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ORIGINAL ARTICLE

Efficacy and Safety of Coronary Intervention Via Distal Trans-Radial Access (DTRA) in Patients with Low Body Mass Index

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ABSTRACT

Background: The distal transradial approach (dTRA) is anticipated to improve the benefits of transradial availability, hemorrhagic incidents and the occurrence of radial artery occlusion (RAO) with the dTRA is uncertain. The aim of this study to investigate the puncture time rate, homeostasis and radial artery occlusion related to low BMI in distal artery access (dTRA) vs conventional radial artery access (cTRA).

Study design: This cross-sectional study was carried out at NICVD, Nawabshah, for the duration of six months from July 2022 to December 2022.

Materials and Methods: The total participants were 160 who diagnosed coronary artery disorder and include 75 participants in dTRA and 85 participants in cTRA. The age group were included >21 years. The demographic data, surgical methods, catheterization, procedure-related data, procedures of puncture, ultrasound follow up and BMI were recorded. All data was analyzed by SPSS 22 version.

Results: The mean age of participants in dTRA group was 72.0±10.1 years and cTRA group was 73.0±18.0 years. In gender, age and BMI were non-significant in both groups. The crossover rate, puncture time, one needle puncture rate and radial artery occlusion were shown significantly change in dTRA and cTRA group, p=0.005.

Conclusion: Distal radial access is a new facility for cardiovascular interventions that provides several benefits over prior links. The key benefits would be less arterial blockage and faster hemostasis. When compared to traditional radial artery access, the dTRA may be a viable and reliable connectivity site for both diagnostic and interventional coronary methods, with a decreased prevalence of RAO, high crossover rate and time needed for hemostasis.

Keywords: Distal transradial artery (dTRA); conventional transradial artery (cTRA); Radial artery occlusion (RAO)

INTRODUCTION

Radial access is suggested as a common method in coronary angiographic methods. Even so, as the number of transradial angiography (TRA) treatments expands, the distinct health problems of radial angiography have become better comprehended. After TRA, the radial artery (RA) diameter and flow-mediated vasodilation (FMD) response are reduced. RA occlusion (RAO) is another common side effect of TRA, and while it does not result in permanent loss of hand function, it can cause symptoms such as wrist pain, cold thumb, and loss of feeling. Besides that, if the RA is planned for a bypass transplants or an arteriovenous fistula, these complications may start causing issues down the road.[1] Distal TRA (DTRA) has emerged as an innovative intervention technique that can decrease the side effects of RAs in recent years. Despite the existence of numerous studies that demonstrate that DTRA is effective and safe, no research has been done to examine the impact of distal RA intervention on RA diameter and endothelial functions to conventional TRA (CTRA) intervention.[2] The performance of the radial artery has taken into account for by an impeded endothelial (vasodilation) response and arterial renovating and its application limited. The circulation vasodilation test method was employed to evaluate endothelial function and to reflect the nitric oxide-mediated endothelium-dependent vasodilation response during inflammatory conditions.[3] There is insufficient understanding of radial endothelial functions and their advancement going to follow FMD test after catheterization along the radial artery and correlate three distinct radial access sites.[4] Obesity has been recognized as an important potential cause for cardiovascular and cerebrovascular disorder. Elevated BMI is affiliated with a lower life expectancy and higher mortality life. Obesity has a negative correlation with results after cardiovascular disease and stroke, based on an increasing number of studies. Numerous research on cardiovascular events and relapse have found that stroke patients with a greater BMI have improved result, while other research has concluded that obesity has no survival benefit in cardiovascular diseases.[5] There have been less research on the effectiveness and safety of percutaneous coronary by dTRA in individuals with having less BMI.[6] This distal radial approach has already been recommended to reduce the risk of forearm radial artery occlusion, internal bleeding, and vascular access side effects, as well as to keep improving operation and effective person satisfaction, particularly by using the left radial strategy. The structure of the radial artery in the ulna, the previous record, the reason for using it, the results were accepted for publication by professional producers, the tactic, its drawbacks, and potential role. This path from the anterior portion to the distal end of the radial artery was officially started and managed to understand.[7, 8] TRA has become the most preferred and basic method for cardiac catheterization. Some many varieties of health problems have been mentioned after three decades of being used. RAO is among the most severe problems. Notwithstanding, due to the lack of diagnoses, the prevalence of RAO may indeed be massively underestimated. Access-related side effects, such as RAO, radial convulsion, bleeding and hematoma, and injury to the surface level subsidiary of the radial nerve, should be regarded by operator as an unique method for cardiac catheterization.[9] When compared to ischemic cardiovascular disease, the redial artery has emerged as the vascular access site of preference for conducting diagnostic and PCI methods with bone access. The radial method minimizes morbidities and losing blood caused by artery access. The most serious side effect is radial artery occlusion (RAO), and the potential risk for RAO is linked to many factors, such as patient demographics, hemostasis guidelines, puncture technique, radial sheath material, and heparin. When using radial access, RAO protection is essential. This peripheral intravenous method has the benefit of keeping the proximal segment of the artery reduced RAO and can be used to recanalize proximal radial occlusion. RA occlusion (RAO) is another common side effect of TRA, and while it does not result in permanent loss of hand function, it can cause symptoms such as wrist pain, cold thumb, and loss of feeling.[10]The aim of this study to evaluate the puncture time rate, homeostasis and radial artery occlusion in distal artery access vs conventional radial artery access

MATERIALS AND METHODS

This cross-sectional study was carried out at NICVD, Nawabshah, for the duration of six months from July 2022 to December 2022.

The total participants were 160 who diagnosed coronary artery disorder and include 75 participants in dTRA and 85 participants in cTRA. The operating methods, puncture procedure and catheterization, ultrasound follow up and BMI were recorded in this study. According to inclusion criteria: participants with clinically diagnosed coronary artery disorder and male gender age group 21-70 years. Exclusion criteria included ST-segment elevation myocardial infraction and total occlusion. The participants follow up until discharge from hospital. Even before to registration, the "Hospital Ethical Committee" gave its approval, and all cases provided informed/written consent. All data was analyzed by SPSS 22 version. A p-value of < 0.05 was considered as statistically significant.

RESULTS

The study was conducted to find demographic and coronary artery diseases participants in Pakistan population. This study included 160 male patients who were suffering cardiac disorder which included to either dTRA n=75 and cTRA n=85.

Table 1: Demographic characteristics in dTRA and cTRA group

Characteristics	dTRA (n=75)	cTRA (n=85)	P= value
Age	72.0±10.1	73.0±18.0	0.787
Gender (male)	43(57.3%)	55(65%)	0.524
BMI kg/m^2	19.7±2.1	20.5±5.1	0.678
Cigarette status	34(45.3%)	37(44%)	0.456
Hyperlipidemia	66(88%)	67(79%)	0.321
Hypertension	49(65.3%)	51(60%)	0.422
DM	58(77.3%)	50(77%)	0.118
Previous PCI	62(83%)	64(75.2%)	0.989
Previous CABG	37(49.3%)	45(53%)	0.432
Chronic cornory syndrome	62(83%)	67(79%)	0.567
Acute chronic syndrome	57(76%)	59(69.4%)	0.446
WBCs count	7.6±2.4	7.7±5.1	0.125
RBCs count	5.5±1.2	5.1±1.1	0.234
Platelet	132.2±55.1	138±50.1	0.444
LVEDD mm	22.11±8.5	20.12±11.0	0.665
LVSD mm	19.5±11.1	22.5±65.0	0.890

Mean±SEM: ANOVA SPSS 22 Test *p<0.01; **<0.001; ***p<0.0001

The median age group was 72.0 years and 73.0 years in both group. Age, sex, BMI, Bp, heart pulse compared to the cTRA and dTRA group were not change significantly. However, the dTRA group were assessed the diameter of LVEDD (22.11±8.5, p=0.665) and (LVESD) (19.5±11.1, p=0.890) were lower than the cTRA group were seen in Table 1.

Table 2: Procedural variables between dTRA and cTRA group

Variables	dTRA (n=75)	cTRA (n=85)	P=value
Right access side	61(81%)	59(69.4%)	0.921
Diagnostic angiography	68(91%)	66(78%)	0.672
PCI	66(88%)	58(68.2%)	0.599
Crossover rate	65(87%)	51(60%)	0.002
Procedural time (min)	48(22,72)	41(18, 55)	0.222
Compression hemostasis time (h)	15(6, 10)	19(20, 15)	0.002
Radiation exposure time (min)	8.5(2.1, 14.5)	3.5(1.9, 11.2)	0.611
Post procedural systolic pressure mmHg	107.5±12.1	109±11.3	0.333
Post procedural diastolic pressure mmHg	71.1±11.3	69.5±10.2	0.890
Post procedural heart rate bpm	70(65, 71)	73(55, 81)	0.111
Median hospital duration, days	5.0(1-6)	5.1(1-6)	0.443

Mean±SEM: ANOVA SPSS 22 Test *p<0.01; **<0.001; ***p<0.0001

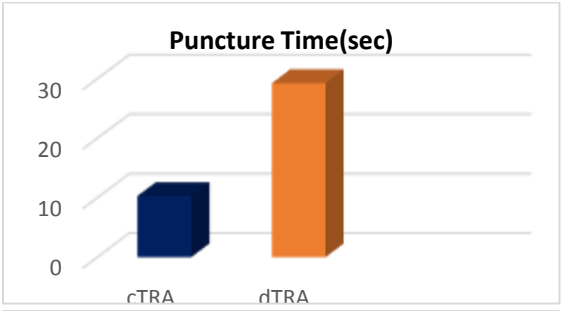
The participants underwent PCI in both groups, resulting in 66(88%) and 58(68.2%), p=(0.599) stents implanted in the dTRA and cTRA groups, respectively. In the dTRA group, 61 (81%) chose right side access, while 59 (69.4%) chose left side access (p= 0.921). The crossover rate was highly significant (p= 0.002) in both groups were seen in Table 2.

Table 3: Comparison of safety between dTRA and cTRA.

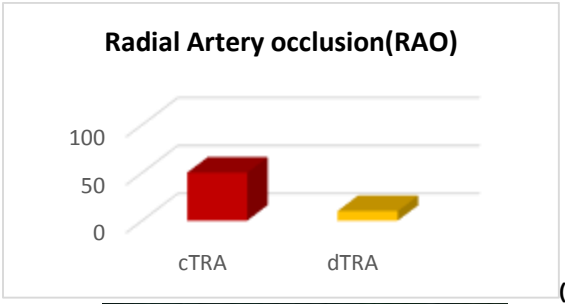
Characteristics	dTRA (n=75)	cTRA (n=85)	P= value
Hand swelling	20(27%)	23(27%)	0.111
Hematoma	18(24%)	21(25%)	0.121
Bleeding	25(33.3%)	29(34.1%)	0.234
Numbness	0(0%)	12(14.1%)	0.556
Puncture success rate	12(16%)	28(33%)	0.432
Puncture success rate of one needle	21(34.1%)	78(92%)	0.002
Puncture time (min)	25(8.5, 6.0)	16(10, 11)	0.005
Radial artery occlusion	10(13.3%)	16(19%)	0.001
Visual Analogue Scale(VSA)	3(3, 4)	4(4, 6)	0.001

Mean±SEM: ANOVA SPSS 22 Test *p<0.01; **<0.001; ***p<0.0001

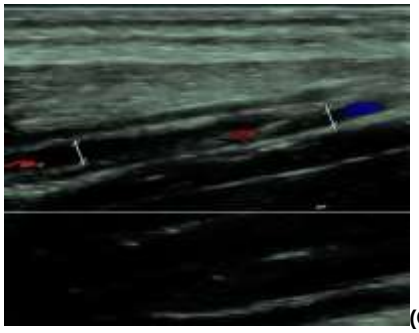
The VAS score in the dTRA group, was significantly lower than in the cTRA group, p= 0.001. Bleeding, haematoma, or numbness were not significant. The incidence of RAO was significantly lower in the dTRA, p=0.001 were seen in Table 3; Fig 1(a, b, c).



(a)



(b)



(C)

Figure 1: (a) show that the puncture time in the dTRA is reduced then cTRA. (b) show that the radial artery occlusion in dTRA is lower then cTRA. (c) show ultrasound image of (RAO) complete and functional.

DISCUSSION

The dTRA has many advantages related to cardiac coronary intervention to diagnosis and treatment.[11] It can reduce the compression time and nursing workload. The transradial approach (TRA) has few adverse effect, decrease mortality rate, and more cost-effective.[12] The use of TRA is not without constraints due to its small diameter, the TRA has been linked to a variety of health problems, including radial artery occlusion (RAO).[13]

Height, weight and BMI were all relevant to conventional radial artery diameter. Using multiple regression, BMI was found to be completely irrelevant to distal radial artery and narrow diameter with low BMI have far less the depression on the dorsum of the arm at the base of thumb, and arteries near to the bones, which trying to make puncture extra complicated.[14], [15] To improve the puncture success rates by the help of lower the puncture rate and increase the contact area between the needle and blood vessels. BMI is strongly associated with poor cardiac health and raises the possibility of hemorrhaging after transplant, in addition to the efficiency and safety of dTRA coronary treatment in patients.[16, 17] In our study to found that the one needle puncture success rate in cTRA was increased significantly 92% as compared to dTRA group 34.1% and significantly increase puncture time of dTRA then cTRA group p= 0.005. There was no significance difference between group such as hematoma and bleeding which related to puncture related complications. The hemostasis was significantly reduced in dTRA and cTRA group p=0.002. [18, 19, 20]

RAO is a common side effect in traditional radial artery interventional cardiology. RAO has been evaluated for its ability to use a variety of techniques and Doppler ultrasound can detect blood cloting and blood circulation, as well as quantify radial artery intima width, it is more precise in evaluating RAO.[21] Several research studies have been carried out to assess the value of RAO reduced in dTRA group. However, few studies have been conducted that the dTRA can reduce the occurrence of RAO in patients having lower BMI. In our research also discovered that the total RAO incidence in the low BMI population was 19% in cTRA, which was increased significantly than the 13.3% in the dTRA group (p=0.001).[22]

CONCLUSIONS

Distal radial access is a new facility for cardiovascular interventions that provides several benefits over prior links. The key benefits would be less arterial blockage and faster hemostasis. When compared to traditional radial artery access, the dTRA may be a viable and reliable connectivity site for both diagnostic and interventional coronary methods, with a decreased prevalence of RAO, high cross over rate and time needed for hemostasis.

REFERENCES

1. Özkan, C., KIZILTUNÇ, E., Çayhan, V., YAKICI, İ. E., Çetin, M., Korkmaz, A., ... & Örnek, E. (2022). The effect of conventional and distal radial access techniques on radial artery structure and vascular functions. Koşuyolu Heart Journal, 25(1), 68-76.
2. Korotkikh, A. V., Babunashvili, A. M., Kazantsev, A. N., & Annaev, Z. S. (2022). Distal Radial Access: Is There a Clinical Benefit?. Cardiology in Review, 10-1097.
3. Soydan, E., Kış, M., & Akın, M. (2021). Evaluation of radial artery endothelial functions in transradial coronary angiography according to different radial access sites. Anatolian Journal of Cardiology, 25(1), 42.
4. Vefalı, V., & Sarıçam, E. (2020). The comparison of traditional radial access and novel distal radial access for cardiac catheterization. Cardiovascular Revascularization Medicine, 21(4), 496-500.
5. Chaudhary, D., Khan, A., Gupta, M., Hu, Y., Li, J., Abedi, V., & Zand, R. (2021). Obesity and mortality after the first ischemic stroke: Is obesity paradox real?. PLoS One, 16(2), e0246877.
6. Cao, G., Liu, W., Ma, L., Cai, H., Zheng, Y., Wen, Y., ... & Cao, J. (2022). Characteristics of distal radial artery diameter and its related factors and predictors.
7. Corcos, T. (2019). Distal radial access for coronary angiography and percutaneous coronary intervention: a state-of-the-art review. Catheterization and Cardiovascular Interventions, 93(4), 639-644.
8. Pua, U., Sim, J. Z. T., Quek, L. H. H., Kwan, J., Lim, G. H. T., & Huang, I. K. H. (2018). Feasibility study of "snuffbox" radial access for visceral interventions. Journal of Vascular and Interventional Radiology, 29(9), 1276-1280.
9. Cai, G., Huang, H., Li, F., Shi, G., Yu, X., & Yu, L. (2020). Distal transradial access: a review of the feasibility and safety in cardiovascular angiography and intervention. BMC Cardiovascular Disorders, 20, 1-12.
10. Li, S. S., Li, J. M., Liu, L. L., Liu, W., Yang, H., & Feng, C. G. (2022). Analysis of the risk factors related to the success rate of distal transradial artery access in patients with coronary heart disease. Risk management and healthcare policy, 657-663.
11. Tsigkas, G., Moulias, A., Papageorgiou, A., Ntouvas, I., Grapsas, N., Despotopoulos, S., ... & Hahalis, G. (2021). Transradial access through the anatomical snuffbox: Results of a feasibility study. Hellenic Journal of Cardiology, 62(3), 201-205.
12. Aoi, S., Htun, W. W., Freeo, S., Lee, S., Kyaw, H., Alfaro, V., ... & Kwan, T. (2019). Distal transradial artery access in the anatomical snuffbox for coronary angiography as an alternative access site for faster hemostasis. Catheterization and Cardiovascular Interventions, 94(5), 651-657.
13. Hamandi, M., Saad, M., Hasan, R., Megaly, M., Abbott, J. D., Dib, C., ... & Al-Azizi, K. M. (2020). Distal versus conventional transradial artery access for coronary angiography and intervention: a meta-analysis. Cardiovascular Revascularization Medicine, 21(10), 1209-1213.
14. Kim, Y., Ahn, Y., Kim, M. C., Sim, D. S., Hong, Y. J., Kim, J. H., & Jeong, M. H. (2018). Gender differences in the distal radial artery diameter for the snuffbox approach. Cardiology Journal, 25(5), 639-641.
15. Naito, T., Sawaoka, T., Sasaki, K., Iida, K., Sakuraba, S., Yokohama, K., ... & Yoshimachi, F. (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.
16. Wang, H., Peng, W. J., Liu, Y. H., Ma, G. Q., Wang, D., Su, B., & Liu, Y. W. (2020). A comparison of the clinical effects and safety between the distal radial artery and the classic radial artery approaches in percutaneous coronary intervention. Annals of Palliative Medicine, 9(5), 2568-2574.
17. Nairoukh, Z., Jahangir, S., Adjepong, D., & Malik, B. H. (2020). Distal radial artery access: the future of cardiovascular intervention. Cureus, 12(3).
18. Lin, Y., Sun, X., Chen, R., Liu, H., Pang, X., Chen, J., & Dong, S. (2020). Feasibility and safety of the distal transradial artery for coronary diagnostic or interventional catheterization. Journal of Interventional Cardiology, 2020.
19. Sattar, Y., Talib, U., Faisaluddin, M., Song, D., Lak, H. M., Laghari, A., ... & Alam, M. (2022). Meta-analysis comparing distal radial versus traditional radial percutaneous coronary intervention or angiography. The American Journal of Cardiology, 170, 31-39.
20. Boonya-Ananta, T., Rodriguez, A. J., Ajmal, A., Du Le, V. N., Hansen, A. K., Hutcheson, J. D., & Ramella-Roman, J. C. (2021). Synthetic photoplethysmography (PPG) of the radial artery through parallelized Monte Carlo and its correlation to body mass index (BMI). Scientific reports, 11(1), 1-11.
21. Jirous, S., Bernat, I., Slezak, D., Miklik, R., & Rokyta, R. (2020). Post-procedural radial artery occlusion and patency detection using duplex ultrasound vs. the reverse Barbeau test. European Heart Journal Supplements, 22(Supplement_F), F23-F29.
22. Sheikh, A. R., Abdelaal, E., Sastry, S., Karim, S., & Zeb, M. (2018). Novel distal left radial artery access in anatomical snuffbox for recanalization of proximal radial artery total occlusion and percutaneous coronary intervention through left internal mammary artery. Circulation: Cardiovascular Interventions, 11(7), e006579.