Transradial Catheterization: Hemostasis, Patency, and Same-Day Discharge

Transradial catheterization can lead to safer, less costly, and more satisfactory coronary angiography and interventions.

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Improving safety and reducing cost are the two biggest focuses in health care. In the cath lab, the transradial approach lends itself to achieving both of these objectives by reducing complications related to coronary angiography and intervention, while at the same time reducing hospital stay and increasing throughput.

The nuances of performing coronary angiography and interventions through radial access are well defined. Although there are differences in catheter manipulation and guide selection, it has been shown that experienced operators achieve similar success rates in the performance of angiography and percutaneous coronary intervention (PCI). This is achieved in all clinical scenarios, from elective catheterization to ST-elevation myocardial infarction, and is done without sacrificing significant time or exposing the operators to dramatically different rates of radiation exposure.[1,2]

Transradial operators have been aggressively (and safely) reducing the time it takes to achieve hemostasis, thereby reducing the need for postprocedure care and increasing hospital throughput by facilitating same-day discharges. This holds true for diagnostic as well as post-PCI patients.

It is for these reasons that many hospitals are pushing for an increase in coronary procedures to be performed through the transradial approach and why there is a growing "radial first" movement among many interventional and invasive cardiologists in the United States and around the world.

IMMEDIATE SHEATH REMOVAL AFTER HEMOSTASIS

One of the fundamental differences between catheterization performed from a transradial approach and those performed through the femoral approach is that the transradial sheath is removed immediately after the procedure. This allows the operator to have firsthand knowledge of the state of the access site immediately after the catheterization and serves to start the clock running when hemostasis is achieved. Furthermore, unlike femoral procedures, this is done regardless of the amount of anticoagulation that the patient has been given or whether an intervention has been performed.

There are now numerous choices for holding pressure on a radial arteriotomy. Many are similar in that they use an air-filled bladder to achieve pressure directly over the site of the sheath arteriotomy.[3] These devices are similar in their placement, the way they achieve hemostasis through pressure, and their ease of use, although some are more comfortable for patients than others and prices may differ.[4]

ENHANCING TRANSRADIAL HEMOSTASIS

There is an increasing focus on reducing the time from removal of a transradial sheath (when used) until hemostasis has been achieved. The amount of time that a patient has to wear the inflated hemostatic band varies. At our institution, diagnostic cases typically have the air slowly reduced at around the 60-minute mark,

whereas interventional cases start having the bands loosened around 90 minutes. There are studies suggesting that even more aggressive removal of the band is both feasible and safe, with the benefit that it may enhance radial artery patency.[5]

Hemostatic patches have been devised, which, when applied to the arteriotomy at the time of hemostatic band placement, enhance the rapidity at which a clot is formed and may dramatically reduce the time to hemostasis (Figure 1).[6,7] Because reduction of time to hemostasis is associated with a reduction in complications such as radial artery occlusion, this type of device may aid in both reducing complications of the procedure as well as reducing time to discharge.[8]

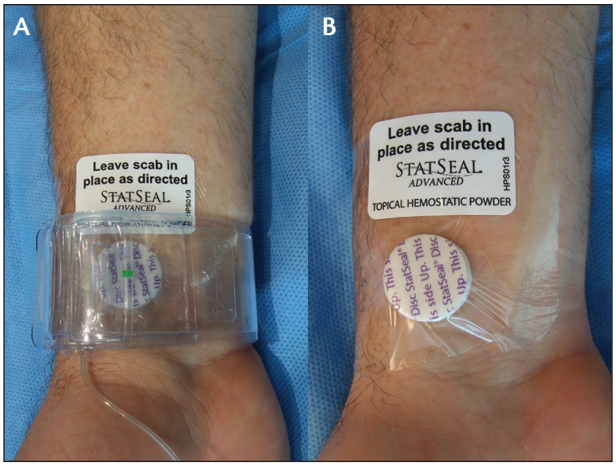
POSTCATHETERIZATION RECOVERY OF TRANSRADIAL PATIENTS

The recovery of postcatheterization and postintervention patients is much simpler with transradial access. Because the operator removes the arterial sheath in the cath lab, there is no longer the obligation to send a patient to a separate area to wait until the sheath can be removed. Patients can be sent back to their rooms, or if additional observation is desired (as is the case with some patients postintervention), they can still be sent to a postoperative area. It is becoming more commonplace to transition patients who receive stents directly back to a room rather than insisting that they have an obligated amount of time in a special recovery room.

Some hospitals have designated an area (sometimes called a "transradial lounge") in which patients can recover.[9] These areas are often communal areas where patients can sit in comfortable reclining chairs and watch television or visit with their families prior to discharge. In hospitals where throughput is limited by space in the recovery area or by issues of adequate staffing, having a transradial program will often ease the flow of these patients.

TRANSRADIAL COMPLICATIONS: PATENT HEMOSTASIS/RADIAL ARTERY PATENCY

Although the incidence of clinically relevant radial artery occlusion (RAO) is perceived to be low, in studies in which meticulous reevaluation of patency is performed, it can range from 1% to 10%.[10] Clinically, RAO does not always cause issues, but it is definitely advantageous to preserve radial artery patency to prevent hand ischemia and to allow future use of the artery for subsequent transradial catheterization, grafting for coronary artery bypass, or hemodialysis access. There are several techniques that have been used to reduce this incidence, including preprocedure evaluation of dual circulation,



Courtesy of Biolife, LLC

Figure 1. StatSeal Advanced (Biolife, LLC) in position under the hemostasis band (A). The device after band removal (B). StatSeal and bandage are removed the following day (24 hours).

use of anticoagulation, choice of sheath size, patent hemostasis, and reduction of the duration of hemostatic time.

The role of preprocedure testing for dual circulation of the hand remains an area of controversy. Most operators rely on the clinical Allen test or the more objective Barbeau test to establish the presence of adequate collateral circulation to the hand. However, it remains to be determined if these methods are predictive of RAO. The RADAR trial suggested no correlation with outcome, and as a result, precatheterization testing for dual circulation is no longer considered the absolute standard of care.[11]

Most of the data regarding this come from the critical care arena in patients with radial arterial lines for hemodynamic monitoring. Surgical data have shown no absolute use for this test in the prediction of hand ischemia.[12] Some operators have stopped routinely testing altogether, as the overall net risk (especially with regard to bleeding) favors the radial approach due to the known risk of femoral artery complications.[13]

Anticoagulation, even for diagnostic procedures, is another way in which transradial catheterization is fundamentally different from femoral catheterization. Many operators utilize a weight-based administration of heparin (similar to that given during anticoagulation for acute coronary syndromes), while others simply give a standard dose. Heparin can be given either intra-arterially (typically through the radial sheath) at the beginning or end of the case, and the use of low-dose heparin can reduce bleeding complications while still providing adequate protection from RAO.[14,15] In one study, a strategy of provisional heparin (given only if patency at the end of the case was not ensured) was as good as routine heparin use.[16]

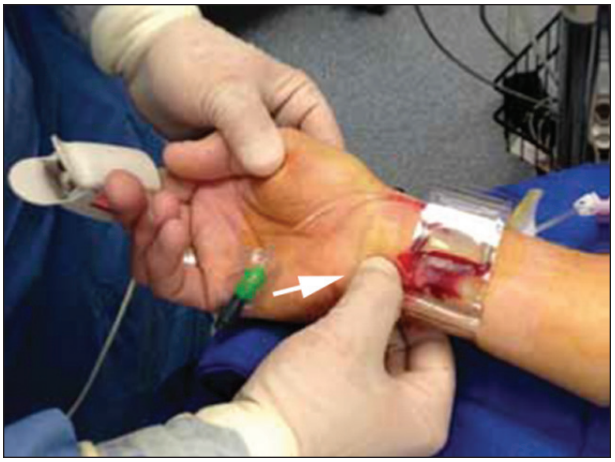


Figure 2. After the hemostatic band has been placed, the sheath removed, and then pressure adjusted to the lowest amount that achieves hemostasis, a reverse Barbeau test is used to confirm radial artery patency. This is done by compressing the ulnar artery (arrow) while observing the plethysmography tracing. Thus, hemostasis is achieved while confirming patency. (Adapted with permission from Pancholy SB. The fine points of radial hemostasis management. Cardiac Interv Today. 2013;7:41–44.)

Because the radial artery caliber is smaller than the femoral artery, it would make sense that sheaths and catheters that are less traumatic to the artery would reduce complications. Use of hydrophilic sheaths can reduce the pain of insertion and removal, as well as potential spasm.[17] Smaller sheath sizes prevent trauma and result in fewer complications.[18] Expandable sheaths (eg, Glidesheath Slender, Terumo Interventional Systems) and shealthless guiding catheters allow for delivery of larger equipment without larger profiles.[19,20]

The concept of plethysmography-based patent hemostasis, largely based on the work of Dr. Samir Pancholy, remains the gold standard for evaluating the radial artery after sheath removal and as a basis for evaluating patency after hemostasis is achieved. Using techniques adapted from Barbeau et al,[21] he evaluated radial artery flow using plethysmography at the time of sheath removal. The pressure applied by the hemostatic band was adjusted to the lowest possible pressure to achieve hemostasis, while allowing for antegrade reduction in RAO at 24 hours and at 30 days, and this remains the best technique for evaluating patency after sheath removal (Figure 2).[22]

In 2013, the Society for Cardiac Angiography and Interventions released a best practices document for transradial angiography and interventions based on expert opinions or clinical studies that have examined various technical aspects and outcomes from transradial procedures.[23] The recommendations for RAO prevention include assessing the radial artery circulation postprocedure and at the first clinic visit after discharge, administering adequate anticoagulation, utilizing the lowest-profile sheaths and catheters to obtain optimal angiographic images, and applying the technique of patent hemostasis postprocedure.[8,18]

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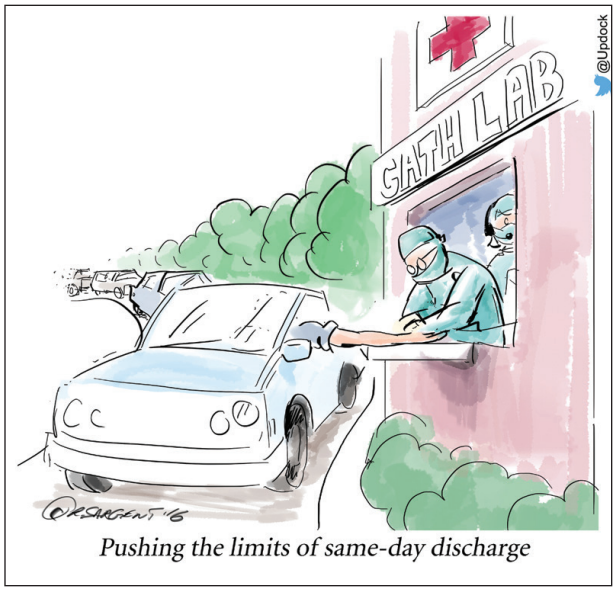
OUR EXPERIENCE

Our institution follows protocols similar to those previously described, but with some notable differences. Although we perform the Allen test on all patients, the lack of "good" Allen test results does not prevent a patient from undergoing transradial access; however, it does provide some insight into the collateral circulation. Plethysmography may be used to assess arterial circulation before the catheterization is performed, and in those patients with poor dual circulation, more close attention may be paid to hemostasis after sheath removal.

Once access is achieved, we choose the lowest-profile sheath (Glidesheath) for our patients: 5 F for smaller patients and 6 F (typically) for larger patients. We have started using 5-F guiding catheters more routinely for smaller patients in whom complex PCI is not likely to be necessary (no branch vessels to compromise, noncalcified, proximal lesions). Our standard dose of heparin is 2,500 units, and we do not base this on patient weight. All patients receive 5 mg of verapamil through the sheath prior to the catheters being introduced. Although we do use a pneumatic compression wrist band (TR Band [Terumo Interventional Systems] or VascBand [Vascular Solutions, Inc.]), we typically do not use plethysmography to adjust band pressure, but instead use palpation of a radial pulse as an indicator of antegrade flow. Over the course of 60 to 90 minutes (shorter time for diagnostic procedures), air is slowly released by support staff caring for the patient. Once hemostasis has been achieved, the band is removed, and a dressing is applied for 24 hours. Radial pulse is documented prior to discharge and at the first postprocedure clinic visit.



Pushing the limits of same-day discharge

SAME-DAY DISCHARGE

One of the big advantages to achieving early hemostasis and reducing the potential for complications is that it allows for early patient discharge. Patients spend less time or no time in a recovery area, have less pain requiring narcotics, and are able to eat and ambulate much more quickly. Early discharge for patients after PCI is feasible for transfemoral access patients, but there is a much lower degree of concern when dealing with transradial PCI patients.[24] In several studies, same-day discharge of PCI patients who underwent a transradial approach was feasible and safe; early complications (although rare) were typically seen within the initial hours after PCI, and complications occurring after the 24-hour mark would not have been caught using a next-day discharge strategy.[25] Same-day discharges for PCI patients allows for greater patient satisfaction, increased throughput, and decreased cost for the patient and the institution.[26,27]

CONCLUSION

The use of transradial access for coronary angiography and intervention is no longer perceived as "niche," and operators who have moved toward performing coronary procedures through this technique have realized significant advantages in the care of their patients. Achieving early hemostasis is a key to avoiding problems with patency, and leveraging these techniques allows for early patient discharge. All of these benefits come with no reduction in procedural efficacy and further increase patient satisfaction and improve an institution's resource utilization. ■

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Disclosures: None.