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ACUTE COMPARTMENT SYNDROME: A RARE BUT IMPORTANT COMPLICATION OF TRANS-RADIAL CORONARY ANGIOGRAPHY

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Abstract

The radial approach become the route of choice for coronary angiography because it is associated with less bleeding, early post-procedure mobilization of patient, and easily tolerated by patients. Because of hand's dual arterial supply and extensive collateral circulation, the risk of serious injury after catheterization through radial approach is essentially decreased to zero. However, minimal amount of bleeding in the anterior compartment can lead to compartment syndrome and may lead to permanent neurovascular injury. The purpose of this case report is to describe our experience with an unusual case of late-onset acute compartment syndrome following trans-radial coronary angiography, and to summarize the available literature on this topic.

Learning objective:

- *The radial approach has become the gold-standard for cardiac catheterization. However, in very rare cases, this approach may be associated with bleeding and acute compartment syndrome.*
- *Patients on anti-coagulant drugs, and those who have severe atherosclerotic disease are at increased risk of this complication. The diagnosis mostly depends on clinician awareness and vigilance as these patients may require early decompressive fasciotomy to prevent permanent neurovascular injury.*

Introduction

The radial artery is the favorite route of many cardiac interventionists for diagnostic coronary angiography and per-cutaneous coronary intervention. If compared with transfemoral access, it is linked with better patient tolerance, earlier mobilization of patient after procedure with less bleeding and in few cases presented after acute coronary syndrome have increased survival. The dual arterial supply in for-arm and hand remove the fear of acute limb ischemia in cases of radial artery injury. However if happens a small amount of bleeding in the anterior compartment it may lead to neurovascular insufficiency and even permanent functional impairment of the hand. It happens quickly, and may be only associated with obscure clinical features.

Although compartment syndrome is a rare complication of trans-radial angiography, it is the significant consequences mandate that it be mostly recognized among interventionalists. Here we report an unusual case of CS with subsequent severe functional impairment of the hand following trans-radial coronary angiography. We also review the existing literature relating to CS following trans-radial and trans-brachial coronary access.

Case report

A 56-year-old woman with a background of Diabetes Mellitus, came to our institution with typical chest pain diagnosed as a case of acute coronary syndrome Her cardiac function was normal. She received loading doses of aspirin, clopidogrel, and heparin.

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A coronary angiogram was carried out via an uncomplicated right radial artery puncture using a 6-Fr sheath. Intra-operative anticoagulation was achieved with 5000 international units of heparin, given as an intra-arterial bolus at the beginning of the case. The angiogram revealed tight proximal stenosis followed by moderate mid disease of Left Anterior Descending Artery. Her angioplasty decision was pending till discussion with family. Compression was applied locally and there was no active bleeding rechecked after two hours of procedure.

Over the following six hours, there was mild discomfort with only minimal superficial bruising at the arterial puncture site. But with passage of time, she had increasing discomfort at the puncture site and was found to have a mildly swollen wrist. Her hand remained warm, with a strong radial pulse and brisk capillary refill time distally. She was diagnosed as having a post-operative hematoma, which was managed according to local guidelines.

After 10 hours post angiogram, she reported paresthesia in a median nerve distribution with a positive Phalen's sign and significant tenderness associated with passive movement of the wrist. This prompted concern about acute Compartment Syndrome and an urgent ultrasound scan was arranged. Ultra-Sonography revealed a hematoma of heterogeneous density deep to the radial artery and flexor tendons. Although atherosclerotic, the radial artery remained patent, with normal Doppler flow and no evidence of pseudo-aneurysm

General surgery opinion was sought, on the basis of clinical features and ultrasonographic findings the diagnosis of acute Compartment Syndrome was made and the patient underwent urgent volar fasciotomy, using a modified Henry approach with extension into carpal tunnel release, under general anesthesia. A hematoma was evacuated from beneath the flexor pollicis longus tendon.

On 12th day to have better outcome skin flap from lateral thigh was grafted on the forearm. She had mild neuropraxia of the right hand and discharge from hospital on day 16.



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Discussion

Acute compartment syndrome is a rare, yet hand-threatening, complication of transradial coronary angiography. A retrospective analysis was made for cases undergoing trans-radial coronary angiograms that were complicated by compartment syndrome at our institution between 01/01/2010 and 31/10/2020. Of the thousands transradial procedures performed, only a single patient experienced compartment syndrome, representing an incidence of less than 0.01%. Another case series has estimated this complication to arise in 0.004% to 0.4% of patients.

The first reported case of compartment syndrome following trans-radial angiography was reported in 1997. Most of reported cases emerged within 10 h of intervention, and majority involved laceration of the radial or brachial arteries. All patients were managed with early decompressive fasciotomy under general anesthesia. At least three of the four patients had delayed primary closure of their wound. Outcome data were available in two of the four reports. One of these patients experienced complete neurovascular recovery, while the other had a Volkman contracture with reduced mobility. The subject of the present report developed unusually delayed symptoms, with only one previously documented case arising after 24 h. However, this nerve injury was secondary to inadequate homeostasis post procedure, rather than from an acute arterial laceration. Fortunately, despite a brief period of neuropraxia, she experienced a complete neurovascular recovery.

CS has also been reported to follow transbrachial coronary angiography. In one case, when a 7-French catheter was employed, bleeding occurred from the puncture site. The remaining patients bled from perforation of the brachial artery or one of its tributaries. Among those patients with available outcome data, one experienced complete neurovascular recovery, while the other had persistent pain without associated neurologic impairment.

In cases of CS after both transradial or transbrachial approaches, unsuccessful hemostasis at the puncture site, or arterial laceration associated with sheath insertion or removal, seem to be the most common sources of bleeding. Given their fragility, heavily atherosclerotic arteries would appear to be at greatest risk of significant bleeding following cannulation. Anticoagulation, particularly if supratherapeutic, is likely to increase this risk.

CS is an uncommon, yet important, potential complication of transradial coronary intervention. Its diagnosis relies upon clinician awareness and vigilance, and affected patients require early decompressive fasciotomy to prevent permanent neurovascular injury.

Conflict of interest

The authors declare that there are no conflict of interest.

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