Treatment of Orbital Vascular Malformations
James Murakami, MD

1. What is the most common malformation you should expect to encounter in an orbital sclerotherapy practice?
   A. Arteriovenous Malformation
   B. Venous Malformation
   C. Lymphatic Malformation
   D. Dermoid

   **Correct Answer: C**

2. What symptom is most likely to bring an orbital malformation to medical attention?
   A. Vision loss
   B. Pain
   C. Intermittent Proptosis
   D. Excessive tearing

   **Correct Answer: C**

3. Which of the following is the least common side effect/complication from orbital sclerotherapy?
   A. Swelling
   B. Bruising
   C. Chemosis
   D. Vision loss

   **Correct Answer: D**

References

Bleomycin Sclerotherapy
Gulraiz Chaudry, MD

1. Which of the following statements regarding bleomycin is true?
   A. It is FDA approved for sclerotherapy of vascular malformations.
   B. It is contraindicated in sclerotherapy of airway lesions.
   C. Post sclerotherapy inflammation is greater when compared to doxycycline.
   D. It is of greater efficacy in sclerotherapy of macrocystic, rather than microcystic, lymphatic malformation.
   E. Local neurotoxicity has been reported as a side effect of sclerotherapy.

   **Correct Answer: D**
Rationale
a. It is FDA approved for treatment of lymphomas, squamous and testicular carcinoma and malignant pleural effusion.
b. There is minimal post-procedure inflammation, which makes it useful in the treatment of airway lesions.
c. While useful in the treatment of microcystic lymphatic malformations, the efficacy is greater in macrocystic disease.
d. Local neurotoxicity is not a recognized complication of bleomycin sclerotherapy.

2. Which of the following is true regarding adverse reactions of bleomycin treatment?
A. The risk of pulmonary fibrosis is dose dependent.
B. Oncologic side effects have been reported following bleomycin sclerotherapy.
C. Bleomycin hypersensitivity is dose dependent.
D. Acute pulmonary toxicity is not a recognized complication of bleomycin sclerotherapy.
E. Hyperpigmentation is an immediate complication.

Correct Answer: A

Rationale
a. The risk of pulmonary fibrosis is dependent on dose, with the incidence rising to 8.5% with a cumulative dose above 300 mg.
b. There are no published reports of oncologic side effects after bleomycin sclerotherapy.
c. Bleomycin hypersensitivity is not dose dependent and can occur within hours of administration.
d. Acute pulmonary toxicity has been reported in an infant following sclerotherapy.
e. Hyperpigmentation is a relatively late manifestation, occurring 2-3 weeks following administration.

3. Which is the following is true regarding the preparation, handling and technique of bleomycin administration?
A. Bleomycin can be reconstituted in the procedure room.
B. All waste should be discarded in a chemical waste container.
C. A maximum dose of 5 units/kg can be used for sclerotherapy.
D. Bleomycin can be reconstituted with 5% dextrose solution.
E. If reconstituted with 0.9% sodium chloride, the solution is stable for 48 hours.

Correct Answer: B

Rationale
a. Bleomycin should be reconstituted under a laminar flow hood in pharmacy.
b. All waste, with the exception of sharps, should be discarded in chemical waste containers.
c. A maximum dose of 1 unit/kg can be used, up to a total single session dose of 15 units.
d. If reconstituted in dextrose solutions, there is loss of bleomycin A2 and B2 potency.
e. If reconstituted in 0.9% saline, the solution is stable for 24 hours.

References

Pediatric Stroke Update

Manraj Heran, MD

1. In adult stroke, which ONE of the following statements is INCORRECT?
   A. The majority of strokes are ischemic.
   B. Hyperdense vessel sign is seen in approximately 75% of acute ischemic strokes.
   C. The time window for administration of intravenous thrombolytic therapy for strokes affecting the anterior circulation is 4.5 hours.
   D. Restricted diffusion can be seen in patients suffering transient ischemic attacks.
   E. Watershed strokes account for 5-10% of all ischemic strokes.

   **Correct Answer: B**

   **Rationale**
   
   *Option A is correct.* Approximately 85% of strokes in adults are of the ischemic variety, with 15% being hemorrhagic.
   
   *Option B is not correct.* The hyperdense vessel sign is seen in approximately 33-50% of acute ischemic strokes.
   
   *Option C is correct.* Intravenous administration of thrombolytics for treatment of acute ischemic stroke are approved for patients in the 0-4.5 hour window, both for anterior and posterior circulation.
   
   *Option D is correct.* Restricted diffusion, which is often considered representative of an acute ischemic infarct, can be seen in 33-75% of adults presenting with transient ischemic attacks.
   
   *Option E is correct.* Watershed strokes, although representing a minority of all ischemic strokes, are an important consideration when assessing for possible etiologies, given the significant differences in potential management.

2. Intra-arterial stroke therapy now has Level 1 evidence to support its use in the management of patients having acute ischemic stroke. Assuming no contraindications, this is best suited for those:
   A. presenting at 12 hours after symptom onset.
   B. having a pure lacunar syndrome.
   C. with a documented large vessel occlusion.
   D. with a matched defect on MTT and CBV.
   E. presenting with malignant hypertension.

   **Correct Answer: C**

   **Rationale**
   
   *Option A is not correct.* Currently, endovascular management of acute ischemic stroke is approved for patients where the treatment can be commenced before 6 hours from the time of symptom onset.
   
   *Option B is not correct.* In the absence of a large vessel occlusion, as a pure lacunar syndrome is usually due to a perforator artery occlusion, intra-arterial stroke therapy offers no significant benefit.
   
   *Option C is correct.* Multiple randomized controlled trials have now clearly shown that intra-arterial stroke therapy using current mechanical thrombectomy techniques offer a significant benefit to patients, with a greater ability to make patients previously left dependent now independent.
Option D is not correct. As MTT reflects ‘tissue at risk’, and CBV is considered ‘tissue already infarcted’, a ‘matched’ defect (ie, MTT and CBV territories being essentially equal) signifies that the majority of the territory considered at risk of infarcting has already done so. Intervention would not offer any benefit of tissue salvage, and would potentially increase the risk of procedure-related complications, such as reperfusion hemorrhage.

Option E is not correct. Malignant hypertension represents an absolute contraindication to intra-arterial stroke therapy due to unacceptably high risk of procedure-related complications (ex: reperfusion hemorrhage). This therapy can be offered if the hypertension can be treated to age-specific acceptable parameters.

3. Current technologies for performing intra-arterial stroke intervention include the following:
   A. suction thrombectomy.
   B. stent retrieval.
   C. carotid revascularization.
   D. administration of tPA.
   E. any combination of the above.

Correct Answer: E

Rationale
Option A is correct. Suction aspiration techniques offer documented high rates of target vessel recanalization and improved stroke treatment outcomes.

Option B is correct. Mechanical thrombectomy using stent retrievers offers another proven technique for rapid recanalization of large vessel occlusion in the setting of those presenting with acute ischemic stroke.

Option C is correct. As carotid dissection and other acute carotid occlusive pathologies are known to potentially cause acute ischemic stroke, either through distal thromboembolism, or via acute hypoperfusion to the downstream brain parenchyma, management of the carotid pathology may be required to achieve recanalization of LVOT, or for restoring appropriate flow to the compromised parenchyma.

Option D is correct. Administration of thrombolytic therapy (ie, tPA) is approved for medical management of those patients presenting with acute ischemic stroke within a 4.5 hour time window, for both the anterior and posterior circulation.

Option E is the best correct answer. All of the options listed above are correct, and any and all may be required to achieve a successful outcome when treating acute ischemic stroke.

References

Important trials that changed acute ischemic stroke management:
- MR Clean (European)
- ESCAPE (North America, Korea, Ireland)
- EXTEND-IA (Australia)
- SWIFT PRIME (USA, Europe)
- REVASCAT
Forgetting the Box in Pediatric Interventional Oncology
Fernando Gomez, MD

1. Regarding radiofrequency (RF) ablation in children, which one of the following is a limiting factor for RF ablation?
   A. Cooling effect from vessels bigger than 3 mm
   B. Cooling effect from bronchial structures bigger than 3 mm
   C. Tumor diameter larger than 30 mm
   D. None of them
   E. A, B and C are correct

   Correct Answer: E

References:

Rationales:
Correct answer is E. The 3 answers are the main physical limitations that predict a likely incomplete treatment by means of RFA
Option A is correct. Blood flowing through vessels of more than 3 mm can cool the heating area and sub-lethal temperatures permit tumor cells survive
Option B is correct. Air flowing through bronchi of more than 2 mm can cool the heating area and sub-lethal temperatures permit tumor cells survive
Option C is correct. The most important factor in the success of the technique in terms of local control is a tumor size smaller than 3 cm, when tumour diameter is shorter the local control rate remains over 90%
Option D is not correct. This is self-explanatory if the rest are right

2. Which of the following is a limitation of systemic chemotherapy?
   A. Unfavourable pharmacokinetics of drugs
   B. Large biodistribution and non-intended extravasation of chemotherapy agents
   C. Poor tumour selectivity
   D. Susceptibility to induce drug resistance in tumour cells
   E. All of them

   Correct Answer: E

References:

Rationales:
Answer is E. A-D explain the limitations and toxic effects of systemic chemotherapy; all of them can be overcome by locoregional administration
Option A is correct. Rapid clearance and rapid biodegradation, determining a short plasma half-life determines the use of highly toxic doses, and imposes a rigorous treatment schedule for reaching a therapeutic effect
Option B is correct. Induce severe toxicity in non-targeted regions
Option C is correct. Chemotherapeutic agents, besides the modern monoclonal antibodies, lack of tumor selectivity
Option D is correct. By many mechanisms relying on ATP pumps like Topo II, MDRP… Again, the induction of anoxia can help to reduce this resistance

3. When planning a major hepatic resection, if insufficient remnant volume is predicted, an option to increase liver parenchyma is:
   A. Hepatic artery embolization
   B. Portal vein embolization
   C. Microwave ablation
   D. Hepatic vein sclerosis
   E. Irreversible electroporation (IRE)

   **Correct Answer: B**

References:

Rationales:
Answer is B. Portal vein distal occlusion induces hemodynamic changes and growing factor release that foster liver remnant development
Option A is not correct. Arterial embolization do not reach sufficient hemodynamic changes
Option C is not correct. Major MWA (lobectomy) could cause occlusion of portal branches and flow redistribution but there is no evidence supporting its use as a technique to induce liver hypertrophy
Option D is not correct. Closing the outflow without stopping the inflow results in a high risk of hemorrhage
Option E is not correct. IRE is an ablation technique that theoretically respects the vessel wall

Advanced MSK/IR Intervention
Neil Johnson, MD

1. Regarding Aneurysmal Bone Cyst:
   A. Occur uncommonly in and around the pelvis
   B. Is most likely a benign neoplasm with defined Oncogene Translocations
   C. Recurrence rate for traditional open surgical treatment is less than 10%
   D. Almost never occurs in association with other bone lesions
   E. Usually considered as in the same spectrum as Unicameral Bone Cyst

   **Correct Answer: B**

References

**Rationale**

In the past, Aneurysmal Bone Cyst has been considered to represent a wide range of possible pathologies including a venous obstructive lesion, post traumatic reparative lesion, vascular malformation, and arteriovenous fistula. However, recent research by Panoutsakopoulus et al. [1] and Oliveira et al. strongly suggest that primary aneurysmal bone cyst is a clonal neoplasm, with 16:17 q22:p13 translocation and/or TRE17/USP6 oncogene translocation. [1,2] Answer A: is incorrect because Aneurysmal Bone Cysts are common in and around the pelvis [3]
Answer C: is incorrect because recurrence rates after traditional surgery are in the range 12-71% [4, 5]
Answer D: is incorrect because Aneurysmal Bone Cyst has been documented as being secondary to other benign and malignant bone lesions, including **chondroblastoma, chondromyxoid fibroma, osteoblastoma, giant cell tumor, fibrous dysplasia** and malignant bone tumors.
Answer E: is incorrect because Unicameral Bone Cyst is considered to be a separate and distinct entity [6]

2. Regarding Langerhans Cell Histiocytosis (LCH)
   A. Occurs only in Skull, Long Bones and Lumbar Vertebrae
   B. Open surgical excision is the only available treatment for skull lesions
   C. LCH lesions, including solitary bone lesions, always require chemotherapy
   D. Approximately 70 -80% of all childhood LCH presents as bone lesions, often solitary
   E. Is a form of leukemia

   **Correct Answer: D**

**References**


**Rationale**

While Langerhans Cell Histiocytosis may present as a multi-organ, infiltrative systemic disease with poor prognosis, approximately 80% of cases present with localized, discrete Langerhans Cell monoclonal histiocyte proliferative lesions, 90% of which are discrete lytic bone lesions, often solitary. [1]

Answer A: is incorrect because LCH lesions occur in all bones [2]
Answer B: is incorrect because percutaneous image guided biopsy and steroid treatment has been described
Answer C: is incorrect because most cases of isolated, discrete bone lesions can be successfully treated by surgical curettage, bone grafting and or/steroid infiltration without chemotherapy. [1] [3] [4]
Answer E: is incorrect because LCH is not a malignancy and not a form of leukemia [1]
3. Regarding Biopsy technique for Pediatric Musculoskeletal tumor lesions
   A. Small caliber (Chiba) needle cytology specimens are diagnostic in over 88% of cases
   B. Open surgical biopsy is required for definitive diagnosis of all pediatric soft tissue
      musculoskeletal lesions
   C. Less than four passes (samples) during biopsy of pediatric soft tissue lesions has been
      associated with non-diagnostic biopsy
   D. Use of cone beam CT with fusion image guidance has been associated with a significant
      increase in patient and operator radiation exposure.
   **Correct Answer: C**

References
   tissue biopsies
   needle biopsy for assessment of pediatric musculoskeletal lesions. Pediatric Radiology
   Volume 41, Issue 7, 848-857
   flat-panel cone-beam CT and CT scan guidance. Cardiovascular Interventional Radiology. Published online March 14, 2014.

Rationale
Answer A: is incorrect because specific diagnostic success rate for cytology only biopsies of
bone tumors is 66% (adult and pediatric cases) [1] and most pediatric institutions do not have
experienced pediatric cytologists available
Answer B: is incorrect because percutaneous image guided biopsy has an 84-88% success
rate with minimal morbidity [2] [3]
Answer D: is incorrect because the radiation dose to patient and operator is reported to be
less with use of cone beam CT guidance [4]

Paediatric IR Tips and Tricks
*Alex Barnacle, MD and Derek Roebuck, MD*

1. Regarding the management of pancreatic cysts and cystogastric stent insertion, in children,
   A. The most common cause of pancreatitis is cholelithiasis.
   B. All pancreatic fluid collections should be drained as soon as practicable, to reduce the risk of
      complications.
   C. A transgastric approach for drainage of pancreatic pseudocysts is better than a retroperitoneal
      approach.
   D. A covered cystogastric stent allows the creation of a 10-mm diameter connection between the
      fluid collection and the stomach.
   **Correct Answer: D**

References
1. Van Camp JM, Polley TZ, Coran AG. Pancreatitis in children: diagnosis and etiology in 57
2. Thoeni RF. The Revised Atlanta Classification of Acute Pancreatitis: its importance for the
   of pancreatic fluid collections: Assessment of the procedure, technical details and review of
Rationale
Option a) is not correct. The etiology varies significantly in different populations, but pancreatitis related to gallstones is very uncommon in childhood. The largest diagnostic category is “idiopathic”, but the most common identifiable cause is trauma [1]. Option b) is not correct. Most acute peripancreatic fluid collections resolve spontaneously. Pseudocysts may also resolve spontaneously. Only symptomatic or infected collections should be drained [2], and in children the best timing is not known. Option c) is not correct. Although the transgastric approach presumably reduces the risk of a cutaneous pancreatic fistula, it is technically harder and has not been shown to be better overall than a retroperitoneal approach [2]. Option d) is correct. The diameter of the stent is 10 mm, which may offer a significant advantage over older designs of cystogastric stent when draining viscous fluid [3].

2. Regarding PCNLS in children,
A. PCNLs should be done using a small calibre track (<18Fr)
B. PCNLs should be performed after a trial of lithotripsy
C. PCNLs are rarely possible via an intercostal approach
D. The commonest PCNL complication is renal scarring

Correct Answer: C

References

Rationale
Option a) is not correct. Large calibre PCNL tracks offer faster stone retrieval options so operating time is reduced and stone clearance rates are often higher. Option b) is not correct. A high proportion of renal stones in children are caused by metabolic disorders and some of these stones (e.g cystinuric stones) cannot be broken down lithotripsy. In addition, many children with renal stones have comorbidities such as scoliosis, poor morbidity and poor bladder emptying, which mean they will not drain stone fragments very easily after ESWL, so PCNL may be a better option. Option c) is correct. Although pediatric kidneys often lie higher than adult kidneys, there is almost no space between the ribs for a substantial sheath or the urology instrument, so a lower pole approach often has to be accepted. Option d) is not correct. Renal scars are rare after PCNL. The commonest significant complications are fever/sepsis, bleeding and hypothermia.

3. With respect to esophageal recanalization, gastric access, and gastrostomy in children:
A. Ultrasound-guided gastric access is best performed using a 21-gauge needle
B. Image-guided percutaneous gastric access requires a distended stomach
C. The ‘push’ technique has a significantly higher complication rate than the ‘pull’ technique
D. It is often easier to cross an esophageal occlusion from below than above.

Correct Answer: D
References

Rationale
Option a) is not correct. The muscular gastric wall is usually quite tough to puncture; this is easier (and possibly safer) with a skinny needle.
Option b) is not correct. If the esophagus is occluded, the stomach will not be distended, and it is necessary to use ultrasound rather than fluoroscopy to puncture it. Once the needle tip is in the lumen of the stomach, air can be instilled to distend the stomach and allow guidewire manipulation into the distal esophagus.
Option c) is not correct. Studies comparing ‘push’ versus ‘pull’ techniques have not shown a higher complication rate.
Option d) is correct. The esophagus above the occlusion is usually distended, and this makes it difficult to find the occluded lumen and to engage it with a catheter and guidewire. In contrast, in a retrograde approach, the lumen of the esophagus tends to taper towards the occlusion, making recanalization much simpler.