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SPONTANEOUS COMPARTMENT SYNDROME OF THE UPPER ARM IN A PATIENT RECEIVING ANTICOAGULATION THERAPY

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□ **Abstract—Background: Compartment syndrome is a condition in which elevated pressures within an osseofascial compartment cause vascular compromise, leading to ischemia and possible necrosis. It commonly occurs after a traumatic event (e.g., fracture, crush, burn); however, compartment syndrome can happen spontaneously and in any compartment of the body. The objective of this case study is to present the signs and symptoms of upper arm compartment syndrome along with a review of the diagnosis and treatment. Case Report: A 75-year-old man receiving anticoagulation for atrial fibrillation developed compartment syndrome in the extensor compartment of his upper arm, diagnosed by clinical examination with the aid of a venous duplex ultrasound study. Conclusion: Although uncommon, spontaneous compartment syndrome can occur, and prompt recognition and intervention are limb- and possibly life-saving.** © **2013 Elsevier Inc.**

□ **Keywords—upper arm; compartment syndrome; spontaneous; anti-coagulation; triceps; extensor; venous duplex ultrasound**

INTRODUCTION

Compartment syndrome is a condition in which elevated pressures within an osseofascial compartment cause vascular compromise, and the consequences often lead to ischemia and possible necrosis. It is most common in the anterior and deep posterior compartments of the leg and the volar compartment of the forearm. However, it can occur anywhere in the body that a compartment is present, including the hand, abdomen, buttock, foot, upper arm, and thigh (1–6). The most common causes include trauma, arterial injury, limb compression, and burns (6,7). Case reports of compartment syndrome after minimal trauma to the upper arm have been noted after instrumentation or procedures such as venipuncture, arterial access devices, and prolonged compression from a tourniquet (8).

Spontaneous compartment syndrome (in the absence of any inciting event), although rare, can occur. Most often it is associated with type 1 diabetes mellitus, hypothyroidism, influenza virus-induced myositis, leukemic infiltration, nephrotic syndrome, ruptured aneurysm, ganglion cyst, and anticoagulation (9–18). Most cases, however, have been localized to the compartments of the lower leg and forearm. A search of the literature revealed no cases of spontaneous upper arm compartment syndrome in the literature within the last 20 years.

CASE REPORT

A 75-year-old man with a history of congestive heart failure, coronary artery disease with placement of two cardiac stents 2 months prior, hypertension, and atrial fibrillation

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presented to our Emergency Department (ED) complaining of intense pain, swelling, and ecchymosis of his right upper arm for approximately 36 h. The pain and swelling had progressively gotten worse and now he was unable to move his wrist on the affected arm. He reported no fevers, recent trauma, or instrumentation. He denied any paresthesia or numbness in the remainder of his arm except for tingling of the fourth and fifth digits on the right hand. The patient stated he was taking the following medications: metoprolol, lisinopril, hydrochlorothiazide, with doxazosin, digoxin, simvastatin, clopidogrel, and warfarin. The patient went on to state that his dose of warfarin was originally 5 mg once a day, but with his last refill, the prescription on the label read take twice a day (a total of 10 mg per day), which he had been doing for the last 14 days.

With the onset of pain and ecchymosis, the patient saw his primary care physician and was found to have an international normalized ratio (INR) of 8.0. He was given a single 10-mg oral dose of vitamin K the night before ED presentation and was instructed to go to the ED if pain or swelling increased.

Upon ED arrival, the patient's vital signs were: blood pressure 163/94 mm Hg, pulse 97 beats/min, respiratory rate 20 breaths/min, temperature (oral) 36.6 °C (97.9°F), and oxygen saturation 99% on room air. Physical examination of the right upper extremity revealed an ecchymotic, tense, and tender triceps with wrist drop. Further evaluation revealed 2/4 distal pulses (brachial, radial, and ulnar), capillary refill of < 2 s, and normal color and appearance of the distal portion of the right arm. Neuromuscular testing revealed intact sensory and motor function except for limited active range of motion in flexion and extension of the elbow, inability to actively extend the wrist, weakness in finger abduction/adduction, and opposition of the thumb and fifth digit. The patient also expressed considerable pain with passive flexion of the arm at the elbow. Due to the above presentation, orthopedic and vascular surgery consults were requested immediately.

Biochemical analysis on admission revealed the following abnormal values: INR 2.5, hemoglobin 11.9 g/dL (reference range 13.5–18 g/dL), platelet count 116 K/mm^3, and creatine kinase 926 U/L; otherwise, admission laboratory testing was normal. The initial evaluation by consultants involved skepticism. The Orthopedics consultant suggested a radiographic study of the arm for fracture—despite the patient's assertion that no trauma was involved—and showed an unwillingness to directly measure the compartment pressure in the presence of an increased INR. Vascular Surgery suggested a venous duplex ultrasound study to assess venous flow.

Radiographic examination of the humerus and forearm were negative for fracture or dislocation. A venous duplex scan was obtained, revealing patent and compressible internal jugular, subclavian, and brachial veins of the right arm with segmental effacement of the distal axillary vein secondary to extrinsic compression by prominent regional soft tissue swelling, and absence of venous outflow.

Although ultrasound with or without venous duplex is not considered diagnostic for compartment syndrome, the combination of the ultrasound findings and the clinical presentation in this case convinced the vascular surgeons to take the patient to the operating room for a fasciotomy. In preparation for the surgery, the patient was given four units of fresh frozen plasma to reverse the anticoagulation effects of his warfarin. Within 6 h from admission to the ED, the patient underwent a fasciotomy. A 15-cm posterolateral incision of the arm was made, including the skin and underlying fascia, with immediate bulging of the muscle of the triceps and compartment, confirming the diagnosis of compartment syndrome. The biceps compartment of the arm was decompressed through the same incision. A significant amount of clotted blood and necrotic portions of the triceps were debrided, exposing the radial nerve in the base of the wound. The patient's course was complicated by respiratory distress, necessitating re-intubation post surgery, and prolonged mechanical support. The patient was eventually extubated and discharged from the hospital.

DISCUSSION

The arm has two relatively large compartments, the anterior or biceps compartment and the posterior or triceps compartment, and the smaller deltoid compartment. Both the anterior and posterior compartments can tolerate relatively large volumes of fluid, thereby limiting the rise in pressure and diminishing the risk of compartment syndrome; however, it can occur (8,19–23). The anterior compartment contains the elbow flexor muscles along with the ulnar and median nerves. The posterior compartment contains the extensor muscles of the elbow and the radial nerve. The deltoid compartment contains the abductors of the arm and the axillary nerve.

In general, the clinical signs and symptoms of compartment syndrome are pain out of proportion to the clinical situation, a palpably tense compartment, pain with passive muscle stretch, paresis, and paresthesia (6,7,24). In addition, compartment syndrome of the upper arm will have certain clinical findings, depending on the compartment involved. For the anterior compartment, paresthesia may exist over the entire forearm and hand. There is pain on passive elbow extension vs. flexion, along with global weakness in the hand and wrist because the radial, median, and ulnar nerves all pass through this compartment. If the posterior compartment