THE ANATOLIAN JOURNAL OF CARDIOLOGY

Official journal of the TURKISH SOCIETY OF CARDIOLOGY

Advancement in Coronary Angiography or Percutaneous Coronary Intervention Using the Distal Transradial Artery Access in Acute Coronary Syndrome and Complex Coronary Artery Disease

REVIEW

ABSTRACT

As the incidence of coronary heart disease increases annually, coronary angiography and percutaneous coronary intervention procedures are also increasing. The femoral artery and radial artery paths are commonly used for percutaneous coronary intervention, but their clinical application is limited to a certain extent due to many postoperative complications. The distal transradial access path is a new surgical path for coronary angiography and percutaneous coronary intervention. In this study, we reviewed the most relevant and recent articles related to distal transradial access and found that coronary angiography or interventional therapy using the distal transradial access path is safe and effective in patients with acute coronary syndrome and complex coronary artery disease. The distal transradial access path is expected to be the first choice for coronary angiography or percutaneous coronary intervention in patients with acute coronary syndrome and complex coronary artery disease.

Keywords: Distal transradial artery, snuff box, interventional therapy, acute coronary syndrome, complex coronary artery disease

INTRODUCTION

Coronary heart disease is currently one of the most common cardiovascular diseases found in clinical practice. Coronary angiography (CAG) and percutaneous coronary intervention (PCI) are the most effective treatment methods for coronary heart disease. The surgical path of CAG, a type of interventional therapy, gradually transitioned from the femoral artery (TF) path initially to the radial artery (TRA) path. A new path, distal transradial access (dTRA), is now being implemented. Although the TF path is the earliest path used for CAG and PCI,[1] it is frequently reported to have postoperative complications, such as arteriovenous fistulas, pseudoaneurysms, severe bleeding, and hematomas. Additionally, the patients must be immobile and bedridden after the TF intervention. Kiemeneij and Laarman[2] first reported the use of the TRA path for PCI in 1993, and since then more cardiologists have preferred this path. In 2013, the European Society of Cardiology (ESC) recommended TRA as the first choice for CAG and PCI.[3] TRA also has complications, such as radial artery occlusion (RAO) and forearm osteofascial compartment syndrome. The incidence of RAO is 1%-33%. Although some preventive strategies have been adopted for RAO in recent years, such as the use of the PreludeSYNC hemostasis compression device,[4] the incidence of RAO is still as high as 3.7%.[5] Therefore, in 2017, Kiemeneij[6] proposed the use of the dTRA path for CAG or PCI.[6]

The transradial approach includes the trans-snuff box, which is a dTRA, and a transpalmar approach. In 2018, Roghani-Dehkordi et al[7] reported the safety and feasibility of CAG or PCI using the snuff box and palmar approach.[7] In 2019, the results of Wretowski et al's[8] study showed that in 60% of

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Received: August 30, 2021
Accepted: December 28, 2021
Available Online Date: March 6, 2022

Cite this article as: Cao G, Cai H, Cao J. Advancement in coronary angiography or percutaneous coronary intervention using the distal transradial artery access in acute coronary syndrome and complex coronary artery disease. Anatol J Cardiol 2022;26(3):163-171.

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DOI:10.5152/AnatolJCardiol.2021.933

patients undergoing elective or emergency CAG or coronary intervention, the dTRA (*in vitro*) was feasible, safe, and comfortable.[8] Shunsuke's study indicated that although the distal radial artery (DRA) approach through the snuff box takes longer, it is a safe and feasible alternative to traditional TRA and may lead to shorter hemostasis time, especially in the case of PCI.[9] Meanwhile, Roghani-Dehkordi et al[10] found that in patients undergoing CAG through the trans-snuff box approach, manual pressing at the puncture site can shorten the hemostasis time.

Studies have shown that the use of dTRA for CAG or PCI in coronary heart disease can significantly reduce RAO.[11] Acute coronary syndrome and complex coronary artery disease (CAD) are particular types of coronary heart disease. In this study, we reviewed the most relevant and recent articles related to dTRA in patients with ACS and complex CAD. Through summarizing the technical characteristics, success rates, advantages and disadvantages of this approach, we evaluated the safety and effectiveness of using dTRA for CAG or PCI in patients with ACS and complex CAD and reviewed its progress.

Anatomical Characteristic of the Distal Transradial Artery

The radial artery descends along the outer forearm above the radius to the wrist and anastomoses with the superficial branch of the ulnar artery, forming a superficial palmar arch. The distal end of the radial artery passes under the abductor pollicis longus and extensor pollicis brevis tendons. After passing between the first and second metacarpal bones, it turns to the palm side and anastomoses with the deep branch of the ulnar artery, forming a deep palmar arch.[12] The radial artery passing through the abductor pollicis longus and extensor pollicis brevis tendons is called the distal transradial artery. The anatomical position of the distal transradial artery is shown in Figure 1. A 6F sheath is inserted through the distal transradial artery, as shown in Figure 2. At present, the diameter of the distal transradial artery lacks large samples of multicenter data. We have collected literature that used the dTRA path for CAG or interventional therapy and measured the diameter of the distal transradial artery[11,13-19] (Table 1). The diameter of the distal transradial artery is 1.7 ± 0.5 mm to 2.4 ± 0.5 mm, and the diameter of the radial artery is 2.1 ± 0.6 mm to 2.7 ± 0.5 mm. The distal transradial artery and radial artery diameters are smaller in the Chinese population and larger in the Korean and Japanese populations. Of course, these data may be biased, and more multicenter and large-sample data are needed in the future. Studies have shown that the diameter of the distal transradial artery in women is significantly smaller than in men (2.40 mm vs. 2.65 mm, $P = .016$).[20] Therefore, if the proportion of men in Table 1 is different, the diameter of the distal transradial artery will also be different.

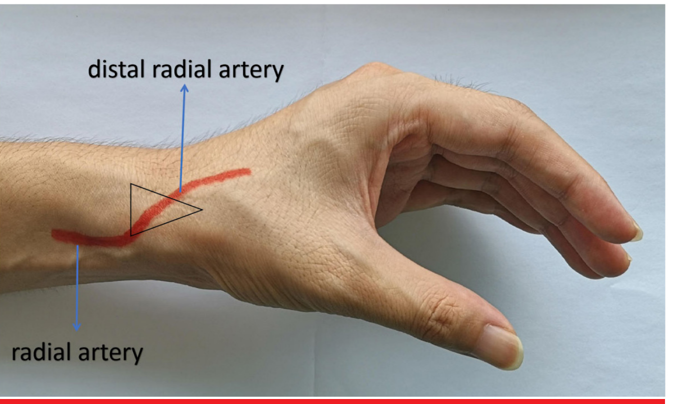

Figure 1. The anatomical location of the distal radial artery and radial artery.

Acute Coronary Syndrome

According to the 2013 ESC guidelines,[3] CAG or PCI is the first choice for TRA in patients with coronary heart disease. However, the radial artery is thinner than the femoral artery, and the puncture time may be longer. Patients with ST-segment elevation myocardial infarction (STEMI) are in critical condition and require the culprit vessels to be opened for the shortest possible time, so TRA was not previously recommended. However, with the constant maturity and development of TRA technology, the 2017 ESC guidelines declared TRA as the first choice for CAG or PCI in patients with STEMI.[21]

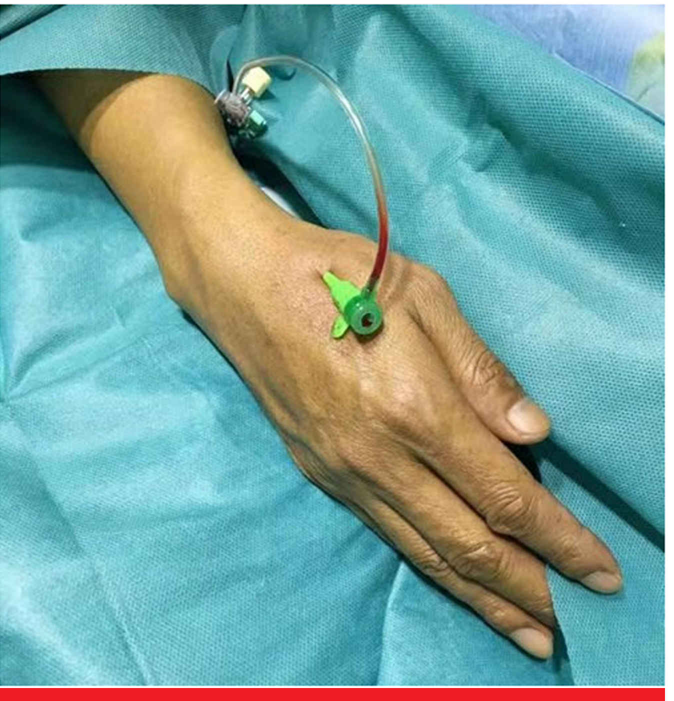
Figure 2. Insertion of 6F sheath through distal radial artery.

HIGHLIGHTS

- This review is the first to summarize the use of distal transradial access (dTRA) for coronary angiography (CAG) or percutaneous coronary intervention (PCI) in patients with acute coronary syndrome (ACS) and complex coronary artery diseases.
- Coronary angiography or interventional therapy using the dTRA path is safe and effective in patients with ACS and complex CAD.
- The dTRA path is expected to be the first choice for CAG or PCI in patients with ACS and complex CAD.

Table 1. Relevant Literature That Provides the Diameter of the Distal Radial Artery

Research	Country	Diameter of Radial Artery (mm)	Diameter of Distal Radial Artery (mm)	Puncture Time	Path Conversion (%)	≥6F Sheath	Male (%)	Radial Artery Occlusion (%)
Babunashvili et al[13]	Russia	2.46 ± 0.4	2.13 ± 0.33	23.3 ± 50.1 seconds	0.3	6F 45% 7F 0.6%	68.1	0.61
Kim et al[20]	Korea	2.72	2.57	NA	12	6F 100%	71.2	NA
Naito et al[15]	Japan	2.57 ± 0.58	2.02 ± 0.44	NA	NA	NA	87.7	NA
Eid-Lidt et al[11]	Mexico	2.7 ± 0.4	2.4 ± 0.5	2.7 ± 1.9 minutes	13.3	6F 88.5%	75	0.7
Vefalı et al[16]	Turkey	2.32 ± 0.48	2.05 ± 0.34	46.85 ± 2.41 seconds	4.9	NA	70.6	NA
Yu et al[17]	China	2.1 ± 0.6	1.7 ± 0.5	2.3 ± 1.77 minutes	4.3	6F 100%	62	0
Mizuguchi et al[18]	Japan	2.7 ± 0.5	2.4 ± 0.5	NA	NA	6F 8.8% 6F Glidesheath 14.9% 7F Glidesheath 4.8%	71.1	0.4
Hammami et al[19]	Tunisia	2.1	2.2	42 seconds	12	6F 64%	75	0

The technology related to the distal transradial artery has developed rapidly in recent years, and related research has also increased. There has been a great amount of evidence that CAG or PCI using the dTRA path in patients with coronary heart disease is safe and effective.[11,16] The distal transradial artery is thinner than the radial artery, the puncture may be more difficult, and the puncture time may be longer. How safe and effective is CAG or PCI using the dTRA path in patients with ACS? The information we collected from relevant documents is presented in Tables 2 and 3.

ST-Segment Elevation Myocardial Infarction

Kim et al[22] analyzed 138 patients with STEMI undergoing direct PCI. The results showed that the success rate of a snuff-box puncture was 92.8%. All patients with successful punctures completed PCI, the snuff-box puncture time

Table 2. Characteristics of ACS or Complex CAD Patients Undergoing Coronary Angiography or Interventional Therapy via the Distal Radial Artery

Patients	Study	Year	Country	Type of Study	Single/ Multicenter	ACS/STEMI or CTO/Complex CAD	Mean Age	Men (%)	Follow-Up
ACS	Sgueglia et al[25]	2019	Italy	Nonrandomized controlled	Single	ACS	68 ± 13	66	In hospital
	Kim et al[20]	2021	Korea	Observational study	Multicenter	STEMI	62.3 ± 10.8	85.2	In hospital
	Soydan et al[23]	2020	Turkey	Observational study	Single	STEMI	58 ± 9.04	87	In hospital
	Soydan et al[24]	2020	Turkey	Nonrandomized controlled	Single	STEMI	NA	26.5	In hospital
Complex CAD	Elbayoumi et al[37]	2020	Taiwan and Egypt	Nonrandomized controlled	Multicenter	CTO	NA	NA	In hospital
	Sgueglia et al[25]	2019	Italy	Nonrandomized controlled	Single	Complex CAD	68 ± 13	66	In hospital
	Gasparini et al[38]	2019	Italy	Observational study	NA	CTO	67.8 ± 5.1	75.6	1 month
	Colletti et al[32]	2020	Belgium	Observational study	Single	Complex CAD	73 ± 8	80	1 month
	Lin et al[39]	2021	Taiwan	Observational study	Single	CTO	61 ± 11	87.3	In hospital
	Lee et al[41]	2021	Korea	Observational study	Single	Bifurcation lesions	63.3 ± 11.1	79.2	1 month

ACS, acute coronary syndrome; CAD, coronary artery disease; CTO, chronic total occlusion; STEMI, ST-segment elevation myocardial infarction.

Table 3. Treatment of ACS or Complex CAD Patients Undergoing Coronary Angiography or Interventional Therapy via the Distal Radial Artery

					ACS patients							
Study		**n**	**Access Success (%)**	**Artery Puncture Time (Seconds)**	**Procedure Success (%)**	**Procedure Duration (Minutes)**	**Fluoroscopy Time (Minutes)**	**Door to Balloon (Minutes)**	**Radial Artery Occlusion (%)**	**Major Bleeding (%)**	**Guiding Catheter (F)**	**Access Site Switch (%)**
Sgueglia et al[25]	dTRA	88	97	NA	95	69 ± 14	21 ± 11	NA	1	0	5-6	1
	TRA	88	99	NA	95	67 ± 13	22 ± 12	NA	4.5	0	5-6.5	2
Kim et al[20]	dTRA	138	92.8	162 ± 96	100	43.2 ± 15.1	NA	70	0	0	6-6.5	7.2
Soydan et al[23]	dTRA	30	100	37.36 ± 17.60	93.3	NA	10.12 ± 5.14	27.77 ± 6.23	0	0	6	0
Soydan et al[24]	dTRA	30	NA	28.63	90	NA	10.11	NA	0	0	6	0
	TF	61	NA	28.93	91.8	NA	13.75	NA	-	1.6	6	6.6
Complex CAD patients												
Study		**n**	**Access Success (%)**	**Artery Puncture Time**	**Procedure Success (%)**	**Procedure Duration (Minutes)**	**Fluoroscopy Time (Minutes)**	**J-CTO Score**	**Radial Artery Occlusion (%)**	**Major Bleeding (%)**	**Guiding Catheter (F)**	**Access Site Switch (%)**
Elbayoumi et al[37]	dTRA	140	NA	186 ± 195 seconds	94.7	116.29 ± 45.35	43.4 ± 14.5	2.6 ± 1.4	0	NA	NA	NA
	TRA	188	NA	102 ± 191.4 seconds	96.2	107.47 ± 47.18	41.3 ± 15.4	2.7 ± 1.3	0	NA	NA	NA
Sgueglia et al[25]	dTRA	88	97	NA	95	69 ± 14	21 ± 11	NA	1	0	5-6	1
	TRA	88	99	NA	95	67 ± 13	22 ± 12	NA	4.5	0	5-6.5	2
Gasparini et al[38]	dTRA	41	82.9	NA	78.1	NA	61.4 ± 35.7	2.19 ± 1.27	0	0	7	17.1
Colletti et al[32]	dTRA	20	NA	NA	95	NA	NA	NA	0	0	7	0
Lin et al[39]	dTRA	298	94.2	4.57 ± 2.91 minutes	93.5	140.0 ± 55.6	55.3 ± 25.7	2.6 ± 0.9	0.5	0.2	6-7	5.8
Lee et al[41]	dTRA	106	100	2.4 ± 1.6 minutes	NA	NA	NA	NA	0	0	5-7	0

dTRA, distal transradial access; CTO, chronic total occlusion.

was 2.7 ± 1.6 minutes, and there were no RAO or severe bleeding complications. In another study of direct PCI in patients with STEMI, all patients were successfully punctured through the distal transradial artery and completed PCI with an average puncture time of 37.36 seconds. There was no RAO, hematoma, hand neurological deficit, or hemorrhage.[23] Soydan et al[24] compared 30 patients with acute STEMI undergoing dTRA and 61 patients undergoing TF PCI. The success rate of PCI in both groups was very high (90% vs. 91.8%, p = 0.795), and the puncture time of the 2 groups was similar (28.63 seconds vs. 28.93 seconds, *P* = .767). However, patients in the dTRA group had shorter fluoroscopy times, total radiation doses, and hospitalization days, and patients in the TF group had a higher mortality rate during hospitalization (0% in the dTRA group and 18% in the TF group, *P* = .013). It is worth noting that in the study by Soydan et al[23] the door to balloon time for patients with STEMI was only 27.77 ± 6.23 minutes, which was much shorter than the 90 minutes required by the chest pain center. Although there have been few studies on CAG and interventional therapy using the dTRA path in patients with STEMI, the results consistently indicate that the puncture time of the dTRA path is not long and does not affect the timely opening of the culprit vessel. Path-related complications, such as RAO, were significantly reduced.

DTRA safety and effectiveness

In 2019, Sgueglia et al[25] studied 176 patients with ACS (dTRA 88 and TRA 88). The results showed that dTRA and TRA have similar puncture success rates (97% vs. 99%), operation times, fluoroscopy times, and surgery success rates, and the incidences of RAO by dTRA were significantly lower than TRA (1% vs. 4.5%). Many studies of CAG or PCI via dTRA have included patients with ACS, and their results have shown that dTRA is safe and effective.[26,27] In addition, many case reports of patients with ACS undergoing PCI via dTRA also show that dTRA is safe and effective.[28,29]

According to the data in Table 3, the puncture time for CAG or interventional therapy using the dTRA path for ACS is 28.63 seconds to 162 ± 96 seconds. According to the data in Table 1, the puncture time of CAG or interventional therapy using the dTRA path for coronary heart disease is 42 seconds to 2.7 ± 1.9 minutes. The puncture time of the dTRA path is shorter in patients with common coronary heart disease or patients with ACS. The factors affecting the puncture time and the success rate of punctures are mainly related to the personal experience and proficiency of the surgeon. A retrospective study analyzed 1000 cases of CAG or interventional therapy with dTRA paths performed by an experienced surgeon and found that after 200 cases of distal transradial artery puncture, the success rate of the dTRA path could be maintained at more than 94%.[30]

Complex Coronary Artery Disease

Complex CAD mainly includes chronic total occlusion (CTO), left main disease, bifurcation disease, severely calcified disease, and severely twisted disease. Percutaneous coronary intervention for complex CAD often requires strong support so that the guidewire can pass through occlusive, severely narrowed, twisted, and calcified lesions. Complex CAD for PCI often requires a large guiding catheter to have enough space to accommodate multiple balloons simultaneously for a balloon kiss and other operations. This makes the TF path ideal for complex CAD. However, more scholars use TRA for PCI in complex CAD due to improvements in the sheath and the guiding catheter, the balloon kiss technique, and the treatment strategy of bifurcation lesions. In 2020, the American Society for Cardiovascular Angiography and Intervention strongly recommended the routine use of TRA for PCI in complex CAD and stated that 7F thin-walled sheaths and 8F non-sheathed guiding catheters for the TRA path are safe and effective.[31] The distal transradial artery has a smaller diameter than the radial artery. How safe and effective is the dTRA path for patients with complicated CAD? The information we collected from relevant documents is presented in Tables 2 and 3.

The study included 88 patients with complex CAD undergoing PCI via dTRA and 88 patients undergoing PCI via TRA. The results showed that the puncture success rates (97% vs. 99%), operation times, fluoroscopy times, and operation success rates were similar in both the dTRA and TRA groups, but the incidence of RAO in the dTRA group was lower than the TRA group (1% vs. 4.5%).[25] Colletti et al[32] used the sheathless technique and 7F guiding catheters to perform 20 complex PCIs. The results showed that dTRA is safe and feasible to perform CAG or PCI using 7F guiding catheters. The studies of Kos et al[33] and Uddin et al[34] included 13.4%-13.9% of the patients with complex CAD, and their results showed that dTRA is safe and feasible. In addition, many case reports have shown that PCI using dTRA is safe and effective for complex CAD.[35,36]

Chronic Total Occlusion

A multicenter study involving 328 patients with CTO (dTRA 140 and TRA 188) showed that the operation success rates of the dTRA and TRA groups were similar (dTRA 94.7% and TRA 96.2%), the puncture times were similar (dTRA 3.1 ± 3.25 minutes and TRA 1.7 ± 3.19 minutes), the average operation times were similar (dTRA 116.29 ± 45.35 minutes and TRA 107.47 ± 47.18 minutes), the total fluoroscopy times were similar (dTRA 43.4 ± 14.5 minutes and TRA 41.3 ± 15.4 minutes), the dosage of contrast medium was similar (dTRA 492.2 ± 21.7 mL and TRA 488.2 ± 24.6 mL), the incidence of major cardiovascular and cerebrovascular adverse events during hospitalization was similar (dTRA 2.14% and TRA 2.12%), the incidence of path-related complications was low (dTRA 2.85% and TRA 1.59%), and there were no serious radial artery spasms, RAO, or other complications in either path. Percutaneous coronary intervention through dTRA in patients with CTO is safe, feasible, and has the same high success rate as TRA.[37] Gasparini et al[38] observed 41 patients with CTO undergoing PCI. The results showed that 82.9% of the patients had a 7F sheath implanted through the distal transradial artery and 78.1% of the patients had the operation completed through the distal transradial artery. The incidence of major cardiovascular and cerebrovascular adverse events during hospitalization was 0%. The incidence of dTRA-related bleeding, radial artery spasms, and RAO was 0%. Lin et al[39] included

298 patients with CTO who underwent PCI through dTRA. None of the patients had severe radial artery spasms and only 2 patients (0.5%) had RAOs, with an operation success rate of 93.5%. The 2019 global expert consensus defines CTOs with a J-CTO score of ≥2 as complex.[40] In the study by Elbayoumi et al[37] the J-CTO scores of the dTRA and TRA groups were 2.6 ± 1.4 and 2.7 ± 1.3, respectively. In the study by Gasparini et al[38] the J-CTO score was 2.19 ± 1.27. In the study by Lin et al[39] the J-CTO score was 2.6 ± 0.9. Complex CTOs account for the vast majority of the research by Elbayoumi et al[37] Gasparini et al[38] and Lin et al.[39]

Bifurcation Lesions

Lee et al[41] studied 106 patients who underwent PCI for bifurcation lesions through left DRA between December 2017 and December 2019. Eleven of those patients (10.4%) received left main bifurcation and true bifurcation treatments, accounting for 39.6% of the cases, and the left anterior descending branch/diagonal branch was the most common bifurcation site (57.5%, 61/106). One hundred one cases (95.3%) used a 6F guiding catheter for PCI. All 106 patients successfully received PCI for bifurcation lesions through left DRA. During the 30-day follow-up, there were no major hemorrhages, radial artery occlusions, forearm hematomas, or deaths.

DISCUSSION

The Path Switching

According to Table 1, the path switching rate of CAG or interventional therapy using the dTRA path in patients with coronary heart disease was 0.3%-13.3%. According to Table 3, the path switching rates of CAG or interventional therapy using the dTRA path in patients with ACS and complex CAD were 0%-7.2% and 0%–17.1%, respectively. What path was converted from the dTRA path? What were the reasons for the inconsistent path switching rates among the studies? In the study by Kim et al[14] 150 patients used the left dTRA path, 10 cases had a failed puncture, and 8 cases were unable to pass the guidewire due to tortuosity and spasms of the distal transradial artery after a successful puncture. In the study by Eid-Lidt et al[11] 13.3% of patients in the dTRA path group switched to the contralateral forearm, and 0.7% of the patients in the TRA path group switched to the contralateral forearm. In the study by Vefalı et al[16] 4 cases (3.8%) in the TRA path group switched to the TF path due to radial artery spasms. Radial artery spasming was not seen in the dTRA path group, but 5 cases (4.9%) switched to the TRA path. In the study by Yu et al[17] 4 patients (4.3%) switched from the dTRA path to the TRA path. One case was due to vasospasms leading to puncture failure, and the other 3 cases were due to more than 5 punctures. In the study by Hammami et al[19] 10 patients (12%) in the dTRA group switched paths due to radial artery puncture failure, radial artery spasms, brachial artery stenosis, or insufficient catheter support, including 4 cases that changed to the ipsilateral TRA path, 3 cases that switched to the contralateral TRA path, and 3 cases that switched to the TF path. In the study by Gasparini et al[38] there were 7 cases (17.5%) of path switching. Three cases were due to weak or missing pulsation of the distal transradial artery.

However, the path switching rate of several other studies is very low. Soydan et al[20] injected nitrate esters and magnesium salts through the sheath after insertion, and the path switching rate was 0%. Colletti et al[32] injected nitrate drugs through the sheath after insertion, and the path switching rate was 0%. Lee et al[41] injected nitroglycerin and verapamil through the sheath after insertion, and the path switching rate was 0%. Arterial tortuosity, spasms, stenosis, and pulsation intensity are important factors affecting the path switching rate. After inserting the sheath, injecting drugs such as nitrate esters through the sheath can reduce arterial spasms, thereby reducing the path switching rate. Gragnano et al[42] randomly assigned 8404 patients with ACS to the TRA or TF path groups for CAG or PCI. The results showed that 183 (4.4%) of the 4197 patients in the TRA path group had path switching (mainly to the TF path), and 108 (2.6%) of the 4207 patients in the TF path group had path switching. Sgueglia et al[25] Soydan et al[24] and Soydan et al[23] used the dTRA path for CAG or PCI in patients with ACS. The path switching rate was significantly lower than 4.4% in the study by Gragnano et al.[42]

The Relationship Between Artery Diameter and Sheath

In previous studies,[43,44] the 6F standard sheath (outer diameter of 2.62 mm) is the most commonly used sheath for CAG or interventional therapy through the TRA path, which allows the 6F guide catheter to be inserted. The results of the study published in 2009 by Grossman et al[43] showed that, compared with the 6F guide catheter, the use of 7F and 8F guide catheters for PCI is associated with more use of contrast agents, renal complications, bleeding, complications related to the surgical path, and the need for postoperative blood transfusions. The use of 8F guide catheters is related to kidney diseases that require dialysis, major adverse cardiac events in the hospital, and mortality. This may be on account of the large outer diameter of the 7F standard sheath, which is significantly larger than the diameter of the radial artery (2.1 ± 0.6 mm to 2.7 ± 0.5 mm). However, in recent years, TRA path equipment and technology have been continuously developed. The 6F thin-walled sheath can be inserted into the 7F guiding catheter for PCI, and the 6.5F, 7F, and 7.5F unsheathed guiding catheters can also be used directly through the radial artery for PCI. At present, Terumo's Glidesheath Slender is the most commonly used thin-walled sheath (6F outer diameter is 2.46 mm and 7F outer diameter is 2.79 mm). The Eaucath Sheathless Guiding Catheter is widely used (7.5F outer diameter is 2.49 mm), and its outer diameter is significantly smaller than the standard sheath. Many research results published in recent years show that the use of the Glidesheath Slender or Sheathless Guiding Catheter via the TRA path for PCI is safe and effective for patients with complex CADs.[45-49] In a prospective multicenter study published by Meijers et al[49] in 2021, 388 patients with complex coronary artery lesions (including CTO, left main artery, severe calcification, or complex bifurcation lesions) undergoing PCI were randomly divided into the TRA path group (7F Glidesheath Slender) or TF path group (7F standard sheath). There was no difference in operation durations, contrast medium dosages, radiation doses, or operation success rates between the 2 groups, and the incidence of path-related bleeding and vascular complications in the TRA path group was significantly lower. Dautov et al[45] divided CTO patients into 2 groups. One group (119 cases) used a self-made 8F sheathless guiding catheter for PCI through the TRA path, and the other group (122 cases) used conventional TRA or TF paths. The results showed that the operation success rates of the 2 groups were similar (both 93%), and the operation times, contrast agent dosages, and radiation doses were similar between the 2 groups. So, is it safe and effective to use the Glidesheath Slender or Sheathless Guiding Catheter through the distal transradial artery? Colletti et al[32] used a 7F sheathless guiding catheter to perform PCI in 20 patients with complex CADs through the dTRA path. The success rates of the operations were as high as 95%, the incidences of major adverse cardiovascular events were 0%, and only 1 case (5%) had an arterial spasm. Gasparini et al[38] used the dTRA path for PCI in 41 patients with CTO, 34 patients (82.9%) successfully used a 7F Glidesheath Slender, and 7 patients (17.5%) were switched to another path due to weak and tortuous pulse of the distal transradial artery, indicating that the 7F Glidesheath Slender was safe and effective for PCI in patients with CTO through the dTRA path.

Differences Between This Review and Other Reviews

Through careful study of previously published reviews on CAG or interventional therapy using the dTRA path, some were found to summarize the anatomical and physiological basis of CAG or PCI using dTRA in patients with coronary heart disease,[12] and some outlined the success rates and complications of CAG or PCI using dTRA in patients with coronary heart disease.[50] However, there is no review to summarize the use of dTRA for CAG or PCI in patients with ACS and complex CADs. Acute coronary syndrome and complex CADs are special types of coronary heart disease, and there are many differences from common coronary heart disease. Therefore, this article reviews the use of dTRA for CAG or PCI in patients with ACS and complex CAD, which has great clinical significance.

Limitations of This Article

Although related research results have been published to show that dTRA is safe and effective for PCI in patients with ACS and complex CAD, the current research is mainly observational, with a small sample size, short follow-up time, and low level of evidence, which inevitably has some bias. Further multicenter prospective randomized controlled studies are needed to confirm.

CONCLUSION

Studies have shown that CAG or interventional therapy is safe and effective in patients with ACS and complex CAD using the new dTRA surgical path. It is expected to become the preferred path for CAG or PCI in patients with ACS and complex CAD.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – J.C.; Design – J.C.; Supervision – J.C.; Funding – None; Materials – G.C., H.X.C.; Data Collection and/or Processing – G.C., H.X.C.; Analysis and/or Interpretation – G.C., H.X.C., J.C.; Literature Review – G.C., H.X.C.; Writing – G.C., H.X.C.; Critical Review – G.C., H.X.C., J.C.

Declaration of Interests: The authors declare that they have no competing interest.

Funding: This study received no funding.

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