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THE HONG KONG MEDICAL DIARY

香 港 醫 訊

VOL.22 NO.2 February 2017

Neurosurgery

OFFICIAL PUBLICATION FOR THE FEDERATION OF MEDICAL SOCIETIES OF HONG KONG ISSN 1812 - 1691

BRILINTA™
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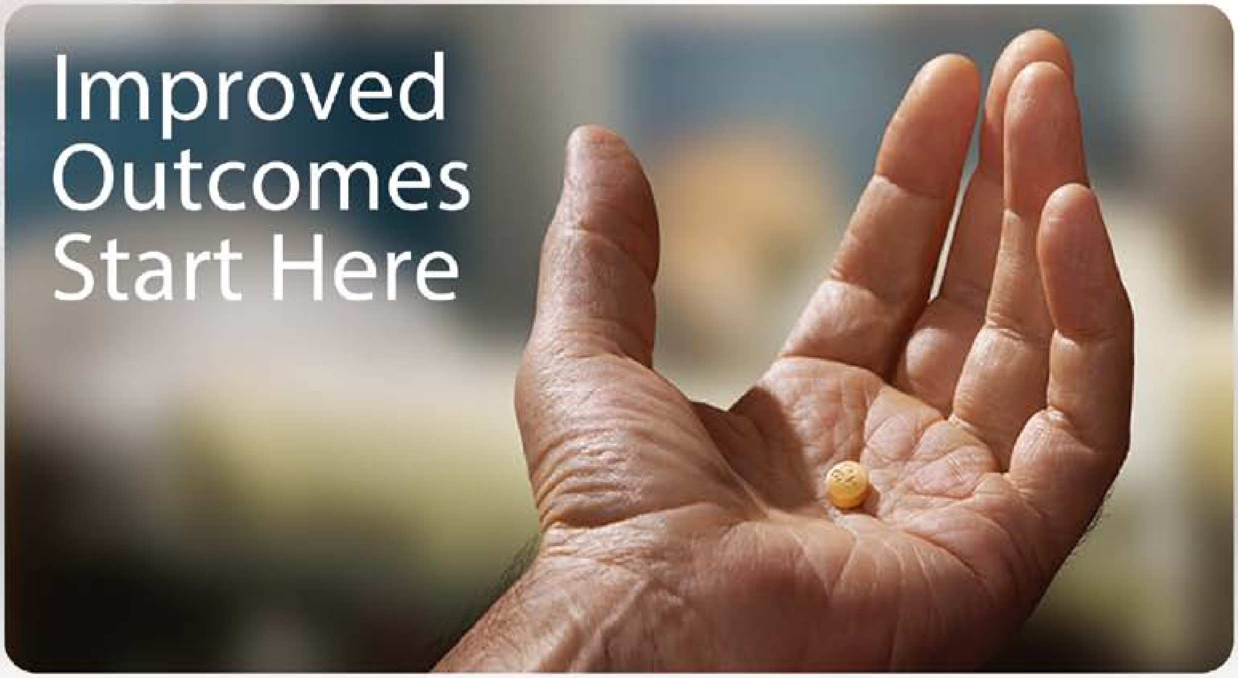

- **Potent and fast onset of action** in platelet inhibition[1]
- **Superior reduction** in CV mortality vs clopidogrel[2]
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- **Supports both** invasive and conservative ACS management strategies[2]
- **Broad** ACS patient applicability[2,8,9]

ACS diagnosis	History of ischaemic stroke or TIA†	Age (18+)	Weight	Sex	Diabetes status	CYP2C19 genotype
✓	✓	✓	✓	✓	✓	✓

* including STEMI, and moderate to high risk NSTEMI patients.
† BRILINTA® is contraindicated in patients with a history of intracranial haemorrhage.

ACS=acute coronary syndrome. CV=cardiovascular. DAPT=dual antiplatelet therapy. NSTEMI=non-ST-elevation myocardial infarction. STEMI=ST-elevation myocardial infarction. TIA=transient ischaemic attack.

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More information is available upon request.

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The Cover Shot

This features the start of Ironman West Australia, taken place at Busselton, Australia on Dec 5, 2010.

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Published by
The Federation of Medical Societies of Hong Kong

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Editorial

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Editor

Dr Yin-chung PO

The world of the Neurosurgeons is ever-challenging and changing. Neurosurgical conditions are well known to be complicated and treatment requires complex and extensive operative treatments with high risks. We are seeing changes in the modern Surgery with changes in the aim of treatment, surgical skills, monitoring techniques and modern technology. The aim of treatment nowadays is maximal disease control with minimal functional deficits.

In pituitary and skull base surgeries, the use of neuroendoscopes would allow access to the skull base region with minimal bony and soft tissue exposure. It allows us to take a closer and deeper look into the region of interest for better disease control.

In the treatment of neurovascular lesions, endovascular treatment opens up a new horizon. It also provides a new form of treatment to revive the ischaemic brain in patients suffering from stroke.

Radiosurgery provides us an invaluable tool for the treatment of tumours and vascular malformations. It allows treatment of multiple and deep seated tumours with good control short hospital stay and recovery.

We also see the development of deep brain stimulation in the Parkinson's disease and other functional disorders of the central nervous system.

Last but not least, not to forget our developing brains, our Paediatric Neurosurgeons would offer a spectrum of the treatment updates on Paediatric Neurosurgery.

To withstand tremendous pressures from the patients' disease and high technical demand, some of us would spend our leisure on training a strong physique. One of our colleagues would show us how his athletic training would be helpful in our career.

Amendment

In accordance to the previous issue, page 17, clarification to the third author title should be as follows:
Dr. Mei Man Chong
BDS(HK), MDS(OMS)(HK), MOMS RCSEd., AdvDipOMS(HK), FHKAM(Dental Surgery), FCDSHK(OMS)
Honorary Dental Officer, Oral and Maxillofacial Surgery,
The Prince Philip Dental Hospital

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* This is a 9 days sailing, will feature Nebuta Festival and call to Aomori as well.

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HKD15,454up

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Deep Brain Stimulation for Movement Disorders – An Update

Dr Michael WY LEE

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Honorary Secretary of the Hong Kong Movement Disorder Society

Dr Michael WY LEE

Deep brain stimulation (DBS) is a well-established neurosurgical procedure introduced 30 years ago by the French neurosurgeon Alim-Louis Benabid[1]. It involves the implantation of a medical device called a neurostimulator (brain pacemaker), which sends electrical impulses, through electrodes, to specific targets in the brain (brain nuclei) for the treatment of medically refractory movement and neuropsychiatric disorders. DBS directly changes the brain activity in a controlled manner with reversible effects (unlike lesioning techniques), and it is one of only a few neurosurgical interventions that allow blinded studies [19].

Unilateral DBS was first approved by the US Food and Drug Administration (FDA) in 1997 for tremor associated with essential tremor and Parkinson's disease[15]. The indications were expanded to include the symptoms of levodopa-responsive advanced Parkinson's disease (PD) using bilateral subthalamic nuclei (STN) as the target in 2002[11] as well as chronic intractable primary dystonia in 2003[23], of which the details of indication, procedure and complications were covered in a previous article by Chan DTM[4]. Meanwhile, the hardware costs of these indications, together with idiopathic cervical dystonia and tardive dystonia, are now funded by the Hospital Authority, which indeed benefits the patients in Hong Kong.

MECHANISM OF ACTION

Despite the fact that DBS is increasingly applied to the treatment of brain disorders with more than 130,000 patients worldwide (2016 figure)[13], its mechanism of action was unknown. Using invasive cortical recordings in PD patients undergoing DBS implantation surgery, the UCSF group led by Philip Starr showed that acute therapeutic DBS reversibly reduces phase-amplitude interactions over a similar time course as reduction in parkinsonian motor signs. It was the first time in vivo demonstration that DBS of the basal ganglia improves cortical function by alleviating excessive beta phase locking of motor cortex neurons[5].

EVIDENCE TO HAVE DBS EARLY

Last year US FDA further expanded the DBS indication to PD patients with (1) at least four years duration and with ***recent onset of motor complications, or (2) motor complications*** of longer-standing duration that are ***not adequately controlled*** with medication[13].

The multicentre prospective randomised controlled EARLYSTIM study, published in the New England Journal of Medicine in 2013[27], found that patients treated with DBS together with best medical therapy (BMT) reported a mean improvement of 26% in their disease-related quality of life at two years, compared to 1% decline in patients treated with BMT alone. For patients who received DBS along with BMT, 85% had a clinically meaningful improvement compared to only 36% in the BMT alone group over 24 months. For patients that remained on BMT alone, 30% got worse over 24 months compared to only 2% in the DBS group. The study also found a 61% improvement in levodopa-induced complications, including dyskinesias and motor fluctuations, in participants receiving DBS therapy at two years, compared to a 13% worsening in those only receiving BMT. Additionally, a long-term study of people with advanced Parkinson's disease who received DBS therapy showed benefits at 10 years, despite potential surgical and device-related complications[2].

EXCELLENT LOCAL EVIDENCE

Thanks to our dedicated multi-disciplinary movement disorder teams, the outcomes of STN DBS in PD patients in Hong Kong stood on par with renowned centres internationally[3]. The mean UPDRS motor score improvement were 57% and 45%, while the levodopa requirement decreased to 63% and 55.9% in the first and second year respectively. The awake "on" time was doubled in the first year and sustained in the second year while the awake "off" time was reduced from 28.1% to 5.9% in the first year and returned to 10.6% in the second year. It is no surprise that PDQ-39 showed significant improvement in quality of life for 2 consecutive years.

NEW INDICATIONS

Epilepsy

The use of DBS in severe and refractory epilepsy was approved in Europe, Canada, Australia and Taiwan, yet in US the FDA approval is still pending. In the multicentre prospective randomised double-blind SANTE (Stimulation of the Anterior Nucleus of the Thalamus in Epilepsy) trial[14], adult medically refractory partial-onset seizure patients, with or without secondary generalisation, were recruited. The mean age of the 110 final study participants was 36.1 years and about half were women. They had a median of 19.5 baseline seizure counts per month. They were randomised to no stimulation or 0 volts (55 control patients), or stimulation at 5 volts (54 patients), using

90-microsecond pulses, 145 pulses per second, "ON" for 1 minute, then "OFF" for 5 minutes since one month after bilateral ANT DBS implantation.

At the end of the blinded phase, at 4 months from baseline, the unadjusted median decreases in seizure frequency were 14.5% in the control group and 40.4% in the stimulated group. After adjustment and exclusion of 1 outlier who had a seizure every 6 minutes with the stimulation, although these stimulation-provoked seizures immediately decreased when the voltage was turned down to 4 volts, the stimulated group had a 29% greater reduction in seizures compared with the control group (P = .0022). The 50% responder rate (the percentage of patients whose seizures were at least reduced by half) were 43% at 13 months, 54% at 25 months, and 67% at 37 months. And 14 patients (12.7%) were seizure-free for at least 6 months. This seizure-free rate was remarkable considering the baseline seizure rate of at least 6 partial seizures per month (≤ 10 per day) despite they were taking at least 3 antiepileptic drugs. For complications, death (6.2 per 1000 years sudden unexplained death in epilepsy), infection (12.7%), and haemorrhage (symptomatic 0%, asymptomatic 4.5%) rates were similar to other studies of DBS[7].

The 5-year SANTE data[25] demonstrated further improvement of seizure control. The median seizure reduction rate was 69% from baseline at 5 years, up from 41% at one year (p<0.001 for both time points). The 50% responder rate, based on a more than reduction in seizure frequency by more than half, was 68% at 5 years, up from 43%. And 16% of patients reported being seizure-free for at least 6 months. Statistically significant seizure severity and quality of life improvements were observed over baseline at five years and one year as measured by the Liverpool Seizure Severity Scale (LSSS) and Quality of Life measure (QOLIE-31) (p<0.001 for both measures). Hence if a medically refractory partial seizure patient is not amenable to resective surgery due to whatever reason, ANT DBS seems to be a reasonable choice of improving seizure control and quality of life.

Additionally there are some open-label clinical trials reported using DBS to treat pharmacoresistant seizures, demonstrating marginal efficacy in stimulating the centromedian nucleus of the thalamus (CMT), caudate nucleus, cerebellum, STN, and amygdalo-hippocampus[17].

Obsessive-compulsive disorder (OCD)

The use of DBS for chronic severe refractory OCD[12] is approved by the FDA under a Humanitarian Device Exemption (HDE) since 2009. Ten adult OCD patients meeting stringent criteria for severity and treatment resistance had DBS implanted bilaterally in the ventral capsule/ventral striatum (VC/VS) in an open-label study[16]. Group Yale-Brown Obsessive Compulsive Scale (YBOCS) scores decreased from 34.6 at baseline (severe) to 22.3 (moderate) at 36 months (p<0.001). Global Assessment of Functioning scores improved from 36.6 at baseline to 53.8 at 36 months (p<0.001). Depression and anxiety also improved, as did self-care, independent living, and work, school, and social functioning.

Nevertheless, there are opinions that anterior capsulotomy (AC) was an established procedure and more superior to DBS for treatment of patients with refractory OCD. In a meta-analysis[22], twenty studies were identified reporting on 170 patients; 62 patients underwent DBS of VC/VS or nucleus accumbens (NAc) (mean age 38 years, follow-up 19 months, baseline YBOCS score of 33), and 108 patients underwent AC (mean age 36 years, follow-up 61 months, baseline YBOCS score of 30). In patients treated with DBS there was a 40% decrease in YBOCS score, compared with a 51% decrease for those who underwent AC (p=0.004). Patients who underwent AC were 9% more likely to go into remission than patients treated with DBS (p = 0.02). No difference in complication rates was noted.

Tourette's syndrome (TS) and others

For TS, besides initial local success was reported[21], new standardised evaluation guidelines[26] were proposed and international registry and database[6] designed to overcome the severe limitations of small-n studies for TS DBS. The project has made considerable progress towards a truly global Database with a hope to consolidate the scientific evidence in management of the disease. DBS is also used in research studies to treat chronic pain, PTSD[18,20], major depression[8], eating disorders, and addiction; none of these applications of DBS has yet been FDA approved.

Currently, there are still very limited data on whether DBS is really useful to patients with traumatic brain injury (TBI) or Alzheimer's disease (AD) despite some encouraging case series. An open-label prospective study by Rezai and colleagues of four TBI patients who had problems with behavioural control and emotional self-regulation were treated with DBS to the anterior limb of the internal capsule and nucleus accumbens (ALIC/NAc) to modulate the prefrontal cortex. All participants had improved outcomes, mainly in "behavioural and emotional adjustment, which in turn improved functional independence." [24]

For AD, DBS of the fornix/hypothalamus has shown promising results in terms of both delaying and reversing the cognitive deterioration. Other targets such as Nucleus basalis of Meyernet (NBM), Pedunculopontine tegmental nucleus (PPN), ALIC/NAc and EC/hippocampus EC have been explored with good initial results. Further randomised controlled trials are required to validate the efficacy of neuromodulation and to determine the most optimal target for AD. [28]

PRESENT DBS DEVELOPMENTS

MRI compatibility

Besides rechargeability resulting in battery longevity, full body MR conditional DBS system is now available. MRI is a standard of care of imaging of many diseases of the body. In US, more than 60% DBS-eligible patients with movement disorders may need an MRI within 10 years of receiving their device, and more than 60% of all these MRI scans are in regions beyond the head[10]. Now, DBS patients can have continued therapy delivery while undergoing MRI, resulting in better comfort and more satisfactory image quality because of reduced patient movement during MRI.

Pregnancy

Most medications used in disabling movement disorders and OCD are considered Pregnancy Category C (Risk not ruled out) due to the lack of evidence about their impact on foetal development and teratogenicity. Women are often forced to reduce or change their treatment, with ensuing clinical worsening. Without systemic effects, DBS could be a better way than medical treatment alone in controlling patients' symptoms during pregnancy. In a case series of the French and Italy groups, it was shown that DBS adjustments limited clinical worsening in five patients and allowed nine out of eleven women to take their pregnancies to term without medical treatment. Not only is it safe for young women with DBS implanted to become pregnant and give birth to babies, DBS seems to be the key to becoming pregnant, having children, and thus greatly improves quality of life[9].

CONCLUSION

DBS is an exciting facet of functional neurosurgery with more advances forthcoming. More patients will benefit from the concerted effort of the multidisciplinary team.

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Update on endovascular therapy for acute ischaemic stroke

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This article has been selected by the Editorial Board of the Hong Kong Medical Diary for participants in the CME programme of the Medical Council of Hong Kong (MCHK) to complete the following self-assessment questions in order to be awarded 1 CME credit under the programme upon returning the completed answer sheet to the Federation Secretariat on or before 28 February 2017.

Introduction

Treatment for acute cerebral infarct has gone through a marked revolution in the past two decades.

The efficacy of intravenous recombinant tissue plasminogen activator (iv r-tPA) treatment was proven in 1995 by the National Institute of Neurological Disorders and Stroke (NINDS) r-tPA trial[1] This was the first randomised controlled trial comparing treatment with intravenous r-tPA and placebo within 3 hours of stroke onset. Patients receiving r-tPA were found to have significantly better outcomes: at least 30% more likely to have mild or no disability at end point assessment. Although pooled data analysis from this and other related trials: ECASS I & II (European Cooperative Acute Stroke Study) and ATLANTIS A & B (Alteplase Thrombolysis for Acute Noninterventional Therapy in Ischaemic Stroke) showed that the treatment window can be extended to 4.5 hours for selected groups,[2,3] the proportion of stroke patients that can receive such treatment is still small. Data in the United States showed that only 22-31% of patients were able to present to the emergency department within 3 hours of stroke onset. Subsequently, only about 5% of patients ended up receiving treatment with r-tPA[4]. The percentage in Hong Kong is expected to be even lower. Another limitation is the low recanalisation rate for large clot burden or large size vessel occlusion[5].

Endovascular therapy was therefore developed to overcome these limitations.

Intra-arterial thrombolysis

This involves using endovascular techniques to directly administer thrombolytic agents to the intra-arterial blood clot.

The PROACT II study[6], published in 1999, was the first randomised controlled endovascular trial that studied clinical efficacy and safety of intra-arterial recombinant pro-urokinase in patients with acute stroke from middle cerebral artery (MCA) occlusion. It concluded that 40% of patients treated with intra-arterial pro-urokinase within 6 hours of MCA occlusion had good clinical outcome, with modified Rankin score (mRS) of 2 or less, compared to 27 % of the control group. On the other hand, symptomatic intracranial haemorrhage occurred in 10% of the treatment group, compared to 2% in the control group. The mortality rate was comparable between the two groups[6].

The IMS II trial[7] in 2007 compared the efficacy and safety of treatment with low dose intravenous tPA and intra-arterial tPA to historical results from the NINDS study. It concluded that the portion of patients having mRS 0–2 at 3 months was significantly higher than the control arm (46% versus 39%). However, it also showed that there were higher rates of symptomatic intracerebral haemorrhage.

Mechanical thrombectomy

Clot removal by mechanical devices then gained popularity by its higher recanalisation rate. This is particularly important for large vessel occlusions: internal carotid arteries, proximal middle cerebral arteries and vertebra-basilar arteries, where iv r-tPA and thrombolysis were known to be less effective[8,9].

The first generation of FDA approved mechanical thrombectomy devices are MERCI Retrieval (Stryker, Kalamazoo, MI, USA) and Penumbra Stroke Systems (Penumbra Inc., Alameda, CA, USA).

The MERCI is a corkscrew shape device with helical nitinol loops that was deployed into and engaging the thrombus, which can then be removed en bloc when the device is retrieved. The recanalisation rate was reported to be 55%, and could be increased to 70% when combined with intra-arterial tPA[10].

Pooled analysis of data revealed that although patients with complete or near complete recanalisation (TIMI 2 or 3) would have better functional outcome and lower mortality, the overall outcome for all patients underwent such treatment did not show a significant benefit when compared to PROACT II historical control arm[11,12].

The original Penumbra system consisted of a mechanical clot separator coupled with clot aspiration via a reperfusion catheter. Its safety and effectiveness were proven in the Penumbra Pivotal Stroke Trial. A recanalisation rate of 82% was achieved[13]. However, no significant improvement in clinical outcome was demonstrated when compared to historical control arm in PROACT II.

In 2013, three separate trials (IMS III[14], SYNTHESIS Expansion[15], and MR RESCUE[16]) compared clinical outcomes with patients treated with these mechanical thrombectomy devices to patients managed with systemic thrombolysis by tPA or standard medical

therapy with antiplatelet drugs. They concluded that the morbidity could not be significantly reduced.

New generation of thrombectomy devices and updated evidence

The switch to using stent retrievers was a critical step in the evolution of endovascular therapy for stroke[17]. A retrievable stent, with its mounting microcatheter, is navigated through the thrombus in the affected segment of the artery and deployed, thereby displacing the thrombus peripherally against the vessel wall. Flow was therefore restored and the clot was trapped within the stent interstices. The clot was removed when the stent was retrieved. Two stent retrieval devices are currently approved by FDA: Solitaire FR (Covidien, Dublin, Ireland) and Trevo (Stryker). The Solitaire FR was found to have a higher overall recanalisation rate when compared to the MERCI result (89% versus 67%). The clinical outcome was also better: 58% of patients having mRS 0-2 at 3 months in the Solitaire group, compared to 33 % in the MERCI group[18].

A breakthrough came in 2015 when five highly successful randomised controlled trials on endovascular stroke therapy were published. The MR CLEAN trial[19] was the first one to demonstrate that patients receiving endovascular treatment (97% treated with stent retriever thrombectomy) within 6 hours of onset have a significantly better functional outcome than the control group, who were treated with iv tPA or standard medical therapy (33% with mRS 0-2 vs 19%). This impact led to a halt and interim analysis of the other four trials: SWIFT PRIME[20], ESCAPE[21], EXTEND IA[22], REVASCAT[23], which supported the benefit of stent retriever thrombectomy as the sole treatment or as an adjunct to iv tPA therapy. In addition, the benefit persisted regardless of the patient's age, severity of stroke and location of occlusion[17].

One other important observation from the 2015 endovascular trials was that a majority of patients have received iv tPA. All patients in the SWIFT PRIME and EXTEND IA trials, and the majority of patients in the MR CLEAN, ESCAPE and REVASCAT trials have had iv tPA before receiving endovascular treatment. Although some subgroup analyses suggested that patients who had endovascular treatment and did not receive prior iv tPA had a higher rate of recovery, the current consensus is that decision for intra-arterial (IA) thrombectomy should not preclude the use of iv tPA.

Apart from the retrievable stent, clot removal by a direct aspiration method is also gaining favour: A direct aspiration first pass technique (ADAPT)[24] was published in 2014. After a large bore aspiration catheter (Penumbra System, Alameda, CA, USA) was navigated to the proximal segment of the thrombus, continuous suction was applied and the catheter was engaged to the clot, which was then removed when the catheter was retrieved. The authors reported a successful revascularisation (TICI 2b or 3) rate of 78%, and improved to 95% with additional use of stent retrievers. Ninety days good functional outcome (mRS 0-2) was 54%[25]. Although the randomised controlled trial – THERAPY[26] that aimed at its detailed assessment is not yet published, the reported results showed a trend towards better outcomes than iv tPA therapy[17].

Patient selection

One of the major determinants for a successful endovascular therapy is patient selection, which in turn relies on the patient's clinical status (NIHSS) and result of image investigation.

Traditionally, endovascular therapy was reserved for patients with a higher NIHSS score (8-10 or above). It is also known that a higher NIHSS score is associated with poorer clinical outcome and a higher risk of intracerebral haemorrhage after treatment[27]. This may partly explain why the treatment outcome was not so favourable in the past. In the 2015 trials, although the median NIHSS of recruited patients was 13-18, patients with much lower NIHSS were included in the MR CLEAN and EXTEND IA[17].

A non-contrast CT brain is a minimal requirement for imaging investigation to rule out intracerebral haemorrhage and assessing the extent of cerebral insult. Hypodensity larger than one-third of the MCA territory is known to be associated with a higher risk of haemorrhage after reperfusion and poor outcome[28]. The ASPECT (Alberta Stroke Program Early CT) score[29] provides more detailed and objective description for predicting the treatment response. A brain image in CT is divided into 10 territories and represented by a total score of 10. A point is subtracted for ischaemic change in each territory. A score of 7 or less predicts a higher risk of haemorrhagic transformation after thrombolysis. It can also be used to predict the final infarct size and clinical outcome[30].

Whereas most centres would now advocate CT angiography (CTA) or MR angiography (MRA) to confirm any main trunk occlusion before proceeding to endovascular therapy, use of a perfusion scan (CT or MRI) is still under debate.

Compared to plain CT scan, CT perfusion can more accurately assess the infarct size and confirm the presence of penumbra, both of which are valuable information in the process of treatment decision. However, more time will be needed for the study and this implies some degree of delay in initiating the actual treatment.

Similarly, MRI and MR perfusion scan can provide even more detailed information. But the imaging and processing time is obviously longer. Besides, patients with compromised conscious level may not be suitable to undergo such lengthy study. In some busy centres, the MRI machine may not be immediately available.

On the other hand, CTA allows assessment of intracranial collaterals, which is a powerful indicator of clinical outcomes after reperfusion treatment[31]. Better pre-existing collaterals help the affected part of the brain to withstand a longer period of hypoperfusion and resulting in smaller infarct size, and subsequently better clinical outcome. The status of collaterals can be visualised by multiphase scanning (in early and late venous phase without additional use of contrast) and compared to unaffected vessels on the contralateral side[32]. The additional time required is much less than that in a perfusion scan.

Unanswered questions

Posterior circulation stroke

One should also note that despite the favourable results concluded by the 2015 endovascular trials, posterior circulation strokes were excluded from all these published studies. In fact, strokes from occlusions in the vertebro-basilar arterial system are associated with high morbidity and mortality. Randomised controlled trials for assessing the efficacy of endovascular treatments for this subgroup are lacking. A meta-analysis of stent retriever treatment for basilar artery occlusion in 2015 concluded that the recanalisation rate (TICI score ≥2b) was 81% and favourable clinical outcome (mRS 0-2 at 3 months) was 42%, with a rate of symptomatic intracranial haemorrhage 4% , and mortality rate 30%[33]. It concluded that the stent retriever is a safe treatment modality in this condition. Nevertheless, treatment decision should be made on an individual basis.

Mode of anaesthesia

Conscious sedation is preferred by a growing proportion of interventionists since it can be delivered much faster. A retrospective analysis of patients undergoing general anaesthesia for the procedure has demonstrated a higher rate of mortality and pneumonia, compared to patients who received treatment under conscious sedation[34]. This was also echoed by the findings in a post hoc analysis of thrombectomy patients in the MR CLEAN trial, which showed that the three months' functional outcome was better for those without general anaesthesia[35]. On the other hand, general anaesthesia is more preferred for patients who are too agitated, with low conscious level who cannot protect their airways, and selected patients with posterior circulation stroke[36].

Conclusion

The favourable results in recently published trials bring about a significant impact to our practice in acute stroke management. We have strong evidence to support more aggressive treatment if it can be initiated within the 6 - 8 hours window period. It also brings about certain implications: obligation to discuss and offer available treatment options to patients and relatives, pressure on facility and personnel resources, availability of qualified interventionists, etc.

Some other trial results will be available in the near future, which hopefully can bring more answers to the unresolved questions, such as the most optimal device / combination of devices, most suitable image modality for decision making, management strategy for subgroups of stroke such as posterior circulation stroke, stroke from arterial dissection, etc.

Keywords:
stroke management, intra-arterial thrombectomy, endovascular therapy

Abbreviations:
TICI- Thrombolysis in Cerebral Infarction
TIMI- Thrombolysis in Myocardial Infarction

NIHSS- National Institute of Stroke Score

Case illustration

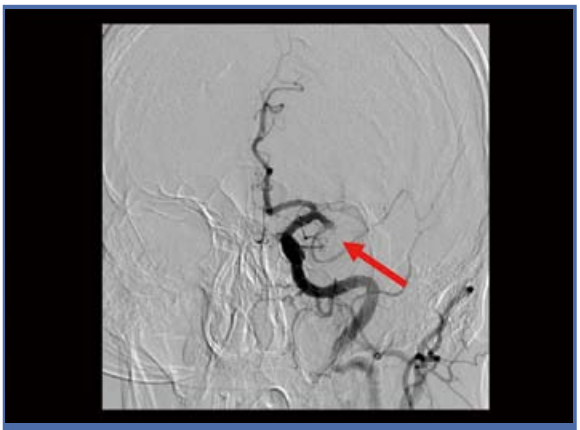

Fig 1a. 46 year old man with atrial fibrillation, presented with sudden onset of right hemiplegia and dysphasia. Cerebral angiogram showing occluded left middle cerebral artery

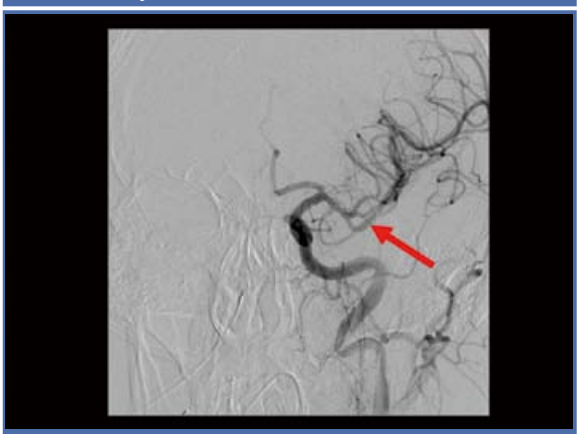

Fig1b. Mechanical thrombectomy with ADAPT technique performed. Total revascularisation of the MCA territory achieved. Right side limb power and speech returned.

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MCHK CME Programme Self-assessment Questions

Please read the article entitled "Update on endovascular therapy for acute ischaemic stroke" by Dr Kar-ming LEUNG and complete the following self-assessment questions. Participants in the MCHK CME Programme will be awarded CME credit under the Programme for returning completed answer sheets via fax (2865 0345) or by mail to the Federation Secretariat on or before 28 February 2017. Answers to questions will be provided in the next issue of The Hong Kong Medical Diary.

Questions 1-10: Please answer T (true) or F (false)

Which of the following therapy (-ies) is/ are the principle treatment for reversal of the neurological deficits for ischaemic stroke provided the indications are met (Q1-Q4) ?

1. Anti-platelet agents like aspirin and clopidogrel.
2. Oral anticoagulants including warfarin and novel oral anticoagulants (NOAC).
3. Recombinant tissue plasminogen activator (r-tPA).
4. Endovascular therapy using balloon angioplasty.
5. Intravenous recombinant tissue plasminogen activator (IV r-tPA) is contraindicated if patients are planned for mechanical thrombectomy in order to avoid bleeding risk.

Which type of patients suffering from ischaemic stroke will require endovascular therapy based on the current standard (Q6-Q7) ?

6. Patients suffering from anterior circulation ischaemic stroke.
7. Therapeutic window within 12 hours from development of symptoms.
8. A Magnetic Resonant Imaging (MRI) of the brain is always necessary for decision for endovascular therapy for ischaemic stroke.
9. Intra-arterial recombinant tissue plasminogen activator (IA r-tPA) can be used to treat selected cases of ischaemic stroke if intravenous tissue plasminogen activator (IV r-tPA) has been used.
10. General anaesthesia (GA) must be used for endovascular therapy for acute ischaemic stroke.

ANSWER SHEET FOR FEBRUARY 2017

Please return the completed answer sheet to the Federation Secretariat on or before 28 February 2017 for documentation. 1 CME point will be awarded for answering the MCHK CME programme (for non-specialists) self-assessment questions.

Update on endovascular therapy for acute ischaemic stroke

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1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐

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Answers to January 2017 Issue

Why do children need early orthodontic assessment?

1. F 2. T 3. T 4. F 5. T 6. T 7. T 8. F 9. T 10. T

Evolving Neuroendoscopy, Past , Present and Future

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Introduction:

When we talked about minimally invasive surgery in neurosurgery, we must include Neuroendoscopy as one of the most important components.

In contrary to endoscopy to other parts of body e.g. GI tract and urinary system, the development of neuroendosocopy was relatively late.

However, with evolving technology, neuroendoscopy became an important part of our daily practice in dealing with ventricular pathology, skull base tumours and spine pathology.

History:

For any endoscopy, we had to solve three problems: 1. The instrument that was inserted into the body (the scope itself), which must be fine and non-traumatic. 2. Light source. 3. Viewing system.

In 1853, Antonin Jean Desormeaux (1815–1894), proclaimed the "father of cystoscopy," used a kerosene lamp that burned alcohol and turpentine and a concave 45-degree mirror to reflect light into the bladder.

The first neurosurgical endoscopic procedure was performed by L'Espinasse[1]. In 1910, he reported the use of a cystoscope to perform fulguration of the choroid plexus in two infants with hydrocephalus. Twelve years later, in 1922, Walter Dandy described the use of an endoscope to perform choroid plexectomy[2].

At this time, the endoscope was mainly used for treating hydrocephalus. With the development of ventriculo-peritoneal shunt and neuro-microscope, endoscope became less favoured.

In the 1950s to 1960s, however, several technical developments had made neuroendoscopy popular again.

In 1966, Hopkins and Storz developed the SELFOC[3] lens system which was a rigid rod-lens system that provided a wider viewing angle, improved colour and resolution, and much more light transmission.

In 1969, George Smith and Willard Boyle invented the first CCD[4] (charged coupling Devices) at the Bell Laboratories. The CCDs are solid-state devices, usually a silicon chip, which are capable of converting optical data into electrical current. The CCD allowed image to be captured in low-light environment and the signal was converted into electrical signal for viewing. The CCD could then be incorporated into a camera head as a capturing device.

In 1970s, fibreoptics[5] was developed which allowed the light source to be separated from the rest of the endoscope. Light could also be emitted from the tip of the endoscope without significant heating through one set of cables, while specializsed, coherently arranged cables could be constructed to conduct images without loss of luminescence.

So the modern neuroendoscopy then matured, with a low-heat but high illumination light source transmitted through an effective lens system, the image was transmitted with less distortion back to the capturing device and projected onto a TV system.

Current Application:

1. *Ventricular surgery*

Endoscopic Third Ventriculostomy (ETV) was the earliest and most widely used indication for neuroendoscopy. In order to avoid hardware problems from ventriculo-peritoneal shunts, ETV was extensively used especially in cases of obstructive hydrocephalus.

Other complicated hydrocephalus cases were likewise being treated e.g. Endoscopic septum pellucidotomy or septostomy to treat isolated lateral ventricles[6]. Fenestration of loculated ventricles can also be performed, along with marsupializsation and fenestration of intracranial cysts. Aqueductoplasty[7] has been explored for treatment of the trapped fourth ventricle syndrome and aqueductal stenosis.

After gaining experience of ventricular endoscopy, Fukushima and colleagues[8] were the first to report use of the neuroendoscope for biopsy procedures in intraventricular tumours. In addition to tumour biopsy sampling, the endoscope has been used for resection of colloid cysts and other intraventricular lesions. Additionally, resection of hypothalamic hamartomas, pineal-region tumours and craniopharyngiomas can, in selected cases, be performed via neuroendoscopic methods[9].

The instrumentation available for intraventricular neuroendoscopic procedures has developed rapidly

over the past several decades, and now typically consists of an endoscope and working channel, external light source, irrigation channel, and a variety of tools that can be introduced via the working channel. These instruments often include grasping forceps, scissors, cautery devices, Fogarty balloons, and various micro-dissectors.

However, we still face the challenge of the inabilitity of bimanual microdissection techniques, difficulty in achieving haemostasis, and adaptation to working in a fluid environment.

2. *Skull base surgery:*

Although intraventricular neuroendoscopy had undergone a rebirth in the 1970s and 1980s, routine endoscopic approaches to pathology of the skull base did not occur until almost two decades later. The first purely endoscopic trans-sphenoidal pituitary operations were developed almost 20 years later after successful collaboration between neurosurgeons and ear, nose and throat surgeons (Carrau et al.[10] and Jho et al.[11]).

Cappabianca et al.[12], Kassam et al.[13], and others brought the discipline of endoscopic skull base surgery to a new level. Over the 15 years that followed, a series of expanded endonasal endoscopic operations, including transplanum, transtuberculum, and transclival skull base approaches, were being reported for a variety of skull base pathologies.

The challenges for skull base endoscopic procedures were the limited corridor with surrounding important vascular and neural structures, difficulty in bimanual manipulation and dissection, difficulty in haemostasis, adaptation to the video system and skull base reconstruction with no CSF leakage. All these problems were encountered by advances in instrument with single shaft dissector, forceps, coagulator, tumour debulking devices, etc. New methods of skull base reconstruction with different graft and pedicled flap, CSF sealing agent were developed.

There has been recent interest in the use of the neuroendoscope to assist with "traditional" skull base microsurgery. The endoscope has already been reported to be a useful adjunct to the microscope in posterior fossa approaches[14] and aneurysm surgery[15].

3. *Spine Surgery*

The neuroendoscope has been an important part of the minimally invasive spine surgery. Endoscopic approaches include thoracoscopic sympathectomy,[16] discectomies,[17] lumbar laminotomies,[18] anterior approaches for spinal reconstruction,[19] and resection of tumours and cysts.[20]

Future:

The trends in future development will be minimisation of the hardware especially camera head, development of 3D endoscope, robotic endoscope and flexible endoscope.

3D endoscope is the most recently developed technology. Surgeons, just like watching movies, have to wear glasses to have a 3D effect. One study[21] has shown that the 3D endoscope has additional benefit on operation. And in fact, it allows new learners to acquire the technique more effectively.

A new compact endoscope is being developed for incorporating the light source, adjustable lens and camera head into one piece. It greatly reduces the weight and size of the endoscope system and increases the applicability in different clinical situations.

Projects on robotic neuroendoscopy are under development. This is another future direction to make the surgery more precise and steady.

Conclusion:

Neuroendocopy development is late to start but quick to catch up. With modern technical advancement, we have widened neuroendoscopy applications to different pathologies to achieve the goal of minimally invasive surgery.

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Recent advances in Stereotactic Radiosurgery

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Introduction

In the past two decades, the trend of minimally invasive procedures has been making an immense impact on neurosurgical practice.In particular, stereotactic radiosurgery (SRS) has revolutionised the use of radiation, a long-proven treatment against cancer in the field of neurosurgery. SRS has proven to be exceedingly successful as a surgical tool in the treatment of a wide spectrum of neurosurgical conditions, including benign and malignant brain tumours, cerebral arterio-venous malformations and even functional disorders of the central nervous system.[1]

SRS treatment requires a concerted effort of a dedicated team, including physicist, radiation oncologist and neurosurgeon, using sophisticated planning software and dedicated radiation oncology hardware to treat lesions with a "surgical" dose of radiation. We can focus radiation beams, highly conformal to the configuration of a defined target. The convergence augments the strength of the radiation dose, achieving scalpel-like precision with ablative intent without the need for a surgical incision.

Stereotactic Radiosurgery

Dr Lars Leksell pioneered and defined radiosurgery in 1960s as "a single high dose fraction of radiation, stereotactically directed to an intracranial region of interest".[2] Up until now, the localisation accuracy meticulousness implicit in the word "stereotactic" remains utmost important for SRS intervention. The development of stereotaxy can be dated back to 1908 when British neurosurgeon and scientist Sir Victor A. H. Horsley and his colleague Robert H. Clarke at the University College London invented the Horsley–Clarke apparatus, a frame-based structure, a stereotactic device that employed a set of three coordinates (x, y and z) in an orthogonal frame of reference (Cartesian coordinates). With the use of a brain atlas, composed by serial transverse sections of the human brain, each brain structure could be assigned a number of coordinates, allowing experimental and surgical intervention in various parts of the brain, from superficial to deep-seated structures.[3]

Frame-based systems are the basis of SRS treatment since its inception in 1960s. Stereotactic head frame has been regarded as the gold standard for head immobilisation, nonetheless many patients consider head frame placement to be traumatic. Frame placement involves risks of bleeding and infection. Patients may require sedation and pre-medications before frame placement and hospitalisation with dedicated nursing and physician support. Frame-based treatment also requires brain imaging and treatment planning to be completed following frame placement on the day of treatment, leading to a tight time constraint making the incorporation of advanced dose planning less feasible.

Inaccuracy of a SRS treatment stems from individual errors accumulated at each step in the radiosurgery process. We have observed that frame immobilisation only ascribes to a fraction of the total treatment accuracy. The problem can be the results of many possible sources of error, which include image registration, external coordinate misplacement, laser misalignment, together with geometric and mechanical errors of the positioning hardware and the gantry of the linear accelerator. Most of these errors occur randomly during the manual patient positioning procedure and as a result impede the treatment accuracy.

Frame-based radiosurgery to image-guided radiosurgery

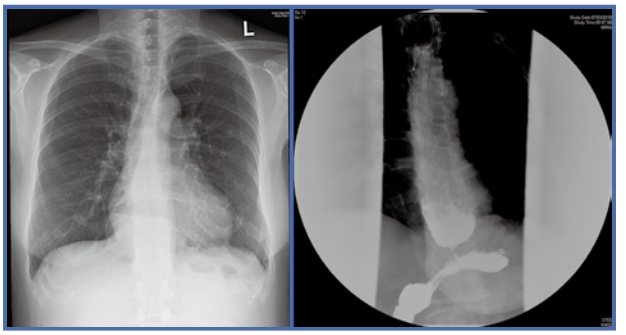
The advancement in computer science and its integration with the imaging technology has created a new treatment paradigm in the last decade that revolutionised SRS. With the use of image-guided radiation therapy (IGRT) technologies and computer-driven radiosurgery workflow, we can minimise every individual error and thereby maximise the accuracy. Henceforth, we can replace the invasive head frame by a non-invasive immobilisation device, usually a facemask, creating a new era of frameless radiosurgery.[4]

A significant advantage of image-guided frameless radiosurgery over frame-based radiosurgery is that the relationship between the immobilisation device and the cranial skeletal anatomy needs not be preserved from treatment planning to actual treatment. The planning team has ample of time to create the best treatment design. This is particularly important as modern imaging like functional MRI and MR tractography can pin point important brain structures and connections like the cortico-spinal tract, Meyers loop and the angular fasciculus that connects the language areas.

The guiding Images taken at the time of treatment after positioning patients on the couch are used to directly determine the position of the target in stereotactic space. The process can be done repeatedly during treatment

Radiology Quiz

Dr Victor LEE



A 50 year old lady presented to her family physician for cough and dysphagia.

Questions

1. What are the findings on the frontal chest radiograph and barium swallow study?
2. What is the most likely diagnosis?
3. What is the further management?

(See P.37 for answers)

and minimise the potential set up errors. Image-guided frameless radiosurgery also permits flexible treatment schedules and unlocks the potential of using fractionated radiosurgery protocols. With fractionation, we can use a lower radiation dose to achieve control of lesions whereas nearby vital structures like the optic nerve or cochlear are protected from radiation damage. Unlike the conventional frame-based systems, the greatest benefit of frameless radiosurgery is to offer patients an improved level of comfort and eliminate their unwanted worry on frame fixation.

Image-guided frameless radiosurgery Hardware

Cyberknife, a product of Accuray is the first commercially available Image-guided frameless radiosurgery system. Cyberknife was introduced to Hong Kong in September 2006. The radiation source, a compact X band linear accelerator that produces 6MV X-ray radiation is mounted on an industrial robot. The radiation is collimated using fixed tungsten collimators of different sizes. Mounting the radiation source on the robot allows freedom to position the source within a space around the patient, enabling the system to deliver radiation from many different directions without the need to move the patient couch as required by current linear accelerator gantry configurations. Cyberknife incorporates two X ray imaging cameras; they are located around the patient allowing instantaneous X-ray images to be taken. The tracking method is called 6D or skull-based tracking. This method is referred to as 6D because corrections are made for the 3 translational motions (X, Y and Z) as well as three rotational motions. The X-ray camera images are compared to a library of computer generated images of the patient anatomy. Digitally Reconstructed Radiographs (DRR's) and a computer algorithm determine the motion corrections that have to be relayed to the robot for patient movement correction.

In 2004, Brainlab introduced a new tracking technology, the ExacTract system. They use similar X- ray cameras and DDRs but the 6D correction occurs in the 6D robotic patient couch. ExacTract, as a guiding system, can integrate with most linear accelerator radiosurgery systems and transform them into an image-guided frameless radiosurgery system. Both Cyberknife and ExacTract system are equipped with optical tracking devices which can monitor the patient's position during SRS, therefore the number of tracking X rays used can be reduced, the integral dose of radiation can be lowered during SRS.

In 2015, Elekta introduced the Icon gamma knife model, the machine is equipped with a Cone Beam Computer Tomography and an optic tracking system, allowing the gamma knife to participate in the IGRT arena.

The treatment duration of radiosurgery varies according to the dose planning and dose rate of the linear accelerator; it may last for minutes to half an hour or even longer. Patients are immobilised during treatment by using a custom made facemask according to their face and skull configuration, avoiding inadvertent movements. Studies have shown that the error arises from patient movement during treatment is proportional to the duration of SRS. Patient education and treatment systems that can offer a shorter treatment duration may reduce potential errors.[5]

Clinical applications

Stereotactic radiosurgery (SRS) usually implies a single session treatment. A single session treatment is widely used for AVM, brain metastasis, acoustic neuroma and meningioma. In general, it is indicated when lesions are relatively small, away from an Organ at Risk (OAR) like the optic nerves, chiasm, cochlear and usually not used in the more radiosensitive part of the brain (Brain stem and basal ganglia). Fig1.

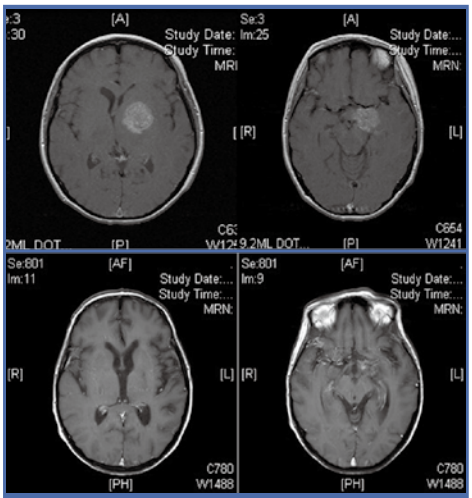


Fig 1A. A female patient diagnosed to have Adenocarcinoma of Lung, with a 2.6cm left basal ganglia metastasis, SRS with 15 Gy delivered to tumour margin, MRI done 15 months later showed complete tumour resolution.

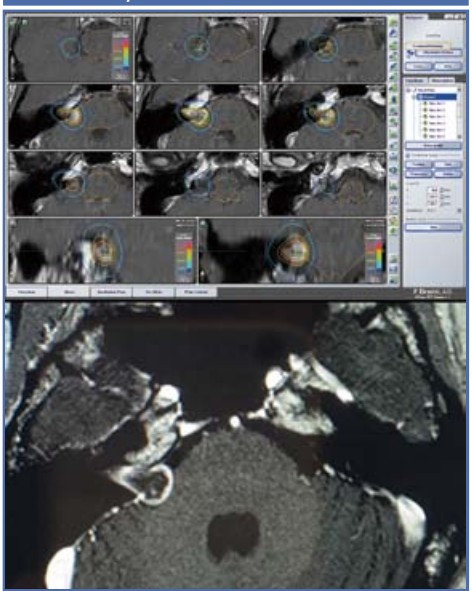


Fig 1B. Patient presented with right ear hearing loss. SRS with 12 Gy delivered to tumour margin, tumour developed cystic change and subsequent shrinkage.

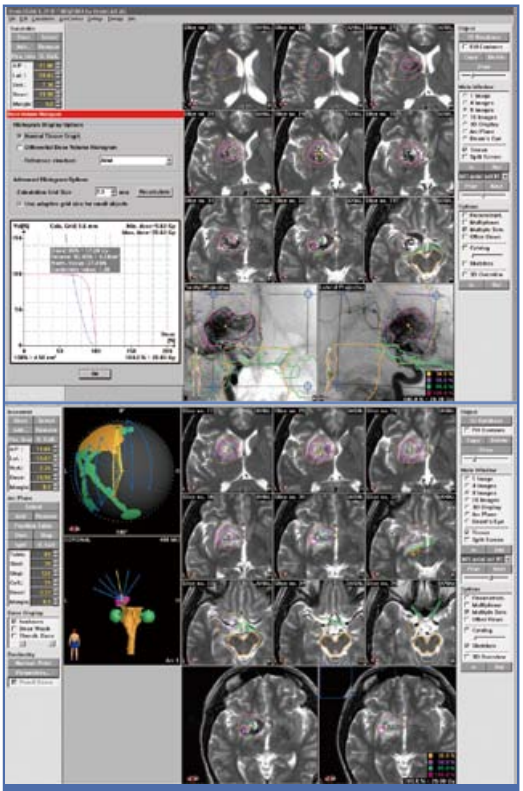


Fig 1C. A small 4.2ml Left basal ganglia AVM was treated by SRS, 17 Gy was delivered to AVM margin. Follow up MRI & angiogram showed obliteration of AVM.

For the treatment of bigger lesions, lesions close to OARs and/or in the brain stem, we can offer hypo-fractionated stereotactic radiosurgery (FSRS). The treatment dose will be reduced but the number of treatment sessions usually ranged from 3 to around 10 fractions, given on a daily basis. The dose prescription is formulated according to the knowledge and understanding of radiobiology of the brain as well as the target lesions. The objective is to achieve lesion control without causing radiation toxicity. Fig 2.

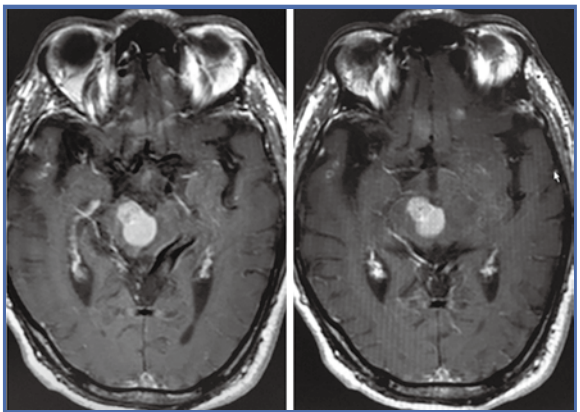


Fig 2A. A male patient suffering from Ca Lung developed a brain metastasis to the right side of midbrain & pons. Fractionated SRS, 5GyX 5 fractions was delivered to the tumour and its cystic component.

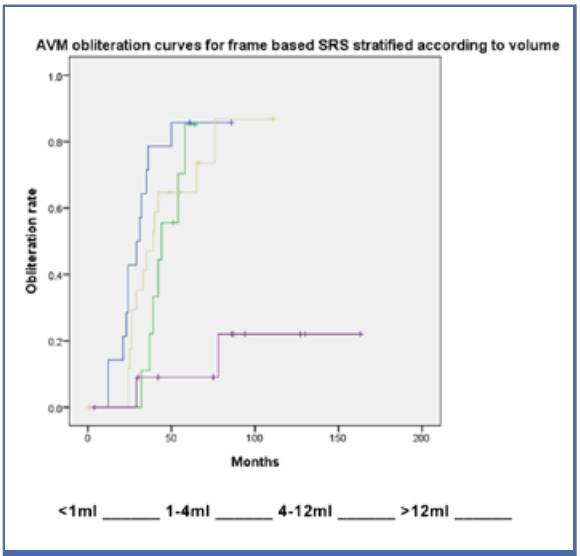
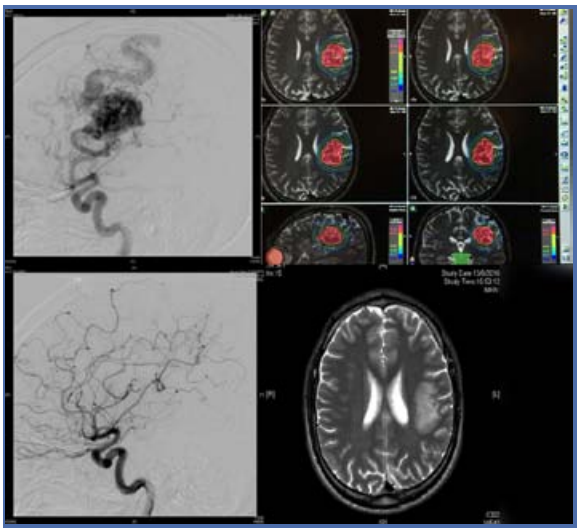


Fig 2B. The obliteration rate of AVMs treated by radiosurgery is related to the AVM volume. We analysed the outcomes of 53 patients treated in TMH, AVMs smaller than 12 ml in volume can reach 83 % obliteration whereas lesions >12ml only have 20 % obliteration rate. We suggested that AVMs > 12ml in volume should not be treated by SRS. FSRS should be considered.

A young man presented with seizure, MRI diagnosed a large 15.5ml AVM over left frontal region close to motor cortex. We offered FSRS, 4 Gy X11 fractions was given and FU angiogram done 4 years later showed complete obliteration.



There are clinical circumstances that dose escalation may not transcend into treatment advantages. The indications include treatment of a large para-sellar meningioma or big acoustic neuroma. The conventional hyper-fractionation, 1.8 to 2 Gy per fraction, given in stereotactic format (SRT) will accomplish the goal without causing significant spillage of radiation to surrounding structures. Fig 3.

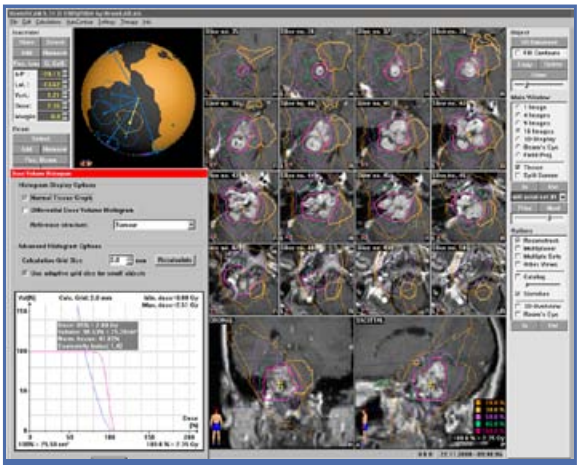


Fig 3. A lady diagnosed to have a large left acoustic neuroma, 25.2ml. She was treated by SRT, 2Gy X 25 fraction. Tumour shrinkage was observed and it remains quiescent for >15 years.

As we are utilising bony landmarks for stereotactic localisation, extra-cranial sites like the spine can be covered. Patients suffering from spinal metastases with or without cord compression can be treated by SRS or FSRT.[6] Fig 4. The development of more advanced techniques like the tracking of movements of the lung and liver during respiration and the incorporation of 4 D CT scan images open up a whole new treatment paradigm called Stereotactic Body Radiation Therapy (SBRT). Primary or metastatic tumours of the lung and liver can be managed by SBRT.

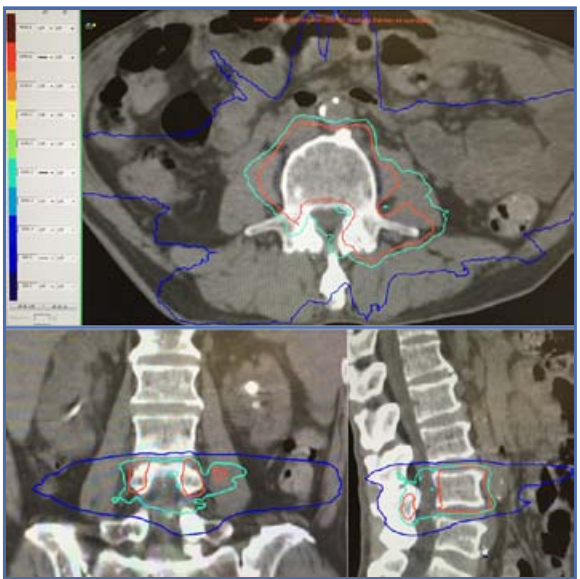


Fig 4. Patient suffering from Carcinoma of Breast developed spinal metastases involving the vertebral body, left pedicle, lamina and spinous process. SBRT 8GyX3 was prescribed. We can even prescribe a treatment plan for patients with complete cord encroachment with the sparing of the centrally located spinal cord.

Advances in computation speed and software development transform SRS service. Clinical conditions previously not amenable by SRS can now be tackled and the throughput of the treatment system enhanced. Software can control and open the leaves of the collimators away from the treatment isocentre. This implies that multiple lesions can be treated simultaneously and the treatment time is close to that of treating a solitary lesion. Patients with up to ten brain metastases can be treated in a single session. Fig 5. We can avoid performing Whole Brain Radiotherapy (WBRT) in these patients and eliminate the potential risk of cognitive decline secondary to WBRT. SRS can be repeated in case they develop new metastases.[7]

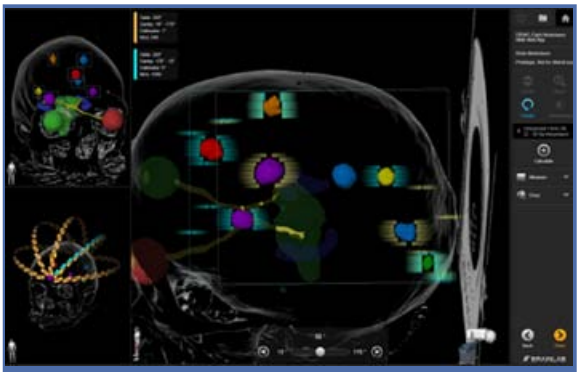


Fig 5. Elements TM Radiotherapy planning applications can treat up to ten brain metastases simultaneously with automated software. By courtesy of Brainlab AG.

Conclusion

Technological advances in radiosurgery open up a new therapeutic window for the treatment of patients with CNS pathologies. Almost all clinical oncology centres in the Hospital Authority and most private hospitals are equipped with linear accelerators capable of performing IGRT. IGRT systems are readily available for use. We must emphasise the fact that the treatment planning be individualised, tailor made according to the size, pathology, location in the CNS, machine availability and the experience of the multi-disciplinary team generating the plan. There must be a meticulous system for regular clinical and imaging follow up. Clinical audit with clear documentation of the efficacy, side effects and toxicity of SRS treatment is mandatory for the betterment and advancement of future patient care.

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HK/423/16-0017 October 2016

Paediatric Neurosurgery – Adopting Technology to Improve Clinical Outcomes

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The pillars of paediatric neurosurgery are resective and reconstructive processes, as in other surgical specialties. Into the 21st century, the challenges peculiar to our resective and reconstructive processes remain in several areas: (1) The acquisition of a comprehensive roadmap of the microsurgical pathoanatomy of a lesion such as its microscopic anatomical relationship, and brain-lesion interface; not only in a pre-operative snapshot, but an intra-operative real-time 3-dimensional modellng coupled with neuronavigation; (2) the capability to extirpate a lesion, un-entangling it from the enwrapping brain structures, with no damage to the embedded functional elements; (3) the control of blood loss, especially in small children; (4) the maintenance and incorporation into the living tissue of a reconstructive construct in the developing child.

Presented here are several examples of adopting technology to the operating rooms in the last 2 decades, in which they have become indispensible tools in paediatric neurosurgery. The introduction of intra-operative magnetic resonance imaging (IOMRI), refinements in intra-operative neurophysiological monitoring of the spinal cord (IONMSC), and intra-operative electrocorticography with high frequency oscillation (HFO) detection are targeted at the first two challenges. These methods enable us to visualise the structural and functional anatomy during an operation. For surgical reconstructions, advancements in synthetic technology have made available materials with characteristics that can facilitate our reconstructive processes in children.

Intra-operative Magnetic Resonance Imaging in Paediatric Neurosurgery

The invention of computerised tomography (CT) in 1972, MRI in 1977; and their continuous upgradations have enabled us to image a lesion with the details that few of our predecessors could dream of. However, in neurosurgery, even the highest quality CT and MRI fall short of ideal because they are not real-time with respect to the moment a lesion is being removed. The current standard of practice is, still, intraoperative guidance with pre-operatively acquired MRI, and post-operative MRI within 72 hours.

As an attempt to provide "near" real-time images, IOMRI was first used in 1994, at the Brigham and Women's Hospital in Boston. Within 20 years, over 100 IOMRI units have been installed worldwide [12]. Current IOMRI models can be broadly classified into low-field (<0.5 T) or high field systems (1.5 - 3T). Low field IOMRI systems allow operations to be carried out within the 5-gauss line, which facilitates frequent imaging during surgery, albeit with compromise on image quality. High field IOMRI systems necessitate moving the patient in and out of the 5-gauss line (Fig 1), in return for diagnostic quality images as well as advanced MRI sequences such as diffusion tensor imaging, perfusion-weighted imaging, and MRI angiography (Fig 2) [3].

Fig 1. A high field intra-operative movable MRI system. Upper panel: Photo showing that a diagnostic room and an operating room with the door separating them open. Left lower panel: The movable MRI is in the diagnostic room, which is used for routine MRI when intraoperative MRI is not in use. Right lower panel: Intraoperative MRI with a patient in the gantry. Courtesy of Prof. Dachling Pang, Oakland, CA.

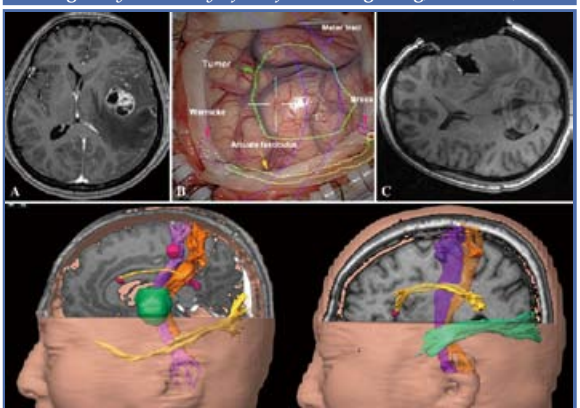

Fig 2. Intra-operative MRI with multi-modal navigation technique for resection of a left parieto-insular glioma. A: Pre-operative T1-weighted MRI with gadolinium injection showing the contrast-enhancing tumour. B: Intraoperative photo. C: Intra-dissection MRI showing complete excision of the tumour. D and E: Pre-operative (D) and post-operative (E) multi-modal MRI images. Green - tumour. Red - Broca and Wernicke areas. Yellow - Arcuate fasciculus. Courtesy of Prof. Dachling Pang. Oakland, CA.

In paediatric neurosurgery, the capability to acquire updated MRI images during an operation is especially valuable in tumour and epilepsy surgeries. IOMRI can demonstrate residual tumour before wound closure, thus enhance the extent of excision, which correlates with disease control in most paediatric brain tumours. The first paediatric brain tumour excised with the use of IOMRI was in 1997 [12]. Thereafter, the efficacy of IOMRI in excision of paediatric brain tumours has been confirmed by several case series. In 20 - 49% of the IOMRI cases, further tumour excision was carried out because of resectable residual tumour shown on intra-dissection MRI [1, 2, 6,10]. As a result, in more than 90% of the cases, a pre-operative goal of gross total excision could be achieved; the 30-day reoperation rate was < 1%. Besides, no additional MRI was required in the same hospital stay; no increase in infection rate or other complications was observed. A small prize of IOMRI was a longer operating room time of 45 – 60 minutes [2, 6].

Likewise, IOMRI has been shown to be beneficial in lesional epilepsy surgery. Again, intra-dissection MRI led to further excision before wound closure in over 20% of cases [10, 16]. In an IOMRI series of extra-temporal lesional epilepsy surgery, complete excision was achieved in all cases, which is substantial complared to an incomplete excision rate of 71 – 85% in conventional settings. In addition, even the complication rates in that series compared favourably with those found in conventional settings [16].

With the availability of advanced MRI sequences provided by high field IOMRI, a multi-modal navigation technique has been developed. This provides a feasible solution for one of the major obstacles in paediatric neurosurgery – intra-operative monitoring of language function. Conventionally, for excision of lesions in close proximity to the language areas, awake craniotomy is the standard, but its application in paediatric cases is challenging and often impossible. IOMRI with its near real-time nature can solve the intra-operative brain-shift issue, and makes accurate location of the white matter tracts relevant to language function possible (Fig 2). Currently, IOMRI with the multi-modal navigation technique can substitute awake craniotomy to a certain extent 16. Hopefully, with further development in MRI technology, this combined technique can completely replace awake craniotomy, and eliminate the constraints to surgery posed by the awake patient.

Intra-operative Neurophysiological Monitoring of the Spinal Cord – Refinements

Spinal cord surgery is a common procedure in paediatric neurosurgery for the prevalence of two disease entities - congenital anomalies involving the spinal cord including the conus medullaris and cauda equina, and intramedullary spinal cord tumours. Thus, IONMSC, which enables us to identify functional elements mingled with abnormal tissues, is indispensible to paediatric neurosurgery.

IONMSC of the sensory tracts, including somatosensory evoked potential (SSEP) by stimulation of the peripheral nerve trunks, was first developed in the 1970s. SSEP has remained an important monitoring modality nowadays. Intraoperative recording of the summation of both the motor and sensory tracts by direct simulation and recording from the spinal cord with invasive methods was first available since early 1970s as well. However, pure motor tract monitoring only became available in the mid 1980s, by stimulation of the brain or spinal cord with invasive approaches (stimulation of the exposed motor cortex or spinal cord), and recording at the spinal cord. The first reported non-invasive transcranial stimulation was by a group at the Great Ormond Street Hospital in1986, though the recording was still invasive (epidurally placed electrodes) [17]. It was not until the early 1990s that non-invasive recording with electromyography (EMG) became practically feasible, due to the introduction of venous anaesthesia. Parallel to the development in neurophysiological modalities, and the stimulation and recording techniques, was the replacement of the cumbersome IONM machines with the present-day portable and much powerful computers, which facilitated the rapid propagation of IONMSC.

In the last 2 decades, the only new IONMSC modality introduced is the "electric" bulbocavernous reflex (BCR), which was first reported in1997. However, there have been constant efforts in refining the monitoring techniques to obtain more stable, repeatable and quantitative values. Examples include the development of double-train stimulation in BCR [15], the application of transcranial muscle motor evoked potential (MEP) in the very young, even in newborns [13, author's unpublished data], and the complementary application of transcranial muscle MEP and epidural MEP (D-wave). Presently, multi-modality IONMSC commonly includes monitoring modalities (SSEP, transcranial EMG, D-wave, and BCR), and mapping modalities (spinal cord stimulation, triggered EMG, and sensory root mapping) (Fig 3).

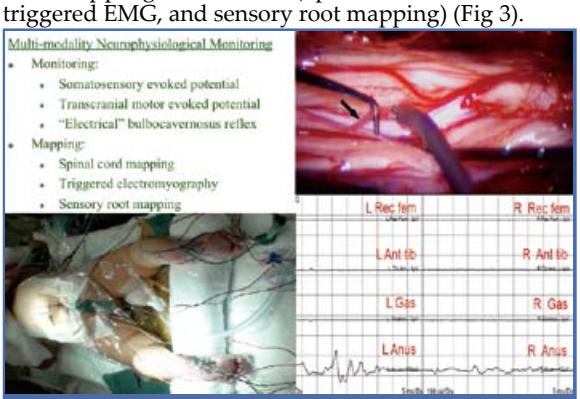

Fig 3. Multi-modality neurophysiological monitoring for surgery of spinal cord lesions.

The dependable and readily available IONMSC has been one of the major facilitators for aggressive surgical repair of congenital spinal cord malformations, and aggressive resection of intramedullary spinal cord tumours. Total and near-total excision of complex spinal dysraphic lesions, which is essential to eliminate the dreadful re-tethering problem, became realistic and hopefully will become a standard soon (Fig 4 and 5)[13]. Intramedullary spinal cord tumours can be removed with lower complication rates [14].

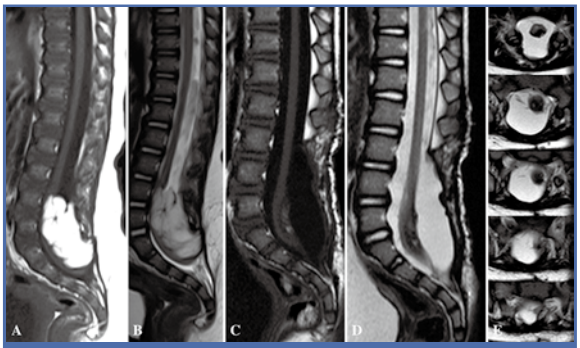

Fig 4. Total/ near-total excision of spinal cord lipoma. A and B: Pre-operative T1-weighted (A) and T2-weighted (B) sagittal MRI images showed a complex lumbosacral spinal cord lipoma. C, D and E: Post-operative T1-weighted sagittal (C), T2-weighted sagittal (D), and T2-weighted axial (E) MRI images showing a near-total excision of the lipoma with complete untethering of the spinal cord.

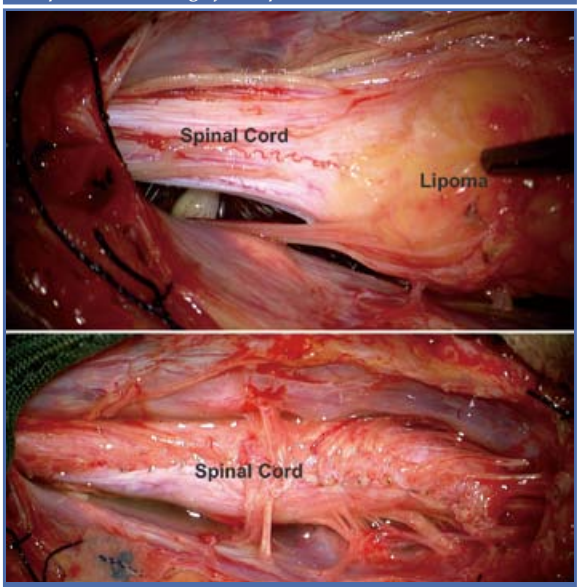

Fig 5. Total/ near-total excision of spinal cord lipoma. Intra-operative photos showing the spinal cord lipoma in Figure 4. Upper panel: Spinal cord fused with the lipoma before excision of the lipoma. Lower panel: The untethered spinal cord after near-total excision of the lipoma and neurulation.

Intra-operative Electrocorticography with Detection of High Frequency Oscillations

Medically refractory epilepsy can be debilitating to the development of a child sufferer. In managing medically refractory epilepsy, "visualising" the pathological tissue (the epileptogenic zone) is, by and large, much more challenging than in detecting brain tumours. In order to achieve good seizure control with epilepsy surgery, the epileptogenic zone needs to be precisely identified, and removed or disconnected. Therefore, investigations for medically refractory epilepsy usually consist of a battery of sophisticated non-invasive modalities such as imaging studies (MRI, positron emission tomography, ictal single photon emission computed tomography, magnetoencephalography) and video electroencephalography (EEG); and invasive monitoring techniques (subdural grid electrodes, and stereotactic depth electrodes). However, to the surgeon, confronted with the brain, the practical questions are: What is the anatomical extent of the epileptogenic zone? Has adequate resection been done? To address these questions, to "visualise" the epileptogenic zone, the technique of utilising intraoperative electrocorticography to detect high frequency oscillations has been developed.

Traditionally, EEG focuses on signal frequencies below 100 Hz. Studies have shown the HFO, i.e. EEG signals of >100 Hz can have physiological and pathological relevance in humans. Furthermore, ictal and even inter-ictal HFO with frequencies between 250 – 500 Hz, called fast ripples, can be biomarkers of the epileptogenic zone, as demonstrated in clinical studies in the mid 2000s [9, 18]. It has been demonstrated that incomplete resection of fast ripples was strongly linked to the occurrence of post-operative seizure (hazard ratio 11.6, p=0.0005) [7]. Therefore, intraoperative detection of inter-ictal fast ripples can be a viable technique to guide the extent of resection by "visualising" neuronal discharges related to epileptogenic zones, and maximise the rate of seizure-free in medically refractory epilepsy.

Bioabsorbable Materials for Skull Reconstruction

Skull reconstructions in children with craniosynostosis mostly are done within the first year of life. It is not difficult to imagine that metal wires, plates and screws are culprits for problems in these children, such as extrusion through the skin, interfering with craniofacial growth, and even intracranial translocation[5]. Bioabsorbable plates and screws were first used in the mid 1990s. They are composed of various formulations of the polymers polyglycolide, poly-L-lactide, poly-DL-lactide, and polydioxanone [5, 8]. However, the earliest chemical formulations and plate designs were bulky, and some also left an imprint in the underlying bone, creating aesthetic problems. Newer formulations have met some of our more stringent expectations for a desirable skull fixation device in the growing skull, such as mouldable but rigid enough to maintain the contour, completely bioabsorbable without inflammatory reactions but able to retain its strength for the necessary period (Fig 6). Bioabsorbable ultrasound-activated pin system was introduced in the mid 2000s, which apart from saving operating time, the bioabsorbable material may also penetrate deeper into the bone and take firmer hold (Fig 7) [4]. Their efficacy has been documented in clinical series [4, 5, 11].

Summary

Advancements in imaging technology, electrophysiological techniques, synthetic technology, and so on can enhance our ability in achieving good clinical outcomes in paediatric neurosurgery enormously. However, in the foreseeable future, technology cannot spare us from labouring, from the need of exercising our basic neurosurgical skills for extirpating diseased tissues, often painstakingly to avoid complications and achieve best outcomes.

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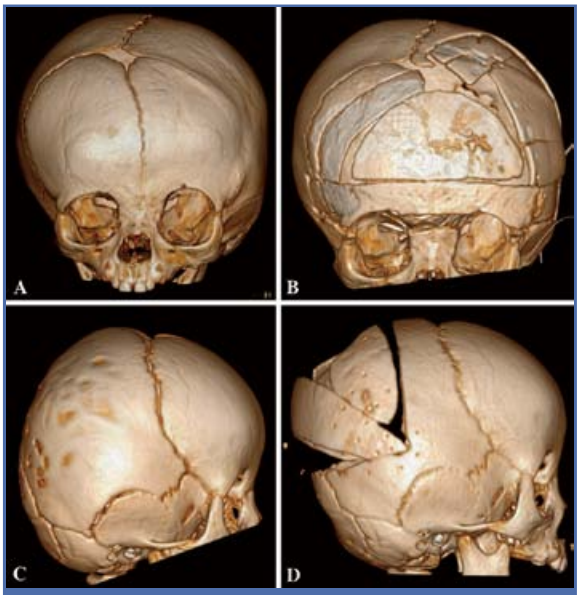

Fig 6. Skull reconstruction for craniosynostosis with bioabsorbable plates and pins. A and B: Pre-operative (A) and post-operative (B) 3D CT images of a child with left coronal suture synostosis. C and D: Pre-operative (C) and post-operative (D) 3D CT images of a child with partial sagittal and bi-lambdoid synostosis.

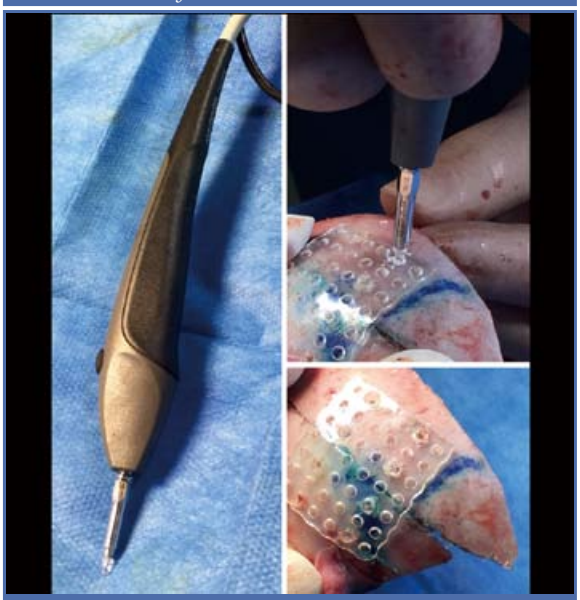

Fig 7. Ultrasound-aided pin system. Left panel: Bioabsorbable pin loaded on a ultrasonic "welding" probe. Right panels: Bioabsorbable plate and pins used to fix two skull bones together.

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Ironman Triathlon

Dr Derek WONG

MBBS(HK), MRCS(Edin.), FCS(HK), FHKAM(Surg.), FRCS(SN)(Edin.)

Specialist in Neurosurgery
Previous member of Hong Kong Triathlon National Squad

Dr Derek WONG

I am not talking the Ironman as Tony Stark. I am talking about an attitude, a spirit, and faith. I am talking about the sport that involves swimming, cycling, and running; three very different disciplines among endurance sports blended into one of the fastest growing sports in the past few decades.

How it all started

This sport has come around for a relatively short period of time. The first ever race took place on February 18, 1978, when U.S. naval officer John Collins and his wife had the race that put together the three toughest races in Hawaii. There were a brave league of 15 athletes took park in the grueling race, having to complete 2.4 miles of swim, 112 miles of bike, and 26.2 miles of run. Collins declared that "whoever finishes first, we shall call him the Ironman".

What is the idea about that distance? First of all you get to swim 3,800 meters; meaning to complete 76 lengths in a standard swimming pool. After that you get to cycle to Guangzhou, and then cycle back to complete the 180 kilometers bike leg. And then happily there is a Marathon run (42.1km) ahead for you. Have you not fallen in love with the idea yet?

You may not have, but many got inspired into the sport since then. One memorable moment of the sport came in February 1982, as Julie Moss suffered from extreme dehydration and collapsed before the finish line. Not given up, she crawled towards the finish line. The Ironman mantra that “finishing is a victory” has been created. Perhaps that is also the reason why it still stays in the rule book that “no form of locomotion other than running, walking or crawling” allowed.

Ironman today

The race format has not changed throughout these years. Every year in October, the Ironman World Championships takes place at Kona Hawaii where the sport was first invented. In order to be qualified for this prestigious event, professional and amateur athletes need to earn their slots by placing top in their categories in races now held all over the world in every continent.

In order to accommodate more athletes into the sport, there are more friendly distances of the race organized nowadays. Ironman 70.3, or so-called half-Ironman, has halved the race distance of the original Ironman race to cover a total of 70.3 miles. Perhaps that is still challenging, but much more manageable.

The sport has grown such popularity that people want to have it in the Olympic Games; but the original format is simply too time consuming to be packed into the schedule. Therefore the International Triathlon Union (ITU) eventually introduced the Olympic distance. Taken from the longest distance in each discipline among existing Olympic program, the official distance for triathlon was set at a 1,500m swim, a 40km cycle and a 10km run. Now the race could be finished within two hours; much more spectator friendly. Finally triathlon made its debut in Sydney Olympic Games in 2000. Perhaps this format of the sport is the most well-known one.

In 2013, ITU estimated that there were 2.1 million active triathletes in total. Imagine how the sport has grown from a group of 15 in 35 years!

Are you ready?

Once you have got into a triathlon race, you would understand why it is addictive. Every athlete is welcomed to the sport, to take on the challenge. You get

to race on the same course with the professionals under the same rules. Amateurs, or we called age-groupers, compose the most active and essential part of the sports. Everyone competes against constraints in life, fights to overcome limits. Finishing at different times, but whoever dares to take on the challenge and finish is victorious. That is how fascinating the sport is, because everyone is a winner!

Triathletes are family. They talk in same language. They cheer for each other to be the better self. Perhaps that is another reason why people just love the sport. There are many out there, individual or team sports; but rare to see one that could build the bondings like triathletes.

I have been a triathlete for 20 years. It was intensely fun to be on the National Squad racing for Hong Kong. It is still enormous fun now to be racing in different format and distance; for the challenge, for the friendship, and for the health. Yet most important of all, it is the attitude of life being a triathlete. There are always challenges and obstacles. There are people who do it better than you. I am reminded though, not to give up. Eventually it is victorious crossing the finish line, and all the hard work in the past is celebrated. It is more than just a sport to me. It is an attitude of life, a spirit to keep, and a faith to hold on.

It may not be easy to take on the Ironman distance at the first place, but the sport welcomes you to start the journey with shorter races as it is very flexible. You can even participate in duathlon (bike & run) if you ain't ready for the swim yet. Are you ready?

Annual Dinner 2016 - Rainbow Extravaganza

With the theme Rainbow Extravaganza, the programme and venue were designed to match a 7-colours theme with wonderful melodies. We were delighted to have exquisite performances delivered by Ms Skye CHAN (陳倩揚) and Ms Amy Ng (吳幸美). The Dinner was another successful example of the Federations spirit. It was attended by over 250 guests from our member societies and partners from the medical & health care communities. The Costume Prize and the Dance Fever Competition were absolutely entertaining and great fun.

We were privileged to have many distinguished guests joining us, including the Chief Executive and Patron of the Federation, The Honourable Mr Chun-ying LEUNG; Secretary of Food and Health, Dr Wing-man KO, Under Secretary for Food and Health, Prof Sophia CHAN; Chairman of the Hospital Authority, Prof John LEONG; President of the Academy of Medicine, Prof Chak-sing LAU; Vice-President (General Affairs) of the Academy of Medicine, Dr LAU Chor-chiu; The Hon Prof Kwok-lun LEE and Prof Diana LEE; The Hon Dr LEONG Che-hung and Dr Lillian LEONG; Prof Gabriel LEUNG; Dr CHEUNG Tse Ming and Dr Cissy YU. The presence of these honourable guests brightened up the evening and we would like to express our heartfelt thanks to all of them.

We were pleased to have several superb and talented performers from the medical communities to give a variety of performances during the dinner, including opening dance performances by Dr Wei-lee HUI & Mr Bun Lau, Mr Wing-chi LAU & Dr Dora WONG; singing performances by Dr Henry YEUNG, Dr Nancy YUEN, Ms Remedy CHIU, Mr Samuel CHAN and the OTA Band; modern & hip-hop dance performance by EC Swag. The dinner was indeed a star-studded event. The highlight was undoubtedly the rendition of the Cantopop classic, 'Friends', by Dr Wing-man KO, Prof Sophia CHAN, Prof Gabriel LEUNG and our executive committee members. The atmosphere of the evening was brought to a climax with the countdown party and pop-songs performed by Dr Mario CHAK, President of FMSHK; Dr Ludwig TSOI, EXCO member of FMSHK & Dr Desmond NGUYEN.

This year, we had many fabulous prizes which were worth up to $100,000, including the Luxury Prize for a 6-Day-5-Night Vietnam Cruise; Premier Prize for a 7 Days Royal Class Romantic Greek Isles Cruise Vacation; a 3-Day-2-Night HK Weekend Getaway Cruise, Nestle Coffee machines, OTO Neck Massagers, Air Defenders and Egg Machines.

All in all, it was a beautiful night during which we shared our joy and excitement together. We would like to express our sincere gratitude to all our sponsors, and thank all our guests for joining us on this memorable occasion.


The Federation Annual Din
Rainbow Extravaganza


The Federation Annual Dinner 2016
2016


The Federation Annual Dinner 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
5	6	★HKMA Yau Tsim Mong Community Network - How New Basal Insulin Help DM Management in Private Practice? ★HKMA Kowloon West Community Network - Certificate Course on DM (Session 1) New Advance in DM Management ★FMSHK Officers' Meeting ★HKMA Council Meeting 7	★Hong Kong Neurosurgical Society Monthly Academic Meeting –Controversies in management of acute cervical spinal cord injuries ★HKMA Central, Western & Southern Community Network - Attention Deficit Hyperactivity Disorder (ADHD) 8	★HKMA Hong Kong East Community Network - Training Course on Dementia for Primary Care Doctors (Session 1) - Early Clinical Diagnosis of Dementia – Core Clinical Features and Diagnostic Criteria ★HKMA New Territories West Community Network - Option of Oral Hypoglycaemic Agent For A Better CV Outcome 9	10	★Refresher Course for Health Care Providers 2016/2017- Geriatrics for primary care 11
12	13	14	15	16	★HKMA Kowloon City Community Network - Option of Oral Anti-diabetic Agent for a Better CV Outcome 17	18
19	20	★HKMA Kowloon West Community Network – Post Stroke Care 21	★HKMA Shatin Doctors Network - Three Non-drug Pillars in Dementia Management ★HKMA Central, Western & Southern Community Network - Certificate Course on DM (Session 1) - Diabetic Nephropathy and Other Common Renal Diseases 22	★HKMA Hong Kong East Community Network - Training Course on Dementia for Primary Care Doctors (Session 2) - Drug Treatment – Strategic Pharmacological Intervention for Dementia ★FMSHK Executive Committee Meeting ★FMSHK Foundation Meeting 23	★HKMA Yau Tsim Mong Community Network - New Paradigm for Double Anti Platelet Therapy (DAPT) – For Whom and For How Long? 24	25
26	27	28				

Date / Time	Function	Enquiry / Remarks
7 TUE 1:00 PM	**HKMA Yau Tsim Mong Community Network - How New Basal Insulin Help DM Management in Private Practice?** Organiser: HKMA Yau Tsim Mong Community Network; Chairman: Dr. CHAN Wai Keung, Ricky; Speaker: Dr. LEE Ka Kui; Venue: Pearl Ballroom, Level 2, Eaton, Hong Kong, 380 Nathan Road, Kowloon	Ms. Candice TONG Tel: 2527 8285 1 CME Point
1:00 PM	**HKMA Kowloon West Community Network - Certificate Course on DM (Session 1) New Advance in DM Management** Organiser: HKMA Kowloon West Community Network; Chairman: Dr. MOK Kwan Yeung, Matthew; Speaker: Dr. TING Zhao Wei, Rose; Venue: Crystal Room IV-V, 3/F., Panda Hotel, 3 Tsuen Wah Street, Tsuen Wan, N.T	Mr. Ziv WONG Tel: 2527 8285 1 CME Point
8:00 PM	**FMSHK Officers' Meeting** Organiser: The Federation of Medical Societies of Hong Kong; Venue: Gallop, 2/F, Hong Kong Jockey Club Club House, Shan Kwong Road, Happy Valley, Hong Kong	Ms. Nancy CHAN Tel: 2527 8898
9:00 PM	**HKMA Council Meeting** Organiser: The Hong Kong Medical Association; Chairman: Dr. CHOI Kin; Venue: HKMA Wanchai Premises, 5/F, Duke of Windsor Social Service Building, 15 Hennessy Road, Hong Kong	Ms. Christine WONG Tel: 2527 8285
8 WED 7:30 AM	**Hong Kong Neurosurgical Society Monthly Academic Meeting –Controversies in management of acute cervical spinal cord injuries** Organizer: Hong Kong Neurosurgical Society; Chairman: Dr MAK Hoi Kwan; Speaker: Dr CHOW Shuk Wan, Joyce; Venue: Lecture Theatre, G/F, Block M, Queen Elizabeth Hospital	Dr. LEE Wing Yan, Michael Tel: 2595 6456 Fax. No.: 2965 4061 1.5 points College of Surgeons of Hong Kong
1:00 PM	**HKMA Central, Western & Southern Community Network - Attention Deficit Hyperactivity Disorder (ADHD)** Organiser: HKMA Central, Western & Southern Community Network; Chairman: Dr. CHAN Hau Ngai, Kingsley; Speaker: Dr. LIN Hoi Yun, Candy; Venue: HKMA Dr. Li Shu Pui Professional Education Centre, 2/F, Chinese Club Building, 21-22 Connaught Road Central, Hong Kong	Mr. Ziv WONG Tel: 2527 8285 1 CME Point
9 THU 1:00 PM	**HKMA Hong Kong East Community Network - Training Course on Dementia for Primary Care Doctors (Session 1) - Early Clinical Diagnosis of Dementia – Core Clinical Features and Diagnostic Criteria** Organiser: HKMA Hong Kong East Community Network & Hong Kong Alzheimer's Disease Association; Chairman: Dr. CHAN Hoi Chung, Samuel; Speaker: Dr. DAI Lok Kwan, David, JP; Venue: HKMA Wanchai Premises, 5/F, Duke of Windsor Social Service Building, 15 Hennessy Road, Hong Kong	Ms. Candice TONG Tel: 2527 8285 1.5 CME Points
1:00 PM	**HKMA New Territories West Community Network - Option of Oral Hypoglycaemic Agent For A Better CV Outcome** Organiser: HKMA New Territories West Community Network; Chairman: Dr. TSUI Fung; Speaker: Dr. CHAN Chun Chung; Venue: Plentiful Delight Banquet, 1/F, Ho Shun Tai Building, 10 Sai Ching Street, Yuen Long	Mr. Ziv WONG Tel: 2527 8285 1 CME Point
11 SAT 2:15 PM	**Refresher Course for Health Care Providers 2016/2017- Geriatrics for primary care** Organiser: Hong Kong Medical Association, HK College of Family Physicians, HA-Our Lady of Maryknoll Hospital; Speaker: Dr. LO Kwok Man; Venue: Training Room II, 1/F, OPD Block, Our Lady of Maryknoll Hospital, 118 Shatin Pass Road, Wong Tai Sin, Kowloon	Ms. Clara TSANG Tel: 2354 2440 2 CME Points
17 FRI 1:00 PM	**HKMA Kowloon City Community Network - Option of Oral Anti-diabetic Agent for a Better CV Outcome** Organiser: HKMA Kowloon City Community Network; Chairman: Dr. CHIN Chu Wah; Speaker: Dr. TING Zhao Wei, Rose; Venue: President's Room, Spotlight Recreation Club, 4/F, Screen World, Site 8, Whampoa Garden, Hunghom, Kowloon	Ms. Candice TONG Tel: 2527 8285 1 CME Point
21 TUE 1:00 PM	**HKMA Kowloon West Community Network – Post Stroke Care** Organiser: HKMA Kowloon West Community Network; Chairman: Dr. WONG Wai Hong; Speaker: Dr. FUNG Bun Hey; Venue: Crystal Room IV-V, 3/F., Panda Hotel, 3 Tsuen Wah Street, Tsuen Wan, N.T	Mr. Ziv WONG Tel: 2527 8285 1 CME Point
22 WED 1:00 PM	**HKMA Shatin Doctors Network - Three Non-drug Pillars in Dementia Management** Organiser: HKMA Shatin Doctors Network; Chairman: Dr. MAK Wing Kin; Speaker: Dr. CHAN Chun Chung, Ray; Venue: Jasmine Room, Level 2, Royal Park Hotel, 8 Pak Hok Ting Street, Shatin, Hong Kong	Ms. Candice TONG Tel: 2527 8285 1 CME Point
1:00 PM	**HKMA Central, Western & Southern Community Network - Certificate Course on DM (Session 1) - Diabetic Nephropathy and Other Common Renal Diseases** Organiser: HKMA Central, Western & Southern Community Network; Chairman: Dr. TSANG Kin Lun; Speaker: Dr. TONG Chun Yip, Peter; Venue: HKMA Dr. Li Shu Pui Professional Education Centre, 2/F, Chinese Club Building, 21-22 Connaught Road Central, Hong Kong	Mr. Ziv WONG Tel: 2527 8285 1 CME Point
23 THU 1:00 PM	**HKMA Hong Kong East Community Network - Training Course on Dementia for Primary Care Doctors (Session 2) - Drug Treatment – Strategic Pharmacological Intervention for Dementia** Organiser: HKMA Hong Kong East Community Network & Hong Kong Alzheimer's Disease Association; Chairman: Dr. LAM See Yui, Joseph; Speaker: Dr. LEUNG Lam Ming, Jess; Venue: HKMA Wanchai Premises, 5/F, Duke of Windsor Social Service Building, 15 Hennessy Road, Hong Kong	Ms. Candice TONG Tel: 2527 8285 1.5 CME Points
7:00 PM	**FMSHK Executive Committee Meeting** Organiser: The Federation of Medical Societies of Hong Kong; Venue: Council Chamber, 4/F, Duke of Windor Social Service Building, 15 Hennessy Road, Wanchai, Hong Kong	Ms. Nancy CHAN Tel: 2527 8898
8:00 PM	**FMSHK Foundation Meeting** Organiser: The Federation of Medical Societies of Hong Kong; Venue: Council Chamber, 4/F, Duke of Windor Social Service Building, 15 Hennessy Road, Wanchai, Hong Kong	Ms. Nancy CHAN Tel: 2527 8898
24 FRI 1:00 PM	**HKMA Yau Tsim Mong Community Network - New Paradigm for Double Anti Platelet Therapy (DAPT) – For Whom and For How Long?** Organiser: HKMA Yau Tsim Mong Community Network; Chairman: Dr. HO Fung; Speaker: Dr. LI Siu Lung, Steven; Venue: Pearl Ballroom, Level 2, Eaton, Hong Kong, 380 Nathan Road, Kowloon	Ms. Candice TONG Tel: 2527 8285 1 CME Point

Upcoming Meeting

11-12 Mar 9:00am-5:00pm	**12th International Symposium on Healthy Aging "Wellness and Longevity: From Science to Service"** Organiser: Research Centre of Heart, Brain, Hormone & Healthy Aging, Li Ka Shing Faculty of Medicine, HKU Chairman: Dr Joseph SK Kwan & Dr Cora SW Lai, HKU Venue: 3/F, Ballroom, Sheraton Hong Kong Hotel & Towers	Phoebe Chow T: 3917 9866 F: 2816 5258

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SHARING EXPERTISE

Answers to Radiology Quiz

Answer:

1. Frontal chest radiograph shows rightward deviation of the lower third of the azygoesophageal recess and retrocardiac air-fluid levels, suggestive of oesophageal dilatation. There is no evidence of pulmonary complications such as aspiration pneumonia.

   Barium swallow confirms that the oesophagus is dilated, with a short segment smooth tapering at the gastroesophageal junction, giving rise to a 'bird beak' sign or 'rat tail' sign. There is stasis of barium and fluid-fluid level consistent with retained secretion at the distal oesophagus.

2. Both imaging findings are in keeping with achalasia.

3. Further endoscopic evaluation of the distal oesophagus and gastric cardia with biopsy is necessary to establish the diagnosis.

Discussion:

Achalasia is a primary oesophageal motility disorder characterised by aperistalsis in the distal oesophagus and incomplete relaxation of the lower oesophageal sphincter, resulting in oesophageal dilatation and stasis. The aetiology is unknown but pathological specimens show degeneration of the Auerbach myenteric plexus.

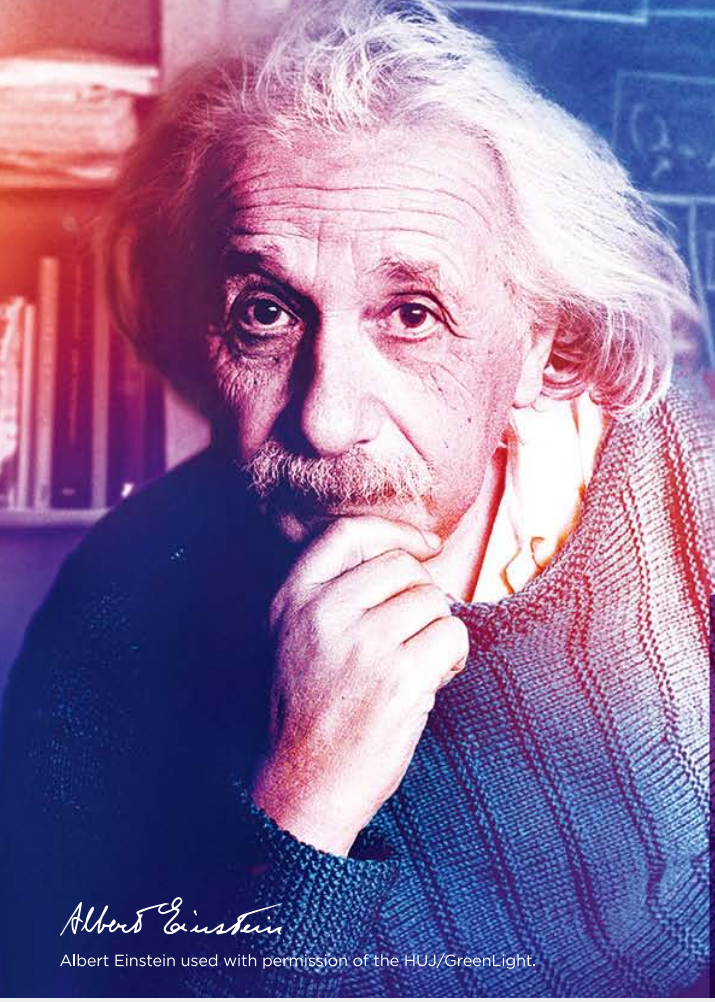
The main differential diagnoses include pseudoachalasia (also known as secondary achalasia) due to malignant infiltration at the gastroesophageal junction, or less commonly Chagas' disease. Pseudoachalasia can be indistinguishable from idiopathic achalasia, but fluoroscopic findings that suggest an underlying malignant tumour would include nodularity and eccentricity of narrowed segment or shouldering. One study has shown that a narrowed distal oesophageal segment longer than 3.5cm and little or no proximal oesophageal dilatation are highly suggestive of pseudoachalasia.

Our case highlights the typical radiological features of achalasia. Recognition of displacement of the azygoesophageal line in chest radiographs may be the first clue to this disease.

Reference:

1. Woodfield CA, Levine MS, Rubesin SE et al. Diagnosis of primary versus secondary achalasia: reassessment of clinical and radiographic criteria. AJR Am J Roentgenol. 2000 Sep;175(3):727-31.
2. Gibbs JM, Chandrasekhar CA, Ferguson EC et al. Lines and stripes: where did they go? - From conventional radiography to CT. Radiographics. 2007 Jan-Feb;27(1):33-48.

Dr Victor LEE



BE THE ONE

WHO CAN CHANGE WHAT'S POSSIBLE

For your HCV F0 to F4 compensated cirrhosis GT1 patients[a]:

Albert Einstein used with permission of the HUJ/GreenLight.

CURE

- Overall **97%** cure in HCV GT1 patients[6,b,c]
  - Overall cure rates of 94–99% across phase 3 studies[1,3–6]

LOW DISCONTINUE RATE

- **99%** completed regimens of up to 12 weeks[7]
  - ≤1% of patients discontinued treatment with HARVONI due to adverse events[1]
- **ONE** pill, once a day[1,d]
  - Single-Tablet Regimen for the majority of HCV GT1 patients[1,d]

☑ IFN free ☑ RBV free[d] ☑ PI free

[a] As assessed by the Metavir fibrosis stage scoring system.

[b] HARVONI is indicated for the treatment of chronic hepatitis C (CHC) genotype 1 infection in adults. 99% cure rates were observed in the ION-1 study in previously untreated HCV GT1 patients treated with HARVONI for 12 weeks. Across the ION studies, SVR rates between 94–99% were observed in HCV GT1 patients treated with HARVONI for 8–24 weeks. 99% of patients completed regimens of up to 12 weeks.[1]

[c] Sustained virologic response (SVR) was the primary endpoint and was defined as HCV RNA <25 IU/mL at 12 weeks after the cessation of treatment. Achieving SVR is considered a virologic cure.[2]

[d] HARVONI offers a single-tablet, ribavirin-free regimen for the majority of HCV GT1 patients, excluding those with decompensated cirrhosis, or who are pre- or post-liver transplant, etc.[1]

HARVONI®
ledipasvir/sofosbuvir

Harvoni® Abbreviated Prescribing Information

Presentation: Orange colored, diamond-shaped, film-coated tablet containing 90 mg ledipasvir and 400 mg sofosbuvir.
Indications: Treatment of chronic hepatitis C genotype 1 infection in adults.
Dosage: Adults: One tablet taken orally once daily with or without food. Pediatric Use: Safety and effectiveness have not been established. Geriatric Use: No dosage adjustment is warranted in geriatric patients. Renal impairment: No dosage adjustment is required for patients with mild or moderate renal impairment. Safety and efficacy have not been established in patients with severe renal impairment or end stage renal disease requiring hemodialysis. No dosage recommendation can be given for these patients. Hepatic impairment: No dosage adjustment is required for patients with mild, moderate, or severe hepatic impairment. Safety and efficacy have not been established in patients with decompensated cirrhosis. Pregnancy: Harvoni should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus. Nursing Mothers: The developmental and health benefits of breastfeeding should be considered along with the mother's clinical need and any potential adverse effects on the breastfed child from the drug or from the underlying maternal condition.
Warnings and Precautions: Serious symptomatic bradycardia when coadministered with amiodarone: coadministration of amiodarone is not recommended. Counseling patients about the risk of serious symptomatic bradycardia and cardiac monitoring are recommended for patients taking amiodarone, patients starting amiodarone therapy and patients discontinuing amiodarone just prior to starting Harvoni; Risk of reduced therapeutic effect due to P-gp inducers: use with P-gp inducers (e.g., rifampin or St. John's wort) is not recommended; Related products not recommended: use with other products containing sofosbuvir is not recommended.
Adverse reactions: The most common adverse reactions were fatigue and headache in subjects treated with Harvoni during clinical trials. Serious symptomatic bradycardia has been reported in patients taking amiodarone from postmarketing experience.
Drug interaction: Any interactions that have been identified with ledipasvir and sofobuvir individually may occur with Harvoni. P-gp inducers (e.g., rifampin or St. John's wort); Acid reducing agents including antacids (e.g., aluminum and magnesium hydroxide), H_2-receptor antagonists (e.g., famotidine) and proton-pump inhibitors (e.g., omeprazole); Antiarrhythmics (amiodarone, digoxin); Anticonvulsants (carbamazepine, phenytoin, phenobarbital, oxcarbazepine); Antimycobacterials (rifabutin, rifampin, rifapentine); HIV antiretrovirals [combination of efavirenz, emtricitabine and tenofovir disoproxil fumarate (TDF), regimens containing TDF and a HIV protease inhibitor/ritonavir (e.g., atazanavir/ritonavir, darunavir/ritonavir, lopinavir/ritonavir), combination of elvitegravir, cobicistat, emtricitabine and TDF, and tipranavir/ritonavir]; HCV products (simeprevir); Herbal supplements (St. John's wort); HMG-CoA reductase inhibitors (rosuvastatin).
Before prescribing, please consult full prescribing information which is available upon request.
Harvoni is a registered trademark of Gilead Sciences, Inc., or its related companies.
HK PI version: HK-MAY15-US-MAR15

References

1. HARVONI HK PI version: HK-MAY15-US-MAR15.
2. EASL Clinical Practice Guidelines. April 2014. Available at: http://www.easl.eu/_newsroom/latest-news/easl-recommendations-on-treatment-of-hepatitis-c-2014.
3. Afdhal N et al. N Engl J Med 2014;370:1889–1898. **4.** Afdhal N et al. N Engl J Med 2014;370:1483–1493. **5.** Kowdley KV et al. N Engl J Med 2014;370:1879–1888. **6.** Saleh A. Alqahtani et al. Hepatology 2015.
7. Data based on studies ION 1, 2 & 3 (Ref. 3, 4 & 5), available upon request.

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10/06/2015