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Prednisone Treatment for Occlusion of the Radial Artery as a Complication of the Transradial Coronary Intervention

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Abstract

Over 1.5 years, 6 patients out of 50 (12%) who had catheterization via the radial approach, developed sterile inflammation at their radial arterial access site. Symptoms of discomfort and inflammation were reported as early as <24 hours to 5 days post arterial access. All initial ultrasounds documented complete (100%) radial artery occlusions. No particular/standardized treatment is available as of now regarding radial artery occlusions that develop post-hospital discharge. After a tapered prednisone treatment for a 2-week duration, repeat ultrasounds documented various degrees of flow restoration at the radial artery with complete symptom resolution. Patients were followed up for 5 years and continued to be asymptomatic.

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Introduction

A well-known complication of cardiac catheterization is artery occlusion at the catheter insertion site. This can be encountered when catheterization is done via the radial artery approach and is a benign condition known as radial artery occlusion (RAO). The occlusion is caused by the thickening of the tunica intima layer of the arterial wall. The thickening is believed to be caused by sterile inflammation in response to traumatic stimuli [1]. Under these specific conditions, Prednisone, a widely available broad-spectrum anti-inflammatory therapeutic drug, was deemed an appropriate treatment to alleviate discomfort associated with inflammation, help reduce intimal edema, and improve radial artery patency. Our report describes a treatment regimen consisting of a short and tapered course of prednisone to restore radial arterial flow along with symptom relief.

Initial and Repeat Ultrasounds of Case J.M

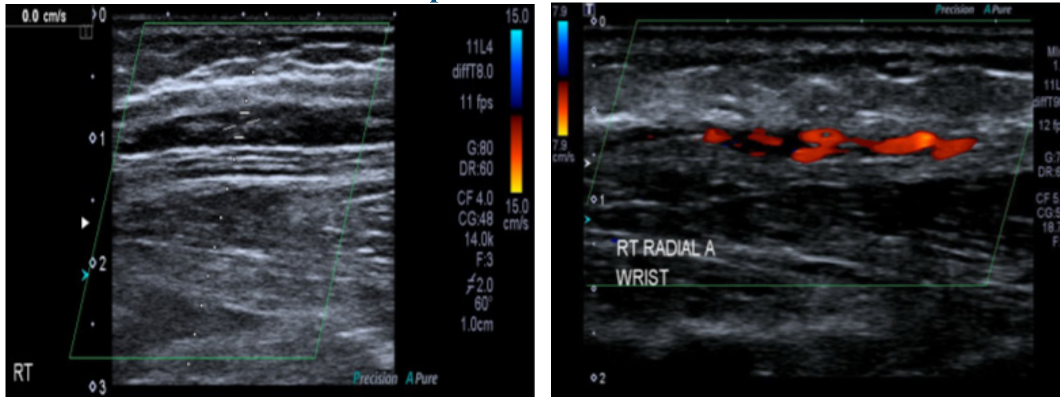


Figure 1: Case J.M. is a 39-year-old woman. (A) The ultrasound taken on the day of symptom onset which shows the lack of blood flow and complete (100%) stenosis of the artery. (B) The ultrasound taken on day 14 (the day of the last dosage of treatment was

Methods

We studied 50 consecutive patients who underwent diagnostic radial coronary angiograms between 2014 and 2016 at a single PCI-capable hospital. 6 patients were identified with symptomatic radial artery occlusion. Patients had an initial ultrasound, followed by a clinical visit (2-4 weeks post-treatment), and a repeat ultrasound. Between the two US studies, patients underwent a prednisone treatment that consisted of 40 mg daily for 1 week, followed by 20 mg daily for an additional week. To assess the effectiveness of the treatment we looked at two areas of concern. The first is, how successful the prednisone treatment is at ceasing the symptoms of RAO. Second, how effective the treatment is at restoring arterial patency. To analyze the data, we used basic statistics to compare averages and means. Quantitative data are expressed as the mean ± SD and comparing averages and means, and qualitative data are presented as frequencies. Continuous variables were compared by documenting the average occlusion rate at each clinical visit.

Case Series

6 patients between the years 2014 and 2016 experienced radial occlusion post-diagnostic heart catheterization procedures.

For all 6 patients' arterial access was obtained in the right radial artery using either a 6Fr or a 5Fr sheath via the Seldinger Technique. All 6 patients' radial arteries were accessed using a single attempt.

Table 1: Clinical Characteristics of Study Patients

Demographic and Baseline	
Age(yrs)	45.1 (12.6)
Gender	
Female (%)	50%
Male (%)	50%
BSA (m^2)	2.2 (0.37)
History	
Diabetes Mellitus	16.6%
Hypertension	33.3%
Smoking	83.3%
CAD	66.6%
Dyslipidemia	33.3%
FHx of cardiac implications	83.3%
Peri-Procedural antiplatelets medication	
Asprin	66.6%
Apixaban	33.3%

Data are presented as the mean value ± SD or number (%) of patients.

Once access was established, an intraarterial radial access cocktail compounded of 2.5mg of Verapamil, 200 µg of Nitroglycerin (NTG), and Heparin (dosage was based on patients' weight) was administered. Patients under 75kg received 2500 units of Heparin while patients above 75kg received 3000 units of Heparin at the outset of the angiogram. All 6 patients' blood loss was minimal (<5ml). As per hospital protocol, following catheter removal, the patient was situated with a VASC Band at optimal pressure for 60 mins. After the initial 60 minutes, 2 cc of air was removed every 15 minutes until the VASC band was out of air. Patients were discharged once no bleeding was confirmed and the patient was evaluated to be stable. All 6 angiographies were performed without complications and patients were discharged the same day. The earliest symptom complaint was recorded at < 24 hours post procedure and the latest 5 days post-procedure. Symptoms included pain at the access site, forearm pain, and tenderness along the radial artery. No hand ischemia signs or symptoms were encountered. Every patient was examined via an ultrasound and all 6 patients were found to have complete (100%) radial occlusion at the right artery due to intimal edema and no intraluminal thrombus was detected. Patients were prescribed a tapered course of steroids. 5 patients were instructed to orally take 40mg of Prednisone daily for 7 days followed by 20mg of Prednisone daily for an additional 7 days. That is a total of 420mg of Prednisone over a 14-day period. 1 out of the 6 patients' regimen was altered due to experiencing a side effect which was documented as “jitteriness” post taking 40mg of prednisone for 2 days. This patient was instructed to orally take 10mg of Prednisone daily for 5 days followed by 5mg of Prednisone daily for another 7 days. Post-completion of the assigned treatment, patients reported total symptom relief and ultrasounds showed various levels of arterial flow restoration.

Table 2: Procedural Characteristics

Procedural and Angiographic Characteristics	
Right Radial Access Site	100%
Number of Attempts	1(0)
Arterial Access Time (min)	29.3(8.1)
Fluoroscopy Time (min)	6.1(2.9)
Contrast Volume (ml)	49.6(16.5)
Percutaneous Access Technique	
Seldinger Technique	100%
Procedure Sedation	
Versed (2mg)	100%
Fentnayl (50µg)	100%
Intraprocedural Medications	
Intraarterial Radial Access Cocktail	
Verapamil (2.5mg), Nitroglycerin (200 µg), Heparin (2500 units)	33.3%
Verapamil (2.5mg), Nitroglycerin (200 µg), Heparin (3000 units)	66.7%
Blood Loss	
Minimal (<5ml)	100%
Sheath Type	
6Fr Sheath	83.3%
5Fr Sheath	16.7%
Catheterization Catheter Type	
5Fr Jacky	50%
5Fr TIG 4.0	50%
Hemostasis Device Type	
VASC Band	100%

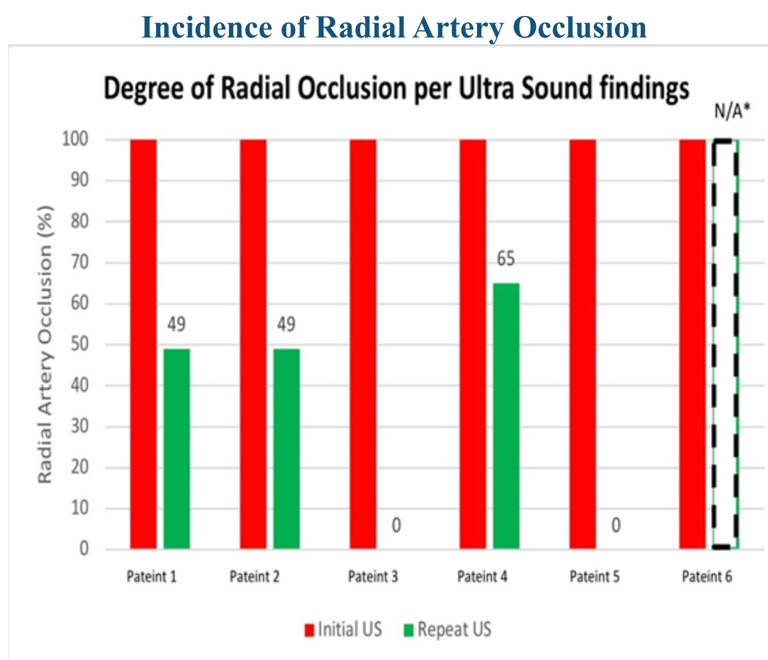
Data are presented as the mean value ± SD or number (%) of patients.

Results

A total of 6 complete RAOs were found on ultrasound (incidence 12%) out of 50 patients who underwent coronary angiographies. These 6 patients were all treated with a tapered course of prednisone. All 6 patients reported complete symptom relief and follow-up ultrasounds documented various levels of radial atrial flow.

1 of the repeat ultrasounds reported moderate stenosis of the artery (65% occlusion), 2 ultrasounds reported mild stenosis of the artery (<49% occlusion), 2 ultrasounds reported no stenosis (0% occlusion), and 1 patient did not get a repeat ultrasound but reported no symptoms. The 6 patients were monitored for 5 years via yearly clinical rechecks, and all 6 patients did not have further complaints or complications with the noted radial artery.

Incidence of Radial Artery Occlusion



Incidence of radial occlusion per patient at time of initial US (red) and time of repeat US (green).
*Indicates that the patient did not get a repeat/final US.
Figure 2:compares the degree of radial occlusion at the initial US versus the final US. *Indicates that the patient did not get a repeat/final US.

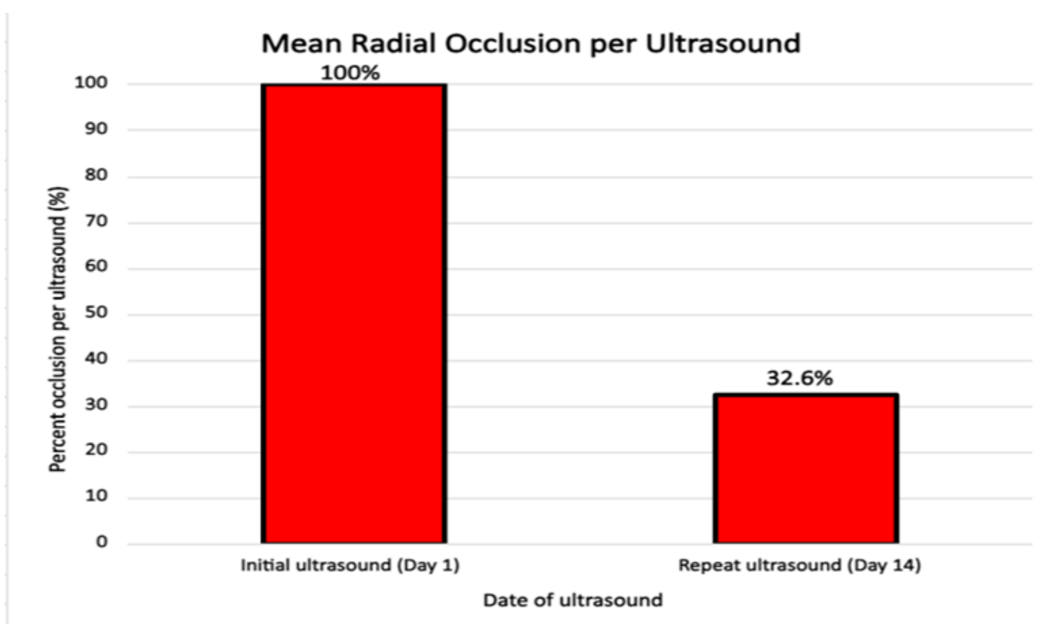


Figure 3: Average Percent (%) of occlusion per US

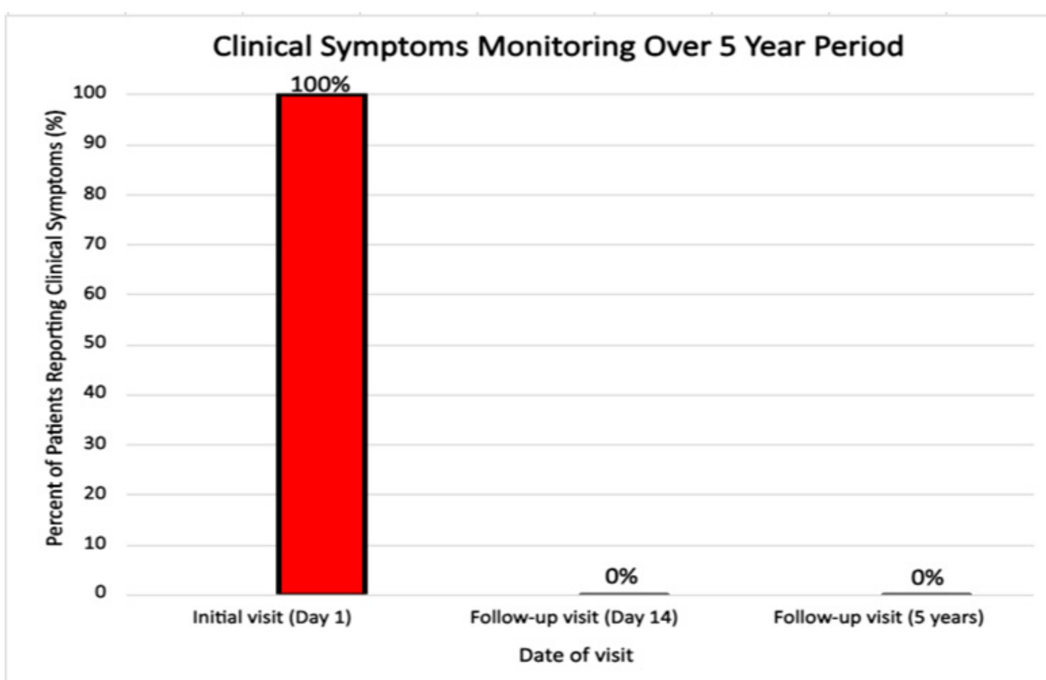


Figure 4: Percent (%) of patients reporting clinical symptoms at the initial clinical visit (day 1), follow-up visit (14 days), and the final visit at 5 years.

Discussion

Early years of cardiac catheterization procedures mostly involved accessing the brachial artery via a cutdown approach [2]. While stability was promptly achieved, the access technique was time-consuming, and complications resulting in thrombosis were relatively frequent. In due course, percutaneous access via the femoral artery became the standard approach. Access through the femoral artery was faster and allowed for the use of larger catheters. Despite its extensive standardization, femoral access came with an array of complications. Major complications included bleeding and minor ones ranging from discomfort associated with compression of the puncture, being positioned in the supine position for hours, to urinary retention [2]. In view of this, access at the radial artery emerged to be a useful site for arterial access. Abundant data support the use of the

radial artery as an access site and complications associated with the approach are documented to be unequivocally low [3,4]. Additionally, transradial catheterization permits early ambulation and shorter hospital stays, consequently reducing cost-of-stay [5].

Despite the overall low complication rates, a known complication is radial artery occlusion (RAO) [6]. RAOs start with damage to the arterial wall from arterial access as well as during manipulations throughout the procedure, which can lead to thrombus formation and/or thickening of the vessel wall. It has also been shown that the inner diameter of the radial artery decreases after transradial intervention [7].

Though most radial artery occlusions are asymptomatic, RAO should be prevented. Obstructed radial artery restricts its use for future access and as conduits in the revascularization of coronary arteries via bypass grafting. The major risk factor for RAO is likely due to the smaller size of the artery in comparison to the femoral artery, the same characteristic that accounts for radial access being considered safer than femoral access [6].

Procedure-related risks for RAO are the use of hydrophilic sheaths, and the administration of lower doses of heparin, which lowers the risk of bleeding but increases the risk of occlusions [8,9]. The use of hydrophilic-coated arterial sheaths increases the risk of RAO because the coating can break down and be deposited subcutaneously at the access site during sheath insertion [10,11]. The use of heparin has been found to prevent thrombus by acting as an anticoagulant, inhibiting the formation of thrombin in the circulatory system. Heparinization, at higher doses, has been found to reduce the occurrence of radial artery occlusion given that there is a suspicion that thrombus formation may be the precursor of the process leading to cessation of blood flow at the radial artery [9,12].

Modifiable patient-related risk factors that induce the formation of RAO include diabetes mellitus, dyslipidemia, peripheral arterial disease, multivessel coronary artery disease (CAD), and reduced renal function. Non-modifiable related risks include younger age, female sex, lower BMI, radial artery diameter, and previous catheterization. Amidst these factors, some factors could be altered over the years through lifestyle changes and pharmacological interventions. Whereas previous radial artery cannulation is an unmodifiable risk factor. Unfortunately, repeated radial cannulation leads to intimal hyperplasia and intima-media thickening, resulting in reduced lumen diameter [13,14].

Contrary, hypertension has been suggested to exert a protective effect against RAO, by inducing a hyperdynamic state within the arterial lumen, leading to the gradual reopening of the occluded portion of the artery [15].

If RAO is diagnosed prior to hospital discharge, the ipsilateral compression of the ulnar artery for about an hour may be an effective technique to regain the artery's patency. This method is associated with an increase in radial blood flow, thereby initiating the release of vasodilator mediators [16].

Given that the known method for restoring blood flow of the radial artery after hospital discharge can be interventionally achieved from a proximal part of the forearm, where the pulse is still palpated. This method is used when the RAO is caused by thrombus formation. The thrombi from the radial artery may be aspirated via a balloon dilation and drilling technique [17].

As previously mentioned, there are no known pharmacological interventions for RAO.

Based on the findings of the patients' initial ultrasounds, edema of the inner layers of the radial artery was documented along with the absence of blood clots. Sterile inflammation is hypothesized to be the pathophysiologic mechanism. Given this diagnosis, the use of a corticosteroid was postulated, specifically prednisone, in lieu of inhibiting the inflammation and subsequently improving the patency of the artery.

Prednisone is a synthetic derivative of cortisone, an anti-inflammatory glucocorticoid. Prednisone is metabolized in the liver and converted to Prednisolone. The FDA identifies Prednisone as an anti-inflammatory or immunosuppressive agent used to treat a broad

range of diseases. It works on the immune system to help relieve swelling, redness, itching, and allergic reactions [18]. Prednisone decreases inflammation by suppressing the migration of polymorphonuclear leukocytes to areas of trauma. Prednisone is a cheap, widely available, and well-known drug to most physicians.

The greatest benefit of this regimen seems to be the symptomatic relief which began within the first day of starting the treatment and symptoms did not recur after the completion of the treatment. 5 out of the 6 patients also had US proof of restoration of blood flow at the radial artery. No recurrence of symptoms was reported for up to 5 years post-therapeutic intervention.

Our relatively high (12%) rate of RAO could be explained by the type of sheaths and dose of heparin used at the time. Since then, the hospital protocol has changed to use a Terumo GLIDESHEATH SLENDER® Hydrophilic Coated Introducer Sheaths as well as administering at least 3000 units of heparin at the start of the procedure regardless of the weight of the patient. We have had only one symptomatic RAO for the next 1 year after implementing these changes. Limitations of the study are the small sample size, lack of a placebo arm, and the use of a single dose strength regimen.

We suggest this treatment plan be carried out on a larger sample size. We recommend a randomized, placebo-controlled trial using several different strengths of prednisone.

Conclusion

A short-term tapered course of prednisone was effective in cases of symptomatic RAO (radial artery occlusion) post heart catheterization in alleviating symptoms and improving the patency of the radial artery in the short (14 days) and medium to long-term (1 month to 5 years) follow up.

References

1. Haudenschild, Christian C (1989) Morphology of Intimal Hyperplasia. Journal of Vascular Surgery 10: 591-92.
2. Kozak, Mark, David R Adams, Michael D Ioffreda, Michelle J. Nickolaus, et al. (2003) Sterile Inflammation Associated with Transradial Catheterization and Hydrophilic Sheaths.Catheterization and Cardiovascular Interventions 59: 207-213.
3. Kanei, Yumiko, Tak Kwan, Navin C Nakra, Michael Liou, et al. (2011) Transradial Cardiac Catheterization: A Review of Access Site Complications. Catheterization and Cardiovascular Interventions 78: 840-846.
4. Pancholy, Samir B, Ivo Bernat, Olivier F Bertrand, Tejas M Patel (2016) Prevention of Radial Artery Occlusion After Transradial Catheterization. JACC: Cardiovascular Interventions 9: 1992-1999.
5. Babunashvili, Avtandil, David Dundua (2011) Recanalization and Reuse of Early Occluded Radial Artery within 6 Days after Previous Transradial Diagnostic Procedure. Catheterization and Cardiovascular Interventions 77: 530-536.
6. Rymer, Jennifer A, Sunil V Rao (2018) Preventing Acute Radial Artery Occlusion. JACC: Cardiovascular Interventions 11: 2251-2253.
7. Mochizuki, Takeo Tanaka (2003) Intima-media Thickening of the Radial Artery after Transradial Intervention. Journal of the American College of Cardiology 41: 1109-1114.
8. Cines, Douglas B (1986) Heparin: Do We Understand Its Antithrombotic Actions?. Chest 89: 420-426.
9. Hahalis, George N, Marianna Leopoulou, Grigorios Tsigkas, Ioanna Xanthopoulou, et al. (2018) Multicenter Randomized Evaluation of High versus Standard Heparin Dose on Incident Radial Arterial Occlusion after Transradial Coronary Angiography. JACC: Cardiovascular Interventions 11: 2241-2250.
10. Ziakas A, G Karkavelas, S Mochlas (2005) Sterile Inflammation after Transradial Catheterization Using a Hydrophilic Sheath: A Case Report. International Journal of Cardiology 99: 495-496.
11. Subramanian, Rajesh, Christopher J White, W Charles Sternbergh, Daniel L Ferguson, et al. (2003) Nonhealing Wound Resulting from a Foreign-body Reaction to a Radial Arterial Sheath. Catheterization and Cardiovascular Interventions 59: 205-206.
12. Pancholy SB (2007) Transradial access in an occluded radial artery: new technique. J Invasive Cardiol 19: 541-544.

14. Wang H, Yin D, Feng L, Song W, Wang H, et al. (2021) Early radial artery occlusion following the use of a transradial 7-French sheath for complex coronary interventions in Chinese patients. Catheter. Cardiovasc Interv 97: 1063-1071.
15. Buturak A, Gorgulu S, Norgaz T, Voyvoda N, Sahingoz Y, et al. (2014) The long-term incidence and predictors of radial artery occlusion following a transradial coronary procedure. Cardiol J 21: 350-356.
16. Bernat I, Bertrand OF, Rokyta R, Kacer M, Pesek J, et al. (2011) Efficacy and Safety of Transient Ulnar Artery Compression to Recanalize Acute Radial Artery Occlusion After Transradial Catheterization. Am J Cardiol 107: 1698-1701.
17. Balaban Y, Elevli MG (2018) It is both possible and safe to perform coronary angiography through the same radial artery, after retrograde recanalization of radial artery occlusion, following a previous coronary angiography. J Interv Cardiol 31: 957-963.
18. Puckette Yana, Aishah Gabbar, Abdullah A Bokhari (2024) Prednisone. StatPearls https://www.ncbi.nlm.nih.gov/books/NBK534809/.

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