SUPPLEMENT 3

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Skull Base Surgery 2030

6 – 7 December 2019

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26th Annual Scientific Meeting of The Hong Kong Neurosurgical Society

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Prof Kenji Ohata
Chairman, Department of Neurosurgery
Osaka City University Graduate School of Medicine
Japan

Guest for ASM Gala Dinner

Dr Hon Pierre Chan
Member of Legislative Council
Hong Kong

SCIENTIFIC PROGRAMME

Venue: Ballroom I & II, 7/F, Cordis Hong Kong at Langham Place, Mongkok, Hong Kong SAR

6 December 2019, Friday

08:00 – 08:30	Registration	Poster Room **EXHIBITION AND POSTERS**
08:30 – 08:40	**WELCOME SPEECH** ***Dr YC Po***	
08:40 – 09:20	**FREE PAPER I** Chairpersons: *Dr YC Po, Dr C Poon*	
09:20 – 09:50	**FREE PAPER II** Chairpersons: *Dr PH Chan, Dr Wilson Ho*	
09:50 – 10:10	Tea Break	
10:10 – 10:50	**FREE PAPER III** Chairpersons: *Dr KY Chan, Dr Wilson Ho*	
10:50 – 11:25	**KEYNOTE LECTURE I** **Surgery for Tuberculum sellae meningiomas** ***Prof Kenji Ohata*** Chairpersons: *Dr Larry Wong, Dr KY Yam*	
11:25 – 11:55	**KEYNOTE LECTURE II** **Surgery for Cavernous Sinus Meningiomas** ***Prof Kenji Ohata*** Chairpersons: *Dr MK Lam, Dr Michael Lee*	
11:55 – 12:20	**FREE PAPER IV** Chairpersons: *Dr Danny Chan, Dr Alain Wong*	
12:20 – 12:50	**KEYNOTE LECTURE III** **Surgery Nuances for Endoscopic Endonasal Approach to Central Skull Base Tumours** ***Prof Kenji Ohata*** Chairpersons: *Dr FC Cheung, Dr YT Kan*	
12:50 – 14:05	Lunch — Shanghai Room on 8/F	
14:05 – 14:40	**KEYNOTE LECTURE IV** **Endoscopic Versus Microscopic Approaches for Craniopharyngiomas: Choosing the Optimal Surgical Strategy** ***Prof James K Liu*** Chairpersons: *Dr KH Chan, Dr ST Wong*	
14:40 – 15:10	**KEYNOTE LECTURE V** **Endoscopic Versus Microscopic Approaches for Skull Base Chordomas: Choosing the Optimal Surgical Strategy** ***Prof James K Liu*** Chairpersons: *Dr Alain Wong, Dr CK Wong*	
15:10 – 15:30	Tea Break	
15:30 – 15:55	**FREE PAPER V** Chairpersons: *Dr KY Pang, Dr HT Wu*	
15:55 – 16:30	**KEYNOTE LECTURE VI** **Transpetrosal Approach** ***Prof Kenji Ohata*** Chairpersons: *Dr WM Hung, Dr HY Law*	

Venue for ASM Gala Dinner: 8/F, Shantung Room, Cordis Hong Kong at Langham Place

16:30 – 18:00	Cocktail Reception
18:00 – 20:30	**ASM GALA DINNER & LECTURE** **Healthcare Reform in Hong Kong** ***Dr Hon Pierre Chan***

7 December 2019, Saturday

08:00 – 08:30	Registration		Poster Room **EXHIBITION AND POSTERS**
08:30 – 09:10	**FREE PAPER VI** Chairpersons: *Dr TS Tse, Dr CC Wong*		
09:10 – 09:45	**KEYNOTE LECTURE VII** **Maximising Extent of Resection and Facial Nerve Function in Acoustic Neuromas Using the Subperineural Dissection Technique** ***Prof James K Liu*** Chairpersons: *Dr ST Chan, Dr HM Chiu*		
09:45 – 10:15	**KEYNOTE LECTURE VIII** **Surgical Management of Complex Sphenoid Wing Meningiomas** ***Prof James K Liu*** Chairpersons: *Dr KM Leung, Dr SC Yuen*		
10:15 – 10:35	Tea Break		
10:35 – 10:45	**HKNS & COC COMMISSIONED RESEARCH** Chairpersons: *Dr SW Lee, Prof G Wong*	**VENUE: BALLROOM III, NURSING SESSION** **Our Achievement, Advancement & Empowerment in the Decade** Chairpersons: *Ms CK Chan, Ms HY Ho*	
10:45 – 11:35	**FREE PAPER VII** Chairpersons: *Dr KY Chan, Prof W Poon*		
11:35 – 12:10	**KEYNOTE LECTURE IX** **Surgical Strategies for Petroclival Meningiomas** ***Prof KS Lee*** Chairpersons: *Dr YW Fan, Dr SC So*		
12:10 – 12:40	**KEYNOTE LECTURE X** **Improving Results of Skull Base Chordoma Surgery** ***Prof KS Lee*** Chairpersons: *Dr Dawson Fong, Dr CP Yu*		
12:40 – 12:50	Group Photo for All		
12:50 – 14:00	Lunch Buffet – on 4/F		
14:00 – 14:35	**KEYNOTE LECTURE XI** **Surgical Treatment of Trigeminal Schwannomas** ***Prof KS Lee*** Chairpersons: *Dr CF Fung, Dr Jenny Pu*		
14:35 – 15:05	**KEYNOTE LECTURE XII** **Transmastoid Approach to the Jugular foramen** ***Prof KS Lee*** Chairpersons: *Dr KF Fok, Dr WK Wong*		
15:05 – 15:30	Tea Break		
15:30 – 16:20	**FREE PAPER VIII** Chairpersons: *Dr Tony Chan, Dr YH Tse*		
16:20 – 16:30	Concluding Remarks		

FP 1.1

Predictive Value of Early Postoperative Random Growth Hormone on Remission of Acromegaly

Cynthia SY Yu, Michael KW See, Marco CL Kwan, Alain KS Wong, KY Chan
Department of Neurosurgery, Kwong Wah Hospital, Hong Kong SAR

Objective: To study the predictive value of early postoperative random growth hormone (GH) on long-term remission of acromegaly after transsphenoidal surgery.
Methods: Patients who underwent transsphenoidal surgery for GH-secreting pituitary tumour from 2003 to 2019 in Kwong Wah Hospital Neurosurgical Department were divided into three groups (Day 1-3, Day 4-14, >Day 14) according to time of first GH measurement after surgery. With reference to the Cortina guideline, remission was defined as GH nadir <2.4 mU/L after oral glucose tolerance test and normalisation of serum insulin-like growth factor 1 adjusted for age and sex. Predictive values on remission rate of the three groups were analysed with the receiver operating characteristic curve.
Results: Areas under the receiver operating characteristic curves for the Day 1-3, Day 4-14, and >Day 14 groups were 0.8873, 0.8379, and 0.8326, respectively.
Conclusion: The GH monitoring after surgery for the Day 1-3 group had the best predictive value of remission. The presence of remnant tumour ought to be investigated early if a patient does not show an appropriate decrease in GH after surgery. This result can aid the neurosurgeon make an early decision on postoperative imaging, adjunctive therapy, and re-operation.

FP 1.2

Water and Sodium Disorders after Operation of Sellar and Parasellar Region Tumours

WL Cheung, Erick Hon, WS Poon
Division of Neurosurgery, Department of Surgery, Prince of Wales Hospital, Hong Kong SAR

Objective: Sodium and water disorders, including diabetes insipidus, are often encountered following surgery for sellar and suprasellar tumour. The aim of the present study was to investigate the risk factors of developing postoperative diabetes insipidus. Desmopressin replacement for patients with diabetes insipidus was also reviewed.
Methods: We located all patients who underwent sellar or suprasellar surgery from January 2017 to December 2018 at Prince of Wales Hospital. These included both elective and emergency cases. They included transsphenoidal surgery, craniotomy, and transventricular endoscopic surgery. Patient demographics, histology, presence of other hormonal disorders perioperatively, perioperative sodium level, other surgical complications, and length of hospital stay were recorded. The incidence of diabetes insipidus and hyponatraemia was calculated.
Results: In total 59 patients were included (47 transsphenoidal surgery, 11 craniotomy and 1 transventricular endoscopic surgery). The overall incidence of diabetes insipidus was 29% (n=17). Of these 17 patients, 59% required long-term desmopressin replacement. The incidence of isolated hyponatraemia was 15%. Incidence of diabetes insipidus was highest for patients with rathke cleft cyst (67%), craniopharyngioma (100%), and germinoma (100%). Incidence of diabetes insipidus did not differ significantly among patients with other hormonal deficiency (eg, hypothyroidism and adrenal insufficiency) or other surgical complications (eg, haemorrhage, cerebrospinal fluid leak). Among three patients with known diabetes insipidus before surgery, all three (100%) developed hyponatraemia after surgery. Among 14 patients who did not have diabetes insipidus before surgery, five (35%) developed hyponatraemia after surgery. The eight patients with diabetes insipidus and hyponatraemia after surgery required long-term desmopressin replacement. Among eight patients with diabetes insipidus but normal sodium level after surgery, one required long-term desmopressin replacement. Those patients who had diabetes insipidus and hyponatraemia after surgery also had longer hospital stay compared with those with normal sodium level (23 days vs 12 days, P=0.024).
Conclusion: The incidence of diabetes insipidus was 29%, which is comparable to previous studies. Certain histology types such as rathke cleft cyst, craniopharyngioma, and germinoma are associated with high incidence of diabetes insipidus. Patients with known preoperative diabetes insipidus are prone to develop hyponatraemia. Patients with postoperative diabetes insipidus and hyponatraemia are likely to need long-term desmopressin replacement. This high-risk group should receive more attention to ensure a safe recovery after surgery.

Neurocritical Care for Primary Bacterial Ventriculitis

FP 1.3

KW See, Calvin HK Mak, FC Cheung
Department of Neurosurgery, Queen Elizabeth Hospital, Hong Kong SAR

Objectives: Primary bacterial ventriculitis (PBV) is a fatal complication of meningitis. Case definition and best treatment are yet to be determined. This study, the largest case series of PBV in the literature, aims to improve understanding of this disease.
Methods: The PBV is defined as inflammation of the ventricular system that were not iatrogenic, or secondary to ruptured brain abscess. Cases were identified in operation record listing from July 2009 to June 2019. Primary outcome is defined as modified Rankin scale (mRS) at 1 month and 12 months were recorded. Secondary outcomes include neurological complications (eg, chronic hydrocephalus, entrapped horns, venous thrombosis) and further interventions.
Results: Seventeen cases were identified. Risk factors included diabetes (33%) and nasopharyngeal carcinoma (27%). Klebsiella pneumonia was the commonest cause (40%). Klebsiella pneumonia was associated with underlying septic foci (eg, liver abscess) that need further intervention (P=0.011). Primary bacterial ventriculitis has high mortality (20% at 1 month and 53% at 12 months) and morbidity (only 20% achieving modified Rankin scale >3 at 12 months). External ventricular drain was inserted in all patients. Intra-operative finding of subdural effusion upon durotomy predicts cortical venous thrombosis (P=0.02). Neurological complications such as chronic hydrocephalus and entrapped horns occurred in 15 cases. Ten patients required further intervention including cerebrospinal fluid shunting and neuroendoscopy.
Conclusions: Neurocritical care for PBV should be multi-modal, including broad-spectrum antibiotics, cerebrospinal fluid drainage, active search for underlying septic foci, and vigilance in neurological complications.

Platelet Function Analysis Test for Occult Platelet Dysfunction Screening in Neurosurgical Practice

FP 1.4

SL Tse, KM Li, YW Fan
Hong Kong Neurosurgical Associates, Hong Kong SAR

Objective: To evaluate the efficacy of the platelet function analysis (PFA) test to screen for occult platelet dysfunction in neurosurgical patients.
Methods: During the period 2014 to 2018, 93 patients underwent PFA test to screen for occult platelet dysfunction before their elective neurosurgical operation. When PFA test showed a prolonged bleeding time, patient would be interviewed again for detailed drug history and bleeding history, and a repeat PFA test would be carried out. If repeat PFA test showed persistent prolonged bleeding time, a von Willebrand Panel test would be carried out, followed by a desmopressin challenge test. We examined the incidence of abnormal test results and their causes.
Results: In total, 14% of patients showed prolonged bleeding time in the first screening test. In all, 5% of all patients had persistent prolonged bleeding time on repeat PFA test. In total, 2% of all patients turned out that they had taken antiplatelet medication without revealing the drug history in the initial interview. Also, 3% of the screened patients had von Willebrand disease. All of them subsequently underwent surgery with either desmopressin or factor VIII cover without bleeding complication. There was no major haemorrhagic complication developed after surgery in this small series of patient.
Conclusion: We believe that PFA is a useful screening test and potentially able to help avoid bleeding complication in neurosurgery.

Neurosurgical Consultation: An Audit in a Regional Hospital in Hong Kong

FP 2.1

YK Wong, ML Tsang, SH Lee, KK Chan, Samuel SK Lam, KY Yam
Department of Neurosurgery, Tuen Mun Hospital, Hong Kong SAR

Introduction: Our department frequently handles urgent consultations from other specialties. This study aimed to review these consultations from the perspective of a neurosurgeon.
Methods: All urgent consultations to the Department of Neurosurgery, Tuen Mun Hospital between July and December 2018 were identified and data were recorded on referring specialty, involved condition, associated imaging, and need for immediate neurosurgical intervention.
Results: Many of the consultations were from the Department of Accident and Emergency or the Department of Medicine, most of which concerned perceived abnormalities on computed tomography scan of the brain, ranging from atrophy to haemorrhage to brain tumours. Several cases required urgent operative intervention.
Conclusion: Some consultations did not require urgent neurosurgical input and could have been handled through routine consultation or out-patient clinic. A referral guideline and consultation feedback system might be constructive in streamlining the workflow.

Instillation of Urokinase after Burr Hole Drainage of Chronic Subdural Haematoma

FP 2.2

Eric YH Cheung, CY Hung, Michael WY Lee, KY Pang
Department of Neurosurgery, Pamela Youde Nethersole Eastern Hospital, Hong Kong SAR

Objective: This study aimed to investigate the effectiveness and safety profile of instillation of urokinase in reducing recurrence of chronic subdural haematoma.
Methods: This was a retrospective cohort study of all adults with chronic subdural haematoma who underwent burr hole drainage at the Department of Neurosurgery, Pamela Youde Nethersole Eastern Hospital, from January 2013 to December 2017. After burr hole drainage, patients were evaluated for instillation of urokinase when computed tomography scan of the brain showed residual haematoma. Clinical records, laboratory data, and medication prescription records were reviewed.
Results: A total of 297 patients with chronic subdural haematoma were treated with burr hole drainage (men=205; women=92) with mean age of 77 years (range, 25-100 years). A total of 100 (33.7%) patients had instillation of urokinase with a mean total dose of 15 800 units over an average of 2 days. The overall recurrence rate was 17.8%. The recurrence rate was significantly lowered in patients with instillation of urokinase (with urokinase 8.0%, without urokinase 22.8%; P=0.002).
Conclusion: Instillation of urokinase after burr hole drainage for patients with chronic subdural haematoma significantly reduced recurrence rate of chronic subdural haematoma.

FP 2.3

Vitamin D Promotes Neurologic Recovery from Intracerebral Haemorrhage by Enhancing Haematoma Resolution in Mice

J Liu, N Li, Z Zhu, Karrie MY Kiang, Anson CK Ng, M Yao, Gilberto KK Leung
Department of Surgery, Li Ka Shing Faculty of Medicine, The University of Hong Kong, Hong Kong SAR

Objective: Intracerebral haemorrhage (ICH) causes significant mortality and morbidities due to haematoma mass effect. Novel therapies aimed at promoting haematoma clearance are essential. Peroxisome proliferator-activated receptors gamma (PPAR γ), a member of the type II nuclear hormone receptor superfamily, can promote microglia polarisation and therefore haematoma resorption. Vitamin D (VD) has neuroprotective effects and can activate PPAR γ. We hypothesised that VD treatment could improve functional outcome of ICH through PPAR γ activation.
Methods: Male C57/6 mice received an intra-striatum injection of collagenase to induce ICH. The VD was administered orally everyday till end points. Experimental outcomes were: (1) neurologic functions on cylinder test and rotarod test; (2) haematoma volume on magnetic resonance imaging (MRI) and digital quantitative analyses, and (3) mechanistic studies by Western blot and immunofluorescence staining of brain specimens.
Results: The VD-treated animals had better neurologic recovery in terms of usage of the affected limb and motor coordination on day 7 and 10. The VD treatment reduced haematoma volume by 32.2% and 59.6% on day 3 ($P<0.05$) and day 5 ($P<0.01$) based on digital analyses, and by 13.2% and 20.1% on day 5 ($P<0.01$) and day 7 ($P<0.001$) on magnetic resonance imaging, when compared with control. The VD treatment upregulated the expression of PPAR γ and PPAR γ downstream targets CD206 and CD36, which are markers of M2 microglia. The VD treatment also enhanced phagocytosis.
Conclusion: The VD promotes haematoma clearance and neurologic recovery in ICH possibly by activating PPAR γ and erythrophagocytosis. This study provides novel preclinical evidence to support future clinical studies on the use of VD in the treatment of ICH.

FP 3.1

Minimally Invasive Transforaminal Lumbar Interbody Fusion with Expandable Cages: The Vital Role of Intraoperative Electrophysiological Monitoring

David YC Chan[1], WK Mak[1], Like WM Wong[1,2], KL Ho[1,2], Claire KY Lau[1,2], David TF Sun[1], George KC Wong[1], WS Poon[1], Danny TM Chan[1]
[1] Division of Neurosurgery, Department of Surgery, Prince of Wales Hospital, Hong Kong SAR
[2] Electrophysiology, Division of Neurosurgery, Department of Surgery, Prince of Wales Hospital, Hong Kong SAR

Objective: Minimally invasive transforaminal lumbar interbody fusion (TLIF) is an established spinal approach. However, the introduction of expandable cages has brought new considerations especially with intra-operative monitoring.
Methods: Minimally invasive TLIF with expandable cages performed at Prince of Wales Hospital from January to September 2019 were reviewed with intra-operative findings.
Results: Technical pearls with expandable cages in minimally invasive TLIF are illustrated. There was an initial interval improvement in intra-operative monitoring signals including motor evoked potential with the increase in height of the expandable cage. This was accountable by the reduction and decompression by the restoration of the disc height by the expandable cages. However, there was a paradoxical drop in motor evoked potential signals when the height of the expandable cage is elevated beyond certain points. The decrease in motor evoked potential was readily reversible upon reduction of the height of the expandable cage. Without intra-operative monitoring, the height of the cage was elevated up to the level as much as the torque limiter allowed, which was not the best electrophysiological operative outcome.
Conclusion: For minimally invasive TLIF with expandable cages, intra-operative monitoring is vital.

FP 3.2

Long-term Treatment Efficacy and Complications of Hypofractionated Stereotactic Radiosurgery in Brain Arteriovenous Malformations

KY Tam[1], David YC Chan[1], Darren Poon[2], Michael Kam[2], Michael Cheung[2], George KC Wong[1]
[1] Division of Neurosurgery, Department of Surgery, Prince of Wales Hospital, Hong Kong SAR
[2] Department of Clinical Oncology, Prince of Wales Hospital, Hong Kong SAR

Objective: To evaluate outcomes of brain arteriovenous malformations (bAVMs) treated with hypofractionated stereotactic radiosurgery (hfSRS).
Methods: We conducted a retrospective review of patients between January 2008 and December 2017 at Prince of Wales Hospital who received hfSRS for bAVMs. Demographic, clinical, and angioarchitectural data from CDARS (The Certificate of Deposit Account Registry Service) and iPlan system were obtained and analysed.
Results: Thirty four patients were identified. In all, 61.8% patients presented with rupture. Most common symptoms were headache (41.2%), motor deficits (17.6%), and seizure (8.8%). The majority of bAVMs were lobar (73.5%). The largest bAVM diameter was 3.93 cm. Median gross total bAVM volume was 17.2 cm^3. The median modified radiosurgery-based AVM score (mRBAS) was 2.705. The median radiological follow-up was 81 months (range, 18-221 months). In total, 11 patients (32.3%) achieved radiological obliteration without new deficits at 3-year follow-up examination. There were three mortalities due to rebleeding. Nine patients (26.5%) had at least one post-hfSRS complication, the most common being rebleeding in four patients (11.8%) and oedema in four patients (11.8%). Higher mRBAS was associated with lower obliteration rate (R=-0.439, P=0.019). A higher 12Gy volume outside lesion was associated with increased overall post-hfSRS complications (R=0.343, P=0.047). Mean irradiated drainage vein volume at 12 Gy was 5.32 ± 6.3 cm^3. When indexed to gross total bAVM volume, irradiated drainage vein volume at 12 Gy was associated with increased rebleeding (R=0.472, P=0.031) and reduced event free survival (R=-0.472, P=0.031).
Conclusion: Hypofractionated radiosurgery allows radiosurgery treatment of cerebral AVM not suitable for single-fraction Linac-based radiosurgery. Careful case selection and discussion with patients for expectations are important.

FP 3.3

Presentations and Outcomes of Arachnoid Cyst Operations in Queen Elizabeth Hospital: A Retrospective Study

Z He, Joyce SW Chow, TL Poon, HM Chiu, FC Cheung
Department of Neurosurgery, Queen Elizabeth Hospital, Hong Kong SAR

Objective: To review the presentations and outcomes of arachnoid cysts that require operative treatments.
Methods: We retrospectively reviewed the patients who received operations for arachnoid cysts from July 1999 to June 2019. The presenting symptoms, demographic data, surgical and radiological outcomes are analysed.
Results: In total, 31 patients received operative treatment for arachnoid cysts from July 1999 to June 2019, including 13 male and 18 female patients. There were 10 paediatric patients in our series. The most common presenting symptoms were focal neurological deficits (48.4%), symptoms of raised intracranial pressure (35.5%), and vestibular symptoms (12.9%). The most common operation performed was microsurgical fenestration (83.9%). There were 38.7% patients who had complete resolution of the presenting symptoms and 45.2% patients who had complete or >50% reduction in the lesion sizes. One patient had haemorrhage after surgery that required clot evacuation and two patients had recurrence of arachnoid cysts that received second operation for fenestration.
Conclusion: Among the operations performed for arachnoid cysts from 1999 to 2019, more than 80% patients had symptoms relieved and more than 80% patients had radiological improvement.

FP 3.4

Timing for Evaluation after Tap Test for Patients with Suspected Normal Pressure Hydrocephalus: A Pilot Study

LK Cheung, HY Law, KY Yam
Division of Neurosurgery, Tuen Mun Hospital, Hong Kong SAR

Objective: To investigate if earlier assessment of walking ability and cognitive function after tap test can increase the sensitivity of the tap test to reveal patients with normal pressure hydrocephalus.
Methods: This was a small-scale prospective cohort study. Gait analysis, cognitive analysis, and modified Barthel index were done before tap test, 2 hours after tap test, and 1 day after tap test for comparison. Patients who showed improvement at 2 hours after but not at 1 day after tap test were identified and called back for a shunting procedure to see if long lasting improvement can be achieved.
Results: Patients that fulfilled the above criteria were identified and improvement after the shunting procedure was noted.
Conclusion: Earlier evaluation after tap test can increase the sensitivity of tap test to identify patients having normal pressure hydrocephalus.

FP 6.1

Improved Quality of Life in Patients with Trigeminal Neuralgia after Microvascular Decompression

X Xiao, Y Chan, Peter YM Woo, W Lam, Alain KS Wong, KY Chan
Department of Neurosurgery, Kwong Wah Hospital, Hong Kong SAR

Objective: To investigate the improvement in quality of life of patients with trigeminal neuralgia after microvascular decompression.
Methods: In this prospective study, patients with trigeminal neuralgia who underwent microvascular decompression in Kwong Wah Hospital between 2014 and 2018 were included. A quality of life questionnaire was administered to all patients with trigeminal neuralgia immediately before and at 3 and 6 months after surgery. The quality of life questionnaire included 12-item Short Form (SF-12) and EQ-5D in addition to the Barrow Neurological Institute pain intensity score and the Wong-Baker Faces Pain Rating Scale.
Results: Between 2014 and 2018, 20 patients were included in the study (5 men and 15 women) with mean age 61.1 years. The final results are under statistical analysis.
Conclusion: To follow.

FP 6.2

Intermittent Theta Burst Stimulation for Motor Rehabilitation after Stroke: A Pilot Study (Phase II Trial)

MH Yuen[1], Bryan SH Chee[2], Anthea Au[2], Calvin HK Mak[1], Helen KY Luk[2], Andy CM Chan[2], FC Cheung[1]
[1] Department of Neurosurgery, Queen Elizabeth Hospital, Hong Kong SAR
[2] Department of Physiotherapy, Queen Elizabeth Hospital, Hong Kong SAR

Objective: To establish the efficacy profile of intermittent theta burst stimulation (iTBS) on motor rehabilitation in patients with subacute or chronic stroke.
Methods: This was a prospective cohort study. Half of the recruited patients received a course of iTBS on top of conventional physiotherapy while the rest only had conventional physiotherapy. Assessment of the patients (Fugl-Meyer assessment of upper limb and motor power) were made at recruitment, and at 1 and 6 months after the start of treatment. Primary outcomes were the differences between assessment at recruitment and assessment at 6 months. Secondary outcomes included any adverse events related to iTBS within 6 months from completion of treatment. Interim analysis will be carried out at 1 month.
Results: In total, 40 patients with subacute or chronic stroke of mean age 52.6 years (range, 32-74 years) were recruited. The mean interval between index stroke and start of treatment was 18.9 months (range, 3-42 months). The iTBS group showed statistically significant improvement in both Fugl-Meyer assessment of upper limb (P=0.011) and motor power (P=0.010) when compared with conventional physiotherapy group. There were no adverse effects in both groups of patients.
Conclusion: The iTBS is safe and appears to be an effective tool in motor rehabilitation in subacute to chronic stroke patients.

FP 6.3

Displacement of Deep Brain Stimulation Lead Location after Implantation: Preliminary Results

CF Ng, X Zhu, Danny TM Chan, WS Poon
Division of Neurosurgery, Department of Surgery, Prince of Wales Hospital, Hong Kong SAR

Objective: To investigate the causes of, and measures to prevent, implantation displacement after deep brain stimulation.
Methods: Patients who underwent deep brain stimulation from 2010 to 2018 were recruited. The first and second computed tomography (CT) scans of the brain were compared. Lead locations and intracranial air were compared and analysed.
Results: In total, 23 patients were recruited with 46 leads inserted in the study period. All operations followed the same precautions and were conducted under local anaesthesia. There was more intracranial air on the left side (P=0.076). Leads on both sides showed inferior and anterior displacement in the second CT scan. Lead displacement was correlated with intracranial air.
Conclusion: Measures to minimise intracranial air are important to minimise lead displacement after implantation.

Directional Leads in Deep Brain Stimulation of Subthalamic Nucleus: A Single-centre Experience

FP 6.4

Ronald Li[1], MH Yuen[1], Iris Chan[2], HF Chan[3], YF Cheung[3], TL Poon[1], FC Cheung[1]
[1] Department of Neurosurgery, Queen Elizabeth Hospital, Hong Kong SAR
[2] Department of Clinical Psychology, Queen Elizabeth Hospital, Hong Kong SAR
[3] Department of Medicine, Queen Elizabeth Hospital, Hong Kong SAR

Objective: To investigate whether directional leads of deep brain stimulation of the subthalamic nucleus result in fewer spill-over adverse effects with similar efficacy to conventional omnidirectional leads.
Methods: This is a case series of a single-centre experience which study upon clinical outcome of the directional leads of subthalamic nucleus in deep brain stimulation of Parkinson disease patient since 2018.
Results: A total of 15 electrodes were inserted in eight patients. Complications and short-term clinical outcomes were reviewed. All patients showed improvement in terms of rigidity, tremor, dyskinesia without substantial hardware or cognitive complications. There was no stimulation-related complication such as dysarthria/dysphonia, which occurs in 4% to 17% of conventional omnidirectional deep brain stimulation procedures. Only one patient (12.5%) had significant adverse effect during surgery and one (12.5%) developed seizure.
Conclusion: Directional leads for deep bran stimulation of the subthalamic nucleus in patients with Parkinson's disease are safe and clinically non-inferior, with fewer spill-over adverse effects.

Strategic Use of Gamma Knife and Microsurgery Minimise Treatment Failures in Skull Base Meningiomas

FP 7.1

CP Yu[1], YW Fan[1], KM Leung[1], YH Tse[1], KP Ng[2]
[1] Hong Kong Neurosurgical Associates, Hong Kong SAR
[2] Gamma Knife Centre, Canossa Hospital, Hong Kong SAR

Objective: To investigate the primary and adjuvant roles of Gamma stereotactic radiosurgery and hypofractionated stereotactic radiotherapy in the management of skull base meningiomas.
Methods: This was a retrospective review of 280 skull base meningiomas treated by stereotactic radiosurgery, and hypofractionated stereotactic radiotherapy (after June 2016) using Leksell Gamma Knife, alone or in combination with microsurgery from 1995 to 2019.
Results: A total of 406 patients with meningioma, with mean age 56 years and female:male ratio of 2.4:1 were treated from 1995 to 2019 at the Gamma Knife Centre. Of 406 patients, 280 (69%) had skull base meningioma. Of them, 114 (41%) skull base meningiomas belonged to a low-resectability type: cavernous sinus, petroclival, and anterior foramen magnum. Mean follow-up duration was 61 months. We stratified results into three groups: (1) Gamma knife alone: 53 patients, no new deficit, one recurrence, and 98% progression-free survival (PFS) at 15 years; (2) planned microsurgery followed by Gamma knife: 23 patients, two transient postoperative deficits, one recurrence, and 75% PFS at 15 years; (3) microsurgery elsewhere, and salvage Gamma knife for residual tumour: 162 patients, 48 (30%) postoperative deficits, 17 recurrences, but follow-up data were insufficient to calculate PFS.
Conclusion: Management of skull base meningioma must be individualised. Strategic use of microsurgery, Gamma stereotactic radiosurgery, and hypofractionated stereotactic radiotherapy prevent treatment-related deficits and prolong PFS with fewer recurrences.

FP 7.2

Outcomes of Vestibular Schwannoma after Stereotactic Radiosurgery: A 20-Year Retrospective Cohort Study

WL Tang, Benedict YY Cheung, KY Yam
Department of Neurosurgery, Tuen Mun Hospital, Hong Kong SAR

Background: Stereotactic radiosurgery (SRS) has excellent local control rates for vestibular schwannomas. In this study, the change in hearing after SRS was assessed to determine which patient-, tumour-, and treatment-related factors influence outcomes.
Methods: Hearing outcomes in patients with vestibular schwannomas who underwent SRS between 1999 and 2019 were retrospectively reviewed. The SRS had been delivered as a single fraction of a median dose of 12 Gy. The SRS utilised either a frame-based or a frameless system in our cohort. Outcomes assessed were post-treatment Gardner-Robertson (GR) class, facial neuropathy (both cranial nerve V and VII), tumour control, and SRS adverse effects.
Results: A total of 52 patients over 20 years were assessed. Of the patients receiving SRS, 25 received SRS via a frameless system. Size of tumours was mean 2.39 cm^3 (range, 0.22-10.32 cm^3) at SRS. There were no new neurological deficits after SRS. Interval decrease in size was noted in over 70% of the tumours. Factors affecting the outcomes are yet to be determined, pending further analysis.
Conclusions: Preliminary results indicate no significant differences in outcomes between frame-based and frameless SRS.

FP 7.4

Factors Determining Visual Outcome of Non-functioning Pituitary Adenoma

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Objective: Sellar lesions are possible reversible causes of vision loss. The aim of this study was to investigate factors that affect visual outcomes of non-functioning pituitary adenoma.
Methods: This was a single-centre, retrospective study conducted at Queen Elizabeth Hospital. In total, 115 patients with sellar tumours underwent surgery during the 3-year period from June 2015 to May 2018. Pituitary adenomas that were non-functioning and without apoplexy at initial presentation were selected for the study. We analysed the correlation of different factors with the visual outcome, including the extent of vertical decompression in terms of change in tumour height after surgery and the extent of lateral decompression in terms of change in Knosp grading. Visual outcome was represented by the visual impairment score, an integrated measurement of visual acuity and visual field deficit.
Results: Although most patients had an objective improvement in visual acuity (88%) and visual field (99%) after operation, a larger reduction in tumour height and successful Knosp downgrading after surgery was associated with better visual impairment score improvement (P=0.04). A greater initial tumour height may predict a greater visual acuity change (P=0.76) and visual field change (P=0.09) after operation.
Conclusion: The extent of both vertical and lateral decompression of non-functioning pituitary adenoma are important determinants that lead to better visual outcome. As endoscopic transsphenoidal approach offers a wider view around the sella, it might be a preferred approach to achieve better vision.

Laryngeal Adductor Reflex Monitoring Using Non-invasive Electromyographic Endotracheal Tube

FP 7.5

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Objective: To evaluate the potential value of laryngeal adductor reflex (LAR) monitoring using a non-invasive tube-based methodology during brain stem surgery.
Methods: Vocal cord mucosa was electrically stimulated via endotracheal tube surface-based electrodes to elicit a LAR. Responses were recorded using the endotracheal tube electrodes contralateral to the stimulating electrodes for each side. Significant changes in LAR amplitude were critical parameters for intra-operative neurophysiologic monitoring interpretation. We observed the association between the intra-operative LAR integrity and vocal cord function after surgery.
Results: From November 2017 to November 2019, 29 patients (14 men and 15 women), aged 31 to 83 years, who underwent brainstem surgeries were included. Contralateral R1 (cR1) responses were elicited in 28 patients (96.6%) and contralateral R2 responses were obtained in 14 patients (48%). Intra-operative reversible decrease in cR1 amplitude correlated with surgical stretching or compressing of the vagus nerve or brainstem temporarily. Permanent and temporary vocal cord paralysis rates were 0% and 13.8%, respectively. Specificity of loss of LAR signal versus postoperative vocal cord paralysis was 92% and the sensitivity was 75%. Negative predictive value was 95.83% whereas its positive predictive value was 60%. There were no perioperative or postoperative complications related to the stimulation and recording of LAR.
Conclusion: LAR monitoring is a novel tube-based method for assessing vagus nerve and lower brainstem integrity during brain stem surgery. It is useful in intra-operative neurophysiologic monitoring interpretation where vagus nerve integrity may be compromised.

To Clip or to Coil? A Comparison of Treatment Outcomes in Ruptured Anterior Communicating Artery Aneurysms

FP 8.1

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Objective: To compare the surgical and clinical outcomes in ruptured anterior communicating artery (ACoA) aneurysms treated by endovascular coiling or surgical clipping.
Methods: This was a 7.5-year retrospective cohort study recruiting cases of first-episode ruptured ACoA aneurysms treated by endovascular coiling or surgical clipping from January 2012 to June 2019 in Department of Neurosurgery, Kwong Wah Hospital. Surgical outcomes were measured by residual aneurysms, re-rupture rate, and reoperation rate of residual lesions. Clinical outcomes were measured by Mini Mental State Examination (MMSE), Montreal Cognitive Assessment (MoCA), and modified Rankin scale (mRS).
Results: A total of 63 patients fulfilled the selection criteria, of which nine were treated by clipping and 54 by coiling. For surgical outcomes, coiling was associated with a higher number of residual aneurysms but there were no re-rupture cases and only 7.4% of the residual lesions required reoperation. Before and after surgery, Glasgow Coma Scale scores were 15 and mRS scores were 0 to 1 for all cases that required a second elective embolisation. For functional outcomes, coiling achieved a higher cognitive score in MMSE and MoCA (P=0.435) and fewer functional deficits by mRS (P=0.023). Clipping was found to have a higher rate of delayed cerebral ischaemia (P=0.009) and shunt dependence (P=0.040), in which both were associated with poorer functional outcomes. The length of hospital stay in the clipping group was also significantly longer than the coiling group (P=0.004).
Conclusion: The "coil first" policy is recommended for ruptured ACoA aneurysms as it is associated with a lower rate of delayed cerebral ischaemia, less shunt dependence and shorter hospital stay, without compromising the surgical outcome significantly.

FP 8.2

Emergency Stent-assisted Embolisation for Ruptured Intracranial Aneurysms: A Single-centre Retrospective Study

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Objective: To investigate the outcomes of stent-assisted coiling cases and identify factors favourable/unfavourable for such outcomes.
Methods: A single-centre retrospective review was conducted from 1 January 2012 to 30 June 2019. The baseline characteristics of these patients and their aneurysm features were collected, and these patients were followed up for at least 6 months with their clinical outcomes defined by the modified Rankin scale score (<3 as good) and the presence of any recurrence/residual aneurysms which required further treatment. Risk profiles were also followed up with complications related to bleeding/antiplatelet usage, in-stent stenosis/thrombosis.
Results: In all, 219 patients within the study period underwent embolisation procedures utilising flow diverters or endovascular stents. Among them, 58 patients (34 women) were emergency cases of stent-assisted coiling by means of endovascular stent/flow diverters. Pipeline Flex and Pipeline stents were the most commonly utilised stents, followed by Neuroform stenting. In total, 36 out of these patients underwent stent-assisted coiling while 22 of them were stenting or flow diverters placed as a primary procedure. Also, 16 of the aneurysms were below to the posterior circulation. Clinical outcomes and predicting factors, as well as complication profiles are pending further analysis.
Conclusion: To follow.

FP 8.3

Extracranial and Intracranial Bypass Followed by Tumour Resection in Advanced Head and Neck Malignancy: A 10-Year Single-centre Experience

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Objective: This study aimed to investigate the outcomes of patients with advanced head and neck cancers with carotid artery involvement who underwent extracranial-intracranial bypass followed by aggressive tumour resection.
Methods: This was a 10-year retrospective review of the survival outcomes in patients with recurrent head and neck tumour who underwent two-stage extracranial-intracranial bypass followed by tumour resection at Queen Mary Hospital from January 2010 to December 2019. Surgical complications, survival outcomes, Eastern Cooperative Oncology Group scores at 1 year and 2 years after surgery, and disease-free survival were evaluated.
Results: This study included 46 patients, (34 men and 12 women) with mean age 65 years (range, 35-72 years). Of them, 33 patients had nasopharyngeal tumour. Two patients died from early complications after surgery. Fourteen patients have been followed up for >2 years and 18 patients survived for >1 year. Seven patients were lost to follow-up after discharge from the hospital.
Conclusion: Pending.

FP 8.4

Long-term Neurovascular Outcome after Carotid Artery Stenting: A Single-centre Experience

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Objective: Carotid artery stenting (CAS) is offered as the first-choice treatment for patients with carotid artery stenosis in our centre. In this study, we aimed to review the long-term neurovascular outcome after CAS.
Methods: We reviewed medical records of patients who underwent CAS in Princess Margaret Hospital of Hong Kong from year 2010 to June 2019. We reviewed and analysed the perioperative (stroke, myocardial infarction, renal failure, and groin pseudo-aneurysm) and long-term (in-stent stenosis, disease progression, recurrent stroke/transient ischaemic attack, need of further stenting, and mortality) complications.
Results: There were 100 patients in total, and the first 70 cases were analysed for preliminary results. Of these 70, there were nine (12.9%) women and 61 (87.1%) men with mean age 69.2 years (range, 40-89 years). Fifty patients were symptomatic and 20 patients were asymptomatic. All surgeries were performed under local anaesthesia. Patients received transcranial Doppler, computed tomography angiography, or magnetic resonance angiography examinations before CAS. All patients had Doppler ultrasound and computed tomography angiography at follow-up examination. Patients with stenosis received digital subtraction angiography examination. Patients were prescribed aspirin and clopidogrel starting before surgery according to protocol. One (1.4%) patient had complete occlusion without symptoms. Four (5.7%) patients had severe restenosis; three received second carotid artery stenting and one developed ischaemic stroke and died before second carotid stent. Twelve (17%) patients died, eleven of which were due to medical conditions, most commonly pneumonia. Relationships between restenosis and previous radiotherapy, systemic disease, and intraoperative findings will be further analysed.
Conclusion: The CAS is a safe and effective option for patients with carotid artery stenosis.

FP 8.5

Comparison of Treatment Modalities in Post-irradiation Carotid Blowout Syndrome: A Multi-centre Retrospective Study

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Objective: To investigate the outcomes of different treatment modalities in the management of post-irradiation carotid blowout syndrome.
Methods: This was a 10-year multi-centre retrospective review of outcome in endovascular trapping, flow diverters, and bypass, in post-irradiation carotid blowout syndrome from January 2009 to December 2019.
Results: For survival, there were no significant differences among the treatment modalities. Age was the only factor that affected survival. For functional outcomes, there were no significant difference among the treatment modalities. Stroke was the only factor that affected functional outcome. The immediate haemostatic rate was 100% for bypass and endovascular trapping and 96% for flow diverters. Rebleeding rate was 20% in flow diverters and 0% in bypass and endovascular trapping. Stroke rate was 25.9% in endovascular trapping, 20% in flow diverters, and 12.5% in bypass. Intended treatment endpoint success rate was 100% in endovascular trapping, 76% in flow diverters, and 62.5% in bypass.
Conclusion: Our results suggest that endovascular trapping is the first-line treatment for carotid blowout. In patients with suboptimal cross flow or those who failed balloon occlusion test, flow diverter is the alternative. Bypass may be indicated in only selected patients, such as those with flow diverters, due to the risk of rebleeding. Early perfusion scan within 3 days after endovascular trapping may indicate patients at high risk of stroke.

Radiation-induced Glioblastoma: A Local Case Series

P 1.1

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Objective: We aimed to investigate patients with radiation-induced glioblastoma (GB) compared with those with radiation-naïve GB to determine the patient-, disease-, and treatment-related factors that predict overall survival.
Methods: This was a case-control study. We included all Chinese adult patients (aged >18 years) who were treated at the Hospital Authority with histologically proven GB and subsequently received the standard therapy of concurrent temozolomide and radiotherapy from 1 January 2009 to 31 December 2014. Cahan's criteria of radiation-induced malignancy was utilised to identify the cases. The GB had to occur within the previous irradiation field with a latency period in terms of years and was histologically distinct from the condition for which the irradiation was prescribed. Patients with secondary GB, a latency period of <1 year, and hereditary syndromes were excluded. Pearson's Chi squared test and independent *t* test were used. Kaplan-Meier survival curves were constructed with Cox regression analysis.
Results: In total, 19 patients diagnosed with radiation-induced GB were identified as cases to compare with 146 patients with radiation-naive GB in the control group. The incidence of radiation-induced GB among patients with GB was 3.2%. Compared with control patients, patients with radiation-induced GB had significantly poorer survival (19.2 vs 4.8 months, P<0.001), fewer pMGMT-methylated GB (21% vs 55%, P=0.01), and more commonly located at the infratentorial region (37% vs 4%, P<0.001). The patients with radiation-induced GB who received radiotherapy, temozolomide, or both survived longer than those who did not, but this result was not significant. We identified nasopharyngeal carcinoma as the commonest primary aetiology for irradiation (37%) followed by germinoma (21%) compared to acute lymphoblastic leukaemia which was reported as the commonest cause in previous literatures.
Conclusion: The overall survival of patients with radiation-induced GB is poorer than that of patients with radiation-naïve GB. They express more MGMT and are more commonly located in the infratentorial region. Nasopharyngeal carcinoma is the commonest cause of irradiation, followed by germinoma and this may be due to the local-regional prevalence of these diseases. Further studies are required to determine an effective treatment regime for this group of patients.

Multi-level Upper Cervical Chordoma: A Case Report

P 1.2

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Background: For the surgical management of upper cervical chordoma, en bloc resection has better prognosis than intralesional resection in terms of oncological outcome. However, en bloc resection is unfeasible in upper cervical region due to surrounding vital structures. In this case report, we demonstrate that aggressive intralesional resection with adjuvant radiotherapy is an alternative approach to achieve complete tumour resection with sparing of neurological function.
Case Report: A 42-year-old woman with good past health presented to the Department of Neurosurgery, Kwong Wah Hospital, Hong Kong, with bilateral upper limb numbness. Magnetic resonance imaging scan in the sagittal plane showed multilobulated T2 hyperintense tumour extending from the C2 to C4 epidural space and invading the C3 vertebral body. In the axial plane, the tumour compressed and displaced the spinal cord to the left. The right vertebral artery was encased by the tumour. The chordoma was first approached anterolaterally, resecting the extraosseous tumour. It was followed by C3 corpectomy, removing the tumours around the right vertebral artery and within the spinal canal. Anterior fixation was performed with an expandable cage at C3 and an anterior plate. Posterior approach was carried out to resect C3 lamina, C2 to 4 facet joints. Posterior fixation with instrumentation was performed with C2 pars screws, C4 to 5 lateral mass screws and rods. The patient did not demonstrate any added neurological deficit after surgery. Adjuvant radiotherapy with total dose of 73.71 Gy in 39 fractions was given. She was able to resume her work. Magnetic resonance imaging scan at 2 years did not show any local recurrence.
Conclusion: We presented a case of multi-level upper cervical chordoma with satisfactory outcome after complete surgical resection with expandable cage reconstruction and posterior instrumentation.

P 1.3

Benefits of Neurosurgery Rotation on Interns' Interpretation of Computed Tomography of the Brain

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Objective: To assess the effect of neurosurgery rotation on interns' skill in interpreting computed tomography (CT) images of the brain.
Methods: Interns from neurosurgery or non-neurosurgery rotation in Prince of Wales Hospital, Hong Kong, were recruited from July 2019 to December 2019. Examination of common CT brain findings was performed on interns before and after neurosurgery rotation with interns from non-neurosurgery rotation as a control.
Results: There was significant improvement in examination score of interns on interpretation of CT brain findings after 6 weeks of neurosurgery rotation.
Conclusion: Rotation to neurosurgery can improve interns' interpretation skills on CT brain and should be included as a part of training in order to decrease misinterpretation on CT brain.

P 1.4

Relationship between Cerebral Abscess and Pulmonary Arteriovenous Malformation: A Case Report and Literature Review

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Objective: We herein report a case of cerebral abscess due to underlying pulmonary arteriovenous malformation and review the literature.
Case Report: A 73-year-old woman presented to the Department of Surgery, Prince of Wales Hospital, Hong Kong, with brain abscess and ventriculitis, complicated with obstructive hydrocephalus. Antibiotics treatment was initiated and endoscopic third ventriculostomy was also performed. A search for underlying septic foci revealed no dental, head and neck, or cardiac sources of infections. During the performance of a transoesophageal echocardiogram with agitated saline test, however, a delayed appearance of bubbles was noticed. Computed tomography thorax was subsequently carried out, showing a pulmonary arteriovenous malformation. Pulmonary arteriovenous malformation classically presents with cyanosis, exertional dyspnoea and finger clubbing. Nevertheless, these features might be absent, with cerebral abscess being the first presentation.
Conclusion: Pulmonary capillary bed could filter out septic emboli from the systemic circulation. An extracardiac shunt in the lung could therefore predispose towards cerebral abscess formation.

'Vaccination' Against Stroke: The Role of Microglia Immune Tolerance in Recurrent Intracerebral Haemorrhage

P 1.5

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Objective: To investigate the role of microglia activation pathways after a second intracerebral haemorrhage in the basal ganglia following a first, less severe episode of haemorrhagic stroke.
Methods: Mice were injected with collagenase into the basal ganglia to induce intracerebral haemorrhage. One group received a light dose of collagenase (0.024 U) 14 days before a heavy dose (0.1 U); the other group was directly treated with a heavy dose of collagenase (0.1 U). Mice from both groups were evaluated by neurological behaviour tests and sacrificed at 3 or 7 days after the heavy dose of collagenase. Microglia of ipsilateral and contralateral hemispheres were harvested and analysed by immunofluorescent staining and flow cytometry. Cell expression markers were evaluated to determine M1/M2 microglia ratio.
Results: Pretreatment with a minor episode of intracerebral haemorrhage attenuated damage when encountering a severe episode, compared with mice that had never received similar stimuli before. Further in-vitro studies of the mechanisms behind this phenomenon will be conducted.
Conclusion: Prior exposure to heme toxicity may modify brain environment and improve outcome for a second haemorrhagic stroke.

Foramen Ovale and Hippocampal Depth Electrodes for Drug-resistant Epilepsy: A Case Report

P 1.6

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Background: We highlight the technique and application of bilateral foramen ovale and insertion of hippocampal depth electrodes in a patient with drug-resistant epilepsy and underlying bilateral mesial temporal sclerosis.
Case Report: A 35-year-old woman presented to the Department of Neurosurgery, Queen Elizabeth Hospital, Hong Kong, with a history of postviral encephalitic drug-resistant epilepsy since age 14 years. Video electroencephalography suggested bilateral temporal onset and ictal technetium-99m hexamethylpropyleneamine oxime brain single-photon emission computed tomography demonstrated hyperperfusion at left temporal lobe. Later magnetic resonance imaging brain revealed bilateral mesial temporal sclerosis more prominent on the left side. In view of inconclusive test results, invasive electroencephalography was performed. Depth electrodes were implanted via Hartel's technique through bilateral foramen ovale and hippocampal depth electrodes via bilateral occipital burr holes under stereotactic guidance. They subsequently showed independent bilateral onset of seizure activities, with some raising suspicion of extratemporal onset. In view of failure to demonstrate laterality, neuromodulative surgery with vagal nerve stimulation is planned.
Conclusion: Depth electrodes are more sensitive than subdural strip electrodes in establishing laterality in seizures of presumed medial temporal onset, with the associated risks of higher invasiveness.

Vertebral Artery to Vertebral Artery Bypass with Radial Artery Graft: A Case Report

P 1.7

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Background: The treatment of recurrent head and neck tumours in patients after radiotherapy with lesions involving major vessels is among one of the most formidable challenges for surgeons. To achieve disease clearance a major artery which also has intracranial supply needs to be sacrificed. Vertebral artery reconstruction using VA-VA bypass with a radial artery graft or an occipital artery graft had previously been reported for treatment of posterior inferior cerebellar artery (PICA) aneurysm but not for recurrent head and neck tumours.
Case Report: A 63-year-old male presented to the Department of Surgery, Queen Mary Hospital, Hong Kong with cancer of oesophagus who underwent radiotherapy after oesophagectomy then had recurrence with localised tumour in right trachea-oesophageal groove partially encasing right common carotid and vertebral arteries. Digital subtraction angiography showed left VA ended at PICA and dominant right VA, there was also a large left posterior communicating artery. First-stage left external carotid artery to right middle cerebral artery (ECA-PTAG-RAG-MCA) bypass with selective neck dissection was performed. The patient then underwent and failed balloon test occlusion of right VA with upper limb weakness developing after 20 minutes of occlusion. Second-stage VA to VA (V3-RAG-V3) artery bypass was performed. Computed tomographic angiography after surgery showed both bypass grafts were patent. The patient was discharged from neurosurgical ward with good clinical results.
Conclusion: The VA-VA bypass using a radial artery graft is an option that can be considered in the strategy for treating recurrent head and neck tumours involving major vessels of the head and neck region.

Protracted Morphological Changes in the Corticospinal Tract within the Spinal Cord after Intracerebral Haemorrhage in Mice

P 1.8

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Objective: To demonstrate prolonged morphological changes of the contralesional dorsal corticospinal tract (CST) in the spinal cord 5 weeks after experimental intracerebral haemorrhage (ICH) in mice.
Methods: This was a longitudinal study that investigated the change in CST in the cervical spinal cord during the first 5 weeks after ICH based on confocal microscopic and electron transmission microscopic analysis.
Results: The induction of ICH in the right striatum led to significant pathological changes in the contralesional/left dorsal corticospinal tract within the cervical spinal cord that persisted for at least 5 weeks after ICH, compared to the sham group and ipsilesional dorsal corticospinal tract in the spinal cord. Individual abnormalities of axons and myelin sheaths, such as demyelination and build-up of membranous debris in the axonal cytoplasm in the affected corticospinal tract, were visualised using electron transmission microscope. These results indicate long-lasting Wallerian degeneration of the CST fibres after ICH.
Conclusion: These results show that white matter injury after ICH could extend into remote regions outside the brain. The protracted degenerative changes implied compromised integrity of the long tract which is considered to be important for motor recovery.

Outcomes of Stent Deployment in Patients with Mechanical Thrombectomy Failure: A Single-centre Retrospective Study

P 1.9

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Objective: To review the technical and clinical outcomes of refractory large vessel occlusion (LVO) stroke rescued with stent deployment as a bail-out strategy.
Methods: This was a single-centre retrospective analysis of LVO patients with thrombectomy done in Queen Mary Hospital, from 2016 to 2019. Patients with refractory LVO rescued with stent deployment were included. The angiographic and clinical outcomes were reported and compared against the remaining LVO thrombectomy cohort.
Results: Among 115 patients, seven patients with a median age of 64 years had stent deployment as rescue therapy. Mean groin-to-perfusion time was 143 minutes in non-stenting group, compared with 73 minutes in stenting group (P=0.004). Stenting group had a rather poorer functional outcome in terms of thrombolysis in cerebral infarction score of 2b/3 (71.4% vs 89.8%; P=0.202) and modified Rankin Scale score of 0 to 2 at 3 months (0% vs 38.9%; P=0.012). The stenting group also had a higher complication rate (42.9%, P=0.034), with no significant difference in haemorrhagic transformation rate.
Conclusion: Stent deployment rescue is feasible for failed thrombectomy, with comparable complication rate and angiographic outcome. However, clinical outcome appears poorer than patients with successful thrombectomy without stent deployment. This may be attributable to the longer groin-to-perfusion time due to the high number of thrombectomy attempts. An earlier treatment decision on stent deployment may achieve a better outcome.

Outcomes of Traumatic Brain Injury with the Trauma and Injury Severity Score Method

P 1.10

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Objective: To assess the influence of age in the traumatic brain injury (TBI) by Trauma and Injury Severity Score (TRISS) method and to investigate the characteristics of non-survivors with TRISS-derived probability of survival (Ps) >0.5.
Methods: Patients admitted through the resuscitation room of Prince of Wales Hospital between 2014 and 2017 with an admission Abbreviated Injury Scale head and neck score ≥2 were included. Outcome measurement was in-hospital mortality. Annual W score (average difference between the actual and TRISS method expected numbers of survivors per 100 patients) and M score (match of injury severity between the study cohort and Major Trauma Outcome Study database, ranging from 0 to 1 and the closer to 1, the more similar the match is) of the cohort, as well as the W scores of older (aged ≥70 years) and younger (aged <70 years) patient groups were calculated. Non-survivors with TRISS-derived Ps >0.5 were identified with further investigation in demographics, causes of injury, co-morbidities, clinical examinations, computed tomography scans of brain, neurological deteriorations, and non-neurological complications.
Results: In 2014, 2015, 2016, and 2017, 352, 398, 445, and 419 patients, respectively, were included, of whom 27.6%, 34.4%, 31.2%, and 40.1%, respectively, were in the older group. In total, 94.5% of the patients had valid Ps for W score. For each year, the W scores were 0.08, -1.62, 1.98, and 0.81, respectively, and the M scores were 0.63, 0.58, 0.55, and 0.54, respectively. The W scores of the older group were -7.29, -5.19, -0.48, and -5.47, respectively, and those of the younger group were 2.89, 0.35, 3.17, and 5.36, respectively. There were 102 non-survivors with Ps >0.5 with mean age 71.0 ± 16.4 years, median Glasgow Coma Scale (GCS) score 14 (interquartile range [IQR]=9-15), and median length of stay 5.4 days (2.2-13.1 days). In all, 85.3% of these patients had co-morbidities before injury. Neurological deterioration after admission including decrease in Glasgow Coma Scale score of ≥2 (66.7%), pupil change (31.4%), and worsened repeat computed tomography of brain (47.1%) were observed in these patients. The three most common non-neurological complications in these non-survivors were systemic infections (42.2%), acute respiratory failure (22.5%), and hypovolemic shock (19.6%).
Conclusion: There is a rising trend of TBI among older adults. The older group showed an overall negative influence on the W score among patients with TBI. From this 4-year cohort, apart from age, further studies are required to elucidate co-morbidities, neurological deteriorations, and non-neurological complications that are not considered by the TRISS method.

Pituitary Stalk Haemangioblastoma in a Patient without von Hippel–Lindau Syndrome: A Case Report and Literature Review

P 1.11

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Background: Haemangioblastoma is an uncommon form of slow-growing vascular tumour, which typically occurs in the cerebellum, brainstem, or spinal cord. It is commonly associated with von Hippel-Lindau syndrome. Sporadic haemangioblastomas are usually solitary. Pituitary haemangioblastoma is rare and likely to raise challenges in diagnosis and treatment owing to its abundant vascularity and close proximity to important neural structures.
Case Report: A 54-year-old man presented to the Department of Neurosurgery, Pamela Youde Nethersole Eastern Hospital, Hong Kong, with headache, nausea, and dizziness and was diagnosed with cerebellar haemangioblastoma. Craniotomy with excision was performed uneventfully in 2010. Subsequent magnetic resonance imaging found interval enlargement of residual tumour, and also two new lesions over T10 spinal cord and pituitary stalk. Burr hole craniotomy with endoscopic transventricular biopsy was performed in 2018, and pathology confirmed to be haemangioblastoma. Blood was also tested for VHL gene and was negative by sequencing analysis and multiplex ligation-dependent probe amplification. Pituitary hormonal profile was unremarkable. The patient is now grossly asymptomatic. Temporal hemianopia is noted on Humphrey visual field analyser. Operative management of the pituitary haemangioblastoma was decided and will be scheduled.
Conclusion: Pituitary stalk haemangioblastoma, although rare, should be considered on the differential diagnosis of pituitary stalk tumours. Careful evaluation and management plan are necessary because of its abundant vascularity and close proximity to important neural structures.

Minimally Invasive Intradural Spinal Surgery with Tubular Retractor System

P 1.12

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Objective: To review the operative outcome of minimally invasive intradural spinal surgery with the use of tubular retractor system.
Methods: Retrospective review of patients with intradural lesion operated in Queen Elizabeth Hospital with minimally invasive approach using tubular retractors between October 2015 and January 2019.
Results: In total, 13 patients with mean age was 62.7 years (range, 41-83 years) were included. Three lesions were at cervical level, seven at thoracic level, and three at lumbar level. Ten patients had intradural extramedullary tumours (7 schwannomas, 3 meningiomas) and the remaining three involved other pathologies. Among the 10 patients with tumour, gross total resection was performed in eight patients and subtotal resection in two patients. Median time of surgery was 178 minutes. Median blood loss was 80 mL. Mean postoperative day 1 visual analog scale pain score was 1.6. Magnetic resonance imaging after surgery demonstrated that no patients had multifidus muscle atrophy. No abnormal signal was detected at paraspinal muscles in 80% of patients, and only mild magnetic resonance imaging changes were seen in 20% of patients.
Conclusion: It is safe and effective to extend the use of tubular retractor in intradural spinal surgeries, offering a minimally invasive alternative to traditional laminectomy for this group of pathology, which hastens patients' recovery and reduces secondary spinal instability.

Surgical Treatment of Paediatric Moyamoya Disease: A Single-centre Study

P 1.13

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Objective: Moyamoya disease (MMD) is characterised by chronic progressive occlusion of terminal portions of internal carotid arteries. Indirect revascularisation, as opposed to direct superior temporal artery–to–middle cerebral artery (STA-MCA) bypass, is the standard treatment for paediatric MMD in many centres due to small vessel calibre. However direct bypass has been shown to yield superior outcomes compared to indirect revascularisation. Direct bypass is therefore now the preferred treatment for paediatric MMD in our centre if vessel calibre allows. We reviewed the outcomes of direct and indirect revascularisation performed for paediatric MMD in our centre.
Methods: All paediatric MMD patients who received treatment at our hospital from 2000 to 2019 were included. Data retrieved included demographics, type of operations, surgical and long-term outcomes.
Results: Thirteen patients were included. Eight patients had indirect revascularisation and five had STA-MCA bypass. All bypasses took place after 2015. Operating time of indirect group was 3 to 4 hours; that of bypass group was 4 to 6 hours. Intra-operative digital subtraction angiogram was included in the operating time of bypass group and not in that of indirect group. Mean vessel calibre of STA and MCA were 1 mm. Bypass flow rates were 20 to 30 mL/min. Length of hospital stay was similar between the two groups. One patient in the bypass group demonstrated deterioration after surgery due to suboptimal blood pressure control. All other bypasses patients demonstrated faster symptoms improvement with better angiographic and perfusion improvement compared to the indirect group.
Conclusion: Direct revascularisation should be attempted in paediatric MMD as the preferred treatment.

Next-generation Sequencing–based Genomics-guided Therapy for Neuro-oncology Patients

P 1.14

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Objective: For patients with advanced neuro-oncological conditions, conventional therapeutic options are limited. The development of next-generation sequencing (NGS)–based genomic analysis has enabled identification of druggable targets of somatic mutations for these rare diseases. This case series reviewed the efficacy of NGS-based, genomics-guided therapy in a local neuro-oncology centre.
Methods: From May 2017 to Aug 2019, NGS panels were arranged for 33 neuro-oncology patients. All patients had exhausted conventional oncological treatments or received NGS panels for clinical trial screening. Targeted deep NGS was used to assess the mutational status, single nucleotide variants, small insertions and deletions and copy number variants of 440 cancer-related genes.
Results: The diagnoses of the 33 patients were glioblastoma (n=21), high-grade glioma (n=3), brain metastases (n=4), chordoma (n=3), atypical choroid plexus papilloma (n=1), and meningioma (n=1). Ten patients received NGS for first-line systemic treatment and 23 for second line or beyond. In most of the patients (32/33, 97%), the NGS panel identified at least one druggable targets, with a median of 3 (range, 0-6). Based on the NGS reports, 21 patients (65.6%) were given genomics-guided therapy. Among them, 12 patients had glioblastoma, three had high-grade glioma, and six had other neuro-oncological conditions. Treatment given included poly(ADP ribose) polymerase inhibitors, check-point inhibitor immunotherapy, anti–vascular endothelial growth factor therapies, and selective CDK4/6 inhibitors. In terms of best response achieved, the number of patients with complete response (n=1), partial response (n=7) or stable disease (n=6) was 14 out of 21 (67%). The genomics-guided treatments were relatively well tolerated with two grade 3 (skin rash, pancytopenia requiring transfusion) and one grade 5 complication (fatal neutropenic fever). The median progression-free survival (PFS) was 215 days (95% confidence interval [95% CI]=70-323 days). For glioblastoma/high-grade glioma patients, median PFS was 125 days (95% CI=48-311 days) and 6-month PFS was 42%. For non-glioma patients, median PFS was 362 days (95% CI=101 days-not reached). For the 12 patients who did not receive genomics-guided treatment, one had no druggable target identified, eight were still stable on standard therapies, one left Hong Kong, and the last one was too weak when NGS report was available.
Conclusion: Early application of NGS-based genomics-guided therapy for selected, advanced neuro-oncological patients yielded promising clinical efficacy and satisfactory safety profile. It holds potential to meet the unmet clinical needs and should be further examined in clinical trial settings.

Microcatheter-protective Technique in Endovascular Coiling of Intracranial Aneurysms

P 2.1

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Background: We herein describe the use of microcatheter-protective technique in endovascular coiling of intracranial aneurysms and to compare its applications with balloon-assisted coiling and stent-assisted coiling.
Case Report: A 56-year-old woman with good past health presented to Department of Neurosurgery, Kwong Wah Hospital, Hong Kong, with good-grade subarachnoid haemorrhage. Computed tomography angiography examination showed a ruptured wide neck posterior communicating artery aneurysm. She was treated with endovascular coiling by microcatheter protective technique. A SL-10 45-degree tipped microcatheter was navigated through right posterior communicating artery into P2 as the protective microcatheter and a XT-17 45-degree tipped microcatheter was cannulated into aneurysm sac for coil delivery. The patient recovered after surgery with normal Glasgow Coma Scale score and full limb power. Microcatheter protective technique, along with balloon-assisted coiling and stent-assisted coiling, shares the common aim of enabling a stable coil frame while protecting the side branch artery or parent artery. It is an optimal choice for small-diameter parent artery or side branch arteries, which are less suitable for placement of stent or balloon. When compared with stent-assisted coiling, it possesses a lower risk of intra-operative thromboembolic event and a lower risk of rebleeding and aneurysm recanalisation by omitting the use of anticoagulants.
Conclusion: Use of the microcatheter protective technique can allow embolisation in wide neck aneurysms with small-diameter parent artery or side branch arteries as well as avoid complications arising from balloon or stent placement.

Haemorrhagic Vestibular Schwannomas: A Case Series

P 2.2

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Objective: Vestibular schwannomas are the commonest tumours located at the cerebellopontine angle comprising 80% of all tumours in this region. They are slow-growing benign tissues that manifest with compression against neural elements. Intratumoural haemorrhage is a rare presentation of these lesions. We present the clinical presentation of such patients and their clinical outcomes.
Methods: This is a retrospective review of four adult patients who were diagnosed with haemorrhagic vestibular schwannoma from 1 January 2012 to 31 August 2019 at a single Hong Kong's public neurosurgical centre. Clinical presentation, radiological imaging, pathological findings, management, and patient outcomes were reviewed.
Results: A total of four patients (2 men, 2 women) were diagnosed to have a haemorrhagic vestibular schwannoma during this period. The mean age was 60 years (range, 43-69 years). Three patients (75%) were fully conscious on admission, while the remaining patient was comatose with a Glasgow Coma Score of 3/15. All complained of dizziness for over 1 month, with ipsilateral hearing impairment. Two patients (50%) had clinically significant intratumoural haemorrhage, and the other two showed evidence of micro-haemorrhage as reflected by increased susceptibility-weighted magnetic resonance imaging (MRI) signal changes within the mass. All haemorrhagic vestibular schwannomas were shown to be compressing the brainstem, although only the comatose patient presented with obstructive hydrocephalus. The tumour sizes were 3.7 to 5.5 cm × 3.1 cm × 3.5 cm (20-28 cc), with a mean volume of 23 cc. The two patients (50%) with micro-haemorrhage underwent tumour excision with retrosigmoid craniotomy, with a mean admission to operation time of 18.5 days. The comatose patient had emergency retrosigmoid craniectomy on the same day of admission, while the remaining patient with clinically significant haemorrhage underwent resection 13 days after admission. All patients had unilateral hearing loss after surgery with reduced dizziness and no facial palsy. The histopathological diagnosis was a typical vestibular schwannoma. All patients were noted to have residual tumour on the magnetic resonance imaging at 6 months after surgery, and three (75%) of them were referred for adjuvant radiosurgery.
Conclusion: Intratumoural haemorrhage of vestibular schwannomas is an uncommon clinical presentation and patients may deteriorate quickly requiring prompt neurosurgical intervention.

Analysis of Negative Pressures Generated by Subgaleal Drains in Neurosurgery

P 2.4

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Objective: To evaluate the negative pressures generated by commonly used subgaleal drains in neurosurgical practice and to analyse the effects of human factors on the pressures generated.
Methods: The negative pressures generated by two different subgaleal drains, namely the Jackson-Pratt® drain (Cardinal Health), and the Exudrain® (Wellspect HealthCare) were measured by pressure sensors. Patients were asked to generate negative pressures by squeezing the reservoirs under standardised instructions, followed by natural expansion of the reservoirs. Two measurements were done for both dominant and non-dominant hands, and for each drain.
Results: Twelve patients were recruited from July 2019 to November 2019. The mean pressure range and mean maximal negative pressure were significantly higher for men than for women (P<0.005). When comparing between medical and non-medical staff, drain designs, and hand dominance, there were no significant differences in the mean pressure range and mean maximal negative pressure generated.
Conclusion: Sex was the only human factor that significantly affected the negative pressures generated by the tested subgaleal drains, irrespective of drain design. In addition, the mean maximal pressure generated by our recruited subjects exceeded the tested subgaleal drain specification of the manufacturer (75 mm Hg). Caution should be advised when applying pressure.

Survival for Patients with World Health Organization Grade II and III Glioma: A 10-Year Retrospective Study

P 2.5

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Objective: To investigate the survival of patients with World Health Organization (WHO) grade II and III gliomas.
Methods: This was a retrospective review of the survival of all patients in Hong Kong diagnosed with WHO grade II and III glioma from January 2008 to December 2018.
Results: In total, 77 patients with histologically confirmed grade 2 or 3 glioma were included. The median progression-free survival (PFS) for patients with grade 2 glioma was 77.37 months, which was significantly longer than that for patients with grade 3 glioma (25.87 months, P=0.006). Overall survival (OS) was not significantly different between patients with grade 2 and grade 3 glioma (105.77 months vs 43.03 months, P=0.061 [log-rank]). The median PFS for patients with astrocytoma was 29.94 months. Isocitrate dehydrogenase (IDH) mutation status was not significantly different for PFS (34.33 months for IDH mutation glioma vs 24.43 months for IDH wildtype glioma, median, P=0.543), but was for OS (86.38 months for IDH mutation vs 31.63 months for IDH wildtype, P=0.001). Among the 13 patients with 1p/19q co-deleted oligodendroglioma, one patient experienced recurrence at 76 months after surgery. There were five patients without 1p/19q co-deletion (PFS=34.33 months, OS=45.67 months) and 11 patients without detailed molecular profile (PFS=26.03 months, OS=92.87 months). With current data on ependymoma, we cannot estimate either PFS or OS, as only one patient had recurrence 18 months after surgery. The median follow-up time for the remaining five patients was 104 months.
Conclusion: The WHO grading is an independent factor in predicting longevity. Further classification with molecular profile can give a clearer forecast for survival.

Tandem Occlusion Stroke: A Single-centre Experience

P 2.6

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Objective: Tandem occlusion, defined as proximal anterior circulation intracranial occlusion and ipsilateral cervical internal carotid occlusion or high-grade stenosis, accounts for 10% to 15% of acute ischaemic stroke due to large vessel occlusion. Although mechanical thrombectomy has been established as the standard treatment for acute stroke due to large vessel occlusion, the management strategies of tandem occlusion stroke are still controversial. Presence of tandem occlusions may hamper intracranial access, while acute carotid stenting with antiplatelet agents can potentially increase the risk of haemorrhagic complications. These cases are often excluded in large randomised trials and the optimal treatment is unknown.
Methods: This was a retrospective review. All patients admitted for acute ischaemic stroke due to large vessel occlusion with mechanical thrombectomy were included from January 2015 to June 2019.
Results: A total of 64 patients were included. Of them, eight patients presented with tandem occlusion, and five required mechanical thrombectomy and carotid artery stenting in an acute setting.
Conclusion: Outcomes will be analysed and presented in the meeting.

Volume Change Theory for Syringomyelia: A Case Report

P 2.7

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Background: The aetiopathogenesis of syringomyelia remains an enigma. Many theories attempted to explain syringomyelia formation. A novel theory based on fluid dynamics at the craniovertebral junction postulated the effect of fluctuations in volume of spinal canal and the craniocervical junction can propagate syringomyelia formation. The volume of spinal canal in flexion is always greater than that in extension, resulting in fluid movement in dorsal spinal subarachnoid space in flexion and ventral spinal subarachnoid space in extension. Cervical and lumbar spinal cerebrospinal fluid (CSF) has maximum bulk, hence these regions undergo maximum deformation during postural changes, which is compensated by changes in posterior fossa CSF volume in normal circumstances. Blockage at foramen magnum does not permit CSF exchange, this results in cavitatory/cystic (syrinx) change at regions with propensity for maximum deformation, such as the cervical and lumbar spine. Augmentation of posterior fossa volume by decompression helps by normalisation of this CSF exchange dynamics. Furthermore, immobilising spinal movement will cease any dynamic volume changes, minimising the destructive influence of the fluid exchange on the cord, thus supporting the rational of treating patients by either means.
Case Report: A 48-year-old man presented with right-side numbness and clumsiness and a history of Chiari malformation with posterior fossa decompression performed and known cervical syrinx. Magnetic resonance imaging scan showing increased size of syrinx. Elective C1/2 fusion was performed. At follow-up examination 3 months after surgery, magnetic resonance imaging showed interval decrease in size of syrinx with concurrent improvement in the patient's symptoms.
Conclusion: The present case validates the volume change theory for syringomyelia.

Effects of Antiplatelet Therapy after Stroke due to Intracerebral Haemorrhage: A Single-centre Study

P 2.8

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Objective: To estimate the effects of antiplatelet therapy on patients with intracerebral haemorrhage (ICH) after surgery.
Background: Antiplatelet therapy reduces the risk of major vascular events for people with occlusive vascular disease, although it might increase the risk of intracranial haemorrhage. Patients surviving the commonest subtype of intracranial haemorrhage, ICH, are at risk of both haemorrhagic and occlusive vascular events. Antiplatelet therapy after ICH has been shown to halve the occurrence of recurrent spontaneous ICH.
Methods: This was a 5-year retrospective review of patients who were admitted to a single Neurosurgical Unit with the diagnosis of ICH from 2014 to 2018. Patient data including patient age, gender, antiplatelet or anticoagulant use and neurological outcomes were collected from Electronic Patient Record. Primary outcome was recurrent spontaneous ICH, secondary outcomes included other major cerebrovascular occlusive events, including ischaemic stroke, transient ischaemic attack and other strokes of uncertain subtype; risk of carotid, coronary, or peripheral revascularisation; and major venous events including deep vein thrombosis and pulmonary embolism. We also collected data on patient deaths. The above were statistically analysed for significance.
Results: In total, 170 patients were identified from our patient database.
Conclusion: Detailed results will be available at time of presentation.

Langerhans Cell Histiocytosis Masquerading as Pituitary Disease: Two Case Reports and Literature Review

P 2.9

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Background: Langerhans cell histiocytosis (LCH) is a rare disease characterised by proliferation of myeloid dendritic cells. Establishing the diagnosis of LCH in pituitary region is challenging. We aimed to review the presentation and diagnosis of LCH disease in central nervous system. We report two cases with biopsy proved to be LCH from July 2014 to June 2019. Literature review on the presentation and diagnosis was performed.
Case Reports: Case 1 was a 51-year-old woman who presented to the Department of Pathology, Queen Elizabeth Hospital, Hong Kong, with partial cranial diabetes insipidus. The patient was later confirmed to have panhypopituitarism and left homonymous hemianopia. Magnetic resonance imaging scan showed enhancing T1 and T2 isointense lesion involving tuber cinereum. Pterional craniotomy with biopsy was done. Frozen section was reported as glioma and final pathology confirmed LCH. Case 2 was a 23-year-old man who presentedwith a history of partial cranial diabetes insipidus and hypogonadal hypogonadism since 2015. Magnetic resonance imaging scan of the pituitary showed thickening of the pituitary stalk and absent posterior pituitary signals. Transfrontal biopsy was done and pathology showed Langerhans cells, compatible with LCH.
Conclusion: This highlights the challenges in diagnosis LCH in pituitary region. The most common presentation is central diabetes insipidus. The diagnosis is usually based on positive clinical, radiological, and histological findings. Multidisciplinary team is required to establish the final diagnosis.

Novel Roles of Insulin-like Growth Factor II and Cell Death in Glioblastoma Temozolomide Resistance

P 2.10

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Objective: To decipher the underlying mechanisms of the temozolomide chemoresistance specifically related to insulin-like growth factor II (IGF2) signalling and cell death pathways, and to determine whether signalling inhibition of IGF2 could reverse chemoresistance.
Methods: Acquired temozolomide-resistant cell lines U87-ATR and U373-ATR were established to compare the molecular profiles between temozolomide-sensitive and temozolomide-resistant glioblastoma. mRNA polymerase chain reaction arrays were performed to shortlist genes with significantly altered expressions. Shortlisted genes were validated with quantitative reverse transcription polymerase chain reaction and Western blotting. In addition, 66 clinical tissue samples of glioblastoma were collected for determining tumour IGF2 level. Insulin-like growth factor II signalling inhibition assay with chromeceptin was performed in vitro to investigate if temozolomide resistance can be reversed. Through investigating LC3B and ATG7 protein expression level, autophagy was preliminarily studied.
Results: U87-naïve and U87-ATR cells demonstrated significant expressional alterations in IGF2 and cell death signalling pathways. Five genes were shortlisted: *BIM, BIRC3, BNIP3, NFAT1*, and *CAMK2A*. BIM, LC3B and ATG7 level change in U87-ATR cells suggested a possible association between autophagy and temozolomide chemoresistance. Clinical tumour samples exhibited a variable range of IGF2 expression, whilst the inhibition of IGF2 signalling with chromeceptin reduced in-vitro tumour growth rate as well as cell survival in temozolomide-resistant U87-ATR cells.
Conclusion: Our findings show that IGF2 and cell death signalling were aberrated in temozolomide-resistant glioblastomas. Inhibition of IGF2 signalling by chromeceptin facilitated inhibition on both cell proliferation and cell survival in the U87-ATR cells. In addition, preliminary results suggested a possible relationship between autophagy and temozolomide chemoresistance in glioblastoma, which elicited further investigations.

Quality of Life after Mild Traumatic Brain Injury: Post-concussion Symptoms and Work Ability

P 2.11

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Objective: To assess the association between quality of life and post-concussion symptoms, as well as work ability, in patients with mild traumatic brain injury (MTBI).
Methods: Patients with MTBI (Glasgow Coma Scale 13-15) aged 16 to 65 years who were admitted to the neurosurgical ward of the Prince of Wales Hospital from 2011 to 2016 were included. Quality of life was assessed by the generic 36-Item Short Form Survey (SF-36) and the disease-specific Quality of Life after Brain Injury (QOLIBRI) questionnaire 1 year after discharge from hospital. Groups that scored 0.3 standard deviations below the population mean on SF-36 scores were considered to have scored below the average range of the normal population on those scores.
Results: In total, 26 patients with MTBI were followed up at 1 year after discharge from the neurosurgical ward. These patients scored below the average range of the normal population on all SF-36 scores except general health. Of the 26 patients, 11 (42%) reported a post-concussion symptom. These patients scored below the average range of the normal population on all SF-36 scores. Compared with patients who did not report a post-concussion symptom, they scored worse on the bodily pain (P=0.035), general health (P=0.035), vitality (P=0.020), and mental health (P=0.036) domains of the SF-36. They also scored worse on the total score (P=0.021), cognition (P=0.006), self (P=0.007), and life and autonomy (P=0.046) domains of the QOLIBRI. Half (50%) of the patients had impaired work ability. These patients scored below the average range of the normal population on all SF-36 scores. Compared with unimpaired patients, they scored worse on the mental component score (P=0.007) and the physical (P=0.036), bodily pain (P=0.017), general health (P=0.013), vitality (P=0.033), social functioning (P=0.008), and mental health (P=0.015) domains of the SF-36. Additionally, they scored worse on the total score (P=0.004), cognition (P=0.021), self (P=0.015), emotion (P=0.007), and physical problems (P=0.002) domains of the QOLIBRI.
Conclusion: In this small cohort of patients with MTBI, poor quality of life at 1 year was associated with reporting a post-concussion symptom or impaired work ability.

P 2.12

Outcome Prediction in Patients with Moderate and Severe Traumatic Brain Injury Using Machine Learning Models: A Big Data Approach in Modern Healthcare Analysis

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Objective: To develop a prediction model using machine learning methods for outcome prediction in patients with moderate and severe traumatic brain injury.
Methods: Patients with moderate and severe traumatic brain injury who were admitted to Queen Elizabeth Hospital from 2006 to 2014 were included. Patient data were extracted from the hospital trauma database, including demographic data, features and measurements on computer tomography of brain, neurological condition on admission, admission vitals, and co-morbidities. Clinical outcomes were based on the Glasgow Outcome Score at 6 weeks and 6 months. Favourable outcome was defined as Glasgow Outcome Score between 4 and 5. Patients were classified by different methods of machine learning, including logistic regression, Naïve Bayes, Random Forest, XGBoost, Support Vector Machine, and artificial neural network. Seven evaluation metrics were utilised to evaluate the classification performance, including accuracy, sensitivity, specificity, precision, recall, F1-score, and the area under the curve (AUC).
Results: A total of 3400 patients were analysed, using different methods of machine learning analysis. After data cleansing, the data were assigned to the training and testing groups in an approximately 4:1 ratio. For outcomes at 6 weeks, artificial neural network had the highest AUC (0.91) for predicting mortality, and Random Forest had the highest AUC (0.90) for predicting favourable clinical outcome. For outcomes at 6 months, XGBoost had the highest AUC (0.91) for predicting mortality, and artificial neural network had the highest AUC (0.92) for predicting favourable outcome.
Conclusion: Machine learning methods can predict outcome and survival of patients with traumatic brain injury, which may be more useful than traditional biostatistical methods in handling big data.

P 2.13

Causes of Acute Non-traumatic Subdural Haematoma

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Objective: To conduct an analysis of different causes of spontaneous subdural haematoma.
Methods: This was a retrospective analysis of cases with primary diagnosis of acute spontaneous subdural haematoma (SDH) admitted to the neurosurgical unit in Queen Elizabeth Hospital from 1 July 2017 to 30 June 2018. Patient data were retrieved from the Clinical Data Analysis and Reporting System. Patients with history of head injury, fall, or trauma in the preceding 6 months were excluded.
Results: A total of 169 cases with chief diagnosis of spontaneous SDH were identified, with 54 cases of acute spontaneous SDH were included after the application of exclusion criteria. In all, 38 cases (70.3%) had operative finding of chronic venous blood, 13 cases (24%) were caused by defect in coagulation system such as over-anticoagulation and thrombocytopenia, two cases (4%) of SDH with arterial bleeding in origin and one case (2%) of SDH caused by brain tumour.
Conclusion: Most non-traumatic spontaneous SDH are of chronic venous bleeding in origin. However, rare causes such as arterial bleeding and tumour bleeding are sometimes encountered.

P 2.14

Problem-based Peers Learning Programme is Effective for Enhancing Knowledge, Skills and Competence of Junior Nurses

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Objective: To enhance the competence and quality of nursing care, and to improve the efficacy of the preceptorship programme for junior nurses.
Methods: Seven junior nurses were invited to participate in the programme. A total of 12 problem-based tutorial sessions were held from December 2018 to May 2019 that included the common illnesses and emergencies encountered for neurosurgical patient. Participants engaged in group discussion, simulations, and skills demonstrations to employ problem-solving skills to sort through research evidence being explored and integrate this into their professional knowledge base. Senior nurses provided feedback and guidance throughout the tutorial sessions. Each participant's neurosurgical knowledge and nursing competence was evaluated before and after the programme. Data were analysed by using paired *t* test to validate the effectiveness of the programme. A post-intervention survey was used to evaluate participant satisfaction.
Results: There were significant improvements in neurosurgical knowledge (144%; P<0.001), and competence (35%; P<0.001) after the programme. All participants were satisfied with the programme.
Conclusion: The Problem-based Peers Learning Programme increased the efficacy in specialty training of junior nurses. This programme enabled junior nurses to improve self-directed learning and to implement of evidence-based nursing practice.

N 1

Evidence-based Clinical Reference for Peripheral Intravenous Access Care in a Neurosurgical Intensive Care Unit

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Objective: Insertion of peripheral intravenous access is one of the most common procedures that patients experience when hospitalised. However, the risk of complications, such as phlebitis and extravasation, can be high. The aim of this study was to review and standardise the current nursing care provided to patients regarding the intravenous access management in a neurosurgical intensive care unit in Queen Mary Hospital. The objectives are to develop a clinical guideline as a reference for peripheral intravenous access care, to familiarise the staff with the key points of the guideline, and to promote proper documentation.
Methods: With the review on the latest evidence-based articles from several databases globally, an evidence-based clinical reference was established for local use (neurosurgical intensive care unit, NS ICU). Pre-test survey was given to all nurses to test their background knowledge on peripheral intravenous access care, while respective education on the clinical reference was then provided to the NS ICU nursing colleagues through identical briefing sessions. Nursing colleagues then took part in the post-test surveys to test their understanding towards the clinical reference.
Results: Among all nursing staff in target unit, 83% of the staff received education towards the evidence-based clinical reference. Six identical questions were set for the pre-test and post-test survey, where the pre-test average score was 23 out of 100 and the post-test average score was 62.
Conclusion: The clinical guideline for peripheral intravenous access care has been successfully developed in the target ward setting. With the posting of the guideline in clinical area and the related education provided to nurses by our team members, staff's awareness towards peripheral access care is raised and they are more familiarised with the key points of the guideline. By following the suggested documentation details, the idea of proper documentation regarding peripheral intravenous access care has been promoted. In order to monitor and maintain the compliance of staff towards the peripheral intravenous access care guideline, periodic assessment with key point's reinforcement is recommended in near future.

Cross-functional Programme: Improving Anti-Embolism Stocking Application in Neurosurgical Unit with Lean and Six Sigma Framework

N 2

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Objectives: To identify the root causes of inappropriate application of TED anti-embolism stockings and to improve the application of TED anti-embolism stockings in a neurosurgical unit.
Methods: The Lean and Six Sigma framework included: (1) Define phase: a multidisciplinary team consisting of nurses and physiotherapists was formed in neurosurgical unit, Prince of Wales Hospital. Project charter was written and literature reviewed on TED anti-embolism stockings usage; (2) Measure phase: for assessing staff performance, physiotherapists were invited to conduct pre-audit in collaboration with authors. Staff knowledge was assessed by questionnaire; (3) Analyse phase: data and graphical analysis were performed to identify the root causes; (4) Improve phase: training sessions were held and videos were shared on an electronic mobile platform. Post-audit of staff performance and knowledge assessment was conducted; and (5) Control phase: a control plan including new staff orientation and regular internal audits was established. Signage was posted to increase awareness among staff and relatives or carers. A video was produced to educate relatives and carers on appropriate use and care of TED anti-embolism stockings, and this was broadcast during visiting hours.
Results: In total, 200 samples were collected in pre- and post-audits, respectively. "Toe stick out of inspection hole" and "wrinkles" were the most commonly reported problems. The instances of improper wearing of TED anti-embolism stockings decreased from 148 to 69 after staff sharing sessions ($P<0.001$, Chi squared test). The overall effectiveness improved from 0.26 to 0.65 ($P<0.001$, paired *t* test). The Sigma level increased from 2.4 σ to 3 σ. Staff knowledge also increased significantly, with mean score increased from 5.9 to 8.8 ($P<0.001$, paired *t* test).
Conclusion: The Lean and Six Sigma framework was useful to improve TED anti-embolism stockings use. Inadequate training and insufficient staff knowledge were identified as causes of improper use of TED anti-embolism stockings.

Tailor-made Electronic Whiteboard for In-hospital Use

N 3

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Objective: To enhance communication and quality of care through application of e-Whiteboard in Neurosurgery, Princess Margaret Hospital, Hong Kong.
Methods: A cross-sectional study with Staff Evaluation Form on e-Whiteboard was designed with Likert-type scale responses from 1 (strongly disagree) to 6 (strongly agree). The Staff Evaluation Form was delivered to nursing staff in the department during the period of 1 September 2019 to 15 September 2019. The satisfactory rate was calculated.
Results: In total, 35 valid responses were received with a response rate of 100%. The satisfactory rate on the application of e-Whiteboard was 92.2%. In total, 94.3% of staff agreed that the information in e-Whiteboard could provide quick access to up-to-date information of patient care, which facilitated performing daily patient care effectively and efficiently.
Conclusion: The e-Whiteboard system was implemented in Princess Margaret Hospital Neurosurgery in July 2019. It is a user-friendly dashboard with information generated from Patient Clinical Handover System automatically for better communication without double entry. This dashboard is hyperlinked from all computers with Clinical Management Systems and PCHOS for quick access. The dashboard offers updated daily care information clearly including risk management on high fall risk cases, high risk of pressure injury cases, and infection precaution cases for all disciplines. Patient's planned appointments and consultations are also displayed to facilitate the daily workflow. Users are allowed to design customised layouts of the e-Whiteboard and were engaged in the early design phases to encourage support for the system. The system is well utilised in all departments of Princess Margaret Hospital and will be rolled out to other hospitals in Kowloon West Cluster. Nurses are encouraged to provide feedback on the design and information on the e-Whiteboard system for further enhancement.

Management of Tracheostomy Emergencies: Design Thinking Process

N 4

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Objective: To assist the frontline staff to tackle the obstacles hindering the tracheostomy care in neurological patients through design thinking process.
Methods: Tracheostomy is commonly performed on neurological patients with respiratory compromise. Tracheostomy emergencies account for the vast majority of tracheostomy related incidents, resulting in significant morbidity and mortality. The obstacles clinical staff encountered were studied multidimensionally through design thinking. Interviews were performed with total 25 frontline doctors and nurses involved and site visit and photo safari were conducted to investigate the obstacles in ward hindering the tracheostomy care. The poor accessibility and availability of the tracheostomy equipment impeded the frontline staff from managing tracheostomy emergencies. A mnemonic care practice, TRACHE and a prototype of tracheostomy emergencies kit with human-centred design were developed and implemented in neurosurgical wards, which aimed at enhancing the efficiency of clinical staff in response to tracheostomy emergencies. The effectiveness of the product was evaluated by Lean management. Value stream mapping was conducted to analyse the processes for tracheostomy resuscitation and the customer satisfactory surveys were performed.
Results: From lean management's perspective, tracheostomy emergencies kit streamlined eight wasteful processes in current state value stream mapping and showed significant reduction on the total value added and non-value added time. It decreased the total lead time for preparation of resuscitation equipment by 76%, compared with current method.
Conclusion: Design thinking explores the frontline staff's unmet desires and places their demands front and centre in the problem-solving process, hence, creating the solution in a human centre way to achieve the success.

Nursing Care after Transsphenoidal Surgery

N 5

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Background: Pituitary tumour accounts for 15% to 20% of all brain tumours. Transsphenoidal surgery is a commonly used surgical approach for pituitary region masses, with significant advantages over open craniotomy. It is minimally invasive surgery performed to remove tumours from the pituitary gland and skull base through the sphenoid sinus, allows preservation of a great majority of the nasal mucosa which promotes rapid healing, preservation of sense of smell and a generally rapid recovery.
Objective: To assess the effectiveness of our nursing care for post-transsphenoidal surgery patient to early identification and prompt treatment of pituitary dysfunction and neurosurgical complications.
Methods: A multidisciplinary team including neurosurgeons, endocrinologist, and nurses is organised to monitor post-transsphenoidal patient's condition, as a variety of clinical signs and symptoms due to the metabolic and endocrinological effects of the hormones pituitary tumour secrete, and due to decompression on surrounding structures. For a successful transsphenoidal surgery, expert nursing care is needed for early identification and prompt treatment of pituitary dysfunction and neurosurgical complications. The literature on nursing after transsphenoidal surgery was reviewed and compared with current nursing practice in Kwong Wah Hospital.
Results: From April 2019 to September 2019, there were nine patients who underwent transsphenoidal pituitary tumour excision in Kwong Wah Hospital. Current nursing care for patients who have undergone transsphenoidal surgery in Kwong Wah Hospital is similar to that reported in the literature.
Conclusion: With comprehensive nursing care, the reduceable complications of transsphenoidal surgery should be reduced for better outcomes of transsphenoidal surgery.

N 6

Prognostic Value of Facial Motor Evoked Potential and Triggered Electromyography for Predicting Postoperative Facial Nerve Function in Cerebellopontine Angle and Skull Base Surgery

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Objective: Postoperative facial palsy is a common complication of cerebellopontine angle and skull base surgery. One of the major objectives of intra-operative neurophysiological monitoring is to identify potential nerve damage in advance in order to prevent facial nerve injury during operation. Besides of traditional free-run electromyography (EMG) and triggered EMG, transcranial electrical facial motor evoked potential (FMEP) has been introduced in author's department since 2015. The objective of this study is to investigate the prognostic value of FMEP and triggered EMG for predicting postoperative facial nerve function in cerebellopontine angle and skull base surgery.
Methods: This was a 3-year (2017-2019) retrospective study to investigate the prognostic value of FMEP and triggered EMG for predicting postoperative facial nerve function. House-Brackmann grading scale was used to grade facial nerve damage after surgery. Final-to-baseline FMEP ratio and threshold of triggered facial EMG were correlated with facial nerve function after surgery. Positive predictive value and negative predictive value, sensitivity, and specificity were compared.
Results: Data collection and analysis are still in progress, the result is pending.
Conclusion: Data collection and analysis are still in progress, the conclusion is pending.

N 7

Intra-operative Electrocorticography for Epilepsy Surgery in a Tertiary Referral Centre: A Nursing Perspective

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Background: Intra-operative electrocorticography (ECoG) has been utilised to guide extent of resection during epilepsy surgery. It is believed that maximal removal of epileptogenic area while preserving surrounding functional area can provide best outcome in seizure control for patients with refractory epilepsy. Selected patients may benefit from the use of intra-operative ECoG, after detailed preoperative assessment and discussion among the multidisciplinary epilepsy surgery team, where nurses play an important role together with neurosurgeons, neurologists, radiologists, clinical psychologists, and neurophysiologists. We hereby report our experience of use of ECoG in Queen Elizabeth Hospital.
Methods: The related multidisciplinary decision and workflow will be described.
Results: Five patients underwent intra-operative ECoG monitoring from 2014 to 2019. Four had focal cortical dysplasia, and one had right frontal lobe epilepsy (underlying right frontal arteriovenous malformation). No intra-operative adverse events were recorded.
Conclusion: The use of ECoG is safe and feasible in selected patients with refractory epilepsy.

AUTHOR INDEX

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