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Chapter 1 : HOME - Life Spine

Life Spine is focused on providing innovative solutions to address spinal pathology from the occiput to the sacrum. Our comprehensive product portfolio that centers around fusion and minimally invasive surgeries is driven by patient and surgeon needs.

Degenerative disc and facet joint disease of the lumbar spine is common in the ageing population, and is one of the most frequent causes of disability. Lumbar spondylosis may result in mechanical back pain, radicular and claudicant symptoms, reduced mobility and poor quality of life. Surgical interbody fusion of degenerative levels is an effective treatment option to stabilize the painful motion segment, and may provide indirect decompression of the neural elements, restore lordosis and correct deformity. The surgical options for interbody fusion of the lumbar spine include: The indications may include: In general, traditional posterior approaches are frequently used with acceptable fusion rates and low complication rates, however they are limited by thecal sac and nerve root retraction, along with iatrogenic injury to the paraspinal musculature and disruption of the posterior tension band. Minimally invasive MIS posterior approaches have evolved in an attempt to reduce approach related complications. Anterior approaches avoid the spinal canal, cauda equina and nerve roots, however have issues with approach related abdominal and vascular complications. In addition, lateral and OLIF techniques have potential risks to the lumbar plexus and psoas muscle. The present study aims firstly to comprehensively review the available literature and evidence for different lumbar interbody fusion LIF techniques. Secondly, we propose a set of recommendations and guidelines for the indications for interbody fusion options. Thirdly, this article provides a description of each approach, and illustrates the potential benefits and disadvantages of each technique with reference to indication and spine level performed. Accepted for publication Oct 23, LIF involves placement of an implant cage, spacer or structural graft within the intervertebral space after discectomy and endplate preparation. There is no clear definitive evidence for one approach being superior to another in terms of fusion or clinical outcomes. These operations can also be performed using mini-open or minimally invasive MIS approaches 2 , 3. Figure 1 A Surgical approaches to the lumbar spine for interbody fusion techniques. The five primary interbody fusion approaches are shown here schematically: Patient expectations and increasing demands for shorter hospital stay and early return to work has led to more innovative surgical techniques to reduce iatrogenic injury and postoperative morbidity. The growth of new techniques attempts to shorten operative times and achieve faster recovery with reduced operative complications 4. Initial descriptions of ALIF and PLIF have been challenged by the evolving alternate approaches, such as the transforaminal, lateral and more recently oblique techniques. Since the initial description of the PLIF technique by Briggs and Milligan in 5 , the method of PLIF has evolved, with the development of additional options of autologous and synthetic bone grafting, advanced methods of spinal segmental fusion techniques, innovative implants including the wide variety of interbody implants we use today and the use of pedicle screw fixation for posterior instrumentation. With advances in implants and techniques, the results of spinal fusion for PLIF has improved. Harms and Rolinger reported a newer technique in via the transforaminal route to achieve the insertion of an interbody cage packed with bone graft, termed TLIF 6. This created another option for surgeons in their armamentarium for treatment of patients with symptomatic disc disease, spondylolisthesis and degenerative lumbar scoliosis. In the PLIF technique, surgical access to the intervertebral disc is gained from a posterior direction. The patient is initially positioned in a prone position on an Andrews or Jackson table. Either an open midline approach with bilateral muscle strip dissection or MIS paramedian Wiltse muscle splitting approach can be used to access the posterior column of the vertebral body. Once the spinous process and laminae at the appropriate levels are identified L1-S1 , a laminotomy may be performed medial to the facet and the dura retracted to exposure a corridor to the disc space. The posterior approach may be suitable for degenerative indications requiring a fusion procedure. Selected patients with segmental instability, recurrent disc herniation, symptomatic spinal stenosis and pseudoarthrosis may also benefit from a PLIF procedure. Contraindications for posterior fusion surgery include extensive epidural scarring, arachnoiditis, and active infection. There are several advantages

associated with PLIF surgery. Firstly, the PLIF approach is a traditional lumbar approach that the majority of spinal surgeons are well trained and comfortable in performing. A posterior exposure allows excellent visualization of the nerve roots without compromising blood supply to the graft. PLIF allows for adequate interbody height restoration, allows for neural decompression whilst maintaining posterior support structures 7. Furthermore, posterior fusion surgery also allows for potential degree fusion through a single incision. There are disadvantages that a surgeon should be wary of when performing PLIF 8. Firstly, there may be significant paraspinal iatrogenic injury associated with prolonged muscle retraction 9. This may delay recovery and mobilization due to approach-related muscle trauma. Using this technique, it may be difficult to correct coronal imbalance and restore lordosis. Endplate preparation may be difficult compared to anterior fusion approaches. Other potential risks include retraction injury of nerve roots causing fibrosis and chronic radiculopathy 10 - 12 Figure 2. High grade isthmic spondylolisthesis presenting with bilateral L5 radiculopathy suitable for posterior rather than anterior approach. PLIF, posterior lumbar interbody fusion. TLIF Another posterior surgical approach for fusion is TLIF, used for stabilization and treatment of degenerative lumbar disease following failed conservative treatment. The main concerns with the posterior fusion approach was the extent of neural retraction required, with particular concerns surrounding potential nerve root injury, dural tears and epidural fibrosis. To address this limitation, the TLIF approach was proposed, involving direct, unilateral access to the intervertebral foraminal space whilst reducing direct dissection and surgical trauma to spinal muscles and structural integrity. By opening the neural foramen on one side only, damage to important anatomical structures such as nerve roots, dura and ligamentum flavum may be reduced. The TLIF approach involves positioning the patient prone after the patient is put under general anesthesia. A midline or bilateral paramedian mini-open incision is used, allowing access to the disc space suitable for levels L1-S1. The spinal canal is entered via a unilateral laminectomy and inferior facetectomy, which facilitates bone graft placement. Indications of a TLIF approach include all degenerative pathologies, including broad-based disc prolapses, degenerate disc disease, recurrent disc herniation, pseudoarthrosis, and symptomatic spondylosis. Contraindications are similar to PLIF and include extensive epidural scaring, arachnoiditis, active infection and conjoined nerve roots that may preclude access to the disc space and osteoporotic patients. Advantages of the TLIF approach include relatively easier access to the posterior structures including the lamina, ligamentum flavum and facet joints. Compared to a traditional PLIF technique, the TLIF approach preserves ligamentous structures which are instrumental to restoring biomechanical stability of the segment and adjacent structures 10 , 13 - In TLIF, a single unilateral incision is able to provide bilateral anterior column support. Access using a MIS mini-open incision and magnification loupes or microscope may further reduce access-associated muscle injury, minimize bleeding and improve postoperative recovery. It may be difficult to correct coronal imbalance and restore lordosis 11 , 16 , Compared to anterior approaches, endplate preparation may be difficult Figure 3. A TLIF with percutaneous screws offers a minimally-invasive option for interbody fusion ES-2, Stryker, USA ; B facetectomy followed by insertion of an interbody device can be performed via either a midline or paramedian approach. The anterior retroperitoneal approach facilitates adequate access to the entire ventral surface of the exposed disc, allowing comprehensive discectomy and direct implant insertion. For this technique, the patient is prepared and positioned supine. An ALIF procedure may be suitable for degenerative disc disease, discogenic disease and revision of failed posterior fusion The ALIF approach is associated with several key advantages. Firstly, this technique allows direct midline view of the disc space and extensive lateral exposure of the vertebral bodies, which permits efficient disc space clearance with rapid endplate preparation. Furthermore, the anterior access allows maximization of the implant size and surface area, which facilitates aggressive correction of lordosis and foraminal height restoration. This may lead to high fusion rates with ample disc space preparation 13 , 14 , 19 , 22 , ALIF also allows sparing of posterior spinal muscles and anterolateral psoas muscles, which may reduce postoperative pain and disability. Disadvantages of the ALIF technique include approach-related complications such as retrograde ejaculation, visceral and vascular injury 14 , 19 , Furthermore, at more caudal levels of the lumbar spine, the lumbar plexus courses more anteriorly and the iliac vessels course more laterally, which increases risk of injury via a lateral approach. A small lateral incision is performed based on

position and angulation of the disc on image intensification when the patient is positioned. Neuromonitoring is essential for the transpsoas access to the disc space. The LLIF approach is suitable for all degenerative indications. It is an excellent option for sagittal and coronal deformity correction, especially for lumbar degenerative scoliosis with laterolisthesis However, the LLIF approach may not be suitable for severe central canal stenosis, bony lateral recess stenosis and high-grade spondylolisthesis For operators using a standalone LLIF approach without posterior instrumentation, this should not be used under high biomechanical stress such as facet arthropathy, instability, deformity, adjacent to a previous fusion and multiple levels The lateral approach is also not suitable in patients with prior retroperitoneal surgery or with retroperitoneal abscess, as well as patients with abnormal vascular anatomy. Aggressive deformity correction can be achieved with high fusion rates and comprehensive disc space clearance 2 , 4. Vascular injury, if it occurs, may be difficult to control and represents another risk of the lateral transpsoas approach 26 , 30 , 31 Figure 5. The transpsoas corridor is used to access the disc space via a retroperitoneal approach performed with the patient in the lateral position. However in contrast to the lateral transpsoas approach, the OLIF technique does not dissect or traverse the psoas muscle. A lateral and paramedian incision is performed based on position and angulation of the disc on image intensification when the patient is positioned Neuromonitoring is not necessary as the anatomical corridor anterior to the psoas muscle is used for access. Lateral position for disc exposure anterior to the psoas. The exposure can be expanded via posterior retraction of the psoas to widen the corridor. Indications for OLIF include all degenerative indications. The OLIF approach is contraindicated in patients with severe central canal stenosis and high grade spondylolisthesis. OLIF also allows aggressive deformity correction, high fusion rates with comprehensive disc space clearance 33 , 34 , Lumbar plexus and psoas injury are unlikely as dissection is performed anterior to the psoas. However, potential risks involved with OLIF surgery include sympathetic dysfunction and vascular injury Comparative evidence based on interbody fusion technique ALIF vs. While both approaches involve removal of the degenerative disc and insertion of an interbody device, the anterior and posterior approaches are both associated with their own unique benefits and challenges. To the best of our knowledge, there has been no published multi-center prospective randomized controlled trial comparing anterior and posterior fusion surgery, for either single or multilevel pathologies. One of the earliest comparative studies was reported by Hacker et al. One criticism of this study, however, was that it represents an early experience of an approach used by few groups, with higher allograft malposition rates 3 out of 53 patients which may be attributed to a learning curve of this technique. More recent studies by Faundez et al. In the context of a lack of randomized evidence, the next best level of evidence is a systematic review and meta-analysis of retrospective comparative evidence. Dural injury was found to be significantly lower in the ALIF group 0.

Chapter 2 : CERVICAL - Life Spine

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Ideal postural alignment is depicted in both the frontal and side views. In each view, the center of mass of the skull, thorax, and pelvis are in a vertical line with respect to gravity. In the frontal view, the spinal column is vertically aligned-a straight column- with respect to gravity. In the side view, the spine has three primary curvatures which will be described below: Neck Curve â€" Cervical Lordosis, 2. Ribcage Curve â€" Thoracic Kyphosis, 3. Harrison Full Spine Model As in all fields of study dealing with the human body, i. The Harrison Spinal Model is an evidenced based model for side view spinal alignment. It is the geometric path of the posterior longitudinal ligament or the backs of the vertebra from the 1st neck vertebra to the bottom of the lower back or top of the sacrum. See Figures below detailing the Harrison Spinal Model. This model details both Ideal and Average geometric shapes for the curves of the spine from the side. Additionally, ideal and average ranges for the spinal segmental angles for each of the spinal regions have been identified. The ribcage or thoracic spine should have a geometric shape that approximates an oval-elliptical shape. And the low back or lumbar spine should have a geometric shape that approximates an oval-elliptical shape. In other words, the Harrison Spinal Model has been found to be able identify pain subjects versus non-pain subjects by what their spinal x-ray shapes are. On the readers left is the Neck or Cervical spine-Here the shape in the neck curve should approximate a piece of a circle. On the Right is the Low back or Lumbar spine. The Harrison Full Spine Model. On the readers left is the exact geometric model of the side view of the spinal curves as identified by Harrison and colleagues. For example, a full spine x-ray on the right is shown. It is apparent that this patient has altered spinal alignment as they do not fit even close to the Harrison Idealized Spinal Model. On the Right is a normal curved patient x-ray. The Harrison Spinal Model in the neck has been shown to reasonably predict which person will have neck pain compared to normal subjects. The Harrison spinal model is depicted as the RED curved line in this figure. The Harrison Spinal Model in the low back has been shown to reasonably predict which person will have low back pain compared to normal subjects. X-Ray Analysis and Utilization To establish optimal and average sagittal models, x-ray analysis and line drawing procedures are utilized. No-one would not take their car to the mechanic and say: Don Harrison was the first to describe abnormal postures of the head, rib cage, and pelvis in this manner. The possible translation postures Tx, Ty, Tz of the head, rib cage, and pelvis are depicted in 3-dimensions. The possible postural rotations Rx, Ry, Rz of the head rib cage and pelvis are depicted in 3-dimensions. Ideal posture can be precisely described as vertical alignment of the centers of mass of the head, ribcage, and pelvis with respect to gravity Figure 1 above. In other words, none of the rotations and translations in Figures 7 and 8 can be present. Using this definition, abnormal postural rotations and translations can be determined. Clinically, these adjusting set-ups were found to result in postural and spinal alignment improvements verified with follow up x-ray; this impression would be subjected to studies later as shown in Table 1 above. For each of these postures illustrated in Figures 7 and 8, Dr. Don Harrison and his brother Glenn Harrison originated drop table adjustments, instrument adjustments both table and hand-held. Don Harrison placed the patient in their opposite posture. Thus, postural adjustments as performed with drop table, hand-held instrument, or even mirror image manipulation procedures, are performed for resetting the nervous system regulation of postural muscle balance. Mirror Image adjustment example for the head posture. The patient has forward head posture translation and the skeletal animation shows what happens to the spine with this posture. The posture is placed in its opposite position and then a Chiropractic adjustment is performed. Mirror Image adjustment example for the ribcage posture. The patient has right lateral ribcage posture translation and the skeletal animation shows what happens to the spine with this posture. Although strength and conditioning exercise has not proven to correct posture,46 postural exercises performed in the mirror image have shown initial promise in the reduction of posture and spinal displacements. Mirror Image exercise example for the abnormal forward head posture. The patient has an abnormal forward head translation posture and the skeletal animation shows what happens to the spine with this posture. The patient actively maneuvers their posture into the opposite or Mirror Image position. Mirror

Image exercise example for an abnormal lateral shifted translated ribcage posture. Don Harrison and Dr. From , several postural and spinal traction methods to restore thoracic and lumbar sagittal curvatures were developed by Dr. Postural mirror image and extension traction for the side view spinal curves provides sustained loading periods of minutes and is necessary to cause visco-elastic deformation to the resting length of the spinal ligaments, muscles, and discs. Whereas some forms of spinal extension traction are available for patients to use at home; the examples shown in Figures are in office types only. Three different subluxations abnormal alignment of the cervical curve and their respective Mirror Image traction methods. In A, hypolordosis with mild anterior head translation requires compression extension traction in B. In C, slight kyphosis with posterior head translation requires 2-way non-compression traction in D. In E, reversal of the upper cervical curve with mild anterior head translation requires compression extension 2-way traction in F. Two different subluxations of the lumbar curve and one of the thoracic curve and their respective Mirror Image traction methods. In A, lumbar kyphosis with anterior thoracic translation requires 3-point bending extension traction in B shown standing. In C, slight lumbar kyphosis with posterior thoracic translation requires 3-point bending in D shown supine. In E, hyper-kyphosis of the thoracic curve requires 3-point bending thoracic traction in F shown standing. The reason for postural mirror image exercises, adjustments, and traction procedures is to address all the tissues involved in spine and posture alignment. Unlike the relief care phase approximately 12 visits , which includes segmental adjusting procedures from other named techniques, the E.

Chapter 3 : What is CBPÂ® â€“ Chiropractic BioPhysics

Primary survey[edit] The first and key part of the assessment of patients presenting with trauma is called the primary survey. During this time, life-threatening injuries are identified and simultaneously resuscitation is begun. A simple mnemonic, ABCDE , is used as a mnemonic for the order in which problems should be addressed. Airway maintenance with cervical spine protection[edit] Main article: If the patient is able to talk, the airway is likely to be clear. The airway can be opened using a chin lift or jaw thrust. Airway adjuncts may be required. If the airway is blocked e. In case of obstruction, pass an endotracheal tube. Breathing and ventilation[edit] The chest must be examined by inspection, palpation , percussion and auscultation. Subcutaneous emphysema and tracheal deviation must be identified if present. Flail chest , tracheal deviation, penetrating injuries and bruising can be recognized by inspection. Subcutaneous emphysema can be recognized by palpation. Tension Pneumothorax and Haemothorax can be recognized by percussion and auscultation. Circulation with bleeding control[edit] Hemorrhage is the predominant cause of preventable post-injury deaths. Hypovolemic shock is caused by significant blood loss. Two large-bore intravenous lines are established and crystalloid solution may be given. If the person does not respond to this, type-specific blood, or O-negative if this is not available, should be given. External bleeding is controlled by direct pressure. Occult blood loss may be into the chest, abdomen, pelvis or from the long bones. A more detailed and rapid neurological evaluation is performed at the end of the primary survey. The Glasgow Coma Scale is a quick method to determine the level of consciousness, and is predictive of patient outcome. If not done in the primary survey, it should be performed as part of the more detailed neurologic examination in the secondary survey. Hypoglycemia and drugs, including alcohol, may influence the level of consciousness. If these are excluded, changes in the level of consciousness should be considered to be due to traumatic brain injury until proven otherwise. Exposure and environmental control[edit] The patient should be completely undressed, usually by cutting off the garments. It is imperative to cover the patient with warm blankets to prevent hypothermia in the emergency department. Intravenous fluids should be warmed and a warm environment maintained. Patient privacy should be maintained. Secondary survey[edit] When the primary survey is completed, resuscitation efforts are well established, and the vital signs are normalizing, the secondary survey can begin. The secondary survey is a head-to-toe evaluation of the trauma patient, including a complete history and physical examination, including the reassessment of all vital signs. Each region of the body must be fully examined. X-rays indicated by examination are obtained. If at any time during the secondary survey the patient deteriorates, another primary survey is carried out as a potential life threat may be present. The person should be removed from the hard spine board and placed on a firm mattress as soon as reasonably feasible as the spine board can rapidly cause skin breakdown and pain while a firm mattress provides equivalent stability for potential spinal fractures. In , PETA announced that it was donating surgical simulators to ATLS training centers in 9 countries that agreed to switch from animal use to training on the simulators. Accredited by two Royal Colleges and numerous emergency services, the course runs numerous times per year for candidates drawn from all areas of medicine and trauma care. Styner , an orthopedic surgeon piloting a light aircraft, crashed his plane into a field in Nebraska. His wife Charlene was killed instantly and three of his four children, Richard, Randy, and Kim sustained critical injuries. His son Chris suffered a broken arm. He carried out the initial triage of his children at the crash site. Styner had to flag down a car to transport him to the nearest hospital; upon arrival, he found it closed. Even once the hospital was opened and a doctor called in, he found that the emergency care provided at the small regional hospital where they were treated was inadequate and inappropriate. Since emergency physicians, paramedics and other advanced practitioners use ATLS as their model for trauma care it makes sense that programs for other providers caring for trauma would be designed to interface well with ATLS. This approach allows for medical and nursing care to be well coordinated with one another as both the medical and nursing care providers have been trained in essentially

the same model of care. Styner Award for Meritorious Service in honor of Dr.

Chapter 4 : Advanced trauma life support - Wikipedia

Surgical Technique 10 1. Patient Positioning/Exposure 10 2. Polyaxial Screw Placement 10 the upper thoracic spine (T1-T3) for the purposes of anchoring the.