

ANSWERS AND ADDITIONAL INFORMATION FOR ORTHOPAEDIC CLINICAL QUIZ

Chung WH, Mansor A, Ahmad TS

Department of Orthopaedic Surgery, University of Malaya, Kuala Lumpur, Malaysia

Answers 1

- i. T4 and T10
ii. L1
iii. T12
iv. T7
- i. The main thoracic curve
ii. The proximal/upper thoracic curve and lumbar curve
- Lenke classification or King-Moe classification

Description 1

Adolescent Idiopathic Scoliosis (AIS) is a three-dimensional deformity characterised by lateral deviation of the spine of more than 10 degrees in the coronal plane. The King-Moe classification, published in 1983, was the first broadly applied classification in the era of instrumented fusion and led to the development of the first AIS treatment guidelines. However, it only analysed thoracic curves and coronal plane deformities, and reported only fair intra- and inter-observer reliability. Lenke and colleagues, in 2001, described a more comprehensive classification system for AIS. It provides analysis of all AIS curves as well as objective criteria for determining curve flexibility, and addresses both coronal and sagittal deformities. The Lenke classification system comprises a three-tiered analysis of AIS curves based on curve type, lumbar modifier and sagittal modifier. This classification also provides recommendations on the selection of fusion levels. Treatment options of AIS are observation, bracing or surgery. Bracing is considered in skeletally immature patients with curves between 20 and 45 degrees. Corrective surgery is recommended in patients with curve progression greater than 40 degrees that fail or cannot tolerate bracing and in those who have curves greater than 45 degrees at skeletal maturity.

References:

- Auerbach JD, Lonner BS, Crerand CE, Shah SA, Flynn JM, Bastrom T, et al. Body image in patients with adolescent idiopathic scoliosis: validation of the Body Image Disturbance Questionnaire--Scoliosis Version. *J Bone Joint Surg Am.* 2014; 96: e61. doi: 10.2106/JBJS.L.00867
- Rose PS, Lenke LG. Classification of operative adolescent idiopathic scoliosis: treatment guidelines. *Orthop Clin North Am.* 2007; 38(4): 521-9. doi: 10.1016/j.ocl.2007.06.001

Answers 2

- i. The left femoral head ossification is located at the superolateral quadrant formed by the Hilgenreiner line and the Perkin line
ii. The Shenton line is disrupted
iii. There is delayed ossification of the left femoral head
iv. There is increased acetabular index of the left hip
- Developmental dysplasia of the left hip
- Reconstructive pelvic osteotomy and hip spica casting
- Any 4 of the following
i. inverted labrum
ii. inverted limbus
iii. transverse acetabular ligament
iv. constricted hip capsule by iliopsoas tendon causing an hourglass deformity
v. pulvinar
vi. elongated ligamentum teres

Description 2

Developmental dysplasia of the hip (DDH) involves a wide spectrum of hip disorders due to abnormal development of the hip, resulting in hip instability, malformation, subluxation and dislocation. The incidence of a dislocated hip at birth is 1:1000 to 5:1000 while the incidence of subluxation and dysplasia is 10:1000. The pathologic anatomy depends on the type, grade and duration of the dislocation. In the neonatal period, mild dysplasia and instability of the hip noted in the first few weeks of life, may resolve by eight weeks of age. Persistent instability or frank dislocation of the hip often progresses to hip dysplasia. Spontaneous reduction of the hip without intervention is unlikely in children over six months of age. In children with progressive dysplasia of the hip, the labrum may be inverted and prevent concentric reduction of the hip. Other structures preventing a concentric reduction of the hip are the limbus, the elongated and hypertrophied ligamentum teres, the pulvinar, the contracted transverse acetabular ligament and the hip capsule which is constricted by the contracted iliopsoas tendon forming an hourglass appearance. The femoral head becomes flattened. The femoral anteversion gradually increases. The acetabulum becomes dysplastic. The aim of treatment is to safely obtain and maintain a stable, concentric reduction of the hip to provide an environment for normal bony development. The appropriate treatment depends on the patient's age, the type of DDH and the amount of bony deformity.

References:

- Kotlarsky P, Haber R, Bialik V, Eidelman M. Developmental dysplasia of the hip: What has changed in the last 20 years?. *World J Orthop.* 2015; 6(11): 886-901. doi: 10.5312/wjo.v6.i11.886

Answers 3

- i. united fracture of distal third of the left radius
ii. widened scapholunate distance / Terry Thomas sign
iii. signet / cortical ring sign
iv. non-union of the ulnar styloid
v. dorsal displacement at the distal radioulnar joint
- i. piano key sign
ii. Watson scaphoid shift test
iii. tenderness at the anatomical snuffbox / radial styloid / dorsal scapholunate interval
- Scapholunate ligament injury with distal radioulnar joint disruption
- Any 2 of the following:
i. scapholunate advanced collapse
ii. wrist arthritis
iii. Distal radioulnar joint arthritis

Description 3

Carpal ligament injuries are common associated injuries following intra- and extra-articular fractures of the distal radius. The incidence of associated carpal ligament injuries with distal radial fractures is reported to be approximately 30% for partial or complete scapholunate tears and 15% for lunotriquetral tears. Arthroscopic assessment is recommended when interosseous scapholunate or lunotriquetral ligament injury is suspected. Complete interosseous ligament rupture in young and active individuals requires aggressive operative treatment. Open repair of scapholunate injuries is recommended after fixation of the distal radial fracture. Arthroscopic pinning or cannulated screw fixation is suggested for partial scapholunate lesions with instability and for unstable or complete lunotriquetral injuries. Non-operative treatment of chronic distal radioulnar joint (DRUJ) instability usually fails. It should be treated operatively as well. Restoration of stability and a full, painless arc of motion are the goals of surgical treatment. In this patient, one recommended treatment is the reconstruction of the scapholunate ligament and the Sauve-Kapandji procedure.

References:

- Wolfe SW, Hotchkiss RN, Pederson WC, Kozin SH. *Green's Operative Hand Surgery*, 6th ed. Philadelphia: Elsevier/Churchill Livingstone; 2010. 2392 p.
- Mrkonjic A, Lindau T, Geijer M, Tagil M. Arthroscopically diagnosed scapholunate ligament injuries associated with distal radial fractures: a 13- to 15-year follow-up. *J Hand Surg Am.* 2015; 40(6): 1077-82. doi: 10.1016/j.jhsa.2015.03.017

Answers 4

- Dynamic stress film (a – sitting / upright film; b – supine stress film)
- High signal intensity / Fluid-filled cleft / Fluid sign
- Osteoporotic vertebral compression fracture with intravertebral cleft
- i. Plain radiograph – comparing 2 consecutive plain radiographs (6-12 weeks apart)
ii. CT scans show sharp cortical breakage, for a recent fracture
iii. MRI shows hyperintensity in the STIR sequence, for a recent fracture.
- Any 2 of the following:
i. Percutaneous vertebroplasty
ii. Balloon kyphoplasty
iii. Vesselplasty
iv. Stentoplasty

Description 4

Fragility fractures involving the vertebral column, as a result of osteoporosis, are becoming an important public health issue worldwide. As life expectancy in developed or developing countries increases, the incidence of osteoporotic vertebral compression fracture (OVCF) has been rising. The standard management of acute OVCF is conservative with optimal medical treatment. There are two types of OVCF: (1) acute fracture and (2) fracture with intravertebral cleft/ cavity formation or pseudoarthrosis, which is filled with "fluid" or "air". The incidence of intravertebral cleft phenomenon which is associated with "dynamic mobility", is much higher than expected. This group of patients will benefit from cement augmentation. Percutaneous vertebroplasty (PCV) and balloon kyphoplasty (BKP) are viable surgical options for OVCF patients who have failed conservative treatment. Both options offer immediate pain relief and improvement of quality of life. There were no differences in terms of restoration of

vertebral body height and reduction in the kyphotic angle between both options. BKP is associated with lesser risk of cement leakage as compared to PCV. However, PCV is much cheaper and more cost effective.

References:

1. Kwan, MK. Vertebroplasty and kyphoplasty for fragility fractures of the spine. In: Johari A, Luk KDK, Waddell JP, editors. Current progress in orthopaedics. Chennai: Krypton Publishing Services Pte Ltd; 2015.
2. Griffoni C, Lukassen JNM, Babbi L, Girolami M, Lamartina C, Cecchinato R, *et al*. Percutaneous vertebroplasty and balloon kyphoplasty in the treatment of osteoporotic vertebral fractures: a prospective randomized comparison. *Eur Spine J*. 2020. doi: 10.1007/s00586-020-06434-3

Answer 5

- a) Any 4 of the following.
 - i. osteolytic lesion at meta-epiphyseal region of distal right ulna
 - ii. expansile lesion
 - iii. multiple septation / soap bubble appearance
 - iv. narrow zone of transition
 - v. Thinning of the cortex with cortical breakage
 - vi. Indentation / pressure effect on the adjacent radius
- b) Giant cell tumour of distal right ulna / Giant cell tumour of the bone
- c) Campanacci classification
- d) Campanacci Grade 3 due to presence of cortical breakage
- e) Any 3 of the following:
 - i. recurrence
 - ii. pathological fracture
 - iii. secondary aneurysmal bone cyst
 - iv. malignant transformation to sarcoma

Description 5

The distal ulna is a rare site for primary tumours. The distal ulna articulates with the distal radius and has ligamentous attachments to the carpal bones. The distal ulna is stabilised by the triangular fibrocartilage complex (TFCC). Furthermore, the distal ulna is crucial in axial load transmission through the wrist, forearm rotation and grip strength. Giant cell tumours (GCT) of the distal ulna have been frequently regarded as difficult to treat, mainly because of their proximity to the carpal bones and the diminished range of motion in the hand and forearm. With the complexity of the distal radioulnar and ulnocarpal joints, and the proximity of the ulnar neurovascular bundle and tendons, preservation of function after resection of the distal ulna remains a challenge. Advanced stage GCT (Stage 3) of the distal ulna often requires wide excision or en bloc resection of the whole tumour. It is controversial whether the resected ulnar stump after the distal ulna resection should be stabilised. Resection without subsequent reconstruction may lead to a painful wrist, weakened hand grip and difficulties on pronation and supination due to radioulnar convergence. However, some authors reported satisfactory functional outcome in patients with distal ulna resection without stabilisation.

References:

1. Dhinsa BS, Gregory JJ, Nawabi DH, Khan S, Pollock R, Aston WJ, *et al*. The outcome of resection of the distal ulna for tumour without soft-tissue or prosthetic reconstruction. *Bone Joint J*. 2014; 96(10): 1392-5. doi: 10.1302/0301-620X.96B10.33664
2. Papanastassiou ID, Savvidou OD, Chloros GD, Megaloikononimos PD, Kontogeorgakos VA, Papagelopoulos PJ. Extensor carpi ulnaris tenodesis versus no stabilization after wide resection of distal ulna giant cell tumors. *Hand (NY)*. 2019; 14(2): 242-8. doi: 10.1177/1558944717743598

Answers 6

- a)
 - i. reduced joint space of the talocrural and subtalar joint
 - ii. subchondral sclerosis of the talocrural and subtalar joint
 - iii. complete obliteration of the medial talocrural space
 - iv. varus deformity of the ankle joint
- b) Ankle arthritis involving the talocrural and subtalar joint
- c) Takakura classification
- d) Rocker bottom shoes
- e)
 - i. hindfoot fusion
 - ii. total ankle arthroplasty and subtalar fusion

Description 6

Primary osteoarthritis of the ankle is rare. Ankle arthritis is most commonly associated with trauma. Other aetiology includes rheumatoid arthritis, avascular necrosis of the talus, septic arthritis, congenital or acquired deformity, instability, haemophilia and post-surgical arthritis. The treatment can be divided into operative and non-operative. The mainstay of initial treatment of ankle arthritis is non-surgical management of the patient's symptoms. Conservative treatment consists of rest, activity modification and anti-inflammatory medication. Intra-articular steroid or viscosupplement injection may provide some short-term relief. Orthotic management with rocker bottom shoes has been shown to improve symptoms. There are many surgical options in the management of ankle arthritis which include ankle debridement, supramalleolar osteotomy, joint distraction with an Ilizarov fixator, ankle arthrodesis and total ankle arthroplasty. Patient-specific factors, such as age, pre-existing comorbidities and activity level are important factors influencing the decision for surgical options. The key to a successful outcome is to engage the patient in the decision-making process.

References:

1. Harris N. Ankle arthritis. *Curr Orthop*. 2001; 15(5): 352-5. doi: 10.1054/cur.2001.0212
2. Hayes BJ, Gonzalez T, Smith JT, Chiodo CP, Bluman EM. Ankle arthritis: you can't always replace it. *J Am Acad Orthop Surg*. 2016; 24(2): e29-38. doi: 10.5435/JAAOS-D-15-00354