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Original Research Article

SAFETY AND EFFICACY OF CORONARY INTERVENTION THROUGH DISTAL TRANSRADIAL ACCESS IN SUBJECTS WITH LOW BODY MASS INDEX

MAHMOOD K, BASHIR M, RAMZAN M*, ADEEB O

Department of Cardiology, Ch. Pervaiz Elahi Institute of Cardiology (CPEIC) Multan, Pakistan
**Correspondence author email address: drramzan123 @yahool.com*

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Abstract: *This study evaluated the efficacy and safety of coronary intervention through dTRA in subjects with low body mass index. The retrospective study was conducted in the Cardiology Department of Ch Pervaiz Elahi Institute of Cardiology Multan from January 2022 to January 2023. A total of 37 patients were included in the study. The patients were divided into Group A (cTRA, n=20) and Group B (dTRA, 17). Procedure-related information was recorded, including puncture time and success rate, procedural method and category, radiation exposure, compression hemostasis, and complications like degree of pain, hand swelling, numbness, hematoma, and bleeding. RAO was recorded in the follow-up. The puncture success rate in Group A was 97.5%, and in Group B was 96.7%; this difference was not statistically significant(P=.856). Group B had a longer puncture time than Group A (72s vs. the 60s, P=.003). 1 patient in group B had puncture failure and was switched to Group A. Procedural time in Group B was significantly longer than in Group A (46 min vs. 31 min, P=.043). Compression hemostasis time in Group B was significantly shorter than in Group A (5h vs. 7h, P<.001). The groups' differences in post-operative complications, including hand swelling, numbness, hematoma, and bleeding, were not statistically significant. However, Group B had a significantly lower VAS score than Group A (1 vs. 2, P=<.001). Based on the results, Distal transradial access provides an effective and safe route for coronary intervention in subjects with low BMI.*

Keywords: Distil transradial access , conventional transradial access , coronary intervention

Introduction

Conventional transradial access (cTRA) is the standard coronary intervention approach. It has a lower (Koutouzis et al., 2019)risk of vascular complications, adverse cardiovascular events, massive bleeding, and mortality than the femoral approach (Bajraktari et al., 2021). However, it has some disadvantages, particularly the occlusion of the radial artery. Recently, cardiac intervention experts have been increasingly researching coronary intervention via distal transradial access (dTRA) and it is now widely used as an alternative route for interventional diagnosis and management (Coughlan et al., 2018; Lin et al., 2020). Though there is a difference between cTRA and dTRA in terms of hematoma, the incidence of radial artery spasm and success of puncture catheterization is not significant; however, dTRA has more clinical value and shorter hemostasis time and lower incidence of radial artery occlusion (Liang et al., 2021). Coronary catheterization through the distal trans-radial route also has disadvantages, such as difficulty in puncturing due to torturous and smaller distal radial arteries, resulting in longer puncture time and lower success rate (Koutouzis et al., 2019; Lee et al., 2018). In subjects with low body mass index (BMI), the diameter of distal radial artery is smaller, so the success rate of puncture is lower (Norimatsu et al., 2019). Studies have reported low BMI as a risk factor for puncture success rate via dRTA (Norimatsu et al., 2019). However, data are scarce on the efficacy and safety of coronary intervention through dTRA compared to cTRA in subjects having low BMI. Thus, this study aims to evaluate the efficacy and safety of coronary intervention through dTRA in patients with low body mass index.

Methodology

The retrospective study was conducted in the Cardiology Department Ch. Pervaiz Elahi Institute of Cardiology Multan from January 2022 to January 2023. The study included patients who underwent coronary artery treatment and had BMI < 18.5 kg/m^2. Those with BMI ≥ 18.5 kg/m^2. A total of 37 patients

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were included in the study. Informed consent of the participants was taken. The ethical board of the hospital approved the study. The number of non-CAD, SAP, UA, NSTEMI, and STEMI patients was 7, 15, 9, 2, and 4, respectively. All the operators had extensive experience. The patients were divided into Group A (cTRA, n=20) and Group B (dTRA, 17). Ultrasound sound was made during the follow-up for evaluating ROA.

Data including gender, age, weight, height, smoking history, diabetes mellitus, hypertension, cerebral infarction, hyperlipidemia, coronary artery disease, and coronary procedures were recorded. Procedure-related information was recorded, including puncture time and success rate, procedural method and category, radiation exposure, compression hemostasis and complications like degree of pain, hand swelling, numbness, hematoma, and bleeding. RAO was recorded in the follow-up. The surgical procedure for puncture and catheterization in Group A and B were performed according to the protocol (Li et al., 2022). The guidewire insertion in the radial sheath and blood return to the puncture needle was considered a successful puncture. A radial artery ultrasound was done during the follow-up period to assess RAO. No blood flow due to thrombus formation was defined as complete occlusion. A slight and monophasic decrease in blood flow was considered functional occlusion (Michael Schulte-Hermes et al., 2018). A visual analog scale assessed pain due to compression hemostasis. The Early Discharge After Transradial Stenting of Coronary Arteries classification was used for assessing hematoma (Rodrigues et al., 2020). Bleeding Academic Research Consortium (BARC) criteria were used to classify bleeding (Kormos et al., 2020). SPSS version 23.0 was used for data analysis. Qualitative data were represented as frequency, and intergroup comparison was made through the Pearson chi-square test. Quantitative data were represented as mean and standard deviation, and intergroup comparison was made through independent sample *t*-test and Wilcoxon test. P<0.05 was considered statistically significant.

Results

The patients' age in Group A was 73.6 years**,** and in Group B was 75.1 years. The difference between the groups in age, sex, medical history, BMI, post-procedural heart rate, and blood pressure was not statistically significant. However, the left ventricular end-systolic diameter (P=.044) and left ventricular end-diastolic diameter (P=.039) in Group B was more minor than in Group A. The puncture success rate in Group A was 97.5%, and in Group B was 96.7%; this difference was not statistically significant(P=.856). The puncture success rate in patients undergoing PCI in both groups was not statistically significant. However, the one-needle puncture success rate was significantly lower in Group B than in Group A (51.8% vs. 81.7%, p=.020). Moreover, Group B had a longer puncture time than Group A (72s vs. the 60s, P=.003). 1 patient in group B had puncture failure and was switched to Group A. The difference between both groups was insignificant in terms of radiation exposure time, contrast dosage, procedural method, and category. Procedural time in Group B was significantly longer than in Group A (46 min vs. 31 min, P=.043). Compression hemostasis time in Group B was significantly shorter as compared to Group A (5h vs. 7h, P<.001) (Table I). Both groups were classified as BARC type II for bleeding and EASY type I for hematoma. The groups' differences in post-operative complications, including hand swelling, numbness, hematoma, and bleeding, were not statistically significant. However, Group B had a significantly lower VAS score compared to Group A (1 vs. 2, P=<.001) (Table II). 11 patients could not be followed up. Among them, 4 died (2 in each Group), 4 refused follow-up, and 3 lost contact. In Group A, complete occlusion occurred in 5 patients and functional occlusion in 3 patients. In Group B, complete occlusion occurred in only 1 patient. Group B had significantly lower radial artery occlusion incidence than Group A(4.1% vs. 33.4%).

***T*able I Inter-group comparison of efficacy**

Characteristics	Group A n = 20	Group AB n = 17	P value
Procedural time (min)	31	46	.043
Procedural method (n,%)			
Coronary angiography	13 (65%)	9 (52.9%)	.386
Percutaneous Coronary Intervention	7 (35%)	8 (47%)	
Procedural Category (n,%)			
Emergency	5 (25%)	4 (23.5%)	.873
Routine	15 (75%)	13 (76.4%)	
Contrast dosage (ml)	61	101	.113
Compression haemostasis time (h)	7	5	<.001
Radiation exposure time (min)	3.4	9.6	.181

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Table II intergroup comparison of safety

Characteristic	*Group A* **n=20**	*Group B* **n=17**	**P value**
Bleeding (n,%)	3 (15%)	2 (11.7%)	.388
Haematoma (n,%)	0 (0)	1 (5.8%)	.240
Numbness (n,%)	1 (5%)	0 (0%)	.224
Hand swelling (n,%)	1(5%)	0(0%)	.393
VAS	2	1	<.001

Discussion

The current study found that the success rate of puncture in the two groups was similar; however, Group B had shorter compression haemostasis time and longer puncture time than Group A. More importantly, the current study shows that Group B had a significantly lower incidence of RAO than Group A. The local anatomy of dTRA offers a significant advantage during coronary intervention. It reduces compression time and increases patient comfort (Vefalı and Sarıçam, 2020). However, the same anatomical structure causes difficulty in dTRA puncture (Rigatelli et al., 2022). A previous study reported that dTRA had a lower puncture success rate than cTRA (Lu et al., 2020).

The correlation between radial artery diameter and BMI is not well established. A study reported no association between BMI and radial artery diameter (Aykan et al., 2015), while another showed that radial artery diameter was associated with BMI, weight, and height (Naito et al., 2019). Though this association is unclear, a previous study reported that low BMI may be associated with smaller radial artery diameters, making puncture more difficult (Norimatsu et al., 2019). In patients with lower BMI, subcutaneous tissue is less, and blood vessels are closer to the bone, which causes puncture failure. A study reported that low BMI is associated with an increased risk of bleeding and adverse cardiovascular events (Held et al., 2022).

This study found that post-operative complications between both the groups were not significantly different; however, VAS and compression haemostasias time in Group B was much lower in Group A. care commonly results in RAO, and few studies have been done to evaluate the reduction in RAO by using dTRA. A study reported that dTRA results in significantly lower RAO than cTRA (Eid-Lidt et al., 2021). Moreover, a study reported lower BMI as a predictor of radial artery occlusion (Garg et al., 2015). However, only a few studies have been conducted on the role of dTRA in reducing the incidence of radial artery occlusion in subjects with low BMI. The current study reported that in Group A, complete occlusion occurred in 5 patients and functional occlusion in 3 patients, while in Group B, complete occlusion occurred in only 1 patient. This patient in Group B previously underwent cTRA, and previous injury could be one of the reasons contributing to radial artery occlusion.

There are a few limitations of our study. First, it's a single center with a sample size. Second, all patients did not undergo post-operative ultrasound examination. Thus, the presence of previous lesions in the proximal radial artery was not confirmed.

Conclusion

Distal transradial access provides an effective and safe route for coronary intervention in subjects with low BMI. It decreases the incidence of radial artery occlusion, shortens compression haemostasias time, and increases patient comfort.

Conflict of interest

The authors declared an absence of conflict of interest.

References

Aykan, A. Ç., Hatem, E., Kalaycıoğlu, E., Altıntaş Aykan, D., Gökdeniz, T., Arslan, A. O., and Çelik, Ş. (2015). Prediction of radial artery diameter in candidates for transradial coronary angiography: is occupation a factor? *Turk Kardiyol Dern Ars* **43**, 450-6.

Bajraktari, G., Rexhaj, Z., Elezi, S., Zhubi-Bakija, F., Bajraktari, A., Bytyci, I., Batalli, A., and Henein, M. Y. (2021). Radial access for coronary angiography carries fewer complications compared with femoral access: a meta-analysis of randomized controlled trials. *Journal of Clinical Medicine* **10**, 2163.

Coughlan, J. J., Zebrauskaite, A., Arnous, S., and Kiernan, T. J. (2018). Left distal trans-radial access facilitates earlier discharge post-coronary angiography. *Journal of Interventional Cardiology* **31**, 964-968.

Eid-Lidt, G., Rodríguez, A. R., Castellanos, J. J., Farjat Pasos, J. I., and Gaspar, J. (2021). Reply: Distal Radial Artery Approach to

[Citation: Mahmood, K., Bashir, M., Ramzan, M., Adeeb, O. (2023). Safety and efficacy of coronary intervention through distal transradial access in subjects with low body mass index. *Biol. Clin. Sci. Res. J.*, **2023***: 215*. doi: https://doi.org/10.54112/bcsrj.v2023i1.215]

Prevent Radial Artery Occlusion. *Cardiovascular Interventions* **14**, 1162-1163.

Garg, N., Madan, B., Khanna, R., Sinha, A., Kapoor, A., Tewari, S., Kumar, S., and Goel, P. K. (2015). Incidence and predictors of radial artery occlusion after transradial coronary angioplasty: Doppler-guided follow-up study. *Journal of Invasive Cardiology* **27**.

Held, C., Hadziosmanovic, N., Aylward, P. E., Hagström, E., Hochman, J. S., Stewart, R. A., White, H. D., and Wallentin, L. (2022). Body Mass Index and Association With Cardiovascular Outcomes in Patients With Stable Coronary Heart Disease–A STABILITY Substudy. *Journal of the American Heart Association* **11**, e023667.

Kormos, R. L., Antonides, C. F., Goldstein, D. J., Cowger, J. A., Starling, R. C., Kirklin, J. K., Rame, J. E., Rosenthal, D., Mooney, M. L., and Caliskan, K. (2020). Updated definitions of adverse events for trials and registries of mechanical circulatory support: a consensus statement of the mechanical circulatory support academic research consortium. *The Journal of Heart and Lung Transplantation* **39**, 735-750.

Koutouzis, M., Kontopodis, E., Tassopoulos, A., Tsiafoutis, I., Katsanou, K., Rigatou, A., Didagelos, M., Andreou, K., Lazaris, E., and Oikonomidis, N. (2019). Distal versus traditional radial approach for coronary angiography. *Cardiovascular Revascularization Medicine* **20**, 678-680.

Lee, J.-W., Park, S. W., Son, J.-W., Ahn, S.-G., and Lee, S.-H. (2018). Real-world experience of the left distal transradial approach for coronary angiography and percutaneous coronary intervention: a prospective observational study (LeDRA). *EuroIntervention* **14**, e995-e1003.

Li, F., Shi, G.-W., Yu, X.-L., Song, R.-X., Xiao, J.-Q., Huang, H.-M., Li, L.-M., Zhang, L.-Y., Gong, C., and Cai, G.-J. (2022). Safety and efficacy of coronary angiography and percutaneous coronary intervention via distal transradial artery access in the anatomical snuffbox: a single-centre prospective cohort study using a propensity score method. *BMC Cardiovascular Disorders* **22**, 1-8.

Liang, C., Han, Q., Jia, Y., Fan, C., and Qin, G. (2021). Distal transradial access in anatomical snuffbox for coronary angiography and intervention: an updated meta-analysis. *Journal of Interventional Cardiology* **2021**, 1-11.

Lin, Y., Sun, X., Chen, R., Liu, H., Pang, X., Chen, J., and Dong, S. (2020). Feasibility and safety of the distal transradial artery for coronary diagnostic or interventional catheterization. *Journal of Interventional Cardiology* **2020**.

Lu, H., Wu, D., and Chen, X. (2020). Comparison of Distal Transradial Access in Anatomic Snuffbox Versus Transradial Access for Coronary Angiography. *In* "The Heart Surgery Forum", Vol. 23, pp. E407-E410.

Michael Schulte-Hermes, M., Oliver Klein-Wiele, M., Marc Vorpahl, M., and Melchior Seyfarth, M. (2018). Feasibility of transradial access for coronary interventions via percutaneous angioplasty of the radial artery in cases of functional radial occlusion. *Journal of Invasive Cardiology* **30**.

Naito, T., Sawaoka, T., Sasaki, K., Iida, K., Sakuraba, S., Yokohama, K., Sato, H., Soma, M., Okamura, E., and Harada, T. (2019). Evaluation of the diameter of the distal radial artery at the anatomical snuff box using ultrasound in Japanese patients. *Cardiovascular intervention and therapeutics* **34**, 312-316.

Norimatsu, K., Kusumoto, T., Yoshimoto, K., Tsukamoto, M., Kuwano, T., Nishikawa, H., Matsumura, T., and Miura, S.-i. (2019). Importance of measurement of the diameter of the distal radial artery in a distal radial approach from the anatomical snuffbox before coronary catheterization. *Heart and Vessels* **34**, 1615-1620.

Rigatelli, G., Zuin, M., Daggubati, R., Vassilev, D., Zuliani, G., Nguyen, T., and Roncon, L. (2022). Distal snuffbox versus conventional radial artery access: an updated systematic review and meta-analysis. *The Journal of Vascular Access* **23**, 653-659.

Rodrigues, A., Silva, M., Almeida, C., Ferreira, F. C., de Morais, G. P., Santos, L., Melica, B., and Braga, P. (2020). Same-day discharge after elective percutaneous coronary intervention: A single center experience. *Revista Portuguesa de Cardiologia (English Edition)* **39**, 443-449.

Vefalı, V., and Sarıçam, E. (2020). The comparison of traditional radial access and novel distal radial access for cardiac catheterization. *Cardiovascular Revascularization Medicine* **21**, 496-500.

[Citation: Mahmood, K., Bashir, M., Ramzan, M., Adeeb, O. (2023). Safety and efficacy of coronary intervention through distal transradial access in subjects with low body mass index. *Biol. Clin. Sci. Res. J.*, **2023***: 215*. doi: https://doi.org/10.54112/bcsrj.v2023i1.215]

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