APSS Basic Spine Course 2019
Tokyo

June 29th, 2019

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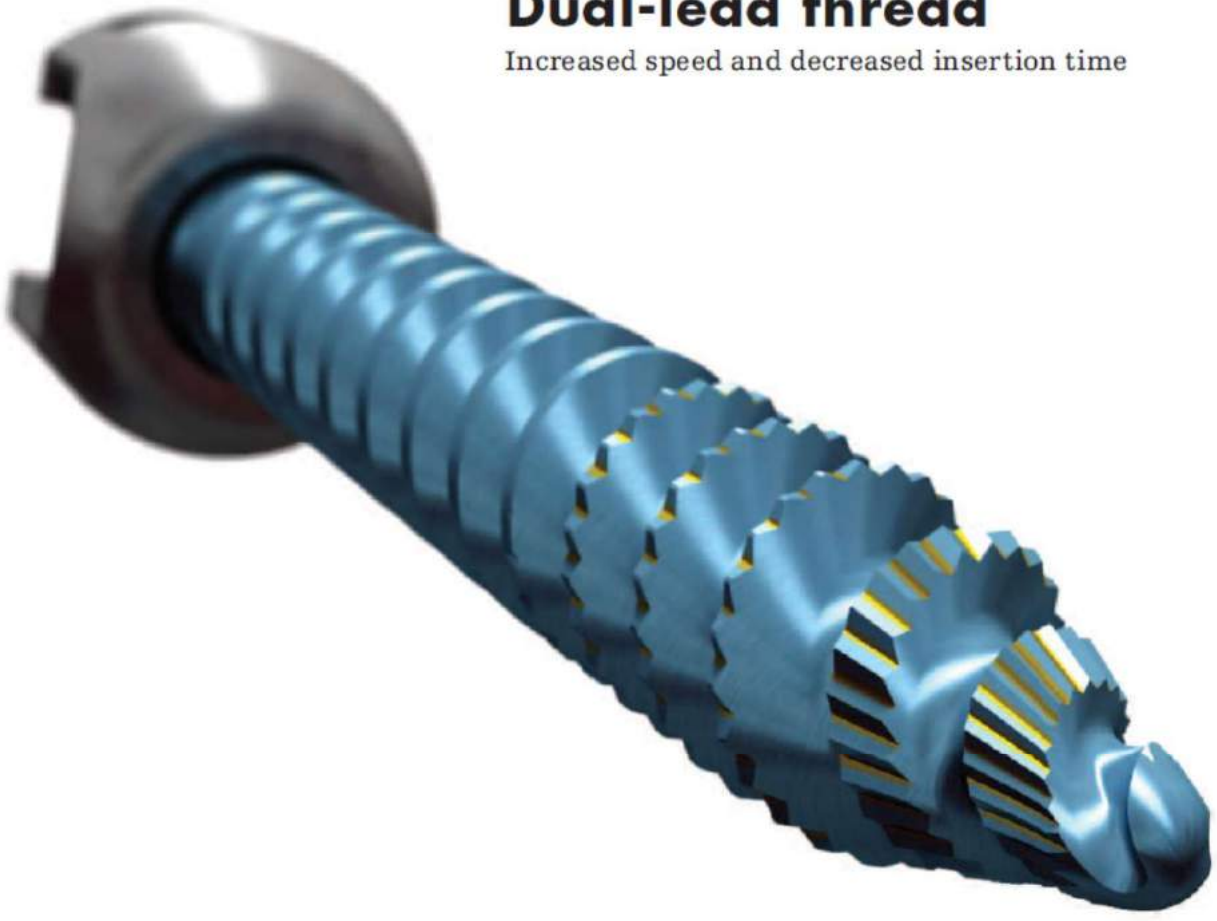

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Dear APSS Basic Spine Paricipants

Welcome Message

It is our pleasure and honor to welcome to you to APSS Basic Spine Course 2019, scheduled to be held on June 29th, 2019, at Keio University, Tokyo, Japan. The program committee has orchestrated a high-quality program that includes lectures and hands-on workshops. The program cover comprehensive topic on spine surgery. This course is suitable for young spine surgeons as it will focus on the essential anatomy, the planning of surgical procedures, and the handling of basic instruments.

I hope each one of you can take an active part in lectures, discussions and hands-on practical exercises. I also hope you will enjoy this APSS educational event and make new friends.

I am looking forward to this remarkable event and seeing you in APSS Basic Spine Course 2019.

Sincerely,

Prof. Masaya Nakamura
Chairperson
Department of Orthopedic Surgery,
Keio University School of Medicine

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- Gabriel Liu, Associate Professor, National University of Singapore
- Chris Yin Wei Chan, Professor, UM Specialist Centre, Malaysia
- Kenny Yat Hong Kwan, Assistant Professor, University of Hong Kong
- Ming-Hsiao Hu, Assistant Professor, Taiwan National University

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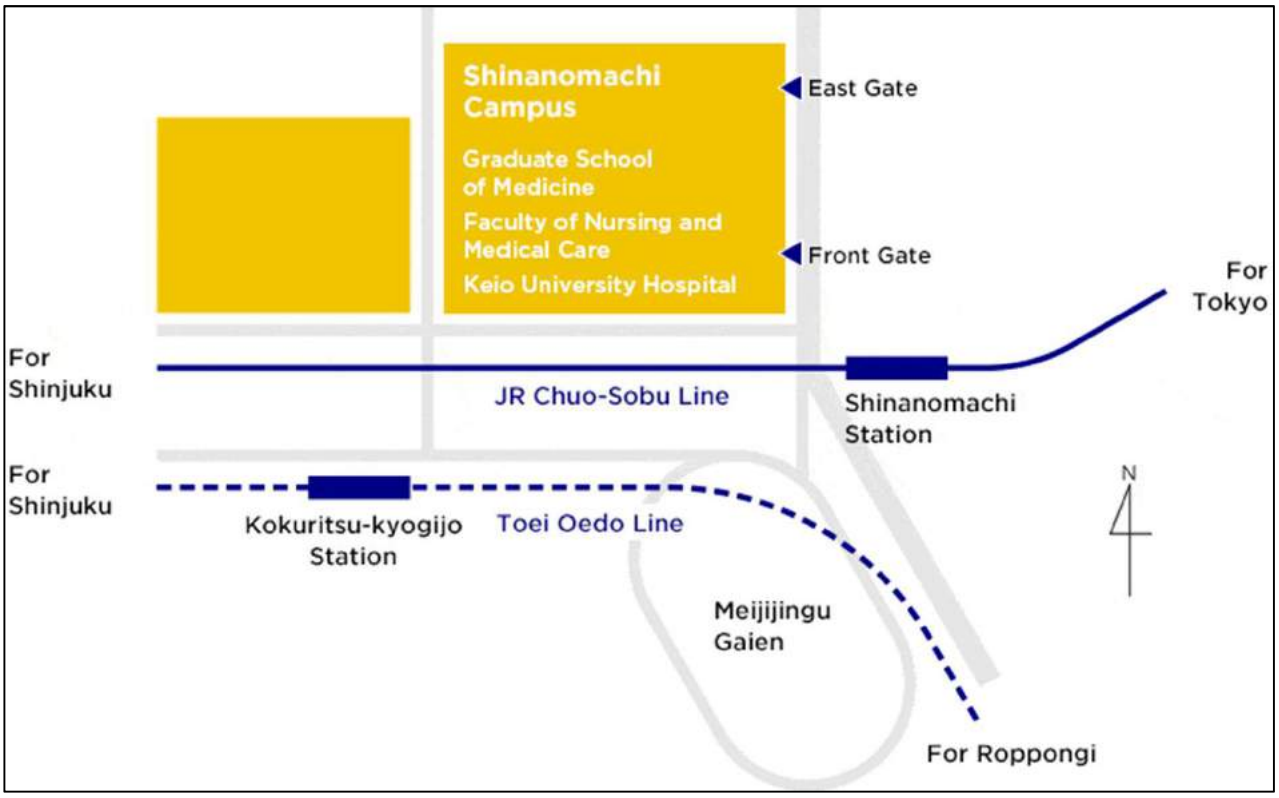

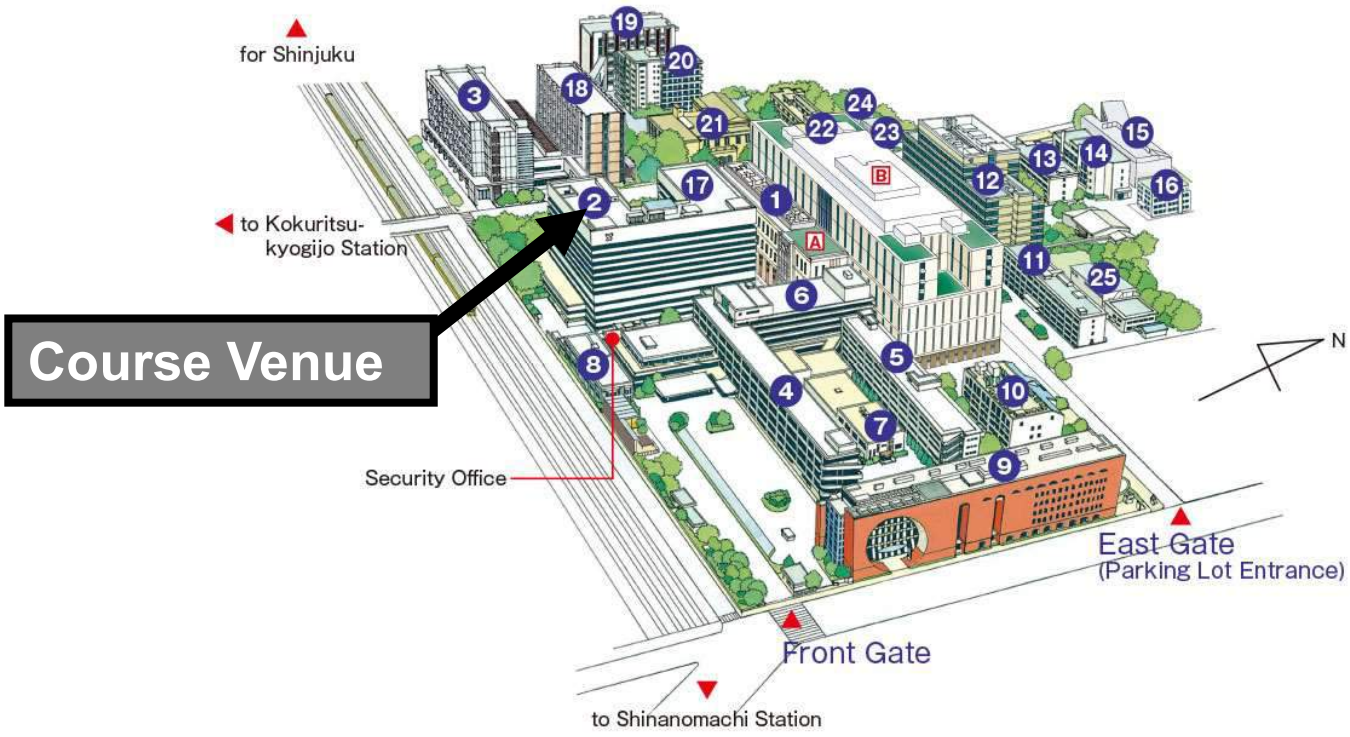

APSS Basic Course 2019 Tokyo Program

28th June (Friday, Day 1) – Keio University Hospital

18:00 – : Welcome reception (All participants are invited to join this session)

29th June (Saturday, Day 2) – Keio University Hospital

8:00 – : Registration

8:25 – : Opening remarks

Cervical Spine

8:30 – : Anterior Approach: Indications, tips and pitfall (Gabriel Liu)

8:45 – : Anterior Fusion (Gabriel Liu)

9:00 – : Disc Replacement (Daisuke Sakai)

9:15 – : Laminoplasty and Foraminotomy (Kazuhiro Chiba)

9:30 – : Lower Posterior Fixation, Tips and pitfall (Chris Yin Wei Chan)

9:45 – : Upper Posterior Fixation, Tips and pitfall (Chris Yin Wei Chan)

10:00 – : Posterior vs Anterior (Manabu Ito)

10:15 – : Tea break

Thoraco-Lumbar Spine

10:30 – : Lateral Approach and fusion (Shinji Takahashi)

10:45 – : Basic techniques and pitfall for posterior decompression (Ming-Hsiao Hu)

11:00 – : Basic techniques and pitfall for posterior fusion (Ming-Hsiao Hu)

11:15 – : AIS Classification and Selection of Fusion Levels (Kenny Yat Hong Kwan)

11:30 – : Curve Correction Techniques in AIS (Kenny Yat Hong Kwan)

11:45 – : Luncheon Seminar (Ken Ishii)

Minimally Invasive Spine Surgery

12:45 – : Tea Break

13:00 – : Current Concepts of Adult Spinal Deformity (Mitsuru Yagi)

13:15 – : Surgical Technique and Pitfalls for ASD (Mitsuru Yagi)

13:30 – : Treatments for osteoporotic vertebral fracture (Hirotaka Haro)

13:45 – : Current Concept of Metastasis (Shinji Takahashi)

14:00 – : Tea Break

14:30 – : **Hands-on-workshop** using bone model

<Cervical Spine>

C1/C2 screws, lateral mass screws and pedicle screws

<Lumbar Spine>

Pedicle screw placement in the lumbosacral spine,

16:30 – : Closing Remarks

Anterior Approach and fusion: Indications, tips and pitfall

Gabriel Liu, National University of Singapore

Anterior cervical spine fusion technique is a common surgical technique that is used for a variety of cervical pathologies . The aims of these talks are to describe the current indications and clinical outcomes of the ACDFs . Surgical techniques and tips in performing the performing this surgery to avoid postoperative complications and subsidence.

Cervical arthroplasty (Total disc replacement)

Daisuke Sakai, Tokai University School of Medicine

Cervical arthroplasty (total disc replacement: TDR) has been widely used for surgical management of cervical spondylosis in the world except for Japan. Several different FDA-approved devices were evaluated, some of them with 10-year follow up. In treating cervical disc disease, it has long been accepted that anterior cervical discectomy and fusion (ACDF) is well tolerated, with satisfactory results in a high proportion of patients. Now with two products approved by the Japanese Pharmaceuticals and Medical Devices Agency in 2018, Japanese patients and surgeon has the option to choose TDR instead of ACDF. Nevertheless, recent studies recommend cervical arthroplasty for improved clinical efficacy. One or two levels TDRs has been shown to spare cervical spinal motion compared to ACDF however, evidence supporting the comparative efficacy and safety of ACDF and cervical arthroplasty is limited and inconclusive.

Cervical disc replacement is currently a regulated procedure in Japan, and surgeons wishing to perform the procedure must fulfill specific requirements, undergo a structured training program, and participate in post-market surveillance.

Mandatory objectives:

- Indications of TDR
- Able to understand the regulations of TDR in Japan
- Obtain knowledge on current evidence of TDR

Laminoplasty and Foraminotomy

Kazuhiro Chiba, National Defense Medical College

Rationale, indications and techniques of expansive open-door laminoplasty for cervical myelopathy are demonstrated. Rationale of expansive laminoplasty is to totally decompress the spinal cord that is compressed at multi-levels by widening the spinal canal and inducing the dorsal shift of the spinal cord through en bloc posterior displacement of the laminae. By preserving the posterior supporting structures, the spinal cord is protected, and the mechanical stability of the cervical spine is maintained.

Indications of laminoplasty are patients with cervical compressive myelopathy caused by disc herniation, spondylosis, and ossification of the posterior longitudinal ligament associated with developmental spinal canal stenosis (AP canal diameter < 14mm on plain lateral radiographs), regardless of the number of pathological levels. By placing the open-side gutter on the symptomatic side, foraminotomy can easily be supplemented in patients with associated unilateral radiculopathy. Contraindications are patients with established cervical kyphosis, in whom adequate posterior shift of the spinal cord cannot be expected, and those with severe spinal instability; e.g., athetoid palsy, and hemodialytic destructive spondyloarthropathy.

The key to clinical success is to strictly follow the sequence of the procedures below. 1) Correct patient positioning using a Mayfield head fixator, 2) exact midline approach and meticulous subperiosteal dissection of the laminae to minimize paracervical muscle damage, 3) open side gutter formation at lamina-facet junction with perforation of the ventral cortex of the laminae by a diamond burr to avoid epidural bleeding, 4) removal of cranial and caudal ligamentum flava, 5) hinge side gutter formation frequently checking stability of the hinge, 6) placement of sutures to hold the laminar door, 7) gentle and gradual laminar expansion to avoid hinge breakage, 8) fixation of the laminar door with pre-placed sutures, 9) placement of a drain followed by meticulous layered closure.

Patients are encouraged to leave bed the next day of surgery without any external support. Gentle neck exercise can be started as soon as the patient can tolerate. Postoperative complications include axial pain, segmental motor weakness, recurrence of myelopathy due to lamina closure and development of postoperative kyphosis. Long-term outcomes assessed using JOA score recovery rate is approximately 50% in average.

Expansive laminoplasty is a safe, effective, and reliable procedure for cervical myelopathy providing acceptable long-term outcomes.

Mandatory objectives:

- Rationale of laminoplasty
- Indications for surgery
- Surgical techniques
- Postoperative care
- Postoperative complications and long-term outcomes

Posterior Cervical Fixation Methods

Chris Chan Yin Wei, University Malaya, Malaysia

Spinal instrumentation is an important tool that complements other aspects of spinal surgery such as decompression, fusion or deformity correction. In the cervical spine, the unique anatomy of the atlas, axis as well as the sub axial vertebrae, and the surrounding neurovascular structures and viscera has important implications to posterior cervical instrumentation.

Modern atlantoaxial instrumentation techniques was first introduced by Goel whereby screws were inserted into the lateral mass of the c1 and pars of C2. The technique was then modified and popularised by Harms whereby C2 pedicle screws were inserted instead of pars screws. Overtime, many authors had practiced variations of the C1 lateral mass screws. C1 lateral mass and C2 pedicle screws techniques had been shown to provide better immediate stability and higher fusion rate. However, awareness of the variation in the posterior arc and vertebral artery anatomy in this region, such as the presence of the ponticulus posticus and high riding vertebral artery is imperative for complication avoidance. Knowledge of salvage techniques such as C2 lamina screws are also important.

For the sub axial cervical spine, modern instrumentation techniques involved the insertion of lateral mass screws and pedicle screws. The lateral mass screws are generally the workhorse for sub axial cervical spinal instrumentation. They are safe with low risk of spinal cord injury as the screws are directed away of the spinal canal. However, there is still risk of vertebral artery and nerve root injuries. Knowledge on variations in the insertion point and trajectory such as the Roy Camille technique or Magerl technique is important. For cervical pedicle screws, they provide stronger anchorage and control in all three planes. However, tips on avoiding spinal cord injury or vertebral artery injury during cervical pedicle screws insertion are vital.

Mandatory objectives:

- Knowledge of the C1 lateral mass screw insertion technique (and its variation) and C2 pedicle screw insertion technique.
- Knowledge of identification of high riding vertebra, ponticulus posticus and structures at risk during C1-2 screw insertion.
- Knowledge on various entry point and trajectory for lateral mass screw insertion
- Knowledge on entry point and various insertion technique of the cervical pedicle screws

Posterior vs Anterior (indications and complications)

Manabu Ito, National Hospital Organization Hokkaido Medical Center

Anterior procedures for the cervical spine are best indicated for any spinal disorders compressing the spinal cord or nerve roots from anterior at one- or two-disc levels. Common pathologies for these procedures are cervical disc herniation, cervical spondylotic radiculopathy or myelopathy and segmental type of OPLL. Cervical spine injuries with comminuted vertebral body fractures are also good indication for anterior reconstruction surgery. If patients have developmental spinal canal stenosis and the levels of spinal cord compression are more than three-disc levels, posterior cervical surgery such as laminoplasty should be considered. Laminoplasty is only effective under lordotic alignment of the cervical spine. Under local kyphosis in the cervical spine, laminoplasty-only surgery is not able to provide sufficient decompression effects on the spinal cord so that any spinal reconstruction surgery using spinal implants to correct local kyphosis should de added to posterior decompression.

Complications of anterior cervical procedures are sometime serious including esophageal injury, recurrent laryngeal nerve palsy, migration of grafted bone and hematoma inside and outside the canal which often requires immediate reduction of the blood clot. Unique complications of posterior procedures for the cervical spine are axial neck pain, C5 nerve tardy palsy and slow progression of local kyphosis.

In recent years, there are minimally invasive surgical procedures under microscope and endoscope for anterior or posterior cervical spine pathologies. During the lecture, not only the conventional surgical treatments, some of the recent minimally invasive procedures for the cervical spine will be presented.

Mandatory objectives:

- Advantages and disadvantages of anterior procedures and posterior procedure
- Surgery related complications of anterior procedures and posterior procedures
- Conventional anterior procedures and posterior procedures
- Minimally invasive procedures for anterior approach and posterior approach

Lateral approach and fusion in lumbar spine

Shinji Takahashi, Osaka City University

Anterior or lateral approach of the lumbar spine for degenerative disease, trauma, or destructive lesions has long been considered a morbid procedure secondary to high rates of injury to the lumbar plexus. However, MIS retractor systems, when occasionally combined with neuromonitoring, have led to renewed interest in these approaches. Lateral approach spine surgery provides effective interbody stabilization, and correction and indirect neural decompression with minimal-incision and less invasive surgery compared with conventional open anterior lumbar fusion. Nonetheless, the approach, particularly at L4–5, is in close proximity to the common iliac vein, ascending iliolumbar vein, and segmental vessels which are potentially vulnerable to injury with this approach. The disc space is then approached through the psoas with the help of electrophysiological monitoring to avoid injury to the lumbar plexus. Also, the psoas muscle is retracted, rather than being split, to minimize postoperative sensory and lumbar plexus motor deficits. Direct visualization through a somewhat larger single incision and to avoid neural compromise due to their partial concealment. The comprehension of anatomy is important to reduce the potential risk of sensorimotor complications, vascular injury and major organ injury.

Anterior decompression with a lateral corpectomy(s) or discectomy(s) followed by reconstruction can be safely undertaken through the MIS retractor system, and once the decompression is completed, interbody(s) or cage(s) can be placed to restore alignment, aid in decompression, and promote fusion

Mandatory Learning Issues (3-5)

- Indication for lateral approach
- Anatomy of nerve and vessels
- Complications

Basic techniques and pitfall for posterior decompression (Thoraco-Lumbar Spine)

Ming-Hsiao Hu, National Taiwan University

Spinal stenosis is commonly encountered in surgery for degenerative spinal conditions as well as in adult spinal deformities, and may contribute to symptoms of neurogenic claudication or radiculopathy from compression centrally and/or in the lateral recess and neural foramina. The gold standard treatment for symptomatic lumbar stenosis refractory to conservative management is a facet preserving laminectomy. The traditional treatment has been central laminectomy. This procedure requires a midline lumbar incision, after which the paraspinous muscles are detached from the spinous processes and vertebral arches and are retracted laterally. Removal of entire lamina, spinous process, interspinous ligament and ligamentum flavum have been usually required.

It has been suggested that extensive resection of the posterior bone, posterior ligaments and muscular structures leads to increases in postoperative pain, perioperative blood loss, complications and length of hospital stay. Controversy continues about the extent of bony decompression required to effectively decompress the spinal canal. As narrowing of the spinal canal occurs predominantly at the interlaminar region involving the arthrosis of the facet joints and bulging of the intervertebral disc and the ligamentum flavum, resection of the whole vertebral arch may not be necessary. Alternatively, an interlaminar or undercutting laminectomy can be performed to decompress the spinal canal. More recently, various authors have recommended surgical techniques that preserve posterior midline structures. Other techniques that are designed to preserve the posterior midline structures include endoscopic laminotomy and spinous process osteotomies. The amount of decompression achieved with these techniques has been shown to be approximately equal to that attained with laminectomy. However, these techniques are technically demanding because of the limited working space for decompression and may result in a higher rate of surgical complications.

Foraminal stenosis may be present with or without associated stenosis within the central canal and subarticular zone. With the exception of L5-S1, where it is accessible via and interlaminal window, it will need to be addressed via intertransverse window to do adequate foraminal decompression without leading to potential instability at the level. For revision decompression, it is difficult due to significant midline scar formation. The goals should be to find residual lamina and to excise this cephalad and laterally, allowing exposure of previously undisturbed dura and roots.

Mandatory Learning Issues (3-5)

- Indications for surgery
- Treatment strategy
- Different Surgical approaches: traditional and minimally-invasive
- Complications after surgery

Basic techniques and pitfall for posterior fusion (Thoraco-Lumbar Spine)

Ming-Hsiao Hu, National Taiwan University

When patients have segmental instability caused by various spinal pathologies, including degenerative spondylolisthesis, iatrogenic instability, discogenic back pain, pseudoarthrosis, adult/pediatric deformity and traumatic fracture/dislocation, additional fusion with/without instrumentation is needed. Posterior fusion is the most common approach in which surgeons can do neural decompression simultaneously and the instrumentation devices are more powerful to reach better fixation.

With the development of modern instrumentation techniques, biomechanical studies demonstrated that pedicle screw and rod fixation created a rigid and stable construct. Despite this, some authors have questioned the use of instrumentation in the elderly population, preferring a noninstrumented posterolateral fusion. Anecdotal evidence may suggest this as a way to save operating room time and/ or blood loss in an elderly patient. However, reoperation rate for noninstrumented fusions that advance to a symptomatic pseudarthrosis is higher. Pedicle screw-rod and hook-rod construct is the most common method in thoraco-lumbar spine instrumentation. Before the surgery, a detailed preoperative planning is very important. Pedicle anatomy can be best assessed on CT. A general assessment as to whether a pedicle in instrumentable can be gained by examining its size on an anteroposterior radiography of the pedicle. Pedicle width and length and starting points can be determined from the axial image. There are two approaches are used: the midline approach is used for most spinal procedures as it allowed direct access to the spinal canal and the paraspinal approach (Wiltse approach) is used for minimally invasive muscle sparing technique.

In traditional posterolateral fusion, fusion bed preparation should be done by decorticating transverse process, the pars interarticularis and the lateral wall of the facet joint. The addition of an interbody fusion is another surgical technique designed to augment fusion and prevent pseudarthrosis. Using either a posterior lumbar interbody fusion(PLIF) or a transforaminal lumbar interbody fusion (TLIF) can allow bone to be placed under compression between the vertebral end plates and may be done in addition to a posterolateral fusion.

Mandatory Learning Issues (3-5)

- Indications for surgery
- Pedicle screw placement(traditional and cortical bone trajectory), Hook insertion(pedicle, transverse process and lamina) and spino-pelvic fixation(iliac screw, S2-AI screw)
- Different fusion technique (traditional posterolateral fusion and posterior/transforaminal lumbar interbody fusion)
- Complications after surgery

Adolescent Idiopathic Scoliosis – Fusion levels and correction techniques

Kenny Kwan, The University of Hong Kong

Adolescent idiopathic scoliosis (AIS) is a three dimensional deformity of the spine of unknown aetiology. It is more common in girls and progresses at the onset of puberty. Spinal fusion is recommended if it reaches 50o before skeletal maturity due to the risk of curve progression. The goals of surgical treatment of AIS are to achieve curve correction, obtain a balanced spine, perform spinal fusion and improve cosmesis while preventing neurologic injury. The selection of fusion levels in AIS is important in achieving optimal clinical outcomes. Longer fusion blocks, especially those involving more vertebral levels in the lumbar spine, can give rise to more back pain than shorter fusion blocks, and can lead to decreases in functional range of motion of the spine, which may in turn induce more stress in the remaining unfused vertebrae for compensation. A shorter fusion block would mean fewer pedicle screws being used, which have costs as well as safety implications, but at the same time, if the fusion block is too short, it may lead to decompensation. In spite of the importance of fusion level determination, there is no consensus amongst deformity surgeons what the ideal strategy is.

The University of Hong Kong first described the fulcrum bending radiograph (FBR) technique in predicting postoperative outcomes. By determining the inherent flexibility of the curves, it is possible to determine fusion level to achieve a balanced fusion block with the shortest possible fusion block. Other techniques described in the literature include the use of the substantially touched vertebra on a standing posteroanterior film. In terms of correction technique, current pedicle screw techniques are based on the concept of correcting a scoliosis on its concave side using either bilateral segmental screws or concave segmental and convex apical screws. Loss of thoracic kyphosis and global sagittal imbalance are well-recognised problems, and direct vertebral rotation technique have been shown to gain correction of thoracic kyphosis and coronal curve. Anterior curve correction technique involves modifying flexibility by discectomies, and vertebral derotation can achieve a satisfactory coronal and sagittal alignment.

Learning Objectives

- Indications for surgery
- Pre-operative planning, surgical techniques and determination of fusion levels
- Intra-operative manoeuvres for correction

Current concept of Adult Spinal Deformity

Mitsuru Yagi, Keio University

Adult spinal deformity (ASD) is a heterogeneous and complex spinal disorder that often requires surgery. As the population ages, it is increasingly common to encounter patients who have ASD requiring surgical correction.

Corrective spine surgery for ASD is invasive, but effective for most symptomatic ASD cases, while conservative treatment often fails. A recent prospective study by Smith et al. showed that surgery for ASD significantly improves the health-related quality of life (HRQoL) at the 2-year follow-up point, whereas conservative treatment does little to reduce pain and disability. Although ASD surgery provides favorable outcomes, it often requires a large dissection, long-segment spinal fusion, osteotomy, blood transfusion, and extended hospitalization, and thus carries a substantial risk for major complications and poor outcomes in both the peri-operative and long-term post-operative time periods. Several demographic, radiographic, and surgical factors have been reported to affect the development of surgical complications and inferior clinical outcomes in ASD surgery. Among them, sagittal balance is recognized as the most important factor for achieving a favorable clinical outcome in the surgical treatment of patients with adult spinal deformity (ASD). It is also widely recognized that positive sagittal balance can cause back muscle fatigue and subsequent pain and disability. Additionally, relationships between HRQoL and comorbidities in adults with chronic conditions are widely recognized. Typically, the presence of frailty and severe comorbidities influences HRQoL, as measured by various protocols and scales, in ASD surgery. Therefore, appropriate patient selection and good surgical decisions are key to successful treatment for the surgical treatment of ASD.

In this lecture participants will have learning outcomes based on the recent knowledge that can be used in critical decision making for the treatment of ASD.

Mandatory Learning Issues

- Classification
- Impact of spinal alignment for HRQOL
- Treatment strategy

Diagnosis and treatment of osteoporotic vertebral fracture.

Hirotaka Haro, University of Yamanashi

The elderly comprise a rapidly increasing proportion of the population worldwide as life expectancies rise and the birthrate declines. The number of estimated patients in Japan with osteoporosis and lumbar degenerative spondylosis was reported to be 10.7 million and 37.9 million respectively. Osteoporotic fractures lead to more than 432,000 hospitalizations and 2.5 million physician office visits every year in the United States. In accordance with an increased proportion of the population being of advanced age, patients surgically indicated for osteoporotic vertebral fractures (OVF) have also increased.

1) Comparison of rigid and soft brace treatments for acute OVF

The multicenter nationwide prospective study, which included 141 female patients aged 65-85 years with acute one-level OVF, examined the anterior vertebral body compression percentage at 48 weeks after treatment with either a rigid-brace or soft-brace for 4 weeks. We also examined EQ-5D and VAS for lower back pain, and JOABPEQ. There were no statistically significant differences in the outcome measures between groups. (J. Clin. Med. 2019)

2) Risk factors of adjacent OVF postoperatively

Surgical treatment was performed on insufficient union cases of OVF at T-L region with vertebroplasty using HA combined with posterior fusion (2010-2012) or X-core with percutaneous pedicle screw stabilization. Adjacent vertebral fracture (AVF) was significantly increased in the vertebroplasty group. Correction loss of local kyphosis was the major risk factor for AVF.

Mandatory Learning Issues

- Conservative treatment
- Surgical indication and treatment
- Complication

Current Concept of Metastasis

Shinji Takahashi, Osaka City University

The spine is the most common site for bone metastases, and the incidence of spinal metastases is increasing with increasingly older populations, longer life expectancy, and improvements in medical treatment. With improvements in chemotherapy, radiotherapy and hormonal therapies, survival times have increased over the years. Surgical techniques have also improved, which, together with advances in technology, now allow the surgeon to treat spinal metastases more effectively than before. Complications may occur in up to 25% of patients who undergo surgery for spinal metastases. Life expectancy is usually determined by the overall extent of the metastatic disease and, therefore, to be of benefit, surgery must improve quality of life. However, the incidence of complications increases with the complexity and extent of an operation, and, therefore, at some point there must be a trade-off between the benefits and risks of surgery.

To guide surgical decision-making, a variety of scoring systems have emerged such as the Spinal Instability Neoplastic Score (SINS) and Tokuhashi system. The 6-point SINS system considers instability based on the extent of vertebral body collapse, quality of pain, location of metastasis, alignment, radiographic appearance, and posterior element involvement. Tokuhashi et al devised a 15-point scale and later revised this system. Based on the results of these studies, patients with a life expectancy based on the revised scoring scale of fewer than 6 months were recommended to undergo conservative treatment, while those with a life expectancy of 1 year or more were recommended to undergo excisional surgery. Those expected to survive 6 months or more were recommended to undergo limited palliative surgery.

Surgical approaches include direct posterior decompression alone, posterior decompression with posterolateral fusion, corpectomy with cage graft placement, posterolateral instrumentation and fusion, vertebroplasty/kyphoplasty alone or in combination with posterolateral fusion, and radiosurgery alone or as an adjunct to surgical treatment. Minimally invasive approaches to the spine for metastatic spinal disease have been performed with varying success. Goals of surgery include deformity correction and stabilization, restoration of neurological function, pain control, and oncological control.

Mandatory Learning Issues

- Indications for surgery
- Scoring systems which guide surgical decision-making
- Treatment strategy
- Surgical approaches
- Complications and mortality after surgery

Memorandum

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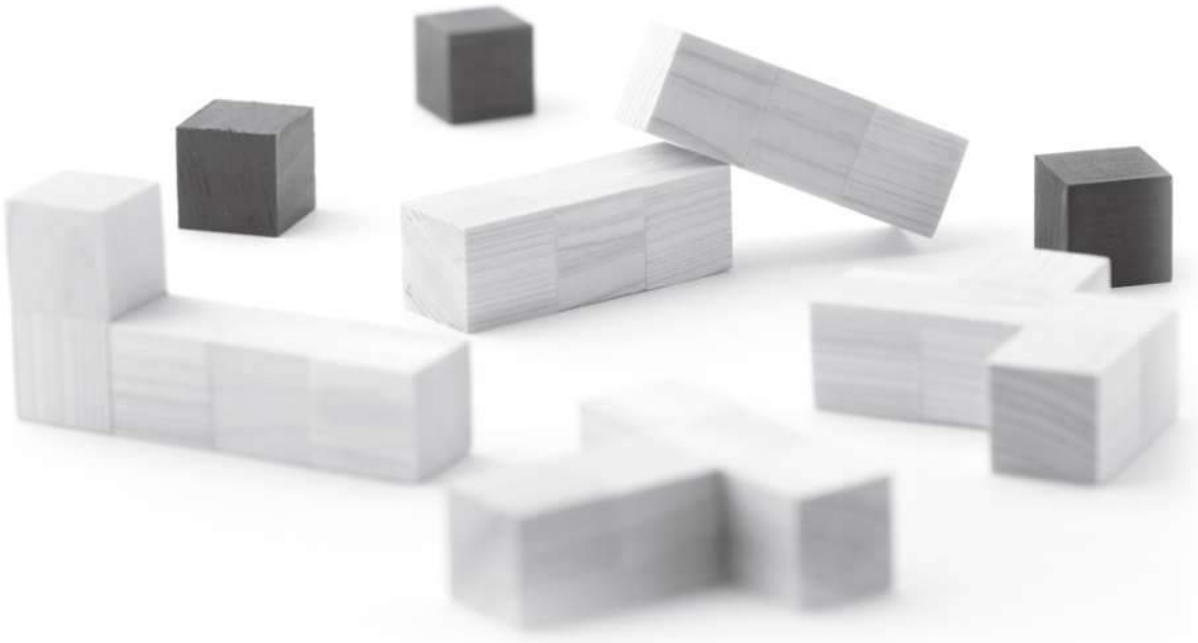

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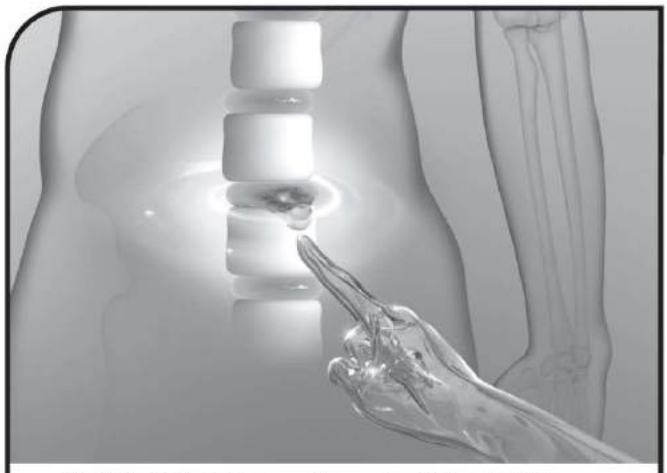

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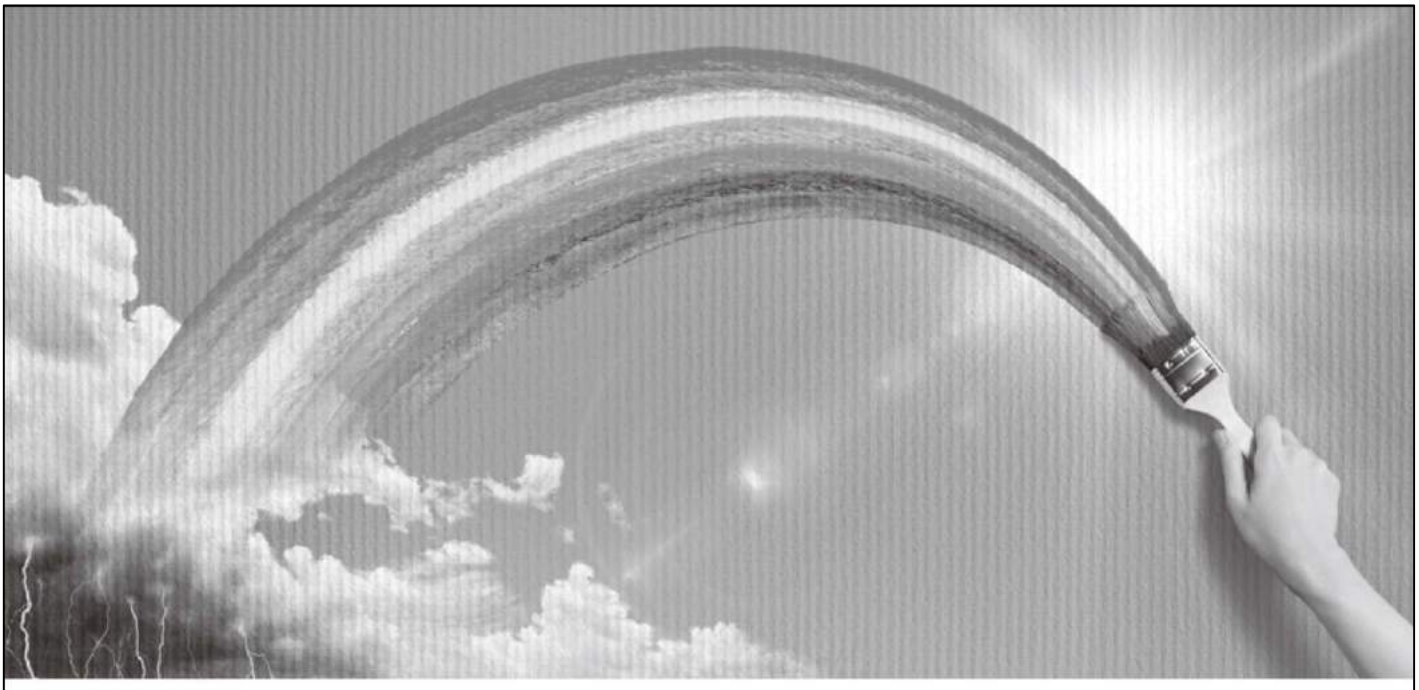

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