AOSpine "Case-Based" Principles Course

Notes for Chairpersons and Faculty Regarding Structure and Content

AOSpine Principles Education Working Group (January 2014)

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Contents

Introduction

This document outlines a multipathology 2-day course with the goal of delivering a more standardized Principles event that delivers the required learning outcomes without being overly prescriptive and that accommodates some regional flexibility.

The accompanying Excel file provides a template for delivering the content described below with suggested timing. (PowerPoint files for lectures and cases will be provided at a later date).

General comments

In this program the aim is to cover all relevant material in a "case-based" format. Information is delivered during the discussions and summarized by faculty at the end of each section with clear take-home messages.

Information regarding classification systems, bone metabolism, and biomechanics relevant to the topics covered should be distributed to participants prior to the course and considered as "assumed knowledge" at the commencement of the program. The focus can then be on the interpretation and application of the classification systems and other materials to clinical practice.

Welcome and introductory remarks

Welcome the participants, introduce the faculty, and provide all relevant logistical information appropriate to the course and venue.

Precourse assessment

Introduce the precourse assessment explaining that the purpose of the course is to help participants achieve their learning goals and for this reason it is important to identify their knowledge gaps.

The assessment questions will be used to focus discussion on the points most relevant to the participants' needs and cases presented during the quiz will be revisited during or at the end of the course to provide answers and explain learning points.

The results of the assessment should be provided to faculty at the end of the first session of the program.

Note: Where possible, use cases from the questions in the discussion of the relevant topics in order to provide an explanation of the answer and to complete the learning loop.

Module 1: Cervical Trauma— upper cervical trauma

Case presentation: *Cervical trauma–C1*

Begin the first session of the course with a case presentation to demonstrate the relevance of the content to their daily activities of assessing patients with cervical trauma. The suggested case is a Jefferson C1 fracture with disruption of the transverse ligament.

Participants should discuss the clinical assessment of patients presenting with a cervical injury, the clinical and radiographic processes for a suspected cervical injury, and "clearing" the cervical spine. Also reinforce ATLS principles.

Discussion should lead into the lecture regarding the classification of upper cervical spine trauma/injury.

Conclude the discussion with a brief summary of key points and take-home messages.

Lecture: *Upper cervical injury classification systems*

The presentation should be an overview of the classification systems relevant to upper cervical injuries (C0–1, C1, and C2 injuries). There is no need to present excessive detail. The focus should be to identify factors that indicate the presence of significant instability or poor outcomes if neglected or treated inadequately. Include clinical examples of fracture patterns in the presentation to reinforce learning points.

The provision of handouts or access to online resources would enable participants to review and consolidate knowledge of the relevant classification systems on their own time.

This lecture and the relevant material may be provided to participants prior to the course and considered "assumed knowledge". In this situation focus on the application of the classification system rather than the details of the system itself. Additional time can then be allocated to the discussion of cases.

Case presentation: *Cervical trauma–C2*

Use the case to review the process for clinical and radiographic assessment of patients with upper cervical spinal trauma. Discuss prognostic factors in relation to upper cervical injuries, particularly the incidence of nonunion with this sort of injury, age-related factors, and indications for surgical intervention. Also consider comorbidities (such as osteoporosis, cardiac, and respiratory disease) and how the presence of these conditions influences management.

Conclude the discussion with a brief summary of key points and take-home messages.

Discussion

Review relevant points and discuss topics identified during discussion that warrant further emphasis or clarification.

Learning outcomes

- Recognize an injury to the upper cervical spine
- Evaluate the stability of an upper cervical spinal injury
- Classify the injury according to an appropriate and recognized classification system
- Describe the nature of the injury to a colleague or supervisor
- Outline the surgical principles and procedures that may be used to stabilize an upper cervical spinal injury

Module 1: Cervical Trauma– subaxial cervical trauma

Case presentation: *Cervical trauma–cervical burst fracture*

Participants should discuss the clinical assessment of patients presenting with a cervical injury, particularly in relation to the assessment of neurological loss. Review the ASIA scoring system and the relevance of neurological compromise in relation to the indications for and timing of treatment. Also discuss the need to achieve stability of the spinal column and decompression of the neural elements, the role of bracing, and the application of traction. Also reinforce ATLS principles and the management of patients with spinal cord injury in relation to associated injuries to the axial skeleton.

Also discuss biomechanical principles in relation to the management of cervical trauma.

Discussion should lead into the lecture regarding the classification of subaxial cervical spinal trauma.

Conclude the discussion with a brief summary of key points and take-home messages.

Lecture: *Subaxial cervical injury classification systems*

The presentation should summarize relevant points only (there is no need to go over all historical classification systems unless relevant to the learning outcomes). Focus on what residents can use in their day-to-day practice that will assist them when they communicate with attending surgeons and colleagues. There is no need to present excessive detail. The focus should be to identify factors that indicate the presence of significant instability or poor outcomes if neglected or treated inadequately. Include clinical examples of fracture patterns in the presentation to reinforce learning points and indicate the need for surgical intervention.

The provision of handouts or access to online resources would enable participants to review and consolidate knowledge of the relevant classification systems on their own time.

This lecture and the relevant material may be provided to participants prior to the course and considered "assumed knowledge". In this situation focus on the application of the classification system rather than the details of the system itself. Additional time can then be allocated to the discussion of cases.

Case presentation: *Cervical trauma–cervical dislocation*

Use the case to review the process for clinical and radiographic assessment of patients with subaxial cervical spinal trauma. As bilateral facet dislocation is usually associated with neurological compromise, discuss the need for a multidisciplinary approach to the management of acute spinal cord injury (ASCI).

The application of traction, the use of traction to achieve reduction, and the role of closed reduction and the associated risks should be discussed.

Also discuss the mechanism of injury and the importance of considering this in determining the structures that have been disrupted and the most appropriate surgical approach when surgery is indicated.

Conclude the discussion with a brief summary of key points and take-home messages.

Case presentation: *Cervical trauma–cervical dislocation*

Use the case to discuss the natural history of central cord syndrome in this group of patients, and the association with preexisting cervical canal stenosis, degenerative disease, and associated comorbidities.

Discuss clinical assessment, features of cord injury syndromes, and indications for surgical intervention.

Conclude the discussion with a brief summary of key points and take-home messages.

Discussion

Review relevant points and discuss topics identified during discussion that warrant further emphasis or clarification.

Learning outcomes

- Recognize an injury to the subaxial cervical spine
- Describe the imaging modalities that are indicated for the assessment of spinal trauma
- Interpret abnormalities evident on x-rays, dynamic films, CT, MRI, etc used to assess spinal trauma
- Identify radiographic features of instability and spinal cord injury
- Define the mechanism and morphology of a spinal injury
- Classify the injury according to an appropriate and recognized injury classification system
- Describe the principles of spinal biomechanics
- Assess neurological status of spinal injured patients using the ASIA scale
- Describe the prognostic factors associated with spinal cord injury
- Recognize complications associated with the presence of a significant spinal cord injury and outline the principles of their management
- Apply and manage cervical traction
- Describe clearly the nature of the injury to a colleague or supervisor
- Outline the surgical principles and procedures that may be used to stabilize an upper cervical spinal injury

Module 2: Cervical Degeneration

Case presentation: *Cervical degeneration–assessment*

Participants should discuss the clinical assessment and natural history of patients presenting with cervical degeneration. The natural history, symptoms, and examination findings associated with this process should be discussed.

Indications for and interpretation of radiological investigations should be discussed. The identification of red flags, myelopathy, tumors, and instability should be covered along with the differential diagnosis of shoulder pathology, fibromyalgia, MS, etc.

Nonoperative treatments, physical therapy, etc and the evidence-based indications for surgical intervention and the influence of psychological issues and compensation should be discussed.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Describe the natural history of cervical degenerative disease
- Obtain a relevant history and perform a screening clinical examination for cervical degenerative disease
- Exclude or differentiate symptoms related to cervical degeneration from other non-spine pathology
- Use and interpret appropriate diagnostic tools to assess cervical degenerative disease
- Outline the role and indications for the use of other diagnostic tools such as EMG and injections
- Correlate investigation findings with clinical features

Case presentation: *Cervical radiculopathy*

Participants should discuss the clinical assessment of patients presenting with cervical nerve root compression along with the natural history, symptoms, and examination findings associated with this condition.

Indications for, and interpretation of radiologic investigations should be discussed. The identification of red flags, myelopathy, progressive neurological loss and differentiation for other conditions (eg, tumors, brachial neuritis, and peripheral nerve syndromes) should be covered.

Nonoperative treatments, physical therapy, and the evidence-based indications for surgical intervention should be discussed. Surgical options, ACDF, and TDR should be discussed without being prescriptive.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Identify patients with cervical nerve root or spinal cord compression due to localized cervical spine pathology—disc protrusions predominantly, but also spondylosis leading to foraminal stenosis
- Correlate diagnostic tests with clinical features
- Implement appropriate nonoperative treatments in the management of cervical nerve root compression
- Describe the natural history and indications for surgical intervention
- Outline the appropriate surgical procedures to manage this condition

Case presentation: *Cervical myelopathy*

Participants should discuss the clinical assessment of patients presenting with cervical myelopathy. The natural history, symptoms, and examination findings associated with this process should be discussed with an emphasis on identifying factors indicating a poor clinical outcome with ongoing nonoperative treatment.

Indications for, and interpretation of radiographic investigations should be discussed. The identification of red flags, tumors, and instability should be covered along with the differential diagnosis of shoulder pathology, fibromyalgia, MS, etc. Also discuss the influence of comorbidities such as rheumatoid disease, diabetes, osteoporosis, and respiratory and cardiac disease on the management of this condition.

The evidence-based indications for surgical intervention should be discussed. It may be useful to present different scenarios, eg, gradual onset of myelopathy with stenosis and signal change on MRI and a case of myelopathy in a patient with rheumatoid arthritis and osteoporosis and/or OPLL to bring out points related to each of these pathologies if relevant to the region where the course is being delivered.

Also discuss surgical options and provide guidelines for anterior vs posterior surgery without being prescriptive. Also discuss possible complications of treatment such as C5 nerve root palsy with laminoplasty, nonunion, and implant failure.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Describe the natural history of cervical myelopathy and the indications for surgical intervention
- Outline the principles for surgical intervention, surgical options, and possible complications

Discussion

Review relevant points and discuss topics identified during discussion that warrant further emphasis or clarification.

Module 3: Practical Exercise

Cervical– Laminoplasty and lateral mass screws

Ensure that activities undertaken during the practical exercise are relevant to the needs of the participants.

This practical exercise should go over the aims of cervical decompression and stabilization and the anatomical landmarks for lateral mass fixation.

While laminoplasty is not an established practical activity, it is a technique that can be well demonstrated using sawbones and is relevant to the learning needs of residents and junior fellows. Some additional resources may be needed for this activity (eg, drill or burr and a spacer) to hold the lamina open once the laminoplasty has been performed.

Learning outcomes

- Identify the anatomical landmarks to perform a laminoplasty and the insertion of lateral mass screws in the cervical spine
- Place C1 lateral mass, C2 pedicle, C2 lamina, and C1–2 transarticular screws
- Place lateral mass screws in the cervical spine

Lumbar/thoracic—Pedicle screw insertion in the thoracic and lumbar spine

Go over the landmarks for pedicle screw insertion and the creation of a simple construct for the treatment of degenerative conditions in the lumbar spine, thoracolumbar trauma, and deformity.

Learning outcomes

- Identify the anatomical landmarks related to the placement of thoracic and lumbar pedicle screws
- Place pedicle screws in the thoracic and lumbar spine

Dural repair (This practical activity is currently under development)

It is hoped a simple model will be available in 2014 for demonstration, allowing participants to practice techniques of dural repair.

Learning outcomes

- Outline the principles for the management of a dural tear
- Perform a “water tight” closure of a simulated dural tear

Module 4: Thoracolumbar Trauma

Case presentation: *Thoracolumbar fracture—A type*

Participants should discuss the clinical assessment of patients presenting with thoracolumbar trauma. Reinforce ATLS principles and review clinical findings and relevant radiographic investigations and interpretation.

Focus on indications for surgical intervention and assessment of stability. Also cover associated injuries and how this influences decision making regarding indications for surgery. Also discuss the role of nonoperative treatments and bracing in patients where criteria for surgical intervention are not met.

Biomechanical assessment and principles should be covered and linked to the application of the classification system for thoracolumbar trauma.

Also consider influence of osteoporosis on management.

Conclude the discussion with a brief summary of key points and take-home messages.

Discussion should lead into the lecture regarding the classification of thoracolumbar trauma.

Lecture: *Classification and management of thoracolumbar fractures*

The presentation should summarize relevant points only. There is no need to go over all historical classification systems unless relevant to the learning outcomes. Focus on what residents can use in their day-to-day practice and what will assist them when they communicate with attending surgeons and colleagues. There is no need to present excessive detail. The focus should be to identify factors that indicate the presence of significant instability or poor outcomes if neglected or treated inadequately. Include clinical examples of fracture patterns in the presentation that reinforce learning points and indicate the need for surgical intervention.

The provision of handouts or access to online resources would enable participants to review and consolidate knowledge of the relevant classification systems on their own time.

This lecture and the relevant material may be provided to participants prior to the course and considered “assumed knowledge”. In this situation focus on the application of the classification system rather than the details of the system itself. Additional time can then be allocated to the discussion of cases.

Learning outcomes

- Describe and apply an appropriate anatomical classification of thoracolumbar fractures to facilitate communication with colleagues and senior surgeons
- Identify the morphology and mechanism of a thoracolumbar injury

Case presentation: *Thoracolumbar fracture– B type*

Focus on assessment of the posterior column and significance in relation to the stability of the segment. Reinforce points from the earlier discussion of classification systems.

Neurological assessment and the differentiation of a cord vs conus vs cauda equina compromise should be covered and the ASIA classification system, discussed in cervical trauma module, reinforced.

Discuss evidence-based treatment options, the indications for surgical intervention, and the approach and timing.

Also cover associated injuries and how these may influence decision making regarding indications for surgery.

Conclude the discussion with a brief summary of key points and take-home messages.

Case presentation: *Thoracolumbar fracture– C type*

Focus on identification of features of the history, examination, and radiographic investigations that indicate shear or translational injures associated with significant instability.

These translational injuries are often associated with neurological compromise so use the discussion to reinforce points discussed in the cervical trauma module and in the discussion of "B type" injuries. Reinforce the importance of a multidisciplinary approach to spinal cord injury management.

Discuss the evidence-based treatment options, the indications for operative intervention, and the approach and timing of surgery.

Also cover associated injuries and how these may influence decision making regarding indications for surgery.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Perform a screening clinical examination to assess the presence and extent of a spinal injury
- Assess and identify the presence of a spinal cord or neurological injury
- Order and interpret appropriate radiographic investigations
- Recognize radiographic features of instability
- Identify features indicating either instability or poor outcomes with nonoperative management of thoracolumbar fractures
- Identify those patients who will benefit from operative intervention
- Identify a spinal cord or neurological injury

- Describe the indications for surgery and options in relation to surgical approach
- Appreciate the importance of a multidisciplinary approach in the management of spinal cord and neurological injuries

Case discussion: End of day 1

The day should end with a case discussion to reinforce points brought out during the program. Consider discussion of a trauma patient with ankylosing spondylitis in order to discuss the risks related to this particular patient group.

Suggested cases:

- A patient with rheumatoid arthritis or OPLL and cervical myelopathy (if not covered earlier in the program)
- A patient with a postoperative infection following stabilization of an unstable spinal injury (an example of how to manage the infection while preserving spinal stability)
- An elderly patient with an odontoid fracture (an example of issues regarding the risk benefit analysis of surgical treatment)

Learning outcomes

- Recognize features in patients with injuries of the spinal column or spinal cord that require special consideration and treatment
- Be aware of conditions such as ankylosing spondylitis and osteoporosis and how they may alter the management of a thoracolumbar injury

Module 5: Lumbar Degeneration

Case presentation: *Lumbar degeneration— assessment*

Participants should discuss the clinical assessment of patients presenting with back pain with or without features of neurological compromise, the indications for imaging and other investigations, and the natural history of acute and chronic degenerate back pain in the absence of neurological compromise or demonstrable instability. Participants should also understand nonoperative treatments such as core stabilization and the use of both therapeutic and diagnostic injection procedures.

Mention the relevance of psychological issues, depression, and compensation in relation to outcomes.

Participants should also be aware of the differential diagnosis of low back, buttock, and leg pain such as hip and sacroiliac pain and be able to identify "red flags" such as infection, tumors, and features of cauda equina compromise.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Describe the natural history of lumbar degenerative disease
- Obtain a relevant history and perform a screening clinical examination for lumbar degenerative disease
- Outline the role and interpretation of investigations used to assess degenerative conditions of the lumbar spine
- Exclude or differentiate symptoms related to lumbar degeneration from other nonspinal pathology (hip, SI joint, knee, etc)
- Initiate appropriate nonoperative interventions in the management of symptoms related to lumbar degeneration
- Outline the evidence regarding the surgical treatment of degenerative disease of the lumbar spine in the absence of instability or neural compromise
- Identify patients with significant psychological issues
- Recognize the importance of a multidisciplinary approach to the management of chronic pain

Case presentation: *Lumbar radiculopathy*

Participants should discuss the clinical assessment of patients presenting with sciatica due to focal nerve root compression. They should discuss the natural history, nonoperative treatments and injections, and appropriate investigations.

Participants should also have an understanding of the surgical treatment of this condition, the surgical approach, outcomes, and common complications.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Describe the natural history of sciatica due to disc herniation
- Request and interpret appropriate radiographic investigations
- Outline the evidence regarding the surgical treatment of disc herniation and relevant complications (recurrence, back pain, discitis)
- Outline the appropriate surgical management of these patients, including timing and type of surgery

Case presentation: *Lumbar spinal canal stenosis*

Participants should discuss the clinical assessment of patients presenting with symptoms of canal stenosis. Participants should discuss the natural history, nonoperative treatments and injections, appropriate investigations, and the evidence-based indications for surgical intervention.

Participants should also be able to differentiate spinal stenosis from vascular claudication, diabetes, SI joint, hip, and knee pathology, and degenerative back pain in the absence of neural compromise.

They should also have an understanding of the surgical treatment of this condition, the surgical approach, outcomes, and common complications.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Describe the natural history of lumbar spinal canal stenosis
- Request and interpret appropriate radiographic investigations
- Discuss the evidence regarding the surgical treatment of lumbar canal stenosis in the absence of instability by decompression alone
- Outline the appropriate surgical management of these patients, including timing and type of surgery
- Identify and manage common complications such as dural tear, epidural hematoma, iatrogenic instability, and aggravation of degenerative back pain

Case presentation: *Lumbar degenerative spondylolisthesis*

Participants should discuss the clinical assessment of patients presenting with symptoms of canal stenosis in association with mechanical instability. They should discuss the natural history, nonoperative treatments and injections, appropriate investigations, and the evidence-based indications for surgical intervention.

Here the focus should be on identifying factors indicating clinical and radiographic features of instability of the spine and the need for fusion/stabilization in association with decompression.

They should also have an understanding of the surgical treatment options for this condition, the risk and benefits of the use of instrumentation, and the surgical options without being prescriptive. This should include a discussion of the outcomes and common complications.

Also consider indications for DVT prophylaxis in patients undergoing spinal surgery.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Identify the clinical and radiographic features of instability in patients presenting with lumbar spinal canal stenosis
- Discuss the evidence in relation to this treatment
- Outline the surgical techniques appropriate to manage this condition
- Identify and manage common complications relating to the management of this condition

Case presentation: *Lumbar spondylolisthesis*

Participants should discuss the clinical assessment of patients presenting with symptoms of spondylolisthesis. They should discuss the incidence, natural history, nonoperative treatments and injections, appropriate investigations, and the evidence-based indications for surgical intervention.

Participants should also have an understanding of the surgical treatment of this condition, the objectives in relation to decompression of neural elements, restoring sagittal balance over reduction of the slip, and achieving a solid fusion.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Identify the clinical and radiographic features of a lytic spondylolisthesis
- Discuss the evidence in relation to the surgical treatment of this condition
- Describe the surgical techniques appropriate to manage low-grade spondylolisthesis
- Discuss the treatment options for high-grade spondylolisthesis
- Identify and manage common complications relating to the management of this condition

Module 6: Deformity

Case presentation: *Adolescent idiopathic scoliosis*

Participants should discuss the incidence, family history, clinical assessment, and treatment principles regarding the management of AIS. They need to be able to identify features indicative of progression and describe the indications for surgical intervention.

Participants should have an understanding of the commonly used classification system (Lenke), the treatment options, and the risks and common complications of both operative and nonoperative (brace) treatment of this condition. They need to understand the need for a detailed clinical and neurological evaluation in order to identify red flags such as tumors, neural tube abnormalities, connective tissue and muscular disease, and their association with spinal deformity.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Perform a screening clinical examination in patients with AIS
- Request and interpret appropriate radiographic investigations
- Describe the main classification system (Lenke) for AIS
- Outline the treatment principles in the management of AIS
- Identify significant associated pathology

Case presentation: *Adolescent idiopathic scoliosis*

Present details of treatment strategy and outcome.

Case presentation: *Congenital scoliosis*

Participants should discuss the etiology, incidence, classification, and association with other congenital anomalies. The clinical assessment and treatment principles regarding the management of congenital scoliosis should be addressed, but the focus should be on identifying factors indicating progression or a risk to neurological structures.

As many patients with this congenital spinal deformity are diagnosed incidentally on a chest or abdominal film performed for other reasons or an intrauterine ultrasound, the indicators for progression and the need to educate parents and monitor progression through growth should be emphasized.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Identify and classify congenital abnormalities of the spine
- Discuss the treatment principles and options

- Recognize associated anomalies and common complications of treatment
- Describe the natural history to enable discussion with parents regarding natural history, need to monitor, and likelihood of surgery

Case presentation: *Degenerative scoliosis*

Participants should discuss the incidence, etiology (AIS or de novo due to degenerative disease), natural history, clinical and radiographic assessment, and treatment principles.

As patients are often elderly the association with other comorbidities (diabetes, osteoporosis, cardiac and respiratory disease, as well as degeneration of the hip, knee, shoulder, and SI joints) that add to the risks of surgery need to be considered and patients need to have realistic expectations of the outcome.

The indications for surgery and the need to define the surgical goals (spinal balance, neural decompression, and the avoidance of complications such as junctional breakdown, nonunion, and implant failure) should be emphasized. However, since participants are unlikely to undertake the assessment of these patients or plan treatment independently, the focus should be on the principles of treatment and evidence-based indications for intervention.

Nonoperative treatment strategies and evaluation of the risks vs benefits should also be discussed.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Outline the treatment principles and options in relation to adult or degenerative spinal deformity
- Recognize associated comorbidities and their influence on the outcome of surgery
- Outline the principles in relation to restoration and maintenance of spinal balance
- Perform assessment in relation to restoration and maintenance of spinal balance

Module 7: Infection

Case presentation: *Pyogenic infection*

Participants should discuss the history, presentation and etiology, and conditions associated with pyogenic infection of the spine, eg, diabetes, HIV, IV drug use, immunocompromise. They should be able to request and interpret appropriate radiographic and laboratory investigations, plain x-rays, MRI, CT, bone scans, and laboratory tests such as the WCC, ESR, and CRP.

Also discuss the need to isolate the infective organism, the principles of biopsy, common pathogens, and the selection, timing, administration, and duration of appropriate antimicrobial therapy and the need to interact with infectious disease specialists in relation to the ongoing management of antimicrobial therapy.

Also discuss the indications for surgical intervention and the principles of treatment—neural decompression, debridement, achieving and maintaining stability, and the management of potential complications.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Identify the features on history and physical examination of pyogenic infection of the spine
- Recognize risk factors associated with the development of this condition
- Request and interpret appropriate radiographic and laboratory investigations
- Describe the principles of medical and operative treatment of this condition
- Initiate and supervise appropriate management of spinal infection

Case presentation: *Spinal tuberculosis infection*

Participants should discuss the history and presentation of this condition and the "at risk" populations.

They should be able to request and interpret appropriate radiographic and laboratory investigations, plain x-rays, MRI, CT, and bone scans, and laboratory tests such as WCC, ESR, and CRP.

Point out risk factors for this condition and discuss appropriate radiographic and laboratory investigations. Also consider the strategy for obtaining a tissue diagnosis and principles of management, both medical and surgical

Also discuss the need to isolate the infective organism, the administration of, and supervision of, appropriate antimicrobial therapy.

Also discuss the indications for surgical intervention and the principles of treatment, neural decompression, debridement, achieving and maintaining stability, and management of potential complications.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Identify the features on history and physical examination of TB infection of the spine
- Recognize risk factors associated with the development of this condition
- Request and interpret appropriate radiographic and laboratory investigations
- Describe the principles of medical and operative treatment of this condition
- Initiate and supervise appropriate management of TB spinal infection

Case presentation: *Postoperative spinal infection*

Participants should discuss the history, presentation, and etiology of early and late postoperative infection. Also review factors indicating increased risk of postoperative infection such as diabetes, immunosuppression, steroid use, prolonged surgery, smoking, obesity.

They should be able to request and interpret appropriate radiographic and laboratory investigations, in the context of associated "normal" postoperative changes and laboratory tests such as the WCC, ESR, and CRP.

Also discuss indications for surgical intervention, debridement, removal of instrumentation, and the clinical and radiographic assessment of stability in this context, eg, implant loosening, deformity, pain.

Focus on the need to maintain/restore stability while eliminating or controlling the infection and the duration of treatment. Also cover strategies to manage deep infection such as the use of negative-pressure wound therapy, etc.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Identify patients with early and late postoperative infection
- Describe the treatment principles of the medical and surgical management of this complication
- Initiate and monitor the progress of treatment and response to therapy
- Explain the biomechanical principles and need to maintain stability

Module 8: Tumor

Case presentation: *Spinal tumor*

Minor compression fracture and radiographic evidence of a missing pedicle suggestive of an infiltrative metastatic process affecting the thoracic or lumbar spine without a history of neoplastic disease

Participants should discuss the typical history and presenting features of metastatic disease as it affects the spine. Make participants aware of the fact that a significant number of patients present with spinal pain without a known history of malignant disease.

They should be able to identify the "red flags" such as nocturnal pain and neurological dysfunction, and request and interpret appropriate radiographic and laboratory investigations. Discuss the differential diagnosis and the relative incidence of primary and secondary neoplastic disease of the spine.

Have an understanding of the process of staging and assessing the prognosis of patients presenting with metastatic spinal disease and an unknown primary.

Discuss the prognostic implications relating to the nature of the tumor, visceral involvement, number of metastatic sites, etc. Also emphasize the need to have a multidisciplinary approach to the staging and work up of these patients with medical oncologists and radiotherapists to optimize patient outcomes.

Participants should have an understanding of the relevant prognostic and staging tools available (Tokuhashi Score, SINS, etc) to assist in determining the indications and nature of any surgical intervention to be undertaken – palliative only to decompress neural elements and achieve stability, or curative or heroic where an attempt is made to resect the lesion where a reasonable duration of survival is expected.

They should also have an understanding of the indications for and appropriate techniques used to achieve a tissue diagnosis (biopsy), and the principles of management when neural decompression or stabilization is needed in the absence of a definite tissue diagnosis, the place of steroids, etc.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Recognize the signs, symptoms, and "red flags" of metastatic disease of the spine
- Initiate and interpret appropriate radiographic, laboratory tests, biopsy, and input from professional colleagues to determine the patient's prognosis

- Determine the appropriate course of action based on presenting symptoms, radiographic features, pathology, and prognosis
- Recognize and manage common complications relating to metastatic disease of the spine
- Outline the principles of performing a spinal biopsy to obtain a tissue diagnosis of spinal infection or tumor
- Request and interpret the results of a spinal biopsy

Case presentation: Metastatic disease of the spine (multiple sites in patient known to have cancer with recent increased pain and neurological deterioration)

Participants should discuss the indications for and the nature of surgery to be undertaken in this circumstance. They should also consider prognostic factors and the need to tailor any planned operative treatment to the immediate needs of the patient– stability and neural decompression with intervention appropriate to the general medical condition of the patient and their expected survival.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Recognize the signs and symptoms of primary malignant disease of the spine
- Initiate and interpret appropriate radiographic, laboratory tests, biopsy, and input from professional colleagues to determine the patient's prognosis
- Determine the appropriate course of action based on presenting symptoms, radiographic features, pathology, and prognosis
- Recognize and manage common complications relating to metastatic disease of the spine

Module 9: Neurosurgery

The level of detail required in relation to information covered in any individual course will be determined by the makeup of the participant group, with greater discussion of surgical principles and techniques appropriate for a neurosurgical audience. This section also may be expanded to include a discussion of craniocervical junction and intracranial pathology if appropriate for the region and the background of the expected participants in the course.

Case presentation: *Chiari malformation and syrinx in a patient with scoliosis*

Participants should be made aware of the possible association of intradural pathology to deformity and patients presenting with pain and neurological disturbance of the upper and lower limbs.

Discuss differentiating clinical and radiographic features for intradural and extradural pathology as participants of a Principles course should be able to recognize common neurosurgical pathology (eg, Chiari malformation, syrinx, intradural and extradural neural tumors).

Also discuss, in general terms, the indications for and the nature of surgical intervention that may be undertaken.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Recognize features of intradural pathology and its relevance in relation to spinal deformity and neurological dysfunction of the upper and lower limbs
- Identify a Chiari malformation and other intradural abnormalities on standard investigations used to assess spinal pathology
- Outline the indications for and interpretation of intraoperative neural monitoring

Case presentation: Postoperative pseudomeningocele following lumbar decompression

Participants should discuss circumstances where a dural tear may occur and strategies that can be employed to minimize this risk. Also discuss the principles for the management of a dural tear when it occurs including the postoperative management.

Discuss the typical clinical presentation of a patient who presents with a pseudomeningocele, appropriate investigations, the indications for surgical intervention, the common findings at operation, and strategies that may be employed to rectify the problem.

Conclude the discussion with a brief summary of key points and take-home messages.

Case presentation: Young man with thoracic back pain and MRI evidence of an intradural lesion (Schwannoma)

Participants should be able to identify patients presenting with pain and/or neurological compromise due to intradural pathology, request and interpret appropriate imaging studies to evaluate this process.

Introduce the concepts in relation to the management of this type of lesion but in most cases referral will be made to neurosurgical colleagues to deal with this pathology.

Conclude the discussion with a brief summary of key points and take-home messages.

Learning outcomes

- Recognize features of intradural pathology and its relevance in relation to spinal deformity, pain, and neurological dysfunction of the upper and lower limbs
- Identify radiographic features of intradural pathology
- Outline the management principles for these conditions
- Recognize and manage common complications such as a postoperative dural leak

Postcourse assessment

Conclude the course with a set of questions that:

- Assess the retention and understanding of the course content
- Evaluate the achievement of the learning outcomes

A prize may be awarded to the individual with the greatest improvement from the precourse assessment or highest overall score.