14:00-14:05
Symposium 1

THE TURBINATE DEBATE

William H. Friedman
Park Central Institute, St. Louis, MO, USA

No other debate in recent otolaryngic history has encompassed more controversy, with more widely ranging opinions from indisputable experts on both sides of the controversy then the still current issue of whether or not middle turbinates should be sacrificed in the performance of ethmoidectomy. The controversy is not new and has raged since the days of Mosher, Yankauer, Goldman, and traditional endonasal surgeons who have routinely performed middle turbinectomies, sometimes to the dismay of their more conservative colleagues.

Inferior turbinate resection, on the other hand, has been implicated in the development of the atrophic rhinitis with much more compelling logic than the middle turbinate resection. Despite this, a large number of responsible otolaryngologists throughout the world continue to perform inferior turbinate resections or reductions on a wide spread scale. I think most otolaryngologists would agree that no more than two of the major turbinates can be resected without the risk of excessive drying, crusting, and postoperative sequelae. The basis for this debate is, a.) whether the middle turbinates should be resected for any reason, and if so which reasons? and b.) whether or not the inferior turbinates can be sacrificed either with or without middle turbinate resection.

From the moderator's viewpoint, middle turbinate resection has been wrongly implicated as a source of postoperative ethmoidectomy diaster. Inferior turbinate resection, however, has probably been part of the ethmoidectomy operation. In any case, the debate rages.

14:05-14:20
Symposium 1

PATHOPHYSIOLOGY OF RHINOSINUSITIS

Yang-Gi Min
Department of Otorhinolaryngology-Head & Neck Surgery, Seoul National University College of Medicine, Seoul, Korea

Purpose: We investigate the roles of cytokines and staphylococcal toxins in sinusitis. Methods: We assessed the effects of IL-1b, TNF-a and TGF-b on CBF of the human nasal epithelial cells (HNESs) in vitro. CBF of sinus mucosa was measured in several concentrations of staphylococcal toxins we observed histologic changes by toxin with light and electron microscope. To evaluate the role of RANTES in eosinophil infiltration in vivo, the tissue distribution of RANTES and interleukin-5 (IL-5) and their correlation with eosinophil infiltration were investigated. Results: IL-6, IL-8, TGF-b, IL-4, IL-5 and IFN-gmRNAs were expressed more frequently in maxillary sinus mucosa from patients with chronic sinusitis that in normal turbinate mucosa. CBF of the HNESs increased after addition of rhIL-1b and rh TNF. In a and b-toxins, CBF decreased gradually and stopped eventually with increasing incubation time. Electron microscopic findings showed mitochondrial swelling and a slight protrusion of the inflammatory cells into the epithelium and lamina propria were observed in the b-toxin induced experimental sinusitis model. Expression of both RANTES and IL-5 significantly increased in allergic mucosa and nasal polyps compared to normal mucosa. Conclusions: Several cytokines may be responsible for recruitment of inflammatory cells and for mucosal thickening in chronic sinusitis. During acute inflammation, some cytokines may have potential roles in defense mechanism by regulating CBF of HNECs. In allergy and nasal polyps, both RANTES and IL-5 play a role in eosinophil recruitment in vivo.

WEDNESDAY

14:01-14:10
Cottle Award

TELE-3D-CA-FESS

Ivica Klapan
ENT Department, University School of Medicine, Zagreb, Croatia

Introduction: The basic purpose od Croatian Tele-Three Dimensional Computer Assisted-Functional Endoscopic Sinus Surgery (Tele-3D-CA-FESS) was to define methods for tele-surgical transmission in basic FESS and to realize safer tele-surgical procedure using the newest computer, medical and network technologies in tee-consultation and tele-navigation through the human anatomy.

Methodology: According to our original idea, computer network, essential for computer collaboration between tele-surgical sites has to be built in a parallel to video network. Our first public Tele-3D CA-FESS (November 1998) was realized between two locations in the city of Zagreb, 10km apart, with interactive collaboration from third location, and the second public TELE-3D-CAD-FESS (April 1999) was realized between two cities, Osijek and Zagreb.

Results: IN our Tele-3D-CAD-FESS we had communication between all sites using InPerson teleconferencing software and native TCP/IP network. Through this network two encoded live video signals from endo-micro camera and operating-room camera were transferred to other remote locations involved in tele-surgical transmission.

Conclusion: Definitely, the new video encoders using MPEG2 standards and ATM computer networks using inverse , multiplexing, greatly improve the safety of surgical procedures, especially in endoscopic surgery. We believe that this type of surgery would be acceptable to many surgeons all over the world.

14:10-14:20
Cottle Award

A LOW-FREQUENCY ULTRASONIC METHOD OF PREVENTION OF UPPER RESPIRATORY INFECTIONS

K. I. Nesterova
Omsk State Medical Academy, Omsk Regional Clinical Hospital, Omsk, Russia

Purpose: Investigation of possibility of use of low-frequency ultrasonic (LFUS) method of interferon prevention of upper respiratory tract infections (URTI) on the peaks of these diseases. Common method of introduction of interferon in nasal cavity in drops is uncomfortable, and inhalation of this preparation excludes accuracy of dose.

Methods: We followed 135 patients (70 males, 65 females, age 9-29 y). In “A” group we’ve conducted intranasal LFUS introduction of interferon by 1,000 IU once per 2 days. “B” group (50 patients) received introducing in drops, by same dose every day in 4 portions. “C” group (29 persons) control had not received interferon. Method of LFUS prevention of URTI is concluded in 5x intranasal introducing of human leukocyte interferon in dose mentioned by means of original device: LFUS-sprayer. It allows dose preparation accurately and sends it in respiratory tract as ionized solution of needed dispersion. Observation period for each patient was 2 mo.

Results: Illness ratio according to groups: 10.7%, 24%, and 41.3%.

Conclusions: Use of LFUS method of interferon prevention allowed reduction of illness ratio in epidemic period by 3.2 times. Use of LFUS method of introducing interferon increases the efficiency of prevention in epidemic period on viral respiratory infections nearly 2 times.

14:40-14:50
Cottle Award

HPV ANALYSIS OF SCHNEIDERIAN PAPILLOMAS COMPARED TO CHRONIC SINUSITIS AND NORMAL NASAL MUCOSA

A. Yoskovitch, S. Frenkiel, E. Franco, F. Coutlée, L. Rochon, D. Nachtigal
McGill University, Montreal, Québec, Canada

Purpose: To characterize the relationship among human papillomavirus (HPV), schneiderian papillomas (SP), chronic sinusitis (CS), and normal nasal mucosa.

Methods: A case-control study was undertaken, matching patients with SP to patients with CS. Patients with normal nasal mucosa served as a control group. All patients had their tissues analyzed for the presence of various HPV subtypes by line blot assay.

Results: A total of 168 patients were identified (74 SP, 74 CS, 20 control). Of these, 70 (41.7%) had detectable DNA, and 9 of 70 (12.9%) had detectable HPV of subtypes 6, 11, and 16. None had detectable HPV type 18. Significant differences were detected in the presence of HPV in CS, SP, and control groups as well as in the presence of low-risk versus high-risk subtypes among investigation and control groups.

Conclusions: Significant differences exist in HPV infectivity between SP, benign nasal pathologies such as CS, and normal nasal mucosa. HPV plays an important role, at least in part, in the development of SP, with types 6, 11, and 16 more pivotal than other types. Line blot assay is a useful technique in identifying HPV in SP.

15:10-15:20
Cottle Award

METHOD OF LOW-FREQUENCY ULTRASONIC THERAPY OF ACUTE PURULENT RHINOSINUSITIS

Klimentina Nesterova and Ivan Nesterov
Omsk State Medical Academy, Omsk Regional Clinical Hospital, Omsk, Russia

Purpose: The main purpose of our investigation was to study the effectiveness of a new method of treating patients with acute purulent rhinosinusitis by low-frequency ultrasound (LFUS).

Methods: One hundred sixty patients with acute purulent rhinosinusitis aged 16 to 45 y (98 men and 62 women) were divided into 2 groups: main “A” (120 patients) treated by “sinus-LFUS” method and control “B” (40 patients) treated by common methods (anti-inflammatory, hyposensitization, local therapy, punctures of paranasal sinuses). Clinical investigation was done on data of common examination, rhinomicroscopy, investigation of nasal separations, smelling function, saccharin time, and bacteriologic and cytomorphologic investigation. “Sinus-LFUS” for treating paranasal sinuses includes 2 stages. 1st—sanitational: washing of paranasal sinuses via designed LFUS device. LFUS-cavitation ensures mechanical cleaning and bactericide effect, and characteristics of variable acoustic pressures promote opening the mouths of paranasal sinuses. 2nd—medicinal stage: LFUS-instrument applies medicine on the mucus as an ionized monodispersal solution. At this time phonophoretic and ionizing characteristics of LFUS make optimal conditions for transcapillary suction of preparations by nasal mucus.

Results: In the “A” group, clinical and cytologic recovery with normalization of smelling, thermoregulating functions of nasal mucus, and mucociliary clearance were noted in an average of 2.9 days earlier than in the “B” group.

Conclusion: Growth of the sanative effect reached its peak on the 3rd day.

14:10-14:20
Case of the Millenium

INVASIVE FUNGAL RHINOSINUSITIS IN A PATIENT WITH ACUTE MYELOBLASTIC LEUKEMIA

A. Galewicz, A. Jˆedrusik, A. Krzeski, J. Rokicka-Milewska, J. Michalik, A. Depta
University of Medicine of Warsaw, Warsaw, Poland

A 28-y-old woman was treated for acute myeloblastic leukemia (M2 according to FAB) since february 1999. She underwent an autologous bone marrow transplantation in October 1999. Five months later, she developed a recurrence. A unilateral edema of the left eyelids was noted in April 2000. A thorought otorhinolaryngologic (ENT) examination, including a rigid endoscopic nasal examination, was then performed by an ENT consultant, who noted a unilateral periorbital cellulitis. The computed tomographic (CT) scan demonstrated unilateral changes in the anterior and posterior ethmoid on the left side. Endoscopic ethmoidectomy on the involved side was performed urgently. The inflammatory changes of the left eyelids did not regress in the early postoperative period and, simultaneously, the rigid endoscopic nasal examination showed that the healing process was not occurring, with a presence of gray, amorphic debris in the operated area. On the 7th postoperative day the patient presented signs suggesting an onset of cavernous sinus thrombosis with proptosis on the operated side, chemosis, limitation of ocular movement due to edema, and severe headache. Contralateral eye signs developed (periorbital edema on the right side). CT scans and magnetic resonance imaging (MRI) performed at that time did not confirm that suggestion. The diagnosis of invasive fungal rhinosinusitis was based on pathologic findings and associated with clinical and endoscopic nasal evaluation as well as CT and MRI scanning. Despite an aggressive medical treatment, including intravenous high-spectrum antibiotics and amphotericin B administration, a waste skin and soft tissues of the eye necrosis occurred, followed by necrosis of the left side of the face and the nasal septum. A second surgical procedure was not done because of poor white blood cell and platelet counts. Despite aggressive medical treatment, the patient died a month later.

14:30-14:40
Case of the Millenium

FIBROSARCOMA OF THE ANTERIOR SKULL BASE: ENDOSCOPICALLY RESECTABLE

Amin R. Javer and Frederick A. Kuhn
St. Paul's Hospital, Vancouver, British Columbia, Canada

Purpose: To report on a 49-y-old truck driver who was examined by his family physician for frontal headaches.

Methods and Results: Magnetic resonance imaging revealed a bony lesion of the right anterior skull base with associated polypoid thickening. The patient had a polypectomy with a biopsy of this bony lesion performed by his primary otolaryngologist. A preliminary histologic diagnosis was made of low-grade osteofibrosarcoma. The patient was referred to us for consideration of further endoscopic treatment. Computed tomography showed a bony lesion extending from the anterior ethmoid artery to the roof of the sphenoid sinus posteriorly and from the lateral cribriform plate and middle turbinate medially to the lamina papyracea laterally. Therefore, the entire roof of the right ethmoid cavity, measuring approximately 4 cm (front-to-back) by 2 cm (side-to-side), was involved and required en bloc excision. A 2-staged endoscopic excision was carried out: access and cleansing of the ethmoid were performed during the first stage; tumor removal and repair were performed during the second stage. Two separate cerebrospinal fluid leaks occurred during the second stage. The anterior skull base was reconstructed using temporalis fascia and 4 pieces of septal bone.

Conclusion: The patient was dismissed 6 d postoperatively and returned to work 1 mo postoperatively. A final diagnosis of low-grade fibrosarcoma was obtained.

14:40-14:50
Case of the Millenium

INVASIVE SPEHNOETHMOIDAL ASPERGILLOSIS WITH INTRACRANIAL EXTENSION

Beverly Davidson and Vinod K. Anand
Division of Otolaryngology, University of Mississippi Medical Associate, Jackson, MS, USA

A 35-year old landscape artist presented to us with agressive invasive aspergillosis. This condition in an otherwise non-immunocompromised host is exceedingly rare. The patient developed rapidly advancing aspergillosis with ophthalmoplegia, loss of vision and intradural extension. At surgery, he was discovered to have wide bony dehiscence of the posterior sphenoid wall, a dehiscent carotid artery and left middle fossa empyema. Following endoscopic surgery, he required bifrontal cranio-orbital approach with resection of the dura mater and reconstruction with a pedicle temporalis muscle flap. The patient responded to surgical treatment, antimycotic therapy and immunotherapy and continues to do well a year after his discharge from the hospital. Literature review of fulminant invasive fungal sinusitis is non-immunocompromised patients is presented along with pre and postoperative MRI, operative micrographs and histologic material from our patient.

15:00-15:10
Case of the Millenium

RECONSTRUCTIVE RHINOPLASTY ACCOMPANIED BY REPAIR OF THE NASAL PASSAGES STENOSES AFTER COSMETIC SURGERY OF THE NOSE

Igor A. Kozin
Clinic of Aesthetic Surgery [Medilaz], Hospital #51, Moscow, Russia

Objective: Description of methods of repairing secondary defects and deformities of the nose and stenoses of nasal passages of iatrogenic origin. Patient G., aged 37, underwent 3 (three) cosmetic operations on the massive nose.

Objectively: The tip and the ridge of the nose are flat, the collumella is cicatricially modified and shortened. Both nasal apertures are sharply narrowed. The nasal breathing is absent due to the cicatricial adhesions around the choana. The nasal breathing is obstructed.

Methods: First stage: April 5th, 1999. A circular incision was made along the perimeter of the stenosed left nostril, the dystopic wing cartilage was mobilised through subcartilaginous incision from the septum; then it was shifted upwards and sutured on to the arch of the opposite cartilage. The base of the left wing was cut off, the cicatrices on the fundus of the nasal passage and choana were dissected. The resulting defect of the mucosa was filled in up by the skin flap on the pedicle from the left clivus. The osteocartilaginous allotransplant from another patient's nose ridge was placed under the mobilised skin of the ridge and the tip of the nose.

Second stage: September 15th, 1999. A semicircular incision was made along the perimeter of the right stenosed nostril, a skin flap on the pedicle based at the limen of this nostril was excised from the upper lip. The interior half of the right wing cartilage was moblised from the septum, which was sutured to the arch of the similar cartilage. The defect of the membranous septum on the right was filled in by the mobilised skin flap on the pedicle from the lip. Then the cicatricial tissues of the fundus of the nose vestibule were dissected and the defect of the vestibular texture was made up by the skin flap on the pedicle taken from the cheek.

Results. The patient was examined a year after the operation: the form and the respiratory function of the nose are fully restored.

WEDNESDAY

15:00-15:10
Case of the Millenium

REPAIR OF COMPLETE STENOSES NASAL PASSAGES AFTER UNSUCCESSFUL UNILATERAL CHEILOPLASTY AND CORRECTIVE CHEILOPLASTY

Igor A. Kozin
Clinic of Aesthetic Surgery, Moscow, Russia

Objective: Description of contemporary methods of reconstructing the upper lip and nasal secondary defects and deformities after unilateral clefts with simultaneous repair of the nasal passage stenoses up to its complete obstruction.
Methods: Reconstructive cheiloplasty is performed according to modified Millard's method implying the excision of the skin-cicatricial flap on the pedicle at the limen of the affected nostril. Rhinoseptoplasty is performed through semicircular or circular incision along the parameter of the flat nostril and through the endonasal transcartolaginous incision on the healthy wing of the nose. The base of the skin-cicatricial flap taken from the lip partially fills in the concealed defect of the fundus texture of the nose vestibule provided the stenosis of the affected nostril is moderate. After reconstruction of the upper lip skin and mucosal defects on the inner side of the nostril and in the nasal cavity were covered with pedical flaps from the upper lip, slope of the nose and the cheek. Thus, the method described allowed for complete reconstruction of the nostril and upper lip as well as reconstruction of the nasal breathing.
The Results of the Surgery: The author has examined and operated on 218 patients with various rate of nasal passage stenoses after primary and corrective cheilorhinoplasty. In most cases optimal aesthetic and functional results are obtained.
Conclusion: While repairing the nasal passage stenoses the defects of the mucosa should be made up by skin flaps on pedicles excised around the defected tissues. I have also elaborated a radical method of cheiloseptorhinoplasty with repair of the nasal passage stenoses of various degree and depth lesion.

15:10-15:20
Case of the Millenium

DEVELOPMENT OF NEO-FRONTAL SINUS AFTER CRANIALIZATION

Amin R. Javer, MD and Frederick A. Kuhn, MD
St. Paul's Hospital and Georgia Nasal & Sinus Inst.

A 73-year old Caucasian female presented with a draining fistula in her left forehead. She had undergone removal of fibrous dysplasia from the posterior table and floor of the frontal sinus and a bilateral frontal sinus cranialization procedure 25 years previously. She denied any symptoms until five months prior to presentation when she developed headaches and swelling over her left eyebrow. Exploratory craniotomy revealed the sinus had completely remucosalized around the methyl methacrylate implanted in her forehead, creating a large right neofrontal sinus with no connection to the nose.l Post operatively the large neosinus spontaneously drained through the left forehead resulting in a fistulous tract. This cavity was separate from an opaque left supraorbital ethmoid cell found on CT./ An endoscopic frontal sinusotomy created drainage of the right mucosal lined space into the nose. The drainage cultured Pseudomonas and Aspergillus fumigatus. The supraorbital ethmoid cell could not be reached. One week later the entire neosinus was lined with a gray fuzzy membrane, which when debrided revealed that 80% of the mucous membrane had been destroyed by the fungal infection. The remaining mucous membrane and fungus were on dura. A craniotomy was used to completely open the supraorbital ethmoid cell into the nose. The upper nonmucosalized neo-sinus was obliterated with a latissimus dorsi free flap. Silastic stents were placed between the neo-sinus, the left supraorbital ethmoid cell and each frontal recess. The external fistula was closed at the end of the procedure. The patient recovered well and was discharged home four days after surgery, only to recur four weeks later.

14:00-14:08
Free Paper
Session 1

IL-4 UP-REGULATES STEM CELL FACTOR PRODUCTION IN NASAL EPITHELIAL CELLS

R. Pawankar, S. Yamagishi, R. Takizawa, T. Yagi
Nippon Medical School, Tokyo, Japan

Purpose: We asked whether Th2 cytokines or proinflammatory cytokines could up-regulate the production of stem cell factor (SCF) from human nasal epithelial cells (NEC).

Methods: NEC were cultured to confluency and stimulated with varying doses of proinflammatory cytokines like interleukin (IL)-1β and tumor necrosis factor (TNF)-α (1-100 ng/mL) as well as Th1 and Th2 cytokines like interferon (IFN)-γ, IL-4, and IL-13 (1-100 ng/mL) for 5 days. The levels of SCF in the supernatants were measured by an SCF-specific ELISA kit. We examined the mRNA expression for SCF in cultured NEC by reverse transcriptase polymerase chain reaction. Finally, we looked at the effect of dexamethasone (10^{-5} to 10^{-8} M) on the production of SCF from cultured NEC.

Results: IL-4 (10 ng/mL) and to a lesser extent IL-13 (100 ng/mL) up-regulated the release of SCF from cultured NEC in a dose-dependent manner. At the optimal dose, IL-4 also up-regulated SCF mRNA expression in cultured NEC. IL-1b, TNF-a, and IFN-g had no effect on the SCF production. Dexamethasone down-regulated the production of SCF from cultured NEC in a dose-dependent manner.

Conclusion: Th2-type cytokines like IL-4 and IL-13 may play further important roles in the pathogenesis of allergic rhinitis by increasing the survival of intraepithelial mast cells (IEMC) via the up-regulation of SCF production from epithelial cells. Furthermore, steroids may reduce the number of IEMC not only through the direct down-regulation of SCF production from nasal epithelial cells but also through the down-regulation of IL-4 and IL-13.

14:08-14:16
Free Paper
Session 1

THE EFFECTS OF PACLITAXEL-IMPREGNATED STENTS ON SHEEP NASAL MUCOSA

Martin J. Citardi, Brian Herrmann, Amin Javer, Frederick A. Kuhn
Saint Louis University, St. Louis, MO, USA

Purpose: Traditional frontal sinus stents serve only as mechanical devices. It has been proposed that stents may also serve as drug-delivery systems for the topical application of drugs that minimize postoperative scarring. Paclitaxel (Taxol), which has recognized antiscarring effects, may be incorporated via a polymeric formulation into standard rubber stents. The impact of topical paclitaxel on nasal mucosa is unknown.

Methods: A sheep model was used for this study. A modified rubber T-tube stent (incorporating paclitaxel at varying dosages) was secured to each side of the septum in each animal. After 4 wk, animals were sacrificed and the nasal mucosa was harvested. The nasal mucosa was sectioned and stained with hematoxylin and eosin. A pathologist then rated the nasal mucosa for vascular congestion, glandular atrophy, chronic inflammation, mucosal metaplasia, and mucosal ulceration.

Results: All specimens showed varying degrees of vascular congestion, glandular atrophy, chronic inflammation, and mucosal metaplasia; the paclitaxel-impregnated stents were not consistently associated with more severe mucosal changes. Mucosal ulceration was rare in all specimens.

Conclusions: Sheep nasal mucosa tolerated the paclitaxel-impregnated stents well. Because paclitaxel minimizes scar at low concentrations, paclitaxel-impregnated stents may prove useful in clinical situations where frontal sinus stenting is deemed necessary.

14:20-14:28
Free Paper
Session 1

EFFECTS OF NITRIC OXIDE ON CILIARY BEAT FREQUENCY IN THE HUMAN NASAL MUCOSA

Wang Feng, Su Zhen Lun, Wang Li, Wang RongGuang, Yang WeiYan, Jiang Si Chang
Institute of Otorhinolaryngology PLA. General Hospital, Beijing, China

Purpose: To investigate the effects of nitric oxide on ciliary beat frequency in the human nasal mucosa, primary cultured human nasal epithelial cells were used as experimental object.

Methods: These cells were randomly divided into 3 groups. The effect of nitric oxide on ciliary beat frequency was observed by videomicroscopy, and the data were analyzed by t test. l-arginine was added to first group, d-arginine to second group, and N-omega-nitro-l-arginine methyl ester (l-NAME) to third group.

Results: It was found that l-arginine significantly increased ciliary beat frequency from 400 ± 48 beats/min to 793 ± 68 beats/min, $n = 9$, $P < 0.001$. d-arginine had no similar effects, while NOS blocker l-NAME inhibited the effect of l-arginine.

Conclusion: Cells cultured by our method could synthesize NOS, which made l-arginine produce NO that could increase ciliary beat frequency in the human nasal mucosa. The value of NO2-, the final production of NO, was also measured. It was found that the amount of NO2- in l-arginine group was more than that in other groups.

14:28-14:36
Free Paper
Session 1

MUCOSAL REGENERATION AFTER SINUS SURGERY: AN EXPERIMENTAL STUDY

Karin Forsgren
Karolinska Institute, Stockholm, Sweden

Purpose: The present investigation concerned functional and structural aspects of the regenerated sinus mucosa after sinus surgery.

Methods: In a rabbit model of surgical removal of sinus mucosa without ostial interference, the regenerative capacity of healthy sinus mucosa was studied by 1) examining whole-mounted nose-sinus complexes by light microscopy, 2) examining vascular castings and immunohistochemistry on histologic sections of the regenerated microcirculatory network, 3) investigating the reinnervation by means of a double-labeling immunocytochemical technique directed against protein gene product 9.5 in combination with either neuropeptide Y or tyrosine hydroxylase, 4) measuring blood flow using radiolabeled microspheres (Sn 113), and 5) evaluating vasoreactivity to the a-2-adrenoceptor agonist oxymetazoline by means of a laser Doppler flowmeter.

Results: The maxillary sinus mucosa of the rabbit became reepithelialized with a respiratory ciliated epithelium by 1 to 2 mo postoperatively. In the lamina propria, however, there were an increased number of vessels and nerve fibers as well as an increase in fibrosis. The submucosal glands did not regenerate, even after 9 mo. The blood flow in the sinus mucosa was not significantly affected by sinus surgery. However, the regenerated sinus mucosa was more sensitive to a locally applied vasoconstrictor, implying a modified vasoreactivity.

Conclusion: Regenerated sinus mucosa has several altered features, structurally as well as physiologically. Conceivably, these reactions are present in all the regenerating paranasal sinus mucosa and should be considered when one decides on the surgical approach.

14:40-14:48
Free Paper
Session 1

CHARACTERIZATION OF CELLULAR INFILTRATES IN NASAL POLYPS COMPARED TO NASAL MUCOSA WITH RESPECT TO APC AND T CELLS

P. Fundová, P. Albrectsen, P. Tingsgaard, A. Hahn, M. Tos, H. Tlaskalová-Hogenová
FNKV, Prague, CZ and Gentofte University Hospital, DK, Barholin Institution, Copenhagen, DK; Institute Microb, AS, Prague, CZ

Purpose: Nasal polyps (NP), edematous projections of nasal mucosa, are characterized by an inflammatory infiltrate of eosinophils, lymphocytes, and plasma cells. This study investigated the subsets and activation status of lymphoid cells as well as number of antigen-presenting cells infiltrating nasal mucosa and NP in intraepithelial and lamina propria compartments.

Methods: With immunohistochemistry, frozen tissue sections of NP from 17 patients and mucosal biopsy specimens of the inferior turbinate from the same patients (n = 11) and from 3 healthy control subjects were stained for the following markers: HLA-DR, CD1a, CD26, CD45RO, and CD103.

Results: Besides a substantial increase of eosinophils, we found significantly increased numbers of antigen-presenting HLA-DR positive cells (22.3 ± 0.7 vs. 13.9 ± 1.9, P = 0.0004) as well as CD1a-positive, Langerhans cells (26.9 ± 2.9 vs. 4.7 ± 1.3, $P < 0.0001$) in NP compared to nasal mucosa from the inferior turbinate of the same patients or healthy subjects. Quantitative evaluation of histologic specimens revealed significantly increased numbers of memory, CD45RO-positive cells (24.4 ± 2.3 vs. 3.4 ± 1.4, $P < 0.0001$) and activated, CD26-positive T cells (21.5 ± 2.7 vs. 1.9 ± 1.1, P < 0.0001) in NP compared to nasal mucosa. The majority of the infiltrate found in NP displayed mucosa-homing properties as documented by CD103 (11.8 ± 1.3 vs. 3.1 ± 0.9, < 0.0001) staining.

Conclusions: Our data show an increased number of antigen-presenting cells and activated, mucosa-homing lymphoid cells, which may play an important role in the pathogenesis of nasal polyposis.

14:48-14:56
Free Paper
Session 1

ROLE OF THE ENZYME DIPEPTIDYL PEPTIDASE IV IN THE NASAL MUCOSA

Roland Giger, Basil Landis, Eric Grouzman, Jean-Silvain Lacroix
University Hospital Geneva, Geneva, Switzerland

Purpose: The endothelial serine protease dipeptidyl peptidase IV (DPPIV) cleaves the tyrosine-proline dipeptide of several inflammatory mediators and neuropeptides. The aims of the present study were 1) to investigate the localization of DPPIV in the human nasal mucosa, 2) to measure the in vitro activity of DPPIV in nasal mucosa biopsies from patients with chronic rhinosinusitis, and 3) to study in the pig nasal mucosa the modulatory effect of DPPIV on the vasodilation evoked by substance P (SP).

Methods: By immunohistochemistry, we studied the localization of DPPIV in human nasal biopsies. The activity of DPPIV was measured in vitro in the nasal mucosa samples of 45 patients with chronic rhinosinusitis and compared with the degree of inflammatory infiltration. In anesthetized pigs (n = 8), we studied the effect of local intra-arterial pretreatment with exogenous DPPIV on the nasal vasodilation evoked by exogenous SP.

Results: Positive immunoreactivity for DPPIV was observed in seromucosal glands, vascular endothelial cells, epithelial cells, and T lymphocytes. A low activity of DPPIV was associated with a high density of inflammatory cells in the mucosa of patients with chronic rhinosinusitis. The regressive correlation was statistically significant (P < 0.001). The vasodilatory effect of exogenous SP was reduced by 70% after DPPIV pretreatment of the pig nasal mucosa.

Conclusions: Low level of DPPIV activity is associated with inflammation of the nasal mucosa and a reduction in the catabolism of SP and most likely of other inflammatory mediators. This enzyme could participate in the pathophysiologic mechanism of nasal hyperreactivity.

15:00-15:08
Free Paper
Session 1

TOPICAL ANTIBIOTIC, ANTIFUNGAL, AND ANTISEPTIC SOLUTIONS DECREASE CILIARY ACTIVITY IN NASAL RESPIRATORY CELLS

Jan Gosepath, Nina Grebneva, Sergej Misshikin, Wolf J. Mann
Mainz Medical School, Mainz, Germany

Purpose: This study was designed to investigate the effect of topical antibiotic, antifungal, and antiseptic agents on the ciliary beat frequency (CBF) of nasal respiratory cells.

Methods: Specimens of nasal mucosa were harvested from healthy volunteers and kept in a chamber, which was perfused with RPMI medium and the following solutions: ofloxacin, amphotericin B, clotrimazole, itraconazole, povidone-iodine, and H2O2. Two different concentrations of each substance were applied while CBF was monitored using video interference contrast microscopy and compared with that of controls, which were held in RPMI medium.

Results: Controls showed a constant CBF of around 10 Hz over at least 10 h. The samples showed a marked decrease in ciliary activity over time. Ofloxacin led to only a slight decrease in CBF, whereas all antifungal substances led to a cessation of ciliary activity within 90 min. H2O2 decreased CBF only 20% to 30% after up to 10 h; however, povidone-iodine made ciliary activity cease after only 60 min. All these effects were clearly dose related, with low doses of the respective substance being less ciliotoxic than higher ones.

Conclusions: The use of the topical agents investigated in this study should be balanced with their ciliotoxic effects, which could lead to a decrease in ciliary activity, possibly resulting in a deterioration of mucociliary clearance and thus in a potential drawback in the treatment of chronic rhinosinusitis.

15:08-15:16
Free Paper
Session 1

COMPARISON OF DIFFERENT METHODS FOR NASAL SECRETION COLLECTION IN ALLERGIC RHINITIS WITH QUANTIFICATION OF ALBUMIN

Tae Young Jang, Kyu Sung Kim, Dong Hak Jung
College of Medicine, Jung-Gu Inchon, South Korea

Purpose: Nasal secretion sampling methods have shortcomings of dilution effect, insufficient dose, irritation, inconvenience, or technical difficulty that might affect the result. We used 3 of the most frequently described sampling methods of nasal secretion collection; lavage, suction, and absorption on each side of nasal cavity in same patients with allergic rhinits to compare each method by means of albumin that is considered as an index of vascular permeability after allergen challenge.

Methods: Samples were obtained from 29 patients with allergic rhinitis to Dermatophagoides pteronyssinus. Suction and lavage methods (group A, n = 12) and absorption with filter paper and lavage methods (group B, n = 17) were applied to each nasal cavity of same patient. The samples were collected 3 times; before allergen challenge as a baseline, 20 min after as an early phase of reaction, and 8 h after as a late phase. Subjective symptom scores were obtained. Concentration of albumin was measured by nephelometry.

Results: In suction and absorption method, albumin concentrations were increased in early phase and returned to baseline levels in late phase ($P < 0.05$). Lavage samples of both groups did not show significant changes in albumin concentration among baseline, early, and late phase ($P > 0.05$). Albumin concentrations of both methods in groups A and B were not correlated ($P > 0.05$). Higher missing values occurred in lavage (74.7%) and suction (80.2%) methods than absorption method (91.4%) because of insufficient amount, under detection limit of assay, bleeding, or excessive irritation.

Conclusions: The absorption method with filter paper was the best.

16:20-16:30
Video

SIMPLIFIED CLOSURE OF CSF RHINORRHEA

Robert M. Meyers
University of Illinois, Niles, IL, USA

This video illustrates a simplified method of closing small CSF leaks regardless of their origin. The key features are the use of fibrin glue, free mucosal grafts, and two hand techniques similar to that used in tympanoplastics.

Three cases will illustrate these techniques. One is iatrogenic; one is spontaneous; and one is pneumocephalus secondary to meningioma removal.

All are done with utilization of visual tracking devices.

16:40-16:50
Video

APPROACH TO THE FRONTAL SINUS

Seung Kyu Chung
Dept. of ORL-HNS, Sungkyunkwan University, Samsung Medical Center, Seoul, Korea

Purpose: Approach to the frontal sinus is the one of the most difficult areas in endoscopic sinus surgery. Anatomy of the frontal sinus and the frontal recess area is very complicated. In this video surgical anatomy of these areas will be explained and approach technique will be suggested.

Methods: Concept of the space which is situated inside the anterior portion of the frontal bone is demonstrated. The relationship between the uncinate process and the ethmoid bulla was analyzed in the coronal computed tomogram of paranasal sinuses.

Results: The frontal sinus and suprabullar recess or supraorbital cell are situated in this space. The roof of agger cell and the bulllar lamella form the floor of the frontal sinus.

Conclusions: Confirmation of the united portion of the upper part of the uncinate process and the bulla lamella is helpful for frontal sinusotomy.

17:00-17:10
Video

ENDOSCOPIC INTRANASAL RECONSTRUCTION FOR MEDIAL ORBITAL WALL FRACTURE

Sea-Yuong Jeon
Gyeong-Sang National University Hospital, Chinju, Korea

Purpose: To present our experience with endoscopic intranasal reconstruction of the medial orbital wall for blow-out fractures.

Methods: After completing an intranasal ethmoidectomy, the herniated orbital contents are mobilized and pushed back laterally. The shape of the medial orbital wall is fixed by a U-shaped Silastic sheet and Merocel packings saturated with an antibiotic solution. The sheet and packing are kept for 4 wk.

Results: We experienced 25 cases of intranasal reconstruction of the medial orbital wall for blow-out fractures from 1993 to 1999. Computed tomographic scan confirmed isolated medial orbital wall fracture in 15 patients and complex orbital fractures in 10 patients. Thirteen patients developed enophthalmos, 12 had diplopia, and 10 had limitation of eye movement. Seven had no eye symptoms but had large defects of the orbital wall, anticipating a delayed enophthalmos. Surgery was performed when the eye function could be accurately assessed, usually at 7 to 14 d following the injury. Twenty-two of 25 patients recovered completely without any residual eye symptoms or complications. Enophthalmos was not improved in 3 patients, and 2 of them had persistent diplopia. However, limitation of eye movement was relieved in all patients.

Conclusion: Endoscopic intranasal reconstruction is a choice of surgery for medial orbital wall fracture with good functional results and cosmetic advantage.

14:01-14:08
Free Paper
Session 2

DIAGNOSTIC VALUE OF CILIARY PARAMETERS FOR PRIMARY CILIARY DYSKINESIA

M. Jorissen and Willems
ENT Department, Leuven, Belgium

Purpose: Primary ciliary dyskinesia (PCD) is characterized by clinical, ultrastructural, functional, and genetic heterogeneity. The actual standard is dynein deficiency in a biopsy, but it lacks sensitivity. The diagnostic reliability of parameters is evaluated and compared with the results after ciliogenesis in culture.

Methods: Functional and ultrastructural data from biopsy specimens and after ciliogenesis in sequential monolayer-suspension culture of more than 700 patients (including 70 PCD patients) were critically evaluated.

Results: Mucociliary transport was absent in all PCD patients investigated but also in more than 20% of non-PCD patients. Coordinated ciliary activity was found in 10% of PCD biopsy specimens; it was absent in 20% of non-PCD biopsies. Ciliary motility was found in 1/3 of PCD specimens and immotility in 8% of non-PCD biopsies. Only hyperfrequent beating was diagnostic for PCD. All other values neither proved nor excluded PCD. Demonstration of dynein deficiency was proof of PCD. Central complex abnormalities in more than 30% of cilia were highly suspect for PCD. All other abnormalities had no diagnostic value. After ciliogenesis, acquired abnormalities were absent and primary abnormalities were expressed, facilitating the diagnosis, but more than 25% of PCD patients had normal ultrastructure. After ciliogenesis, immotility was proof of PCD, but motility did not exclude PCD. After ciliogenesis, coordination was present in 100% of non-PCD patients and absent in 100% of PCD patients.

Conclusion: Only coordination of ciliary activity after ciliogenesis is 100% reliable for diagnosis of PCD.

14:08-14:16
Free Paper
Session 2

PERSISTENCE OF EPITHELIAL M CELLS IN NASAL-ASSOCIATED LYMPHOID TISSUE IN MICE WITH SEVERE COMBINED IMMUNODEFICIENCY

Todor Karchev, Tetsuo Watanabe, Hideyuki Kawauchi, Goro Mogi
Medical University, Sofia, Bulgaria

The appearance of mucosal lymphoid aggregates in the respiratory system of mammals was found in germ-free conditions as well as in fetal lung transplanted subcutaneously into syngeneic recipients. We describe for the first time, using light, scanning, and transmission electron microscopy, the presence of mucosal epithelial antigen-sensitive M cells, together with mesenchymal nonlymphoid cells at the site of nasal-associated lymphoid tissue in mice, having no active endogenous T and B cells. It means that in cell-cell and especially cell-matrix recognition, determining the exact location of unencapsulated, without afferent lymphatic vessels, mucosa-associated lymphoid organs in body architecture, the role of M cells and reticulum cells should be decisive.

14:20-14:28
Free Paper
Session 2

CYTOKINE PROFILES OF HUMAN T LYMPHOCYTES SAMPLED FROM NASAL MUCOSA OF PATIENTS WITH NASAL ALLERGY OR CHRONIC INFECTIVE RHINITIS

Hideyuki Kawauchi, Keisuke Sano, Chiaki Sano, Ryotaro Ishimitsu
Shimane Medical University, Izumo, Japan

Purpose: The precise study of the mucosal immunity of nasopharynx in humans has been started by several research groups. Analyses of T-cell subset distribution with flow cytometry and cytokine profiles with reverse transcriptase-polymerase chain reaction (RT-PCR) have been done using biopsy specimens of nasal mucosa from patients with nasal allergy and chronic infective rhinitis. We examined quantitatively the functional role of human nasal T lymphocytes in the pathogenesis of allergic inflammation and infection.

Methods: We used a flow cytometric analysis, a quantitative RT-PCR with limited numbers of nasal lymphocytes, and the ABI-PRISM 7700 sequence-detection system. Cytokine gene expression (interferon [IFN], interleukin [IL]-4, IL-5) of nasal mucosa and peripheral blood lymphocytes was examined. Total RNA was processed for reversed transcription and a quantitative PCR.

Results: We detected gene expression of IFN and IL-5 but not IL-4 in nasal T lymphocytes. However, our preliminary data indicated that when sampled nasal T cells were cultured with a specific allergen in vitro for an appropriate time, cytokine-specific mRNA expressions were augmented.

Conclusions: Our preliminary data indicated that T and B cells, CD4+ and CD8+ T cell subsets, can be clearly analyzed, even with a small number of nasal lymphocytes (1,000-10,000) purified from sampled nasal mucosa.

14:28-14:36
Free Paper
Session 2

MUCOSAL IMMUNITY IN NASOPHARYNX: AN INVESTIGATION IN TCR-TRANSGENIC (OVA23-3) MICE

Hideyuki Kawauchi, Takaya Yamada, Keisuke Sano, Ryotaro Ishimitsu
Shimane Medical University, Izumo, Japan

Purpose: Immunity of nasal mucosa was investigated in T-cell antigen receptor-transgenic (OVA23-3) mice stimulated with nasal challenges using ovalbumin (OVA) with or without cholera toxin (CT).

Methods: Mice were intranasally challenged with 100 mg of OVA with 1 mg of CT 7 times at 2-d intervals. Nasal washings and sera were sampled 2 wk after final challenge. Antibody titers were measured by an enzyme-linked immunosorbent assay method, and antibody-producing cells in nasal lymphocytes were examined by enzyme-linked immunospot assay. Cytokine profiles of nasal T lymphocytes were examined by reverse transcriptase-polymerase chain reaction (RT-PCR).

Results: OVA-specific immunoglobulin (Ig) A and IgG antibodies increased in nasal washings of CT-nontreated mice as well as CT-treated mice. OVA-specific IgA and IgG antibody-producing B cells were also found in nasal lymphocytes derived from nasal-associated lymphoid tissue and nasal propria. These data were quite different from those in wild-type C57BL/6 mice, in which no significant OVA-specific antibody increase was shown in nasal washings after intranasal challenge with OVA without CT. Analysis of cytokine gene expression by RT-PCR showed that expressions of interferon, interleukin (IL)-2, IL-6, and transforming growth factor were detected in nasal lymphocytes of OVA-primed transgenic mice (OVA23-3).

Conclusions: Mucosal adjuvant is essential for induction of antigen-specific mucosal antibody response. The frequency of antigen-specific T-helper cell clones in nasal mucosa is also critical for induction of local antibody response in nasopharynx.

14:40-14:48
Free Paper
Session 2

REGULATION OF MUCOCILIARY MOTILITY BY NITRIC OXIDE AND EXPRESSION OF NITRIC OXIDE SYNTHASE IN HUMAN SINUS EPITHELIAL CELLS

Yang-Gi Min, Jeong-Whun Kim, Chae-Seo Rhee, Chul Hee Lee
Seoul National University College of Medicine, Seoul, South Korea

Purpose: To investigate the changes of ciliary beat frequency (CBF) after treatment with l-arginine in human sinus mucosa and to determine the distribution of inducible nitric oxide synthase (iNOS) and endothelial NOS (eNOS) in healthy sinus mucosa.

Methods: CBF was measured in the sphenoid sinus mucosae of 12 subjects who had transseptal transsphenoidal hypophysectomy due to pituitary gland tumor. CBF was measured over 24 h in DMEM (Dulbecco's Modified Eagle Medium) solution after treatment with l-arginine, its inactive spatial isomer d-arginine, or an NOS inhibitor, l-NAME (NG-nitro-l-arginine methyl ester). DMEM solution without treatment with these materials was used as a control. Other pieces of mucosa were exposed to l-NAME and its inactive spatial isomer d-NAME after preincubation with l-arginine. The specimens were immunohistochemically stained for iNOS and eNOS.

Results: CBF increased 24 h after treatment with l-arginine compared with CBF in control groups. CBF increased in proportion to the increasing concentrations of l-arginine. No significant change existed after treatment with d-arginine or l-NAME. CBF increased after treatment with l-arginine at 30 min and was maintained for 24 h. l-NAME inhibited the increase in CBF by l-arginine, but d-NAME showed no such effect. Immunoactivity was frequently observed to both iNOS and eNOS in the ciliated epithelial cells and was stronger to eNOS than to iNOS.

Conclusions: NO produced by iNOS and eNOS using l-arginine may increase CBF in healthy sinus mucosa, and NO may have a regulatory function on ciliary motility.

14:48-14:56
Free Paper
Session 2

CHANGES IN EXPRESSION OF ION AND AQUAPORINS IN NORMAL HUMAN NASAL EPITHELIAL CELLS

Hwan-Jung Roh, Eui-Kyung Goh, Soo-Geun Wang, Jin-Sup Jung, Kyong-Myong Chon
Pusan National University, Pusan, Korea

Purpose: Genes for water channel (aquaporins, AQPs), Na^+ channel (ENaC), cystic fibrosis transmembrane regulator (CFTR), and mucin (muc5B) have been known to influence ion and water transport of the epithelium. The aims of this study are to identify isoforms of AQPs in cultured normal human nasal epithelial (NHNE) cells, to determine whether differentiation affects the expression of these genes, and to evaluate the effects of retinoic acid (RA) and dexamethasone on the expression of these genes in NHNE cells.

Methods: Primary culture and air-liquid interface (ALI) culture were done after NHNE cell isolation from inferior turbinate mucosa. For detection of AQP isoforms, degenerative reverse transcription-polymerase chain reaction (RT-PCR), cloning, and sequencing of cDNA were done. Semiquantitative RT-PCR of cornifin, AQPs, ENaC, CFTR, and muc5B genes was performed. Cellular morphology, 3H-thymidine incorporation assay, and semiquantitative RT-PCR of these genes were done after RA and dexamethasone treatment to NHNE cells.

Results: Cultured NHNE cells expressed AQP 3, AQP 4, CFTR, and ENaC. ALI culture induced expression of muc5B, AQP 3, and CFTR. RA inhibited proliferation and squamous differentiation of NHNE cells, induced expression of muc5B and CFTR, and inhibited expression of cornifin. These effects of RA were enhanced by ALI culture. Dexamethasone induced ENaC expression in NHNE cells of ALI culture but did not affect expression of other genes.

Conclusion: Maintenance of cell polarity and RA are important to the differentiation and to the ion and water transport of normal human nasal epithelium.

15:00-15:08
Free Paper
Session 2

A DIAGNOSTIC PARADIGM FOR CHRONIC SINUSITIS

James A. Stankiewicz and James M. Chow
Loyola University Medical Center, Maywood, IL, USA

Purpose: The current method of diagnosing chronic rhinosinusitis is based on history and physical examination (including endoscopic examination). Patients diagnosed in this manner receive antibiotic therapy for 1 mo and a computed tomographic (CT) scan is performed if symptoms persist after treatment. No study has looked scientifically at identifying cost-effective accurate diagnosis. This prospective study of 100 patients meeting the definition for chronic sinusitis will show what is the most accurate, cost-effective way of diagnosing chronic rhinosinusitis.

Methods: Prospective chart review of 100 patients with symptoms of chronic rhinosinusitis, physical examination including endoscopy, and pretreatment CT scans.

Results: The results indicate that a screening CT scan is the most efficient objective way of diagnosing chronic sinusitis before treatment. The full paper will compare and contrast history, physical examination, endoscopy, and CT scan as they relate to diagnosis to create a diagnostic paradigm.

Conclusion: The most efficient cost-effective accurate way of diagnosing chronic rhinosinusitis is to be delineated, and CT scanning plays a prominent role.

14:01-14:08
Free Paper
Session 3

NASAL EPITHELIAL CELLS EXPRESS THE HIGH-AFFINITY IgE RECEPTOR

S. Yamagishi, R. Pawankar, R. Takizawa, T. Yagi
Nippon Medical School, Tokyo, Japan

Purpose: Epithelial cells express several adhesion molecules and may play other important roles via cell-cell interaction. We reported that a proportion of nasal epithelial cells (NEC) express the MHC class II molecule (HLA-DR) and CD86 and can induce the antigen-specific proliferation of T cells. To elucidate whether nasal epithelial cells could play a role in antigen recognition via expression of the high-affinity IgE receptor (FcεRI), we examined the expression of the FcεRI in NEC and its regulation by cytokines.

Methods: By flow cytometry, we examined the expression of the FcεRI in cultured NEC from patients with perennial allergic rhinitis (PAR) as well as chronic infective rhinitis (CIR). Next, we examined the expression of the FcεRI in freshly isolated NEC from patients with seasonal allergic rhinitis (SAR) in and out of season, by immunohistochemistry. Finally, NEC were cultured to confluency and then stimulated with varying doses of proinflammatory cytokines like interleukin (IL)-1β and tumor necrosis factor (TNF)-α (1-100 ng/mL) as well as Th1 and Th2 cytokines like interferon (IFN)-γ, IL-4, and IL-13 (1-100 ng/mL) for 5 days.

Results: A proportion of NEC from PAR and CIR patients expressed the FcεRI, and the level of the FcεRI expression in NEC was greater in PAR than CIR patients and was up-regulated in season compared with out of season in SAR patients. Finally, IL-4 up-regulated the FcεRI expression in cultured NEC.

Conclusion: NEC may affect allergic rhinitis through the up-regulated expression of the FcεRI. Furthermore, Th2 type cytokines like IL-4 may affect pathogenesis of allergic rhinitis by up-regulating the FcεRI in NEC.

14:08-14:16
Free Paper
Session 3

EFFECTS OF ROAD RUNNING ON NASAL RESPONSE

C. Cingi, H. Cakli, L. Arinik, E. Ozudogru, C. Kecik, E. Cingi
Osmangazi University and Anadolu University, Eskisehir, Turkey

Purpose: Road running is becoming popular in our country. Although exercise reduces nasal resistance, road running is done mostly under improper conditions. The aim of this study was to investigate the effects of running combined with the effects of air pollutants on nasal response.

Methods: Twenty road runners were enrolled in this study. All subjects were men aged 20 and 41 y. They ran 60 min on the right side of an avenue in the center of the city. It is in a residential area but has heavy traffic. It was the same course that they run regularly. They prefer to run in the road to avoid the steps of the pavements of every block. One week later they were invited to run 60 min through a running course away from traffic, which is located outside the city. Both trials were performed in March to eliminate the possible effects of pollens. Nasal resistances were measured by active anterior rhinomanometry before and immediately after running. Nasal transport rate was also measured after rhinomanometric evaluations by saccharin transport method. The findings of 2 trials were compared statistically.

Results: In both trials rhinomanometric measurements showed reduction of nasal resistance after exercise. Nasal transport time was shorter in the first trial when they ran in the city, but the difference was not statistically significant.

Conclusions: Nasal respiration is important in running. Air pollutants, mostly suspended particulates, affect the nose. Further investigations should be done on nasal functions and nasal mucosa of road runners who run on a regular basis (3 to 7 times/wk).

14:20-14:28
Free Paper
Session 3

AIR CONDITIONING IN NASAL AIRWAYS: TECHNICAL EQUIPMENT AND CLINICAL RESULTS

Gerhard Rettinger and Tillmann Keck
University of Ulm, Ulm, Germany

Purpose: Air conditioning in the nasal airways includes heating, humidification, and particle filtration. The effectiveness of the nasal airways was judged by comparing the intranasal values with simultaneous measurements at the nostrils.

Methods: Intranasal temperature was recorded with a miniature thermocouple fixed to a sensor for simultaneous humidity measurement. In another test, individuals were exposed to starch particles of defined diameters and concentrations. Intranasal particle distributions were detected by air samples continuously aspirated through a probe placed at different positions. Number and size of particles were measured with a laser particle-counter.

With this equipment, temperature, relative humidity, and particle values could be measured at different levels continuously during respiration.

Results: Results are presented for normal subjects under different conditions (ambient air temperature and humidity and mucosal decongestion) and patients with septal perforations.

Conclusion: In healthy individuals, the most important area for air conditioning seems to be the level between the nasal valve and the head of the turbinates.

14:28-14:36
Free Paper
Session 3

ULTRASTRUCTURE OF NASAL MUCOSA AFTER NASAL CLOSURE IN ATROPHIC RHINITIS

Hany Amind and Azzeb M. Azzeb
Benha Medical School, Cairo, Egypt

Purpose: To learn the cause of failure of atrophic rhinitis treatment after nasal closure.

Methods: In 27 patients atrophic rhinitis was confirmed by ear, nose, and throat examinations, nasal swab cultures, and histopathologic examination of the nasal mucosa. Computed tomographic imaging verified if they had sinusitis. Nasal closure was by modified Young technique to the atrophic side. Specimens for histopathologic studies and electron microscopic studies of nasal mucosa before and after nasal closure were taken intraoperatively. The patients were divided into 2 groups. In group A, 14 patients had functional endoscopic surgery. Medical treatment continued after nasal closure for 3 to 6 mo according to bacterial swabbing taken by nasoendoscopy. In group B, 13 patients had by nasal closure only. Reopening was done after 1.5 y (mean, 18.16 mo).

Results: In group A, 12 patients had complete cure of symptoms. The other 2 had minor symptoms of crustations. In group B, 7 patients had recurrence of symptoms, 4 patients had the full picture of atrophic rhinitis, and the other 3 had minor symptoms. Both groups were followed up for a mean of 40.3 mo. Electron microscopic studies of nasal mucosa after nasal closure revealed cell injury criteria in the mitochondria and ribosomes. Abnormal mucin formation was more like keratin in structure. Bacilli were still found in the submucosa of group B. Squamous metaplasia of the nasal mucosa was the result of the histopathologic studies.

Conclusion: 1) Closing the nasal fossa does not return the normal nasal mucosa, but it changes to squamous metaplasia in atrophic rhinitis. 2) The main cause of recurrence of atrophic rhinitis after nasal closure is infection, either intranasal or sinusitis.

WEDNESDAY

14:40-14:48
Free Paper
Session 3

PERIPHERAL EOSINOPHILIA IN PATIENTS WITH INFECTIOUS AND ALLERGIC SINUSITIS

Pablo Arango, Larry Borish, Stilianos Kountakis
University of Virginia, Charlottesville, VA, USA

Purpose: In examining patients with chronic sinusitis, a distinct subtype of allergic sinusitis can be observed. However, its relationship with chronic infectious sinusitis has not been completely elucidated. The exact role that eosinophils play in the pathogenesis of chronic sinusitis has not been determined. This study was designed to examine differences in peripheral eosinophilia among patients with allergic and infectious sinusitis.

Methods: Twenty-eight patients with chronic sinusitis presented for functional endoscopic sinus surgery. Pathologic examination of their sinus contents was used to determine if they had allergic or inflammatory sinusitis. Patients were classified to have allergic sinusitis if eosinophils comprised greater than 10% of the inflammatory infiltrate in the pathologic specimen. Patients with less than 10% were considered to be infectious. Peripheral blood was obtained to measure total eosinophils.

Results: Of 28 patients, pathologic diagnosis and peripheral eosinophil levels were obtained from 23 subjects. Nine were found to have allergic sinusitis, and 14 were considered to have infectious sinusitis. The average of peripheral eosinophils in the infectious group was 200, with a standard error mean of 49.17. The average of eosinophils in the allergic group was 433, with a standard error mean of 121.34 ($P = 0.05$).

Conclusions: Patients with allergic sinusitis have a statistically significant increase in peripheral eosinophil levels when compared with those with inflammatory sinusitis. Use of peripheral blood tests may facilitate the diagnosis of allergic sinusitis. Further studies in larger populations may make this relationship clearer.

14:48-14:56
Free Paper
Session 3

NONTUBERCULOUS MYCOBACTERIA ISOLATED FROM ENDOSCOPIC SINUS CULTURES IN IMMUNOCOMPETENT PATIENTS: A DIAGNOSTIC AND TREATMENT DILEMMA

Bill W. Berry, Jr. and Frederick A. Kuhn
Georgia Nasal & Sinus Institute, Savannah, GA, USA

Purpose: This study presents the largest known series of the isolation of nontuberculous (atypical) mycobacteria (NTM) from the paranasal sinuses of immunocompetent patients and proposes diagnostic and treatment recommendations from the clinical data and a review of the English language world literature.

Methods: During a consecutive 3-month period, 132 endoscopic sinus cultures were collected from approximately 475 patient visits at a tertiary center for chronic sinusitis and related diseases. All specimens were sent for bacterial, fungal, and mycobacterial examination. Twenty (20) patients demonstrated the presence of NTM on at least 1 specimen. Their charts were retrospectively reviewed with respect to demographic and clinical data.

Results: The 20 patients ranged in age from 11 to 69 y, with a 2:1 female-to-male ratio. The diagnosis in 19 patients was chronic sinusitis alone or in combination with allergic fungal sinusitis, and all patients had undergone multiple endoscopic surgical procedures. Fifteen positive NTM cultures were from specimens collected in the office and 5 were from operative specimens. To date, 10 patients have undergone tissue biopsy, but none have demonstrated acid-fast bacilli within the tissue or characteristic granulomatous findings. Only 2 of 12 demonstrated NTM on > 1 occasion. Identification of the NTM species is currently available for 13 patients and demonstrates M avium complex (7), M chelonae (5), and M gordonae (1). All patients tested to date are immunocompetent.

Conclusions: The American Thoracic Society NTM diagnostic criteria and treatment guidelines for NTM pulmonary disease (1997) appear to be a logical starting point.

14:05-14:45
Mini-Course 1

VIDEO CLIPS OF MAURICE H. COTTLE, M.D.

Pat Anthony Barelli
University of Missouri--Kansas City School of Medicine,
Kansas City, MO, USA

Doctor Cottle was a pioneer in modern rhinology and left a legacy in his early teaching when television and recording were first introduced. In 1971, the facilities of the then newly constructed University of Missouri-School of Dentistry opened to the American Rhinologic Society. In this wonderful setting with lecture halls, anatomic laboratories, operation suites, and television studios, many presentations of a rhinologic nature were recorded. A series of 10 day seminars were given almost on an annual basis, and many lectures, nasal surgeries, and demonstrations of anatomic material were presented by Dr. Cottle and select members of The American Rhinologic Society. Selected video clips will be shown of some members and of Dr. Cottle's lectures and presentations. His natural talent and dynamic approach to teaching show his philosophy and emphasis on conservative nasal-septal and nasal surgery. Rhinology, through his inspirational teaching, research, and innovations, was raised from its obscure level into the full light and prominence it now holds with otology and laryngology.

14:00-15:20
Mini-Course 2

NASAL PHYSIOLOGY AND NASAL FUNCTION TESTS

R. Eccles
Common Cold Centre Cardiff University, Wales, United Kingdom

This mini course will cover the following areas of rhinology. Physiology of the nose with discission on; functions of the nose, autonomic and sensory innervation, vasomotor and granular activity, nasal reflexes, control of nasal airflow and factors affecting nasal airflow, sensation of nasal airflow and effects of methanol, nasal cycle, assessment of nasal obstruction using rhinomanometry and acoustic rhinometry. Objectives versus subjective measures of nasal obstruction. Assessment of the efficacy of nasal surgery for the treatment of nasal obstruction using measures of unilateral nasal airflow.

WEDNESDAY

14:05-14:25
Mini-Course 3

ANTERIOR SKULL BASE SURGERY

J. David Osguthorpe
Medical University of South Carolina, Charleston, SC, USA

The anatomy, pathology, and characteristic behaviors of neoplasia of the anterior skull base will be briefly presented, as will an overview of the evaluation and options in management. The major emphasis will be on the various surgical approaches to this region, ranging from transnasal cavity, midfacial degloving and lateral rhinotomy to craniofacial accesses.

14:45-15:05
Mini-Course 3

TUMORS OF SKULL BASE – METHODS OF ENDOSCOPIC REMOVAL

Aldo Stamm
São Paulo ENT Center, São Paulo, Brazil

The management of lesions involving skull base, orbit, optic nerve and paranasal sinuses has changed dramatically since the introduction of the Transnasal Micro-Endoscopic Techniques associated with advanced surgical new instrumentation.
From 1990 to 2000, eighty-one patients with pituitary tumors; seventy-two CSF rhinorrhea (cribriform plate, ethmoid and sphenoid sinuses); mucocele involving skull base (18); orbital (8) and optic nerve decompression (6); inverting papilloma (19/32); angiofibroma (9/68); clivus chordoma (5); nasal glioma (4); nasal hemangiopericytoma (3); orbital apex lesions (3); sphenoid sinus carcinoma (2); cavernous hemangioma (1) involving the olfactory groove were operated at eh Sao Paulo ENT Center by using these techniques.
A variety of lesions are illustrated, in video by the author, both intraoperatively and postoperatively. Usually, with these operations, there is cerebrospinal fluid leakage and a large dural defect. These were usually repaired with a fascia latal graft, fibrin glue, and overlying second free graft of mucoperiosteum taken from the inferior or middle turbinate.

14:05-14:30
Mini-Course 4

ENDOSCOPIC FRONTAL SINUS, INDICATIONS, TECHNIQUES & RESULTS

Lanny Garth Close
Columbia University College of Physicians & Surgeons, New York, NY, USA

The author reviews the prevalence and incidence of chronic sinusitis in United States. After reviewing the anatomy and physiology of the sinuses, he differentiates sinusitis from allergic rhinitis, delineates the features of acute versus chronic sinusitis, differentiates the symptoms of acute sinusitis according to site, and reviews diagnostic and therapeutic methods. Medical management is emphasized, considering endoscopic surgery as an alternative of treatment if medical treatment fails. Indications, techniques and results of endoscopic sinus surgery are then reviewed.

14:55-15:20
Mini-Course 4

COMPLICATIONS OF FRONTAL SINUS SURGERY: PREVENTION AND TREATMENT

Jospeh B. Jacobs, M.D.
New York University Medical Center, New York, NY, USA

The surgical treatment of chronic inflammatory frontal sinus disease has varied between intranasal and external procedures. A single approach that consistently leads to relief of symptoms, eradication of disease with a minimum of deformity has not yet been attained. The functional theory of sinus disease and the evolution of endoscopic surgery with computer guidance have renewed interest in the intranasal approach utilizing endoscopic techniques.

However, this approach which attempts to surgically recreate adequate ventilation and drainage, can create mucosal and bony injury within the frontal sinus drainage pathway as well as anatomic distortion. This region's anatomy is extremely variable and complex based upon a profoundly variable embryologic development. Therefore, meticulous technique and a thorough knowledge of the anatomy is required.

The potential morbidity of an endoscopic approach for the treatment of chronic frontal sinus disease will be reviewed based on the anatomy and the etiology of the disease process. Prevention and treatment will be discussed utilizing endoscopic photography and videotapes.

A conservative approach for the surgical management of frontal sinus disease is recommended since the treatment of postsurgical failure is a significant management dilemma.

WEDNESDAY

14:00-14:05
Mini-Course 5

RHINOPLASTY: MY PERSONAL TECHNIQUES THAT WORK: CAUDAL AND NASAL DEFORMITIES

David A. Sherris
Mayo Clinic, Mayo Foundation, Rochester, MN, USA

I will present my approach to the treatment of difficult caudal and dorsal deformities of the external nose and nasal septum. The discussion will include a presentation of the external rhinoplasty approach I typically use for these disorders along with algorithms for graft choices and specific case presentations too highlight these disorders.

14:00-14:40
Mini-Course 5

INSTRUCTIONAL MINI-COURSE: RHINOPLASTY: MY PERSONAL TECHNIQUES

Enrique Azuara
Instituto Nacional de Pediatria, Mexico

“Experience is the best teacher, frequently it comes very late”

Rhinoplasty is the most challenging procedure in facial plastic surgery. Rhinoplasty is a surgery with a large history. Many surgeons have contributed to improve the results in the appearance of the external nose. It is in the last century when the knowledge of respiratory physiology called the attention of the physicians, and a new era for functional and aesthetic rhinoplasty began. As a result of the accumulation of the quantity of knowledge amassed in all the centuries, here we are with the great responsibility of the experience. Now we should know when to make a reduction in a nose or when to make an augmentation, or when to make a scar resection or when to make or not to make a secondary procedure.
Rhinoplasty should be done by a surgeon who is interested in the nose as a very complex organ which can severely affect the patients. Rhinologists should always be working in an integral medical and surgical concept to make better noses. Better noses should look better and should function better. To achieve this, we as rhinologists, should know more about function and more about aesthetics. To know more about function we should be convinced that we have to be able to solve every problem located in the internal and external nose. To know more about aesthetics we should acquire experience.
If we are not able to get the concept of an integral work and to acquire experience in making better noses we could be condemned to be producers of “respiratory disables or facial disables”.

16:00-16:08
Symposium 3

COMPLICATIONS WITH POWERED INSTRUMENTATION

James A. Stankiewicz
Loyola University Medical Center, Maywood, IL, USA

A brief review if complications of endoscopic sinus surgery with specific form on powered instrumentation. Discussed with the injury etiology, prevention and treatment. The complications with powered instrumentation are the same as with standard endoscopic sinus surgery. Knowledge of depth, distance, and location of orbit and skull base are most helpful in avoiding complications.

16:35-16:55
Symposium 3

HOW TO USE POWERED INSTRUMENTS SAFELY AND RESULTS

John H. Krouse
University of Florida, Ormond Beach, FL, USA

The use of powered instrumentation in nasal ans sinus surgery has in many ways revolutionized the practice of surgical rhinology. Since their introduction in the early 1990's, powered microdebriders and shavers have been applied in a variety of procedures, and have been shown to be effective and safe devices for both soft tissue and bony dissection. As with any surgical instruments, misuse can lead to complications. An appreciation's of the surgical anatomy of the nose and sinuses, and of the potential for injury fro the use of powered devices. Will decrease the likelihood of serious complications. We have examined the postoperative complications of powered surgery of the sinuses, and have shown a decreased incidence of synechiae, lateralization of the middle turbinate, and ostial stenosis, as well as decreases bleeding with the use of this technology. This data will be updated, and the implications of these findings will be discussed. In addition, a standard approach for powered surgery of the sinuses will be presented. At the conclusion of this presentation, the physician will have a better understanding of safe and effective powered endoscopic sinus surgery, as well as an appreciation of the research related to complications of these procedures.

16:15-16:30
Symposium 4

RHINOSEPTOPLASTY IN CHILDHOOD

Piskunov G., Yakushenkova A.
Presidential Medical Center, Moscow, Russia

Rhinoseptoplasty in childhood is one of the most discussioned problems of nasal reconstructive surgery of the last century. Our purpose is present late results of phinoseptoplasty in childhood.
We exsaminated 41 patients which had surgical intervention at the age of 8 to 15. There were 32 male and 9 female. Catamnes made up from 2 to 12 years after operations. Reasons of deformations septum nose were inborn (31 patients) and acquired (10 patients). 20 children had different anomalies at orthodontist`s examination. Septoplasty is leading as minimally invasion surgery septum nose in our clinic. There were leading correction intranasal structurs, adenotomy, polypotomy and other at that time. We used for examinations nasal endoscopy, computerized tomography, rhinomanometry, photographies before and after operation.
As a result we had no one septal perforation. During catamnes patients hadn`t acute purulent sinusitis and otitis, also there were registreted improvement of course of spasmodic asthma, decrease of pespiratopy infection and chronic sinusitis and otitis. 16 patients had normal registers of phinomanometry. 12 patients had difficulties in nasal respiration process.
Conclusion: 1. Rhinoseptoplasty is necessary at that age when nasal obstruction, deformation septum nose and external nose were registreted, because it is necessary to regain physiologic respiration and to preserve for chronic diseases. 2. In a deformation septum nose and external nose the better results are by rhinoseptoplasty. 3. Rhinoseptoplasty in childhood must be led by minimal invasion surgery. 4. Children with deformation septum nose need ortodontist`s examination.

16:15-16:30
Symposium 4

RHINOSEPTOPLASTY IN CHILDHOOD

G. Piskunov and A. Yakushenkova
Presidential Medical Center, Moscow, Russia

Purpose: Our purpose is to present late results of rhinoseptoplasty in childhood.

Methods: We examined 41 patients who had surgical intervention at age 8 to 15 y. There were 32 males and 9 females. Follow-up was from 2 to 12 years after operation. Reasons for deformations of nasal septum were inborn (31 patients) and acquired (10 patients). Twenty children had different anomalies at orthodontist examination. Septoplasty is the leading minimally invasive surgery for nasal septum in our clinic. Also, there were major corrections of intranasal structures (adenotomy, polypotomy) at that time. Examinations used nasal endoscopy, computed tomography, rhinomanometry, and photography before and after operation.

Results: As a result we had not one septal perforation. During follow-up, patients had no acute purulent sinusitis and otitis. There was improvement in spasmodic asthma, decrease of respiratory infection, chronic sinusitis, and otitis. Sixteen patients had normal results of rhinomanometry. Twelve patients had difficulties in nasal respiration; among them, 8 men had nasal allergy, 2 had turbinate hypertrophy, and 2 had cartilage deviation. One had a second septoplasty, with good functional and cosmetic results at 5 years after the second operation.

Conclusions: 1. Rhinoseptoplasty is necessary at that age when nasal obstruction, deformation septum nose and external nose were observed because it is necessary to regain physiologic respiration and to protect against for chronic diseases. 2. In a deformation septum nose and external nose, the better results are by rhinoseptoplasty. 3. Rhinoseptoplasty in childhood must be led by minimal invasive surgery. 4. Children with deformation septum nose need an orthodontic examination.

16:30-16:45
Symposium 4

EXTERNAL RHINO-SURGERY IN CHILDREN

Wolfgang Stoll
ENT Dept. University Muenster, Muenster, Germany

On one hand external rhino-surgery in childhood is still considered as experimental surgery. On the other hand authors emphasized special nasoseptal pathology requires an external approach.

The analysis of these opinions and own experiences helped to find an acceptable outlook on this problem. We recommend open rhinoplasty for removal of ectodermic and other congenital malformations. Furthermore this technique should be reserved for most severe deformities of the ventro-cranial and ventro-caudal septum.

Up to now long-term experience are still limited, therefore we strongly recommend restriction of external surgery in regard to mild pathologies and cosmetic indication.

16:45-17:00
Symposium 4

COMPLICATIONS OF NASAL SURGERY IN CHILDREN

Ranko Mladina
ORL Department, University Hospital Salanta, Zagreb, Croatia

There are at least two relevant complications of surgery in children: midface “secondary deformation” and nasal growth impairment. Verwoerd’s have proved that mucoperichondrial elevation for septal surgery regularly causes intraperichondrial lesions which might lead to new cartilage formation. They proved that growth of the cut ends of the septal cartilage can overlap, presenting in this way side-to-side instead of end- to-end junction between two cartilaginous parts, leading to the formation of the septal spine or even septal deformity (“secondary deformity”) during further development. According to Verwoerd’s and Pirsig’s research, the best way to prevent secondary deformity after septal surgery in children is implantation of newly engineered autologous cartilage containing less differentiated chondrocytes.

WEDNESDAY

16:01-16:10
Symposium 4

ENDOSCOPIC RECONSTRUCTION OF CSF FISTULAE

P. Thulasi Das
Chennai Kaliappa Hospital 43, Chennai, India

Purpose: To investigate the use of endoscopic reconstruction of cerebrospinal fluid (CSF) fistulae.

Methods: Endoscopic reconstruction of CSF fistulae was used in 55 cases of primary spontaneous CSF rhinorrhea.

Results: In 55 cases of primary spontaneous CSF rhinorrhea, we had a success rate of 98.4% in the first attempt and an overall success rate of 100%, including revisions. None required craniotomy. Barring 2 patients showing early signs of meningitis in the immediate postoperative period and 1 developing a secondary mucocele of the frontal sinus, no major complications were encountered.

Conclusions: Endoscopic repair of CSF fistulae has become an accepted procedure, since it is simple, less morbid, and associated with few complications, compared to the intracranial procedure. A technique of reconstructing the CSF fistulae with free temporalis fascia and tragal and conchal cartilage grafts is described in this video presentation. The choice of graft material used for repair is dictated by the defect. Just enough tissue is used to reconstruct the defect, which results in faster healing. Besides, the tissue used matches the tissue lost in the defect.

16:40-16:50
Symposium 4

APPROACH TO THE FRONTAL SINUS

Seung Kyu Chung and Hun Jong Dhong
Sungkyunkwan University School of Medicine, Seoul, South Korea

Purpose: The approach to the frontal sinus is one of the most difficult in endoscopic sinus surgery. Anatomy of the frontal sinus and the frontal recess area is complicated. In this video, surgical anatomy of these areas is explained and an approach technique is suggested.

Methods: The space inside the anterior portion of the frontal bone is shown. The relationship between the uncinate process and the ethmoid bulla was analyzed in the coronal computed tomogram of the paranasal sinuses.

Results: The frontal sinus and suprabullar recess or supraorbital cell are in this space. The roof of the agger cell and the bullar lamella form the floor of the frontal sinus.

Conclusions: Confirmation of the united portion of the upper part of the uncinate process and the bullar lamella is helpful for frontal sinusotomy.

17:00-17:10
Symposium 4

MEGADOSE STEROIDS AND INTRANASAL OPTIC NERVE DECOMPRESSION IN THE TREATMENT OF TRAUMATIC OPTIC NEUROPATHY

Sea Yuong Jeon
Gyeong-Sang National University Hospital, Chinju, Korea

Purpose: To present our experience with endoscopic intranasal reconstruction of the medial orbital wall for blowout fractures.

Methods: After completing an intranasal ethmoidectomy, the herniated orbital contents are mobilized, and pushed back laterally. The shape of the medial orbital wall is fixed by a U-shaped Silastic sheet, and Merocel packings saturated with an antibiotic solution. The sheet and packing are kept for 4 weeks.

Results: We experienced 25 cases of intranasal reconstruction of the medial orbital wall for blowout fractures from 1993 to 1999. CT scan confirmed isolated medial orbital wall fracture in 15 patients, and complex orbital fractures in 10 patients. Thirteen patients developed enophthalmos, 12 had diplopia, and 10 had limitation of eye movement, Seven had no eye symptoms but had large defects of the orbital wall, anticipating a delayed enophthalmos. Surgery was performed when the eye function could be accurately assessed, usually at 7 to 14 days following the injury. Twenty-two out of 25 patients recovered completely without any residual eye symptoms or complications. Enophthalmos was not improved in 3 patients, and 2 of them had persistent diplopia. However, limitation of eye movement was relieved in all patients.

Conclusion: Endoscopic intranasal reconstruction is a choice of surgery for medial orbital wall fracture with good functional results and cosmetics advantage.

16:10-16:20
Cottle Award

CHRONIC RHINOSINUSITIS: IS THE NOSE REALLY INVOLVED?

Neil Bhattacharyya
Brigham & Women's Hospital, Harvard Medical School, Boston, MA, USA

Purpose: To determine if chronic rhinitis usually accompanies chronic sinusitis, critically examining the concept of chronic rhinosinusitis.

Methods: Paired specimens of nasal septal mucosa and ethmoid sinus mucosa were obtained in a prospective cohort of patients undergoing endoscopic sinus surgery for chronic rhinosinusitis. The histopathologic degree of inflammation for each specimen was scored on a 5-point rating scale. Cell counts were determined for eosinophils and inflammatory cells per high-power field (HPF). The degree of inflammation and inflammatory cell counts in the septal and ethmoid mucosa were compared.

Results: Forty-two ethmoid-septal biopsy specimen pairs were examined. Mean patient age was 40.5 y. Mean Lund score was 9.3. The inflammation grade of the septal mucosa was within 1 point of the ethmoid mucosa in 36 cases (85.7%) and correlated exactly in 24 (57.1%). A statistically significant correlation was found between septal and ethmoid mucosa inflammation grades ($P = 0.048$). No significant difference in mean noneosinophilic inflammatory cell count per HPF was noted between ethmoid mucosa and septal mucosa. Ethmoid mucosa had a significantly higher mean eosinophil count than septal mucosa (6.6 versus 1.9 cells/HPF, $P < 0.001$). For combined inflammatory cell counts, no significant difference was noted.

Conclusion: Histopathologic evidence of rhinitis is associated with chronic sinusitis. This supports the concept of rhinosinusitis rather than sinusitis alone. Eosinophils are found in significantly higher numbers in sinus mucosa than in nasal mucosa, suggesting a site-specific role in sinus inflammation.

16:40-16:40
Cottle Award

REGIONAL VARIATIONS IN THICKNESS OF THE HUMAN NASAL SEPTUM AND NASAL GROWTH

J. van Loosen, H. L. Verwoerd-Verhoef, C. D. A. Verwoerd
Erasmus University Medical Center Rotterdam, Rotterdam, The Netherlands

Purpose: Regional differences in thickness of the human cartilaginous nasal septum were reported for the neonatal period. In this study, thickness of the human septal cartilage was investigated at later ages.

Methods: Eight human nasal septa were collected post mortem. Age varied from newborn to 42 y. Sections (5 microns) were prepared every 2.5 mm, for the entire length of the septum. Three-dimensional representations were constructed, measuring the thickness in various areas of the septum.

Results: A marked increase in thickness, from 400 to 3,500 microns, occurs in the neonatal septum from anterior to posterior. During further growth, the most anterior part of the septum remains thin and nowhere exceeds 1,000 microns. The posterior part of the septum starts to ossify in the second year of life, resulting in a progressive loss of the thickest cartilage posteriorly. The ratio between thin and thicker areas decreases from 1:9 in the neonate to 1:6 in the adult. Endochondral ossification is balanced by simultaneous growth of the cartilage. Two marked zones of thicker cartilage are present in all specimens. The first, supporting the nasal dorsum, is initially based on the sphenoid but later on the caudal edge of the perpendicular plate. The second extends from the sphenoid to the anterior nasal spine.

Conclusions: This study demonstrated that 1) the human nasal septum is characterized by a specific 3-dimensional architecture; it is assumed that the parts of the septal cartilage play a specific role in nasal and midfacial growth; 2) the thickness in the zones of the nasal cartilage hardly increases during growth of the child; and 3) the sagittal dimensions of the cartilaginous part of the septum are constant after the 2nd year of life.

17:00-17:10
Cottle Award

DUALISTIC PHYSIOLOGIC EFFECTS OF NOCTURNAL EXTERNAL NASAL DILATION IN SNORERS—SOLVING A RHINOLOGIC CONTROVERSY?

Per G. Djupesland, Olav Skatvedt, Anne Kari Borgersen
Ullevaal University Hospital, Oslo, Norway

Purpose: To study the effect of external dilation on nasal airway dimensions, sleep architecture, and snoring.

Methods: Eighteen heavy snorers without severe obstructive sleep apnea syndrome reporting nocturnal nasal obstruction were enrolled in a randomized (controlled) crossover study to evaluate subjective and objective effects of external nasal dilation (Breathe Right, CNS, Inc, Bloomington, MN, USA). Polysomnography, recording of snoring sound, and repeated acoustic rhinometry were performed on 2 consecutive nights, 1 with the active dilator and 1 with a placebo strip.

Results: Nasal dimensions increased significantly with the active dilator compared with placebo, both in the evening and in the morning. In a subgroup of habitual snorers with severe morning obstruction, external dilation significantly improved the mean sleep and the percentage of sleep. Duration of snoring remained unchanged regardless of the subgrouping.

Conclusions: Objective beneficial effects of external nasal dilation were restricted to a subgroup of habitual heavy snorers. There may be a narrow range of nasal dimensions (relative to ventilation) that is optimal for serving the many physiologic functions of the nose.

15:00-15:08
Free Paper
Session 3

IS "NO" THE ANSWER TO EOSINOPHILIC FUNGAL RHINOSINUSITIS?

Per G. Djupesland
Ullevål University Hospital, Oslo, Norway

A hypothesis as to the role of fungi in the pathogenesis of chronic rhinosinusitis (CRS) is presented.

At the interface between the innate and adaptive immune systems lies the high-output/inducible isoform of nitric oxide synthase (iNOS). In the paranasal sinuses a particular iNOS isoform is expressed continuously in epithelial cells, producing high levels of nitric oxide (NO). NO promotes ciliary motility and inhibits multiplication of pathogenic microorganisms, including fungi. In CRS, cystic fibrosis, and primary ciliary dysfunction, nasal NO levels are markedly reduced. Long-term antibiotics significantly reduce skin NO synthesis, presumably by altering the sweat acidity and nitrate contents and the skin commensal bacterial and fungal flora. Similar mechanisms may be involved in CRS. Many nonpathogenic fungi of the genera found in CRS are capable of reducing nitrite anaerobically to form NO. Failure of fungi to act as inducers of NOS may be related to their virulence, and the presence of a polysaccharide capsule appears to mask the signal necessary for NO production. Furthermore, fungal proteases released from pathogenic fungal strains may decrease the physical epithelial barrier and elicit an inflammatory response against the fungi.

It is conceivable that the nonpathogenic fungi in nasal mucin may play a protective role by inducing NO production, whereas mutations (induced by long-term antibiotics, steroids, etc.) of the same genera (not producing NO) may elicit a damaging immune response. Coupled with genetically reduced epithelial NO synthesis, ciliostasis, and altered mucin composition and viscosity, this may contribute to the chronic eosinophilic inflammation in CRS.

15:08-15:16
Free Paper
Session 3

NITRIC OXIDE IN THE NASAL AIRWAY—A NEW DIMENSION IN OTORHINOLARYNGOLOGY

Per G. Djupesland, Jose M. Chatkin, Wei Qian, James S. J. Haight
Ullevål University Hospital, Oslo, Norway

Purpose: Throughout the last decade, nitric oxide (NO) has been found to play important roles in various physiologic and pathophysiologic processes, including vasoregulation, hemostasis, neurotransmission, immune defense, and respiration. The objective of this review was to highlight some aspects of the origin, physiology, and functions of upper airway NO.

The high concentrations of NO in the nasal airway and paranasal sinuses have important implications for understanding nasal airway physiology and the concept of "the united airways." Inhalation of nasal NO causes bronchodilation and improves oxygen uptake in the lungs. Consequently, in patients with upper airway obstruction, restoration of normal autoinhalation of nasal NO may improve pulmonary function and other remote physiologic processes. Furthermore, normal levels of NO contribute to the first-line defense against microorganisms by its antiviral, antifungal, and antimicrobial activity and by up-regulation of ciliary motility.

However, NO, like several other mediators, has a dualistic function. Airway NO levels are increased in airway inflammation, such as that occurring with asthma, allergic rhinitis, and viral respiratory infections, but are reduced in sinusitis, cystic fibrosis, primary ciliary dysfunction, and chronic cough and after exposure to tobacco and alcohol. NO may prove valuable as a simple noninvasive diagnostic marker of airway pathologies.

Conclusion: An understanding of the high NO levels in the nose and paranasal sinuses may alter our current conceptions of airway physiology.

16:01-16:08
Free Paper
Session 4

SINONASAL DISEASES IN PATIENTS WITH BRONCHIECTASIS: RESULTS OF A PROSPECTIVE STUDY IN 20 PATIENTS

Brugel-Ribere, Bassinet, Escudier, Coste
Hopital Intercommunal, Creteil, France

Purpose: The origin of diffuse bronchiectasis remains unknown in 50% of cases. The aim of this prospective study was to evaluate sinonasal disease in patients with bronchiectasis.

Methods: Twenty patients suffering from bronchiectasis were investigated using high-resolution pulmonary computed tomography (CT), CFTR gene analysis and sweat test, nasal endoscopy, nasal cytology with measure of ciliary beat frequency, nasal biopsy for ultrastructural analysis of cilia, bacterial analysis of mucus sampled in the middle meatus, and CT of the sinus.

Results: Six patients had no sinonasal pathology, 3 were free of sinonasal disease but had previous history of sinusitis, and 2 had chronic rhinitis with an increased percentage of squamous or mucous epithelial cells. In 2 patients, CT revealed a fungus ball of the frontal sinus. Two patients had a chronic rhinosinusitis with high sweat chloride values (1 with deltaF508/R117H mutation of CFTR), 2 patients had chronic edematous rhinosinusitis, and 1 had nasal polyposis. Two patients had chronic purulent rhinosinusitis with the same bacteria in nasal and bronchial secretions.

Conclusion: Among the 11 patients with a sinonasal disease, direct involvement of this disease in the evolution of bronchiectasis is likely in the 2 cases of chronic purulent rhinosinusitis. In the 2 cases with cystic fibrosis, this latter disease can explain both rhinosinusitis and bronchiectasis. In the 7 other cases the link between sinonasal and bronchial disease remains hypothetical.

16:08-16:16
Free Paper
Session 4

CAN ENDOSCOPIC NASAL SURGERY IMPROVE ASTHMA SYMPTOMS?

Richard Voegels, Fabrizio Ricci Romano, Josiane Aguiar, Carlos Eduardo Nigro
University of São Paulo, São Paulo, Brazil

Purpose: A large number of patients undergoing nasal surgery have asthma. We tried to determine the influence of endoscopic nasal surgery on the management of the pulmonary symptoms of these patients.

Methods: We did a retrospective study of the medical sheets of 40 patients who underwent endoscopic surgery for chronic rhinosinusitis and had asthma concomitantly. These patients were classified by age, sex, and nasal disease and were evaluated regarding their pulmonary conditions after surgery.

Results: After surgery, 67.5% of our patients had improvement of their asthma. None of them got worse. Polyposis occurred in 77.5% of the patients, and of these, 74.2% got better. Rhinitis occurred in 37.5% of the patients, and 66.6% of them had no improvement of the asthmatic condition. Of the patients with Widal's triad (7.5%), all got better.

Conclusion: We conclude that endoscopic nasal surgery could improve the asthmatic conditions in our patients. Therefore, we believe there is a relationship between these diseases.

16:28-16:36
Free Paper
Session 4

EFFECT OF WEB 2170 BS, PLATELET-ACTIVATING FACTOR RECEPTOR INHIBITOR IN THE RABBIT MODEL OF SINUSITIS

R. Murat Karasen, Yavuz Sutbeyaz, Celil Uslu, Cemal Gundogdu, Hasan Ozdemir
Ataturk University, Erzurum, Turkey

Purpose: Platelet-activating factor (PAF), a potent inflammatory mediator, is a biologically active phospholipid. Recent studies have shown that PAF may play an important role in the pathogenesis of inflammation. WEB 2170 BS has been shown to be a PAF antagonist both in vitro and in vivo. In this study, anti-inflammatory effects of WEB 2170 BS were investigated in a rabbit model of sinusitis.

Method: Sinusitis was induced by the maxillary sinus inoculation of killed Staphylococcus aureus after mechanical occlusion of each animal's anatomic ostium. Either WEB 2170 BS solution or placebo was administered intraperitoneally 2 h before sinus inoculation and was repeated twice daily for 4 d. Outcome of treatment was determined by measurement of myeloperoxidase activity in the samples of sinus mucosa and by histopathologic evaluation.

Results: Myeloperoxidase activity in the WEB 2170 BS-treated group was significantly lower than that in the control group. Histopathology of nasal mucosa indicated decreased inflammation in the treated group compared with the controls.

Conclusion: These results demonstrate that WEB 2170 BS can produce significant anti-inflammatory effects in this model of sinusitis.

16:28-16:36
Free Paper
Session 4

EFFECT OF WEB 2170 BS, PLATELET-ACTIVATING FACTOR RECEPTOR INHIBITOR IN THE RABBIT MODEL OF NASAL INFLAMMATION

R. Murat Karasen, Yavuz Sutbeyaz, Celil Uslu, Cemal Gundogdu
Ataturk University, Erzurum, Turkey

Purpose: Platelet-activating factor (PAF), a potent inflammatory mediator, is a biologically active phospholipid. PAF may play an important role in the pathogenesis of inflammation. WEB 2170 BS has been shown to be a PAF antagonist both in vitro and in vivo. In this study, anti-inflammatory effects of WEB 2170 BS were investigated in a rabbit model of sinusitis induced by the maxillary sinus inoculation of killed Staphylococcus aureus after mechanical occlusion of each animal's anatomic ostium.

Methods: Either WEB 2170 BS solution or placebo was administered intraperitoneally 2 h before sinus inoculation and was repeated twice daily for 4 d. Outcome of treatment was determined by measurement of myeloperoxidase activity in the samples of sinus mucosa and by histopathologic evaluation.

Results: Myeloperoxidase activity in the WEB 2170 BS-treated group was found to be significantly lower than that in the control group. Histopathology of nasal mucosa indicated decreased inflammation in the treated group compared with the controls.

Conclusion: These results demonstrate that WEB 2170 BS can produce significant anti-inflammatory effects in this model of sinusitis.

16:40-16:48
Free Paper
Session 4

THE MODIFIED LOTHROP: EFFICACY IN FRONTAL SINUS DISEASE

T. T. Tollefson, D. A. Nuckols, T. A. Sanford, T. T. Tsue, L. A. Hoover
University of Kansas, Kansas City, KS, USA

Purpose: Medical and surgical management of frontal sinusitis often presents a significant challenge. A review of the authors' experience with the modified Lothrop (ML) procedure has helped to determine specific selection criteria for surgical candidates for this procedure.

Methods: Retrospective analysis was performed on 36 patients ranging from 18 to 78 years old who underwent ML from 1997 to 2000.

Results: The overwhelming majority of patients had chronic frontal sinus infectious disease, but others were chronic polyp formers. A few patients had this approach for the removal of tumor. In excess of 75% of a patient's primary symptoms were improved or alleviated.

Conclusions: This report, with an accompanying video, details the authors' surgical technique with specific recommendations for a systematic procedure that limits complications and provides the best opportunity for long-term success. Postoperative surgical cavity management has been of great importance in achieving good frontal sinus drainage and access. Medical management, including saline, antiseptic, and antibiotic irrigations, plus courses of oral steroids, topical steroid sprays, and solutions, along with meticulous endoscopic surgical debridement have resulted in an acceptable success rate in this extremely difficult patient group.

16:48-16:56
Free Paper
Session 4

ALLERGIC FUNGAL SINUSITIS

S. Vlaminck
AZ St-Jan Hospital, Brugge, Belgium

Purpose: Allergic fungal sinusitis has been accepted widely as a distinct clinical entity. Diagnosis is mainly by pathology. Treatment is primarily surgical. Adjunctive antibiotics, systemic and local steroids, and nasal saline irrigations are used as needed. Endoscopic control is the standard in follow-up, because of recurrences.

Methods: Forty patients with proven AFS on histology (eosinophil layers, Charcot-Leyden crystals, and clearly demonstrated hyphae) have been reviewed. We mention also the 20 AFS-like patients (hyphae not demonstrated or cultured). Experiences gathered over the years provide some guidelines for ENT surgeons.

Results: All the patients were immunocompetent. Mean age was 55 years. No sex predominance was noted. Chronic rhinosinusitis was the indication for endoscopic surgery. In 18 of 33 available computed tomographic scans, a typical central hyperattenuation could be observed; 10 adjunctive soft windows showed a more pronounced central hyperattenuation. Immunologic work-up does not always show an allergic background. Therapy is individually tailored. Three groups can be identified: 1) inflammatory disease without normalization of the mucosa, 2) long intervals (more than 1 y) with complete normal mucosa on endoscopic control, and 3) short intervals of "endoscopic normalization" between recurrences.

Conclusion: Obtaining the allergic mucin is the key for diagnosis. The pathologist should be familiar with the typical features of the disease. Some radiologic features may be present before surgery. Surgery is mandatory for "complete exenteration" of the allergic mucin. Medical therapy is individually tailored on the basis of endoscopic surveillance.

17:00-17:08
Free Paper
Session 4

AN EXPERIENCE WITH ENDOSCOPIC SINUS SURGERY

Muhammad Ajmal and Ayub-ur-Rehman
Allied Hospital, Punjab Medical College, Faisalabad, Pakistan

Purpose: To evaluate the improvement in symptoms after endoscopic sinus surgery (ESS) as assessed by visual analog score and complications which may occur with this treatment.

Methods: A total of 50 patients who were considered fit for ESS underwent endoscopic examination of nose apart from detailed history and routine examination of nose. These patients were assessed after radiographs of the peripheral nervous system and computed tomographic (CT) scans and diagnosis were established and explained to patients. After informed consent, they were subjected to ESS.

Results: Headache, nasal blockage, and rhinorrhea were common presenting symptoms. Middle meatus blocked by small polypi was a common endoscopic finding. Best results of ESS were seen in improvement of headache, congestion, and blockage. Full recovery in rhinorrhea was seen in only 57% of patients. Number of complications was minimal.

Conclusions: ESS has assumed an important place in the treatment of chronic sinusitis. Complete knowledge of the anatomy, understanding of the principles of technique, and experience with the external ethmoidectomy approach are essential to minimize complications. Endoscope and CT scan should be used frequently to help diagnose sinus disease, and patients should be persuaded to have operation at an earlier stage.

17:08-17:16
Free Paper
Session 4

NASAL SEPTUM TRANSPOSITION IN SECONDARY RHINOPLASTY IN WHICH COLLAPSE OF THE NASAL TIP AND MEDIAL NOSE ENSUED

R. Zivkovic, M. Stankovic, S. Zivaljevic, D. Milisavljevic
The University Clinic of Ear, Nose and Throat, Nis, Serbia, Yugoslavia

Purpose: The aim of our paper is to show the solution in patients in whom the tip of the nose and medial nose had fallen after the first operation.

Methods: We report a retrospective review of 49 patients who were operated on at the University Clinic of Ear, Nose and Throat in Nis, Serbia.

Results: We show our experience with these patients for whom we used material from the septum and raised nasal tip, which were left with permanent effects without using transplants.

Conclusion: We report a new idea for the surgical technique, which can be performed worldwide.

17:20-17:28
Free Paper
Session 4

THE RELATIONSHIP BETWEEN OLFACTORY DYSFUNCTION AND CHRONIC SINUS DISEASE

Yongxiang Wei and Demin Han
Beijing Tongren Hospital, Beijing, China

Purpose: To research the relationship between olfactory dysfunction and chronic polypoid sinusitis.

Methods: Sixty patients who had chronic polypoid nasal sinusitis in combination with olfactory dysfunction had T & T testing (T & T olfactometer standard odors for measuring olfactory sense) before and after endoscopic sinus surgery (ESS). Immunohistochemical methods were used to observe olfactory marker protein (OMP), Tau, and neuron-specific enolase (NSE) antibody expression in olfactory mucosa.

Results: 1) In 60 cases, the percentage of mild, moderate, and severe olfactory disturbance was 15%, 48.3%, and 36.7%, respectively. After ESS, 31.7% patients recovered their olfactory function, the symptoms of 38.3% patients were improved, and the effective rate was 70%. 2) Pathologic changes: 26.7% cases had normal or mildly abnormal olfactory epithelium in type I, 53.3% cases had epithelium metaplasia or the amount of olfactory receptor neurons (ORNs) decrease in type II, and 20% cases had atrophic olfactory epithelia or ORNs disappear in type III sinusitis. 3) Immunohistochemical results: 81.6% cases expressed OMP in type I and type II, 9.1% cases expressed it weakly in type III, 86.8% cases expressed NSE in type I and type II, 13.6% cases expressed it weakly in type III, 87.5% cases showed Tau in type II and type III.

Conclusions: 1) Chronic polypoid sinusitis is often accompanied by olfactory dysfunction. 2) ESS helps solve olfactory dysfunction induced by chronic polypoid sinusitis. 3) Pathologic results of olfactory epithelium can provide morphologic evidence for the diagnosis of olfactory disturbance. OMP, NSE, and Tau can reflect the degree of lesion of olfactory mucosa and be used in clinical diagnosis and prognosis of olfactory dysfunction.

16:01-16:08
Free Paper
Session 5

THE VALUE OF MITOMYCIN-C IN ENDOSCOPIC SINUS SURGERY: A PRELIMINARY REPORT

Vijay K. Anand and Clark Huang
Weill Cornell Medical Center of The New York Presbyterian Hospital, New York, NY, USA

Purpose: Mitomycin-C is a chemotherapeutic agent that when used in minuscule doses is effective in diminishing the rate of scar tissue formation in opthalmologic and laryngologic uses. The purpose of the study was to find out if mitomycin would diminish the rate of synechia formation and have any adverse effects on sinonasal mucosa.

Methods: An Investigational Review Board-approved, double-blind prospective randomized trial was initiated at The New York Presbyterian Hospital. After routine endoscopic sinus surgery (ESS), mitomycin was randomly placed into 1 nasal cavity and left in for 5 min. The contralateral side, serving as the control, received only normal saline. Postoperatively, the patients were evaluated for mucosal quality and incidence of synechiae. Biopsy specimens were also taken for pathologic evaluation approximately 1 mo after surgery.

Results: As of March 2000, 12 patients have been enrolled in the study. No synechia has been detected on the sides receiving mitomycin (0%), whereas 2 cases of synechiae were present on the control sides (16.7%). No discernible gross mucosal differences were visualized between the 2 sides.

Conclusions: Synechia is the most common complication following ESS. These preliminary data show that the use of mitomycin at the end of ESS decreases the rate of synechia formation without causing damage to the sinonasal mucosa.

16:08-16:16
Free Paper
Session 5

CADAVERIC ANALYSIS OF THE VARIATIONS OF THE ANATOMY OF THE ANTERIOR ETHMOID ARTERY

Vijay Anand, Mukesh Prasad, Clark Huang, Jason Newman
Weill Cornell Medical Center of New York Presbyterian Hospital, New York, NY, USA

Purpose: To document the predominant position of the anterior ethmoid artery through dissection of 30 anterior ethmoid arteries from 16 cadaver heads.

Methods: Cadaveric dissection of the anterior ethmoid artery via both a Lynch incision external approach and endoscopic approach was completed on 30 specimens. Subsequently, measurements were made of the distance of the anterior ethmoid artery from the lacrimal crest via the external approach as well as from the nasal spine and nasolacrimal duct via the endoscopic approach.

Results: The anterior ethmoid artery was identified on average to be 23.3 mm (standard deviation, 6.0 mm) from the lacrimal bone via the external approach. Intranasal endoscopic evaluation showed the artery to be 59.1 mm (6.7 mm) from the nasal spine and 23.5 mm (4.7 mm) from the nasolacrimal duct.

Conclusions: Surgical experience and more recently computer-aided applications have assisted sinus surgeons in locating key structures which need to be preserved during sinus surgery. The anterior ethmoid artery, however, is one such structure that has eluded imaging. The data we present allow for an assessment of the position of the anterior ethmoid artery in cases of both external and endoscopic ethmoidectomies. These guidelines will prove beneficial in endoscopic sinus surgery, where identifying this crucial anatomic structure has been made difficult by previous dissection or poor landmarks.

16:20-16:28
Free Paper
Session 5

ENDOSCOPIC CHARACTERISTICS OF FRONTAL RECESS AND FRONTAL SINUS SURGERY

Zhou Bing, Han De Min, Liu Hua Chao, Zhang Luo
Affiliated Beijing Tongren Hospital of Capital University of Medical Sciences 2, Beijing, China

Purpose: The aim is to study the endoscopic anatomic characteristics of frontal recess and how to locate the frontal sinus ostium in endoscopic frontal sinus surgery.

Methods: We used combined methods of computed tomographic (CT) scan and endoscopy. The standard axial and coronal CT scan of 31 cases (46 sides) of chronic frontal sinusitis were made with bony windows (ww 1500 HU, wl 150 HU). We detected the anatomic characteristics of frontal recess with the endoscope during endoscopic sinus surgery. We tried to divide the endoscopic characteristics of frontal recess into 4 types.

Results: In 42 sides (91.3%) frontal recess drains between the uncinate and middle turbinate when uncinate process is attached to the lamina papyracea and in 4 sides (8.7%) frontal recess drains directly into the infundibulum when uncinate process is attached to the roof of anterior skull base or the anterior superior part of attachment of middle turbinate. The uncinate process is the main anatomic landmark in frontal recess. We divided the anatomic characteristics of frontal recess into 4 types. Among them, type I is 27 sides (58.7%); type II, 15 sides (32.6%); type III, 3 sides (6.5%); and type IV, 1 side (2.2%).

Conclusions: The uncinate process plays a key role in the form of frontal drainage and is a dependable anatomic landmark in the CT scan and endoscopic frontal sinus surgery. CT scan is the effective and believable imaging method to evaluate frontal drainage and its adjacent structures.

16:28-16:36
Free Paper
Session 5

ALLERGIC FUNGAL SINUSITIS IN AN ANIMAL MODEL

George M. Brinson, Stuart M. Hardy, Brent A. Senior, Jiri Prazma
University of North Carolina School of Medicine, Chapel Hill, NC, USA

Purpose: Recently, there has been considerable interest among otolaryngologists in allergic fungal sinusitis (AFS). Several human studies have implicated AFS in chronic sinusitis, and the research implies that AFS accounts for a large portion of all cases of chronic sinusitis. Despite these data, there has been little basic-science research to investigate the pathophysiology of the disease. The goal of this project was to develop an animal model of AFS.

Methods: BALB/c mice were sensitized to Aspergillus fumigatus antigen through both intraperitoneal and intrasinus challenge. The mice were sacrificed after 4 wk of sensitization, and sinus tissue was analyzed histologically for signs of allergic fungal disease. Serum also was analyzed for eosinophilia.

Results: Although most mice lacked substantial peripheral eosinophilia, all mice treated with antigen demonstrated inflammatory changes characteristic of AFS.

Conclusions: An animal model was designed which can be used to further study the pathophysiology of AFS. With this model, researchers can investigate novel treatments for this challenging disease.

16:40-16:48
Free Paper
Session 5

ENDOSCOPIC TREATMENT OF ISOLATED SPHENOID LESIONS

P. Castelnuovo, F. Pagella, G. Delu', L. Semino
University of Pavia, IRCCS Policlinico S. Matteo, Pavia, Italy

Purpose: Sphenoid disease is usually insidious in onset and at the time of diagnosis, bony erosion with extension of the disease to the structures adjacent to the sphenoid is often present.

Methods: A total of 1,236 patients had endoscopic sinus surgery from November 1993 through December 1999. Twenty-seven patients with isolated sphenoid sinus disease were identified (age, 10 to 83 y; mean, 46.5 y; 11 patients were female). Mycotic sphenoid sinusitis was diagnosed in 11 subjects (40.7%), mucoceles in 7 (26%), bacterial sinusitis in 5 (18.5%), and 1 each of chondrosarcoma (3.7%), inverting papilloma, ossifying fibroma, and foreign body. The most frequent symptoms were: headache in 24 patients (88.9%), nasal obstruction in 5 (18.5%), and rhinorrhea in 2 (7.4%). Visual disturbances were present in 7 patients (25.9%). All patients were investigated with coronal and axial computed tomographic scans of the paranasal sinuses; a magnetic resonance image was performed in 9 patients. Fourteen patients underwent transethmoid sphenoidotomy, and 13 patients were treated with a transnasal approach. For anatomic reasons, endoscopic septoplasty was performed in 7 patients and traditional septoplasty in 1. A revision surgery under local anesthesia had to be performed in 2 patients to enlarge the sphenoidotomy because of scar stenosis.

Results: After 5 mo to 5 y, all patients are disease-free, with absence or considerable reduction of the symptoms. One patient still complains of total amaurosis.

Conclusion: Endoscopic surgery is the optimal technique for the treatment of isolated sphenoid disease. However, only early diagnosis and prompt treatment reduce the percentage of irreversible damage.

16:48-16:56
Free Paper
Session 5

ENDOSCOPIC ANATOMIC STUDY OF THE CAVERNOUS SINUS AND PTERYGOMAXILLARY FOSSA

P. Castelnuovo, A. M. Poletti, P. Palma, M. Bignami
University of Pavia, Pavia, Italy

Purpose: To provide a sharp picture of the different neurovascular structures as seen by endoscopic approach.

Methods: Two fresh-frozen heads were used, one with vascular injection of colored resin. Transnasal transethmoid endoscopic dissection of the cavernous sinus and pterygomaxillary fossa was done after microscopic transcranial and endoscopic endocranial dissections.

Conclusion: The endosurgeon has to be familiar with the neurovascular anatomy and the paranasal sinuses.

17:00-17:08
Free Paper
Session 5

APPLICATION TECHNIQUES FOR THE USE OF MITOMYCIN-C TO PREVENT ADHESION FORMATION FOLLOWING SINONASAL SURGERY

Mathew J. Cosenza and Ralph B. Metson
Massachusetts Eye and Ear Infirmary, Harvard Medical School, Boston, MA, USA

Purpose: Postoperative adhesion formation is one of the most common causes of recurrent symptoms after sinonasal surgery. Mitomycin-C is an antineoplastic antibiotic that has been shown to reduce postoperative scar formation after ophthalmologic surgery. This agent may also have a role in the reduction of adhesion formation and ostial stenosis after sinonasal surgery.

Methods: Mitomycin-C was applied to either the right or left middle meatus at the conclusion of sinus surgery in 35 patients. The contralateral side served as a control. Application times varied from 2 to10 min. Concentrations ranged from 0.4 to 1.0 mg/mL. Application devices included a 2-mm microswab, a 5-mm cotton-tipped applicator, or a 2.0-cm2 cotton pledget.

Results: Patients underwent endoscopic examination of the surgical site at 1 wk, 1 mo, and 2 mo after surgery. All patients appeared to heal well without evidence of infection or delayed mucosalization. Use of the 1 mg/mL concentration appeared to result in an increase in mucosal edema during the first postoperative week. One month after surgery, there was no statistically significant difference in adhesion formation or ostial stenosis between the application side and the control side regardless of differences in the concentration of mitomycin-C, exposure time, or application device.

Conclusion: The application of mitomycin-C to the region of the maxillary and frontal sinus ostia at the conclusion of surgery can be done with relative ease and a minimum of deleterious effects on mucosal healing. The incidence of postoperative adhesions is being studied with larger numbers of patients.

17:08-17:16
Free Paper
Session 5

ALLERGIC FUNGAL SINUSITIS: MANAGEMENT AND FOLLOW-UP

Rajesh K. Dhir and A. K. Gupta
General Hospital and Pgimer, Chandigarh, U. T., India

Purpose: Our purpose was to study the clinical, mycologic, and therapeutic aspects of patients with allergic fungal sinusitis.

Methods: The operative specimens of 16 consecutive patients with paranasal sinus mycosis diagnosed on the basis of history, clinical presentation, and radiologic findings were sent for microscopic examination, culture, and histopathologic examination for confirmation of diagnosis. All cases were regularly followed up.

Results: The patients were age 14 to 57 y; 11 were male; 10 had a rural background. They presented with a history of nasal obstruction (100%), rhinorrhea (87.5%), rhinogenic headache (75%), and proptosis (25%) of 1-1.5 y duration; 8 had bronchial asthma and 2 had allergic bronchitis. All patients were immunocompetent. Computed tomographic scan of paranasal sinuses showed a heterogeneous soft tissue density mass involving ethmoids (100%), maxillary sinus (75%), sphenoid sinus (31.25%), and frontal sinus (12.5%) and bowing of lamina papyracea (12.5%). Intranasal ethmoidectomy was done in 37.5%; external ethmoidectomy (Lynch Howarth approach), 31.25%; intranasal ethmoidectomy with sphenoidotomy, 31.25%, and Caldwell-Luc, 12.5% cases. Fungal culture revealed Aspergillus flavus (62.5%), A fumigatus (25%), and A niger (12.5%). Histopathologic study showed inflammatory (allergic) polypi with eosinophilic mucin. All patients received local steroids for 6 mo.

Conclusions: All diagnosed patients should be treated with clearance and drainage of diseased sinuses. A regular follow-up is important to diagnose early recurrence. Oral antifungal therapy has no role. The overall cure rate was 87.5%.

16:01-16:08
Free Paper
Session 6

FUNCTIONAL ENDOSCOPIC SINUS SURGERY (FESS) SURGICAL TECHNIQUES AND HOW TO AVOID COMPLICATIONS

Yousef El Hefny
Mafraq Hospital, Abu Dhabi, UAE

Purpose: This presentation highlights the steps by which surgeons may embark on endoscopic sinus surgery (ESS) and how to avoid complications.

Methods: The orientation of the surgeon with the anatomic landmarks of the lateral nasal wall is mandatory. Patients should be evaluated endoscopically using 0 and 30 degrees telescope and radiologically using computed tomography, coronal and axial view of bony window but mostly coronal view. The steps of ESS include ethmoidal infundibulotomy, ethmoidectomy (anterior and posterior), and frontal recess resection. Sphenoidectomy will be demonstrated with emphasis on how to avoid complications in each step.

Results: The following potential complications of FESS are the minor, major, and fatal complications. Minor complications are epiphora, periorbital hematoma, bleeding from inferior turbinate or middle turbinate, and injury of the anterior or posterior ethmoid artery. Major complications are those injuries of optic nerve, internal carotid artery, base of the skull, and cerebrospinal fluid leak. Fatal complications are injuries of the base of the skull, intracranial hemorrhage, cerebral injuries, and death.

Conclusions: FESS is a type of endoscopic surgery that requires utmost care in dealing with the vital structures and preservation of the intranasal anatomic landmarks and also understanding of the anatomy of lateral nasal wall, which can be achieved by comprehensive training. Cadaver dissections are mandatory to obtain direct experience on how to avoid complications during FESS. Good illumination and visualization are a must to avoid complication.

16:08-16:16
Free Paper
Session 6

ENDOSCOPIC ENDONASAL SURGERY AND GRAVES OPHTHALMOPATHY

Ph. Eloy, Ph. Rombaux, B. Bertrand
Catholic University of Louvain, Louvain, Belgium

Purpose: To assess the validity of the endonasal endoscopic approach for the resection of tumors located in the nasopharynx with or without extension to the nasal fossa, the sphenoid sinus, or the internal portion of the pterygopalatine fossa.

Patients: Three male teenagers underwent a successful endoscopic endonasal resection of juvenile angiofibroma (JNA). The mean age was 16.7 y (range, 13-20 y). In all cases, preoperative arteriography and selective embolization of the nutrient arterial branches from the external carotid system were done. In one case, the tumor was located in the nasopharynx. In the second case, the tumor extended to the sphenoid sinus. In the third case, the tumor invaded the nasal fossa, the sphenoid sinus, and the internal portion of the pterygopalatine fossa.

Result: All 3 patients were free of symptoms with a follow-up of at least 6 mo (range, 6 mo-4 y). The magnetic resonance image showed no evidence of recurrence or persistence of the JNA.

Conclusion: Resection of JNA through a transnasal endoscopic approach is a safe and effective surgical treatment for JNA extending to the nasal fossa, the sphenoid sinus, the ethmoid sinus, and the medial part of the pterygopalatine fossa. The surgeon should be experienced and trained in endoscopic sinus surgery before starting this kind of surgery, which remains the most difficult one to be performed.

16:20-16:28
Free Paper
Session 6

THE FRONTAL SINUS: INDICATIONS AND RESULTS OF THERAPEUTIC AND PROPHYLACTIC SURGERY

Michael Friedman, Roee Landsberg, David Caldarelli
Rush-Presbyterian-St. Luke's Medical Center, Chicago, IL, USA

Purpose: At the conclusion of this presentation, the participants should be able to understand the surgical anatomy of the frontal sinus and how it can direct the surgical approach.

Methods: We treated 250 patients with a surgical technique that relies on the superior attachment of the uncinate as the key landmark. Patients' complaints, computed tomography findings (based on the Kennedy staging system), intraoperative findings, and results were studied over a 2-y period with minimum follow-up of 12 mo. We will describe the surgical technique in detail, including the following key points: superior uncinate identification and removal, agger nasi dissection, and removal of the bulla lamella superior attachment to achieve continuity between the posterior wall of the frontal sinus and the ethmoid roof. We will also explain the principles of frontal sinus exploration for prevention of iatrogenic frontal sinus disease.

Results: Postoperative results, including patient complaints and frontal sinus patency, were recorded. The patency rate is approximately 85% and is comparable to patency rates of any other sinus surgery.

Conclusion: The best way to protect or treat the frontal sinus is to identify key anatomic landmarks. During ethmoid surgery, avoidance does not guarantee protection of the frontal sinus outflow tract. When disruption of the frontal recess is suspected, frontal recess dissection is indicated to achieve patency. Stenting of the frontal sinus is not routinely indicated.

WEDNESDAY

16:28-16:36
Free Paper
Session 6

OBSTRUCTION OF THE OSTEOMEATAL COMPLEX BY AN ECTOPIC THIRD MOLAR

Usamah Hadi, Abdel Salam Hasbini, Joseph Ghafari
American University of Beirut Medical Center, Beirut, Lebanon

Purpose: To report the infrequent occurrence of an ectopic third molar at the level of the osteomeatal complex and the endoscopic removal of the tooth along with an associated dentigerous cyst in a 21-y-old man who had a left-sided nasal obstruction for 2 y.

Methods and Results: On endoscopic evaluation, a medial bulge at the level of the middle turbinate was observed. Computed tomography of the paranasal sinuses showed an aberrant tooth, presumably a third molar, obstructing the left osteomeatal complex and bulging into the ethmoid infundibulum. In addition, the entire left maxillary sinus showed opacity that was indicative of cystic formation. A transnasal endoscopic sinus technique was used to create a large middle meatal antrostomy to remove the tooth and the cystic content and wall. Dental radiographic and clinical records, as well as the surgical specimen, confirmed that the impacted tooth was a third molar. Pathologic analysis disclosed the nature of the cyst as dentigerous. After recovery from surgery, the patient was able to breathe through his nose.

Conclusion: The position of the tooth at the level of the osteomeatal complex, as well as use of a surgical approach less morbid than commonly used methods (eg, Caldwell-Luc), warrant presentation, particularly because of the available literature in which most ectopic teeth are described at other sites within the maxillary sinus.

16:40-16:48
Free Paper
Session 6

ENDOSCOPY AND SURGICAL CAPABILITY ENHANCEMENT

Mohamed Zaki Helal
Ain Shams University, Cairo, Egypt

Approaches to nasal sinuses and cranial base are difficult because of anatomic complexity and presence of nearby vital structures. To reach deep areas, normal tissues have to be either radically extirpated or mobilized. Endoscopy is superior to visually unaided conventional surgery in minimizing the need to mobilize or extirpate normal structures. The angled panoramic endoscopic view with its unlimited depth of focus is the main factor in visualizing deep hidden recesses. Spatial orientation of anatomy is best with endoscopes, and the magnification effect can be appreciated by coming closer to the target. Microscopy, on other hand, has limited value in conserving cranial base anatomy and function and in anatomy orientation, yet it is better for close-up examination and valuable for tissue identification and detailed study.

If augmented with endoscopes, limits of exposure of extracranial skull base approaches are considerably expanded. Sphenoidotomy approaches are enhanced with endoscopy, and safe manipulations in its lateral wall are achieved under adequate visual control. Transseptal sphenoid approach alone is suitable for sphenoid and sellar lesions. If augmented with endoscopes, limits of exposure are considerably expanded to clivus and nasopharynx. Skull base repairs are refined by endoscopes, with their illumination and perfect front view facing the skull base. Orbitotomy and intraorbital manipulations are also enhanced and refined if augmented with endoscopes. Video clips will be presented.

16:48-16:56
Free Paper
Session 6

NASAL NITRIC OXIDE BEFORE AND AFTER FUNCTIONAL ENDOSCOPIC SINUS SURGERY: THE IMPACT OF INDICATION AND OF MIDDLE MEATAL ANTROSTOMY DIAMETER

Mark Jorissen, Lefevere, Verleden
UZLeuven, Leuven, Belgium

Purpose: Nasal nitric oxide (NO) is a recently recognized local airway defense mechanism. The values in different diseases and the effect of surgery and contributing factors after surgery are largely unknown.

Methods: In a prospective study, nasal NO was measured preoperatively and 7 wk after functional endoscopic sinus surgery (FESS) in 31 patients. The indications were nasal polyps (POL) (n = 11), chronic sinusitis (CHS) (n = 13), and noninflammatory disease including recurrent acute sinusitis with anatomic variants (VAR) (n = 7). The size of the maxillary sinus opening was measured 7 wk after FESS. Nasal NO was measured in parts per billion by a chemiluminescence-analyzor (CLD 700 AL, sampling flow 0.77 L/min) via a tube in one nostril with the contralateral nostril open, while breath-holding.

Results: Preoperatively, nasal NO was 171 ± 118 in POL, 341 ± 203 in CHS, and 649 ± 138 in VAR. These differences were statistically significant ($P < 0.05$). Seven weeks after surgery, nasal NO was 336 ± 204, 328 ± 157, and 533 ± 77 in POL, CHS, and VAR, respectively. There was a statistically significant increase of nasal NO in POL after surgery ($P = 0.007$). The values of nasal NO postoperatively correlated with the diameter of the maxillary sinus opening (linear regression, nasal NO = 15.8 x diam, mm + 135; $R2 = 0.38$).

Conclusion: Nasal NO correlates inversely with the inflammatory component of the disease. Nasal NO increases after FESS in POL, and it correlates with the diameter of the maxillary sinus opening.

17:00-17:08
Free Paper
Session 6

CUTTING VERSUS NONCUTTING FORCEPS IN ENDOSCOPIC SINUS SURGERY

Mark Jorissen, Vauterin, Vander Poorten
UZLeuven, Leuven, Belgium

Purpose: The instruments used during endoscopic sinus surgery are judged of great importance for the final outcome. Because the superiority of cutting forceps compared to classic forceps regarding mucosal healing is based only on personal experience, we intended to compare the outcome of cutting forceps with that of non-cutting forceps.

Methods: A prospective, randomized, double-blind study was conducted in 100 patients consecutively operated on for bilateral benign sinus disease. In each patient, cutting forceps were used on one side (randomly assigned) and noncutting forceps on the other side. Each patient served as his own control. Lateralized symptoms (headache, maxillary pressure, nasal obstruction, secretions, and a global evaluation) were recorded daily for the first 3 wk and approximately 1 y after surgery. Endoscopic evaluation (blood, pus, secretions, crusts, edema, polyps, adhesions) was done weekly during the first 3 wk and 1 y after surgery.

Results: Both types of instruments resulted in reduction of symptoms and endoscopically visible healing over time. No significant difference was found in symptom relief or in endoscopic improvement. Also, 1 year after surgery no significant differences were found between the cutting and the noncutting instrument groups. Indication for surgery and extent of surgery had no effect.

Conclusions: Cutting forceps result in a similar healing process as noncutting forceps.

WEDNESDAY

17:08-17:16
Free Paper
Session 6

THE PLACE OF SEPTOPLASTY IN FESS

Kevin J. Kane
Royal Victorian Eye and Ear Hospital, East Melbourne, Victoria, Australia

Purpose: A valid cohort of 72 patients suffering from chronic rhinosinusitis and nasal obstruction were investigated with rhinomanometry before surgery and then separated into those requiring functional endoscopic sinus surgery (FESS) alone or FESS combined with a septoplasty at the same operation to clear their nasal obstruction.

Method: Results are outlined by the measured change in rhinomanometry recordings before and after surgery together with a sinonasal outcome test (SNOT) 20 filled in by each patient before surgery and at 6 mo postoperatively.

Results: The results of these tests show a statistically valid improvement in airway freedom measured objectively by rhinomanometry and subjectively by the SNOT 20 tool.

Conclusion: The study conclusion showed that rhinomanometry is a useful test in separating patients with nasal obstruction and chronic rhinosinusitis who require septal surgery and endoscopic sinus surgery from those who merely require FESS alone.

16:00-17:20
Mini-Course 6

ALLOPLAST IN ESTHETIC AND FUNCTIONAL NASAL SURGERY

Kris Conrad
University of Toronto, Mount Sinai Hospital, Toronto, Ontario, Canada

The use of alloplasts in rhinoplasty remains controversial. Physical properties, unlimited supply, practicality (no donor site morbidity) and stability of implants compared with grafts have a motivation in the search for materials with high biocompatibility. Expanded polytetrafluoroethylene (Gore-Tex) and high density polyethylene (Medpor) have an unparalleled safety record in Facial Plastic Surgery. Their use in reconstructive and cosmetic nasal surgery will be discussed, focusing on the indications, surgical techniques, advantages and the disadvantages associated with these templates.

16:40-17:20
Mini-Course 8

HEREDITARY HEMORRHAGIC TELEANGIECTASIA: INDICATIONS, SURGICAL TECHNIQUES, EXPERIENCE, AND RESULTS

M.L. Facer, G.W. Facer
Mayo Clinic, Mayo Foundation, Rochester, MN, USA

Purpose: This lecture course is a thorough review of Hereditary Hemorrhagic Telangiectasia (HHT) including the pathophysiology, clinical manifestations, and medical and surgical management. HHT is a non-sex linked autosomal dominant systemic vascular dysplastic disorder usually involving small blood vessels. The participants will become more familiar with HHT. The surgical management will be emphasized and the authors' modification of septal dermoplasty will be detailed.

Methods: The Mayo Clinic records of patient with HHT between January 1972 and December 1999 were reviewed. The demographics, symptoms, organ systems affected, and the effectiveness of medical and surgical treatment were assessed.

Results: Epistaxis (91 %) was the most common symptom. Females (60%) more commonly developed the disorder than males. Other organ systems were involved including: lung (27%), gastrointestinal system (23%), central nervous system (3%), liver (2%), and kidney (1%). Treatment modalities include cautery, laser coagulation, topical and systemic estrogen therapy, septal dermoplasty, arterial ligation, and arterial embolization. Epistaxis was severe enough in 29% of patients to require one or more blood transfusions, 25% of HHT patients underwent septal dermoplasty. Following surgery 68% noted improvement in epistaxis and none were worse.

Conclusions: HHT is a rare potentially life threatening systemic disorder frequently resulting in epistaxis. Medical and surgical therapy may be considered. Septal dermoplasty is effective in the management of HHT patients with significant epistaxis.

16:00-17:20
Mini-Course 9

VASOMOTOR RHINITIS - INSTRUCTIONAL MINI-COURSE

Robert M. Bumsted
Rush Medical Center, Chicago, IL, USA

Vasomotor rhinitis (VMR) (non-allergenic rhinitis) is excessive swelling of the nasal mucosa for which no underlying etiology can be detected. This condition is often associated with an underlying intranasal structural problem such as a deviated nasal septum. Barometric pressure changes, temperature changes, environmental irritants (smoke), strong odors and occasional alcohol (especially wine or beer) frequently aggravate it. Symptoms frequently include nasal stuffiness, drainage, and headaches or facial pain. The nasal obstruction may cause decreased sense of taste and smell, dry mouth, frequent sore throats or upper respiratory infections.

Therapy includes medical treatment with antihistamines, decongestants, anticholinergics, and topical nasal steroids. Chemical cautery (or acid burn) of the nasal lining will be described in detail. Surgical therapy includes the use of cryotherapy, laser, coblation and electro-cautery. By combining medical therapy, chemical cautery and surgical procedures, the vast majority of patients will experience significant improvement or elimination of their symptoms of VMR.