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Axillary, Chest Wall and Abdominal Hematoma as a Rare Complication of Radial Artery Catheterization

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
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Conflict of interest: None declared

Patient: Male, 58
Final Diagnosis: Axillary • chest and abdominal wall hematoma
Symptoms: Discolored/bruised chest and abdominal wall
Medication: —
Clinical Procedure: Coronary angiogram via trans radial route
Specialty: Cardiology

Objective: Diagnostic/therapeutic accidents

Background: Radial artery access during coronary angiography has gained popularity as there are fewer associated complications when compared with femoral artery access. However sporadic complications can occur following radial artery catheterization. A rare case of axillary, chest wall and abdominal hematoma is presented following radial artery catheterization.

Case Report: A 58-year-old man with hypertension, type 2 diabetes, with a history of smoking, underwent elective coronary artery angiography via the right radial artery route. He was discharged from care without event, before returning 24 hours later with a large hematoma of the right axilla, extending to the anterior chest wall and abdomen. One year previously, he underwent coronary artery angiography with catheterization of the femoral artery, which was without complications. On this occasion, after resolution of the hematoma, he underwent coronary artery bypass graft (CABG) surgery.

Conclusions: This case has reported a rare complication of radial artery catheterization that involved extensive hematoma involving the chest, abdominal wall, and axilla. Although such complications may be rare, a high level of vigilance should be maintained for rare complications in patients undergoing radial artery catheterization.

MeSH Keywords: Cardiac Catheterization • Coronary Angiography • Hematoma • Radial Artery

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Background

Radial artery access during coronary angiography has gained popularity as there are fewer associated complications when compared with femoral artery access, and there is early mobilization following femoral artery catheterization, but sporadic complications do occur [1]. Femoral artery catheterization is recognized to be associated with significant bleeding, myocardial infarction, and stroke, which can be fatal. This report is of a case of a 58-year-old patient with a large hematoma of the axilla, extending to the chest and abdominal wall following radial artery catheterization. To our knowledge, this is the first reported case of these complications.

Case Report

A 58-year-old Trinidadian man of East Indian descent, presented for an elective repeat left heart catheterization with coronary angiography in preparation for coronary artery bypass graft (CABG) surgery. One year previously, he underwent coronary artery angiography with catheterization of the femoral artery, which was without complications. His medical history included hypertension, type 2 diabetes mellitus, and a previous smoking history of 20 pack-years.

His symptoms at presentation included angina at rest, associated with shortness of breath.

On hospital admission, his medications included aspirin 81 mg once daily, which was stopped five days before the procedure, sublingual glyceryl trinitrate (GTN) tablets as needed, which he used each day, perindopril 4.0 mg and indapamide 1.25 mg once daily, trimetazidine dihydrochloride 35 mg twice daily, simvastatin 40 mg at night, atenolol 25 mg once daily, gliclazide 80 mg once daily, and insulin glargine 10 units at night. He was known to be allergic to clopidogrel. His usual aspirin treatment had been stopped, as the usual clinical policy, to reduce the risk of bleeding before CABG surgery, which had been planned to follow coronary angiography.

On physical examination, his blood pressure was 158/76 mmHg with a pulse of 78 beats per minute and oxygen saturation of 100% on room air. His first and second heart sounds were normal with no murmurs or additional heart sounds. Air entry was equal and adequate bilaterally throughout the lung fields with no evidence of wheezing or crackles. Tests of radial artery patency, including the modified Allen test (application of pressure to the radial vessels when the hand is elevated, and the fist is clenched), and the Barbeau test (pulse oximetry of the index finger or thumb) were used to demonstrate collateral blood supply to the distal right hand before radial artery

puncture. The remainder of his physical examination was unremarkable.

Pre-operative laboratory tests included a full blood count, which showed a hemoglobin (Hb) of 13.4 g/dl, a platelet count of $246 \times 10^9/L$, a coagulation profile that included a prothrombin time (PT) of 12.3 seconds, a partial thromboplastin time (PTT) of 25.1 seconds, and a basic metabolic profile that were all within normal limits. A two-dimensional A transthoracic echocardiogram (TTE) demonstrated mild concentric left ventricular hypertrophy with a left ventricular ejection fraction of 70%.

The right forearm and wrist were supinated and extended respectively. The right radial artery was palpated. A local anesthetic with 1% lidocaine was injected in the skin at the site of the puncture. Using the Seldinger technique a 5 French (Fr) sized catheter and the hydrophilic guidewire was inserted into the right radial artery. Heparin was administered intravenously at the beginning of the procedure, before radial artery cannulation, at a dose of 5000 units (70 units/kg). Coronary angiography showed a left main stem coronary artery stenosis and advanced triple vessel coronary artery disease. Following angiography, the wound was immediately sealed using an arterial puncture-closing device (APCD), composed of natural fiber cellulose hemostatic gauze placed in direct contact with the puncture site. Manual compression was then applied using a trans-radial band (TR band) to the radial area for two hours to minimize bleeding and blood loss.

The patient was observed for four hours following the procedure with no evidence of bleeding or hematoma and was referred to cardiothoracic surgery for an urgent CABG. The radial artery was assessed as an easily palpable, large caliber vessel, which was easily cannulated without evidence of vasospasm. Therefore, glyceryl trinitrate and verapamil, which are normally administered for radial artery vasospasm, were not required in this case.

Twenty-four hours following radial artery catheterization, unnoticed by the patient, he was found to have ecchymosis (bruising) affecting the right axilla, anterior chest wall and anterior abdominal wall (Figures 1, 2). His blood hemoglobin level dropped to 11.1 g/dl on repeat full blood count 24 hours following radial artery catheterization, and the platelet count was $217 \times 10^9/L$. He remained hemodynamically stable with a blood pressure of 156/75 mmHg and a pulse rate of 61 beats per minute. Serial hemoglobin levels then remained stable. A chest X-Ray was performed and showed no evidence of pleural collections or widened mediastinum and the lung fields were clear. One week later, he proceeded to successful on-pump CABG without complications.

Figure 1. Following radial artery catheterization, a right axillary hematoma is shown in a 58-year-old-man.

Figure 2. Following radial artery catheterization, a right axillary hematoma tracking to the chest wall and abdomen is shown in a 58-year-old-man.

Discussion

For the performance of coronary artery angiography, arterial catheterization using the radial route has gained popularity as it has been reported to be associated with fewer complications than femoral artery catheterization [2,3]. Major complications during diagnostic coronary angiography are rare and are reported in less than 1% of procedures, with vascular complications being the most common [4]. Complications associated with arterial catheterization, when they do occur, include minor bleeding and hematomas at the puncture site, which are usually well managed with manual compression or the use of mechanical compression devices. During the immediate observation period, the patient in this report showed no signs of bleeding or other complications until 24 hours following the arterial catheterization procedure.

Precautionary post-procedure protocols used in arterial catheterization include the immediate placement of hemostatic adhesive gauze at the puncture site, radial band compression for one to two hours following the procedure, and continuous

monitoring of blood pressure, pulse rate, and pulse-oximetry monitoring for four hours before discharge, as were performed in this case. However, this patient developed bruising to the axillary region, which tracked superficially, to the lower anterior chest wall and abdomen. While the hematoma appeared more intense on the left side of the abdominal wall, the ecchymosis (bruising) started in the right axilla and chest wall and spread further to the abdomen.

Factors that may have increased this patient's risk of bleeding were considered, but he had a normal coagulation screen, full blood count, and basic metabolic profile pre-procedure, with no use of glycoprotein IIb/IIIa inhibitors or antiplatelet therapy. Intravenous (IV) heparin was given at the recommended 70 units/kg (5,000 units). The use of the 4Ts clinical scoring system, as a pretest probability method to detect heparin-induced thrombocytopenia (HIT), was negative with a score of 0 points. There was no significant drop in the patient's platelet levels, no evidence of venous or arterial thrombosis, and this patient proceeded to CABG where higher doses and longer durations of heparin exposure were used, and the surgery was without event [5]. Following recognition of the hematoma, and after discussion with the interventional cardiologist, it was decided that computed tomography (CT) would be performed if there were signs of deterioration. The patient remained stable at 48 hours with no further drop in hemoglobin and a CT scan was not performed. An initial chest X-ray was normal.

As in this case, hydrophilic guidewires are used during the trans-radial arterial catheterization approach to traverse tortuous arterial segments and to prevent radial artery spasm, but when a vascular complication does occur it is usually in the form of a forearm hematoma. These hematomas have been described as avulsions of a small branch of the radial artery, or due to 'recurrent radial artery,' arising from a radial loop proximal to the access site during the passage of the guidewire [6]. The morbidity associated with avulsion of a recurrent radial artery, including compartment syndrome and distal hand ischemia, makes this a well-documented complication. However, perforations or avulsions affecting more proximal segments of the upper extremity during the trans-radial approach remain unexplained.

Vascular injury due to perforation or dissection and subsequent complications of bleeding can occur anywhere along the course of the wire or catheter manipulation, including the radial, axillary, subclavian arteries or any of the side branches. Upper limb arterial anomalies have a prevalence of 4–18.5%, according to autopsy studies [7,8]. Artery anomalies include a high bifurcating radial artery, radial artery tortuosity, and tortuous subclavian arteries. Following a review of the available literature, the possible mechanism of the complication that

occurred in this patient may have been an injury to a small vessel or branch in the region of the axillary or subclavian artery that resulted in a slow hemorrhage. This mechanism would explain the gradual development of the hematomas and bruising, which were not apparent on discharge, and which started at the right axilla and progressed to the anterior chest and abdominal wall 24 hours following arterial catheterization.

The presentation of the complication described in this patient resulted in a clinical dilemma, as CABG surgery had to be delayed by one week in a patient with critical coronary artery disease, and careful consideration had to be given before further antiplatelet and anticoagulation (heparin) treatment. This case resulted in several questions, including whether there are complications associated with radial access during coronary angiography that remain unknown, whether there may be a subgroup of patients with an anomalous blood supply to the upper extremity that might increase the risk of similar

complications, and whether there should be there be closer follow-up following trans-radial angiography. Finally, the question remains as to how the development of the complications found in this patient impact on cardiothoracic surgeons when planning urgent CABG surgery.

Conclusions

This case report has shown that radial artery catheterization can be associated with complication, which may be rare but could include chest, abdominal wall and axillary hematomas. A high level of vigilance and reporting should be maintained for rare complications in patients undergoing all forms of arterial catheterization, including catheterization of the radial artery.

Conflict of interest

None.

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