A swollen shoulder after repair of acute dissection of the aorta: An unusual presentation of a compartment syndrome

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A compartment syndrome is caused by elevated pressure in a closed neuromuscular compartment. It is a rare but serious complication after cardiothoracic surgery. Early recognition and prompt fasciotomy to decompress the neuromuscular compartment may save life and limb. We describe the case of a patient in whom an acute compartment syndrome of the shoulder developed after repair of an acute dissection of the ascending aorta. Predisposing factors and treatment are discussed.

Clinical Summary
A 47-year-old right-handed body builder experienced sudden chest pain and dizziness during a workout in the gymnasium. He was pre-
viously fit, except for hypertension. On admission to his local hospital all peripheral pulses were present, but the blood pressure in the right arm measured 80/31 mm Hg and in the left arm 140/65 mm Hg. He was also noted to have a murmur of aortic regurgitation. Computed tomography showed a dissection of the ascending aorta extending into the aortic arch and the descending and abdominal aorta. The patient was transferred to our center for emergency surgery.

At operation an intimal tear was found just above the origin of the right coronary artery. The dissection involved the coronary arteries and aortic root proximally and extended beyond the arch distally. Severe aortic incompetence was present. Cardiopulmonary bypass was established between the left femoral artery and right atrium. A crossclamp was placed half way the ascending aorta, the aorta was opened, and cardioplegic solution was given directly into the coronary ostia. The aortic root was replaced with a 25-mm St Jude Medical (St Paul, Minn) composite vascular graft. The distal anastomosis was performed during a period of deep hypothermic circulatory arrest. The crossclamp was removed, the aorta trimmed back to 2 cm below the innominate artery, and the distal end of the graft was sewn in. The patient was weaned from bypass uneventfully, receiving a dopamine dosage of 5 µg · kg⁻¹ · min⁻¹, and was transferred to the intensive care unit in stable condition. There was minimal bleeding in the postoperative period.

Six hours after the operation the patient’s family noted that the right shoulder and upper arm appeared larger than normal. On examination, the radial and ulnar pulses were intact and symmetrical, and capillary refill of the fingers was good. The circumference of the right upper arm was 42.5 cm compared with 39 cm on the left side. Right upper arm compartment pressures were elevated, measuring 30 mm Hg anteriorly and 32 mm Hg posteriorly. The serum creatine kinase level was 36,000 IU/L (reference 0–140 IU/L), indicating severe rhabdomyolysis. An acute compartment syndrome was diagnosed and the patient underwent urgent surgical decompression.

Extensive anterolateral fasciotomy of the deltoid and upper arm compartments was performed extending into the forearm. The muscles were edematous, but contractile and bleeding, and no resection was necessary. The wound was left open, and on repeat inspection over the next few days the viability of the muscles was confirmed. Acute renal failure developed as a result of the severe rhabdomyolysis, and hemofiltration was begun. On the third postoperative day, he had erosive gastritis and hematemesis and required multiple blood transfusions. His hemodynamic condition progressively deteriorated, multiorgan failure ensued, and he died on the fifth postoperative day.

Comments
To our knowledge, this is the first reported case of an acute compartment syndrome in the upper arm after repair of an acute dissection. Compartment syndrome in the lower extremity after dissection was reported before by Yamamoto and coworkers, and Poullis, Lawrence, and Ratnatunga reported an acute compartment syndrome of the forearm after redo sternotomy and aortic root replacement.

Compartment syndrome is the result of elevation of pressure in a closed neuromuscular compartment. The underlying causes are multifactorial. In cardiothoracic surgery, femoral cannulation for cardiopulmonary bypass and the use of the intra-aortic balloon pump have been followed by acute compartment syndrome. In these cases, ischemia-reperfusion injury may have led to tissue edema and increased compartment pressure. In addition, venous congestion related to femoral vein cannulation, as well as capillary leak associated with cardiopulmonary bypass, may have had an effect. In our case, however, the upper extremity was involved. The lower blood pressure in the right arm at the initial presentation suggests that ischemia may have been present, and successful repair of the dissection may thus have resulted in a reperfusion injury. A further contributing factor may have been the heavy muscular build of our patient. Compartment syndrome after minor trauma has been reported in body builders.

Early recognition is of vital importance for the treatment of acute compartment syndrome. Pain that is out of proportion to the injury usually draws the attention to the affected limb. Because our patient was sedated and ventilated, this symptom was not available. An early diagnosis was still made, however, because swelling of the right shoulder was observed. Although the muscles appeared viable, extensive rhabdomyolysis still occurred, probably related to the extensive muscle bulk of the patient. This resulted in a cascade of events culminating in multiorgan failure and ultimately the death of this patient.

References