SUPRACONDYLAR HUMERUS FRACTURE

Surgical Specialty:	Orthopedic Surgery
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Background:

- General Considerations
  - The most common elbow fracture in pediatrics and is most often caused by a fall onto an outstretched hand with the elbow fully extended.[1]
  - Displaced fractures are treated surgically, most commonly with closed reduction and percutaneous pinning, but in rare instances with an open reduction.[1]
  - Nerve and vascular injury is common.[1] Gentle clinical examination (radial pulse, finger movements depending on the ulnar or radial nerve integrity) is recommended.
- Patient Considerations
  - Compartment syndrome is a concern and can develop before or after surgical management.[2]
  - Often not an emergent case, unless there is an open fracture, neurovascular compromise, or compartment syndrome. In the absence of these indications for urgent repair, the timing of surgery has been shown to not have a major impact on outcomes.[3]
  - Associated Comorbidities/Syndromes
    - No specific associated comorbidities/syndromes.

Anesthetic Planning:

- Pre-Anesthetic Evaluation
  - Pre-anesthetic evaluation to optimize any patient risk factors as time allows. This can include palpation of a radial pulse and a neuro exam focusing on the function of the radial and ulnar nerves.
  - Often will have workup done in the emergency department or at an outside hospital
  - Confirm what medicines (acetaminophen, NSAIDs, antibiotics) have been given to avoid inappropriate repeat dosing
  - Discussions to have with surgeon/family
    - Talk with the surgeon about whether there are risk factors that make the surgery emergent.
    - Talk with family and surgeon about pain management options, including balancing the risk of compartment syndrome with the analgesic potential of a brachial plexus block.

- Specific or Unique Room Set-up Requirements
    - Airway
        - RSI setup if the case is emergent and the patient is not NPO.
    - Drugs
        - Emergence delirium prophylaxis
            - Dexmedetomidine (0.5 mcg/kg)
        - PONV prophylaxis
            - Ondansetron (0.1-0.15 mg/kg, max 4mg)
            - Dexamethasone (0.1 mg/kg, max 4mg)
        - Nerve block
            - Bupivacaine 0.25% (max 2.5 mg/kg) or ropivacaine 0.2%(max 2.5 mg/kg), in older children can use ropivacaine 0.5% (max 2.5 mg/kg)
            - Supraclavicular or infraclavicular approach brachial plexus block, ultrasound-guided
        - Analgesia
            - Ketorolac (0.5 mg/kg)[4]
            - Fentanyl 0.5-2 mcg/kg
            - Acetaminophen PR/PO/IV
    - Monitors
        - Standard ASA monitors.
    - Blood Availability
        - Not indicated in most cases. Consider having type and screen if there is vascular injury.
    - PICU Bed Availability
        - Not indicated in most cases.
    - Other Indicated Resources
        - Ultrasound if a nerve block is indicated.

Intraoperative Considerations:

- General
    - Generally minimal physiologic disruption from surgical factors
    - Potential for major blood loss if there is a vascular injury (tourniquet in case of open repair)
- Induction
    - Propofol 2-3 mg/kg IV
    - If hemodynamically unstable consider ketamine 1-2 mg/kg or etomidate 0.3-0.4 mg/kg
    - Succinylcholine 1-2mg/kg or rocuronium 0.6-1.2 mg/kg if RSI
- Positioning
    - Supine
    - Anticipate 90-degree turn of the table and no immediate access to the airway
    - Provide radiation protection to the patient as surgical radiation use can be significant
- Maintenance
    - Volatile anesthetic
- Hemodynamic/Physiologic goals
    - Maintain normotension
- Surgical Considerations
    - Discuss with the surgeon the need for muscle relaxation
- Emergence/Disposition
    - Awake extubation depending on NPO status

- Post-op Care
    - Discuss with the surgeon the need for an overnight hospital stay, often admitted for neurovascular monitoring (risk of compartment syndrome)

Case-Specific Complications/Pitfalls

- Lost Airway
    - Ensure the Airway is secure prior to handing the patient over to the surgeon for positioning
- Emergent Surgery
    - RSI
    - Utilize orogastric suctioning post-induction to minimize aspiration on extubation
    - Awake extubation

References

1. Ladenhauf, HN, Schaffert, M, and Bauer J. The displaced supracondylar humerus fracture: indications for surgery and surgical options: a 2014 update. Current Opinion Pediatrics, 2014, 26: 64-69. PubMed Link
2. Armstrong, DG, MacNeille, R, et al. Compartment Syndrome in Children With a Supracondylar Fracture: Not Everyone has Risk Factors. Journal of Orthopedic Trauma, 2021, 35 (8): 298-303. PubMed Link
3. Suganuma, S, Tada, K, et al. Timing of Surgery for Pediatric Supracondylar Humerus Fractures and Early Postoperative Results. Journal of Hand Surgery (Asian-Pacific Volume), 2020, 25 (2): 226-231. PubMed Link
4. Adams, AJ, Buczek, MJ, et al. Perioperative Ketorolac for Supracondylar Humerus Fracture in Children Decreases Postoperative Pain, Opioid Usage, Hospitalzation Cost, and Length-of-Stay. Journal of Pediatric Orthopedics, 2019, 39: 447-451. PubMed Link

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