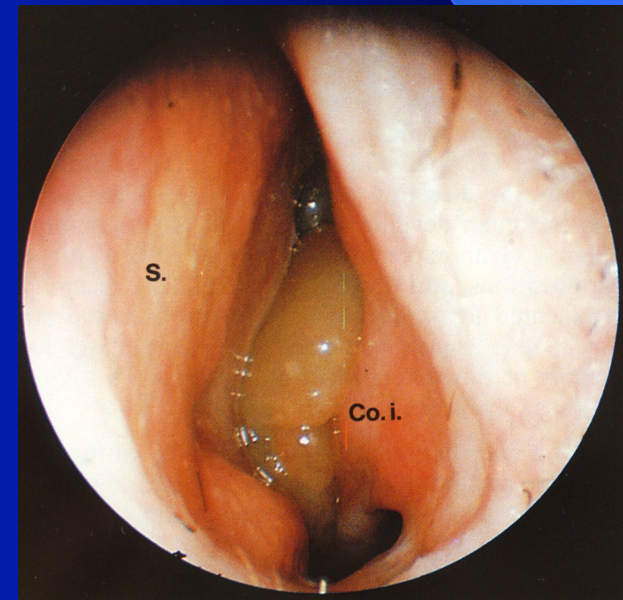
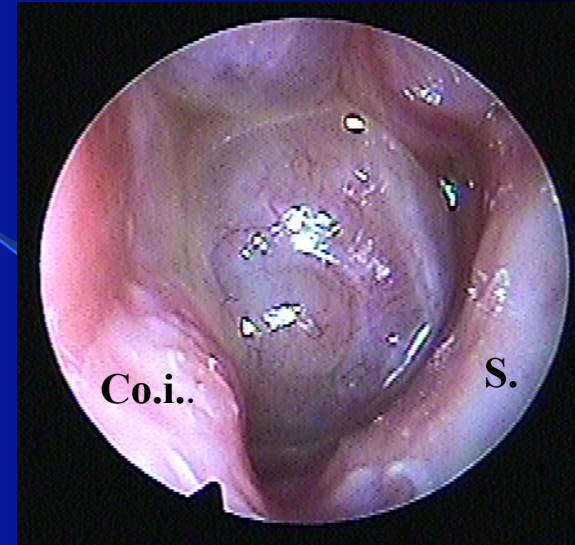
- renewal of communication between nose and maxillary sinus
- usually part of extent surgery



Pansinus surgery

Indication : chronic inflammations with polyposis

Aim : nasalisation of big paranas. sinuses



Pansinus surgery - CT



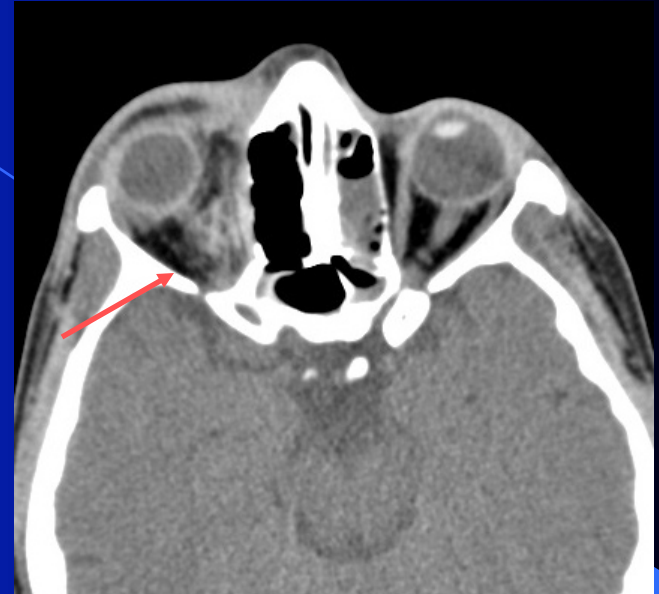
Complications

- **„Small“**

- bleeding
- hematoma, emphysema of eye lids
- headache

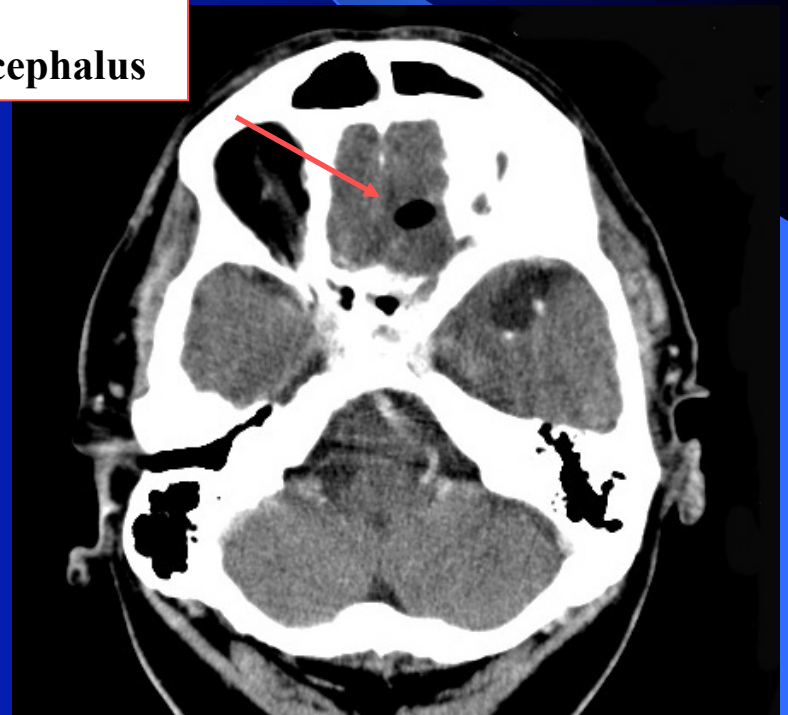
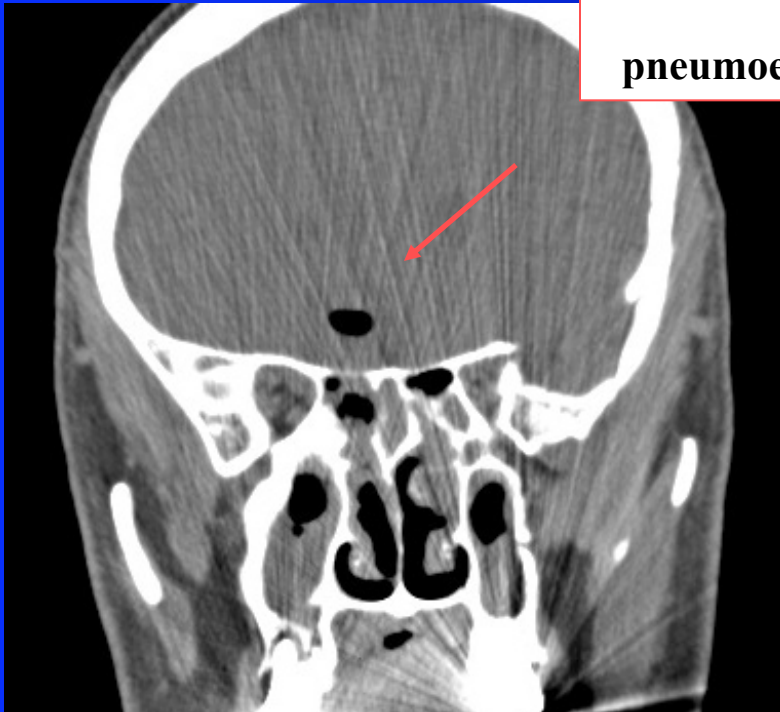
- **„Big“**

- retrobulb. hematoma - 2
- meningitis - 1
- liquorea - 4
- Bleeding from ACI
- death



Complications II

Likvorea
+
pneumoencephalus



CAS – computer assisted surgery Navigation system (Medtronic, Scopis – magnetic navigation)

