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CASE REPORT

Brachial Artery Embolectomy in a Polytrauma Patient: A Case Report

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ABSTRACT

Introduction: The upper extremity is a frequent site of injury. Upper limb arterial thromboembolism, a rare complication of such injuries, may be missed if typical signs, such as pain, pulselessness, and sensory loss, cannot be ascertained or are overlooked by physicians, especially in the case of polytrauma or comatose patients. **Case presentation:** In this report, we present the case of a left brachial artery thromboembolism in a polytrauma patient for which brachial artery embolectomy was performed. Before surgery, the diagnosis was established with doppler ultrasonography of the upper limb vessels, performed upon suspicion of thrombus formation. Brachial artery arteriotomy and thrombo-embolectomy were performed using a size 6 Fr Fogarty catheter, after which 500 IU heparin was flushed to ensure adequate back and forward flow. Limb function and blood flow were restored immediately after the procedure. **Conclusion:** A high index of suspicion, timely assessment, and a prompt intervention can significantly reduce the rate of limb ischemia and/or amputations in polytrauma patients, especially in resource-limited settings.

Keywords: thromboembolism, polytrauma, anticoagulant, embolectomy

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INTRODUCTION

Arterial thromboembolism is an uncommon vascular emergency that occurs less frequently in the upper extremity compared to the lower extremity.[1–3] With preexisting atherosclerosis or intra-cardiac clots as the source in over 80% of cases,[4,5] arterial thromboembolism in the upper limb may not be easily recognized in the atypical setting of polytrauma, occasionally leading to amputations.[6] Typically, the diagnosis is established based on history and a combination of clinical examination and imaging,[7] an approach that is not practically achievable in polytrauma and/or comatose patients. Common revascularization options include administration of heparin, embolectomy, thrombolysis, thrombo-aspiration, and percutaneous transluminal angioplasty.[8] Functional prognosis after treatment, however good, is inarguably dependent on the extent and duration of ischemia, which further underscores the importance of a high index of clinical suspicion for diagnosis and the need for prompt treatment. In one study, despite a longer average time to surgical intervention of about 64 hours, the authors reported successful recovery in over 70% of cases.[9,10] Nonetheless, the exact treatment approach, whether or not to

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administer anticoagulants before surgery, and reports of thrombus recurrence raise questions about the long-term benefits of surgical intervention over the short-term functional recovery. In this report, we present the case of a non-cardiac patient with acute brachial artery thromboembolism, for which the first attempt of embolectomy was performed at Komfo Anokye Teaching Hospital. Here, we highlight our diagnostic and therapeutic approach that we believe is applicable to most resource-limited settings.

CASE PRESENTATION

A middle-aged man (exact age unknown) with no known illnesses, was shot during a dispute and presented to the emergency department with multiple gunshot wounds, severe abdominal pain, and reduced mobility in both upper limbs. The patient was admitted within 24 hours of the alleged incident as a referred case from a primary care facility. Examination revealed an immobile but arousable middle-aged man, with heart rate of 93/min, blood pressure of 124/76 mmHg, and respiratory rate of 20/min. He presented with multiple gunshot wounds, mainly in the abdomen, left upper limb, left side of the chest, and the back.

The abdomen was distended, tender with guarding and rebound tenderness. Bowel sounds were absent, with no clinically detectable free fluid in the peritoneum. The right arm was warm to the touch, with capillary refill time <2 seconds and a 2 cm wound on the posterior aspect, with no signs of compartment syndrome or neurological deficits.

ASSESSMENT OF LEFT ARM

There was a 2 cm wound on the medial side of the lower left arm. Passive flexion and extension at the elbow joint were possible but limited. There was a palpable but weak brachial pulse. However, radial pulse was absent, and capillary refill time was >2 seconds. The X-ray showed an incomplete fracture at the proximal left radius, with multiple firearm pellets noticeable at the fracture site. Doppler ultrasonography of the left arm revealed a faint flow in the radial artery with a peak systolic velocity of 15 cm/s. The arterial wall was collapsible wall-to-wall, with a luminal thrombus occluding >95% of the arterial lumen. No intramural thrombus was noted.

Other findings included a compound fracture of the distal third of the right humerus with multiple pellets around the fracture site. The chest and abdominal X-rays showed a fracture of the 11th rib on the left, with two large bullets in the right and left flanks of the abdomen, and multiple smaller pellets scattered around this site. There were also multiple pellets in the paravertebral regions, noticeably two pellets between the L1 and L2 vertebrae, but without any obvious vertebral fractures.

BRACHIAL ARTERY EMBOLECTOMY

After the patient was stable following an emergency laparotomy and orthopedic consultation for the fractures, we performed an embolectomy under strict aseptic conditions. Local cutaneous infiltration was achieved with 0.5% plain lidocaine, followed by a left supraclavicular nerve block using 2.5% bupivacaine. A longitudinal medial incision was made at the left cubital fossa, followed by dissection and isolation of the left brachial artery. Arteriotomy and embolectomy were performed with a size 6 Fr Fogarty catheter, and a 3–4 cm long thrombus was extracted from the left brachial artery (Figure 1), followed by the infusion of 100,000 U of streptokinase into the artery, flushed afterwards with 500 IU of heparin to ensure adequate forward and backward flow. Arteriotomy repair was done with Prolene 6/0 in a simple continuous fashion, and Nylon 3/0 skin closure was done in a simple interrupted fashion. The surgical wound was subsequently covered with sterile dressing.

CLINICAL OUTCOME AND FOLLOW-UP

Limb function and blood flow were restored immediately after the procedure. The left limb, which was initially cold, immobile, and pulseless distally, became pink and mobile, though with limited range of motion. Distal pulses were palpable with good volume, a clinical proof that the intervention was a complete success.

Unfortunately, on postoperative day 3, the patient's temperature spiked, and he developed acute renal failure. His abdomen had become extremely tensed, and the transvesical ultrasonographic measurement of intra-abdominal pressures at expiratory hold consistently recorded >26 mmHg. A diagnosis of abdominal compartment syndrome warranted a re-laparotomy. Intraoperatively, most organs in the abdomen were found to be ischemic, and since damage-control surgery could not save the situation, the patient died the day after re-laparotomy. Surrogates of the patient provided informed consent prior to the procedure, and the institution agreed with the publication of the case.

DISCUSSIONS

Acute embolism of the upper extremity is a relatively infrequent event, accounting for 16–33% of all cases of

acute limb ischemia.[1–3] For patients with preexisting atherosclerotic or cardiac conditions, obstructive embolism is more common in the right upper limb than the left. However, embolic events caused by trauma or injuries, such as the case reported here, are not expected to follow these statistics. Of the upper limb vessels, the brachial artery is the most commonly obstructed vessel,[11–13] consistent with this case. In previous studies, 82–87% of cases of acute ischemia of the lower and upper extremities were classified as cardiogenic embolisms, and more than 50% of these patients had atrial fibrillation.[1,2] Despite the lack of medical history in the case presented here, we did not find any evidence of atrial fibrillation or sources of thrombi other than that originating from the traumatic injury to the upper limb vessels.

Common practice dictates the use of either a continuous infusion or boluses of anticoagulants, commonly heparin, for the prevention of cardiogenic thromboembolism post-embolectomy. Evidence supporting the benefit of this practice is, at best, conflicting. While some authors have reported an improvement in survival rates,[14,15] other studies, notably Licht *et al*.,[16] reported no significant differences in survival rates between patients who did or did not receive any anticoagulants or acetylsalicylic acid.[16] In our case, as the patient's medical history was unknown, we administered only initial doses of streptokinase and heparin. It is noteworthy that extreme care must be exercised, especially in cases where the patient's risk of bleeding is significant. Furthermore, as there was no evidence of atrial fibrillation, antiplatelet prophylaxis was not administered in this case.

Of great emphasis in this report is the fact that arterial extremity injury can easily be missed if typical signs are either overlooked by physicians or cannot be ascertained in the case of comatose patients. Asymmetric blood pressure measurements, peripheral neurologic deficits, and proximity of injury to a major vessel are subtle clinical signs that can be important clues when typical signs are not present.[17] The investigations of choice for peripheral embolism include computed tomography (CT) angiography — with or without contrast, magnetic resonance angiography, and doppler ultrasonography (USG). USG has become the more popular choice for its portability/bedside use advantage and the noninvasive real-time hemodynamic assessment of the occluded vessel without exposure to contrast agents or X-ray radiations.[18] Crawford *et al*. found doppler USG alone to be sufficient for diagnosis, with surgical outcomes and survival rates equivalent to those of patients assessed with CT angiography.[18] In our case, USG sufficiently confirmed the diagnosis and aided in the operative planning. Granted that the diagnostic accuracy of USG is operator-dependent, this is an extremely important tool, especially in resource-limited settings where CT technology may not be readily available.

Available treatments for acute upper extremity ischemia include thrombo-embolectomy, thrombolysis, percutaneous transluminal angioplasty, bypass in cases with stenosis, and the new, yet less employed, percutaneous intra-arterial drip tissue plasminogen activator infusion.[19,20] There is overwhelming evidence of immediate functional recovery following any of the aforementioned treatment options. However, the risk of thromboembolism at other sites, possibly as a consequence of the initial thrombotic event, increases gradually over time. Furthermore, data from the literature suggest that mortality and morbidity rates become worse during long-term follow-up. For example, Magishi *et al*.[19] reported the rate of freedom from thromboembolism post-treatment to be 80% at one month, 74% at one year, and 27% at three years, which suggests that follow-up should ideally go beyond the third year after the procedure. Furthermore, Licht *et al*. reported poor survival rates of 54% and 37% at three and five years, respectively, citing cardiovascular and cerebrovascular events as the main causes of death in long-term follow-up in about 54% of cases.[16] These poor survival rates are likely due to other comorbidities, like the case presented here, where the patient died because of acute renal failure, among other diagnoses.

CONCLUSIONS

A high index of diagnostic suspicion is required to diagnose acute arterial embolism in atypical settings. The diagnostic accuracy of doppler USG is comparable to CT angiography and is advantageous for its ease of use. Timely intervention for this relatively uncommon upper extremity complication can significantly reduce the rate of limb amputations and ensure better results in the case of polytrauma patients, especially in resource-limited settings.

CONFLICT OF INTEREST

The authors declare no competing interests.

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