PS1-1-1 Presidential address
Kenji Ohata
Department of Neurosurgery, Osaka City University Graduate School of Medicine, Japan

PS1-1-2 How endoscope can support skull base microsurgery
Madjid Samii
INI Hannover, Germany

The microsurgical technique with different approaches has made it possible to reach all pathological lesions at skull base. The introduction of endoscope and development of special instruments has created a complimentary step for further skull base surgery. From one side the use of endoscope has been overemphasized and exaggerated with even more complications, from the other side the combined endoscopic microsurgery has extended our possibilities to achieve the radicalness of the surgical procedure but in the same time to be minimal invasive. Different examples will be demonstrated.

PS1-1-3 Skull base surgery: The premise and the promise
Ossama Al-Mefty
Department of Neurosurgery, Brigham and Women’s Hospital, Harvard Medical School, USA

PS1-2-1 Training for risk management in skull base surgery: Is it rocket science?
Jacques Morcos
Department of Neurosurgery, University of Miami, USA

PS1-2-2 Risk management for human spaceflight system and operations
Kanecaki Narita
Japan Aerospace Exploration Agency, Japan

PS2-1-1 The cavernous sinus – The avalanche in the skull base surgery since 1986: Past, present and future perspectives
Vinko V. Dolenc
Department of Neurosurgery, University Clinical Centre Ljubljana, Slovenia

More than 30 years ago, it was possible to follow the anatomical studies and clinical work of previous authors: Taptas, Parkinson, Hakuba and Peacock, and to start with well programmed neuro-anatomical dissections in the laboratory. Spending time in the neuro-anatomical laboratory and working on the injected fresh cadaver specimens, the anatomical relationship of the complex structures in the parasellar compartment became better understood regarding the location of the vascular and/or tumorous pathologies in the region, and their effects on the complex normal anatomy. Understanding the coursing of the ICA throughout the skull base and relation of its individual segments to the CNs, it was possible to realize the safe triangular windows through which the access to the parasellar compartment was possible. Based on this new knowledge, operating the tumorous lesions in the CS has been changed dramatically. Previously, without proper knowledge of the anatomy of the CS, the tumors in the region were “pulling” the surgeon into the parasellar compartment. The new approaches with appropriate knowledge of the complex anatomy were completely the opposite, and that is that the surgeons could understand where they “were” in the CS, and they could anticipate the encountering of the vital neural and vascular structures before they actually “met” them while resecting the tumor from the CS. These new approaches did represent the upside down approaches in comparison to the previous ones. The most “conscious” neurosurgeons did avoid entering the CS prior to accumulate necessary – mandatory – knowledge of the relevant anatomy. But those who did not spent enough time in the laboratory and were not satisfied with their results, could endanger the CS surgery with their own fame and incompetence. And that’s why they started to advertise their opinion that the CS surgery is too dangerous, and that radiosurgery is “omni-potent” in solving the problems in treatment of tumorous lesions in the region.

The contemporary policy for surgery in CS might still be in favor for radiosurgery. With the series of serious new-comers into the field of parasellar surgery, the correct balance between the microsurgical and radiosurgical modalities will be established. And this is the future I can see from my perspective.

And at the end, without being dogmatic, I do believe that the anatomy – though complex – should be respected. Despite being a neurosurgeon
I do not believe that the scalpel is the ultimate answer for the treatment of tumors. I do believe that the ultimate solution will be biochemical. However, for the time being we have to be practical and we have to treat the patients according to our best knowledge of the normal and pathological anatomy of the region.

**PS2-1-2**  
**Skull base high flow bypass 130 case**  
Takanori Fukushima  
Department of Neurosurgery, Duke University Medical Center, USA

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**PS2-1-3**  
**Chinese skull base surgery: History and current situation**  
Liwei Zhang  
Department of Neurosurgery, Beijing Tian Tan Hospital, China

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**PS2-1-4**  
**Skull base surgery: Graduation from art to science**  
Basant K. Misra  
Department of Neurosurgery, PD Hinduja National Hospital and Medical Research Centre, India

Introduction: Giant intracranial aneurysms (GIA) are treacherous lesions with significant risks in management. A retrospective analysis of our strategy and results with microsurgery of GIA in the 21st century is presented.  

Material and Method: The author has operated on 133 GIAs microsurgically till July 2014. 109 patients have been operated since 2000, the material of this presentation. Age ranged from 2 to 73 years and the female to male ratio was 2:1. 91 were in the anterior circulation and 18 in the posterior circulation. Various Intraoperative neuroprotection measures were taken and a postoperative check angiogram was routinely performed.  

Results: Exclusion of the aneurysm from the circulation by direct repair (clipping, aneurysmorhaphy, excision & suture) was done in 65. Flow diversion and ECIC bypass was done in 35, high flow bypass in 33 and STMC in 2. Trapping was done in 11. Temporary ECIC protective bypass was done in 3. Hypothermic cardiac arrest was used in 2 cases of giant basilar artery aneurysm with femoro-femoral bypass for direct repair. Dedicated skull base approach and lumbar drainage helped in avoiding brain retraction. Postoperative outcome was good in 79%, poor in 16% and 5 patients died.  

Conclusions: Judicious surgical strategy and appropriate technology can result in good outcome in nearly 80% of cases of GIA. Majority of the GIA can be treated microsurgically, the preferred modality today.

**PS2-1-5**  
**Surgical decision making in petroclival meningiomas**  
Jacques Morcos  
Department of Neurosurgery, University of Miami, USA

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**PS2-2-1**  
**Lateral skull base approaches for skull base paragangliomas: Experience of over 400 cases**  
Mario Sanna, Alessandra Russo, Sampath Chandra Prasad Rao, Gianluca Piras  
Gruppo Otologico, Italy

BACKGROUND: The purpose of this study was to share our review of surgical strategies and long-term outcomes in the management of Skull Base paragangliomas.  

METHODS: Retrospective study with a literature review. The records of 465 patients with tympanojugular, tympanomastoid, vagal and carotid body paragangliomas were analyzed for tumor class, surgical procedure, preoperative vascular management, and perioperative sequelae.  

RESULTS: 150 patients had tympanomastoid, 278 tympanojugular, 27 vagal and 10 carotid body paragangliomas respectively. 56.2% tumors had intracranial extensions and 4.3% involved the vertebral artery. A single-stage procedure was adopted in 85.4% tumors. The infratemporal fossa type A approach was used in most of the tympanojugular paragangliomas. In 9.7% patients, an intra-arterial stenting of the internal carotid artery was performed. Gross-total tumor removal was achieved in 89.7% of patients and 2.4% among them developed a recurrence.  

CONCLUSION: A thorough understanding of skull base techniques and a logical decision-making process in the management of skull base paragangliomas can achieve a high rate of success in terms of recurrences and complications.
Endoscopic management of sinonasal malignancy: Oncologic outcomes

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Endoscopic endonasal surgery (EES) for the management of sinonasal malignancy (SNM) remains controversial. Interpretation of oncologic results is hampered by diverse histologic types with different biological behaviors, misdiagnosis, changing treatment paradigms and advancements in non-surgical therapies, and lack of adequate follow up. Surgical options include complete oncological resection, debulking prior to radiochemotherapy, salvage surgery following radiochemotherapy, and palliative surgery. Skull base involvement with dural/brain invasion is not an absolute contraindication to EES. Limitations of EES include lateral spread over the roof of the orbit and involvement of the frontal sinus and orbit. Treatment strategy depends on the biological behavior of the tumor and extent of disease. Low-grade SNM is best managed with EES followed by radiation therapy. High-grade SNM is often treated with radiochemotherapy followed by surgical salvage. Data from our institution suggests that most patients with recurrent SNM benefit from EES. Prognostic criteria are used to develop treatment algorithms that stratify patients into operative and palliative care pathways.

Sinonasal cancers: Progress, challenges, and future directions

Ehab Hanna
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Progress in prognosis of patients with nasal and paranasal carcinoma has been made during the last 40 years (Figure). This is probably due to advances in both the evaluation and treatment of these patients. Office endoscopy and high-resolution imaging allow better assessment of the extent of disease and hence better treatment planning. Advances in cranial base surgery and microvascular reconstruction have allowed more adequate resection of advanced sinonasal cancer, even if it involved the cranial base. Improvements in the delivery of radiation therapy using highly conformal radiation such as IMRT or proton therapy have allowed more targeted and homogenous dosimetry to the tumor while sparing nearby critical structures. The integration of more effective chemotherapeutic and targeted agents in the overall management of patients with sinonasal cancer has improved local control of the disease.

Hearing rehabilitation with cochlear implant in patients with single side deafness after translabyrinthine resection of tumours of the inner ear canal

Jörg Schipper
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Surgical strategy for small acoustic neuroma having good hearing

Shingo Murakami
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Final goal of acoustic neuroma (AN) surgery is total removal of tumor with functional preservation. We have operated 84 cases with small AN via middle cranial fossa approach. Hearing preservation of class A or B AAO-HNS classification was achieved in 72.0%, useful hearing of class A, B or C in 84%. Class A hearing was more highly preserved in intracanalicular tumor (46%) than small tumor (30%). Class A hearing was achieved only in 20% of the patients with the tumor extended to the lateral end of IAC whereas it was in 49% of the patients with absent of tumor in fundus. Class A or B hearing was achieved more highly in patients with the tumor arising from SVN (93%) than IVN (64%). Useful hearing of class A or B was restored 89% in patients having class A hearing preoperatively whereas it was only in 59% of the patients with having class B hearing preoperatively. These data concluded that healing preservation can be achieved more frequently in patients having intracanalicular tumor, empty fundus, SVN tumor and preoperative class A hearing. I will discuss surgical strategy for small acoustic neuroma having good hearing.

Meningiomas of craniocervical junction

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In this paper the author will present his experience in the management of 45 patients with meningiomas of craniocervical Junction. The surgical technique, approach selection, results and
challenging ones. Not that long ago petroclival meningiomas were deemed surgically untreatable and cp angle tumours as ones with morbidity/mortality (MM) rate unacceptably high. Recent neurosurgery, employing surgical microscope, ultrasound aspirator, neuromonitoring, intensive care and above all MR imaging, allows much safer treatment now. However, we still face several important and unsolved problems. We have rather high MM rate in tumours of petroclival (and not only petroclival) location. Another problem is taxonomy. We need simple, easy to understand and repeatable definition of various locations of PFM. We have reviewed our series of 186 PFM over the 15 years period (2001-2015). In the lecture only the MM versus localisation is adressed. At first we have divided the PFM into 1.spehopetroclival and petroclival, 2.cerebellopontine angle (CPA), 3. junction of transverse, petrosus superior and sigmoid, 4.torcuar-rectus-pineal, 5.tentorium, 6.incisural edge and 7.CC junction. However, we felt this grouping unsatisfactory with many overlaps. We then dividend the tumors into the 2 groups only 1.anterior to the cranial nerves and 2.posterior to the nerves. GOS 1-3 on the first group was 10,4%, GOS 4 37,6% (n=77) while in group 2. GOS 1-3 was 1,8% and GOS 4 in 10% (n=109). The diference is statistically significant. Five of eight group 1 patients were operand with decreased GCS prior to Sumery, this was also the case in one of two patients in group 2.

Recent departmental policy is to divide PFM into the two groups only - 1. Anterior to the cranial nerves and 2. dorsal to the nerves. In the group 2. we aim at resection Simpson 1 or 2 in all surgical candidates. In the group 1. we also aim at Simpson 1 or 2 but other options are carefully evaluated, both observation in asymptomatic patients and radiosurgery in symptomatic ones. During surgery in these patients whenever we encounter difficulties and dangers we restrict ourselves to maximum safe resection controlled by intraoperative MR. Remnants are than either observed or treated by gamma knife.

**PS3-1-2 Struggles in the anatomical jewel box: Cavernous sinus meningiomas**

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**Objective** Cavernous sinus meningiomas (CSMs) represent a cohort of challenging skull base tumors. Proper management requires achieving a balance between optimal resection, restoration of cranial nerve (CN) function, and maintaining or improving quality of life. The objective of this study was to assess the pre-, intra-, and postoperative factors related to clinical and neurological outcomes, morbidity, mortality, and tumor control in patients with CSM.

**Methods** A retrospective review of a single surgeon’s experience with microsurgical removal of CSM in 72 patients between January 1996 and April 2016 was done. Sekhar’s classification, modified Kobayashi grading, and the Karnofsky Performance Scale were used to define tumor extension, tumor removal, and clinical outcomes, respectively.

**Results** Preoperative CN dysfunction was evident in 63.9% of patients. CN II deficits were most common. The greatest improvement was seen for CN V deficits, whereas CN II and CN IV deficits showed the smallest degree of recovery. Complete resection was achieved in 41.7% of cases and was not significantly associated with functional CN recovery. Internal carotid artery encasement significantly limited the complete microscopic resection of CSM (p < 0.0001). Overall, 19.4% of patients showed symptomatic recurrence after their initial surgery (mean follow-up 60.8 months [range 3–199 months]). The use of adjuvant stereotactic radiosurgery (SRS) after microsurgery independently decreased the recurrence rate (p = 0.009; OR 0.036; 95% CI 0.003–0.430).

**Conclusions** Modified Kobayashi tumor resection (Grades I–IIIB) was possible in 41.7% of patients. CN recovery and tumor control were independent of extent of tumor removal. The combination of resection and adjuvant SRS can achieve excellent tumor control. Furthermore, the use of adjuvant SRS independently decreases the recurrence rates of CSM.

**PS3-1-3 Posterior fossa meningiomas**

Vladimír Beneš
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Posterior fossa meningiomas (PFM) constitute some 10% of all meningiomas. PFM are both, the surgically easiest tumours and also the most challenging ones. Not that long ago petroclival meningiomas were deemed surgically untreatable and cp angle tumours as ones with morbidity/mortality (MM) rate unacceptably high. Recent neurosurgery, employing surgical microscope, ultrasound aspirator, neuromonitoring, intensive care and above all MR imaging, allows much safer treatment now. However, we still face several important and unsolved problems. We have rather high MM rate in tumours of petroclival (and not only petroclival) location. Another problem is taxonomy. We need simple, easy to understand and repeatable definition of various locations of PFM. We have reviewed our series of 186 PFM over the 15 years period (2001-2015). In the lecture only the MM versus localisation is adressed. At first we have divided the PFM into 1.spehopetroclival and petroclival, 2.cerebellopontine angle (CPA), 3. junction of transverse, petrosus superior and sigmoid, 4.torcuar-rectus-pineal, 5.tentorium, 6.incisural edge and 7.CC junction. However, we felt this grouping unsatisfactory with many overlaps. We then dividend the tumors into the 2 groups only 1.anterior to the cranial nerves and 2.posterior to the nerves. GOS 1-3 on the first group was 10,4%, GOS 4 37,6% (n=77) while in group 2. GOS 1-3 was 1,8% and GOS 4 in 10% (n=109). The diference is statistically significant. Five of eight group 1 patients were operand with decreased GCS prior to Sumery, this was also the case in one of two patients in group 2.

Recent departmental policy is to divide PFM into the two groups only - 1. Anterior to the cranial nerves and 2. dorsal to the nerves. In the group 2. we aim at resection Simpson 1 or 2 in all surgical candidates. In the group 1. we also aim at Simpson 1 or 2 but other options are carefully evaluated, both observation in asymptomatic patients and radiosurgery in symptomatic ones. During surgery in these patients whenever we encounter difficulties and dangers we restrict ourselves to maximum safe resection controlled by intraoperative MR. Remnants are than either observed or treated by gamma knife.

**PS3-1-4 Decompressive surgery for cavernous meningioma**

William Couldwell
Department of Neurosurgery, University of Utah, USA
PS3-2-1  Current understanding of the meningioma genome
Ian F. Dunn
Department of Neurosurgery, Brigham and Women’s Hospital, USA

PS3-2-2  Prospective evaluation of molecular prognostication markers in clival chordomas
Paul A. Gardner
Department of Neurological Surgery, University of Pittsburgh Medical Center, USA

Object: To evaluate a molecular prognostication panel for clival chordomas.
Methods: Ki-67 and fluorescent in situ hybridization for 1p36 and 9p21 (p16) were prospectively evaluated in 92 clival chordomas and correlated with radiographic progression free survival after surgery (RPFSS) and radiation (RPFSR). Median follow-up was 45 months.
Results: We found that each percentile increase in tumor cells with homozygous 9p21 (p16) deletion (p=0.001), 1p36 deletion (p=0.012), 1p hyperploidy (p=0.018), and Ki-67 staining (p=0.001) were predictive of a shorter RPFSS. Increasing percentages of cells with homozygous 9p21 (p16) deletions (p<0.001) and Ki67 (p=0.001) were also predictive of a shorter RPFSR. Ki-67 remained unchanged in 72% of recurring tumors. Prior irradiation inversely correlated with increases in Ki-67 over 5% (r=0.392; p=0.029).
Conclusion: Targeting HER2 may be promising avenue for the development of novel therapies for SNUC.

PS3-2-3  Molecular characterization of sinonasal undifferentiated carcinoma - Update
Yoko Takahashi
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Objective: Sinonasal undifferentiated carcinoma (SNUC) is a rare, highly aggressive cancer that arises in the nasal cavity and paranasal sinuses. Molecular profiling of SNUC is essential to understand the biological features of SNUC and help develop new therapies.
Methods: To examine genomic alterations in SNUC, we performed whole genome sequencing (WGS) in one of the SNUC cell lines we had established before. Phosphorylation and expression levels of tyrosine kinase receptors and several protein kinases were evaluated by western blot analysis.
Results: The analysis of WGS showed deletion of putative tumor suppressor genes and amplification of oncogenes. We also identified potential mutations in tumor suppressor genes. These mutations and amplification might be integrated to a few major pathways including HER2.
Finally, we examined HER2 signaling in the SNUC cell line. HER2 was overexpressed and phosphorylated. Treatment with lapatinib effectively inhibited HER2 signaling pathway in our SNUC cell line and suppressed growth of the SNUC cells both in vitro and in vivo.
Conclusion: Targeting HER2 may be promising avenue for the development of novel therapies for SNUC.

PS3-2-4  Intracranial pressure revisited: A novel intravascular receptor detected
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INTRODUCTION: The molecular regulation of intracranial blood pressure is poorly understood and specific receptors for homeostasis have not been identified. However, the endolymphatic sac (ES) and surrounding tissue have been suggested to house such a receptor. METHODS: Using fresh human ES’s harvested by vestibular schwannoma surgery, standard light microscopy and transmission electron microscopy was used for morphological analysis, and both DNA microarrays and immuno-histochemistry for molecular biology.
RESULTS: The morphological picture in the subepithelial capillary network was consistent with the occurrence of intravascular situated cells, whose cell bodies penetrated the endothelial wall. Two cell types are described with the morphological appearance of neuroendocrine cells or nerve terminals. This was strongly supported by the DNA analysis, and confirmed by immuno-histochemistry. CONCLUSION: We hypothesize that the capillary network interposed between the human ES and sigmoid sinus hosts a dopamine dependent intravascular receptor, which may react to changes in intracranial pressure and/or plasma sodium concentration.
PS3-3-1  Understanding the intricacies of endoscopic endonasal carotid dissection
Arturo Solares
Department of Otolaryngology, Center for Cranial Base Surgery, Georgia Regents University, USA

PS3-3-2  Recognition and management of late complications of anterior skull base surgery
Stacey Gray
Department of Otolaryngology, Massachusetts Eye and Ear, Harvard Medical School, USA

PS3-3-3  Extent of surgical resection in the management of sinonasal and skull base malignancies: Is there a role for structure preservation?
Derrie T. Lin
Department of Otolaryngology, Massachusetts Eye and Ear, Harvard Medical School, USA

PS3-3-4  Lateral skull base reconstruction- when fat is not the answer
Rupert Obholzer
Department of ENT, King’s College, UK