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SUPPLEMENT 5

24th Annual Scientific Meeting of The Hong Kong Neurosurgical Society

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Guest for ASM Gala Dinner

Hon Mrs Regina IP, GBS, JP

SCIENTIFIC PROGRAMME

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

24 November 2017, Friday

08:30 – 09:00	Registration	Poster Room
09:00 – 09:10	**WELCOME SPEECH** ***Dr YC Po***	**EXHIBITION AND POSTERS**
09:10 – 09:50	**KEYNOTE LECTURE I** **Neurosurgery in Elderly Patients: Past, Present and Future** ***Dr Salvatore Chibbaro*** Chairpersons: *Dr YC Po, Dr SC Yuen*	
09:50 – 10:30	**KEYNOTE LECTURE II** **Diagnosis and Treatment of Idiopathic Normal Pressure Hydrocephalus** ***Prof Masatsune Ishikawa*** Chairpersons: *Dr ST Chan, Dr CK Wong*	
10:30 – 10:50	Tea Break	
10:50 – 11:30	**FREE PAPER I** Chairpersons: *Dr SC So, Dr WM Lui*	
11:30 – 12:10	**FREE PAPER II** Chairpersons: *Dr PH Chan, Dr Danny Chan*	
12:10 – 12:50	**KEYNOTE LECTURE III** **Cerebrospinal Fluid Bulk Flow Theory: Is It True?** ***Prof Masatsune Ishikawa*** Chairpersons: *Dr CP Yu, Dr HM Chiu*	
12:50 – 14:00	Lunch — Shanghai Room on 8/F	
14:00 – 14:40	**KEYNOTE LECTURE IV** **Normal Pressure Hydrocephalus: Current Evidences and Trends** ***Dr Salvatore Chibbaro*** Chairpersons: *Dr CF Fung, Dr David Sun*	
14:40 – 15:20	**KEYNOTE LECTURE V** **Practical Points in Treatment of Idiopathic Normal Pressure Hydrocephalus** ***Prof Masatsune Ishikawa*** Chairpersons: *Dr Daniel Ng, Prof WS Poon*	
15:20 – 15:40	Tea Break	
15:40 – 16:20	**FREE PAPER III** Chairpersons: *Dr KH Chan, Dr Michael Lee*	
16:20 – 17:00	**KEYNOTE LECTURE VI** **Chronic Subdural Haematoma and Anticoagulation Therapy in Elderly Patients** ***Dr Salvatore Chibbaro*** Chairpersons: *Dr Dawson Fong, Dr TC Tan*	
Venue for ASM Gala Dinner: 8/F, Shantung Room, Cordis Hong Kong at Langham Place		
17:00 – 18:30	Cocktail Reception	
18:30 – 21:00	**ASM GALA DINNER & LECTURE** **The Belt and Road and the Opportunities for Hong Kong** ***Hon Mrs Regina Ip***	

25 November 2017, Saturday

08:30 – 09:00	Registration		Poster Room
09:00 – 09:40	**KEYNOTE LECTURE VII** **Endonasal Endoscopic Surgery for Giant Pituitary Adenoma and Anterior Cranial Fossa Meningioma** ***Dr Salvatore Chibbaro*** Chairpersons: *Dr YW Fan, Dr WK Wong*		**EXHIBITION AND POSTERS**
09:40 – 10:20	**KEYNOTE LECTURE VIII** **Endonasal Endoscopic Surgery for Clival Chordoma and Ventral Cranio-cervical Junction Lesions** ***Dr Salvatore Chibbaro*** Chairpersons: *Dr Joseph Lam, Dr HT Wong*		
10:20 – 10:40	Tea Break		
10:40 – 11:20	**KEYNOTE LECTURE IX** **Management of Cerebral Aneurysms in Elderly Patients** ***Dr Salvatore Chibbaro*** Chairpersons: *Dr YT Kan, Dr XL Zhu*		
11:20 – 12:00	**FREE PAPER IV** Chairpersons: *Dr John Kwok, Dr FC Cheung*	**VENUE: BALLROOM III** **NURSING SESSION** **Enhancement of Safety in Neurosurgical Nursing Practice** Chairpersons: *Ms SY Chan, Ms SF Ma*	
12:00 – 12:20	**HKNS COMMISSIONED RESEARCH SUBCOMMITTEE PRESENTATION** **Territory-wide Audit on Elderly Head Injury** Chairpersons: *Dr KM Leung, Dr KY Yam*		
12:20 – 12:50	**FREE PAPER V** Chairpersons: *Dr KM Leung, Dr KY Yam*		
12:50 – 13:00	Group Photo for All		
13:00 – 14:00	Lunch Buffet — Shanghai Room & Shantung Room on 8/F		
14:00 – 15:00	**PANEL DISCUSSION ON FAILING BRAIN— ETHICS & LEGAL ASPECTS BY ALL GUEST SPEAKERS** Speakers: *Dr Derrick Au, Dr David Dai, Dr TH Cheung* Chairpersons: *Dr Gilberto Leung, Dr YC Po*		
15:00 – 15:40	**FREE PAPER VI** Chairpersons: *Dr KY Pang, Dr TS Tse*		
15:40 – 16:10	Tea Break		
16:10 – 16:50	**FREE PAPER VII** Chairpersons: *Dr Clarence Leung, Dr Jenny Pu*		
16:50 – 17:00	Lucky Draw and Concluding Remarks		

FP 1.1

Microvascular Decompression for Hemifacial Spasm: Value of Lateral Spread Response

Remy SL Hung, Alberto CH Chu, T Chan, HT Wong, KY Chan
Department of Neurosurgery, Kwong Wah Hospital, Hong Kong SAR

Objective: To investigate the value of lateral spread response in intra-operative monitoring during microvascular decompression for hemifacial spasm.
Methods: A retrospective single-centre review was conducted on eight patients undergoing microvascular decompression for hemifacial spasm with intra-operative electromyography monitoring for lateral spread response at Kwong Wah Hospital, Hong Kong between November 2015 and May 2017.
Results: Mean (range) age of patients was 58 (26-69) years, and female-to-male ratio was 3:1. Lateral spread response was present in all eight cases at the beginning of surgery and persisted in two patients at the end of surgery. Immediately after surgery, six (75%) patients experienced resolution of symptoms and the remaining two (25%) experienced improvement of symptoms. During follow-up at 6 months, seven (87.5%) patients experienced resolution of symptoms and recurrence occurred in one patient.
Conclusion: Intra-operative relief of lateral spread response did not correlate well with immediate and long-term outcome of microvascular decompression for hemifacial spasm.

FP 1.2

Can Electromyography Monitoring Replace Clinical Assessment for Capsular Side-effect in Subthalamic Nucleus Deep Brain Stimulation Operation? A Correlation Study between Electromyography and Clinical Response

Jason MK Ho, XL Zhu, Danny TM Chan, KY Lau, WS Poon
Division of Neurosurgery, Department of Surgery, Prince of Wales Hospital, Hong Kong SAR

Objectives: Deep brain stimulation for Parkinson's disease can be very uncomfortable physically and psychologically under awake condition. Intra-operative electromyography may pick up abnormal muscle activity due to the test stimulation, although not as sensitive as clinical response. By correlating the electromyographic and clinical response, electromyography monitoring during the operation can potentially replace the clinical assessment of capsular side-effect. It can be a useful adjunct for the operation under general anaesthesia.
Methods: A single-centre prospective study was conducted to review consecutive subthalamic nucleus deep brain stimulation awake operation from December 2014 to July 2017 with electromyography monitoring in addition to conventional clinical assessment. Analysis of capsular side-effect threshold between (1) intra-operative and electromyography; (2) intra-operative and clinical; and (3) extra-operative and clinical (during programming) were performed.
Results: A total of 22 patients with Parkinson's disease who underwent deep brain stimulation were analysed. The capsular side-effect tended to correlate with electromyography signals.
Conclusion: Electromyography monitoring can be adopted to assess the capsular side-effect of the stimulation. Further study with larger sample is warranted to investigate the amount of electromyography signal representing the degree of proximity with internal capsule in order to guide the trajectory.

Sodium Valproate-induced Hyperammonaemia: a Prospective Cohort Study

FP 1.3

Eric YH Cheung, Peter YM Woo, W Lam, HT Wong, KY Chan
Department of Neurosurgery, Kwong Wah Hospital, Hong Kong SAR

Objectives: Sodium valproate is widely prescribed for patients for a range of disorders including seizures, psychiatric conditions, and chronic pain syndromes. Although it is generally well tolerated, valproate is associated with adverse effects involving the hematopoietic, hepatic, and gastrointestinal systems. Valproate-induced hyperammonaemia is an idiosyncratic phenomenon with an incidence reported in up to 75% of patients with most being asymptomatic.[1] However, in rare instances valproate-induced hyperammonaemic encephalopathy can occur and is potentially lethal.[2] This study aimed to investigate the incidence of hyperammonaemia among Chinese neurosurgery patients taking sodium valproate and to identify its risk factors. We also aimed to determine the incidence and predictors of valproate-associated adverse effects.

Methods: A prospective cohort study was conducted on all adult (≥18 years) Chinese patients admitted to the Department of Neurosurgery from 1 April 2016 to 30 September 2017. Blood serum valproate levels, liver function, hepatitis B viral antigen positivity, and ammonia levels were taken for all patients at a minimum of 1 week after valproate administration. Clinical records, laboratory data, and medication prescription records were reviewed. Multivariate binary logistic regression and linear regression hypothesis testing were conducted with an alpha level of 0.05. Statistical analysis was performed with SPSS for Windows, version 21.0.

Results: A total of 131 neurosurgical patients (73 men and 58 women) were identified, with a male-to-female ratio of 1.25:1 and mean (range) age of 52 (18-83) years. In all, 28 (21%) patients had hyperammonaemia with a mean valproate intake of 7 months (range, 7 days to 18 months). The mean serum valproate level was 442 μmol/L (range, 55-848 μmol/L; therapeutic levels: 347-693 μmol/L). Among patients with hyperammonaemia, only five (17.9%) had deranged liver function and two were symptomatic. One patient presented with progressive drowsiness with a valproate level of 462 μmol/L. Valproate was stopped and the patient recovered full consciousness. Another patient became comatose with fatal diffuse cerebral oedema with an ammonia level of 411 μmol/L (normal range, 10-47 μmol/L) despite haemofiltration therapy.

Conclusion: There was a relatively high incidence of hyperammonaemia among our neurosurgical patients. Further findings will be discussed.

References

1. Murphy JV, Marquardt K. Asymptomatic hyperammonemia in patients receiving valproic acid. Arch Neurol 1982;39:591-2.
2. Gomceli YB, Kutlu G, Cavdar L, Sanivar F, Inan LE. Different clinical manifestations of hyperammonemic encephalopathy. Epilepsy Behav 2007;10:583-7.

Geriatric Neurosurgery: Analysis of a Single Tertiary Centre

FP 1.4

SK Chan, HK Mak, TS Tse, HM Chiu
Department of Neurosurgery, Queen Elizabeth Hospital, Hong Kong SAR

Objective: To perform a cross-sectional study on geriatric neurosurgery admission in a single tertiary centre.
Methods: Data were retrieved from the Clinical Data Analysis and Reporting System in Clinical Management System. Details of all neurosurgery admissions of patients aged ≥80 years in Queen Elizabeth Hospital, Hong Kong, from 1 January 2014 to 31 December 2016 were included. Patient demographics, principal diagnosis, operation performed, length of stay, and mortality were studied.
Results: A total of 1391 admissions were included, which accounted for 17.5% of all neurosurgery admissions during that period. The mortality rate was 12.5%, whereas the general figure was 4.6%. The majority (51%) of the patients were admitted for head trauma. In all, 262 (18.8%) patients underwent operations, in whom the mortality was 11.8%. Burr hole operations were the main category (60%) of all geriatric neurosurgical procedures. Subgroup analysis of craniotomy or craniectomy group showed that the use of antiplatelet or anticoagulant was associated with higher mortality. However, no statistically significant risk factors for mortality were noted.
Conclusion: A significant portion of patients admitted for neurosurgery were aged ≥80 years and the majority of these were trauma-related. Nearly one fifth required neurosurgical intervention. The operative mortality was 11.8%, which was similar to the overall mortality in this age-group.

Effect of Cranioplasty on Neurocognitive Function and Cerebral Perfusion

FP 2.1

CF Ng, HK Mak, FC Cheung
Department of Neurosurgery, Queen Elizabeth Hospital, Hong Kong SAR

Objectives: Syndrome of the trephined is a recognised phenomenon after craniectomy in certain group of patients, characterised by neurocognitive deficit. There have been case reports showing cognitive improvement in up to 30% of patients after cranioplasty, yet the underlying mechanism remains unclear. Some studies have demonstrated enhanced cerebral perfusion by non-invasive investigations, but there is a lack of large-scale structured studies to verify such effect. This study aimed to investigate the effect of cranioplasty on cognitive function, and to investigate the effect of cranioplasty on autoregulation on cerebral blood flow.
Methods: This was a prospective investigational study in which 15 patients with craniectomy performed more than 6 months prior were recruited from 2015 to 2016 at Queen Elizabeth Hospital, Hong Kong. Autologous bone flap that had been stored in the bone bank or synthetic materials (acrylic or titanium) were used for cranioplasty. Patients were included only if they were able to obey simple commands and static in cognitive recovery. Patients with unstable medical and neurosurgical conditions were excluded. Cognitive assessment was performed by an occupational therapist independent of the surgical procedure before cranioplasty and at 1 month and 3 months postoperatively. Transcranial Doppler was used as an indirect and non-invasive measurement of the cerebral vascular haemodynamic changes and cerebrovascular reactivity. Patients were required to hold their breath; transcranial Doppler findings were recorded before and while holding breath.
Results: There was a statistically significant improvement in Rey-Osterrieth Complex Figure Test in immediate recall at 3 months (P=0.05), delay recall at 1 month (P=0.014), and delay recall at 3 months (P=0.028).
Conclusion: Cranioplasty had a positive effect on cognitive functions in patients with craniectomy.

FP 2.2

Flow Diversion with Pipeline Embolisation Device for Intracranial Aneurysms—Our 9-Year Single-centre Experience

Jane CY Lau[1], CF Fung[1], PW Cheng[2]
[1] Private Practice
[2] Scanning Department, St. Teresa's Hospital, Hong Kong SAR

Since its introduction to Hong Kong in 2008, flow diversion with various stents for intracranial aneurysms has been a mainstay treatment for intracranial aneurysms. In this retrospective single-centre study, we shared our 9-year experience in managing cerebral aneurysms using a Pipeline Embolization Device. We studied clinical and radiological data from 155 patients who underwent 183 flow diverter stents placement for 226 cerebral aneurysms using Pipeline Embolization Device from September 2008 to December 2016. The patterns of clinical presentation, properties of the aneurysms, and usage of antiplatelet regimen were examined, and the clinical and radiological outcomes of these patients were analysed.

FP 2.3

Age and Outcome Following Non-traumatic Intraventricular Haemorrhage: Do Elderly Patients Fare Worse?

Kevan J Sham, WS Poon
Division of Neurosurgery, Department of Surgery, Prince of Wales Hospital, Hong Kong SAR

Intraventricular haemorrhage (IVH) is a subtype of intracerebral haemorrhage that is associated with high mortality and severe disability. With an ageing population, we are now treating an increasing number of elderly patients with IVH. Few studies have examined IVH in elderly cohort. We aimed to compare the clinical outcome between younger and older adults, and to examine other factors influencing outcome. A 10-year retrospective review was conducted on all patients admitted to our unit from 1 January 2007 to 31 December 2016 with external ventricular drain insertion for non-traumatic intracerebral haemorrhage of <30 mL and IVH obstructing the third and fourth ventricles. Patients with associated subarachnoid haemorrhage were excluded. Patients were divided into two groups: ≥65 and <65 years. The primary outcome was assessed by the modified Rankin Scale (mRS) score at 6 months. Good outcome was defined as mRS score ≤3. A total of 66 patients were included, with age range from 20 to 77 years; median age was 55 years. In all, 15 patients were aged ≥65 years. The median Glasgow Coma Scale score at admission was 9. Also, 32 (48.5%) patients had mRS score between 0 and 3 at 6 months, and there were 13 (19.7%) mortalities at 6 months. Further analysis will be presented.

FP 2.4

Aneurysmal Subarachnoid Haemorrhage in Elderly Patients: a Retrospective Review

Natalie MW Ko, Rebecca Ng, KY Pang, CK Wong
Department of Neurosurgery, Pamela Youde Nethersole Eastern Hospital, Hong Kong SAR

Objective: We are witnessing a steady rise in human life expectancy globally thanks to advances in improved social conditions and in the treatment and prevention of diseases. The number of elderly patients presenting with aneurysmal subarachnoid haemorrhage (SAH) increases as our local population also increases. This study aimed to investigate the clinical outcomes of aneurysmal SAH in elderly patients.
Methods: A single-centre retrospective review was conducted on consecutive elderly patients presenting to our centre for ruptured intracranial aneurysm, from 1 January 2012 to 31 December 2016, who had undergone either endovascular therapy or neurosurgical clipping.
Results: The 25 patients identified had mean age 84.5 years. Seven (28%) cases of aneurysmal SAH resulted in death within the same episode of admission. Ten (40%) patients were treated either conservatively or with external ventricular drainage, especially if presenting with poor-grade aneurysmal SAH. Endovascular coiling was the preferred treatment in 15 (60%) patients who underwent surgical intervention.
Conclusion: Treatment of a ruptured aneurysm in elderly patients >75 years was feasible, especially in those admitted in good clinical condition.

FP 3.1

Is There Any Difference in Cerebrovascular Reserve on Computed Tomography Perfusion in Patients with Moyamoya Disease and Atherosclerotic Disease?

CW Tang[1], WL Poon[2]
[1] Department of Radiology, Pamela Youde Nethersole Eastern Hospital, Hong Kong SAR
[2] Department of Radiology and Imaging, Queen Elizabeth Hospital, Hong Kong SAR

Objective: To compare cerebrovascular reserve (CVR) in patients with carotid and cerebral stenotic disease due to moyamoya disease and atherosclerotic disease.
Methods: All patients with >50% carotid or intracranial arterial stenosis, either due to atherosclerosis or moyamoya disease, and underwent computed tomography perfusion between February 2015 and December 2016 were retrospectively reviewed. Patients who had prior cerebral revascularisation were excluded. Cerebrovascular reserve in patients with moyamoya disease and atherosclerotic disease was compared. The regional cerebral blood flow (CBF) before and after intravenous 1 g acetazolamide injection was determined by computed tomography perfusion. Adequate baseline CBF and CVR were defined as 50 mL/100 g/min and 10% increment, respectively. Chi squared test was used to compare the CVR in two groups of patients.
Results: A total of 43 patients were recruited (17 men and 26 women; mean age, 52 years). In all, 26 patients had moyamoya disease with intracranial stenosis and 17 had atherosclerotic disease with intracranial stenosis or extracranial carotid stenosis. Subnormal baseline CBF were observed in 25 (96.2%) and 15 (88.2%) patients with moyamoya disease and atherosclerotic disease, respectively. Inadequate CVR was more commonly seen in patients with moyamoya disease (n=20, 76.9%) than those with atherosclerotic disease (n=8, 47.1%; $P<0.05$).
Conclusion: Patients with moyamoya disease had worse baseline CBF and CVR compared with those with atherosclerotic disease. We postulated that moyamoya disease affects microcirculations besides more proximal intracranial arteries, therefore the intracranial vasculatures have lower vasodilatory capacity on acetazolamide challenge; whereas atherosclerotic disease only affects the more proximal intracranial or extracranial vessels. Early cerebral revascularisation might be beneficial to patients with moyamoya disease.

FP 3.2

Single-centre Review of Management and Outcomes of Ruptured Dissecting Vertebral Artery Aneurysms

Joanna WK Ho, Derek PH Wong, KF Fok, HM Chiu
Department of Neurosurgery, Queen Elizabeth Hospital, Hong Kong SAR

Endovascular treatment for ruptured dissecting aneurysms within the posterior circulation remains controversial, as the conventional treatment of trapping the dissecting segment carries risk of medullary infarct, which is a complication for which risk factors are not well understood. Endovascular stenting and flow diverters have recently emerged as alternative treatment options of these aneurysms. Hence, a literature review of available evidence of treatments of ruptured vertebral aneurysms was performed along with a single-centre review of the management and outcomes of such aneurysms. A retrospective review was conducted on consecutively treated ruptured vertebral aneurysms from 1 January 2012 to 31 March 2017 in Queen Elizabeth Hospital, Hong Kong. Baseline characteristics concerning patient demographics, dimensions of the aneurysm, location of aneurysm in relation to the posterior inferior cerebellar artery, modes of treatment, and grading of subarachnoid haemorrhage were collected. Primary outcome was defined as functional dependence and death as charted by modified Rankin Scale score at 6 months. Secondary outcomes included re-bleeding, development of posterior circulation infarct, symptomatic intracerebral haemorrhage, vasospasm, seizures, development of cerebral salt wasting, and hydrocephalus. Univariate and multivariate analyses were performed to identify associations with poor outcome and development of complications. Results and conclusions of this study are pending.

FP 3.3

Application of Point-of-care Platelet Function Assay in Guiding Platelet Transfusion in Aspirin Users with Intracranial Haemorrhages

Denise KY Cheng, CP Tsang, Gilberto KK Leung
Division of Neurosurgery, Department of Surgery, Queen Mary Hospital, Hong Kong SAR

Objectives: To study the changes in platelet activities following platelet transfusion in aspirin users and to identify factors associated with differential responses to platelet transfusion.
Methods: Patients who took aspirin and presented with intracranial haemorrhages were recruited. Patients who were on other anticoagulation or antiplatelet agents were excluded. Baseline aspirin response units were measured using VerifyNow and only aspirin responders were included. Four units of platelet concentrate were transfused. Aspirin response units were then repeated at 4 hours, 24 hours, and 48 hours from time of transfusion and their trend of platelet activity identified. The interval changes of the intracranial haemorrhage on computed tomographic scan and the patient outcome were set as secondary outcomes.
Results: From February 2014 to April 2017, 26 patients were recruited into this prospective pilot study. Three patients whose platelet transfusion was deemed not necessary clinically, two with concomitant use of antiplatelet or anticoagulation agents, and one who was an aspirin non-responder at baseline were excluded. Fifteen patients had a definite history of head injury. Only one patient required an emergency operation. At 4 hours after transfusion, 11 (55%) patients became aspirin non-responders after platelet transfusion. Overall, eight patients had persistently normalised platelet function, three had delayed normalisation, and four transiently normalised. Five (25%) patients had persistently abnormal platelet function. Factors that might affect platelet activity including platelet count on admission and baseline renal function were studied.
Conclusions: Platelet activity was successfully normalised in more than half of the patients at 4 hours after platelet transfusion, but the duration of this effect varied. Further studies on whether to give additional platelet transfusions to persistent aspirin responders based on the VerifyNow result, and if any differences in outcome in giving platelet transfusion based on their responder status on presentation are warranted.

Territory-wide Primary Decompressive Craniectomy Outcomes for Ischaemic Stroke Patients in the Hospital Authority

FP 3.4

Sarah SN Lau[1], ML Chang[2]; Working Group on Neurosurgical Outcomes Monitoring
[1] Department of Neurosurgery, Tuen Mun Hospital, Hong Kong SAR
[2] Department of Clinical Effectiveness and Technology Management, Quality and Safety Division, Hospital Authority Head Office, Hong Kong SAR

Objective: To review local primary decompressive craniectomy outcomes from 2015 to 2017, and to identify any risk factors for poor outcome.
Methods: Data of 138 patients aged >18 years who underwent decompressive craniectomy for ischaemic stroke in Hong Kong Hospital Authority hospitals from 2015 to 2017 were collected and retrospectively analysed. Thirty-five patients had infratentorial infarcts and were excluded. Primary endpoint was mortality at 6 months and secondary endpoints were modified Rankin Scale score at 3 and 6 months.
Results: Mean (standard deviation, range) age of patients was 58.6 (9.86, 24-84) years. In all, 61% of patients were men, and 39% were taking antiplatelet agent 90 days before onset of stroke. Besides, 35% of patients had left hemispheric stroke and 31% underwent operation in <24 hours. In those aged <61 years, the mortality was 25.6% at 6 months. Good outcomes (modified Rankin Scale score <4) were noted in 12.8% of patients at 3 months and 17.9% at 6 months, respectively. In our analysis, patient age of <61 years was a significant predictor of mortality and good outcome at 6 months ($P<0.05$). Time to operation, aspirin use, laterality of stroke, occlusion site, post-intravenous or intra-arterial tissue plasminogen activator, haemorrhagic transformation of infarct, and preoperative National Institutes of Health Stroke Scale score of >16 were not significant predictors of mortality or good outcome.
Conclusion: Patient age was a significant predictor of mortality and good outcome for decompressive craniectomy patients locally.

Trans-sphenoidal Endoscopic Surgery for Skull Base Tumours with Nasoseptal Flap

FP 4.1

Ronald Li, CL Kwan, HT Wong
Department of Neurosurgery, Kwong Wah Hospital, Hong Kong SAR

Objective: Among the various endoscopic skull base technique advancement over the years, one of the greatest concerns is the method of skull base reconstruction and repair of cerebrospinal fluid (CSF) leak. We conducted a retrospective review to study the clinical outcomes as well as the associated nasal complications in trans-sphenoidal endoscopic excision performed in our centre.
Methods: All patients having trans-sphenoidal endoscopic excision of skull base tumours from January 2016 to July 2017 were reviewed. All patients were also followed up in the Ear, Nose and Throat Department of our hospital. Data regarding the tumour pathology, CSF leakage, olfactory complications, methods of reconstruction, and clinical outcomes like visual improvement and flap status were studied.
Results: Five men and four women were reviewed. All patients had either improved or static visual functions. Among these nine patients, eight had nasoseptal flap as the method for skull base reconstruction. None of them had CSF leak. Two patients had olfactory complications postoperatively.
Conclusion: The use of nasoseptal flap as skull base reconstruction during trans-sphenoidal excision for skull base tumours was shown to be satisfactory with a relatively low rate of CSF leak and associated nasal complications.

Change of Olfactory Function after Endoscopic Trans-sphenoidal Surgery for Pituitary Tumours: a Cohort Study

FP 4.2

KT Yeung, Danny TM Chan, CM Cheung, MW Chow, WS Poon
Division of Neurosurgery, Department of Surgery, Prince of Wales Hospital, Hong Kong SAR

Objective: To investigate the change of olfactory function after endoscopic trans-sphenoidal surgery (TSS) in our locality.
Methods: This was a prospective cohort study performed in Prince of Wales Hospital, Hong Kong. Inclusion criteria were patients aged 18 to 65 years and a diagnosis of pituitary adenoma requiring TSS. Exclusion criteria were Parkinson's disease, history of olfactory dysfunction, uncooperativeness, and a history of TSS. The University of Pennsylvania Smell Identification Test (UPSIT; Sensonics International) was performed preoperatively, as well as at 2 months and 6 months postoperatively. The olfactory function was categorised as normosmia, mild microsmia, moderate microsmia, severe microsmia, and anosmia.
Results: A total of 16 pituitary adenoma patients were recruited. Mean age of patients was 58.6 (range, 33-76) years. Before operation, 18.8% of patients had mild microsmia, 37.5% had moderate microsmia, 37.5% had severe microsmia, and 6.2% had anosmia. After surgery, 37.5% had transient deterioration of olfactory function (drop in the test score 2 months postoperatively and recovery 6 months postoperatively). Besides, 18.8% had persistent deterioration of olfactory function 6 months postoperatively; 25% had stable score pre- and post-operatively; and 18.8% had improved UPSIT score at 2 and 6 months postoperatively.
Conclusion: A phenomenon of baseline olfactory dysfunction in this cohort was found. Majority of patients (37.5%) had transient olfactory deterioration, whereas 18.8% had persistent deterioration 6 months after TSS.

Elderly Patients with Glioblastoma—A 7-Year Single-centre Retrospective Review

FP 4.3

NL Chan, FC Cheung, HK Mak
Department of Neurosurgery, Queen Elizabeth Hospital, Hong Kong SAR

Objective: To investigate the clinical outcome after surgical and adjuvant treatments for geriatric patients with glioblastoma, as well as the predictive factors of good clinical outcome.
Methods: This was a single-centre retrospective study including all patients aged >70 years with histologically confirmed glioblastoma from January 2010 to September 2017. Primary outcome was overall survival. Predictive factors for good outcome were also measured.
Results: There were 30 patients aged ≥70 years (range, 70-85 years) diagnosed with glioblastoma within the study period; all were supratentorial tumours. Majority of the patients had craniotomy rather than a biopsy. Median overall survival was 12.5 months (range, 1-38 months). Two-thirds of these patients received either chemotherapy with temozolomide or radiotherapy or combination. Predictive factors for good outcome included better Karnofsky Performance Score, concurrent chemoradiotherapy, and free of any medical co-morbidity. Patients receiving tumour excision had better survival than those with biopsy only, but there was no significant difference between gross total removal and subtotal removal.
Conclusion: It is worthwhile to consider aggressive treatment in selected group of patients with glioblastoma multiforme. Craniotomy for tumour excision would be a better choice of surgical treatment than biopsy. Completeness of tumour excision did not affect the overall survival.

FP 4.4

Long-term Outcome of Patients Undergoing Combined Transcranial and Trans-sphenoidal Resection of Giant Pituitary Adenomas—A Retrospective Study

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Objective: The extended endoscopic trans-sphenoidal approach for tackling giant pituitary adenomas, albeit safe and effective, is technically challenging and requires expertise. A widely adopted alternative is the "above and below" approach which combines the best of both transcranial and trans-sphenoidal approaches: it aids complete resection of large suprasellar lesions whilst reducing the risk of haemorrhage within the intradural space. Herein we present our experience in treating giant pituitary adenomas via a single-setting combined approach, with a focus on the long-term outcomes and clinical implications on patient management.
Methods: A retrospective review was carried out on patients undergoing combined approach for treatment of pituitary adenoma in our centre from October 2000 to October 2017. Outcomes in terms of completeness of resection, surgical complications, permanent endocrine and visual deficits, resolution of presenting symptoms, and presence of residual or recurrent tumours were reviewed.
Results: Our study included 25 patients (16 women and 9 men) with mean age 49 years (range, 17-85 years) at presentation. In all, 20 (80%) patients presented to our hospital for the first time, and five (20%) had a history of resection. Symptoms on presentation included visual disturbance (92%), obstructive hydrocephalus (8%), acute confusion (8%), acromegaly (4%), and cranial nerve palsy (4%). Tumour height ranged from 2.4 cm to 5.8 cm. Three (12%) patients had cerebrospinal fluid leakage, three (12%) had cranial nerve injury, two (8%) had graft donor site complications, one (4%) had meningitis, and one (4%) had deep vein thrombosis and subsequent pulmonary embolism. No postoperative intracranial haemorrhage or operative mortality was reported. Permanent hormonal deficit was noted in 21 (84%) patients, whilst 14 (56%) had persistent visual defects. On discharge, 11 (44%) patients had complete resolution of presenting symptoms. Gross total removal was achieved in 14 (56%) patients: 10 remained tumour-free; three had residual disease of which one required radiotherapy for progressive disease; and one refused postoperative magnetic resonance imaging resulting in unknown tumour status. Subtotal removal was performed in 11 (44%) cases, with six having static residual disease. Ten patients received postoperative radiotherapy and two are pending reassessment imaging before deciding if adjuvant therapy is needed.
Conclusion: With limited existing data, it is difficult to make direct comparisons on the safety and effectiveness of combined approaches in treating pituitary macroadenomas. However, our results revealed a 100% success rate in avoiding postoperative intracranial haemorrhage, which is an important advantage advocated by this technique. Furthermore, with the exception of one case, all our patients achieved either tumour-free status or static residual disease. Further studies on the application of this surgical technique in clinical practice are warranted to analyse which group of patients can benefit the greatest from this approach.

Elderly Patients with Traumatic Brain Injury—A 2-Year Cohort Study

FP 5.1

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Objective: To identify predictive factors for 30-day mortality in patients aged ≥65 years with traumatic brain injury (TBI).
Methods: Patients admitted through resuscitation room of Prince of Wales Hospital, Hong Kong between 2014 and 2015 with admission Abbreviated Injury Scale head and neck score of ≥2 were included. Their baseline characteristics, medical history, clinical evaluations, admission brain computed tomographic features, and cranial surgery triage were collected. Besides, 30-day mortality and favourable outcome defined by Glasgow Outcome Scale at discharge were assessed. Comparisons of the outcomes among age-stratified groups (65-74, 75-84, and ≥85 years) were analysed.
Results: A total of 289 patients with TBI, with mean (standard deviation) age 78.8 (8.4) years and median Glasgow Coma Scale (GCS) of 15 (interquartile range, 14-15) were included. In all, 82% of the patients had preventable fall (<2 metres), 30-day mortality was 20%, and rate of favourable outcome was 65%. Univariate analysis showed all variables were significantly associated with mortality except gender, cause of injury, and pre-TBI medications. Cranial surgery triage, pre-TBI condition, Injury Severity Score (ISS), and GCS (eye opening) were predictive factors by logistic regression (R^2: 74%; goodness of fit: 0.82). Comparisons among age-stratified subgroups showed significant differences in gender, cause of injury, and pre-TBI condition. Furthermore, favourable outcomes were significantly different across the age-groups (70%, 72%, and 51%, respectively; P=0.007) whereas cranial surgery triage and 30-day mortality were not significantly different.
Conclusion: Preventable fall is a predominant cause of TBI in patients aged ≥65 years. Poor pre-TBI condition, high ISS, low GCS (eye opening), and unfit for cranial surgery predicted mortality at 30 days in TBI. Favourable outcomes at discharge were heterogeneous among the age-groups.

Use of Tranexamic Acid for Traumatic Brain Injury with Contusions or Traumatic Subarachnoid Haemorrhage in Elderly Patients

FP 5.2

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Objective: To investigate the impact of tranexamic acid (TXA) as an initial non-operative treatment on the mortality rate of traumatic brain injury with contusions or traumatic subarachnoid haemorrhage in elderly patients.
Methods: This was a 7-year retrospective study of consecutive patients admitted for traumatic brain injury with contusions or traumatic subarachnoid haemorrhage from 2010 to 2016, at Queen Mary Hospital, Hong Kong. Primary outcome was overall mortality rate. Secondary outcomes included rate of deterioration requiring operation and the survival rate without operations.
Results: A total of 651 consecutive patients were identified. In all, 81 patients had TXA (TXA group) and 570 did not (control group) during admission. Their mean age was 73.92 years (95% confidence interval [95% CI=68.77-77.84] years) for the TXA group versus 65.36 years (95% CI=63.24-67.48 years) for the control group (P=0.0062). The overall mortality rate with TXA was 7.40% versus 8.77% in the control group (odds ratio [OR]=0.832, 95% CI=0.345-2.007; P=0.682). The rate of deterioration requiring operation in the TXA group was 6.17% versus 16.3% in the control group (OR=0.337, 95% CI=0.133-0.857; P=0.022). The survival rate without operations in the TXA group was 88.89% versus 77.89% in the control group (OR=2.270, 95% CI=1.104-4.667; P=0.026).
Conclusion: Patients in the TXA group was significantly older than that in the control group. The overall mortality rates were comparable in the two groups. The TXA group had a lower rate of operation. There were significantly more survivors without operations with the use of TXA.

FP 5.3

Outcomes and Complications of Surgery for Sporadic Vestibular Schwannoma in the New Territories West Cluster: a Retrospective Review

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Objective: To review the case numbers and surgical complications of sporadic vestibular schwannoma from 2012 to 2016 in the New Territories West Cluster group of hospitals in Hong Kong.

Methods: This was a retrospective review of patients with sporadic vestibular schwannoma, who received operative treatment in our unit. Operation records from 2012 to 2016 were reviewed and summarised. Tumour pathologies were retrieved from patient medical records. Epidemiological results were categorised based on case numbers and demographic data. Total catchment area population of New Territories West Cluster was retrieved from government statistics. Preoperative symptoms and signs, tumour sizes, surgical procedures, and the degree of excisions were reviewed. The primary outcomes were postoperative complications. Major complications included postoperative mortality, intracranial haemorrhage, meningitis, and cerebrospinal fluid (CSF) leakage. Facial nerve functions by House-Brackmann (HB) grading were compared before and after the operation. Acoustic nerve functions were assessed by both clinical and pure-tone audiograms preoperatively and postoperatively. Other complications including trigeminal nerve deficit, abducens nerve palsy, lower cranial nerve paresis, cerebellar impairment, and hydrocephalus were also analysed.

Results: There were 60 patients with sporadic vestibular schwannoma excised in the study period, with an annual case number of 1.06 per 100 000 population. Vestibular schwannoma had a female-to-male ratio of 0.88. The mean age of patients at the time of operation was 53.8 years. The mean maximal preoperative diameter was 28.6 mm. The common presenting symptoms of vestibular schwannoma in our series included hearing impairment (85.0%), tinnitus (33.3%), disequilibrium (45.0%), and facial numbness (26.7%). Among the 60 patients who received surgical treatment, the retromastoid approach was adopted in 59 (98.3%) patients and translabyrinthine approach in one (1.7%) patient. The methods of CSF release included 14 (23.3%) cases from lumbar drain, eight (13.3%) from external ventricular drainage, and 37 (61.7%) from cisterna magnum. The mean operating time was 418 minutes, with the drilling of internal acoustic meatus performed in 25 (41.7%) patients. Gross total removal and near total removal were performed in 10 (16.7%) and 15 (25.0%) patients, respectively. The mean postoperative length of stay was 12 days. One (1.7%) patient missed subsequent follow-up. There was no postoperative mortality, but one (1.7%) patient had postoperative minor intracranial haemorrhage with no intervention required. There was one (1.7%) case with postoperative meningitis, and another (1.7%) of CSF leakage with surgical repair performed. At 6 months postoperatively, two (3.3%) patients had abducens nerve palsy and one (1.7%) had HB grade 4, two (3.3%) had HB grade 3, and 18 (30.0%) had HB grade 2 facial nerve palsy. Besides, 19 (31.7%) patients had a serviceable hearing before the operation, but 15 (25.0%) had deteriorated hearing over the operative side. Also, 10 (16.7%) patients had preoperative hydrocephalus and ventricular-peritoneal shunts were performed in three (5.0%). Also, there was one (1.7%) patient with cerebellar ataxia after the operation without cerebellar infarction and another (1.7%) with persistent vocal cord palsy. Trigeminal nerve deficits after the operations resolved in the long-term assessment.

Conclusion: The major complication rate for sporadic vestibular schwannoma was 5.0%, including 1.7% risk of CSF leakage, 1.7% risk of meningitis, and 1.7% risk of intracranial haemorrhage. The risk of persistent lower cranial nerve palsy was 1.7% and that of abducens nerve palsy was 3.3%. Facial nerve palsy rate was 35.0% and significant facial nerve palsy with HB grade 3 or above was observed in 5.0% patients in long-term follow-up. Hearing preservation was achieved in 21.0% patients.

FP 6.1

Case Series of Frameless Stereotaxic Radiosurgery and Radiosurgery for Patients Aged ≥80 Years in a Regional Hospital

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Objective: Frame-based immobilisation is the gold standard for giving radiotherapy and radiosurgery to intracranial pathologies. As technology advances, frameless technique is also available. In our hospital, radiosurgery or radiotherapy for patients aged ≥80 years is becoming more common. We report a case series of patients aged ≥80 years receiving frameless radiotherapy or radiosurgery and investigate the characteristics of this particular group compared with other age-groups. We also report the progress after frameless radiotherapy or radiosurgery.
Methods: This was a retrospective study to collect all the patient data since the commencement of frameless radiotherapy or radiosurgery service in our centre. Disease categories, Eastern Cooperative Oncology Group Performance Status, Karnofsky Performance Status before and after treatment, disease progression, and incidences of radionecrosis in different age-groups were also compared.
Results: Five patients aged ≥80 years received radiotherapy or radiosurgery in the study period. None had intravascular pathology. All patients had less aggressive type of intracranial lesions (meningiomas or vestibular schwannomas) and had no change in Karnofsky Performance Status and Eastern Cooperative Oncology Group Performance Status. No disease progression was detected after treatment. No radionecrosis was noted in the follow-up imaging study.
Conclusion: Frameless-based treatment is an effective alternative to treat intracranial lesions for patients aged ≥80 years. However, owing to the small number of patients during the study period, we will continue the study and review the results later.

FP 6.2

Descriptive Study on Radiosurgery-treated Arteriovenous Malformation in Tuen Mun Hospital from 1998 to 2016

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Background: Radiosurgery is a widely adopted treatment for central nervous system arteriovenous malformation (AVM). However, the complexity of high-grade AVM leads to controversy in treatment options. This study aimed to investigate the results of radiosurgery-treated AVM in Tuen Mun Hospital, Hong Kong, from 1998 to 2016.
Methods: This was a descriptive study reviewing the outcome of radiosurgery-treated AVM in Tuen Mun Hospital. Data were retrieved from the Clinical Data Analysis and Reporting System using keywords 'radiosurgery' and 'arteriovenous malformation' from 1998 to 2016. Data were studied and analysed using SPSS. The focus of the study was to identify the factors affecting the outcome. Primary outcome was obliteration rate and secondary outcome was modified Rankin scale (mRS) score.
Results: There were 82 radiotherapies performed during the study period; 14 were of stereotactic radiotherapy. There were 68 stereotactic radiosurgeries performed, of which 19 were under frameless localisation. Overall obliteration rate was 47.6%. Over 90% of the patients had good outcome (mRS score 0-3). There was statistical significance between nidus volume/nidus diameter/Spetzler-Martin (SM) grading and obliteration rate. Rupture status was significantly related to mRS score. There was statistical significance between obliteration rate and mRS score.
Conclusion: The majority of radiosurgery-treated AVMs in Tuen Mun Hospital had a good outcome. Nidus volume/nidus diameter/SM grading were associated with obliteration rate which in turn effects mRS score. Rupture status was found to have a direct relationship with mRS score.

FP 6.3

Postoperative Stereotactic Radiotherapy/Radiosurgery and Whole Brain Radiotherapy for Metastatic Brain Tumours

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Objective: This study aimed to review the current practice of postoperative radiotherapy in Tuen Mun Hospital, Hong Kong. Demographics, survival, evidence of cognitive decline, and recurrence of patients were also examined.
Methods: A retrospective review was conducted on 150 patients with metastatic brain tumour undergoing craniotomy for resection of brain tumour from 2011 to 2016. They underwent whole brain radiotherapy (WBRT) or stereotactic radiotherapy/radiosurgery (SRT/SRS) postoperatively. Demographic data, extent of resection, systemic control, and choice over WBRT or SRT/SRS were compared. The difference in survival, local and other regional brain recurrence, and cognitive decline between these two groups were compared. Statistical analysis was done using SPSS.
Results: This study involved 140 patients aged between 21 and 82 years who underwent cranial operation for their brain metastases, followed by either WBRT or SRT/SRS. Their mean age was 56 years and the mean follow-up period was 18 months. The mean survival was 18 months. Local recurrence was noted on follow-up imaging and compared between WBRT and SRT/SRS group. Cognitive decline was rarely assessed by both the neurosurgeons and oncologists. The long-term post-radiation effect was found on follow-up magnetic resonance imaging with white matter atrophy and lacunar lesions.
Conclusion: The postoperative adjuvant radiation therapy in Tuen Mun Hospital was reviewed. The recurrence rate after SRS or WBRT was compared. Cognitive decline was compared between the two groups.

FP 6.4

Mesenchymal Stem Cell Secretome Benefits Functional Recovery in Experimental Traumatic Brain Injury Model

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Objective: To evaluate the beneficial effects of mesenchymal stem cells (MSCs) and secretome on functional improvement in an experimental traumatic brain injury (TBI) model.
Methods: A TBI was induced in Sprague-Dawley rats with an electromagnetically controlled cortical impact device. Animals were divided into three groups. In Group A, MSCs derived from adipose tissue of transgenic green fluorescent protein (GFP) were applied topically to the exposed cerebral cortex within 1 hour after TBI and fixed in position with a thin layer of fibrin. In Group B, 100 μL of concentrated MSC supernatant (secretome) was gradually infused to cerebral cortex through osmotic pump. No treatment was given to the animals in control group (Group C). Neurological functions were evaluated by Morris water maze daily and rotarod training assessment on days 3, 7, and 14.
Results: Within 6 days following topical application, GFP-positive cells were found in injured brain parenchyma. Thereafter, no GFP-positive cells were detected. Compared with the controls (Group C), neurological functions were significantly improved in Groups A and B ($P<0.05$). From day 3 to 5 during the water maze test, Group B travelled a shorter distance to reach the hidden platform than Group A (day 3: 5.8±0.3 m vs 6.9±0.2 m, $P<0.05$; day 4: 5.8±0.9 m vs 7.5±0.3 m, $P<0.05$; day 5: 6.5±0.1 m vs 7.4±0.3 m, $P<0.05$). The latency to fall from the accelerating motor rod was significantly longer in Group B than Group A on day 3 (93.9±3.8 s vs 77.3±3.4 s; $P<0.05$).
Conclusion: Both MSC and MSC supernatant (secretome) enhanced functional recovery in TBI rat model. This study suggested secretome further improved the functional outcome.

Vitamin D3 Promotes Motor Functional Recovery after Experimental Spinal Cord Injuries

FP 7.1

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Objective: To investigate the therapeutic effects of vitamin D3 supplementation after experimental spinal cord injuries.
Methods: Experimental spinal cord injury models were performed in both vitamin D (VD) normal and VD-deficient Sprague-Dawley rats. Vitamin D3 (cholecalciferol) was administered to treatment groups by oral gavage 2 hours after complete recovery from anaesthesia, while coconut oil was given as controls. Motor functions were evaluated using Basso, Beattie, and Bresnahan open field locomotor scores. Immunohistochemical staining was conducted to detect the post-traumatic pathological alterations within the epicentres.
Results: Vitamin D supplementation significantly improved motor functional recovery after spinal cord when comparing treated subjects with control ones, in both normal and deficient cohorts. Immunohistochemical staining showed a better-preserved myelin sheath integrity as well as less vacuolation within the white matter in VD-treated rats, indicating a possible mechanism through which VD might act.
Conclusion: Vitamin D3 supplementation improves motor functional recovery after experimental spinal cord injuries possibly through preserving myelin sheath integrity.

Functional Roles of Cytoskeleton Protein Adducin 3 in Glioblastoma Multiforme

FP 7.2

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Objective: Adducin is a membrane skeleton protein encoded by distinct genes mapped to different chromosomes, referred to as ADD1, ADD2, and ADD3. Adducin primarily functions in the assembly of spectrin-actin network that provides physical support to the plasma membrane, also mediates signal transduction in various cell physiological processes upon regulation by protein kinase C–dependent and calcium/calmodulin-dependent pathways. Dysregulation of adducin may contribute to alterations in cellular functions involved in pathological pathways. These aberrations are associated with wide range of diseases and may confer risks in cancer. This study aimed to characterise the role of ADD3 in glioblastoma and determine how it may contribute in glioma pathogenesis.
Methods: Bioinformatics analyses were performed to determine the expression profile of ADD3 in glioblastoma as compared to its normal counterparts. We characterised the functional roles of ADD3 by in-vitro loss of function studies. The molecular alterations were identified by immunofluorescence staining, Western blot, and quantitative polymerase chain reaction analyses.
Results: ADD3 expression was differentially expressed in between glioblastoma multiforme with ADD3 high and low patients. Bioinformatics analysis suggested that low ADD3 expressions may be involved in activating DNA damage checkpoints. Loss of ADD3 induced mitotic defects, reduced glioma cell proliferation, cell migration, and increased apoptosis.
Conclusion: This study is ongoing, and it is the first study on the functional role of ADD3 in GBM beyond those as a structural protein. Results indicate that ADD3 may serve as a novel target in glioblastoma and deserves further investigation.

Outcomes of Intracranial Tumour Operations in Elderly Patients

FP 7.3

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Background: Elderly patients with intracranial tumours commonly have more co-morbidities, higher anaesthetic risks, and less favourable functional status than other age-groups. These factors may deter the surgeon from recommending surgery for elderly patients with intracranial tumours that would be treated with surgery if they occurred in younger patients. Over the years, we have operated on elderly patients (≥75 years) with intracranial tumours after evaluating the risks and benefits of operations in a case-by-case basis. This study aimed to assess the outcomes of these patients, and to identify prognostic indicators for better functional outcome and survival.

Methods: We retrospectively reviewed patients aged ≥75 years, with intracranial tumours undergoing surgery at Tuen Mun Hospital, Hong Kong from January 1999 to December 2016. Patients with incomplete follow-up information were excluded. The presenting systems, co-morbidities, perioperative and long-term follow-up results were recorded. All patients received standard physiotherapy and rehabilitation pre- and post-operatively. Functional performance was assessed at 3 months postoperatively. Good functional outcome was defined as postoperative Karnofsky Performance Score (KPS) of ≥70. We also looked for two other groups of patients: (1) postoperative KPS not lower than preoperative KPS; and (2) patients returned to home care. Prognostic indicators were calculated by Pearson correlation coefficient.

Results: A total of 132 patients were involved during the study period. Eleven cases were excluded due to incomplete information. For the 121 patients included, their mean age was 78 (range, 75-86) years and the male-to-female ratio was 1:1.05. The four most common pathological categories were meningiomas (39%), pituitary adenomas (17%), high-grade gliomas (15%), and brain metastases (14%). Median tumour size was 3.6 cm (range, 1-9.5 cm). Median preoperative KPS was 80 (range, 40-100) and median postoperative KPS at 3 months was 70 (range, 30-90). In all, 66.1% of patients had good functional outcome (subgroup analysis: meningioma 81%, pituitary tumour 87%, brain metastasis 50%, high-grade glioma 27.8%, and others 50%). The 1-year and 5-year survival rates were 77.7% and 46.7%, respectively. Meningioma and pituitary adenoma had long survival, while median survival for brain metastasis and high-grade glioma were only 7 months and 6 months, respectively. Significant prognostic indicators were identified, including tumour size of >3 cm (P=0.005), more than two medical co-morbidities (P=0.0006), and presentation with confusion or altered Glasgow Coma Scale (P=0.04). Systemic malignancy favoured to poor outcome (P=0.06).

Conclusions: A high proportion (66.1%) of elderly patients (≥75 years) with intracranial tumours could have a functional survival period (median, 60 months) after undergoing operation with our management strategy.

FP 7.4

Age Increases Poor Outcomes after Traumatic Brain Injury: a Review of Head Injury in Patients Aged ≥80 Years

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Objective: To review the outcomes of head injury in patients aged ≥80 years.
Methods: Data for 278 patients aged ≥80 years admitted to a large-volume centre in Hong Kong from 2015 to 2016 were collected and retrospectively analysed. Primary outcome was death at 30 days and at 6 months after admission.
Results: In all, 42% of patients were aged 80 to 85 years, 31% 86 to 90 years, and 27% ≥91 years. The most frequently reported mechanism of injury was slip and fall injury (97%) followed by road traffic accidents (2%). Overall, the mortality rate was 11.2% at 30 days and 16.9% at 6 months' follow-up. The rate of favourable outcome (good recovery or moderate disability) was 27.7% at 30 days and 28.1% at 6 months. Of the 46 patients who died within 6 months after injury, 18 died after discharge from the institution. Of the 30 patients who died within 30 days after injury, 23 (76%) died within the first 7 days of injury, three (10%) died at 8 to 14 days after injury, and four (13%) at 15 to 30 days. Age and injury severity scores were significant predictors of outcome.
Conclusion: Age was an important factor influencing outcome after traumatic brain injury in patients aged ≥80 years.

FP 7.5

Treatment Outcome of Acute Subdural Haematoma for Elderly Patients in Hong Kong: a Territory-wide Multi-centre Cohort Study

Hong Kong Neurosurgical Society Research Subcommittee

Objective: To evaluate the treatment outcomes of acute subdural haematoma in elderly patients in Hong Kong.
Methods: This was a 2-year territory-wide multi-centre cohort study. Data of consecutive patients from all seven neurosurgical centres in Hong Kong admitted with acute subdural haematoma during the study period from July 2014 to June 2016 were retrospectively reviewed. Inclusion criteria included age ≥65 years, presence of acute subdural haematoma as evidenced by computed tomography or magnetic resonance imaging, and having had operations such as burr hole, craniotomy, or craniectomy. Those without neurosurgical operations were excluded. Primary outcome was the mortality rate. Secondary outcomes included types of operations performed, rate of postoperative seizures, and Glasgow Outcome Score at 6 weeks and 6 months.
Results: A total of 174 patients were identified. The mean age was 76.08 years (range, 65-94 years). The overall mortality rate was 51.1%. The mean length of hospital stay was 38.2 days (range, 1-288 days). In all, 71.4% had craniotomy for clot evacuation, 27.9% had craniectomy, and 0.68% had burr hole. Subsequently, 32.9% had tracheostomy and 12.24% had postoperative seizures. Poor functional outcome (Glasgow Outcome Score 1-3) was recorded in 75.51% of patients at 6 weeks and in 72% of patients at 6 months.
Conclusion: This territory-wide study has evaluated the treatment outcome of elderly patients with acute subdural haematoma treated with operations. Overall mortality was high. The majority of patients had poor functional outcome at 6 weeks and at 6 months.

Electrical Visual Evoked Potentials for Intra-operative Monitoring of Visual Function

P 1.1

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Intra-operative neurophysiological monitoring aids identification of important neurological structures which may become inadvertently damaged during an operation. It is widely adopted, with different forms of monitoring incorporated according to the type of surgery and method of recording. Its effectiveness, however, depends on the procedure and modality of monitoring employed. Monitoring of optic nerve function via visual evoked potentials recorded from the primary visual cortex has shown variable usefulness in correlating with clinical findings. However, this topic has not been widely explored. Herein we present our findings on the use of visual evoked potentials to monitor visual function, and their effectiveness and application in the clinical setting.

Post-carotid Artery Stenting Restenosis for Radiation-related Carotid Stenosis

P 1.2

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Objective: To review the rate of in-stent restenosis (ISR) in patients with radiotherapy-induced carotid artery stenosis treated with stenting, and to investigate whether these patients developed stroke symptoms following restenosis and required subsequent treatment, as well as possible risk factors associated with development of ISR.
Methods: A retrospective case review was conducted for patients who underwent carotid stenting between 2000 and 2017 in Queen Mary Hospital, Hong Kong. Electronic medical records extracted from the Clinical Management System database were reviewed.
Results: A total of 24 patients (23 men and 1 woman, mean age 63 years) with radiation-induced carotid artery stenosis treated with stenting between 2000 and 2017 were reviewed. In all, nine developed haemodynamically significant ISR following initial stenting, and only two were subsequently restented. Mean time between initial stenting and detection of restenosis was 4.7 years. Most patients had no stroke symptoms, and restenosis was identified on follow-up imaging studies. Possible risk factors for development of ISR included advanced age and presence of cardiovascular risk factors such as hypertension and diabetes mellitus.
Conclusion: Nine of 24 cases of radiotherapy-induced carotid stenosis patients who underwent carotid stenosis developed haemodynamically significant ISR. Most of them were asymptomatic and only two required restenting. Patients with advanced age and cardiovascular risk might have a higher risk of ISR.

P 1.3

Antiplatelet and Antithrombotic Use Affects Chronic Subdural Haematoma Recurrence after Burr Hole Drainage in Patients Aged >80 Years Old

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Introduction: Chronic subdural haematoma (CSDH) is one of the most common neurosurgical conditions found in older patients. Burr hole drainage is the mainstay of operative management. Prognosis of these patients after burr hole drainage is affected by many different factors. The present study aimed to identify factors which might affect recurrence rates of CSDH after surgery.

Methods: We retrospectively analysed patients requiring burr hole drainage from January 2012 to December 2015 in the New Territories West Cluster. Clinical, radiological, and surgical data were collected and outcomes were analysed.

Results: A total of 100 patients aged >80 years who underwent burr hole drainage of subdural haematoma were examined. Among them, 20 were on aspirin only, three on regimen with clopidogrel, seven on regimen with warfarin, and two on regimen with novel oral anticoagulants. Patients with or without antithrombotic regimen were equally likely to develop recurrence requiring reoperation. Postoperative venous thromboembolism was statistically associated with antithrombotic use. Radiological classification, midline shift, thickness of the CSDH, and early resumption of antithrombotics did not predict recurrence of CSDH in our cohort.

Conclusion: This retrospective cluster-wide cohort study showed that antiplatelet and antithrombotic use do not affect the recurrence of CSDH after burr hole drainage.

Pituicytoma—A Rare and Tough Challenge in Trans-sphenoidal Surgery

P 1.4

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Pituicytoma is a rare sellar and suprasellar tumour arising from neurohypophysis.[1] It is difficult to differentiate pituicytoma from non-functioning pituitary adenoma on magnetic resonance imaging (MRI).[2] Tumour resection is often subtotal owing to its hypervascularity.[3] We present a patient with pituicytoma of vascular nature posing a surgical challenge.

A 62-year-old man presented with blurred vision for 3 months. Physical examination showed bitemporal hemianopia with impaired visual acuity (right 20/100, left 20/30). Contrast MRI showed a 20-mm × 23-mm × 29-mm gadolinium-enhanced sellar and suprasellar mass. Elevation of the optic chiasm was noted. Trans-sphenoidal partial excision of the pituitary tumour was performed. Intra-operative findings revealed a sellar and suprasellar tumour with multiple arterial feeders at tumour capsule. The thin rim of the superior tumour capsule was left behind in view of hypervascularity and firm consistency of tumour. The arachnoid descended and pulsated well. Pathology came back to be pituicytoma. Postoperative computed tomographic brain showed mild intraventricular haemorrhage in the third ventricle. Follow-up MRI 4 months after the operation showed a 13-mm × 17-mm × 13-mm residual tumour with downward sagging of the suprasellar component seen. His visual acuity improved (right 20/50, left 20/35) after the operation. He also regained his right superior temporal visual field loss.

Pituicytoma is a rare mimicker of pituitary adenoma. Its hypervascularity and firm consistency often pose challenges during trans-sphenoidal surgery. Complete resection is difficult. Careful haemostasis is required and one should consider halting the operation once decompression is achieved.

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A Case of Cerebral Venous Thrombosis Associated with Thyrotoxicosis

P 1.5

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We report a case of cerebral venous thrombosis (CVT) associated with thyrotoxicosis. Cerebral venous thrombosis is a rare cause of stroke and a challenging diagnosis. It is usually associated with prothrombotic conditions, with no cause identified in 12.5% of cases.

A 39-year-old woman with no known history of thyroid disease and 3-year history of oral contraceptive pill use presented with right hemiparesis and unequal pupil size, with Glasgow Coma Scale of E4 V2 M5.

Computed tomography brain showed a wedge-shaped venous infarct with internal acute intracerebral haematoma at the left parietal and temporal lobe. Computed tomographic angiogram and venogram confirmed acute thrombosis of left transverse and sigmoid sinus causing haemorrhagic venous infarction. Biochemical test showed hyperthyroidism (free thyroxine 42.1 pmol/L, thyroid-stimulating hormone <0.01 mIU/L), with high antithyroid peroxidase antibody (133.5), and raised CA125 (57). Complete blood count, clotting profile, inflammatory markers, and other tumour markers were otherwise normal. Ultrasound later showed thyroid nodule and no pelvic mass.

This report illustrated a case of CVT as first presentation of thyrotoxicosis. Previous studies have suggested thyrotoxicosis as a cause of hypercoagulability. Investigation of thyroid function should be considered during workup of CVT to initiate appropriate treatment.

P 1.6

Glioblastoma with Diffuse Leptomeningeal Spread and *BRAF* Mutation Treated with BRAF Inhibitor Therapy as First-line Treatment

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BRAF-V600E mutations are observed in the majority of paediatric low-grade gliomas and is detected in 15% of young adult glioblastomas (age range, 17-35 years). There is increasing evidence suggesting that this mutation is a significant prognostic biomarker independent of MGMT promoter methylation status. The use of BRAF inhibitor (BRAFi) target therapy is well established in the treatment of advanced stage or recurrent melanoma, but its role in other malignancies remains unproven. Diffuse leptomeningeal spread occurs in up to 20% of glioblastoma cases and is often refractory to standard therapy. We report the first case in the literature of using BRAFi therapy as first-line treatment for a young female with glioblastoma with leptomeningeal metastases.

A 22-year-old Chinese woman presented with headache for 3 months. Magnetic resonance imaging revealed a left temporal heterogeneously contrast-enhancing intra-axial brain tumour. Craniotomy with near-total excision was performed and the temporal ventricle was entered. An external ventricular drain (EVD) was placed, but there was persistently elevated intracranial pressure with communicating hydrocephalus that required a ventriculoperitoneal shunt. Magnetic resonance imaging 3 weeks postoperatively revealed diffuse leptomeningeal spread. The histological diagnosis was glioblastoma with wild-type IDH1, MGMT promoter methylation, and *BRAF*-V600E mutation. Her consciousness deteriorated rapidly, and the shunt became blocked requiring placement of an EVD. Oral BRAFi therapy, dabrafenib and trametinib, was started with a single fraction of whole brain radiotherapy (3 Gy) to improve blood-brain barrier drug penetration. There was both clinical (with re-established shunt patency) and radiological treatment response after 2 weeks of treatment and the patient was discharged 8 weeks later with grade 2 Eastern Cooperative Oncology Group Performance Status.

This is the first report describing the use of BRAFi target therapy as first-line treatment for glioblastoma with diffuse leptomeningeal spread. This case suggests that *BRAF*-V600E mutation is not only an important, but possibly a predictive prognostic biomarker.

Recurrence Rate Following Subarachnoid Haemorrhage: Determinants of Risk Factors

P 1.7

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Spontaneous subarachnoid haemorrhage (SAH) is often caused by ruptured intracerebral aneurysm and brings devastating clinical outcomes, with high mortality rate and subsequent neurological deficit. We aimed to analyse the risk factors predicting the recurrence rate following an initial acute treatment of SAH.

A total of 209 patients who presented with spontaneous SAH to Prince of Wales Hospital, Hong Kong between 2009 and 2013 were included. In all, 199 patients were confirmed to have an aneurysm by either computed tomographic angiography or digital subtraction angiography (DSA); 180 patients went on to receive further intervention by either DSA coil embolisation or surgical clipping. A cohort study was conducted to analyse the risk factors for predicting the recurrence risk using regression statistical models. Results of this study will be presented and discussed.

Four Seasons for Neurosurgeons: Seasonal Variation of Stroke Requiring Neurosurgical Emergency Operation

P 1.8

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Objective: To investigate the seasonal variation of stroke requiring emergency neurosurgical intervention in a local hospital.

Methods: This was a retrospective study of stroke patients admitted to Prince of Wales Hospital, Hong Kong, from September 2014 to September 2017 who required emergency operation. Diseases were categorised into: (1) subarachnoid haemorrhage (SAH) due to ruptured aneurysm, (2) hypertensive haemorrhagic stroke, (3) ischaemic stroke, and (4) rupture of arteriovenous malformation (AVM). During the study period, 1522 neurosurgical emergency operations were carried out, and 421 cases fulfilled the inclusion criteria. Seasons were defined as spring (March to May), summer (June to August), autumn (September to November), and winter (December to February).

Results: Of all neurosurgical strokes requiring emergency operations, SAH (n=126), hypertensive haemorrhagic stroke (n=119), and ischaemic stroke (n=28) peaked in winter followed by spring; whereas rupture of AVM (n=22) peaked in autumn (36.4%) followed by spring (27.3%). In terms of season, winter accounted for most case load (n=90) followed by spring (n=77). Subarachnoid haemorrhage accounted for most case load in spring (42.9%), autumn (46.3%) and winter (44.4%), whereas hypertension-related stroke accounted for most case load in summer (49.2%). There was doubling of ischaemic strokes requiring emergency operations in winter compared with other seasons.

Conclusion: Seasonal variation was observed in neurosurgical stroke, and thereby allowing us to predict future patterns of stroke requiring neurosurgical emergency operations. With these data, neurosurgical teams can better manage different types of strokes by preparing necessary equipment, beds, and personnel according to temporal variations.

IOX, an Analogue of Genistein, Increases the Cytotoxicity of Temozolomide in Glioblastoma Cells

P 1.9

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Objective: Temozolomide (TMZ) is a chemotherapeutic agent widely used in the treatment of glioblastoma multiforme. The plant hormone genistein harbours anti-tumour properties in a variety of cancers. The role of IOX, an analogue of genistein, in glioma cells remains unclear. This study aimed to investigate the efficacy of IOX alone and in combination with TMZ in glioma cells, and the underlying mechanisms involved.
Methods: The therapeutic effects of IOX and TMZ, alone or in combination, in human glioblastoma multiforme cells were evaluated by in vitro cell viability assay. The underlying mechanisms of IOX-mediated cell death were investigated by immunoblotting analysis.
Results: IOX exerted cytotoxic effect and enhanced TMZ efficacy in both TMZ-sensitive and TMZ-resistant glioma cells. Moreover, immunoblotting analysis showed that IOX downregulated Akt phosphorylation level and increased expression of cleaved caspase-3 as a marker of apoptosis. These results suggested that IOX may mediate cytotoxic effect in TMZ-sensitive and -resistant cells through inhibiting Akt signalling pathway.
Conclusion: IOX as the analogue of genistein would be a new therapeutic candidate for newly diagnosed TMZ-sensitive and recurrent TMZ-resistant gliomas.

Is Intra-uterine Contraceptive Device a Cause of Brain Abscess? A Case Report of Brain Abscess Presenting with Seizure

P 1.10

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We present a possible case of intra-uterine contraceptive device (IUCD)–related brain abscess. A middle-aged woman was admitted to medical unit because of three episodes of generalised tonic-clonic seizure. She had a medical history of post-RAI hypothyroidism and recent insertion of IUCD in 2016. She was then transferred to neurosurgical unit in the setting of left frontal hypodense lesion. Magnetic resonance image of brain revealed heterogeneously T1 isointense and heterogeneously T2 hyperintense mass lesion in the subcortical region of left frontal lobe with contrast enhancement and small hypoenhancing components with restricted diffusion. Associated vasogenic oedema was noted. Metastasis was suspected as a more likely cause than infection. An excision biopsy, however, revealed an abscess formation caused by a *Fusobacterium* infection. Because no infective foci were found, the infective origin was possibly related to the IUCD.

Long-term Neurovascular Outcome after Carotid Stenting: a Single-centre Experience in Hong Kong

P 1.11

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Objective: The CREST trial revealed similar long-term outcomes between carotid artery stenting (CAS) and carotid endarterectomy. Carotid artery stenting has been offered as the first-choice treatment for patients with carotid artery stenosis in our centre. This study aimed to review the long-term neurovascular outcome after CAS.
Methods: We reviewed medical records of patients who underwent CAS in Princess Margaret Hospital, Hong Kong from 2010 to June 2017. Complications including perioperative (stroke, myocardial infarction, renal failure, groin pseudo-aneurysm) and long-term (in-stent stenosis, restenosis, disease progression, recurrent stroke/transient ischaemic attack, need of further stenting, mortality) were reviewed and analysed.
Results: A total of 62 cases were analysed, including seven (11.3%) women and 55 (88.7%) men with mean age 69.3 years (range, 40-89 years). All CAS procedures were performed under local anaesthesia. Patients had transcranial Doppler, computed tomography angiography (CTA), or magnetic resonance angiography performed before CAS. All had Doppler ultrasound and CTA for follow-up. Digital subtraction angiography was conducted in case of suspected stenosis. Patient had aspirin and Plavix started preoperatively according to protocol. Among three (4.8%) patients who had severe re-stenosis requiring a second CAS, one had previous radiotherapy and one had poorly controlled systemic disease.
Conclusion: Carotid artery stenting is a safe and effective option for patients with symptomatic carotid artery stenosis.

Establishment and Outcome of Endoscopic Trans-sphenoidal Surgery for Sellar Lesions at the University of Hong Kong–Shenzhen Hospital

P 1.12

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Objective: To review the initial patient outcome of endoscopic trans-sphenoidal surgery at University of Hong Kong–Shenzhen Hospital (HKU-SZH).
Methods: We conducted a retrospective analysis of 35 consecutive cases of endoscopic trans-sphenoidal resection of sellar tumours performed between 2012 and 2017. Primary outcomes included the extent of resection and postoperative complications.
Results: The study included 15 women and 20 men with mean age 45 years (range, 22-75 years). Pathological diagnoses included growth hormone–secreting in 10 (28.6%), adrenocorticotropic hormone–secreting in four (11.4%), prolactin-secreting in six (17.1%), 12 (34.3%) non-functioning adenomas, craniopharyngioma in one (2.9%), and Rathke's cleft cysts in two (5.7%) cases. Gross total resection was achieved in 28 (80%) patients. There was no mortality or major complications. Postoperative cerebral spinal fluid rhinorrhoea occurred in two (5.7%) patients which resolved on conservative management with lumbar drainage. Postoperative epistaxis occurred in two (5.7%) cases. Transient diabetes insipidus occurred in three (8.6%) patients and all improved within 2 weeks. None had visual deterioration.
Conclusion: The introduction of endoscopic trans-sphenoidal surgery and the training of junior staff in this technique was feasible and was able to achieve satisfactory patient outcomes at the HKU-SZH.

Can Deep Brain Stimulation Help Advanced Parkinson's Patients with Dopamine Dysregulation Syndrome?

P 1.13

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We aimed to investigate the effect of deep brain stimulation on patients with Parkinson's disease exhibiting dopamine dysregulation syndrome (DDS). We report on a patient who was first diagnosed with Parkinson's disease in 2008. He first presented with bradykinesia, tremor, and cogwheel rigidity. He was started on carbidopa-levodopa since 2009, and started increasing dosage of his own in 2011 propelled by a feeling of elation and euphoria. In 2014, he developed a habit of pathological shopping, with progressive dyskinesia, rigidity, and drug craving behaviour. Subsequently, he was diagnosed to have DDS after neuropsychological assessment in the preoperative evaluation. We decided to perform bilateral deep brain stimulation for the treatment of Parkinson's disease in September 2017. The target was globus pallidus interna instead of the subthalamic nucleus, in order to avoid provoking further stimulation-related psychiatric side-effects. The effect of deep brain stimulation and the severity of DDS was evaluated. Deep brain stimulation could decrease the severity of DDS in patients with Parkinson's disease.

Temporal Pattern of Neurological Deficits after Subarachnoid Haemorrhage in Mice

P 1.14

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Objective: To investigate the time course of gait deficits and cognitive dysfunctions in a subarachnoid haemorrhage (SAH) murine model.
Methods: Subarachnoid haemorrhage was induced by endovascular perforation on C57BL/6 mice. Neurobehavioural assessments were performed on postoperative days 1, 3, 5, and 10. The Mouse Motor and Sensory Scale was employed to evaluate sensorimotor function. Spatial learning ability and long-term memory were evaluated using the Morris Water Maze test. Short-term memory was assessed using the Object Recognition Test. Gait analysis was performed by a computer-assisted system named Catwalk.
Results: The mice with SAH showed subarachnoidal bleeding around the Circle of Willis and presented body weakness and headache-induced moaning. The significant sensorimotor deficits were observed from day 1 to 5 after SAH. These mice with SAH exhibited significantly impaired learning ability over time from day 1 to 4, with a flat learning curve, in training phase of Morris Water Maze. In the probe trial, SAH mice showed significant deterioration of long-term memory, presenting significantly less exploration in the target quadrant. In the Object Recognition Test, SAH mice demonstrated early short-term memory deficits, with failing to discriminate the novel object from the familiar one on day 1 to 3. The gait analysis suggested that the static gait functions were affected in early phase, while the dynamic parameters altered mostly in late phase.
Conclusion: The SAH model mimicked aneurysmal SAH. Mice with SAH showed neurological dysfunctions on sensory motor, spatial learning, short-term, and long-term memory domains. The gait deficits showed heterogeneous patterns after SAH induction. Systematic assessment of cognitive function after aneurysmal SAH elucidated the longitudinal course of cognitive recovery and provided a time window for potential interventions.

P 2.1

Assessing Risk of Stroke and Complications of Stenting in Vertebral Artery Stenosis Patients in Hong Kong: a Retrospective Study

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Objective: Given the unclear efficacy of vertebral artery (VA) stenting in reducing stroke risk and future complications, this study aimed to examine the long-term outcomes of symptomatic VA stenosis patients who underwent stenting to elucidate the clinical impact of the procedure.
Methods: Patients with VA stenosis who received stenting from Queen Mary Hospital, Hong Kong from 2007 to 2017 were identified using the Hospital Authority's Clinical Management System. Demographic factors, clinical characteristics, surgical outcomes, and adverse events during follow-up were evaluated via retrospective review. The primary outcome was the occurrence of fatal/non-fatal stroke in any arterial territory during follow-up. Secondary outcomes included the occurrence of posterior circulation stroke, fatal/non-fatal stroke within 90 days of procedure, death of any cause, and VA restenosis.
Results: The patient cohort consisted of 28 patients (21 men and 7 women) with mean age 64.2 years at operation and mean follow-up 59.8 months. In all, 11 (39.3%) patients had left VA stenosis, eight (28.6%) patients had right VA stenosis, and nine (32.1%) patients had bilateral VA stenosis. Fourteen (50%) patients qualified for stenting owing to previous ischaemic stroke and nine (32.1%) patients qualified owing to imaging evidence of cerebral ischaemia. During follow-up, three (10.7%) patients suffered stroke and six (21.4%) patients required restenosis. There was one case of fatal stroke and two patients died of non-stroke causes.
Conclusion: Our results demonstrate a high stroke and restenosis risk among Hong Kong VA stenosis patients who received stenting. Outcome comparisons with patients who did not receive surgical intervention should be made to corroborate the study findings.

P 2.2

Intra-thrombus Thrombolysis with Urokinase—A Potential Method for Treatment of Cerebral Venous Sinus Thrombosis

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Cerebral venous thrombosis (CVT) is an uncommon cause of stroke. Intravenous heparin injection is the conventional treatment. Mechanical thrombectomy and local thrombolysis have been reported as alternative treatment options. Herein we describe three cases of cerebral venous thrombosis treated with intra-thrombus urokinase at our hospital. This is a case series of three patients with CVT who had undergone local thrombolytic therapy. Continuous intra-thrombus urokinase instillation (10 000 units/hour) was performed with a microcatheter system for 1 week after the initial endovascular procedure. Pre- and post-interventional angiographic results were reviewed. The risk factors, as well as baseline and post-treatment clinical characteristics and 6-month long-term outcomes are also reviewed.

Valsalva Manoeuvre and Risk of Intracranial Haemorrhage

P 2.3

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Case reports have discussed the effect of the Valsalva manoeuvre on intracranial pressure. Some have also hypothesised that Valsalva manoeuvre may actually increase the risk of intracranial haemorrhage. Herein we report a case of 74-year-old female who presented with acute onset of left hemianopia on February 2017 after swimming. Magnetic resonance imaging of brain showed right occipital lobe acute haemorrhage and no underlying vascular lesion was detected. She was treated conservatively, and subsequent repeated imaging showed complete resolution of the haematoma. Later she developed another episode of left hemianopia after swimming in June 2017. Magnetic resonance imaging of brain showed right occipital haemorrhage again near the previous anatomical region. No underlying vascular abnormality was noted. Again, she was treated conservatively, and interval brain computed tomographic imaging showed resolution of the right occipital haematoma. Both episodes of intracranial haemorrhage were related to swimming and the Valsalva manoeuvre. Literature review on the effect of intracranial pressure with Valsalva manoeuvre was performed and discussed.

Retrospective Review of Factors Affecting the Outcomes of Intracerebral Haemorrhage

P 2.4

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Objective: To investigate the relationship between anticoagulant use and clinical outcomes in patients presenting to our neurosurgical unit with intracerebral haemorrhage.
Methods: This was a 1-year retrospective study of all patients admitted to the neurosurgical unit of Pamela Youde Nethersole Eastern Hospital, Hong Kong from July 2016 to June 2017. Patients with a diagnosis of intracerebral haemorrhage (subcortical, cortical, brain stem, cerebellum, multiple or unspecified) were identified via the Clinical Data Analysis and Reporting System. The relationships among anticoagulant use, the need for operation, and death on discharge were analysed using SPSS.
Results: A total of 151 patients with intracerebral haemorrhage were included. Four (2.6%) patients were taking new oral anticoagulants and six (4.0%) were on warfarin. The overall operative rate was 21.9% and death rate on discharge was 12.6%. Patients on warfarin (mean difference 11.869 years; 95% confidence interval=1.425-22.313; P=0.026) or on any anticoagulants (either warfarin or new oral anticoagulants) [mean difference 11.302 years; 95% confidence interval=3.125-19.479; P=0.007] were significantly older than those not on anticoagulants (Student's t test). There were no statistically significant correlations among anticoagulant use, the need for operation, and death on discharge.
Conclusion: Patients admitted for intracerebral haemorrhage with anticoagulant use were significantly older than those without. Further studies with larger sample sizes are warranted, to demonstrate the effect of anticoagulant use on outcomes, such as need for operation and death.

Enriched Environment Enhances Motor and Sensory Function Outcomes in Rat Intracerebral Haemorrhage Model

P 2.5

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Objective: To investigate the effect of enriched environment (EE) on motor and sensory recovery in rat intracerebral haemorrhage (ICH) model.
Methods: A total of 45 male Sprague-Dawley rats (age 3 months) received type IV collagenase (0.25 U in 1 μL saline) injection in right striatum. The EE entailed housing animals in a large cage equipped with various toys and platforms that allowed animals to move and explore freely. After ICH, rats were divided into the standard cage control group and the EE group. For the EE group, EE training was given to ICH rats for 1 hour a day for 1 month from day 5 after ICH. Motor function (Menzies' score and Cylinder test) and somatosensory evoked potential were examined before surgery and at days 5, 10, 15, 20, and 25 after ICH.
Results: Significant improvements in motor and left front limb sensory function were observed in the EE group from day 10 to day 25 compared with control group ($P<0.05$). Significant differences in the sensory function of left hind limb were found between EE and control groups at day 20 and day 25 ($P<0.05$). Within the EE group, improvements for both motor and sensory (left front limb) functions were observed from day 10 ($P<0.05$).
Conclusion: Enriched environment promoted motor and sensory function recovery in post-ICH rehabilitation. The rate of recovery speed of sensory function was faster in the upper limb than in the lower limb in this striatum ICH model.

Differential Gene Expression Profiles and Functional Properties Associated with Cathepsin D in Glioblastoma

P 2.6

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Objective: Cathepsin D, a lysosomal aspartic protease involved in protein degradation and programmed cell death, is a potential biomarker for poor prognosis in glioblastoma patients. This study aimed to investigate the differential gene expression profiles and functional properties associated with cathepsin D in glioblastoma.
Methods: Gene expression profiles of 159 human glioblastoma specimens from Gene Expression Omnibus database GSE16011 were studied. Bioinformatics analysis showed differential gene expression patterns between high- and low-cathepsin D groups. Gene ontology enrichment and pathway analysis revealed related biological functions and signalling pathways that associated with cathepsin D.
Results: A total of 5741 differentially expressed genes were identified between high and low cathepsin D groups, of which 103 were with a fold change ≥2. Gene ontology enrichment analysis showed that these upregulated genes were associated with a wide range of biological functions related with cancer biology, such as cell migration, angiogenesis, and extracellular matrix organisation. Gene ontology pathway analysis revealed signalling pathways related with high cathepsin D expression, such as integrin cell signalling pathway and TP53 pathway.
Conclusion: The differential gene expression profiles, biological process, and signalling pathways between high and low cathepsin D expression glioblastoma patients provide us with valuable information on the functional roles of cathepsin D in glioblastoma.

P 2.7

Neurological Manifestations of Atrial Myxoma—Metastatic Cavernomas, Intracranial Aneurysms, and Central Retinal Artery Occlusion

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Atrial myxomas are known to be associated with cerebrovascular accidents due to embolism. Rarer associated conditions include metastatic intracranial aneurysms and cavernomas, of which there are only two case reports to date. We report a case with atrial myxoma in which all three neurological complications occurred, and describe a novel approach to treat the metastatic intracranial aneurysms. A 58-year-old man initially presented with confusion due to intracranial haemorrhage, and imaging showed multiple cavernomas with bleeding. Craniotomy with excision of vascular malformation was performed and pathology showed cavernoma only. He subsequently presented with right eye vision loss and found to have right central retinal artery occlusion. Echocardiogram to work up for arterial embolisation showed left atrial myxoma, and excision was performed. Further imaging of the cerebral vasculature showed multiple saccular aneurysms. Pathology of the previously excised vascular malformation was then reviewed, which confirmed cavernoma with cardiac myxoma involvement. Frameless stereotactic radiotherapy was performed on the larger cerebral aneurysms. Atrial myxoma is a rare cause for multiple intracranial aneurysms and multiple cavernomas. The intracranial vascular malformation and aneurysms may persist and recur even after excision of the cardiac tumour. Hence, underlying atrial myxoma should be considered as a cause in patients with multiple intracranial aneurysms, cavernomas, and embolic events. Stereotactic radiotherapy is a viable treatment option for metastatic cerebral aneurysms caused by atrial myxoma.

P 2.8

Intraventricular Urokinase to Re-establish External Ventricular Drain and Ventriculoperitoneal Shunt Patency in a Patient with Glioblastoma Leptomeningeal Spread

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Regular intraventricular urokinase can be used to re-establish catheter patency in patients with malignant communicating hydrocephalus. We report a case of right temporal glioblastoma (*BRAF*-V600E mutated) with leptomeningeal metastases and malignant hydrocephalus. The patient was a 22-year-old woman. Programmable ventriculoperitoneal shunt was inserted to treat the hydrocephalus, but a blockage was found at day 5 post-shunting. External ventricular catheter (EVD) was inserted and viscous cerebrospinal fluid with high protein content was drained. However, the EVD became blocked intermittently. Therefore, urokinase was regularly instilled into the EVD. After more than 2 weeks of regular urokinase instillation into the EVD catheter, re-establishment of EVD patency was achieved. Intraventricular urokinase instillation is a safe and effective method to treat glioblastoma patients with obstructed ventricular catheters secondary to malignant communicating hydrocephalus.

Shall We Use 3-cc, 5-cc, or 10-cc Syringes for Brain Lesion Biopsy?

P 2.9

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Objective: To investigate a safe and effective way of brain lesion biopsy by biopsy cannula resulting in high tissue yield and low risk of excessive tissue removal and haemorrhage.
Methods: We setup an in vitro brain lesion biopsy model by using fresh pig brain and standard brain lesion biopsy cannula (BrainLAB brain biopsy cannula with 10-mm side-window cutting). A digital vacuum pressure transducer was connected with a three-way T connector between the cannula and the syringe. Using 3-cc, 5-cc, and 10-cc syringes, manual aspiration at 1 cc, 1.5 cc, 2 cc, 3 cc, 4 cc, 5 cc, 6 cc, 8 cc, and 10 cc were made. The length of tissue yield, the maximum suction pressure, and mean suction pressure were recorded. Tissue length of >5 mm was regarded as adequate while >12 mm as excessive and dangerous.
Results: A total of 26 passes were made for measurement. For the 10-cc syringe, seven passes were made (10 cc × 1 / 8 cc × 1 / 6 cc × 1 / 5 cc × 1 / 4 cc × 1 / 3 cc × 1 / 2 cc × 1); all tissue yields showed excessive length and the maximum suction pressure were all >40 kPa. For the 5-cc syringe, six passes were made (5 cc × 1 / 4 cc × 1 / 3 cc × 1 / 2 cc × 1 / 1 cc × 2); all tissue yields showed excessive length and the maximum suction pressure were all >21 kPa. For the 3-cc syringe, 13 passes were made (3 cc × 1 / 2.5 cc × 1 / 2 cc × 3 / 1.5 cc × 1 / 1 cc × 7); all tissue yields for ≥1.5 cc were excessive with maximum suction pressure of >23 kPa. Of the seven passes at 1-cc aspirations, three showed excessive length and had maximum suction pressures of >21 kPa. The other four yielded adequate tissue length (5.94, 10.95, 10.36, and 9.03 mm) at maximum suction pressures of 14.66, 14.91, 18.08, and 21.75 kPa, respectively.
Conclusion: Our data and results showed that cannula brain lesion biopsy is a suction pressure-driven procedure. Maximum suction pressure of >21 kPa would result in excessive tissue yield. Using a 10-cc or 5-cc syringe resulted in excessive yield in all samples with maximum suction pressure of >21 kPa. Using a 3-cc syringe with ≥1.5 cc volume suction would also result in excessive yield and maximum suction pressure >21 kPa. Aspiration at 1 cc using a 3-cc syringe with a maximum suction pressure <21 kPa would result in adequate tissue yield.

Retrospective Study on Neurodevelopment Outcome of Neonatal Intraventricular Haemorrhage

P 2.10

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Neuroendoscopic lavage is a new strategy for management of severe neonatal intraventricular haemorrhage (IVH) to limit intraventricular blood clotting volume. This study aimed to review whether the volume of intraventricular blood is a major factor affecting neurodevelopment outcome and to further discuss this new strategy for management of IVH. We located babies born in the New Territories East Cluster who were diagnosed with neonatal IVH from 2007 to 2016 by the Clinical Data Analysis and Reporting System. All babies with calculated age of >12 months were included for assessment of development. Demographic data including gestation age at birth, presence of multiple pregnancy, Apgar score, and presentation of IVH were retrieved. The IVH grading, as well as presence of hydrocephalus and seizures were recorded. Primary outcome measures included the presence of developmental delay. Secondary outcome measures included death, cerebral palsy, and need for permanent implants (shunts). A total of 140 babies with neonatal IVH were studied. Among them, six were lost to follow-up within the first year of life (non-mortality). Among the remaining 134 babies, the median gestation age at birth was 27 weeks. Multiple pregnancy (twin or triplet) was involved in 26% of cases. In 34.3% of cases, developmental delay was reported, in various aspects and to different degrees. All-cause mortality rate was 29.8%.

Lateral Ventricular Haemangioblastoma: a Case Report

P 2.11

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We report a case of sporadic right lateral ventricular haemangioblastoma with a review of the current literature. Central nervous system (CNS) haemangioblastoma is a rare entity accounting for about 2% of all CNS tumours. The majority of CNS haemangioblastomas are infratentorial or spinal in origin while supratentorial haemangioblastomas are exceedingly rare with only around 140 cases reported; among these around 7% were intraventricular in origin. About 30% of haemangioblastomas are associated with von Hippel–Lindau complex. We report a case of right supratentorial intraventricular haemangioblastoma in a 43-year-old woman who underwent successful transsylvian excision. There was no family history or manifestation of von Hippel–Lindau complex nor polycythaemia. Supratentorial intraventricular haemangioblastoma is a rare entity and poses a diagnostic challenge.

A Case of Giant Mesencephalic Tumefactive Perivascular Spaces Presenting with Obstructive Hydrocephalus

P 2.12

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Intracranial giant tumefactive perivascular spaces are clusters of non-neoplastic cystic lesions of ≥1.5 cm. They are pial-lined, interstitial fluid–filled structures that accompany penetrating arteries generally located at the mesencephalothalamic region. Their clinical presentation is protean including headache, cognitive decline, and visual disturbance. It can also present with obstructive hydrocephalus requiring surgery. Giant mesencephalic tumefactive perivascular spaces are isointense relative to cerebrospinal fluid in all sequences of magnetic resonance imaging and neither demonstrate contrast enhancement nor restricted diffusion. Differential diagnoses include cystic neoplasms, parasitic cysts, or ventricular diverticula. A 55-year-old man experienced unsteady gait with frequent falls for 6 months that was associated with progressive mild left lower limb weakness of Medical Research Council grading 4/5. He also had impaired memory recall as reflected by a Montreal Cognitive Assessment score of 26/30 and severe deficits in the memory domain as evaluated by the Neurobehavioral Cognitive Status Examination. Brain magnetic resonance imaging revealed a non-gadolinium contrast–enhancing multicystic intra-axial lesion of right tegmentum of the midbrain extending into the anterior third ventricle, causing obstructive hydrocephalus and transependymal oedema. A ventriculo-peritoneal shunt was inserted. Six weeks after operation, his walking stability, limb weakness, and memory recall were recovered with the Montreal Cognitive Assessment score 30/30 and all domains in Neurobehavioral Cognitive Status Examination within normal range. Giant tumefactive perivascular spaces are a well-documented phenomenon which has unique radiological features and should not be mistaken for more ominous diseases, such as cystic midbrain gliomas. A compatible radiological diagnosis will prevent unnecessary biopsies. Symptomatic patients with neurological deficits secondary to obstructive hydrocephalus can be reversible with ventriculoperitoneal shunting.

Endovascular Treatment of Vertebro-vertebral Fistula

P 2.13

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We report a rare case of vertebro-vertebral fistula successfully managed with endovascular coiling and Onyx liquid embolising agent. A 53-year-old woman presented with pulsatile tinnitus, dizziness, and neck murmur. Computed tomographic angiogram showed cervical vascular malformation with tortuous segment 2 of right vertebral artery (C2-6), multiple levels of dilated right internal jugular vein, external jugular vein, and dilated epidural vein from C1-2 in spinal canal. Further investigation with digital subtraction angiogram showed two arteriovenous fistulas over right neck with feeders supplied by cervical segment of right vertebral artery and deep cervical artery. Venous varices were seen, which drained into right internal, external jugular veins, and paraspinal venous plexus. Transarterial embolisation of the fistula and venous varix was performed with coils and Onyx. The right vertebral artery was sacrificed, with complete occlusion of fistula achieved, and check angiogram showed no residual fistula. On follow-up, the patient's symptoms completely resolved and there was no neurological deficit. Interval magnetic resonance angiogram 6 months postoperatively showed occluded fistula with no evidence of recurrence. The cervical vertebro-vertebral fistula was successfully managed with endovascular coiling and Onyx embolising agent with complete occlusion achieved. No recurrence was noted on follow-up magnetic resonance angiogram 6 months postoperatively. Endovascular coiling and Onyx are effective treatments for vertebro-vertebral fistula.

Excision of Meningiomas in Older Patients

P 2.14

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Objective: To provide an objective evaluation of the postoperative recovery aspects after meningioma excision in older patients.
Methods: This was a single-centre retrospective cohort study. Symptomatic patients aged ≥75 years, with emergency admission to our department during March 2006 till May 2015 were analysed. Primary outcomes included postoperative length of stay, complications, and change in modified Rankin score in the next clinical follow-up arranged within 3 months.
Results: Of 42 patients studied, six had atypical meningiomas and six had spinal involvement. The mean length of stay was 28.2 days. At 3-month follow-up, 19 patients had clinical improvement; 31 patients were free of postoperative complications and postoperative mortality (at 30 days). There was no significant difference in the primary outcomes for patients with multiple co-morbidities, previous surgeries, or with atypical meningioma.
Conclusion: There were no identifiable factors causing deterioration in functional status for older patients with meningioma excision done.

Oral Hygiene for Neurosurgical Patients

N 1

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Objective: To improve the oral hygiene of patients in a general neurosurgical ward.
Methods: An oral care project was implemented in a general neurosurgical ward, which involved personal care assistants (PCAs) and student nurses who provide oral hygiene to patients. Educational talks including theory and practice were also conducted. The attitudes and knowledge of PCAs and student nurses were measured before and after the talks. After implementation of the oral care, oral conditions of patients were compared with the baseline measurements with Bedside Oral Exam (BOE).
Results: A month before the start of the project, BOE of 33 patients and the attitudes and knowledge of PCAs were recorded. The mean BOE score among the patients was 13.4 and 43% of BOE scores were higher than the cut-off score (14) for severe oral health conditions. Overall, 93% of PCAs expressed knowledge of oral care, and only 20% were discontented with the care they provided. One third of PCAs claimed they had insufficient time to carry out the oral care routine, 60% did not like to perform oral hygiene, and 93% reported patient resistance to the oral care they provided. The results after implementation of educational talks are pending.
Conclusion: To improve the oral condition of patients, PCAs and student nurses should be aware of their knowledge and the measurement of oral conditions. Techniques for reducing patient resistance should be explored.

N 2

Ongoing Quality Assurance Process in Nursing Observation of Peripheral/ Central Venous Catheter for Neurosurgical Patients

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Objectives: To draw up standard of care in nursing observation of peripheral/central venous catheter for neurosurgical patients.

Methods: An observation chart modified from Prince of Wales Hospital[1] was adopted in neurosurgery department of Queen Elizabeth Hospital, Hong Kong, to monitor intravenous catheter (IVC) site condition. Numbering of IVC, 'follow-up care after catheter removal', and 'good practice points' were included in the chart. Attainment of standard was evaluated by incidence of phlebitis, peer review, and nursing audit. Incidence of phlebitis was observed from 19 June 2017 to 19 September 2017 to determine whether international standard was achieved and for evaluation of outcome in future. Nurses' review on usefulness of the chart and willingness of implementation were collected by questionnaires in August 2017. An audit on compliance of the chart would be conducted in early October 2017 for quality assurance and identification of area for improvement.

Results: The incidence of phlebitis was 2.66% in the department during the observation period. According to international guideline, the acceptable rate of phlebitis should be ≤5% in any given population.[2] No severe phlebitis (wound management/antibiotics treatment required) was reported. Also, 82% of respondents commented the chart was useful to monitor IVC site condition. They generally commented that it could facilitate nursing documentation. 'Good practice points' were good reminder for fresh graduate staff. About three quarters of respondents were willing to keep using the chart.

Conclusion: The phlebitis rate in neurosurgery department achieved international standard. The observation chart is useful to monitor IVC site condition and facilitate nursing documentation. Audit and re-evaluation are required in future.

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Anti-wandering Door Monitor System to Prevent Wandering of Neurosurgical Patients with Cognitive Impairment

N 3

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Background: Cognitive impairment and dementia are prevalent among patients aged >80 years in neurosurgical wards. Wandering is a frequent behaviour among these patients, which imposes a burden on health care workers, especially when the patients go missing. Since 2014, our department has employed the Anti-Wandering Door Monitor System (AWDMS) to tackle this problem. This study aimed to assess the effectiveness of the AWDMS in preventing patients with cognitive impairment and dementia from going missing.
Methods: A pilot study was conducted in ward N11 of Kwong Wah Hospital, Hong Kong, from March 2014 to July 2017. Ambulatory patients aged >80 years with cognitive impairment and dementia who were assessed suitable to wear the AWDMS were recruited. The number of patients who went missing was recorded to assess the outcome of the System.
Results: From March 2014 to July 2017, 20 eligible patients were recruited. No missing persons were reported.
Conclusion: The AWDMS is an effective, non-invasive, and user-friendly intervention to prevent patients with cognitive impairment and dementia from going missing. It can help to reduce wasting already limited manpower in searching for missing patients. Overall, the clinical staff involved showed high satisfaction with AWDMS, despite the need for extra training in the initial period and occasional false alarms when patients walked close to the door. We are keen to share the success of this pilot study to other centres in pursuit of greater efficiency and safety in clinical practice.

Water Swallowing Test in the Department of Neurosurgery at Princess Margaret Hospital

N 4

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Objectives: To identify patients' risk of dysphagia and aspiration pneumonia, to develop educational programme for nursing staff in neurosurgery in using the screening tool, and to evaluate staff compliance rate of using the screening tool.
Methods: The programme was incorporated from 24 July 2017 in the Department of Neurosurgery at Princess Margaret Hospital, Hong Kong. The Water Swallowing Test training programme was developed and implemented. All nursing colleagues in the Department attended the training programme and were then assessed by speech therapists of the same hospital about the related knowledge and practical skills of the Test. At the end of training programme, all new admissions and conditions that changed patients' swallowing ability were assessed by qualified nursing staff. The compliance and effectiveness of the dysphagia screening tool were evaluated from 16 August 2017 to 15 September 2017 in the Department.
Results: All the nursing staff passed the assessment after training. The staff compliance rate on Water Swallowing Test was 54%. Non-compliance cases were due to missing test on transferral in cases, heavy workload, and patients having nasogastric tube feeding before admission. All patients who passed the Water Swallowing Test had started feeding without any abnormality detected and no speech therapist consultation required.
Conclusion: Surgery and neurological disorders involving various structures or pathways can effect the swallowing ability of a patient. Thus, these patients should be assessed using the Water Swallowing Test, in order to reduce complications with swallowing. Observation of dysphagia and signs of aspiration, and periodic review of the Water Swallowing Test, would encourage better compliance with administering the Water Swallowing Test.

N 5

Neurological Care—Standard 8 Nursing Audit Report "Care of Patient with External Ventricular Drain"

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Objective: To investigate the compliance rate of patients with external ventricular drain.
Methods: This was a nursing audit based on the Neurosurgical Nursing Specialty Guidelines carried out from April 2017 to August 2017 among all neurosurgical centres from seven cluster hospitals in Hospital Authority.
Results: There were 65 patients included and 15 items in the checklist were assessed. The total compliance rate was 99.5%.
Conclusion: This nursing audit demonstrated efficient and effective nursing care, which were carried out to the patients with external ventricular drain.

AUTHOR INDEX

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