

Intraoperative Management of Iatrogenic Axillary Artery Injury Discovered During Repair of Proximal Humerus Fracture

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INTRODUCTION

- Proximal humerus fractures are the third most common fracture type, are more often found in elderly patients, and when associated with axillary artery injury, can result in significant morbidity and mortality (1).
- In a population-based retrospective study, only 0.085% of patients with proximal humerus fractures were found to have concomitant axillary artery injury, and an iatrogenic axillary artery injury, as occurred in this case, is an even rarer occurrence (1).
- Axillary artery injury can be surgically managed by either open repair or endovascular repair (2).

CASE PRESENTATION

- The patient was a 76 year old female with a past medical history of type 2 diabetes, chronic kidney disease (stage 3b), anemia of chronic disease (with thalassemia trait), and peripheral arterial disease (with a history of left lower extremity angioplasty), who had a fall 6 weeks prior to presentation, with a right shoulder x-ray revealing a proximal humerus fracture.
- The patient received an ultrasound guided right sided interscalene block. A 22-gauge echogenic needle was inserted under ultrasound guidance, with direct visualization of the C5 to C7 roots of the brachial plexus at the interscalene level.
- Negative aspiration was confirmed at a needle insertion depth of 3 cm, and a 20G catheter was inserted at 5cm at skin depth and 20 mL of ropivacaine 0.5% was injected. There were no paresthesias on injection, and no bleeding or apparent complications.

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INTRAOPERATIVE COURSE

- The patient proceeded to the operating room for right reverse total shoulder arthroplasty. Induction occurred with propofol and rocuronium, the patient was intubated, and she received cefazolin for surgical antibiotic prophylaxis. A phenylephrine infusion was started at 10 mcg/min for decreasing mean arterial pressures (MAPs) to the 80s.
- About 30 minutes after surgery start, the surgical team informed the anesthesia team of unexpected arterial bleeding. Vascular surgery was notified for immediate evaluation but was not available in house. A right radial arterial line was placed for hemodynamic monitoring and a 16-gauge left hand intravenous catheter was placed for additional access. Massive transfusion protocol was initiated.
- At this time, the patient’s MAPs were stable with phenylephrine infusion at 15 mcg/min. 1 liter of normal saline was given and 1 unit of packed red blood cells was transfused, with an additional unit given after the arrival of vascular surgery. The patient became increasingly hypotensive, with MAPs decreasing to the 50s, and a third unit of packed red blood cells, an additional liter of normal saline, 1 unit of fresh frozen plasma, and 1 unit of platelets were given. An additional 2mg of midazolam was given since the patient was being maintained at 0.5 MAC.
- The patient’s surgical incision was widened and a transection of the axillary artery was discovered, with over ¾ of the circumference of the vessel disrupted. Open repair of the defect and end-to-end anastomosis with 6-0 Prolene nonabsorbable surgical sutures was conducted. During the repair, the patient’s MAPs remained above target while on a phenylephrine infusion dosed at 20 mcg/min.
- 40mg of rocuronium was given for transport to the surgical intensive care unit at the end of the case and an OnQ intrathecal pain pump was initiated at 4ml/hr.

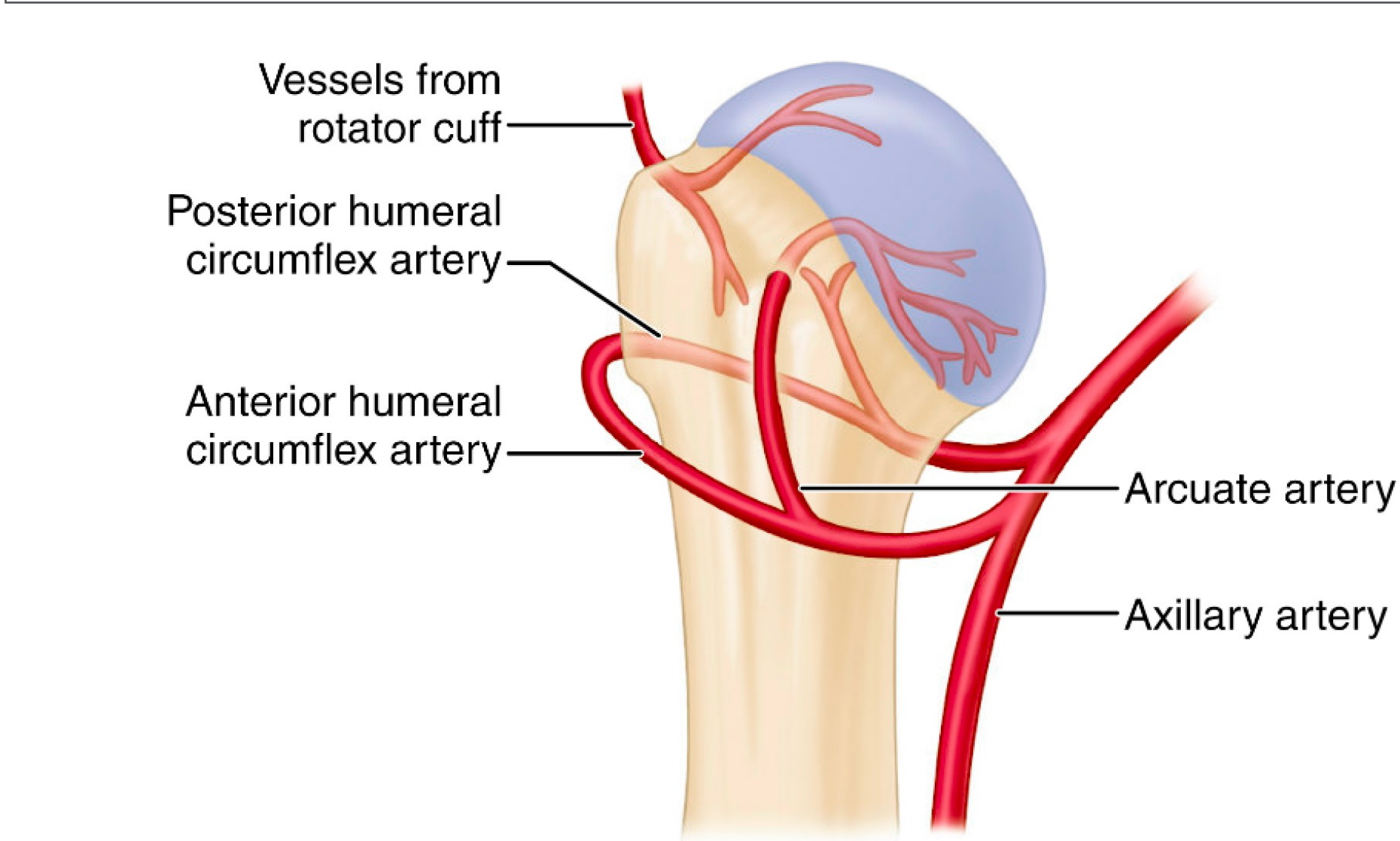


Figure 1: Arterial Circulation of the Proximal Humerus. Perez, Edward A. Fractures of the Shoulder, Arm and Forearm. Campbell's Operative Orthopaedics. December 31,2020. Pages 3031-3126.e9.

POSTOPERATIVE COURSE AND DISCUSSION

POSTOPERATIVE COURSE

- Postoperatively, a repeat exam and ultrasound of the right upper extremity was conducted, and there was noted to be good radial and ulnar flow and the hand of the affected extremity was warm and well perfused. The patient was extubated the following day and had an uncomplicated hospital stay until discharge on POD #5.

DISCUSSION

- Factors for this patient that were likely associated with greater risk of axillary artery injury included pre-existing disease of the vessel due to significant peripheral arterial disease and atherosclerosis, increased fracture severity, with complete displacement of the shaft of the humerus, and the presence of significant scar tissue around the fracture site, as noted by the surgical team.
- Axillary artery injury poses a high risk for significant hemorrhage, and activation of institutional massive transfusion protocol may be appropriate to obtain sufficient blood products for transfusion while maintaining a balanced mix of blood products to prevent transfusion-associated acidosis, hypothermia and coagulopathy (3).
- It is important to administer sufficient tranexamic acid and calcium, due to chelation by citrate during massive blood transfusion.
- Adequate resuscitation is important to maintain hemodynamic stability, with MAP goals above 55 at least, with sufficient crystalloid, colloids, and vasopressors as appropriate to maintain adequate end organ perfusion (4).
- Other considerations include maintaining sufficient anesthetic depth and neuromuscular blockade, particularly to avoid any patient movement during vascular repair, timely administration of antibiotics to prevent post-operative infection, and the avoidance of hypothermia with the use of forced air warmers and warmed intravenous lines for fluids and transfusions.