6th International MSS Scientific Congress

THEME
“Advances in Spine Surgery”

3rd - 5th AUGUST 2018

HILTON KUALA LUMPUR MALAYSIA

SOUVENIR PROGRAMME & ABSTRACT BOOK
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Organising Committee 2
Malaysia Spine Society – Office Bearers 2017-2019

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CHAIRMAN
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Dato’ Dr Mohd Hisam Muhamad Ariffin
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Dr Azrul Azmi

MALAYSIA SPINE SOCIETY
OFFICE BEARERS 2017–2019

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Professor Dr Sabarul Afian Mokhtar

HON SECRETARY
Professor Dr Kwan Mun Keong

HON TREASURER
Associate Professor Dr Zamzuri Zakaria

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Dr Abdul Malik Mohamed Hussein

SENIOR ADVISOR
Professor Dato’ Dr Mohamad Abdul Razak
Dato’ Dr K S Sivananthan
Assalamualaikum wbt. and Greetings

Welcome to all participants of the 6th International Malaysia Spine Society (MSS) Scientific Congress.

With the theme “Advances in Spine Surgery”, this annual conference, organised by the Malaysia Spine Society, has gathered reputable and highly skilled surgeons and medical professionals from prestigious institutions to share invaluable knowledge on surgical techniques, issues or trends, and challenges that are faced and handled in spinal care, which will hopefully improve the medical fraternity's ability and capacity to care and treat patients.

I would like to thank the Organising Committee for their effort in organising this prestigious conference. In addition, I would also like to express my gratitude towards the invited speakers, for generously sharing their insights and exciting findings with us.

I hope this conference will be a beneficial event to the participants and speakers, both socially and scientifically. Lastly, to the international speakers and delegates, I hope you will enjoy the warmth and friendliness of our Malaysian hospitality, as well as our diverse cultural delights.

Thank you.

YBhg Dato’ Dr Hj Azman Bin Hj Abu Bakar
Deputy Director-General of Health (Medical)
Ministry of Health, Malaysia
On behalf of the Malaysia Spine Society, it gives me immense pleasure to welcome you to Kuala Lumpur for the 6th International Malaysia Spine Society Scientific Congress.

Guided by the theme of “Advances in Spine Surgery”, the Congress will present to you, an inspiring academic meeting with an exciting programme that highlights the latest spine care and management education, research and innovation. The scientific programme concentrates on pre-congress and post-congress workshops, plenary, symposia, operative video sessions, expert forums and expert case discussions, to be given by our distinguished national and international speakers.

We look forward to having you at our meeting which serves as a platform for you to interact with experts from all over the world. It is also a great opportunity to share experiences and improve knowledge on the latest international research and development in the field of spine surgery.

The Malaysia Spine Society strives to achieve continuous development and progress in spine surgery through education, research, training and ethical, professional practice among the spine surgeons in Malaysia, and our annual congress is an integral component in accomplishing this mission.

Along with the educational programme, I invite you to take time to explore the wonderful local cuisine and immerse in the multi-culturalism of the beautiful city of Kuala Lumpur.

Professor Dr Sabarul Afian Mokhtar
President, Malaysia Spine Society
It is my great pleasure to announce the 6th International MSS Scientific Congress, Kuala Lumpur, from 3rd to 5th August 2018. On behalf of the Organising Committee, I would like to welcome all of you to this year’s Congress in Kuala Lumpur, the capital city of Malaysia.

Following the success of the 5th International MSS Scientific Congress last year in Melaka, the Organising Committee has worked very hard to ensure that the Congress continues to be one of your unforgettable international events. I would like to encourage all participants to participate actively in the Congress and hope that your active interactions with the speakers will help in improving knowledge and skills in managing our patients.

I would also like to thank the Scientific Committee, led by Associate Professor Dr Chris Chan Yin Wei, for their hardwork in bringing in esteemed local and international faculties to be part of this Congress.

I would also like to thank the industries for their continuous support for this meeting, and sharing their latest tools and technologies which enable us to provide better care for our patients.

I wish that all of you will enjoy, not only the advanced knowledge and experience by the eminent faculties, but also your stay in Kuala Lumpur.

Dato’ Dr Fazir Mohamad
Organising Chairman
It gives me great pleasure to briefly introduce our scientific programme for this year’s Malaysia Spine Society’s annual meeting. The theme of the meeting is ‘Advances in Spine Surgery’ and was chosen due to the rapidly evolving techniques, technology and knowledge in this dynamic subspecialty.

For this meeting, we have invited distinguished surgeons who are prominent not only in our region, but also worldwide. By sharing their experiences through lectures, case discussions, and video surgical technique presentations, we will be able to benefit greatly from this meeting.

For the first time in our annual meeting, we have also collaborated with our neurosurgical colleagues to discuss common spinal conditions, as we believe through intellectual discourse, both parties and our patients will reap the benefit of such a session. Lastly, I wish the course will run smoothly, and that our participants would enjoy the camaraderie and friendship among all surgeons.

Happy learning!

Associate Professor Dr Chris Chan Yin Wei
Scientific Chairman
## PROGRAMME SUMMARY

**Theme:** Advances in Spine Surgery

### 3rd August 2018 (Friday)

<table>
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| 0700 – 0800 | MEET-THE-EXPERTS  
Case Discussion               |
| 0800 – 0830 | SYMPOSIUM 1  
Recent Advances in Spine Surgery |
| 0830 – 0900 | PLENARY  
Lunch Satellite Symposium  
(*Sutra Medi-Environ*) |
| 0900 – 0930 | FREE PAPERS PRESENTATION 1  
Coffee / Tea |
| 0930 – 1000 | OPENING CEREMONY  
Friday Prayers  
Lunch Satellite Symposium  
(*Baxter*) |
| 1000 – 1030 | Coffee / Tea |
| 1030 – 1100 | BEST RESEARCH AWARD  
Adolescent Idiopathic Scoliosis  
(Oral Presentation) |
| 1100 – 1200 | EXPERT FORUM 1  
Adult Spinal Deformity |
| 1200 – 1300 | EXPERT FORUM 2  
Cervical Spine |
| 1300 – 1330 | EXERT FORUM 3  
Tips and Tricks of My Favourite Surgery |
| 1330 – 1400 | SYMPOSIUM 3  
Lumbar Degenerative Disease |
| 1400 – 1430 | EXPERT FORUM 4  
The Most Memorable Case in My Spine Practice |
| 1430 – 1500 | SYMPOSIUM 4  
Conservative Treatment in Spine Surgery |
| 1500 – 1530 | SURGICAL TECHNIQUE VIDEO PRESENTATION  
ORTHOPAEDIC-NEUROSURGERY COMBINED SYMPOSIUM  
Case Discussion |
| 1530 – 1600 | MEDICO-LEGAL FORUM  
Open Discussion |

### 4th August 2018 (Saturday)

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| 0700 – 0800 | MEET-THE-EXPERTS  
Case Discussion               |
| 0800 – 0830 | SYMPOSIUM 2  
Complications of Spine Surgery |
| 0830 – 0900 | PLENARY  
Lunch Satellite Symposium  
(*Sutra Medi-Environ*) |
| 0900 – 0930 | FREE PAPERS PRESENTATION 1  
Coffee / Tea |
| 0930 – 1000 | OPENING CEREMONY  
Friday Prayers  
Lunch Satellite Symposium  
(*Baxter*) |
| 1000 – 1030 | Coffee / Tea |
| 1030 – 1100 | BEST RESEARCH AWARD  
Adolescent Idiopathic Scoliosis  
(Oral Presentation) |
| 1100 – 1200 | EXPERT FORUM 1  
Adult Spinal Deformity |
| 1200 – 1300 | EXPERT FORUM 2  
Cervical Spine |
| 1300 – 1330 | SYMPOSIUM 3  
Lumbar Degenerative Disease |
| 1330 – 1400 | EXPERT FORUM 3  
Tips and Tricks of My Favourite Surgery |
| 1400 – 1430 | SYMPOSIUM 4  
Conservative Treatment in Spine Surgery |
| 1430 – 1500 | SYMPOSIUM 5  
The Most Memorable Case in My Spine Practice |
| 1500 – 1530 | SURGICAL TECHNIQUE VIDEO PRESENTATION  
ORTHOPAEDIC-NEUROSURGERY COMBINED SYMPOSIUM  
Case Discussion |
| 1530 – 1600 | MEDICO-LEGAL FORUM  
Open Discussion |

### 5th August 2018 (Sunday)

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| 0700 – 0800 | MEET-THE-EXPERTS  
Case Discussion               |
| 0800 – 0830 | EXPERT FORUM 5  
Spinal Metastasis |
| 0830 – 0900 | PLENARY  
Lunch Satellite Symposium  
(*Sutra Medi-Environ*) |
| 0900 – 0930 | FREE PAPERS PRESENTATION 1  
Coffee / Tea |
| 0930 – 1000 | OPENING CEREMONY  
Friday Prayers  
Lunch Satellite Symposium  
(*Baxter*) |
| 1000 – 1030 | Coffee / Tea |
| 1030 – 1100 | BEST RESEARCH AWARD  
Conservative Treatment in Spine Surgery  
(Oral Presentation) |
| 1100 – 1200 | EXPERT FORUM 1  
Adult Spinal Deformity |
| 1200 – 1300 | EXPERT FORUM 2  
Cervical Spine |
| 1300 – 1330 | SYMPOSIUM 3  
Lumbar Degenerative Disease |
| 1330 – 1400 | EXPERT FORUM 3  
Tips and Tricks of My Favourite Surgery |
| 1400 – 1430 | SYMPOSIUM 4  
The Most Memorable Case in My Spine Practice |
| 1430 – 1500 | SYMPOSIUM 5  
The Most Memorable Case in My Spine Practice |
| 1500 – 1530 | SURGICAL TECHNIQUE VIDEO PRESENTATION  
ORTHOPAEDIC-NEUROSURGERY COMBINED SYMPOSIUM  
Case Discussion |
| 1530 – 1600 | MEDICO-LEGAL FORUM  
Open Discussion |

### Pre-Congress Workshop

**Live Surgical Demonstration**  
*Medtronic*  
Venue: Hospital Canselor Tuanku Muhriz, Kuala Lumpur

### Post-Congress Workshop

**Live Unilateral Biporal Endoscopy (UBE)**  
**Demonstration**  
**RIFF RAFF PAIN CAST**  
Venue: Sunway Medical Centre, Selangor
EVENT: LIVE SURGICAL DEMONSTRATION (MEDTRONIC)

VENUE: Operating Theatre Level 2, Hospital Canselor Tuanku Muhriz, (Universiti Kebangsaan Malaysia Medical Centre), Kuala Lumpur

PROGRAMME

0830 – 0900  Registration

0900 – 0915  OPENING AND WELCOME
Chairperson: Sabarul Afian Mokhtar

0915 – 0935  LECTURE on OLIF (Oblique Lateral Interbody Fusion)
Azmi Baharudin

0935 – 1200  1st Surgery: OLIF Degenerative Scoliosis (Incorporating Tea Break)
Moderator: Azmi Baharudin
Live surgery performed by Mohd Hisam Muhamad Ariffin

1200 – 1245  LUNCH

1245 – 1330  LECTURE on Adolescent Idiopathic Scoliosis: Thoracic screw, anterior release, correction & rotation
Wong Chung Chek

1330 – 1350  LECTURE on Neuro monitoring in spinal surgery
Ashok Kumar Jaryal

1350 – 1630  2nd Surgery: Adolescent Idiopathic Scoliosis (Incorporating Tea Break)
Moderator: Azmi Baharudin
Live surgery performed by Wong Chung Chek, Mohd Hisam Muhamad Ariffin

1630 – 1645  CLOSING
Chairperson: Sabarul Afian Mokhtar
0700 – 0800  **MEET-THE-EXPERTS** Case Discussion  
**Moderators:** Fazir Mohamad, Kwan Mun Keong  
**Expert Panels:** S Rajasekaran, Shoichi Kokubun, Hiroiuki Nakase, Jose Manuel F Ignacio

0800 – 0900  **SYMPOSIUM 1** Recent Advances in Spine Surgery  
**Moderators:** Chiu Chee Kidd, Abdul Hadi Husin  
- Diffusion Tensor Imaging of the spinal cord and its clinical applications [pg 24]  
  S Rajasekaran  
- Neuromonitoring in spine surgery: Stepwise management of lost signal [pg 25]  
  Ashok Kumar Jaryal  
- Magnetically Controlled Growth Rods: Is it the final answer in Early Onset Scoliosis? [pg 26]  
  Wong Yat Wa  
- Acute Spinal Cord Injury – Evidence-based practice [pg 27]  
  Jose Manuel F Ignacio

0900 – 0930  **PLENARY**  
**Moderator:** K S Sivananthan  
- Navigation in spine surgery: Fact or fiction? [pg 28]  
  S Rajasekaran

0930 – 1000  **OPENING CEREMONY**

1000 – 1030  **COFFEE / TEA**

1030 – 1130  **BEST RESEARCH AWARD (ORAL PRESENTATION)** [pg 73 – 79]  
**Moderators:** Mohd Imran Yusof, James Tan  
- The presence of tear drop psoas morphology predisposes patients for post-operative psoas muscle weakness and pain during Oblique Lateral Lumbar Interbody Fusion (OLIF) [pg 74]  
  Mohd Hisam Muhamad Ariffin  
- The morphometric study of L2-S1 lumbar spine using magnetic resonance imaging: Feasibility anatomy analysis for Oblique Lumbar Interbody Fusion (OLIF) approach in Malay Malaysian population [pg 75]  
  Azizul Akram Salim  
- Upper Instrumented Vertebrae (UIV) tilt angle is an important post-operative radiological parameter that correlates with post-operative neck and medial shoulder imbalance [pg 76]  
  Ler Xin Yi
Predictive factors for post-operative medial and lateral shoulder imbalance following Posterior Spinal Fusion (PSF) in Lenke 1 and 2 Adolescent Idiopathic Scoliosis (AIS) patients [pg 77]  
Goh Saw Huan

The conformity of radiological shoulder balance parameters in Adolescent Idiopathic Scoliosis (AIS) patients after corrective surgery [pg 78]  
Tan Pheng Hian

Accuracy, safety and diagnostic outcome of percutaneous fluoroscopic vs CT-guided transpedicular core needle biopsy for spinal infections and tumors – A prospective randomised trial [pg 79]  
Lee She Ann

1130 – 1230  
**EXPERT FORUM 1**  
Adult Spinal Deformity  
Moderators : Abdul Hadi Husin, Jayamalar Thurairajasingam

Case presentation – Severe kyphoscoliosis with underlying neurofibromatosis [pg 29]  
Brian Teo

Risk management in Adult Deformity Surgery [pg 30]  
Mohd Hisam Muhamad Ariffin

Planning correction in patients with sagittal imbalance : Do we have the answer? [pg 31]  
Sabarul Afian Mokhtar

Reducing the risk and complications in spinal osteotomies for sagittal imbalance  
Chung Jae-Yoon

Minimally Invasive Spine Surgery in Adult Spinal Deformity : What are the limits?  
Gabriel Liu

Case presentation : What was done  
Brian Teo

1230 – 1300  
**LUNCH SATELLITE SYMPOSIUM**  
(Sutra Medi-Environ)  
Moderator : Khoo Eng Hooi

Percutaneous Stenoscopic Lumbar Decompression (PSLD) [pg 32]  
Lim Kang-Taek

1300 – 1430  
**FRIDAY PRAYERS**
1430 – 1530  **EXPERT FORUM 2**  
Cervical Spine  
*Modemators*: Mohamad Fauzlie Yusof, Lee Chee Kean  
*Casr presentation – Atlanto-dental osteoarthritis with spinal canal stenosis and cervical myelopathy at C1/C2 level* [pg 33-34]  
Thuraikumar Kanniah  
The never-ending debate in Cervical Spondylotic Myelopathy (CSM): Should I approach from the front or back? [pg 35]  
Zamzuri Zakaria  
*Surgical treatment of Cervical Sagittal Malalignment* [pg 36]  
Suk Kyung-Soo  
Patients with high grade cord compression with Myelopathy: How do we reduce the risk of post-operative neurological worsening? [pg 37]  
Kuniyoshi Abumi  
Silent Cervical Spondylotic Myelopathy with significant cord compression: The role of conservative treatment [pg 38]  
Mohamad Zaki Haji Mohd Amin  
*Case presentation: What was done*  
Thuraikumar Kanniah

1530 – 1630  **SURGICAL TECHNIQUE VIDEO PRESENTATION**  
*Modemators*: Abd Shukor Mohd Hashim, Sureisen Mariapan  
*Pedicle Subtraction Osteotomy for Ankylosing Spondylitis*  
Wong Chung Chek  
*Oblique Lumbar Interbody Fusion* [pg 39]  
Mohd Hisam Muhamad Ariffin  
*Total En Bloc Resection of Uncinate for Cervical Spondylotic Radiculopathy* [pg 40]  
Suk Kyung-Soo  
*Reduction Technique for High Grade Spondylolisthesis*  
Chung Jae-Yoon  
*Neurosurgical Virtual Reality Simulation in Cranio-vertebral junction lesions* [pg 41]  
Hiroyuki Nakase

1630 – 1700  **COFFEE / TEA**

1700 – 1800  **MSS 11TH ANNUAL GENERAL MEETING** (MSS Members only)
0700 – 0800  MEET-THE-EXPERTS (ELI LILLY) Case Discussion
  Moderators : Abdul Malik Mohamed Hussein, Chris Chan Yin Wei
  Expert Panels : Kuniyoshi Abumi, Suk Kyung-Soo, Chung Jae-Yoon, Wong Yat Wa, Gabriel Liu,

0800 – 0900  SYMPOSIUM 2
  Complications of Spine Surgery
  Moderators : Brian Teo, James Tan

  Massive intra-operative blood loss : Risk factors, prevention and management [pg 42]
  Saw Lim Beng

  Surgical site infection following spine surgery – What we do when dealing with surgical site infection? [pg 43]
  Brian Teo

  Avoiding pedicle screw malposition in spine surgery [pg 44]
  Luthfi Gatam

  Epidural Haematoma in spine surgery – Detection and management [pg 45]
  Jose Manuel F Ignacio

0900 – 1000  FREE PAPERS PRESENTATION 1 [pg 80 – 87]
  Moderators : Mohamad Zaki Haji Mohd Amin, Ed Simor Khan Mor Japar Khan

  Cervical spondylotic radiculopathy – The role of conservative management [pg 81]
  See Lei Peng

  Does transverse diameter of the cervical spinal canal play a role on CSM development? [pg 82]
  Murat Sayin

  Complications associated with Oblique Lateral Interbody Fusion L5/S1 performed without an access surgeon [pg 83]
  Mohd Hisam Muhamad Ariffin

  Surgical outcome of percutaneous stenoscopic lumbar decompression [pg 84]
  Ozlan Izma Muhamed Kamil

  Intra-operative nerve monitoring in treating spine tumors [pg 85]
  Nishanthi Apparow

  2-year radiological outcome study of Adolescent Idiopathic Lumbar Scoliosis treated with short segment anterior fusion [pg 86]
  Nur Aida Faruk Senan

  Perioperative outcome of severe Adolescent Idiopathic Scoliosis (AIS) (Cobb angle > 90°) utilising a dual attending surgeon strategy [pg 87]
  Chian Xue Han

1000 – 1030  COFFEE / TEA
1030 – 1130  
**EXPERT FORUM 3**  
Adolescent Idiopathic Scoliosis  
*Moderators*: Abdul Malik Mohamed Hussein, Nor Azlin Zainal Abidin

Case presentation – Presumed Adolescent Idiopathic Scoliosis with Large Extradural Spinal Arachnoid Cyst with Absent Channel Pedicles undergoing surgery – *A rare case report and experience* [pg 46-47]  
Lim Sze Wei

Adding on phenomenon in AIS : Can we prevent it?  
Gabriel Liu

Decision-making for selective thoracic fusion in Lenke 1C and 3C curves [pg 48]  
Wong Yat Wa

Approach to patients with Severe Idiopathic Scoliosis [pg 49]  
Luthfi Gatam

Prevention of shoulder imbalance in Adolescent Idiopathic Scoliosis [pg 50]  
Fazir Mohamad

Case presentation : What was done  
Lim Sze Wei

1130 - 1230  
**EXPERT FORUM 4**  
Lumbar Degenerative Disease  
*Moderators*: Lau Choon Ping, Dzulkarnain Amir

Case presentation [pg 51]  
Amir Fariz Zakaria

Cauda Equina syndrome from lumbar disc herniation : Does surgical timing matter? [pg 52]  
Warat Tassanawipas

The role of conservative treatment in acute lumbar disc herniation [pg 53]  
K S Sivananthan

Central lumbar disc herniation : Decompression alone versus fusion  
Azmi Baharudin

Minimally invasive approach to lumbar disc herniation : Is there an advantage?  
Nor Azlin Zainal Abidin

Case presentation : What was done  
Amir Fariz Zakaria
**FREE PAPERS PRESENTATION 2** [pg 89 – 98]

**Moderators**: Abdul Malik Mohamed Hussein, Amir Fariz Zakaria

Defining two subtypes of Lenke 1 curve: An analysis of pre-operative shoulder balance and post-operative outcome following Posterior Spinal Fusion (PSF) in Adolescent Idiopathic Scoliosis (AIS) patients [pg 91]

Ng Yun Hui

How common is pre-operative medial and lateral shoulder discordance in Lenke 1 and 2 curves? An analysis of shoulder balance among 151 AIS patients [pg 92]

Sherwin Johan Ng

Does medial and lateral shoulder discordance affect post-operative shoulder balance following posterior spinal fusion? [pg 93]

Nur Sulwana Mohamad Hanapi

Does the severity of the curve (Lenke 1 & 2) affect the distance of the aorta to the vertebra? [pg 94]

Siti Mariam Mohamad

The comparison between cervical supine side bending versus cervical supine traction radiographs in predicting proximal thoracic flexibility for Lenke 1 and 2 Adolescent Idiopathic Scoliosis [pg 95]

Josephine Rebecca Chandren

Minimally invasive fracture reduction using monoaxial percutaneous pedicle screws in thoracolumbar burst fracture: Surgical technique and preliminary report of radiological outcome [pg 96]

Siti Mariam Abd Gani

Defining two subtypes of Lenke 5 Adolescent Idiopathic Scoliosis patients undergoing posterior spinal fusion [pg 97]

Chung Weng Hong

The outcome of operative treatment modalities in patients with spinal metastases [pg 98]

Nur Aida Faruk Senan

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**LUNCH SATELLITE SYMPOSIUM (Baxter)**

**Moderator**: Sabarul Afian Mokhtar

Challenges in the management of haemorrhage and CSF leak in spinal surgery [pg 54]

Dharmendra Ganesan
1430 - 1530  SYMPOSIUM 3
Tips and Tricks of My Favourite Surgery
Moderators: Tan Chor Ngee, Chiu Chee Kidd
Discectomy [pg 55]
Mohd Imran Yusof
Anterior Cervical Discectomy and Fusion
Gabriel Liu
Cervical Laminoplasty [pg 56]
Kuniyoshi Abumi
Cortical bone trajectory technique for Lumbar Degenerative Disease [pg 57]
K S Sivanathan

1530 - 1630  ORTHOPAEDIC-NEUROSURGERY COMBINED SYMPOSIUM: Case Discussion
Moderator: Sabarul A/f_ian Mokhtar
ORTHO Panels: Chooi Yue Seng, Mohd Imran Yusof, Chong Chee Seang, Abdul Hadi Husin
NEURO Panels: Hiroyuki Nakase, Sia Sheau Fung, Kantha Rasalingam, Regunath Kandasamy
CASE 1: Grade 1 lumbar spondylolisthesis with spinal stenosis [pg 58]
Amir Fariz Zakaria
CASE 2: C1-C2 Instability
Sia Sheau Fung
CASE 3: Case of severe Spondylotic Myelopathy with central cord syndrome [pg 59]
Azrul Azmi
CASE 4: Spinal Epidural Abscess
Kantha Rasalingam

1630 - 1645  COFFEE / TEA

1645 - 1745  MEDICO-LEGAL FORUM: Open Discussion
Moderators: K Parameshwaran, Sabarul Afian Mokhtar
Malaysia medico-legal climate and spine surgery [pg 60]
K S Sivanathan
Compensation for spinal injuries in medico-legal cases [pg 61]
Raja Eileen Soraya
Aggravated damages in medico-legal suits [pg 62]
Shanti Abraham
0700 – 0800  **MEET-THE-EXPERTS Case Discussion**
*Moderators:* Azmi Baharudin, Chiu Chee Kidd
*Expert Panels:* Warat Tassanawipas, Luthfi Gatam, K S Sivananthan, Sabarul Afian Mokhtar

0800 – 0900  **EXPERT FORUM 5**
**Spinal Metastasis**
*Moderators:* Saw Lim Beng, Hishamuddin Salam

Case presentation – Multiple spinal metastasis in renal cell carcinoma treated with minimally invasive spinal stabilisation and circumferential decompression followed by stereotactic body radiation therapy  *Chung Weng Hong*  *(pg 63)*

Management considerations for metastatic epidural spinal cord compression  *Wong Chung Chek*  *(pg 64)*

The role of Stereotactic Body Radiation Therapy (SBRT) in the management of spinal metastasis  *Wan Zamaniah Wan Ishak*  *(pg 65)*

Assessment and management of spinal instability in patients with spinal metastasis  *Fazir Mohamad*  *(pg 65)*

The role of palliation in patients with advanced spinal metastasis  *Lam Chee Loong*  *(pg 65)*

Case presentation: What was done  *Chung Weng Hong*  *(pg 65)*

0900 – 0930  **COFFEE / TEA**

0930 – 1030  **ORTHOPAEDIC-NEUROSURGERY COMBINED SYMPOSIUM**
*Moderators:* Lau Choon Ping, Kantha Rasalingam

Iatrogenic Dural Injury: Prevention and management  *Dharmendra Ganesan*  *(pg 66)*

Cervical disc arthroplasty: Is it a fad or the future?  *Abdul Malik Mohamed Hussein*  *(pg 67)*

Annular tear in patients with low back pain  *Jagdeep Nanra*  *(pg 68)*

Importance of pelvic parameters in fusion of the lumbar spine  *Sabarul Afian Mokhtar*  *(pg 68)*
1030 – 1130  
**SYMPOSIUM 4**  
Conservative Treatment in Spine Surgery

*Moderators:* Ahmad Sabri Omar, Ozlan Izma Muhamed Kamil

- The role of bracing in scoliosis  
  *Harwant Singh*

- Natural history of cervical spondylotic radiculopathy  
  *Shoichi Kokubun*

- Spinal injections for lumbar radiculopathy: Do they really work?  
  *Deepak Ajit Singh*

- Management of low back pain: The perspective of a pain physician  
  *Lim Heng Hing*

1130 - 1230  
**SYMPOSIUM 5**  
The Most Memorable Case in My Spine Practice

*Moderators:* Abdul Malik Mohamed Hussein, Nor Azlin Zainal Abidin

- First case of hemivertebra excision  
  *Shoichi Kokubun*

- A case of Severe Structural Scoliosis with unusual pathology and treatment  
  *K S Sivananthan*

- My most memorable case in my spine practice  
  *Warat Tassanawipas*

1230 - 1300  
**CLOSING CEREMONY, AWARD PRESENTATION & LIFE MEMBERS’ CERTIFICATE PRESENTATION**
EVENT:  LIVE UNILATERAL BIPORTAL ENDOSCOPY (UBE) DEMONSTRATION (RIFF RAFF PAIN CAST)

VENUE:  Sunway Medical Centre, Selangor

INVITED OVERSEAS SPEAKER:  Son Sang-Kyu  
Neurosurgeon  
Park Weon Wook Hospital, Busan, South Korea

FACILITATORS:  Lim Heng Hing  
Orthopaedic Spine Surgeon  
Sunway Medical Centre, Selangor, Malaysia  

Toh Charng Jeng  
Neurosurgeon  
Sunway Medical Centre, Selangor, Malaysia

PROGRAMME

1300 – 1400  LUNCH

1400 – 1600  UBE 1st Case – Lumbar Central Spinal Stenosis

1600 – 1800  UBE 2nd Case – (To be confirmed)

1800 – 1830  Q & A / CLOSING
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ABSTRACTS
DIFFUSION TENSOR IMAGING OF THE SPINAL CORD
AND ITS CLINICAL APPLICATIONS

S Rajasekaran
Department of Orthopaedic & Spine Surgery, Ganga Hospital, Coimbatore, India

The ability to identify the extent of neural damage after both acute and chronic spinal cord injury is essential if the degree of recovery is to be predicted. Currently, this is usually assessed by magnetic resonance imaging (MRI). Although spinal cord oedema, haemorrhage and interstitial fibrosis will appear as changes in signal intensity on conventional MRI, these changes are of only limited value in the prediction of functional outcome. It is not possible to distinguish between neuronal structures and interstitial parenchymal tissues on MRI. Hence, any method that could improve our ability to evaluate the integrity of nerve fibre tracts and assess the functional status of the spinal cord would be of value.

Diffusion tensor imaging (DTI) is extensively used to image the brain and show specific nerve fibre tract bundles. It can potentially detect early damage to the myelin sheath before gross changes are obvious. However, its efficacy in imaging of the spinal cord remains largely unexplored. This presentation will discuss the basis of DTI MRI and its applications in trauma and non-traumatic disorders like cervical myelopathy, infections and tumor.
In deformity correction spine surgery, the neuromonitoring is done for motor tracts and sensory tract using the technique of TcMEP and SSEP. In neurosurgery of spine, monitoring of motor tract requires recording of D-wave along with TcMEP. The alarm criterion for SSEP is well established with 50% drop in amplitude or 10% increase in latency. The alarm criteria for TcMEP range from drop in amplitude by 50% to total loss of response, doubling of strength of stimulus required to elicit same response or change in morphology.

The alarm criterion for D-wave is 50% drop in amplitude. It is pertinent to note that drop/loss of signal can occur due to technical reasons, changes in depth of anaesthesia and changes in the general physiological status like temperature and blood pressure of the patient apart from surgical procedure. Accurate identification of the cause of drop determines further management. Every instance of loss of signal must be noted and the ongoing surgical procedure should be halted and a standard check-list should be quickly run by surgical, neuro-anaesthesia and neuromonitoring team. If changes in depth of anesthesia and other physiological factors are ruled out as the cause, then surgical decisions have to be taken.

In deformity correction surgery, the manipulation performed should be immediately reverted in stepwise manner with a watch on signal. In case signal returns, further deformity correction can be done. In case signal does not return, it is advisable to under-correct, decompress, stabilise the spine and close. In neurosurgery of spine, if the TcMEP signal is lost but D-wave is intact, then surgery should continue as planned, the patient will wake up with immediate neurological deficit but will recover. If both TcMEP and D-wave signal is lost then long term neurological deficit will occur and surgical procedure must be stopped. False positive and false negative alarm usually are due to incorrect interpretation of signals. Accurate interpretation of signal is critical for effective and useful use of intraoperative neuromonitoring in spine surgery.
MAGNETICALLY CONTROLLED GROWTH RODS: IS IT THE FINAL ANSWER IN EARLY ONSET SCOLIOSIS?

Wong Yat Wa

The University of Hong Kong, Hong Kong, China SAR

Early onset scoliosis (EOS) is caused by diversified etiologies. However, most can be classified into congenital, neuromuscular, syndromic or idiopathic origins. The severity of the deformity is also variable. The most severe extreme is very small thoracic volume, poor cardiopulmonary function, very limited growth potential and disfiguring appearance. Although some spine surgeons regard all scoliosis below 10 years old as EOS, severe deformity below 5 years old imposes great management challenge.

The aims of treatment for EOS are to correct both the spinal and chest wall deformity, and at the same time maintain normal growth of the spine and thorax with minimal complications. Serial casting or bracing may control mild curves. These non-operative techniques can also buy time for moderate to severe deformity.

Many patients end up with surgery. Fusion is not desirable for the young kids, and growth friendly surgery is chosen by most spine surgeons. They can be classified into distraction based, guided growth and compression based. The basic principles of magnetically controlled growing rods (MCGC) and the traditional dual rods are the same. However, MCGC has the advantages of non-invasive distractions done at outpatient clinic, no anesthesia needed for distractions and more frequent distractions to mimic normal spinal growth. Unfortunately, MCGC cannot be implanted into very small children simply because of the size, has high complication rate including unplanned surgery and cannot correct the chest wall deformity directly.
The guidelines in the management of acute spinal cord injuries continue to evolve and controversies still exist as to the ideal medical and surgical treatment of such cases. No aspect in the medical management of the condition is as controversial as the use of steroids. There are, however, established guidelines which are founded on good evidence such as the medical stabilization of patients’ hemodynamic status, the need for immobilization and the use of proper diagnostic pathways in establishing the stability of the spine injury as well as the presence and location of compression. Timing of surgery is likewise controversial although early decompression appears to have better evidence in literature supporting this practice. Ongoing researches are being made on the use of other pharmacologic substances which aim to reduce damage to the cord from secondary injury.
Pedicle screw fixation is the most preferred method of stabilising unstable spinal fractures. Pedicle screw placement may be difficult in cases of fractured posterior elements, deformed spine, gross instability and spinal pathology obscuring the anatomical landmarks. Surgeons are continuously looking at ways to improve the accuracy and safety in such situations. Computer Navigation offers a method of increasing accuracy in spinal instrumentation. Over the years, many different methods of navigation have evolved, mainly differing in the method of anatomy registration. CT based navigations were used initially but the recent 3D ISO-C fluro-navigation allows intraoperative registration with greater accuracy and ease of surgery. The increased accuracy allows the surgeon to perform demanding procedures such as deformity correction, complex cervical spinal fixations, precise tumor clearance surgery, minimally invasive fixations and pedicle screw fixations even in pediatric age groups.

This presentation will discuss with case illustrations the various applications and limitations of computer navigated spine surgery and also the results of a Randomised Control Trial on the accuracy of screw placement in spinal deformity surgeries.
CASE PRESENTATION –
SEVERE KYPHOSCOLIOSIS WITH UNDERLYING NEUROFIBROMATOSIS

Brian Teo Yian Young

Sarawak General Hospital, Kuching, Sarawak, Malaysia

BACKGROUND
Children with neurofibromatosis develop dystrophic or non-dystrophic scoliosis. Dystrophic scoliosis is known as a more severe form of scoliosis.

REPORT
We report a case of severe kyphoscoliosis with underlying neurofibromatosis. Patient undergone few operations during early age with complication of non-union and implant related infection. He had restrictive lung disease due to severe kyphosis. We performed three level vertebrectomy to reduce the deformity. Post-operatively, patient had neurological deficit and surgical site infection. However, wound and neurological status improved after one year post-surgery.

CONCLUSION
Risks of non-union, surgical site infection and neurological deficit are high in severe kyphoscoliosis and neurofibromatosis patient.
RISK MANAGEMENT IN ADULT DEFORMITY SURGERY

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Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia

Adult spinal deformity is divided into 3 main types:

Type 1: De Novo or Primary Degenerative Scoliosis.
Type 2: untreated adolescent idiopathic scoliosis that progressed into adulthood.
Type 3: secondary to previous surgery, trauma or metabolic bone disease.

Adult deformity surgery is associated with more complications but these elderly patients had the greatest degree of improvement, with outcome measures of disability, health status, and back and leg pain. Therefore despite facing the greatest risk of complications, they may stand to gain a disproportionately greater improvement in disability and pain with surgery.

These stepwise risk management approaches may reduce the overall complications:

PRE-OPERATIVE
1) Select and tailor patient to appropriate levels of treatment.

PERI-OPERATIVE
1) Avoid long surgery.
2) Blood loss management.
3) Reducing risks of nerve irritation/injury.
4) Reducing infection and poor healing.
5) Problems associated with performing spinal fusion:
   a) Poor placement of instrumentation.
   b) Failure of instrumentation.

POST-OPERATIVE
1) Loss of proper spinal balance (flatback, kyphotic decompensation syndrome).
2) Failure of good bone healing (pseudarthrosis).
3) Degeneration or failure of unfused levels of the spine (decompensation, instability).
Adult spinal deformity is defined by abnormal coronal (i.e. de novo scoliosis) or sagittal balance (i.e. iatrogenic flat back deformity), or both. Sagittal plane imbalance is increasingly recognised as the cause of pain and disability. It can be due to an increased in thoracic kyphosis and/or loss of lumbar lordosis. Abnormal sagittal balance causes increased energy expenditure required for walking and standing upright. In patients with adult spinal deformity, correction of sagittal balance is the primary determinant of improved pain and function after surgery.

Understanding the aetiology, location and magnitude of the deformity causing the sagittal imbalance, is crucial in planning correction surgery. Objective parameters have been developed to guide surgeons in determining how much correction is needed to achieve favourable outcomes. Currently, the goals of surgery are to restore a sagittal vertical axis < + 5 cm, pelvic tilt < 20 degrees and lumbar lordosis equal to pelvic incidence ± 9 degrees.

It is concluded that restoring harmonious spino-pelvic alignment is associated with significant improvement in health-related quality-of-life outcome measures and patient satisfaction.

Keywords
Spinal deformity, Sagittal balance, Pelvic incidence, Lumbar lordosis
PERCUTANEOUS STENOSCOPIC LUMBAR DECOMPRESSION (PSLD)

Lim Kang-Taek
Good Doctor Teun Teun Spine Hospital, Korea

PURPOSE
Traditional transforaminal endoscopic surgery to manage far lateral disc herniations is performed through Kambin's triangle which is often very narrow in foramina and extraforaminal stenosis. To overcome this hurdle, we introduce a modified full endoscopic procedure with use of stenoscope (12 degrees endoscope) and paraspinal surgical approach to treat foraminal and extraforaminal stenosis with or without disc herniation. The purpose of this study was to describe Paraspinal PSLD (Percutaneous stereoscopic lumbar decompression) technique and to demonstrate the preliminary clinical outcomes.

MATERIALS AND METHODS
Prospective data from 30 consecutive patients with foraminal and/or extraforaminal stenosis with or without far lateral disc herniation, were collected who underwent paramedic PSLD. The clinical outcome was noted using the visual analog scale, Oswestry Disability Index, and Odom's Criteria. The site of pathology was approached from 5-6 cms from midline with docking of working channel over isthmus and facet. Foraminal decompression was done after exposing the exiting nerve root using high speed burr and punches.

RESULTS
The preliminary results of 30 patients (M:F=12:18) with mean age 67.21 ± 14.31 years (ranging from 45-89) were noted at 6 months of follow up. The VAS for leg pain improved from preoperative Score 8.13 ± 1.68 to postoperative Score 2.81 ± 1.32 at 6 months of follow up. The ODI improved from 63.2 ± 10.67 to 24.2 ± 5.42 postoperatively at 6 months follow up. Excellent or good results were obtained in 85% of patients on the basis of Odom's criteria and symptomatic improvements were obtained in 95% of patients. Only 2 patients (6.67%) had postoperative dysesthesia which resolved in 3 months of time.

CONCLUSION
Paraspinal PSLD could be an efficacious alternative to overcome the hurdles of traditional transforaminal approach to manage foraminal and extraforaminal stenosis with or without far lateral disc herniation which offers full scale decompression after exposure of exiting nerve root, thus reducing the risk of its injury.
Mr N, 52 years old, male presented with progressive neck pain for the past 6 months. He experience severe dull to sharp pain over the upper cervical region which radiates to the temporal region and bilateral arm. He also complaint of progressive bilateral upper and lower limb weakness and numbness with unsteady gait. He requires walking aid to walk. During presentation, he had difficulty to perform fine motor function of bilateral hand. He had difficulties in opening his shirt button and writing. He spent most of the time in the wheelchair.

On examination, he was having difficulty to walk and need to use walking frame. From lateral assessment noted there is loss of cervical lordosis. The was localised tenderness over the upper cervical to the base of the neck. There was neurological deficit; Power: Upper limb generally grade 3 and lower limb grade 4. Sensation is reduced C5 to T1. He is hyperreflexic. Myelopathic signs are positive.

**IMAGING**

X-Ray

CT Scan

CT features raise suspicion of ankylosing spondylitis with secondary degenerative changes. There is spinal canal stenosis at C1-C2 level.
MRI

Atlanto-dental osteoarthritis with spinal canal stenosis and cervical myelopathy at C1/C2 level. Differential is atlanto-dental rheumatoid arthritis.

2. Fusion of atlanto-occipital joints.

2. Bilateral C5/C6 and right C6/C7 perineural cysts.

He underwent decompression and fusion from Occipital to T2.
THE NEVER-ENDING DEBATE IN CERVICAL SPONDYLOTIC MYELOPATHY (CSM) :
SHOULD I APPROACH FROM THE FRONT OR BACK?
Zamzuri Zakaria

International Islamic University Malaysia Medical Centre, Kuantan, Pahang, Malaysia

Cervical spondylotic myelopathy (CSM) is a spinal cord dysfunction caused by the degenerative process of the cervical spine. This process involves biomechanical and biochemical changes affecting the intervertebral disc, facet joints, uncovertebral joints and ligamentum flavum. Upper-motor neuron findings, such as hyperreflexia below the level of compression and gait disturbances are typical presentation of the problem.

The natural history of CSM is the disease will progress over time and therefore, the main purpose of surgery is to halt the progression of the disease. Factors to consider are the severity of neurologic deterioration, the amount of pain and the magnitude of cord compression seen on imaging studies.

The choice of surgical approach is based on the location of the compression, the number of involved levels, the presence of instability and the overall sagittal plane alignment.
SURGICAL TREATMENT OF CERVICAL SAGITTAL MALALIGNMENT

Kyung-Soo Suk

Department of Orthopaedic Spine, Yonsei University College of Medicine, Seoul, Korea

For good sagittal alignment center of the head should lies on center of the pelvis. Good lordosis does not mean good sagittal alignment. To evaluate cervical sagittal alignment we should check sagittal vertical axis (SVA). C2-C7 SVA is most commonly using SVA. It is highly reliable. However, it cannot express high cervical pathology. Therefore, sometimes we check C1-C7 SVA or CGH-C7 SVA. CGH is center of gravity of the head located on anterior margin of the external auditory meatus. Theoretically CGH-C7 SVA is the best SVA to evaluating the cervical sagittal alignment. However, it has low reliability.

T1 slope is very important parameter deciding sagittal alignment and sagittal correction. The problem of T1 slope is changing parameter. The T1 slope can be changed after the surgery. My idea is “fix T1 and T1 slope will not change”.

For good correction of sagittal malalignment I prefer AP combined surgery. I prefer multilevel ACDF to corpectomy in anterior surgery. Through multilevel ACDF we can get anterior release, anterior support and half degree of correction, and make posterior correction easier. We also restore disc height and prevent iatrogenic foraminal stenosis and/or buckling of ligamentum flavum. Through posterior surgery we can get rigid fixation, powerful correction, enhance fusion, and prevent iatrogenic cord compression with less risk of fixation failure or pseudarthrosis.

In conclusion, we should check sagittal vertical axis for accurate evaluation of sagittal alignment. AP combined surgery is safe and effective surgical option for correction of sagittal malalignment.
PATIENTS WITH HIGH GRADE CORD COMPRESSION WITH MYELOPATHY: HOW DO WE REDUCE THE RISK OF POST-OPERATIVE NEUROLOGICAL WORSENING?

Kuniyoshi Abumi
Sapporo Orthopaedic Hospital Centre for Spinal Disorders, Sapporo, Japan

Narrowing of the spinal canal and segmental instability are the common causative factors of severely affected spinal cord signs. However, cervical deformity can be another factor of progression of cervical spinal cord lesion in some patients. Favorable outcomes of the treatment can be achieved by proper selection of surgical procedures considering causative factors of myelopathy progression. For the patients with narrow cervical spinal canal without instability nor deformity, simple decompression by anterior or posterior must be sufficient. If patients have segmental instability, decompression and spinal fusion using cervical instrumentation must be required. For the patients with marked kyphotic and/or scoliotic deformity, decompression and deformity correction provide favorite surgical outcomes.

Possibility of post-operative neurological worsening may be higher in the patients with high grade spinal cord compression than in patients with mild myelopathy. Precise preoperative radiological evaluations using CT and MRI are essential to prevent post-operative neurological worsening, and additional examination of CTA/MRA are required in patients with specific pathologies such as patients with previously operated condition, congenital skeletal and/or vascular anomaly, requiring instrumentation surgery, etc. Neuro-monitoring is recommended for the patients with severe deformity.
Silent Cervical Spondylotic Myelopathy is defined as patient who had clinical sign of myelopathy but do not have neck pain or radiating pain. It is an important clinical entity and thorough clinical examination will allow early clinical diagnosis and confirmatory imaging.

CSM is a surgical disease. However surgical timing is still debatable. Several studies have reported early surgical decompression have better surgical outcome and higher potential for neurological recovery. Therefore, the management of silent cervical spondylotic myelopathy with significant cord compression become controversial topic in spine surgery. Majority patient not keen for surgery and whether the attending physician should persuade for surgical intervention.

Conservative treatment is indicated for patients with radiographic evidence of cervical stenosis without clinical signs or symptoms of myelopathy or patients with mild clinical disease such as hyperreflexia or slight balance disturbance. However, close clinical monitoring and radiographic studies are required during follow-up.
Lateral (DLIF/XLIF) spine surgery has been an effective procedure for the past few decades. They result in better fusion, better lordosis, better sagittal balance correction and the resultant indirect decompression also reduces epidural scarring. Lateral approach has its own setback especially neurological issues due to blunt diving into the psoas muscle for docking despite heavy reliance on neuromonitoring to reduce lumbar plexus injury. Furthermore breaking the table for positioning may lead to postoperative complications including femoral nerve injury. Access to the L4-5 level due to the high iliac crest in some patients is difficult. Finally to access the L5-S1 space the patient needed to be flipped from the side to the supine or prone position. Finally, the surgeon has a poor sagittal plane posture while operating as he hunched over the patient.

Surgical procedures have always evolved to address unmet clinical needs. The OLIF surgical corridor is anterior to the Psoas, minimising psoas muscle injury and therefore the risk of lumbar plexus injury. The oblique corridor also allows access to L4-5 despite high iliac crest. OLIF allows access the L5-S1 level in the lateral position thereby obviating the need to reposition the patient just to treat that single level. OLIF does not require breaking the table minimising Femoral nerve injury. Finally, more ergonomic working position for the surgeon, increasing your surgical longevity.
Cervical spine has a peculiar anatomical structure different from thoracolumbar spine, which is uncinate process. Arthritic change of unco-vertebral joint can result in cervical spondylotic radiculopathy (CSR) that compress the nerve root at the foramen. We can decompress the nerve root by anterior or posterior foraminotomy to relieve arm pain. However, CSR patients have both arm pain and neck pain. To relieve both arm pain and neck pain, fusion surgery (ACDF) may be necessary. We can decompress the nerve root by indirect method (increasing disc height) or direct method (uncinate resection) during ACDF. In some CSR patients, indirect decompression method may be effective. On the contrary direct decompression method is necessary in most of CSR patients.

Direct removal of osteophyte from uncinate process has risk of injury to nerve root or vertebral artery. Base of uncinate process is safe area. I cut the uncinate process at its base, just above the pedicle using high speed burr and osteotome. After removal of uncinate process as one piece we can see the decompressed nerve root on direct vision. I can get complete, perfect decompression of nerve root by total en bloc resection of uncinate process. Bone from uncinate process can be reused as a graft material. During this procedure I’ve never experienced vertebral artery injury.

In conclusion, uncinate process resection is safe and effective surgical option for cervical spondylotic radiculopathy.
BACKGROUND
Cranio-vertebral junction (CVJ) is quite complex anatomically and biomechanically. Advances in computing power have enabled continued growth in virtual reality (VR), visualization, and simulation technologies. VR-based simulators are becoming common in some surgical subspecialties, and 3-dimensional (3D) imaging data can be used to further understand complex anatomical relationships in specific patients. However, their actual use in spinal procedures remains unclear.

OBJECTIVES
We retrospectively reviewed our clinical data on preoperative multi-modality fusion 3D image of CVJ lesions and compared theses with actual surgical findings to improve the surgical effect.

METHODS
From June 2016 to December 2017, pre-surgical simulation were performed in 27 CVJ lesions by CT-MRI multimodality fusion image using software Synapse Vincent (Toshiba) in our institute. The series composed 13 male and 14 female, ranging in age from 5 to 81 years old. The original lesions include Chiari malformation in 9, atlanto-axial dislocation in 5, tumor in 9, AVF in 2, and pseudo-tumor in 2 cases.

RESULTS
Correspondences between surgical exposure, anatomical features, and the locations of pathology were readily observed when comparing intra-operative video with the simulation, indicating the predictive ability of the virtual surgical environment. Complex spatial relationships between the lesion and surrounding tissues can be observed in detail by use of a VR model. There was no surgical complication in this series.

CONCLUSIONS
Neurosurgical VR simulation for CVJ lesions was useful in better understanding complicated spatial relations of anatomical landmarks and in examining surgical approaches, and is hoped to improve the surgical results.
Uncontrolled intra-operative blood loss obscure visualization, potentially causing hemodynamic imbalance, anemia and associate with higher post-operative morbidity such as hematoma or infection. Anticipation and management of intra operative blood loss is the fundamental skill required to improve operative outcome in major spinal surgeries.

Conventionally the underlying pathology (tumor/infection) or type of surgical procedure (anterior surgery/osteotomies) could predict occurrence of blood loss but may not applicable in all cases. Other factors such as obesity, usage of anticoagulant, herbs should be screened pre-operatively so preventive measure could be initiated before surgery.

The prevention includes proper patient positioning, meticulous tissue dissection or exposure, operation under microscope. Administration of systemic antifibrinolytic agent such as tranexamic acid inhibits fibrinolysis and helps to reduce blood loss. Controlled hypotensive anesthesia could reduce 20-30% systolic blood pressure lessens blood loss but it may carry ischemic risk to the heart and brain.

Management of intra operative blood loss range from managing bleeding from bone, epidural vessel or tumor. Various methods that could be applied include diathermy, hemostatic sponges/patties and local hemostatic sealant. Intra operative blood salvage method may reduce allogenic blood transfusion but the efficacy and cost effectiveness cost is questionable, moreover, its use is restricted from tumor and infection cases.
SURGICAL SITE INFECTION FOLLOWING SPINE SURGERY – WHAT WE DO WHEN DEALING WITH SURGICAL SITE INFECTION?
Brian Teo Yian Young
Sarawak General Hospital, Kuching, Sarawak, Malaysia

BACKGROUND
Surgical site infection (SSI) following spine surgery is complicated with significant morbidity and economic burden. The reported infection rates range from 0.7 to 11.9%.

REPORT
This is a case of patient with multiple spine surgery done from 2010 to 2016. Her last operation in 2016 was complicated by surgical site infection. Few wound debridement and removal of implants surgeries were done and long-term antibiotic was given. Unfortunately, infection was not controlled and patient’s symptoms worsened. We performed osteotomy, posterior instrumentation and wound debridement for this patient when she was transferred to our centre.

CONCLUSION
Long-term antibiotic and spinal stability are important aspect to treat surgical site infection.
Pedicle screw system has been widely used as the stabilisation instrument for the thoracolumbar spine for several decades. As the increase use of pedicle screw systems, the accuracy of inserting pedicle screw is always a concern due to the potential risk of iatrogenic injury on the neurovascular structure they pass. Even spinal cord or cauda equina injury are rare following pedicle screw insertion, but malposition of pedicle screw sometimes is not realized intraoperative. The knowledge of pedicle anatomy in each vertebrae is very important before attempting pedicle screw insertion. The pedicle anatomy in the mid thoracic vertebrae and vertebrae that have altered morphology due to scoliosis or other morphology are the most difficult to cannulate. Several techniques had been described for inserting the pedicle screw, either with free hand technique or with assistive technique such as fluoroscopy guidance and stereotactic navigation. Many studies have reported high accuracy pedicle screw insertion in all three-core techniques. Given appropriate training and experience, theoretically the pedicle screw can be cannulated easily with free hand technique. Despite all available technique recommendation, it must be chosen based on surgeon's preferences, experience and specific pathology that will be treated.
The occurrence of symptomatic post-operative epidural hematoma is very rare with incidence usually reported in less than 1% of cases. The occurrence of delayed post-operative epidural hematoma causing new neurological deficits are even rarer and is defined as neurologic deficits occurring 3 days after surgery. The surgeon should be quick to suspect its occurrence in postoperative cases that develop new neurologic deficits where there was none immediately post-operatively. Emergent diagnostic imaging should be performed once the condition is suspected and once established, emergent exploration and decompression of the spinal cord should be performed. Risks factors are divided into pre-operative, intraoperative and post-operative causes. Early decompression gives the best results whereas surgery performed 24 hrs after the onset of neurologic deterioration do not show as good a result with regard to neurologic recovery.
INTRODUCTION
Presumed adolescent idiopathic scoliosis associated with intraspinal anomalies were reported to be as high as 16 %, however most reported intraspinal anomalies are syringomyelia associated with or without Arnold Chiari Malformation-1 [1]. Association with a large purely extradural spinal arachnoid cysts without cord abnormality are rare and unheard of in the literature. We would like to share our experience in managing one such case that require scoliosis corrective surgery for a large thoracic curve of 100 degree cobb angle associated with large extradural spinal arachnoid cyst.

CASE REPORT
A 14 year old girl presented with scoliosis at the aged of 11 years when her mother noted a hump on her right shoulder and brought her to a clinic where diagnosis of adolescent idiopathic scoliosis was made and was subsequently referred to our centre for further management. There is no family history of scoliosis and her developmental milestone were normal. Whole spine standing X-ray reveal a right sided thoracic scoliosis with Cobb angle of 45 degree from T6 to T12. Clinically no subtle neurological signs can be detected. The Cobb angle rapidly worsen within 2 ½ years to 100 degree. Also noted in the plain X ray are the widened inter pedicular distance in the upper and mid thoracic spine. Her thoracic kyphotic angle was 65 degree measured from T4 to T12 just prior to surgery. MRI whole spine done reveal a large intraspinal type 1a extradural spinal arachnoid cyst [2] extending from T5 to T9 vertebra measuring 1.5cm(AP) x 2.5cm(W) x 7.9cm(H). CT guided aspiration was done and microscopic examination was acellular and negative for malignancy. CT scan also reveal expanded spinal canal, small vertebral bodies with small to absent channel pedicles from T2 to T10 vertebrae. Combined surgery involving Neurosurgery and Orthopaedic Spine team was performed with laminectomy and decompression of the extradural spinal arachnoid cyst follow by corrective scoliosis surgery via posterior only approached using combined extrapedicular and pedicular screws and rods technique from T2 to L4 vertebrae [3]. Post operative period was uneventful with Cobb angle reduce from 100 to 53 degree and thoracic kyphotic angle from 65 to 35 degree. Patient was able to walk without aid on day 2 and discharge home on day 3 after surgery. Good fusion with no failure of implant was noted on follow up 6 months post surgery.

DISCUSSIONS
Adolescent idiopathic scoliosis with rapidly progressing curve is an indication for surgical correction. However, for a large thoracic curve of 100 degree couple with its association with a large intraspinal extradural spinal arachnoid cyst resulting in expanded spinal canal with small to absent channel pedicles post a significant challenge to the operating spine surgeon.

It is well-known that there may be a risk of neurological complications when scoliosis corrections are performed without decompression in patients with syringomyelia, the most common neural axis abnormality. (Noordeen MH, Taylor BA, Edgar MA. Syringomyelia: a potential risk factor in scoliosis surgery. Spine (Phila Pa 1976) 1994;19:1406-9).

Spinal extradural arachnoid cysts are an uncommon entity and symptomatic cysts are rare. In the literature these cysts mostly appear as a single case reports or small case series [4]. However, none of them were associated with scoliosis and there is paucity
of data in the literature regarding its association with Adolescent idiopathic scoliosis. According to Aaron E. Bond et al [5], overall outcome following surgical excision for symptomatic cysts are excellent with complete remission of 87% of cases.

Presumed idiopathic adolescent scoliosis with intraspinal anomalies were reported to be as high as 16%. Most reported intraspinal anomalies are syringomyelia and association with large meningeal cyst is extremely rare (S Rajasekaran 2010). MRI scan is warranted in rapidly progressing curve even when no subtle neurological signs can be elicited as majority of intradural arachnoid cyst are asymptomatic. According to Aaron E. Bond et al (2012) overall outcome following surgical excision are excellent with complete remission of 87% of cases. Corrective scoliosis surgery is a challenge where there is absent of pedicle channel due to the large intraspinal meningeal cyst. Combined extrapedicular and pedicular screws and rods contract is a safe and viable option in such cases (Lee CS 2011).

REFERENCES

DECISION-MAKING FOR SELECTIVE THORACIC FUSION IN LENKE 1C AND 3C CURVES

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The main aim of adolescent idiopathic scoliosis (AIS) surgery is to correct the deformity as much as possible (both clinically and radiologically) with minimal number of fusion segments. Controversy often arises for Lenke lumbar modiﬁer C and double major scoliosis on whether the lumbar curves need to be fused. Preserving the lumbar curves keeps more mobile segments and requires less extensive surgery. Traditionally, lumbar modiﬁer C is an indication for fusion, but spine surgeons stretch their indications for selective thoracic fusion (STF) in highly selected cases. This talk focuses on the thoracic curves as major curves with lumbar modiﬁer C. For Lenke 1C, the magnitude of the lumbar curves may be large but they do not have structural changes. The lumbar curves of type 3C AIS have structural changes.

The following factors are important in identifying suitable patients for STF:

• Lumbar curve magnitude: absolute value and ratio with the thoracic curve
• Flexibility: absolute value and ratio with the thoracic curve
• Lumbar apical rotation: absolute value and ratio with the thoracic curve
• Lumbar apical translation: absolute value and ratio with the thoracic curve
• Clinical / cosmetic appearance
• T10-L2 sagittal alignment
• Degree of thoracic curve correction
• Tilting of LIV
• Skeletal maturity

These factors do not have linear relationship. Sometimes it is difficult to make decision for patients in grey zone. Pre-operative good communication with patients and family is critical.
Severe idiopathic scoliosis with an angle of more than 90 degrees is a condition that often comes to clinics with large cobb angles, unbalanced shoulders, unbalanced trunk, rib hump, and sometimes with cardiorespiratory complications, this is due to negligence in handling or ignorance of her parents. To achieve the maximum correction requires conditions such as adequate mobilization, often requiring extensive surgical intervention and also with the concern of complications are neither clinical nor neurological. Traction, temporary internal distraction, releases, various osteotomies and apical vertebral resections are sometimes required to achieve maximum results.

In the last five years, there are 14 severe idiopathic scoliosis that will be discussed about the indication, the final result, either coronal or sagittal balance, patient satisfaction about the results achieved.
Learning your child has Adolescent Idiopathic Scoliosis always takes a parent by surprise. Although the child has no pain or neurologic weakness, however, several visible symptoms such as distortion of chest wall, waist asymmetry and shoulder imbalance always worries the parents. Shoulder balance itself is one of the major determinants of the cosmetic outcome of surgery in Adolescent Idiopathic Scoliosis. Determination of the shoulder balance before surgery is important to prevent over-correction or under correction, or worsening of the shoulder imbalance. Therefore, what are the parameters to be looked into? How to prevent it from happening? How does spinal fixation influence shoulder balance?

The outcome of spine surgery is dependent on the surgeon's decision making and execution of the decision.
CASE PRESENTATION

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BACKGROUND

Lumbar degenerative disease includes spondylotic and degenerative disc disease of the lumbar spine. This can occur with or without neuronal compression or spinal instability.

REPORT

We report a case of 55 years old female lady with complain of low back pain, radiculopathy to both legs and neurogenic claudication. The condition had been evolving for around two years, despite analgesia, muscle relaxants and physiotherapy. Physical examination revealed tenderness on palpation of lumbar paravertebral region. Lasegue’s sign were positive bilaterally. Radiographs of lumbar-sacral spine showed degenerative changes with normal sagittal balance. Dynamic views demonstrated instability of the lower lumbar region. Lumbar MRI revealed spinal stenosis at L4/L5 and L5/S1, hypertrophy of facet joints and yellow ligament, with bulging of intervertebral discs. Diagnosis of lumbar degenerative disease with spinal stenosis of L4/L5 and L5/S1 was then made.

After failed non-operative treatment, she underwent surgery; open decompression and posterior instrumentation of L4/L5 and L5/S1. Her symptoms then resolved following surgery.

CONCLUSION

Lumbar degenerative disease may present with one or more of a combination of axial pain, radiculopathy and neurogenic claudication. Decompressive surgery is the gold standard for stenosis whereby fusion is required if there is associated instability.
Cauda equina syndrome (CES) is defined as syndrome of rectal and urinary incontinence, saddle anesthesia bilateral sciatica and lower motor weakness. The syndrome can be caused by trauma or injury but this syndrome should be also considered in chronic low back pain patient whose the rectal and urinary incontinence has rapidly established, as well as leg weakness and difficulty in walking. Most patients, about 70%, may present with severe low back pain and leg pain but up to 30% may present without low back pain. Numbers and incontinence may occurred gradually over days, weeks and months. There is the classification of Cauda Equina Syndrome (CES).

CES – S (Suspected)
CES – I (Incomplete)
CER – R (Retention)
CER – C (Completed)

Mid-sagittal T2-weighted magnetic resonance imaging (MRI) showing massive.

The incidence of CES from lumbar disc herniation is varied about 2-6% of all lumbar disc herniation.

Surgical decompression within 48 hours after onset, provides up to 70% reversible urinary incontinence within two years compare to only 40% of recovery when decompression is delayed more the 48 hours. The magnitude of compression and nature of the prolapsed disc may play important roles on recovery.

CONCLUSION

CES from lumbar disc herniation should be treated by surgical decompression as early as possible, preferably within 48 hours in acute cases since the recovery of bowel, bladder, sensory and motor function depend on this decompression.
Lumbar disc herniation is a common condition that frequently affects the spine in young and middle-aged patients.

Regardless of etiology, herniations represent protrusions of disc material beyond the confines of the annular lining and into the spinal canal.

The pain associated with lumbar radiculopathy occurs due to a combination of nerve root ischemia and inflammation resulting from local pressure and neurochemical inflammatory factors present within the disc material.

Compared with conservative therapy, surgical treatment provided faster relief from back pain symptoms in patients with lumbar disc herniation, but did not show a benefit over conservative treatment in midterm and long-term follow-up.

While both conservative and surgical options are shown to be efficacious, the ultimate decision regarding initial and definite management should be made by the patient based on their desires and individualised requirements, following a frank discussion regarding risks and benefits of the various treatments with their surgeons.
One of the most common bane in the spinal surgery would be haemorrhage and dural tear.

In terms of haemorrhage, the first step is to ensure the patient is optimum in term of platelet and clotting profile. The next step would be the anticipation of the vascularity of the surgery, based on the suspected pathology and surgical procedure and technique. The role of pre-op embolisation has to be explored. The adequate monitoring to gauge the blood lost, in order to replace blood judiciously. The use of medication (eg. tranexamic acid). The surgical control of bleeding – bone wax, diathermy, haemostatic agents, cottonoid, etc. The use of cell saver. Venous haemorrhage vs arterial haemorrhage. Wary of DIVC. Bleeding in minimally invasive surgery.

In terms of CSF leak: consenting for surgery. The location of the dural tear. Type of dura tear – tear vs dural loss. Primary repair – suture prolene 6/0, synthetic dura, fascia lata, tissue sealant, etc. The importance of proper layered closure. The use of wound drain. The need for lumbar spinal drain or external ventricular drain. CSF leak in MIS surgery. Is pseudomeningocele a problem?
Lumbar discectomy is the most common spinal procedure and all orthopaedic surgeons in Malaysia are entitled to do discectomy. Lumbar discectomy techniques have greatly evolved over the last 30 years with better magnification, illumination and smaller incision. However, indications and contraindications remain unchanged, and the aims remain the same, which is to achieve complete decompression and symptom relief and to avoid complications associated with the procedure. Many things can go wrong during the procedure, including discectomy at a wrong level, spinal instability due to accidental facet joint damage, dural tear, inadequate decompression and persistence of symptoms post-operatively. Fail discectomy and complications can happen to any patient even if the procedure is performed by an experienced surgeon.

The purpose of the presentation is to highlight the tips and technique performed by the author to achieve satisfactory outcome and to minimise surgical complications.
Direct anterior decompression is effective for ventrally compressed cervical spinal cord in cervical spondylosis (CSM) or ossification of the posterior longitudinal ligament (OPLL). Decompression through posterior approach is also effective for major cases in the cervical spine with physiological lordosis. There are controversy for selection of surgical procedure among the surgeons.

Suda et al showed that kyphotic alignment of the cervical spine is major factor causing poor surgical outcome after laminoplasty for CSM. Fujiyoshi et al proposed the K-line defining as a line that connects the midpoints of the spinal canal at C2 and C7. They demonstrate that a sufficient posterior shift of the spinal cord and neurologic improvement will not be obtained after posterior decompression surgery in the K-line (-) group. Matsumoto et al showed that preoperative kyphosis of the cervical spine and severe (>60%) compromise of the spinal canal by OPLL appear to be the limiting factors for the indication of laminoplasty. Yoshii et al demonstrated that the postoperative recovery rate was similar in the posteriorly and anteriorly managed groups, and in patients with massive OPLL with kyphotic alignment, neurologic recovery rate in the anterior was superior. However, they resulted that the rate of perioperative complications was higher in the anterior group than the posterior group.

Surgical procedure for myelopathy caused by CSM or OPLL must be selected considering cervical alignment in the sagittal plane, canal occupying ratio by ossified ligament, types of ossification, etc. However, author prefer simple bilateral open laminoplasty without interspinous process spacers.
CORTICAL BONE TRAJECTORY TECHNIQUE FOR LUMBAR DEGENERATIVE DISEASE

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Midline lumbar fusion (MIDLF) using cortical pedicular screws is a new alternative for minimally invasive surgery.

This technique has the following benefits:

1. Small incision (4-5 cm) (same as the laminectomy incision)
2. No extension needed for screw insertion
3. Less muscle damage
4. Almost 0 muscle retraction
5. Less blood loss
6. Higher pull out strength and equivalent construct strength vs. traditional PS fixation

The cortical screw fixation is from the inframedial aspect of the pedicle to the supralateral aspect of the pedicle. The cortical screw, which is usually about 5 mm in diameter, is inserted obliquely.

This fixation for spinal fusion has the following advantages:

**FIXATION**
- Trajectory maximises cortical bone contact

**VISUALISATION**
- Single small midline incision
- Familiar open anatomy with clear visualization
- Not restricted by a tubular retractor

**PRESERVATION**
- Less muscle disruption than traditional open technique
- Less neurovascular elements compromised
- Capsules of posterior joints not damaged
- Less blood loss
GRADE 1 LUMBAR SPONDYLOLISTHESIS WITH SPINAL STENOSIS

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BACKGROUND
Spondylolisthesis in elderly is an acquired anterior vertebral body displacement without disruption of the pars interarticularis. It is associated with degenerative changes of intervertebral disc, ligamentous hypertrophy and osteophyte formation. The combination of these degenerative changes can lead to central canal or lateral recess stenosis causing neural compression. This invariably leads to symptoms of back pain, radiculopathy, and weakness, as well as gait deterioration.

REPORT
A 62 year-old lady presented with complain of low back pain for more than a year. It has worsened over recent months with incapacitating pain in the back and lower extremities, difficulty in ambulating and leg paresthesia. Pre-operative radiographs demonstrated a grade 1 degenerative spondylolisthesis of L3/L4 and L4/L5 with instability on flexion-extension radiographs. MRI demonstrates thickened ligamentum flavum and facet joints, marginal osteophytes and disc bulges causing narrowing of lumbar canal. After failed non-operative treatment, she underwent a 2-level TLIF with posterior spinal instrumentation. Postoperatively, her symptoms improved gradually.

CONCLUSION
Grade 1 lumbar spondylolisthesis with spinal stenosis commonly affects the elderly population. Though they are many surgical strategies for this condition, spinal decompression and fusion led to better clinical outcomes than decompression alone. TLIF has gained benefit with increased mechanical strength, segmental lordosis restoration, disc height restoration, and indirect foraminal decompression.
CASE OF SEVERE SPONDYLOTIC MYELOPATHY WITH CENTRAL CORD SYNDROME

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A 56 year-old Malay man presented with complain of progressive weakness over bilateral lower limb for three weeks after fall while gardening. He had previous history of neck pain associated with numbness of both upper and lower limbs for the past three years with history of multiple falls but did not seek medical treatment. Examination revealed loss of power over lower limbs with hypertonia and hyperreflexia. We shall discuss the radiological findings with treatment options and post-operative management of complication on this patient.
Medico-legal cases are on the increase in Malaysia especially for spine surgery.

People sue doctors for the following reasons:

1) Complication
2) Bad outcome of treatment
3) Economics
4) Failure to deliver promised services
5) Patient sense of abandonment
6) Missed or delayed diagnosis
7) Unauthorised release of personal patient data
8) Chronic pain
9) Overly competitive medical community

The types of medico-legal cases that can arise are:

1) Negligence suits
2) Disciplinary inquiries
3) Criminal proceedings
4) Inquests
5) Breach of confidentiality

The proper way to reduce medico-legal problems are:

1) Proper history taking, careful examination and relevant investigations go a long way in establishing an inculpable diagnosis although subsequent events may point to a different diagnosis.
2) Make (and keep) clear, legible and adequate records.
3) Do not practice beyond the level of your expertise and, similarly, it is unwise to delegate tasks to those who lack the necessary expertise.

Listen to your patients and communicate well with them especially when there are complications.
COMPENSATION FOR SPINAL INJURIES IN MEDICO-LEGAL CASES

Raja Eileen Soraya

Messrs Raja, Darryl & Loh, Kuala Lumpur, Malaysia

Damages in medico-legal cases have been the subject of prolific debate in recent years. Healthcare professionals undertaking high risk procedures that may result in serious injuries frequently face multi-million Ringgit claims. Compensation in court cases involve the Court weighing the factual and expert evidence supplied by the parties in the case and applying relevant legal precedents. It is important that healthcare professionals develop some form of basic undertaking of what this entails. This speaking slot will provide an overview of recent claims involving spinal injuries and will attempt to de-mystify the approach taken by the courts.
AGGRAVATED DAMAGES IN MEDICO-LEGAL MATTERS
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The willingness by the Courts to award Aggravated Damages is poised to change the dynamics and trajectory of medico-legal matters and medico-legal claims.

But wait… Has this always been a risk in medico-legal matters?

Is Malaysia just two decades late?

Is it reasonable to impose aggravated damages when medical mishaps/mistakes manifest into complications?

Just as doctors begin grappling with ever increasing damages, the award of aggravating damages now brings a new element to the management of medico-legal mishaps.

Lapping at the edge of damages is punitive damages and possibly criminal complaints.

What do doctors need to know? How should doctors manage themselves, their practice and their patients? What features of spine practice may open spine doctors to an allegation of aggravated damages.

The session will feature examples from the war zone.
CASE PRESENTATION:
MULTIPLE SPINAL METASTASIS IN RENAL CELL CARCINOMA TREATED WITH MINIMALLY INVASIVE SPINAL STABILISATION AND CIRCUMFERENTIAL DECOMPRESSION FOLLOWED BY STEREOTACTIC BODY RADIATION THERAPY

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BACKGROUND
Conventional open surgery for spinal metastasis is associated with higher morbidities. The advent of minimally invasive percutaneous pedicle screw stabilisation has revolutionised the treatment of spinal metastasis.

REPORT
A 42 year-old lady, was diagnosed with left renal cell carcinoma, complicated with left renal vein thrombosis and posterior wall infiltration. She underwent radical left nephrectomy and lymph node clearance later. Histopathological examination showed clear cell carcinoma.

Three months later, she complained of instability back pain for one month. She denied any neurological deficit or bowel and urinary incontinence. Physical examination revealed mild tenderness at lumbar region with no obvious deformity. Neurological examination was normal. Magnetic resonance imaging of the spine showed L1 to L3 vertebral metastasis, paravertebral mass at L3 extending into the epidural space with spinal stenosis encasing the dural sac and L2/3 nerve root compression. Computed tomography showed an expanding lytic lesion. Spinal Instability Neoplastic Score (SINS) was 7 (indeterminate), Tomita score was 4 (middle term) and Tokuhashi score was 9 (palliative surgery). We proceeded with preoperative spinal artery embolisation and followed by minimally invasive spinal stabilisation (MIST) with percutaneous pedicle screws from T11 to L5 with circumferential decompression at L3 level. Stereotactic Body Radiation Therapy (SBRT) was given one month later. Currently, at three years post-operative, she has a stable disease with no back pain, neurological deficit or implant failure.

CONCLUSION
MIST with circumferential decompression followed by post-operative SBRT is a feasible option for spinal metastasis, providing good pain relief, lower surgical risks with no implant failure.
THE ROLE OF STEREOTACTIC BODY RADIATION THERAPY (SBRT) IN THE MANAGEMENT OF SPINAL METASTASIS

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Stereotactic body radiation therapy (SBRT) has emerged as a novel treatment modality for spinal metastases. Due to advances in radiation therapy delivery technologies, it is now possible to deliver ablative high doses radiation to spinal metastases safely and effectively. Data from the literature has demonstrated high rates of pain and local control with SBRT for spinal metastases. In solitary metastatic tumour, the potential cure rate is high, as well as under a lot of investigations.
ASSESSMENT AND MANAGEMENT OF SPINAL INSTABILITY IN PATIENTS WITH SPINAL METASTASIS

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Spinal instability is defined as loss of stiffness. This is a biomechanical definition of spinal instability. It is a mechanical entity. An unstable spine is a result of the state of the spine is not in a stable state of equilibrium. It is a result of damage or laxity of the restraining structures that altered the equilibrium and stability of the spine. The main aspect of management of spinal instability in patients with spinal metastasis includes diagnosis, treatment and education.

The assessment of the spinal metastasis includes the assessment of the amount of bone destruction, the degree of metastasis and the presence or absence of complications such as hypercalcaemia, spinal instability, vascularity of the lesion, the degree of spinal cord or cauda equina compression, and the degree of soft tissue involvement.

Provided that no contraindication to surgery exists, the decision as to whether the treatment should be surgical will depend on the presence of complications that require surgery such as spinal instability and/or spinal cord or cauda equina compression.
IATROGENIC DURAL INJURY: PREVENTION AND MANAGEMENT

Dharmendra Ganesan

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Dural injury during surgery is not uncommon, particularly in certain conditions such as tight spinal canal and ossified posterior longitudinal ligament (OPLL). In the quest to achieve proper decompression of the canal, dural injury may be a consequence.

We will explore the techniques of prevention of dural injury, eg. teasing the dura, thinning the lamina before removal, small bone ronguer, microscope, etc.

In the event of dural injury, methods that can be employed to repair the spinal dura, eg. prolene suture, synthetic dura, tissue glues, wound drain, lumbar drain, etc.

These options will be discussed as the technique varies and the outcome may differ from case to case.
CERVICAL DISC ARTHROPLASTY: IS IT A FAD OR THE FUTURE?
Abdul Malik Mohamed Hussein
KPJ Damansara Specialist Hospital, Selangor, Malaysia

Based on:

1. Result.
2. Adjacent Disc Degeneration.
3. Heterotopic Ossification (HO).
4. Hybrid mix Artificial and fusion give good outcome.


2. Lower incidence of ADD (Adjacent Disc Degeneration) in the long term.

3. Presence of HO did not affect the long-term outcome.

4. You can mix artificial disc and fusion in the same patient with good outcomes.
IMPORTANCE OF PELVIC PARAMETERS IN FUSION OF THE LUMBAR SPINE

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The pelvis plays an important role in the sagittal balance of the spinal column by its orientation and compensatory mechanism. The current sagittal balance measurements of the spine are defined in relation to the physiologic sacral end plate angle using the pelvic incidence technique by encompassing the measurement of pelvic incidence, sacral slope and pelvic tilt. Theoretical optimum lordosis can be evaluated from the measurement of the pelvic incidence.

Lumbosacral disorders are commonly associated with sagittal imbalance. Whether it is well compensated or not, depends on the ability of the compensatory mechanism within the lumbosacral area and even the lower limbs. These phenomena can translate into a cascade of functional, neurological and mechanical events.

Lumbosacral fusion surgery is one of the mainstay of treatment when non-operative modalities or decompression alone are not successful. Fusion of functional spinal unit make changes to the mobility and biomechanics of the spinal column. Not restoring adequate lumbar lordosis during lumbar fusion surgery may result in mechanical low back pain, further sagittal imbalance due to decompensation and adjacent segment degeneration.

Keywords
Sagittal balance, Pelvic incidence, Lumbar lordosis, Spinal deformity
Scoliosis is a spinal deformity that has complex origins, much of which is still not well-understood. Some natural histories of the scoliosis curves may be altered by bracing; specifically, the deformities that are in evolution, and do not exhibit a vertebral or growth plate issues. In addition to the curves, some rib hump deformity may also be controlled. The issues that confront the practitioner are mainly compliance by the wearer, as it is dose dependent; and the technology of the material the brace is made with.
In painful conditions, it is impossible to observe their natural history without treatment. About 30 years ago, in order to know surgical indications for cervical spondylotic radiculopathy, we simply observed its courses with conservative treatment with NSAIDs ± collar fixation ± Glisson neck traction. The number of patients was 43. They visited us within 2 months after onset and were observed for 13 to 30 months. The severity of symptoms and signs were assessed by our rating system in which the normal score is 20 points.

The mean score of 6.1 point at the first visit improved sharply to 13.1 points (mean recovery rate: 50%) after 4 months but it improved little to 14.9 points (mean recovery rate: 63%) at the last visit. In detail, all 5 patients with 8 points or lower and 9 among 15 patients with 9 to 13 points never improved beyond 13 points. A score of 14 points, for example, might be as follows: mild intermittent neck pain, arm pain and finger paresthesia, minimal sensory loss, mild motor weakness rated as G and diminished tendon reflex.

Based on these observations, a score of 8 points or lower and a score of 9 to 13 points after 4 months should be an indication and a possible indication for surgery, respectively. Because of their serious functional disturbance, however, drop shoulder and drop fingers need to be surgically treated before 4 months if they never respond well to conservative treatment or they show muscle atrophy.
INTRODUCTION

Low Back Pain is a common clinical problem that can arise from many mechanical and non mechanical sources. The optimal treatment involve many disciplines including Orthopaedic, Neurosurgeons, Pain Physician, Rheumatologist, Physiotherapists, Chiropractor, Psychologist/Psychiatrist, and other traditionalists. Each discipline complement each other.

Pain Physicians plays a very important role in managing acute and chronic mechanical low back pain. The treatment philosophy is similar to that of surgeons but differs greatly in these areas :-

1) A biochemical etiology of pain is well-understood and how the drug therapy and physical therapy is used effectively.

2) A high awareness of role of peripheral and central sensitisation is used to modulate pain in a subset of patient with neuropathic pain.

3) Recognition of different causation of pain and its treatment, e.g. Cluneal nerve entrapment syndrome, pyriformis syndrome and autonomic pain.

4) Unique ability to manipulate and treat pathological processes within the spinal canal with the epiduroscope, Racz procedure, Dorsal Root Ganglion Block and spinal cord stimulator.

These topics will be discussed in this presentation.
As surgical correction of congenital scoliosis using halo-pelvic traction was poor, I got an idea of hemivertebra excision, which shortens the spine, and waited for several years for a case simple and reasonable enough to perform as the first case.

In 1977, nine years after my graduation from university, I succeeded in the first hemivertebra excision through a two-stage anterior and posterior approach and fusion using Harrington compression system. The case was a 6-year-old girl with L2 hemivertebra and the upper and lower adjacent vertebral bodies and intervertebral discs causing a 46-degree scoliosis. The scoliosis was corrected to 9 degrees soon after surgery and 7 degrees at 18 years of age.

After the success, I started believing that in principle, shortening osteotomy has many advantages: It can be a one-stage surgery. A better correction is obtained. Smaller instruments are enough for fixation. Fewer segments need to be fused. The fusion takes a shorter time. The correction loss is minimal.

Thereafter, I applied the spine-shortening concept to the following conditions and performed the first surgery for each condition in the year described.

1. Excision of more complicated hemivertebra in 1978.
2. Wedge osteotomy forming hemivertebra in 1989 for balancing the spinal column.
3. Closing posterior wedge osteotomy in 1994 for kyphotic deformities caused by congenital kyphosis, lumbar degenerative kyphosis, post-trauma kyphosis, etc.
OP 1  THE PRESENCE OF TEAR DROP PSOAS MORPHOLOGY PREDISPOSES PATIENTS FOR POST-OPERATIVE PSOAS MUSCLE WEAKNESS AND PAIN DURING OBLIQUE LATERAL LUMBAR INTERBODY FUSION (OLIF)
Mohd Hisam Muhamad Arifin, Azmi Baharudin, Kamalnizat Ibrahim
Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia

OP 2  THE MORPHOMETRIC STUDY OF L2-S1 LUMBAR SPINE USING MAGNETIC RESONANCE IMAGING: FEASIBILITY ANATOMY ANALYSIS FOR OBLIQUE LUMBAR INTERBODY FUSION (OLIF) APPROACH IN MALAY MALAYSIAN POPULATION
Azizul Akram S, Nawawi R, Yusof M I, Joehaimey J
Department of Orthopaedic Surgery, Universiti Sains Malaysia, Kubang Kerian, Kota Bharu, Kelantan, Malaysia

OP 3  UPPER INSTRUMENTED VERTEBRAE (UIV) TILT ANGLE IS AN IMPORTANT POST-OPERATIVE RADIOLOGICAL PARAMETER THAT CORRELATES WITH POST-OPERATIVE NECK AND MEDIAL SHOULDER IMBALANCE
Chris Yin Wei Chan, Chee Kidd Chiu, Xin Yi Ler, Yun Hui Ng, Xue Han Chian, Pheng Hian Tan, Mun Keong Kwan
University of Malaya, Kuala Lumpur, Malaysia

OP 4  PREDICTIVE FACTORS FOR POST-OPERATIVE MEDIAL AND LATERAL SHOULDER IMBALANCE FOLLOWING POSTERIOR SPINAL FUSION (PSF) IN LENKE 1 AND 2 ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS) PATIENTS
Mun Keong Kwan1, Chee Kidd Chiu1, Pheng Hian Tan1, Xue Han Chian1, Xin Yi Ler1, Yun Hui Ng1, Sherwin Johan Ng1, Saw Huan Goh1, YU Yamato2, Tomohiro Banno2, Shin OE2, Yukihiro Matsuyama2, Chris Yin Wei Chan1
1University of Malaya, Kuala Lumpur, Malaysia
2Hamamatsu School of Medicine, Shizuoka, Japan

OP 5  THE CONFORMITY OF RADIOLOGICAL SHOULDER BALANCE PARAMETERS IN ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS) PATIENTS AFTER CORRECTIVE SURGERY
Chee Kidd Chiu, Chris Yin Wei Chan, Saw Huan Goh, Sherwin Johan Ng, Pheng Hian Tan, Xue Han Chian, Yun Hui Ng, Xin Yi Ler, Mun Keong Kwan
University of Malaya, Kuala Lumpur, Malaysia

OP 6  ACCURACY, SAFETY AND DIAGNOSTIC OUTCOME OF PERCUTANEOUS FLUOROSCOPIC VS CT-GUIDED TRANSPEDICULAR CORE NEEDLE BIOPSY FOR SPINAL INFECTIONS AND TUMORS – A PROSPECTIVE RANDOMISED TRIAL
She Ann Lee1, Chee Kidd Chiu1, Chris Yin Wei Chan1, Nur Adura Yaakup1, Jeannie Hsueh Ding Wong2, Khairul Azmi Abdul Kadir2, Mun Keong Kwan1
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THE PRESENCE OF TEAR DROP PSOAS MORPHOLOGY PREDISPOSES PATIENTS FOR POST-OPERATIVE PSOAS MUSCLE WEAKNESS AND PAIN DURING OBLIQUE LATERAL LUMBAR INTERBODY FUSION (OLIF)

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BACKGROUND
OLIF was developed to avoid the complications associated with psoas muscle disruptions and injury to lumbosacral plexus during transpsoas interbody fusion. Despite neuromonitoring, transpsoas approach neurologic complications ranges from 13.8-39.5%. The teardrop psoas morphology at L4/5 is associated with anterior migration of the lumbar plexus and posterolateral migration of iliac vasculature, increasing the risk of neurovascular injury in lateral approach.

OBJECTIVE
We hypothesise this teardrop psoas morphology is associated with higher risk of vascular injury, psoas muscle dysfunction or neurologic injury post operatively even in OLIF.

METHODS
Between June 2016 - December 2017, 43 patients underwent OLIF for lumbar degenerative disc disease. We exclude adjacent segment disease, adult onset scoliosis and when MRI wasn’t done at our centre. MRI of 28 patients were analysed for the presence of teardrop psoas. A standard microsurgical mini-open oblique lateral retroperitoneal approach, directs visualisation anterior border of psoas and dissection before placing tubular retractors and disc preparations for inter body fusion was performed. Intra-operative neuromonitoring was normal in every patient.

RESULTS
We identified 6/28(21.4%) teardrop psoas morphology at L4/5. 50% patients with tear drop psoas developed post-operative psoas dysfunction or neurologic injury in contrast to only 9% (2/22) when its absent (p=0.05). No cases of vascular injury.

CONCLUSION
In the presence of teardrop shaped psoas, the incidence of post operative psoas dysfunction or neurologic injury is 50%(p=0.05). Carefully look for this variant pre-operatively and consider alternative fusion technique if risk is unacceptable.
THE MORPHOMETRIC STUDY OF L2-S1 LUMBAR SPINE USING MAGNETIC RESONANCE IMAGING: FEASIBILITY ANATOMY ANALYSIS FOR OBLIQUE LUMBAR INTERBODY FUSION (OLIF) APPROACH IN MALAY MALAYSIAN POPULATION

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BACKGROUND

Oblique Lumbar interbody fusion (OLIF) approach, one of the minimally invasive spine surgery (MISS) approaches was recently introduced in lumbar fusion surgery. To date, there was no proper feasibility analyses exist to evaluate anatomy features that complicated this new approach especially in our Asian population.

OBJECTIVE

To determine feasibility anatomy features that may complicate OLIF surgical approach in Malay Malaysian population.

METHODS

Cross-sectional study with 110 patients presented for lumbar spine assessment. Distance between anterior plane of disc and anterior plane of psoas muscle (PDP), lateral border of aorta and anteromedial border of psoas muscle (PAP), mid-sagittal line of the inferior end plate of L5 to medial border of the left common iliac vessels, and the distance between attachment of the psoas muscle and posterior border of the inferior vena cava (IVC)/common iliac vein (PVP) was taken via magnetic resonance image.

RESULTS

Approximately 6% of the patients have psoas muscle located anteriorly to anterior disc at L3-L4, 30% at L4-L5 with significantly larger found in male patients. Smallest oblique corridor was found at L4-L5 level, with incidence of 41% for both genders. IVC was located posteriorly to psoas attachment (PVP) in 16% of cases.

CONCLUSIONS

The anatomic features complicating the oblique lumbar approach to L2-S1 were observed in about 30-40%. In 16% of the cases, special care would be required to avoid the IVC injury during cage insertion, as these patient the IVC was posterior to attachment of psoas muscle.
UPPER INSTRUMENTED VERTEBRAE (UIV) TILT ANGLE IS AN IMPORTANT POST-OPERATIVE RADIOLOGICAL PARAMETER THAT CORRELATES WITH POST-OPERATIVE NECK AND MEDIAL SHOULDER IMBALANCE

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BACKGROUND
Studies found that current recommendations for UIV selection were not predictive of good post-operative shoulder balance.

OBJECTIVE
To investigate the association between post-operative UIV tilt angle with post-operative medial shoulder and neck balance.

METHODS
98 AIS patients with Lenke 1/2 curves who underwent PSF were recruited. UIV Tilt Angle, T1 Tilt, Cervical Axis and Clavicle Angle were measured pre-operatively, post-operatively and at final follow-up.

RESULTS
Mean follow-up was 37.9 ± 6.5 months. Significant factors affecting post-operative T1 Tilt were post-operative UIV Tilt Angle, pre-operative T1 Tilt and pre-operative UIV Tilt Angle. Post-operative UIV Tilt Angle and pre-operative Cervical Axis were significant factors affecting Cervical Axis at final follow up. UIV level was not significant independent factor that affected post-operative T1 Tilt and Cervical Axis. There was strong correlation between post-operative UIV Tilt Angle and T1 Tilt for the whole cohort (p< 0.001), when UIV was at T2 (p<0.001), T3(p<0.001) and T4 (p<0.001). Post-operative UIV Tilt Angle also had significant correlation with Cervical Axis when UIV was at T2 (p=0.021) and T3(p=0.009).

CONCLUSIONS
Post-operative UIV Tilt Angle was an independent factor that had significant correlation with post-operative T1-Tilt and Cervical Axis measurement. There was strong correlation between post-operative UIV Tilt Angle and T1-Tilt for the whole cohort, when UIV was at T3 and T4. There was very strong correlation between post-operative UIV Tilt Angle and T1-Tilt when UIV was at T2. There was also moderate and significant correlation between post-operative UIV Tilt Angle and Cervical Axis for the whole cohort.
PREDICTIVE FACTORS FOR POST-OPERATIVE MEDIAL AND LATERAL SHOULDER IMBALANCE FOLLOWING POSTERIOR SPINAL FUSION (PSF) IN LENKE 1 AND 2 ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS) PATIENTS

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BACKGROUND
Post-operative Shoulder Imbalance (PSI) had been found to affect post-operative patient satisfaction and was reported to occur in 6.7% to 55.4% of AIS patients. Authors have reported that medial and lateral shoulder imbalance is distinct phenomenon.

OBJECTIVE
To identify the factors that would affect medial and lateral shoulder imbalance following PSF in Lenke 1 and 2 AIS patients.

METHODS
This study was carried out in 2 tertiary institution in Malaysia and Japan between 2011 and 2015. 153 Lenke 1 and 2 AIS patients who underwent PSF were recruited.

RESULTS
There were significant positive relationship found between pre-operative T1 Tilt (p<0.001,r=0.66) and Follow Up PT Cobb with Post-operative T1 Tilt (p<0.001,r=0.42), Postop PT Cobb with Post-op CA (p<0.001,r=0.32), MT Flexibility/PT Flexibility with Post-op RSH (p=0.036,r=-0.16). There were significant negative relationship between Preop MT Cobb SB (p=0.006,r=-0.23) and PT Correction Rate (p=0.041,r=-0.13) with postop RSH. When T1 Tilt was stratified into balanced/imbalanced group, the following parameters: Lenke Type, Preop PT Cobb, Preop MT Cobb, Preop PT side bending Cobb, Preop T1 and FU PT Cobb showed significant intergroup differences. When CA was stratified into balanced/imbalanced group, the following parameters: Preop CA and FU PT Cobb showed significant intergroup differences (p<0.05). For RSH, only follow up MT Cobb showed significant intergroup differences (p<0.05).

CONCLUSIONS
Pre-op T1 tilt had strong correlation to postop T1 tilt. Higher residual PT cobb angle was correlated with post-operative T1 tilt and CA. Preop MTSB angle, PT correction rate and MT/PT flexibility had weak correlation with post-op RSH.
THE CONFORMITY OF RADIOLOGICAL SHOULDER BALANCE PARAMETERS IN ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS) PATIENTS AFTER CORRECTIVE SURGERY

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INTRODUCTION
There are several radiological parameters used to assess shoulder balance after corrective surgery for AIS. However, there were no reports on their measurement conformity when measurements were done repeatedly during the follow-up period.

OBJECTIVE
To investigate the conformity of radiological shoulder balance parameters in AIS patients.

METHODS
50 AIS patients who had corrective surgery were recruited. Radiological parameters on the anterior posterior standing radiographs were measured. The parameters were radiological shoulder height, clavicle angle, coracoid height difference, clavicle rib intersection distance, cervical axis angle and T1 tilt angle. These parameters were measured four times on the same patient at different occasions during post-operative follow up at 3, 6, 12 and 24 months.

RESULTS
There were 38 female patients and 12 male patients with the mean age of 16.3±7.0. The mean Cobb angle was 61.3±23.7°. We found that radiological shoulder height and clavicle angle had poor conformity with significant interclass correlation (ICC) values of less than 0.40 (p<0.05). The coracoid height difference, clavicle rib intersection distance and cervical axis angle had fair conformity with ICC between 0.40-0.59 (p < 0.05). T1 tilt angle had excellent conformity with ICC of 0.78 (p < 0.05).

CONCLUSIONS
Radiological shoulder height and clavicle angle were poor parameters to assess the shoulder balance post-operatively. T1 tilt angle was the best parameter to measure the post-operative shoulder balance and had excellent conformity on 3, 6, 12 and 24 months follow-up.
ACCURACY, SAFETY AND DIAGNOSTIC OUTCOME OF PERCUTANEOUS FLUOROSCOPIC VS CT-GUIDED TRANSPEDICULAR CORE NEEDLE BIOPSY FOR SPINAL INFECTIONS AND TUMORS – A PROSPECTIVE RANDOMISED TRIAL

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BACKGROUND

Spinal biopsy is important to obtain culture and histopathological diagnosis in spine infections and tumors.

OBJECTIVE

This study evaluated the accuracy, safety and diagnostic outcome of fluoroscopic guided and Computed Tomography (CT) transpedicular biopsy techniques.

METHODS

A prospective randomised trial was performed in 60 patients divided into fluoroscopic and CT-guided spinal biopsy groups. Transpedicular approach was done with 8G core biopsy needle. Diagnosis were made based on biopsy results, clinical criteria and disease progression during six months follow-up. Radiation expose to patients and doctors were measured with optically stimulated luminescence dosimeters (OSLDs).

RESULTS

There was no significant difference between the diagnostic accuracy of both fluoroscopic and CT-guided spinal biopsy (p=0.67) and between diagnostic accuracy of spinal infection and spinal tumor in both group (p=0.402 for fluoroscopy group and p=0.223 for CT group). Radiation dose exposed to patients and doctors was approximately 26 times and 2 times higher in CT group respectively without lead protection. Lead shield significantly reduced the radiation exposure of doctors approximately 2 to 8 times. No complications were observed for both groups and the differences in post-biopsy pain scores were insignificant.

CONCLUSIONS

The accuracy rate, operative time, complication rate and pain score for both fluoroscopic and CT-guided spinal biopsy were similar. However, the radiation dose exposed to patients and doctors were significantly higher in CT group without the lead apron and thyroid shield. With the use of lead protection, radiation exposed to doctors were reduced significantly.
### FP 1 CERVICAL SPONDYLOTIC RADICULOPATHY – THE ROLE OF CONSERVATIVE MANAGEMENT

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### FP 2 DOES TRANSVERSE DIAMETER OF THE CERVICAL SPINAL CANAL PLAY A ROLE ON CSM DEVELOPMENT?

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### FP 3 COMPLICATIONS ASSOCIATED WITH OBLIQUE LATERAL INTERBODY FUSION L5/S1 PERFORMED WITHOUT AN ACCESS SURGEON

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### FP 4 SURGICAL OUTCOME OF PERCUTANEOUS STENOSCOPIC LUMBAR DECOMPRESSION

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### FP 5 INTRA-OPERATIVE NERVE MONITORING IN TREATING SPINE TUMORS

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### FP 6 2-YEAR RADIOLOGICAL OUTCOME STUDY OF ADOLESCENT IDIOPATHIC LUMBAR SCOLIOSIS TREATED WITH SHORT SEGMENT ANTERIOR FUSION

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### FP 7 PERIOPERATIVE OUTCOME OF SEVERE ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS) (COBB ANGLE > 90°) UTILISING A DUAL ATTENDING SURGEON STRATEGY

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CERVICAL SPONDYLOTIC RADICULOPATHY –
THE ROLE OF CONSERVATIVE MANAGEMENT

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BACKGROUND
Cervical spondylotic radiculopathy is common and most patients experiencing an acute episode of unilateral radiculopathy without major motor deficit and no evidence of cord compression can be managed by non-operative measures.

OBJECTIVE
This study aimed to determine the severity of degenerative changes on plain radiograph among patients with cervical spondylotic radiculopathy and patients’ rated outcomes following conservative treatment. It will also study the correlation between pain and disability of patients with severity of degenerative changes of the cervical spine and different level of root compression among them.

MATERIALS AND METHODS
An observative cohort study where all patients with a clinical diagnosis of cervical spondylotic radiculopathy were recruited from Dec 2016 to Jan 2018. Patients rated pain score and neck disability index at presentation and three months after conservative treatment were evaluated. Demographic data, radiographic severity grade, neck disability index and pain score were analyzed via Pearson correlation test to determine the correlation after conservative management.

RESULT
There were total of 29 patients, with mean age of 49 years old. In this study, 41% patients had Grade 2 radiographic severity changes. Patients’ rated outcomes with neck disability index (NDI) and pain score showed moderate improvement after conservative treatment with Pearson Correlation (r = 0.523). There is statistically significant correlation between pain score and NDI (p-value <0.001). However, there are no statistically significantly between radiographic severity grade and pain score and patient rated outcome of neck disability index.

CONCLUSION
Patient with cervical spondylotic radiculopathy who treated conservatively show favorable clinical outcome.
DOES TRANSVERSE DIAMETER OF THE CERVICAL SPINAL CANAL PLAY A ROLE ON CSM DEVELOPMENT?

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OBJECTIVES
Cervical spondylotic myelopathy (CSM) is the most common cause of spinal cord dysfunction. It may manifest itself with asymptomatic or severe symptoms. It is important to clarify the risk factors that may lead to the disease because it is an insidious disease. For this purpose, we investigated whether the transverse diameter of the spinal canal had an effect on the development of CSM by comparing the canal diameters of patients who underwent surgery for CSM with healthy individuals.

MATERIAL AND METHODS
20 men and 20 female patients who were operated for CSM in the last two years at of Izmir Katip Çelebi Hospital were randomly selected. Anterior-posterior and transverse diameters of the corpus mid-points were measured digitally. The results were compared with the cervical spinal canal diameters of our Anatolian society (200 patients). The data was evaluated in the statistical package program SPSS.

RESULTS
The mean age of the CSM group (20 E-20 K) was 52 ± 9.3 while the average age of the healthy group (100 E-100K) was 51 ± 19. Spinal canal anteroposterior diameters of the CSM group were measured as 10.03 and 12.2 (Fig. 1). The transverse diameter of the canal ranged from 19.62 to 26.93 (Fig. 2). (Table 1).

CONCLUSION
The transvers diameter of CSM patients was not significantly different from the healthy subjects.
COMPLICATIONS ASSOCIATED WITH OBLIQUE LATERAL INTERBODY FUSION L5/S1 PERFORMED WITHOUT AN ACCESS SURGEON

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BACKGROUND
Oblique Lateral Interbody Fusion (OLIF) L5/S1 is essentially an Anterior Lumbar Interbody Fusion performed between the bifurcation of the internal iliac vessels in lateral position, traditionally with help of an access or vascular surgeon. Main risk involved is still vascular injury and the superior hypogastric plexus injury.

OBJECTIVES
Prospective study to assess the intra and peri-operative complications associated with OLIF L5/S1 without an access surgeon.

METHODS
Between June 2016 - October 2017, 13 patients (7 males, 6 females) underwent OLIF L5/S1 (6 isolated L5/S1 fusion, 7 multilevel fusion). All procedures were performed through an oblique incision magnified by loupe or surgical microscope. The abdominal muscles were split, retroperitoneal space entered by blunt dissection, direct visualisation and positive identification of the left ureter, left psoas, internal iliac artery, vein and disc space made before their mobilisation and retraction. Finally, standard discectomy performed and inter body fusion cage inserted. The patients were then flipped posteriorly for percutaneous pedicle screw insertion.

RESULTS
Average operating time 37 minutes (25-55 minutes). We had one lacerated left internal iliac with 800mls blood loss, otherwise blood loss range 30-100mls. No approach related injury to the ureters, bladder, inadvertent entry into peritoneal cavity, bowel injury or arterial injury. No post operative neurologic deficit, hip flexion pain, infection, wound dehiscence, incisional hernia, DVT, cage dislocation/migration, secondary haemorrhage or reoperation. No case of retrograde ejaculation.

CONCLUSIONS
Performing OLIF L5/S1 is safe without an access surgeon. Vascular injury remains the main threat involved.
SURGICAL OUTCOME OF PERCUTANEOUS STENOSCOPIC LUMBAR DECOMPRESSION

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BACKGROUND

Percutaneous Stenoscopic Lumbar Discectomy (PSLD) is a minimally invasive surgical technique utilising interlaminar approach for discectomy or decompression. The surgical approach is similar to a traditional mid-line discectomy or decompression. Other advantages include better visualisation through magnification and a wider range of surgical field through angulation and rotation of the endoscope. PSLD also allows multi-level decompression through a small (10mm) single incision.

OBJECTIVE

Description of surgical technique, patient outcome and complications.

METHODS

Case series.

RESULTS

Seventeen patients were operated from May 2017 until February 2018. Eleven patients underwent discectomy and six patients underwent decompression. Fifteen were single leveled and two were two-leveled surgeries. Complications encountered were one rootlet tear and two mid-line dural tears which were repair through open surgery at the same sitting.

CONCLUSION

PSLD is an excellent option to conventional open surgery but it has a steep learning curve.
INTRA-OPERATIVE NERVE MONITORING IN TREATING SPINE TUMORS

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BACKGROUND
Spine tumors possess high morbidity and poor patient outcome due to the complexity of its presentation. Types of tumors are intradural extramedullary (IDEM), intradural intramedullary (IDIM) and extradural (ED).

OBJECTIVE
A review on the requirement of intraoperative nerve monitoring (IONM) in treating spinal tumors.

METHODS
All patients with spine tumors admitted to the Department Of Neurosurgery, Hospital Queen Elizabeth II between 1st April, 2015 and 31st March, 2018 were included. Patients’ records were reviewed and analysed for usage of IONM and patient outcome. Due to departmental financial burden, IONM is only used for IDIM tumor if the patient pays the cost.

RESULTS
A total of 56 patients with spine tumors were operated and out of this 6 patients required the usage of IONM. 36 patients presented with IDEM tumors, 12 with ED tumors and 8 with IDIM tumors. All 6 patients with IONM usage had better Glasgow Outcome Score compared to patients operated without IONM. As for the IDEM and ED tumor patients, all had good recovery without the usage of IONM.

CONCLUSIONS
IONM have proven to be beneficial in the surgical removal of IDIM tumors of the spinal cord although it is considered challenging and believed to carry a significant risk for surgical damage. As for IDEM and ED tumors, a thorough knowledge of surgical anatomy is adequate for good surgical outcome. This helps to reduce the financial burden of requiring an IONM for every spine tumor cases which is unnecessary.
2-YEAR RADIOLOGICAL OUTCOME STUDY OF ADOLESCENT IDIOPATHIC LUMBAR SCOLIOSIS TREATED WITH SHORT SEGMENT ANTERIOR FUSION

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INTRODUCTION
Anterior spinal fusion was historically preferred in treatment for Lenke 5C curves in adolescent idiopathic scoliosis because of better curve correction, powerful derotation while preserving more motion segments. The benefit of saving distal motion segment and preventing denervation of the powerful paraspinal muscles is still a valid reason to approach from anterior. We present our experience in treating these selected group of patients with short segment fusion using monoaxial pedicle screws with staples and a one-rod system.

MATERIAL AND METHODS
We retrospectively reviewed patients with adolescent idiopathic scoliosis (Lenke 5) that was treated with short segment anterior fusion surgery at a single centre from 2012-2015. The radiographs were assessed preoperatively then post-operatively at two years. Results were analysed using statistical analysis (SPSS).

RESULTS
There were ten patients, who underwent anterior lumbar fusion from T12 –L3, except one patient who was fused from T12 to L2. The average pre-op Lumbar Cobb angle was 53.8 degrees and was corrected to 18.4 post-operatively, producing a correction rate of 65%. The fulcrum flexibility rate was 44% (p value < 0.05). The fulcrum bending correction index was 104%. (p value < 0.05). At the two year follow up, there was no incidence of significant progression of the lumbar curve and the thoracic non-structural curve.

CONCLUSION
Short segment lumbar fusion surgery may be a good option to treat Lenke 5 lumbar curves. There were no long-term radiological evidence of curve progression seen at two years.
PERIOPERATIVE OUTCOME OF SEVERE ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS) (COBB ANGLE > 90°) UTILISING A DUAL ATTENDING SURGEON STRATEGY

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INTRODUCTION
Dual attending surgeon strategy in AIS was shown to reduce blood loss, shorten operating time and led to faster patient recovery.

OBJECTIVE
To evaluate the perioperative outcome of dual attending surgeon strategy for severe AIS patients with Cobb angle ≥ 90°.

METHODS
The patients were stratified into two groups, Cobb angles 91°-100°(Group 1) and >100°(Group 2). Perioperative outcome measures that were recorded included operative time, blood loss, need for allogenic blood transfusion, postoperative haemoglobin, total PCA morphine usage, and length of stay.

RESULTS
85 patients were recruited. The majority of the patients were Lenke 2 curves (60%) with the average Cobb angle of 103.7 ± 12.6°. The average operative time was 198.5 ± 47.5 minutes with an average blood loss of 1699.5 ± 939.3 mL. The allogeneic blood transfusion rate was 17.6%. Average length of stay postoperatively was 71.6 ± 22.5 hours. Comparing the patients between Group 1 and Group 2, the operating time, total blood loss, allogeneic transfusion rate showed significant difference in Group 2. Five complications were documented: 1 intra operative seizure, 1 massive blood loss, 1 intra-operative loss of SSEP signal and 2 superficial wound breakdown.

CONCLUSIONS
Dual attending surgeon strategy in PSF for severe AIS led to an average operative time of 199 minutes and blood loss of 1.7L, with 17.6% of patients requiring allogenic blood transfusion. Patients with Cobb angle >100° had a significant longer operating time and greater blood loss compared to patients with Cobb angle 91-100°.
FP 8 DEFINING TWO SUBTYPES OF LENKE 1 CURVE: AN ANALYSIS OF PRE-OPERATIVE SHOULDER BALANCE AND POST-OPERATIVE OUTCOME FOLLOWING POSTERIOR SPINAL FUSION (PSF) IN ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS) PATIENTS
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FP 9 HOW COMMON IS PRE-OPERATIVE MEDIAL AND LATERAL SHOULDER DISCORDANCE IN LENKE 1 AND 2 CURVES? AN ANALYSIS OF SHOULDER BALANCE AMONG 151 AIS PATIENTS
Chris Yin Wei Chan, Chee Kidd Chiu, Sherwin Johan Ng, Saw Huan Goh, Xin Yi Ler, Yun Hui Ng, Mun Keong Kwan
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FP 10 DOES MEDIAL AND LATERAL SHOULDER DISCORDANCE AFFECT POST-OPERATIVE SHOULDER BALANCE FOLLOWING POSTERIOR SPINAL FUSION?
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FP 11 DOES THE SEVERITY OF THE CURVE (LENKE 1 & 2) AFFECT THE DISTANCE OF THE AORTA TO THE VERTEBRA?
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FP 12 THE COMPARISON BETWEEN CERVICAL SUPINE SIDE BENDING VERSUS CERVICAL SUPINE TRACTION RADIOGRAPHS IN PREDICTING PROXIMAL THORACIC FLEXIBILITY FOR LENKE 1 AND 2 ADOLESCENT IDIOPATHIC SCOLIOSIS
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FP 13 MINIMALLY INVASIVE FRACTURE REDUCTION USING MONOAXIAL PERCUTANEOUS PEDICLE SCREWS IN THORACOLUMBAR BURST FRACTURE: SURGICAL TECHNIQUE AND PRELIMINARY REPORT OF RADIOLOGICAL OUTCOME
Weng Hong Chung, Wei Cheong Eu, Chee Kidd Chiu, Chris Yin Wei Chan, Siti Mariam Abd Gani, Mun Keong Kwan
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FP 14  DEFINING TWO SUBTYPES OF LENKE 5 ADOLESCENT IDIOPATHIC SCOLIOSIS PATIENTS UNDERGOING POSTERIOR SPINAL FUSION
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FP 15  THE OUTCOME OF OPERATIVE TREATMENT MODALITIES IN PATIENTS WITH SPINAL METASTASES
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DEFINING TWO SUBTYPES OF LENKE 1 CURVE: AN ANALYSIS OF PRE-OPERATIVE SHOULDER BALANCE AND POST-OPERATIVE OUTCOME FOLLOWING POSTERIOR SPINAL FUSION (PSF) IN ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS) PATIENTS

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BACKGROUND
UIV selection in Lenke 1 curves is controversial with 55.4% of patients experience postoperative shoulder imbalance (PSI).

OBJECTIVE
To compare Lenke 1–ve (flexible) and Lenke 1+ve (stiff) by preoperative, postoperative and follow-up radiological parameters (curve characteristics and shoulder balance).

METHODS
111 Lenke 1 AIS patients who underwent PSF were recruited, grouped patients as Lenke 1 –ve (flexible) curves when their preoperative Proximal Thoracic Side Bending (PTSB) Cobb angle was <15°, and as Lenke 1 +ve (stiff) curves when the PTSB Cobb angle was 15° to 24.9°. Fifty patients were Lenke 1-ve curves and 61 were Lenke 1 +ve.

RESULTS
A significant difference found between Lenke 1–ve vs. Lenke 1+ve subtypes for pre-operative T1 tilt and CA measurements. Mean T1 tilt for Lenke 1-ve patients was -4.9 ± 5.3 while for Lenke 1+ve patients was -1.0±5.3. Mean CA were -0.1±3.2 (Lenke 1-ve) and 2.3±3.5 (Lenke 1+ve). RSH and Cla-A were similar in these two groups. Following surgery, there were significant differences comparing T1 tilt (p<0.001), RSH (p=0.019) and CA (p=0.029). 40.0% of patients with Lenke 1 +ve curve types had +ve T1 tilt compared to 2.0% in Lenke 1 –ve group. 22.4% of Lenke 1+ve patients had +ve RSH compared to 10.2% for Lenke 1 –ve curves. 22.0% of Lenke 1+ve patients had +ve Cla-A compared to 8.2% for Lenke 1 –ve curves.

CONCLUSIONS
Lenke 1-ve and Lenke 1+ve curves had distinct pre-operative T1 tilt and CA and post-operative RSH and CA found significant.
HOW COMMON IS PRE-OPERATIVE MEDIAL AND LATERAL SHOULDER DISCORDANCE IN LENKE 1 AND 2 CURVES? AN ANALYSIS OF SHOULDER BALANCE AMONG 151 AIS PATIENTS

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BACKGROUND
Postoperative shoulder imbalance (PSI) is still common in Lenke 1 and 2 AIS. This could be due to presence of medial dan lateral shoulder discordance.

OBJECTIVE
To analyse the incidence and patterns of medial and lateral shoulder discordance among Lenke 1 and 2 patients.

METHODS
151 patients with Lenke 1 and 2 AIS were recruited. Lenke 1 were sub-classified into Lenke 1-ve (PTSB Cobb angle<15˚) and 1+ve (PTSB Cobb angle between 15˚ to 24.9˚). T1 tilt represented “medial shoulder balance” and Radiological Shoulder Height (RSH) represented “lateral shoulder balance”. Patients were stratified into 3 concordant shoulder pattern types - Medial Balanced/Lateral Balanced (MB/LB), Medial Imbalanced +ve/ Lateral Imbalanced +ve (MI+ve/LI+ve), Medial Imbalanced -ve/Lateral Imbalanced -ve (MI-ve/LI-ve) and 6 discordant shoulder types.

RESULTS
81 patients (53.6%) had concordant patterns and 70 patients (46.4%) with discordant patterns. Lateral shoulder imbalance was 35.1% and medial shoulder imbalance was 43.7%. In Lenke 1-ve curves, 35 patients (68.6%) had concordant imbalance with Medial Imbalanced -ve/ Lateral Imbalanced -ve (MI-ve/LI-ve) being the commonest (68.6%). In Lenke 1+ve curves, 33 patients (55.0%) had concordant patterns with Medial Balanced/ Lateral Balanced (MB/LB) being the commonest type (57.6%). In Lenke 2 AIS, 27 patients (67.5%) were discordant with Medial Imbalanced +ve/ Lateral Balanced (MI+ve/LB) being the commonest pattern (44.4%) (p-value = 0.002).

CONCLUSIONS
Preoperative medial and lateral shoulder discordance was present in 46.4% of Lenke 1/2 patients. There was significant difference in the incidence and pattern of shoulder discordance among Lenke 1-ve vs. Lenke 1+ve vs. Lenke 2 curves.
DOES MEDIAL AND LATERAL SHOULDER DISCORDANCE AFFECT POST-OPERATIVE SHOULDER BALANCE FOLLOWING POSTERIOR SPINAL FUSION?

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BACKGROUND
Recently authors have reported medial and lateral shoulder discordance as a common phenomenon. The effect of shoulder discordance on postoperative shoulder balance among AIS patients is still unknown.

OBJECTIVES
To determine the correlation between postoperative shoulder balance with shoulder discordance.

METHODS
151 AIS patients with Lenke 1/2 curves who underwent posterior spinal fusion between 2013 and 2015 (minimum follow up of two years) were recruited. Medial Balanced (MB) shoulder is -3°≤T1 tilt≤ +3°, Medial Imbalance (MI) was further stratified into positive (MI+ve) and negative (MI-ve) based on the direction of the T1 tilt. Lateral Balanced (LB) shoulder is -10mm<RSH<+10mm, Lateral Imbalance (LI) was stratified to LI+ve and LI-ve. LI+ve was when the left shoulder was higher.

RESULTS
Pre-operative shoulder discordance were among 70/151 (46.4%) AIS patients and they had medial and lateral shoulder discordance. 61 (40.4%) patients had balanced medial and lateral shoulder. Pre-operative shoulder discordance had no significant correlation with post-operative shoulder balance (p>0.05). Pre-operative shoulder discordance did not influence the occurrence of post-operative shoulder discordance (p>0.05). Among 67 patients (44.3%) with MB pre-operatively, 40 (59.7%) will have MB post-operatively and 22 (32.8%) will have MI+ve. This was not affected by presence of shoulder discordance (p>0.05). For lateral shoulder balance, the majority of patients (54.3%) had pre-operative LI-ve. Following surgery, 98 (64.9%) obtained LB. This was also not affected by the presence of shoulder discordance (p>0.05).

CONCLUSIONS
Pre-operative shoulder discordance had no significant correlation with post-operative shoulder balance and did not influence the occurrence of post-operative shoulder discordance.
DOES THE SEVERITY OF THE CURVE (LENKE 1 & 2) AFFECT THE DISTANCE OF THE AORTA TO THE VERTEBRA?

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INTRODUCTION
There were no reports on the variation of the distance of the aorta to the vertebra in relation to the magnitude of the main thoracic Cobb angle for AIS patients.

OBJECTIVE
To describe the anatomy of the aorta in Lenke 1 and 2 patients with different curve severities.

METHODS
39 AIS patients with Lenke type 1 and 2 who had pre-operative CT scan were recruited. Pre-operative CT scans in supine position were reconstructed using the MIMICS programme. The aorta-vertebra distance (AD), defined as the shortest distance between the aorta and the vertebra, were measured.

RESULTS
There were 33 female patients and 6 male patients with the mean age of 16.2 ± 3.6. The AD ranged from 2.1mm to 5.1mm, with the shortest at L1 and the longest at T8. The aorta was found to be very near the vertebra (2-3mm) at T5, T12, L1, L2 and L3. The aorta was found to be further away (more than 4mm) at the apical region (T7 to T10). There were significant positive correlations between the magnitude of the main thoracic Cobb angle and the AD from T8 to T12 (p<0.05). The correlations were weak (r < 0.5) at T8, T9 and T11, and were moderate (r < 0.7) at T10 and T12.

CONCLUSIONS
The aorta is located very near to the vertebral body (2.1-5.1mm) and the Aortic Vertebral Distance is positively correlated with severity of Cobb angle in Lenke 1 and 2 AIS patients.
THE COMPARISON BETWEEN CERVICAL SUPINE SIDE BENDING VERSUS CERVICAL SUPINE TRACTION RADIOGRAPHS IN PREDICTING PROXIMAL THORACIC FLEXIBILITY FOR LENKE 1 AND 2 ADOLESCENT IDIOPATHIC SCOLIOSIS

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BACKGROUND
Cervical Supine Traction (CST) radiographs are widely used to assess proximal thoracic flexibility in adolescent idiopathic scoliosis (AIS) patients. However, there were no reports comparing Cervical Supine Side Bending (CSSB) and CST radiographs in the assessment of this parameter. The knowledge regarding the proximal thoracic flexibility is crucial in surgical planning.

OBJECTIVE
This study compared between (CSSB) radiographs and (CST) radiographs in their ability to assess flexibility of the proximal thoracic curve for (AIS) Lenke 1 and 2 patients who underwent posterior spinal fusion (PSF) surgery.

METHODS
Thirty patients scheduled for PSF surgery were recruited. A standing whole spine radiograph, a physician supervised CSSB radiograph (which included the cervical and proximal thoracic segment) and a supervised CST radiograph (using a Halter traction device) were performed. The main thoracic Cobb angle and proximal thoracic Cobb angle were measured. After PSF surgery, these parameters were re-measured and recorded. From the data collected, curve flexibility and curve correction index were calculated and compared.

RESULTS
The CSSB Cobb angle (16.6±10.4) was significantly lower than CST cobb angle (23.8±10). The CSSB flexibility (45.4±20.0) was significantly higher than CST flexibility (21.1±17.6). The CSSB Correction Index was closer to 1 compared to CST Correction Index. When stratified into Cobb angle < 25°, 25° - 35° and > 35°, all parameters showed significant difference except correction index when Cobb angle was less than 25°.

CONCLUSIONS
CSSB radiographs were more accurate than CST radiographs in the prediction of proximal thoracic curve correction for Lenke 1 and 2 AIS.
MINIMALLY INVASIVE FRACTURE REDUCTION USING MONOAXIAL PERCUTANEOUS PEDICLE SCREWS IN THORACOLUMBAR BURST FRACTURE: SURGICAL TECHNIQUE AND PRELIMINARY REPORT OF RADIOLOGICAL OUTCOME

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BACKGROUND
Minimally invasive spine surgery has revolutionised the treatment of thoracolumbar fractures compared to conventional open surgery in terms of intra-operative blood loss and operative time.

OBJECTIVES
To describe the reduction technique of thoracolumbar burst fracture using percutaneous monoaxial screws and its radiological outcomes compared to polyaxial screws.

METHODS
All surgeries were performed by minimally invasive technique with percutaneous monoaxial screws inserted at adjacent fracture levels perpendicular to both superior end plates. Fracture reduction is achieved with adequate rod contouring and distraction maneuver. Radiological parameters were measured during pre-operation, post-operation and follow-up.

RESULTS
21 patients were included. 11 patients were performed with monoaxial pedicle screws and 10 patients performed with polyaxial pedicle screws. Based on AO Thoracolumbar Classification System, 10 patients in monoaxial group had A3 fracture type and 1 had A4. In polyaxial group, 6 patients had A3 and 4 patients had A4. Total correction of anterior vertebral height ratio (AVH) was 0.30 ± 0.10 and 0.08 ± 0.07 in monoaxial and polyaxial group, respectively (P = 0.000). Total correction of posterior vertebral height ratio (PVH) was 0.11 ± 0.05 and 0.02 ± 0.02 in monoaxial and polyaxial group, respectively (P = 0.000). Monoaxial group achieved more correction of 13° (62.6%) in local kyphotic angle compared to 8.2° (48.0%) in polyaxial group. Similarly, in regional kyphotic angle, 16.5°(103.1%) in monoaxial group and 8.1°(76.4%) in polyaxial group.

CONCLUSION
Monoaxial percutaneous pedicle screws inserted at adjacent fracture levels provides significantly better fracture reduction compared to polyaxial screws in thoracolumbar fractures.
DEFINING TWO SUBTYPES OF LENKE 5 ADOLESCENT IDIOPATHIC SCOLIOSIS PATIENTS UNDERGOING POSTERIOR SPINAL FUSION

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BACKGROUND

Coronal imbalance following posterior spinal fusion (PSF) in Lenke 5 Adolescent Idiopathic Scoliosis (AIS) is common which results in unnecessary revision surgeries requiring extension to the thoracic spine. To date, there is no consensus in upper-instrumented vertebra (UIV) selection in Lenke 5 AIS.

OBJECTIVES

To define 2 subtypes of Lenke 5 AIS: Lenke 5-ve (flexible) and Lenke 5+ve (stiff), by comparing their pre-operative and final follow-up radiological outcomes.

METHODS

This was a retrospective study involving 80 Lenke 5 AIS patients with minimum follow up of 24 months. We categorised patients as Lenke 5-ve (flexible) curves when pre-operative Main Thoracic Side Bending (MTSB) Cobb angle was <15°, and as Lenke 5+ve (stiff) curves when MTSB Cobb angle was 15° to 24.9°, with 40 patients in each group.

RESULTS

There was significant difference in UIV selection (p=0.003) and number of fusion levels (p<0.001) between both groups. In Lenke 5-ve, the commonest UIV were T9 dan T10 (25.0% each), followed by T11 (22.5%) and T6 (15.0%). In Lenke 5+ve, the commonest UIV was T6 (30.0%), T5 (10.0%), T8 (10.0%) and T4 (7.5%). Lenke 5-ve has shorter fusion (7.9 ± 2.0 levels) compared to Lenke 5+ve (9.6 ± 1.7 levels) (p<0.001). There was no significant difference in pre-operative and post-operative coronal balance, T1 tilt, radiological shoulder height and clavicle angle.

CONCLUSION

The UIV selection was statistically different between Lenke 5-ve and 5+ve curves, with shorter fusion in Lenke 5-ve. Due to these differences, the management may need to be tailored accordingly.
THE OUTCOME OF OPERATIVE TREATMENT MODALITIES IN PATIENTS WITH SPINAL METASTASES

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INTRODUCTION

Cancer is increasingly becoming a major health problem globally. One of the complications of cancer is metastases which can be debilitating, causing pain, instability and neurological injuries such as incontinence and paraplegia².

MATERIALS & METHODS

All patients who presented to a single centre from July 2014 to July 2016 with spinal metastases were included. There were 31 men and 20 women with an average age of 55.1 (range 23 to 98). Each patient was scored using the modified Tokuhashi Score, SF 36 and Karnofsky's Performance status upon admission. The patients or their next of kin were then interviewed one year from the time of admission or surgery.

RESULTS

Out of the 51 patients enrolled, 10 patients and their next of kin were uncontactable. The highest type of primary malignancy was breast carcinoma with 23.5%, followed by lung carcinoma at 21.6%. The modified Tokuhashi predicted survival rate of 60.8% for less than six months, 29.4% for 6 to 12 months and 9.8% for more than one year. A total of 37 patients underwent a surgical procedure, 11 of which were biopsies, posterior instrumentation with laminectomy (12, 46.2%) and posterior instrumentation with vertebrectomy (10, 38.5%). The other 14 were treated conservatively. From those who underwent surgical palliation, 69.2% showed improved SF 36 and Karnofsky's performance status, as compared to 27.3% among the biopsied patients and 21.4% from those treated conservatively.

CONCLUSION

Palliative surgery in patients with spinal metastases was associated with improved quality of life⁸,⁹, as opposed to conservative management.
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NEW SURGICAL TECHNIQUE FOR LUMBAR LAMINECTOMY WITH POSTERIOR LIGAMENTOUS COMPLEX RETAINING

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BACKGROUND

The classic surgical procedures for lumbar spinal stenosis usually compromise the posterior stability of the vertebral segment and require posterior instrumentation. The procedures can be lengthy, messy, difficult and expose the patients to various intra-operative and post-operative complications. Shorter, less technical demanding and less tissue destruction surgical technique with preservation to posterior ligamentous complex can be very desirable to surgeons and patients.

REPORT

We present a case of open bilateral partial laminectomy at the level of L4 & L5 lumbar vertebrae for prolapse intervertebral disc with bilateral lumbar stenosis L4/L5 & L5/S1. This decompressive procedure includes bilateral partial laminectomy of L4 & L5 vertebrae using ultrasonic bone scalpel without sacrificing the posterior ligamentous complex. It is distinctive in term of technicality as it does not require the implant to maintain the spinal stability as compared to the more popular conventional laminectomy with posterior spinal stabilisation. This new technique reduces the operative time and intra-operative bleeding significantly and lessens the soft tissue injury particularly to the nervous tissue. Day one post-operative, the patient could immediately return to normal daily physical activities with very minimal backpain and desirable compressive symptom relief.

CONCLUSION

Excellent recovery is achieved and complications like rigid lumbar vertebrae, implant failure and infection can be minimised via this technique.
DERMATOFIBROSARCOMA PROTUBERANS METASTASIS TO THE SPINE – A MIRACLE IN A TRAGEDY

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BACKGROUND

Dermatofibrosarcoma protuberans (DFSP) is a rare malignant dermal neoplasm. Incidence worldwide has been reported <2% of all reported sarcomas. It is characterised by infiltrative growth and high rate of recurrence. Despite its locally aggressive behavior, it rarely metastasizes. We would like to report a rare case of DFSP that metastasized to the cervical spine with incomplete neurology in which patient has a full recovery post-cervical metastasis debulking, and subsequent radiotherapy (External beam).

REPORT

A 30-year-old lady presented to us with sudden onset of bilateral lower limb weakness, bowel incontinence and urinary retention. On further questioning she had a history of abdominal wall mass 2 years ago that was resected. Histopathology reported as DFSP. However she defaulted her follow-up. On examination, her bilateral lower limb power was MRC 0, MRC 2 for bilateral C8 and T1 and reduced sensation from C7 downwards. MRI showed a destructive soft tissue mass at C7 levels with extradural extension and cord compression. We proceeded with anterior plating C6 – T1, debulking of the C7 tumor and cage insertion. Histopathology reported a high-grade sarcoma of fibroblastic lineage, which is an extremely rare metastasizing DFSP. Post-operatively she was referred to oncology team and was started on radiotherapy and chemotherapy. During our follow-up at 6 weeks post-op, we noted that she has complete recovery of her neurology. She was able stand up and walk and her bladder function has returned. She claims to have able to move her lower limbs during an earthquake, in which she felt she needed to run to safety.

CONCLUSION

DFSP rarely metastasize even after multiple recurrences. In this patient, not only that the DFSP was only excised once, it metastasized to the spine. It is reported that DFSP has a recurrence rate of up to 53% and only 6% of metastasis. In a systematic review predicting neurological recovery after surgery in patients with deficits secondary to metastatic epidural spinal cord compression (MESCC), it was reported that neurological recovery depends on the severity of the neurological deficit and duration of impairment. It also recommends that they require urgent surgical intervention. In our case the surgery was delayed and the neurological impairment was poor, however miraculously patient has a full recovery of her neurology.
INTRODUCTION
The current method of stabilisation of cervical spine injury or deformity in a toddler age group has come to involve various techniques including but not limited to posterior wiring or corpectomy, fusion with circumferential instrumentation or stabilisation with Halo-Vest alone. To date, usage of a fibula strut graft as an adjunct for a corpectomy defect has been less commonly reported, especially in a paediatric age group.

REPORT
We report a case of C5 vertebral body collapse with kyphosis due to septic arthritis and clinically myelopathic, who was surgically treated with a C4/C5 Corpectomy and Fibula strut graft fusion with post-operative Halo-Vest fixation. This technique was utilised to achieve a successful stabilisation and fusion with full recovery of neurological deficit at three years follow-up, and no significant limb shortening affecting gait.

CONCLUSION
Fibular Strut Grafts could be a useful adjunct in spinal fusion surgeries in paediatric population as it prevents instrumented fusion and instrument related complications.

AUTOLOGOUS FIBULA STRUT GRAFT FOR CERVICAL KYPHOTIC DEFORMITY IN A TODDLER – A TECHNICAL NOTE
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USE OF SYRINGE TO MOULD PMMA CEMENT AS SPACER FOR RECONSTRUCTION FOLLOWING ANTERIOR CERVICAL CORPECTOMY

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BACKGROUND
In spine metastasis, aim of surgery is mainly for stabilisation while fusion is secondary. Following corpectomy, the void will usually be filled with autologous bone graft or artificial spacer, e.g. cage or mesh. We report a case of a patient with lung adenocarcinoma with C3 spinal metastasis. We describe our method of using syringe to mould cement spacer for reconstruction following corpectomy.

REPORT
A 38 year-old gentleman presented with worsening neck pain without neurological deficit for 3 months. Investigations revealed primary lung carcinoma with C3 cervical spine metastasis. Patient planned for single level C3 corpectomy, reconstruction using cement spacer followed by anterior stabilisation of cervical spine. After corpectomy of C3, we cut a 10cc syringe to 24mm tube. This acts as mould for the cement. Two K-wires were cut at 28mm length and placed vertically at each side of the spacer within the syringe. The cement spacer is then placed within the void. Anterior plating was then done to provide stabilisation.

CONCLUSION
Our method of preparing the cement spacer addressed the previously known concerns of cement spacer. By using syringe ex-vivo to mould the cement, we managed to avoid direct heat injury to cord. The cement can be mould to desired height and size. K-wire tips embeds into end plates of vertebral above and below, thus, improving anchorage of the cement spacer to prevent migration. To top it off, cement spacer is cheap, readily available in theatres and fast to prepare.
INTRODUCTION

The objective of this study is to analyse the outcome of surgical spinal decompression in patient who was diagnosed with traumatic cauda equina syndrome (CES) / conus medullary syndrome (CMS) in relation to time of surgery as variable to determine its association with its clinical outcomes.

METHODS

This is a retrospective study. All patients were selected at a single centre whose medical record had precise calculation of time to surgery were included. CES was defined as perineal anaesthesia and other lumbosacral root sensory deficits, lower extremity weakness, difficulty with bladder and bowel control, sexual dysfunction, low back pain, and unilateral or bilateral sciatica. Outcome of surgery was analysed with relation to time of surgery – starting when the diagnosis of traumatic CES/CMS was made as a variable.

RESULTS

<table>
<thead>
<tr>
<th>Features</th>
<th>I</th>
<th>II</th>
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<th>IV</th>
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<tr>
<td>Back pain</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Bladder retention</td>
<td>Yes</td>
<td>No</td>
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<td>Bladder incontinence</td>
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<tr>
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<td>Yes</td>
<td>No</td>
<td>Yes</td>
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<td>Saddle anaesthesia</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Level of lesion</td>
<td>L3-L4</td>
<td>L5-S1</td>
<td>L4-L5</td>
<td>T12-L1</td>
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<tr>
<td>Onset of CES prior spinal decompression (Hours)</td>
<td>74</td>
<td>122</td>
<td>96</td>
<td>125</td>
</tr>
</tbody>
</table>

TABLE 1: Initial clinical presentation prior surgery.

The timing of surgery more than 72 hours was significantly associated with persistent CES outcome post-operatively. Also noted, the delay of diagnosis is partly due to incomplete neurological assessment in patients due to insertion of urinary Foley catheters in all trauma patients. Post-operatively, continuous monitoring for at least six months revealed all the patients still had not recovered.

CONCLUSION

In this single-centre CES series, time to surgery have a convincing relationship with the outcome. However, due to small sample size, future prospective studies with large number of sample and longer follow-up are needed to determine the relationship of timing of surgery with the outcome in patients with CES.
Giant cauda equina schwannoma with extensive scalloping of the lumbar vertebral body is a rare pathology with only thirty cases reported up to date in the English literature. We reported a case in a 43-year-old lady presented with progressive lower limbs weakness associated with urinary incontinence for six months duration.

Examination revealed a Medical Research Council (MRC) power grade 3/5 of bilateral lower limbs with sensory level at T12. Per rectal examination revealed lax anal tone with reduced perianal sensation. Blood investigations were unremarkable. Plain radiograph of spine showed a striking feature of multi-level posterior scalloping of lumbar and sacral vertebrae.

Magnetic Resonance Imaging confirmed an intraspinal multilobulated cystic mass arising from the level of L1 to S3 with widening of spinal canal and cord compression. Computed tomography guided biopsy of this mass is performed. Histopathological examination is consistent with Schwannoma. Immunohistochemical study showed these neoplastic cells are positive for S100 and negative for CD 34 stain.

Posterior scalloping of spine vertebrae denotes a longstanding presence of lesion as most intraspinal tumors produce marked neurological symptoms before surgery is performed. Most of the cases in literature were managed with single stage excision surgery with spinal reconstruction to address for the spinal instability due to extensive vertebra erosion. These cases reported a good outcome even with incomplete tumor excision as recurrence risk is low. In conclusion, such a bizarre and locally invasive benign tumor do have good outcome if captured and treated in early stage of disease.
GIANT CELL TUMOR OF THE CERVICAL SPINE: A RARE ENTITY

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BACKGROUND
Giant cell tumor is an intriguing entity due to its aggressive nature despite being a benign tumor. It usually involves the long bone has only been rarely reported involving the spinal region.

REPORT
Giant Cell Tumor of the spine is uncommon and usually involves the sacral region. Involvement of the cervical spine are rare and patient management methods are still controversial. We report a unique case of a patient presented with history of neck pain and numbness akin to degenerative spondylosis of the cervical spine. Further investigation and histopathological result revealed Giant Cell Tumor of the cervical spine.

Patient underwent anterior corpectomy and instrumentation and repeat histopathological confirmed diagnosis and treatment ensued. Post-treatment follow-up does not reveal any recurrence. We conclude that Giant Cell Tumor of the spine can be successfully treated with anterior corpectomy with fusion.
A CURIOUS CASE OF MULTILEVEL MRSA VERTEBRAL OSTEOMYELITIS IN AN INFANT

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BACKGROUND
Vertebral involvement of osteomyelitis although prevalent in adults, is a rare occurrence in infants and children. Its detection made more difficult with vagueness of history and clinical examination.

REPORT
Vertebral osteomyelitis occurrence in children are rare and is commonly attributed to staphylococcus aureus. We report an unusual case of a 2-month-old infant whom was diagnosed with severe MRSA sepsis with necrotising pneumonia at age of two weeks with concurrent multilevel pyogenic spondylitis presented as kyphosis noted clinically as a hard swelling at the back. His treatment with custom designed brace with prolonged IV antibiotics was successful with no neurological deficit. We conclude that early recognition of vertebral osteomyelitis in an infant is difficult and its detection requires high clinical suspicion followed by prompt treatment once diagnosis for a good outcome.
FACTORS ASSOCIATED WITH DEEP SURGICAL SITE INFECTION IN SPINAL SURGERY

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2International Islamic University Malaysia, Kuantan, Pahang, Malaysia

BACKGROUND
Surgical site infection (SSI) rate in spinal surgery have ranged from 1% to 9%, depending on the type of procedure and institution. SSI gives rise to increased morbidity, poorer outcomes and increased healthcare costs. Various risk factors have been reported in the literature but there is no such related report from Malaysia.

OBJECTIVES
This pilot study aims to determine the incidence and risk factors of deep surgical site infections which require surgical debridement in patients who have undergone spinal surgeries.

METHODS
All patients who had undergone spinal surgeries at Hospital Tengku Ampuan Afzan, Kuantan, from 1st January 2016 to 31st December 2017, were included in this study. Associations between SSI and risk factors were analysed with IBM SPSS v21. Age, body mass index, number of vertebral level involvement, hemoglobin reduction and white blood cell count were analysed by the student t-test while gender, smoking status, spinal cord involvement, fracture dislocation at thoraco-lumbar junction and history of pre-operative blood product transfusion were analysed by Fisher’s exact test.

RESULTS
Four (17%) out of 24 patients developed deep SSI which require surgical debridement. Fracture dislocation at the thoraco-lumbar junction (p=0.008) and history of pre-operative blood product transfusion (p=0.003) were associated with deep SSI.

CONCLUSIONS
This study highlights different risk factors associated with deep SSI in spinal surgeries. A larger study is needed to further confirm these findings.
EVALUATION OF TREATMENT FOR HANGMAN’S FRACTURE

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Department of Neurosurgery, Kyoto Okamoto Memorial Hospital, Kyoto, Japan

BACKGROUND

The term “hangman’s fracture,” describing traumatic spondylolisthesis of the axis, has been used since the original description in 1965 by Schneider et al.

OBJECTIVES

We evaluated the treatment for three consecutive patients with hangman’s fracture.

METHODS

There were three females with a mean age of 70.3 years. The average follow-up period was four months (range 3-7 months). The cause of injury was a fall from height in all patients.

RESULTS

Surgeries were done in two patients, one with anterior C2-C3 interbody fusion, other with bilateral C2 pars screw osteosynthesis. One patient had closed reduction followed by halo immobilisation for eight weeks. All the patients showed solid union with no implant failure. There were no neurological complications. Radiological evaluation showed improvement of translation of C2 and C3 vertebral body.

CONCLUSIONS

Operative treatment of hangman’s fracture achieved good clinical and radiological outcomes in this series.
SACRAL TUBERCULOSIS : AN ATYPICAL MANIFESTATION

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BACKGROUND

Sacral tuberculosis (TB) is extremely rare and its unusual entity might delay the diagnosis and treatment of this treatable disease.

REPORT

A 38-year-old lady presented with one year history of lower back pain with radiculopathy more to right lower limb. Patient was initially treated as Prolapsed Intervertebral Disc (PID), but showed no improvement despite regular physiotherapy and medication. Subsequently, the pain was confined to right gluteal area and became more severe. Quality of life was impaired in which patient started using walking aid and stopped working. There was weight loss of 20kg. No other symptom of TB infection or history of contact with TB patient. Bowel and urinary functions were normal. Examination showed localised tenderness at the right gluteal area. Neurological assessment of both lower limbs were MRC grade 5. Blood investigations were normal including the ESR level (17mm/hour). Mantoux test was positive with 18mm induration. MRI revealed a large rim enhancing paravertebral collection at pre-sacral space which extended into bilateral piriformis and gluteal muscles. Patient underwent CT-guided drainage of both gluteals and specimens taken confirmed the diagnosis of TB. Patient showed significant improvement clinically within one week after the drainage procedure and initiation of antituberculous chemotherapy.

CONCLUSION

The initial presentation of this patient mimics PID due to irritation of sciatic nerve at piriformis level. However, a change in the presentation and failure of conservative treatment should raise a high index of suspicion and necessitates further investigation to establish correct diagnosis hence proper treatment can be initiated.
ADOLESCENT IDIOPATHIC SCOLIOSIS WITH SPINE TUBERCULOSIS: A RARE CASE REPORT

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CASE REPORT

A 13-year-old girl who is a known adolescent idiopathic scoliosis presented with history of back pain for six months, associated with bilateral lower limb weakness of two weeks durations. Clinically noted gibbus over thoracolumbar junction along with mild thoracic and lumbar hump. Scoliosis noted on the X-ray with cobb angle of 30 degree from T6 to T12 and 34 degree from T12 to L5 while thoracic kyphosis measures 100 degree. MRI whole spine shows T10 and T11 infective spondylodiscitis causing vertebral destruction and gibbus deformity with paravertebral collections, left erector spinae myositis, surrounding soft tissue inflammatory changes with associated spinal canal stenosis and cord compression. Her lower limb neurology worsened over a period of two weeks from Frankel D to Frankel B. In view of her deteriorating neurological status in spite of two weeks of anti-TB treatment, emergent surgery was performed. Corpectomy T10/T11 with T2 altitude cage insertion along with corrective scoliosis surgery was done via single stage posterior approach. Her neurological status improve from Frankel B to Frankel D three months post-surgery and was able to walk without aid.

Anterior decompressive debridement is usually recommended when there was a substantial abscess collection and rapidly deteriorating neurological symptoms. However, in our case due to its association with scoliosis we opted to do a single stage posterior vertebral column resection along with correction of her scoliosis and posterior fusion from T5 to L4.
REPORT : HELP! MY LEGS ARE GETTING WEAKER

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Hospital Umum Sarawak, Sarawak, Malaysia

BACKGROUND

This is a 60-year-old gentleman with a known case of achondroplasia. He presented to our department since February for progressive weakness over bilateral lower limb more on the left side and difficulty ambulating. Sensation and pin prick was normal for his lower extremities. He had a history of posterior instrumentation five years ago for L3/L4 spondylolisthesis and was well till February 2018. MRI done shows stenotic foramen magnum causing cervicomedullary cord compression with resultant focal myelomalacia. Thus, given the potential consequence of a high cervical cord compression we decided to operate and perform posterior instrumentation and occipital plate with laminectomy on him before his neurology worsened or respiratory compromise develops. Post operatively, patients neurology improved and there were no apnea episodes.

REPORT

Achondroplasia is most common form of heritable skeletal dysplasias due to a defective FGFR3 gene affecting the proliferative zone of the physis which causes a myriad of problems from short stature, craniofacial deformities to spine deformities like thoracolumbar kyphosis and lumbar stenosis. Foramen magnum stenosis is well-documented due a defect in endochondral ossification in the basiocciput or premature fusion of the posterior synchondroses. Clinical manifestations of the foramen magnum can result in cervical myelopathy such as hyperreflexia, hypotonia, difficult swallowing, abnormal breathing patterns, and sudden death. Although many reports have detailed achondroplasia and foramen magnum stenosis in children but none detailing it in adults.

CONCLUSION

Treatment of cervical canal stenosis by surgery is an effective modality based on our centres experience and early intervention is warranted before respiratory compromise develops.
A NOVEL SURGICAL TECHNIQUE IN REDUCING CHRONIC SEVERE ATLANTO-AXIAL DISLOCATION

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BACKGROUND
Traumatic atlanto-axial dislocation can be surgically managed. However, in chronic presentation, reduction becomes challenging. We present a case of chronic atlanto-axial dislocation that was reduced to an acceptable degree using a novel technique.

REPORT
A 73-year-old man presented with chronic neck pain and occipital headache a bunch of oil palm fruit fell on his neck ten years ago. He was experiencing hand numbness and lower limb weakness since two years ago.

Physical examination revealed impaired sensation of left limbs and presence of myelopathy signs. Radiographs showed odontoid peg fracture with atlanto-axial dislocation associated with spinal canal stenosis and cord oedema.

Patient underwent posterior spinal instrumentation and fusion with cage and bone graft insertion. The challenge in this surgery was the reduction of dislocation. There was no specific instrument available for reduction of chronic dislocation, therefore the surgeon carefully used rigid instruments such as Cobb spinal elevator and osteotome to lever and gradually reduce C1. The kyphotic angle between C1 and C2 improve from 18.76° to 7.23°.

His numbness improved immediately post-operation. His neurological symptoms had been improving throughout the subsequent follow-ups.

CONCLUSION
Reducing a chronic atlantoaxial dislocation can be challenging, however, careful usage of existing tools can help in achieving a greater degree of reduction which translates to better clinical outcomes.
INTRODUCTION
Casting is still a relevant and useful technique for treating early onset scoliosis. A proper table is crucial for the application of the cast. Challenges arise when such tables are not available due to limited resources. In this condition, we offer an alternative method of using a hip spica table and manpower to replace supports and traction devices.

METHOD
The pictures (not included here) demonstrate the child on a hip spica table. In addition to the person applying the cast, this method requires another four people, one to hold the halter traction, one for the pelvis and legs and one for each upper limb. Slings are made around the pelvis and tied around the body of the assistant holding the legs.

A stockinette is put around the trunk from the shoulders to the iliac crests. Holes are cut for the upper limbs. The prominences are padded out, and straps of felt applied over the shoulders. Plaster of Paris is applied in the usual manner while traction is applied by the person holding the legs and halter.

Fiberglass is then used to strengthen the final cast. An oval shaped hole is cut to relieve pressure on the diaphragm and abdominal viscera. This cast was kept on for three months until patients next review.

CONCLUSIONS
The use of this modified method has enabled us to perform Risser casting for despite not having the conventional table. Although it requires more manpower and time, it is highly useful in a resource limited setting.
Odontoid fracture accounts for 5-15% of cervical fractures and majority of them being type II. Type I and type III odontoid fractures usually do not warrant surgical treatment. However, there are controversies regarding management of type II odontoid fracture. The relatively high non-union rate of non-surgical treatment resulting in more surgical correction for this type of fracture. Among the various surgical corrections of odontoid fracture, anterior screw fixation is an excellent method of treating type II odontoid fracture due to the fact that it provides immediate stability, preserve atlantoaxial rotation and good union rate. We reported a case of type II odontoid fracture treated with bicortical screw fixation in our centre.

KEYWORDS
Odontoid fracture, anterior screw fixation, bicortical screw.
CARDIAC ARREST DURING PEDICLE PROBING IN SCOLIOSIS SURGERY – A CASE REPORT

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Cardiac arrest during scoliosis surgery is rare in idiopathic scoliosis. We presented a case of cardiorespiratory collapse during pedicle probing in a young patient with idiopathic scoliosis. A diagnosis of venous air embolism was made by exclusion. A cardiorespiratory resuscitation was performed in supine position. Patient recovered without any sequelae and had operation completed six weeks later.

KEYWORDS
Cardiorespiratory arrest, venous air embolism, scoliosis, survive.
CORTICAL BONE TRAJECTORY MAY PREVENT IMPLANT LOOSENING

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²Universiti Tunank Abdul Rahman, Kuala Lumpur, Malaysia

INTRODUCTION
The cortical bone trajectory (CBT) technique engages the cortical region of the vertebra in the presence of osteoporosis. It may prevent implant loosening.

MATERIAL AND METHODS
From December 2012 till June 2016, 180 adult post-menopausal osteoporotic women underwent lumbar spine decompression and instrumentation. Every other patient was treated using the CBT technique while the alternate patient, classical pedicle screw (PS) fixation. Surgery was indicated for lumbar spine stenosis presenting with radiculopathy and performed up till three lumbar levels. Excluded were fractures, malignancies, infections and spondylolisthesis. CBT technique was performed in 86 patients and classical pedicle screw, 94. All had bilaminar decompression and at least one level of interbody fusion. Monitoring for a minimum of 24 months, we did quarterly radiographs in the first year and twice annually in the second, with CT scans at 12 and 24 months. Radiographs were interpreted separately by the author and two radiologists, with statistical adjustment of inter-observer variation. We studied the comparative rates of fusion between the two arms. For CBT to be touted as a viable alternative to PS, it must first demonstrate equivalence or better to PS in fusion rates.

RESULTS
Both arms showed equivalent rates of fusion with statistical relevance. Loosening was seen in 7.8% PS and 3.3% CBT cases.

CONCLUSION
We conclude that cortical bone trajectory has shown significant impact in preventing implant loosening and deserves more attention as a viable technique.
SURGICAL AMELIORATION OF A CASE OF SYMPTOMATIC MONOSTATIC LUMBAR PAGET’S DISEASE REFRACTORY TO ANTIPAGETIC THERAPY

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REPORT

Paget’s disease of bone (PDB), the second commonest metabolic bone disease first described by Sir James Paget (1877) is well-known among those of Anglo-Saxon origin but remains a rarity within the Asian population. Those who require instrumented fusion and decompression surgery refractory to medical therapy are even scarcer in the literature. Spine (~50% over lumbar) is the second commonest site of involvement, with 75-90% being polyostotic.

Follow-up CT urography on a 47 year-old female of Chinese ethnicity incidentally discovered solitary expansile (both AP and Lateral dimensions) L4 vertebral sclerosis. Patient recalled vague pain in the preceding ten months. Open biopsy ensuing an inconclusive percutaneous biopsy revealed irregular and disorganised trabeculae of mature lamellar lined by plump osteoblasts and multinucleated osteoclasts consistent with PDB. 14 months into Alendronate treatment, patient projected unremitting neurological claudication rendering her out of work.

Disturbance of remodelling process in PDB contributes to bony expansion leading to spinal stenosis, one-third of which is symptomatic. MRI by then demonstrated marked facets hypertrophy, protruded subjacent discs, posterior vertebral body expansion – a ‘trefoiling’ appearance with both central and lateral recesses neural impingements. L3-L5 instrumented interbody fusion, distinct from cases in the literature with laminectomy alone, was elected as medial facetectomies without fusion would render her instability pain worse off.

Biphosphonates have been shown to be responsive at osteolytic phase. Despite being refractory herein owing to osteosclerotic phase, profuse intraoperative bleeding was not encountered as preoperative bisphosphonate treatment have been evident to aid in normalising bone blood flow negating bleeding complications.
SUDDEN COMPLETE PARAPLEGIA AFTER THROMBOLYTIC THERAPY

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BACKGROUND
Spontaneous spinal epidural hematoma is an uncommon but an emergent condition. Among the causes are trauma, surgery, epidural catheterisation, disorder of coagulation or idiopathic. The accumulation of hematoma at the epidural space may compromise the spinal cord and give rise to back pain or paresis of the limbs. Mainstay of treatment is urgent surgical evacuation of hematoma.

REPORT
A 55 year-old man was admitted in coronary care unit for acute myocardial infarction. He was immediately given a dose of IV Streptokinase 1.5mg followed by SC Fondaparinux 2.5mg OD and Tab Clopidogrel 300mg OD base on International Guideline for acute myocardial infarction. He, however, complained of low back pain a few hours later followed by weakness of both lower limbs within 48 hours after thrombolytic therapy. Examination revealed absent power and sensory of both lower limbs. MRI lumbosacral showed long segment epidural hematoma at T9-L3 region compressing the spinal cord and cauda equina. He underwent emergency spinal decompression and evacuation of hematoma. Post-operatively, his neurological deficit improved gradually.

CONCLUSION
Thrombolytic therapy should be used with caution. Its action as a doubled edged sword may cause benefit in treatment of coronary artery thrombosis but may also cause spontaneous spinal epidural hematoma.
POSTERIOR SPINAL FUSION IN A SCOLIOTIC PATIENT WITH CONGENITAL HEART BLOCK TREATED WITH PACemaker – AN INTRA-OPERATIVE TECHNICAL DIFFICULTY

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BACKGROUND
Congenital complete heart block requires pacemaker implantation at birth through thoracotomy, which can result in scoliosis. Corrective surgery in this patient was challenging. Height gain after corrective surgery may potentially cause lead dislodgement. The usage of monopolar electrocautery may interfere with the function of the implanted cardiac device. The objective of the report is to describe the technical difficulties on performing posterior spinal fusion (PSF) on a pacemaker-dependent patient with complete congenital heart block and right thoracic scoliosis.

REPORT
A 17-year-old boy was referred to our institution for the treatment of right thoracic scoliosis of 700. He had underlying complete congenital heart block secondary to maternal systemic lupus erythematosus (SLE). Pacemaker was implanted through thoracotomy since birth and later changed for four times. PSF was performed by two spine surgeon with temporary pacing inserted prior to the surgery. The monopolar electrocautery device was used throughout the surgery with the grounding pads applied on the shoulders. The PSF was successful performed without any technical issues and complications. Post-operatively, his permanent pacemaker was functioning well. Three days later, he was recovering well and was discharged home from hospital.

CONCLUSIONS
This case indicates that PSF can be performed successfully with thoughtful anticipation of technical difficulties on a pacemaker-dependent patient with underlying congenital heart block.
RAPID PROGRESSION OF SCOLIOSIS CURVE IN A MATURE PATIENT WITH UNDIAGNOSED PITUITARY MACROADENOMA: A RARE CASE REPORT

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University of Malaya, Kuala Lumpur, Malaysia

BACKGROUND

Growth hormone secreting pituitary tumour or gigantism has not been previously reported to be associated with rapid progression of scoliosis in the literature. However, there are some literature indicating scoliosis can be worsened by growth hormone therapy in children and adolescents. The objective of the report is to describe a rare case of a patient with undiagnosed growth hormone secreting pituitary macroadenoma who developed a progressively worsening thoracolumbar scoliosis.

REPORT

A 19-year-old boy was referred to our institution for the treatment of right thoracolumbar scoliosis. Cobb angle worsened from 29° to 83° over a two-year duration. He attained puberty at the age of 13. He had a previous history of slipped upper femoral epiphysis (SUFE), which was operated in 2015, with no clinical features of gigantism. Pre-operative assessment was performed. He was diagnosed with growth hormone secreting pituitary macroadenoma by magnetic resonance imaging of brain and whole spine with high serum level of insulin-like growth factor-I (IGF-I).

CONCLUSIONS

This case indicates that growth hormone secreting pituitary macroadenoma could result in rapid progression of scoliosis without distinct clinical features of gigantism.
SPONTANEOUS RECOVERY OF SYMPTOMATIC SPINAL EPIDURAL HEMATOMA AFTER CORRECTIVE SCOLIOSIS SURGERY: A CASE REPORT

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University of Malaya, Kuala Lumpur, Malaysia

BACKGROUND

Post-operative symptomatic spinal epidural hematoma (SEH) is rare, yet a known complication after spinal surgery. This could potentially result in spinal cord compression with progressive neurologic deterioration leading to paralysis. As such, urgent spinal decompression surgery is mandatory. The objective of the report is to describe a case of post-operative symptomatic spinal epidural hematoma with spontaneous recovery three hours post-corrective scoliosis surgery.

REPORT

A 12-year-old girl with Lenke 2AN adolescent idiopathic scoliosis underwent posterior instrumented spinal fusion (PSF) with local bone grafting from T2 to T11. Intra-operative somatosensory evoked potentials (SSEP) were normal. Upon reversal of anesthesia, she experienced complete paraplegia with complete sensory loss up to mid-thoracic level. Urgent computed tomography (CT) scan of spine showed no pedicle screw perforations. Magnetic resonance imaging (MRI) scan were suggestive of SEH at T5/T6 level. Subsequently, she had spontaneous neurological recovery at three hours postoperatively. CT myelogram was done to confirm the diagnosis of SEH. She regained the ability to walk and was discharged well from the hospital seven days later.

CONCLUSIONS

Symptomatic spinal epidural hematoma can have spontaneous neurological recovery without surgical intervention. Therefore, surgical decision has to be tailored according to the clinical findings.
POST-OBLIQUE LUMBAR INTERBODY FUSION VERTEBRAL FRACTURE – A LEARNING POINT

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BACKGROUND
Oblique lumbar interbody fusion is an excellent option in treating degenerative disc disease in lumbosacral region. OLIF was described by M Mayers in 1977, utilising MIS approach via corridor between the peritoneum and psoas muscles. However, OLIF is not without complications. To our knowledge, there were no reported cases on fracture post OLIF with an anterior plate. We explore the surgical technique in OLIF and its learning points.

REPORTS
A 63-year-old gentleman presented with worsening low back pain with radiculopathy over bilateral lower limbs. Clinically patient had reduced power over L3 and L4 region. MRI showed multilevel disc bulge with narrowing exiting foramen at L2-L5. The patient underwent OLIF and anterior plating in September 2017, using the 12mm-6degree cage for L3/L4 and 14mm-6degree for L4/L5 with two anterior plates. Both plates were put on same vertical axis. Two months later, the patient complained of worsening back pain and radiculopathy after minor trauma associated with reduced power over and sensation over L4/L5. Radiograph showed L4 vertebra fracture. The patient underwent posterior instrumentation and fusion done over the L2-S1 level. At six months clinical and radiological union were achieved, the patient was able to return to fully functional status.

CONCLUSION
Biomechanically, eighty-percent of vertical load is transmitted via anterior column further emphasises on cage size and placement. Cage subsidence and end plate fractures are among the highest complications. We learned that fixing the anterior plate on the same axis will increase stress riser in vertical load hence may have caused the fracture. We, therefore, advocate that OLIF should be supplemented with posterior instrumentation.
RECURRENT OF SPINAL GIANT CELL TUMOUR: IS THE OUTCOME BETTER IN MARGINAL RESECTION WITH BISPHOPHONATE AS COMPARED TO INCOMPLETE RESECTION WITH DENOSUMAB

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REPORT
Recurrent spinal giant cell tumour (GCT) carries poor prognosis due to high intra-operative and post-operative morbidity and mortality. We are presenting our experience with two cases of recurrent spinal GCT treated with two different approaches. Highlight was made on treatment paradigm of recurrent spinal GCT. Both patients had recurrent spinal GCT with partial neurological deficit 2-3 years after excision surgery. Both cases had been graded as Campanacci stage 3 without distant metastasis. Treatment goal was achieved with systemic bisphosphonate and denosumab. First patient underwent three level vertebrectomy with complete marginal excision of thoracolumbar junction GCT supplemented with post-operative adjuvant IV pamidronate.

Second patient underwent intralesional resection of upper cervical GCT followed by post-operative denosumab for control of residual GCT. Complete excision in case 2 was not feasible due to extensive soft tissue extension encasing the left vertebral artery. Post-operatively, both patients attained recovery of neurology. Before the emergence of systemic treatment for GCT, emphasis has been placed on radical resection and reconstruction. However, poor long-term outcome has been reported in radical surgery. The first patient, despite having a complete marginal excision, acquired a lower Karnosky score of 60, restrictive lung disease, and moderate intermittent back pain. In contrast, the second patient who had intralesional resection has a higher Karnosky score and greater satisfaction.

CONCLUSION
Treatment paradigm of recurrent spinal GCT has changed with the existence of systemic bisphosphonate and denosumab. Cases of inoperable recurrent spinal GCT attained a better progression free survival rate and mutilating surgery can be avoided.
LATERAL LUMBAR SPINAL STENOSIS: ASSOCIATION OF OSWESTRY DISABILITY INDEX, VISUAL ANALOGUE SCALE AND MAGNETIC RESONANCE IMAGING (MRI)

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BACKGROUND
Degenerative spinal stenosis is a common problem in the sixth decade of life involving L4-L5 and L5-S1 levels. Lateral stenosis is often underestimated because of no established relationship between the degree of lateral stenosis and disc degeneration with the daily disability and pain severity.

OBJECTIVES
To establish a relationship between the posterior disc height, degree of disc degeneration and degree of lateral stenosis from MRI with the pain severity and daily disability for lateral lumbar spinal stenosis.

METHODS
Clinical data of 69 patients with lateral spinal stenosis was evaluated using Oswestry Disability Index (ODI) and Visual Analogue Scale (VAS) while the degree of disc degeneration and lateral stenosis were assessed on MRI.

RESULTS
Most patients (mean age of 59.07 ± 6.1) presented with crippled disability (50.7% with ODI score between 61% and 80%) and high pain intensity (52.2% with VAS score between 61 to 80). MRI revealed 69.6% patients had grade 4 disc degeneration of L4/L5 (mean posterior disc height of 7.1mm ±1.8mm) while 50.7% had grade 4 disc degeneration of L5/S1 (mean posterior disc height of 6.4mm ±1.8mm). Lateral stenosis anatomical grading revealed 58.0% of patient had grade 2 lateral recess stenosis, 73.9% of patient had grade 2 intraforaminal stenosis and 53.6% had extraforaminal stenosis. However, no statistically significant association between clinical symptoms and MRI finding were found.

CONCLUSIONS
Clinical evaluations are crucial for adequate diagnosis but MRI is good diagnostic workout for decision in management and intervention of the patients with spinal stenosis.
5-YEAR EXPERIENCE OF SCHOOL SCOLIOSIS SCREENING PROGRAMME IN PERAK POPULATION – A CLINICAL EVALUATION OF EPIDEMIOLOGY, EFFECTIVENESS AND LIMITATION OF SCOLIOSIS SCREENING FROM 2011 TO 2015

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STUDY DESIGN
Retrospective cohort study of school scoliosis screening program (SSSP) in Perak, involving more than 100 primary schools.

OBJECTIVE
The aim of this study was to assess current prevalence and distribution of adolescence idiopathic scoliosis and to compare with the results of other studies done in Malaysia and other countries.

BACKGROUND DATA
Data collected from SSSP from 2011 to 2015. A total of 42,866 school children with age of 11 to 12 were screened. However, due to several factors, we drop the first two years of screened school children. In the three later years, 34,638 school children screened.

METHODS
School children were screened by screening tools such as shoulder and pelvic imbalance, abnormal spinal alignment, forward-bending test, and measurement of the angle of trunk rotation by scoliometer. The diagnosis and treatment were based on the Cobb angle. The personal information, demographic information, and results of tests performed were recorded and analysed.

RESULTS
1.08% (374) of children screened were referred for radiological assessment, however only 258 turn up to the scoliosis clinic. 132 of them had confirmed diagnosis. The corrected prevalence rate is 0.574%. Prevalence according to severity of cobb angle 10° to 20°, 21° to 40° and 41° above are 0.286%, 0.092% and 0.017% accordingly. The prevalence of AIS in need of treatment (brace or surgery) was 0.11%. Positive predictive value (PPV) of screening program is 57.5%.

CONCLUSION
The SSSP in Perak is effective with a good PPV of 57.5%. The prevalence rate of AIS was 0.574% in our study. Screening of standard six girls yielded a significant benefit from preventive treatment.
OUTCOME OF ADOLESCENT IDIOPATHIC SCOLIOSIS DEFORMITY CORRECTION USING DUAL RIGIDITY ROD OF COBALT CHROMIUM AND TITANIUM ALLOY

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BACKGROUND
Deformity correction of adolescent idiopathic scoliosis largely depends on material of rods used apart from pedicle screw fixation. Correction using cobalt chromium (CoCr) rods in the concave side of curve and titanium alloy (Ti) rods in the convex side is gaining popularity and we term it as dual rigidity rods. We evaluate the amount of correction achieved postoperatively using this method in comparison with Ti rods alone.

REPORT
Eight AIS patients were included. Four were instrumented with dual rigidity rods (CoCr at the concave and Ti at the convex) and another with Ti rods alone. All patients had pedicle screws inserted at intervals on both concave and convex side. Radiological measurements of Cobb angle were compared pre-operatively and post-operatively for both groups. Post-operatively, no significant differences were observed between dual rigidity rods and titanium alloy alone. Mean correction angle were 34.75° and 33.5° respectively.

CONCLUSION
CoCr with Ti rod versus Ti rods alone both provide significant and stable correction in AIS. Both achieved similar mean correction angle post-operatively.
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