Cardiovascular Revascularization Medicine 20 (2019) 786–789

Contents lists available at ScienceDirect

Cardiovascular Revascularization Medicine

The Left Distal Transradial Artery Access for Coronary Angiography and Intervention: A US Experience☆

Karim M. Al-Azizi [a,*], Vikram Grewal [b], Kyle Gobeil [b], Khawar Maqsood [b,c], Ali Haider [b,d], Amir Mohani [b], Gregory Giugliano [b,d], Amir S. Lotfi [b,d]

[a] Department of Interventional Cardiology, The Heart Hospital – Baylor Plano Baylor Scott & White, 1100 Allied Dr, Plano, TX 75093, United States of America
[b] Baystate Medical Center, University of Massachusetts Medical School, Springfield, MA, United States of America
[c] Holyoke Medical Center, MA, United States of America
[d] Tufts University School of Medicine, MA, United States of America

ARTICLE INFO

Article history:
Received 13 September 2018
Received in revised form 18 October 2018
Accepted 18 October 2018

Keywords:
Radial artery access
Left distal trans-radial artery
Cardiac catheterization
Coronary angiography and intervention
Snuff box technique

ABSTRACT

Background: The radial artery is the access of choice in many catheterization labs around the world due to its proven benefits over the femoral artery access. There has been growing interest in the left radial artery. We sought to evaluate the feasibility, safety and complication rates of the left distal radial artery (ldTRA) access for cardiac catheterization.

Methods: This is a single arm retrospective study evaluating the feasibility and safety of performing cardiac catheterization through ldTRA. The procedure was completed using standard diagnostic and guiding catheters. Hemostasis was achieved with a radial band. Feasibility was the ability to cannulate the distal left radial artery as well as completing the procedure without requiring an additional arterial access. The safety point included hematoma, bleeding or neuropathy.

Results: ldTRA was attempted in 61 patients. 59 patients had successful completion of the procedure through ldTRA. Conversion occurred in 1 patient (1.7%), requiring an additional arterial access to complete the procedure. 34 patients (55.7%) required percutaneous coronary intervention (PCI). There was no access site bleeds post procedure, no hematomas, with 100% successful hemostasis with a radial hemostatic band. There were 2 cases requiring reaccess of the distal left radial artery access for repeat revascularization, with procedure success and good left radial artery patency.

Conclusion: ldTRA is a safe and feasible arterial access in a radial experienced catheterization lab. ldTRA provides improved operator ergonomics and patient's comfort, in addition to the advantage of being able to cannulate the bypass grafts and with a very low risk of vascular complications.

1. Introduction

The left distal radial artery access or "the snuffbox" has been a growing topic of discussion in the world of interventional cardiology. First introduced and reported by Kiemeneij [1] in Sept 2017, the left distal transradial artery (ldTRA) catheterization was born. The distal radial artery lies in the anatomical snuffbox of the hand, and in good candidates, can be successfully accessed and cannulated. The procedure may be completed in a more comfortable fashion for both the operator and the patient, by maintaining a pronated rather than a supinated hand position. We recently published a case series outlining our experience [2] and a step by step approach in selecting patients, accessing the radial artery and ending by hemostasis.

Such access requires radial artery cannulation expertise as well as understanding the anatomy of the artery in the anatomical snuff. The data on distal left radial artery access is limited to case reports and series [3] [4]. Understanding that we need further evidence to evaluate feasibility and safety of such access, we report the outcomes of 61 patients with attempted ldTRA, in a high volume, radial artery utilizing cardiac catheterization lab.

2. Methods

This is a retrospective single arm study, evaluating all patients that underwent ldTRA attempts in a high volume radial artery utilizing cardiac catheterization lab. This was to evaluate the safety and feasibility of this arterial access. Patients' charts and procedure notes were

Abbreviations: PCI, percutaneous coronary intervention; CAD, Coronary artery disease; CABG, Coronary artery bypass grafting; ldTRA, left distal trans-radial artery access; LIMA, Left internal mammary artery.

☆ Disclosures: None

* Corresponding author.
E-mail address: karim.alazizi@gmail.com (K.M. Al-Azizi).

https://doi.org/10.1016/j.carrev.2018.10.023
1553-8389/

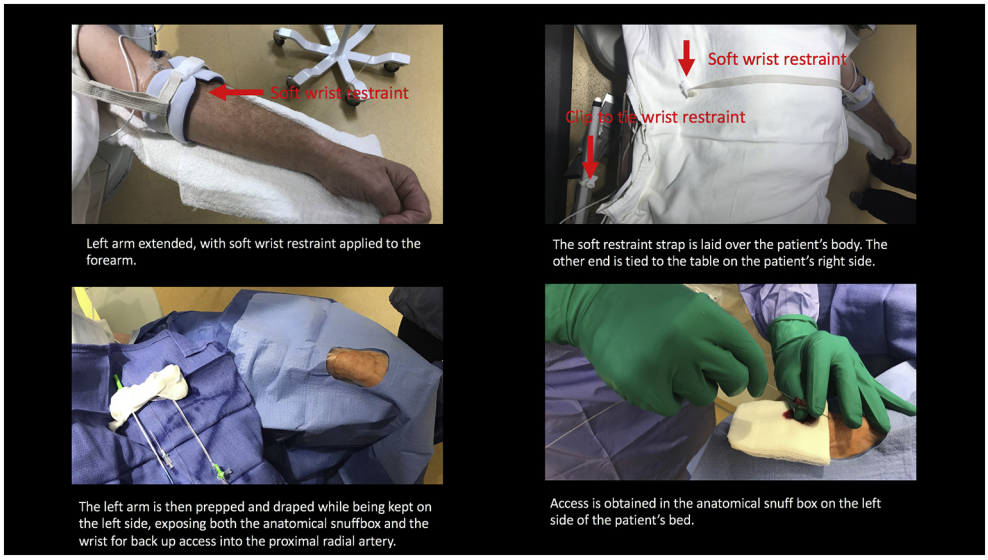

Fig. 1. Wrist restraint setup to help support the arm during the procedure. Access is obtained on the left side of the patient.

evaluated in the electronic medical records (EMR) system. The procedures were performed by 5 operators in this catheterization lab who are radial experts and have agreed to participate in this study.

To evaluate the feasibility of ldTRA in this study, we evaluated 2 components. 1- Successful wiring and cannulation of the left distal radial artery, and 2- Successful completion of the procedure without requiring an additional arterial access site. To evaluate the safety, patients were evaluated for access site bleeding, hematoma or any vascular complications seen prior to discharge.

As previously described [2], the distal left radial artery is palpated in the anatomical snuff box. Patients with weak pulses in the left snuffbox were excluded in the pre-operative area. When the distal left radial artery is not palpable, ultrasound was used pre-operatively to decide if it was of an appropriate size to puncture and cannulate with a radial sheath. Patients with large hands or who had IV cannulas at or close to the snuffbox that may interfere with the hemostatic radial band were excluded. Fig. 1 and Fig. 2 illustrate the setup, the procedure and the hemostasis obtained at the end of the procedure.

3. Results

61 patients were identified who underwent cardiac catheterization utilizing the ldTRA as the default arterial access, between November 2017 and May 2018, in a tertiary medical and primary PCI center. Reasons for not attempting this access routinely on certain patients included left shoulder discomfort preoperatively, small/non-palpable distal left radial artery, the absence of left radial artery (used for dialysis shunt or for a bypass graft), the presence of the IV access near the left anatomical snuffbox and unstable patients. There was an earlier wash-out period that included 22 cases of successful ldTRA access during which operators attempted and completed the procedure successfully.

Patients' baseline demographics are listed in Table 1. 46 patients were males (75.4%), with 84% whites. Mean age of patients in this cohort was 70 years. Mean BMI of patients was 29.23 kg/m^2. 8 patients had prior CABG and 17 patients had a prior percutaneous coronary intervention (PCI). 73.7% (n = 45) of the patients were referred for cardiac catheterization for acute coronary syndrome (ACS). 29.5% of

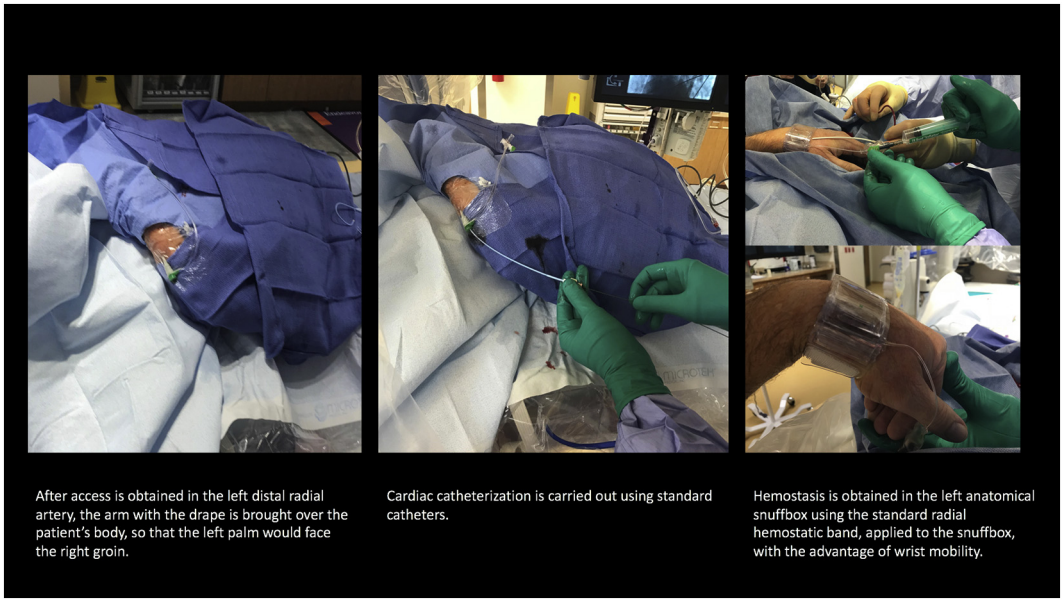

Fig. 2. The arm is brought over the body to be resting on the right groin. This demonstrates the ability to perform cardiac catheterizations from ldTRA. The sheath is removed, and a hemostatic TR band is applied to the arteriotomy site. This figure illustrates the ability of the patient to move their wrist immediately after the procedure safely.

Table 1
Baseline patient demographics and characteristics.

Baseline demographics	
Variable	ldTRA (n = 61)
Males	46(75.4)
White	51 (84)
Mean age, years	70
Mean BMI, kg/m^2	29.23
CAD	20 (32.8)
Prior PCI	17 (27.9)
Prior CABG	8 (13.1)
PVD	10 (16.4)
DM	29 (47.5)
CHF	14 (22.9)
Dyslipidemia	43 (70.5)
CVA	4 (6.6)
CKD	12(19.6)
Hypertension	51 (84)
Tobacco use	24 (39.3)

the patients had unstable angina, 42.6% had Non-ST segment elevation myocardial infarction (NSTEMI). 1 patient was referred for a rescue PCI after failed thrombolytics after being transferred from a non-PCI capable center.

34 patients underwent PCI in this cohort. 12 patients underwent fractional flow reserve assessment of intermediate lesions and 6 patients underwent intravascular ultrasound assessment as highlighted in Table 2. 1 patient required left main PCI, 12 patients had left anterior descending artery PCI, 10 patients had left circumflex artery PCI and 16 patients had right coronary artery PCI. 3 patients required advanced complex prolonged interventions, including graft interventions, excimer laser angioplasty, and guide extending catheters. Mean contrast volume used across the cohort was 126.7 ml. 6 French (Fr) radial sheaths were used in 53 patients (86.9%) and 5 French sheaths were used in 8 patients (n = 8, 13.1%). The mean number of diagnostic catheters utilized per case was 2.09, and 1.1 guiding catheters for interventions. (See Table 3.)

The mean lidocaine injection-to-sheath time was 4.32 min (the time between lidocaine injection and successful sheath insertion). Mean fluoroscopy time was 18 min and 18 s. Mean procedure time was 1 h and 34 min.

59 of the 61 patients (96.7%) had successful procedure completion through the ldTRA. One patient had failed arterial cannulation with the radial sheath wire due to the severe tortuosity of the distal radial artery. As an alternative, the proximal left radial artery was accessed, and the procedure was completed successfully. The second patient underwent successful ldTRA cannulation. Unfortunately, due to the severe tortuosity of the left subclavian artery and despite the use of several catheters and stiff wires to deliver them, we were not successful in selectively cannulating the right coronary artery or the remaining venous grafts off the aorta. As a result, the right radial artery was used to access the remaining vessels.

Table 2
Procedure indications and characteristics.

Procedure related data	ldTRA (n = 61)
Indication for cardiac catheterization	
Unstable angina	18 (29.5)
NSTEMI	26 (42.6)
STEMI	1 (1.6)
Non ACS	16 (26.2)
Sheath size	
5	8 (13.1)
6	53 (86.9)
Diagnostic catheters per case (mean)	2.09
Guiding catheters per case (mean)	1.1
FFR	12 (19.7)
PCI	34 (55.7)
IVUS	6 (9.8)
Coronary artery treated	
Left main	1 (1.6)
Left anterior descending artery	12 (19.7)
Left circumflex	10 (16.4)
Right coronary artery	16 (26.2)
Mean contrast volume (cc)	126.7
Mean lido stick to sheath time	4.32 min
Mean flouro time (hh:mm:ss)	0:18:18
Mean procedure time (hh:mm)	1:34

Table 3
Outcomes of the attempted left distal radial artery access.

Outcomes	
Successful completion of the cardiac catheterization	59/61 (96.7%)
Successful cannulation and insertion of the sheath through the distal left radial artery	60/61 (98.4%)
Conversion rate	1/60 (1.7)
Major bleeding	0
Post-procedure radial band hematoma	0

There were no reported bleeding, hematoma or vascular complications. Excellent inpatient follow-up with good patient satisfaction as well as nursing and medical team staff, due to a more predictable hemostasis and no hematomas. All patients had a patent and palpable proximal and distal left radial pulses prior to discharge. 2 patients underwent repeat PCI of different vessels months apart. Both were reaccessed using ldTRA with successful procedure completion. A few patients were seen in outpatient follow-up following their procedure, with a strong palpable and patent left distal radial artery. All patients had uneventful hospital courses and discharged in a stable condition.

4. Discussion

This experience demonstrates both feasibility and safety of ldTRA in a radial expert cardiac catheterization lab. This study shows that when patients are carefully screened and selected, patients can undergo a cardiac catheterization successfully through the ldTRA. Patient selection and post-procedure care are key, as is the case with any procedure. This was not an all-comers study, rather patients were carefully selected for ldTRA access based on a good palpable pulse in the snuffbox and visualization of the artery on ultrasound. In our catheterization lab, and specifically the 5 operators who participated in this study, the right radial artery is the access of choice in ~80% of the cases, the femoral artery in ~15% of the cases and then the left radial artery access in ~5% of the cases.

As seen in our cohort, there were no reports of vascular complications or hematomas. Patients were able to use their right-hand post procedure, especially if they were right-handed, as well as the ability to mobilize their wrists with no increased risk for vascular complications given the direct pressure of the hemostatic band against the scaphoid bone. All patients had palpable left distal radial artery pulses prior to discharge with two patients undergoing repeat cardiac catheterization through the distal left radial artery a few months later following their initial procedure.

The advantages of utilizing ldTRA are several including, the ability to selectively and successfully perform angiography in patients with prior CABG who have a LIMA graft. It also provides improved patient and operator ergonomics. Patients are more comfortable with a pronated hand position as compared to maintaining a supinated position. This can be very helpful for patients who are obese or with limited left arm/wrist mobility in which keeping the hand pronated maybe useful. In a recent study by Mamas et al. [5], using a propensity-matched analysis, comparing left to right radial PCIs, left radial PCIs were associated with lower in-hospital strokes as compared to right radial PCIs. In addition, the right radial artery and the proximal left can be preserved for future procedures, bypass grafting, or arterio-venous shunts.

4.1. Limitations

The distal left radial artery is limited by the typical limitations of the radial artery access. This includes radial artery tortuosity, anatomical variances, subclavian tortuosity (as seen in our case). It is also not a one-size-fits-all, patients have to be screened and selected carefully for successful access. In addition, the left distal radial artery is in many patients smaller, compared to the proximal radial artery in the wrist. Hence this may not be the access of choice in certain patients. As we add more data to the literature, we still need to have randomized clinical data comparing this access to the traditional proximal radial artery access.

Effects on the scaphoid bone blood supply with the ldTRA is unknown. The scaphoid bone receives its blood supply primarily from lateral and distal branches of the radial artery, via palmar and dorsal branches. These provide an “abundant” supply to the middle and distal bone but neglects the proximal portion, which relies on retrograde flow. The dorsal branch supplies the majority of the middle and distal portions, with the palmar branch supplying only the distal third of the bone. Yet in all documented case reports, no scaphoid bone injury/necrosis was reported. Due to the small size nature of the radial artery, the femoral artery remains the artery of choice for large bore devices including mechanical circulatory support devices as well as for structural heart interventions.

This is a retrospective study, with a small number of patients. It is a single arm cohort with no comparison to a right radial artery access. A larger prospective randomized trial is needed to evaluate ldTRA against conventional right radial artery access. Patients were carefully selected for this access site.

5. Conclusion

This study demonstrates the safety and feasibility of the left distal radial artery access for coronary angiography and intervention in a radial expert cardiac catheterization lab. LdTRA provides improved operator ergonomics and patient's comfort, in addition to the advantage of being able to cannulate the bypass grafts and with a very low risk of vascular complications. Similar series and small studies have emerged to show similar results. There is a learning curve as is the case with conventional radial artery access. Further data is needed in a randomized fashion to evaluate for the superiority of this access as compared to the proximal conventional right radial access.

References

[1] Kiemeneij F. Left distal transradial access in the anatomical snuffbox for coronary angiography (ldTRA) and interventions (ldTRI). EuroIntervention 2017;13:851–7.
[2] Al-Azizi KM, Lotfi AS. The distal left radial artery access for coronary angiography and intervention: a new era. Cardiovasc Revasc Med 2018;19(8S):35–40.
[3] Davies RE, Gilchrist IC. Back hand approach to radial access: the snuff box approach. Cardiovasc Revasc Med 2018 Apr - May;19(3 Pt B):324–6.
[4] Valsecchi O, Guagliumi G. Early clinical experience with right and left distal transradial access in the anatomical snuffbox in 52 consecutive patients. J Invasive Cardiol 2018 Jun;30;6:218–23 Epub 2018 Mar 15.
[5] Rashid Muhammad, Nolan James, Mamas Mamas. Incidence, determinants, and outcomes of left and right radial access use in patients undergoing percutaneous coronary intervention in the United Kingdom. JACC: Cardiovascular Interventions 2018:3671. https://doi.org/10.1016/j.jcin.2018.01.252.