PD1-1-1 Auditory brainstem implants

Robert Behr
Department of Neurosurgery, Klinikum Fulda Academic Hospital of the University of Marburg, Germany

PD1-1-2 Hearing rehabilitation in NF2

James R. Tysome
Department of ENT Cambridge University Hospitals, UK

Hearing loss resulting from bilateral vestibular schwannomas (VSs) has a significant effect on the quality of life of patients with neurofibromatosis Type 2 (NF2). A national consensus protocol was produced in England in 2011 as a guide for cochlear implantation (CI) and auditory brainstem implantation (ABI) in these patients.
Patients should undergo more detailed hearing assessment once their maximum aided speech discrimination score falls below 50% in the better hearing ear. Bamford-Kowal-Bench sentence testing scores below 50% should trigger assessment for auditory implantation. Where this occurs in patients with bilateral stable VS or a unilateral stable VS where the contralateral cochlear nerve was lost at previous surgery, CI should be considered. Where VS surgery is planned, CI should be considered where cochlear nerve preservation is thought possible, otherwise an ABI should be considered. Intraoperative testing may be used to determine whether a CI or ABI is inserted.
Multisite, prospective assessments of this protocol have resulted in an increase in CI in NF2. This provides an essential model for evaluating candidacy and outcomes in this challenging patient population.

PD1-1-3 Evaluation of clinical factors of NF2 from nationwide registry data in Japan.

Kensho Iwatate[1], Kiyoshi Saito[1], Takeshi Yokoo[2], Eriko Iwatate[2], Jun Sakuma[1], Masazumi Fujii[1], Masahiro Ichikawa[1], Taku Sato[1], Yugo Kishida[1], Shinya Jinguji[1]
[1]Department of Neurosurgery, Fukushima Medical University, [2]University of Texas Southwestern Medical Center, Dallas, TX

Background: NF2 is a rare disease. The clinical features and prognosis are variable and with little data available inform optimal management decisions. **Objective:** To characterize the clinical, oncological, and neurological features of the NF2 in Japan and determine the risk factors for symptomatic progression.**Methods:** Japanese Ministry of Health, Labor, and Welfare NF2 nationwide survey data between 2009-2013 of 807 patients. Risk factors of neurological progression were identified using univariate and multivariate analyses. **Result and Conclusion**: The clinical characteristics of the Japanese NF2 population were: mean age 28.1 yrs, and male-to-female ratio of 43.8:56.2%. Family history was present in 66.7%. Severity score progressed by $\geq$ 3-points in 86.4% of patients over the 5-year study period. The significant risk factors of progression included: younger age at diagnosis (p=0.002), intracranial meningioma (p=0.033), hearing loss (p=0.001), facial paralysis (p=0.008), dysphasia/dysarthria (p=0.025), vision loss (p<0.001), hemiparesis (p=0.006) and lower initial severity score (p<0.001).

PD1-1-4 Growth patterns of intracranial tumors in neurofibromatosis Type 2

Steffen Klaus Rosahl, Anna Cecilia Lawson Mclean
Department of Neurosurgery, HELIOS Klinikum, Erfurt, Germany

Objective: To investigate volumetrically the median growth rate per year, the length of growth-free intervals, and the growth patterns of intracranial tumors in patients suffering from neurofibromatosis type 2 (NF2).
Methods: MR images of 188 tumors from 52 patients were included. Median follow-up time was 76.5 months (range 13 - 199 months). Tumors that had undergone previous radiation or chemotherapy were excluded. 39 vestibular schwannomas (VS), 95 meningiomas (M), 23 non-vestibular schwannomas (NVS) and 31 tumors of the cerebello-pontine angle that had been subjected to surgery previously (TX) were investigated.
Results: Median time to significant tumor progression was 21 months for VS, NVS and TX, and 17 months for M. Saltatory growth with intervals between episodes of expansion was the most common growth pattern (46.85%), followed by linear (29.37%), and exponential growth (11.89%). 5.59% of tumors remained stable and 6.29% decreased in size.
Conclusions: Saltatory growth necessitates longer follow-up periods when assessing the results of non-surgical treatment (radiosurgery, chemotherapy). M and untreated VS grow more rapidly than NVS and TX.

PD1-1-5 Dynamic Contrast Enhancement in MRI as a tool for assessing and predicting response to Bevacizumab treatment for Vestibular Schwannoma in NF2

Hannah Jd North, Simon K Lloyd, Ibrahim Ka Djoukhadar, K Li, X Zhu, Scott A Rutherford, Andrew T King, Charlotte L Hammerbeck-Ward, Simon Rm Freeman, D Gareth Evans, Alan Jackson
Salford Royal Foundation Trust, England

Object: Dynamic contrast enhancement MRI (DCE MRI) is a molecular imaging technique that measures the difference in signal intensity following changes in contrast agent (CA) concentration. It allows us to estimate the vascular permeability (K*trans*) and interstitial fluid volume ($R1_n$). Our aim was to determine if these biomarkers correlate with effect of Bevacizumab on tumour growth and response to treatment.
Method: 12 patients with NF2 who met criteria for Bevacizumab were commenced on treatment dose of 5mg/kg fortnightly. K*trans* and $R1_n$ were correlated with tumour volume, change in volume and percentage change in volume.
Result: Treatment response correlated with a decrease in vascular permeability (K_{trans}, 0.684) and an increase in interstitial fluid volume ($R1_n$, -0.913). Pre treatment K_{trans} was significantly lower in non responders ($p<0.05$). Non responders had significantly higher $R1_n$ pre treatment ($p<0.001$).
Conclusion: Decrease in vascular permeability (K*trans*) correlates as a biomarker with reduction in tumour volume and tumour growth. A higher K*trans* prior to treatment suggests vestibular schwannoma is more likely to respond to Bevacizumab.

PD1-1-6 Activity and toxicity of bevacizumab treatment for neurofibromatosis- 2 related vestibular schwannoma

Scott Plotkin
Department of Neurology and Cancer Center, Massachusetts General Hospital, USA

PD2-1-1 Robotic system for neurosurgery

William Couldwell
Department of Neurosurgery, University of Utah, USA

PD2-1-2 Validation of precision for a multi-port approach to the cochlea

Jörg Schipper
Department of Otorhinolaryngology, University Hospital Düsseldorf, Germany

PD2-1-3 Medical engineering and micro-neurosurgery

Akio Morita[1], Shigeo Sora[2], Hirogfumi Nakatomi[3], Kanako Harada[4], Naohiko Sugita[4], Nobuhito Saito[3], Mamoru Mitsuishi[4]
[1]Department of Neurological Surgery, Nippon Medical School, Japan, [2]Department of Neurosurgery,Tokyo Metropolitan Police Hospital, Japan, [3]Department of Neurosurgery, University of Tokyo, Japan,[4]Department of Engineering Synthesis, University to Tokyo, Japan

Introduction: Robotics and medical engineering can convert traditional surgery into digital and scientific procedures. In this review, we introduce our trials in developing microsurgical robotic systems and applying engineering technology in assessing microsurgical skills.
Methods: With collaboration of neurosurgeons and engineering team, we have developed two types of microsurgical robotic system (deep and superficial super-fine). Both are constructed with master and slave manipulator robots. Another trials are digitalization of surgical technique and scientific analysis of surgical skills. Robotic and human hand motions are analyzed in numerical fashion and we tried to define surgical skillfulness in digital formats.
Results: Robotic system (MM-1, 2) provided secure and accurate procedure in the deep surgical field. Super fine robotic system (MM-3) made very fine surgery doable and will be applied in clinical trials. Engineered skill assessment is feasible and should be useful in future training of microsurgery.
Conclusions: Robotics and medical engineering should bring science into surgical field and training.

PD2-1-4 Development of robotics neurosurgery

Tetsuya Goto[1], Kazuhiro Hongo[1], Shigeaki Kobayashi[2]
[1]Department of Neurosurgery, Shinshu University School of Medicine, [2]Medical Research and Education Center and Stroke and Brain Center, Aizawa Hospital

Robotics neurosurgery has been developed from 1996 in Shinshu University. 1) NeuRobot (microscopic micromanipulator): NeuRobot has 3-dimention endoscope and 3 microinstruments

with 4 degrees of freedom in the 10 mm of insertion tube. The NeuRobot is controlled by tele-manipuilated. The NeuRobot has been developed with Tokyo University, Tokyo Woman's Medical University, and HITACHI corporation. 2) EXPERT (intelligent surgeon's arm supporting robot): The EXPERT holds surgen's arm in microscopic neurosurgery. It has no motors but the joints are controlled by robotics technology. Surgeon can control the EXPERT without any attentions. The EXPERT has been developed with Waseda University, Tokyo Woman's Medical University, and HITACHI corporation. 3) iArmS: Further development of EXPERT with DENSO corporation producted iArmS, which was put in the market since the spring of 2015. Conclusions: The development of robotics surgery is concentration of knowledge of surgeon and engineers, in university and industry. Further development will create more precise and safe micro-neurosurgery.

PD2-1-5 Advances of robotic cochlear implantation in Bern, Switzerland

Marco Domenico Caversaccio[1,2], Stefan Weber[2], Nicolas Gerber[2], Kate Gavaghan[2], Wilhelm Wimmer[2], Franca Wagner[3], Christof Rathgeb[2], Tom Williamson[2], Juan Anso[2]

[1]University Hospital Bern, Department of ORL, Head and Neck surgery, [2]Artorgcenter, [3]neuroradiology

This work aims to evaluate the accuracy and usability of the developed system in a study on human temporal specimens. A complete surgical workflow for robotic assisted minimally invasive cochlear Implantation was developed. In addition to standard image guidance, the system incorporates a number of redundant safety mechanisms including heat reduction through drilling process control, integrated facial nerve monitoring, intraoperative imaging, and drill position estimation in the homogeneous bone in the mastoid. The proposed workflow, the accuracy of the robotic system, and the effectiveness of the integrated safety features were evaluated in a total of 22 human temporal bone specimens. A drilling accuracy of 0.15±0.07 mm was observed at the round window of Cochlea.The System was approved by the Swissmedic regulatory and the Swiss Ethical Committee has given permission for a first in man clinical trial.

PD2-2-1 Endoscopic transcranial corridors to the lateral skull base

Daniele Marchioni

Otolaryngology Department, University Hospital of Verona, Italy

PD2-2-2 Exclusive endoscopic approach to the acoustic neuroma

Livio Presutti

Otolaryngology Department, University Hospital of Modena, Italy

PD2-2-3 Totally endoscopic transcanal infracochlear approach to a petrous apex cholesterol granuloma

Seiji Kakehata

Yamagata University Faculty of Medicine Department of Otolaryngoligy H&N, Japan

In patients with serviceable hearing, a cholesterol granuloma (CG) in the petrous apex (PA) is often surgically managed by complete drainage of the cyst and establishing ventilation to prevent recurrence. We performed a totally endoscopic transcanal infracochlear approach to treat a huge PA-CG which eroded the bony wall of the carotid artery, jugular bulb, internal acoustic canal and clivus. After a superiorly based tympanomeatal flap was elevated with a 2.7-mm endoscope, the prominence of the inferior external auditory canal (EAC) was removed to create a working space while preserving the bony tympanic ring. An infracochlear tunnel was opened into the space between the carotid artery, jugular bulb and cochlear with a 2-mm diamond curved burr and curettes. Then direct endoscopic visualization was established and as much of the granuloma as possible was removed with forceps and by suctioning. This totally endoscopic transcanal approach is less invasive and provides a more direct and closeup view of the infracochlear region as well as inside the petrous apex itself.

PD2-2-4 The Endoscopic Suprageniculate Approach

Nirmal Patel
Otology/ Neurotology/ Skull Base Surgeon Director, Kolling Deafness Research Centre, Macquarie University, Sydney, Australia

Endoscopic Ear Surgery offers minimally invasive access, with a superior view of middle ear anatomy and disease. The limits of the approach are now being extended to regions around the otic capsule and toward the petrous apex.
The suprageniculate approach describes a surgical pathway to the region above the geniculate ganglion of the facial nerve and therefore a superior approach to the petrous apex. The endoscopic approach allows access to the area in a total transcanal minimally invasive way.
This presentation will highlight the endoscopic anatomy of the region, surgical steps to endoscopic access and potential pathologies that may be treated with the approach.
The management of suprageniculate cholesteatoma spread will be demonstrated with emphasis on the endoscopic method.

PD2-2-5 Exclusively endoscopic resection of vestibular schwannoma and other CPA lesions

Robert Behr
Department of Neurosurgery, Academic Hospital of the University of Marburg, Germany

PD2-3-1 Common management strategies of Facial Nerve Schwannomas

Romain Kania, Philippe Herman, Benjamin Verillaud, Sebastien Froelich
Paris Sorbonne University, Paris 7 University, APHP

Facial nerve schwannomas (FNS) are rare benign tumors. Four treatment strategies exist for FNS: microsurgical excision, surgical decompression, follow-up and stereotactic radiosurgery.
There is controversy regarding the resection of facial nerve tumors of any size when the facial nerve function is normal or near normal (HB grade I-II). Preservation of the best possible facial nerve function must be prioritized regardless of the tumor size except in cases where the tumor is causing compressive symptoms, such as brainstem compression or labyrinthine erosion. Followup can be considered as a good management option. The advantages of stereotactic radiation include the avoidance of surgery, potential growth arrest of the tumor and possible preservation of facial nerve function. If patients exhibit a progressively worsening clinical and radiological condition (HB grade II-IV and radiological evidence of growth) treatments including, fallopian canal decompression, radiation or surgical resection with facial nerve repair are considered.
Stereotactic radiosurgery is an alternative for patients with early facial dysfunction (HB grade II-III).

PD2-3-2 Facial nerve schwannoma-consideration for the best outcome

Jong Woo Chung, Hwan Seo Lee, Chan Joo Yang, Woo Seok Kang
Department of Otorhinolaryngology-Head & Neck Surgery, University of Ulsan College of Medicine, Asan Medical Center

There are many different ways to manage facial nerve schwannoma. The main treatment of choice for FNS is surgical excision. However, decision-making is challenging for cases with no or subtle facial nerve palsy.
For the best outcome, purpose of surgery must be determined preoperatively. Selection of surgical approach is dependent on the location and the size of the mass. Facial nerve preservation surgery or observation therapy are good options if applicable.
We analyzed the clinical data of 32 patients with facial nerve schwannoma. Results showed that surgical excision is an effective method for treating facial nerve schwannoma and favorable facial nerve function is possible after surgery and reconstruction of the facial nerve.

PD2-3-3 Management of facial nerve tumor

Yang-Sun Cho
Department of ORL-HNS, Sungkyunkwan University, Samsung Medical Center

Although the estimate prevalence is extremely low, facial nerve schwannomas (FNS) are the most common primary tumor of the facial nerve.
The principal goal of management is to maximize facial function over the longest period possible in the absence of other symptoms demanding treatment.
In this talk, clinical manifestation and outcomes of 18 cases of FNS and 1 case of glomus faciale surgically-managed in Samsung Medical Center from 1999 to 2015 will be also introduced.
There are 8 men and 11 women, and their mean age was 42.0 years old. Tumor was completely removed in all cases and FN was reconstructed by cable graft, direct anastomosis or facial-hypoglossal hook-up. In 4 cases, FNS was located only in the IAC without facial palsy, and presented as vestibular schwannoma. Once identified as FNS in the IAC, these tumors should be managed conservatively as possible. Fascicle preservation surgery was not possible in most cases, and facial outcome was better in cases operated earlier after initiation of facial palsy.
Based on our experience, early House-Brackmann grade III is the best time point for surgical intervention.

PD2-3-4 Who is the best candidate for stripping technique in the facial nerve schwannoma?

In Seok Moon
Yonsei University Colleage of Medicine

Although clinical decision-making is complicated in the facial nerve schwannomas with good facial function, early nerve-sparing tumor resection, stripping technique, has been designed to minimize facial deficits associated with facial nerve schwannomas with good facial function.
We have tried a nerve-preserving stripping surgery on 28 patients with facial nerve schwannomas. The House-Brackmann grading(HBG) system was used to assess pre- and postoperative facial functions. Of the 28 patients 18 patients successfully underwent stripping surgery. Favorable recovery was only observed in 16 patients who underwent stripping surgery. Favorable facial function after nerve sparing stripping surgery were shown to the patients who had good preoperative facial function(HBG ≤II), small sized localized tumor and tumor located at geniculate ganglion and/or it's proximal portion.
Facial nerve-preserving technique can be

recommended to the facial nerve schwannoma patients who has preoperatively good facial function(HBG≤2), tumor located at geniculate ganglion less than two segment involved, small sized tumor.