Původní sdělení | Original research article

Effect of Radial Artery Grafting on Clinical Outcomes After Coronary Artery Bypass Surgery: a Prospective Study on a Sample from Yemen

Abeer Shaiaa Naji Saadan[a], Nabeel Y. Al-Madwahi[b]

[a] *The Yemeni Board of Medical Specializations, Scientific Council of Surgery, Sana'a, Yemen*
[b] *Yemeni Board of Medical Specializations, Department of Vascular Surgery, Al-Thawra Modern General Hospital, Sana'a, Yemen*

ARTICLE INFO

Article history:
Submitted: 27. 12. 2025
Revised: 20. 1. 2026
Accepted: 21. 1. 2026
Available online: 25. 8. 2026

Klíčová slova:
Aortokoronární bypass
Klinické výsledky
Štěp z radiální tepny

SOUHRN

Kontext: Klíčovým faktorem ovlivňujícím klinické výsledky koronárního bypassu (coronary artery bypass grafting, CABG) je volba štěpu. Díky svým vynikajícím biologickým vlastnostem a průchodností ve srovnání se štěpy ze safény se postupem doby radiální tepna stala preferovaným tepenným štěpem, nicméně množství údajů z prospektivních studií popisujících krátkodobé klinické výsledky a obnovu funkcí spojených s použitím radiální tepny v rutinní klinické praxi je stále omezené.
Metody: Do této prospektivní deskriptivní studie byli zařazováni dospělí pacienti, u nichž byl proveden elektivní koronární bypass na vysoce specializovaném kardiochirurgickém pracovišti. Ve studii se shromažďovaly demografické, klinické, operační a postoperační údaje. Srdeční funkce se hodnotila elektrokardiograficky a transtorakální echokardiografií před výkonem a během následného sledování. Pacienti byli sledováni po dobu 3–6 měsíců. Hodnotily se klinické výsledky, pooperační komplikace, délka hospitalizace a pacientem uváděná kvalita života. Statistická analýza se prováděla pomocí neparametrických testů při statistické významnosti nastavené na hodnotu $p \leq 0{,}05$.
Výsledky: Do studie bylo zařazeno celkem 22 pacientů; sledování bylo dokončeno u všech. Štěpy z radiální tepny byly použity v 90,9 % případů. Statisticky významné pooperační zlepšení potvrdilo jak elektrokardiografické vyšetření, tak echokardiografie ($p < 0{,}001$). Méně závažné pooperační komplikace se vyskytly u 31,8 % pacientů; během sledování nedošlo k žádnému úmrtí, ani se nevyskytl žádný případ infarktu myokardu nebo cévní mozkové příhody. Kvalita života se zlepšila u 95,5 % pacientů. Celková úspěšnost výkonu dosáhla 90,9 %.
Závěry: Použití radiální tepny jako štěpu pro CABG bylo bezpečné a účinné a bylo spojeno se statisticky významným zlepšením srdeční funkce, nízkým výskytem komplikací a zlepšené krátkodobé kvality života. Tato zjištění podporují častější využívání radiální tepny jako štěpu u vhodných pacientů indikovaných k CABG.

Keywords:
Coronary artery bypass grafting
Clinical outcomes
Radial artery graft

ABSTRACT

Background: Conduit selection is a critical determinant of clinical outcomes following coronary artery bypass grafting (CABG). The radial artery has emerged as a preferred arterial conduit because of superior biological properties and patency compared with saphenous vein grafts. However, prospective data evaluating short-term clinical outcomes and functional recovery associated with radial artery use remain limited in routine clinical practice.
Methods: This prospective descriptive study included adult patients undergoing elective CABG at a tertiary cardiac surgery center. Demographic, clinical, operative, and postoperative data were collected. Cardiac function was assessed using electrocardiography and transthoracic echocardiography before surgery and during follow-up. Patients were followed for 3–6 months. Clinical outcomes, postoperative complications, hospital length of stay, and patient-reported quality of life were evaluated. Statistical analysis was performed using nonparametric tests, with a significance level set at $p \leq 0.05$.
Results: A total of 22 patients were included, all of whom completed follow-up. Radial artery grafts were utilized in 90.9% of cases. Significant postoperative improvement was observed in both electrocardiographic and echocardiographic findings ($p < 0.001$). Minor postoperative complications occurred in 31.8% of patients, with no reported cases of mortality, myocardial infarction, or stroke during the follow-up period. Quality of life improved in 95.5% of patients. The overall procedural success rate was 90.9%.
Conclusions: The use of the radial artery as a conduit in CABG was safe and effective, resulting in significant improvement in cardiac function, low complication rates, and enhanced short-term quality of life. These findings support broader adoption of the radial artery as a preferred arterial conduit in suitable patients undergoing CABG.

Address: Abeer Shaiaa Naji Saadan, MD, The Yemeni Board of Medical Specializations, Scientific Council of Surgery, Sana'a, Yemen,
e-mail: doctorabeer2018@gmail.com
DOI: 10.33678/cor.2026.007

Please cite this article as: Saadan ASN, Al-Madwahi NY. Effect of Radial Artery Grafting on Clinical Outcomes After Coronary Artery Bypass Surgery: a Prospective Study on a Sample from Yemen. Cor Vasa 2026;68:461–469.

Introduction

Though there is a noticeable advancement in the pharmacological therapy and percutaneous coronary intervention (PCI), the empirical findings show that coronary artery disease (CAD) continues to impose a considerable worldwide health burden. In addition, it has been established that CAD is among the leading causes of cardiovascular morbidity and mortality all over the world.[1–3] Although contemporary medical therapy and PCI have significantly improved outcomes in patients with stable and anatomically less complex disease, their benefits diminish as coronary complexity increases.[4] Consequently, in patients with multivessel CAD, left main coronary artery involvement, or diabetes mellitus, coronary artery bypass grafting (CABG) remains the most reliable and durable revascularization strategy.[5] This strategy offers superior long-term survival and sustained freedom from repeat revascularization.[6,7]

Importantly, the long-term success of CABG extends beyond operative technique and perioperative care. Rather, it is critically shaped by conduit selection, as graft durability directly influences postoperative survival, recurrent ischemia, the need for subsequent interventions, and long-term quality of life.[8,9] Among the available conduits, the left internal thoracic artery (LITA) has consistently demonstrated exceptional long-term patency and survival benefit and is therefore universally accepted as the gold-standard graft for revascularization of the left anterior descending artery.[8,10] In contrast, the optimal choice of a second conduit remains less clearly defined and continues to be the subject of active clinical investigation.[11]

For decades, the saphenous vein graft (SVG) has served as the default second conduit, largely due to its availability, ease of harvesting, and technical versatility.[12] However, mounting long-term evidence has revealed inherent biological limitations of venous grafts.[13] When exposed to systemic arterial pressure, SVGs are vulnerable to endothelial injury, intimal hyperplasia, and accelerated atherosclerotic change, processes that ultimately lead to progressive luminal narrowing and graft occlusion.[14–16] Indeed, angiographic studies have shown that up to 40–50% of SVGs may fail within a decade following CABG, thereby undermining long-term procedural durability and clinical benefit.[17,18]

By comparison, arterial conduits possess intrinsic biological characteristics that confer superior long-term performance.[19] These include preserved endothelial function, enhanced nitric oxide–mediated vasodilation, and greater resistance to atherosclerotic degeneration.[20,21] Within this context, the radial artery has emerged as a particularly compelling alternative.[22] Its favorable anatomical profile, appropriate luminal diameter, muscular wall composition, and capacity for physiological vasomotor adaptation render it well suited for coronary bypass grafting when carefully selected and supported by appropriate pharmacological management.[23,24]

Over the past two decades, a growing body of evidence from randomized controlled trials and large-scale observational studies has consistently demonstrated superior patency rates and improved clinical outcomes with radial artery grafts compared with SVGs.[25] Notably, the Radial Artery Patency Study and subsequent meta-analyses have reported significantly lower rates of graft occlusion and major adverse cardiac events among patients receiving radial artery conduits.[9,24,26] Furthermore, extended follow-up data suggest that radial artery use is associated with improved survival and a reduced need for repeat revascularization, particularly among younger patients and those with diabetes mellitus.[27]

In response to this accumulating evidence, contemporary international guidelines have increasingly endorsed the radial artery as the preferred second arterial conduit in suitable candidates undergoing CABG.[28] Both the European Society of Cardiology (ESC) and the American College of Cardiology/American Heart Association (ACC/AHA) guidelines now recommend radial artery grafting over saphenous vein use in the absence of contraindications, highlighting its long-term clinical.[29,30]

Despite strong evidentiary support and clear guideline endorsement, the adoption of radial artery grafting remains uneven across institutions and geographic regions.[26,31] This variability is particularly pronounced in low- and middle-income settings, where concerns related to surgical expertise, operative duration, vasospasm, and resource availability may limit routine implementation.[9] Moreover, although graft patency and long-term survival have been extensively examined, prospective data addressing short-term postoperative outcomes, functional recovery, and patient-reported quality of life in everyday clinical practice remain comparatively scarce.

Against this backdrop, the present study was designed to prospectively evaluate the safety and clinical effectiveness of radial artery grafting in patients undergoing elective CABG. Specifically, we sought to assess early postoperative cardiac function, perioperative complication rates, and short-term quality-of-life outcomes. We hypothesized that the use of the radial artery as a bypass conduit would be associated with favorable early clinical outcomes, a low complication profile, and meaningful improvements in short-term quality of life following CABG.

Patients and methods

Study design and setting

This study was designed as a prospective descriptive investigation conducted at a tertiary cardiac surgery center in Yemen. The study aimed to evaluate short-term clinical outcomes associated with the use of the radial artery as a conduit in coronary artery bypass grafting (CABG). The research protocol followed standard clinical research principles and reflected routine surgical practice at the study center.

Study population

Adult patients scheduled for elective CABG were consecutively screened for eligibility during the study period. Inclusion criteria comprised patients aged 35 years or older who were candidates for isolated elective CABG. Patients undergoing emergency surgery, those with a history of previous CABG, severe left ventricular dysfunction

(left ventricular ejection fraction <30%), significant valvular heart disease requiring surgical intervention, aortic pathology, or peripheral vascular disease affecting radial artery suitability were excluded. Patients unable or unwilling to provide informed consent were also excluded.

Preoperative assessment

All enrolled patients underwent comprehensive preoperative evaluation, including detailed medical history and physical examination. Cardiovascular risk factors such as diabetes mellitus, hypertension, hypercholesterolemia, smoking status, physical inactivity, and khat chewing were documented. Baseline investigations included electrocardiography, transthoracic echocardiography, laboratory testing, and coronary angiography. Radial artery suitability was assessed clinically, and Doppler ultrasonography was performed when indicated to confirm adequate collateral circulation and exclude arterial disease.

Surgical technique

All CABG procedures were performed through a standard median sternotomy under general anesthesia. The radial artery was harvested using an open, atraumatic technique with meticulous handling to minimize endothelial injury. Intraoperative antispasmodic measures were routinely employed. The radial artery graft was anastomosed to coronary vessels with significant stenosis to reduce the risk of competitive flow. The number and configuration of grafts were determined according to coronary anatomy and surgeon discretion.

Postoperative management and follow-up

Following surgery, patients were managed according to standard postoperative care protocols, including intensive care monitoring and guideline-directed medical therapy. Antiplatelet agents, statins, and other cardiovascular medications were prescribed unless contraindicated. Clinical assessments were between 3 and 6 months after surgery. Follow-up evaluations included physical examination, electrocardiography, echocardiography, and assessment of postoperative complications. Coronary computed tomography angiography was performed selectively to assess graft patency when clinically indicated.

Outcome measures

The primary outcome was overall procedural success, defined as survival without major adverse cardiac or cerebrovascular events and with objective improvement in cardiac function. Secondary outcomes included postoperative complications, length of hospital stay, need for repeat revascularization, graft patency when assessed, and patient-reported quality of life.

Data collection and management

Data were collected using a structured case report form and entered into a secure database. Data accuracy and completeness were verified prior to analysis. All patient identifiers were removed to ensure confidentiality.

Statistical analysis

Statistical analysis was performed using SPSS software. Continuous variables were summarized as means and standard deviations, while categorical variables were presented as frequencies and percentages. Preoperative and postoperative comparisons were conducted using the Wilcoxon signed-rank test. Associations between categorical variables were analyzed using the chi-square test, and correlations were evaluated using Pearson's correlation coefficient. All statistical tests were two-sided, and a p-value ≤ 0.05 was considered statistically significant.

Ethical considerations

The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the institutional review board of the study center. Written informed consent was obtained from all participants prior to enrollment. Patient confidentiality and data protection were strictly maintained throughout the study.

Results

Patient enrollment and baseline characteristics

Table 1 presents the demographic characteristics and personal habits of the study participants. The mean age of the patients was 50.0 ± 10.5 years, with the majori-

Table 1 – Demographic characteristics of the study population (N = 22)

Variable	Category	n	%
Age (years)	<50	14	63.6
	≥50	8	36.4
	Mean ± SD	50.0 ± 10.5	—
Sex	Male	22	100
Body mass index (kg/m²)	Underweight (<18)	1	4.5
	Normal (18–24.9)	4	18.2
	Overweight (25–29.9)	14	63.6
	Obese (≥30)	3	13.6
	Mean ± SD	26.0 ± 3.5	—
Marital status	Married	19	86.4
	Divorced	3	13.6
Residence	Urban	14	63.6
	Rural	8	36.4
Smoking	Yes	14	63.6
	No	8	36.4
Tobacco powder use	Yes	10	45.5
	No	12	54.5
Regular exercise	Yes	4	18.2
	No	18	81.8
Khat chewing	Yes	17	77.3
	No	5	22.7
Regular medication use	Yes	5	22.7
	No	17	77.3

Table 2 – Post-surgery outcomes at ≥3 and 6 months (N = 22)

Follow--up period	Outcome	Category/Symptom	n	%
≥3 months	Clinical outcome	Improvement	21	95.5
		Wound infection	1	4.5
	Adverse events	Bleeding	0	0.0
		Stroke	0	0.0
		Myocardial infarction	0	0.0
		Heart failure	0	0.0
		Pericardial effusion	0	0.0
		Death	0	0.0
6 months	Complications	Yes	7	31.8
		No	15	68.2
	Symptoms	Chest pain	0	0.0
		Shortness of breath	0	0.0
		Palpitations	0	0.0
		Leg swelling	7	31.8
		Other	0	0.0

ty being younger than 50 years (63.6%). All participants were male. The mean body mass index (BMI) was 26.0 ± 3.5 kg/m²; most patients were classified as overweight (63.6%), while 13.6% were obese. The majority of patients were married (86.4%) and resided in urban areas (63.6%). Regarding personal habits, a high proportion of participants reported cigarette smoking (63.6%) and khat chewing (77.3%). Most patients did not engage in regular physical exercise (81.8%) and did not use medications regularly (77.3%). More than half of the participants reported no use of tobacco powder (54.5%).

Post-surgery evaluation (≥3 months)

Long-term postoperative outcomes, including both the three-month and six-month follow-ups, are summarized in **Table 2**. At three months post-surgery, the majority of patients exhibited clinical improvement (21 patients, 95.5%), while only one patient (4.5%) experienced a wound infection, which subsequently resolved with appropriate care. No adverse events such as bleeding, stroke, myocardial infarction, heart failure, pericardial effusion, or death were reported during this period.

At six months post-surgery, most patients continued to show favorable outcomes with no complications (15 patients, 68.2%). A minority of patients (7 patients, 31.8%) experienced complications, all of which were limited to leg swelling. No patients reported chest pain, shortness of breath, palpitations, or other cardiac-related symptoms, indicating sustained clinical stability and safety of the surgical procedure over time (**Fig. 1**).

Medical history, cardiovascular risk factors, and surgical characteristics

The medical history, cardiovascular risk factors, and surgical characteristics of the study population are summarized in **Table 3**. Among the 22 participants, common comorbidities included hypercholesterolemia (14 patients, 63.6%), diabetes mellitus (13 patients, 59.1%), physical inactivity (13 patients, 59.1%), obesity (9 patients, 40.9%), and hypertension (8 patients, 36.4%). These findings highlight the prevalence of modifiable and non--modifiable risk factors in this patient cohort.

Regarding surgical characteristics, radial artery grafts were employed in 20 patients (90.9%). In all cases where the radial artery was used, a single graft was implanted. Additional arterial or venous grafts were required in one patient (4.5%). No intraoperative mortality or major technical complications were reported, reflecting the safety and technical feasibility of the procedure.

Success rate after surgery

Overall, 20 patients (90.9%) were classified as having a successful surgical outcome, while 2 patients (9.1%) did not meet the success criteria (**Table 4**).

Cardiac function before and after surgery

Cardiac and vascular evaluations were performed preoperatively and postoperatively to assess the effectiveness of

Table 3 – Medical history, cardiovascular risk factors, and surgical characteristics

Category	Variable	Category/Outcome	n	%
Medical history & cardiovascular risk factors	Diabetes mellitus	—	13	59.1
	Hypertension	—	8	36.4
	Hypercholesterolemia	—	14	63.6
	Obesity	—	9	40.9
	Physical inactivity	—	13	59.1
Surgical characteristics	Radial artery graft used	Yes	20	90.9
		No	2	9.1
	Number of RA grafts	One	20	90.9
		None	2	9.1
	Additional grafts used	Yes	1	4.5
		No	21	95.5

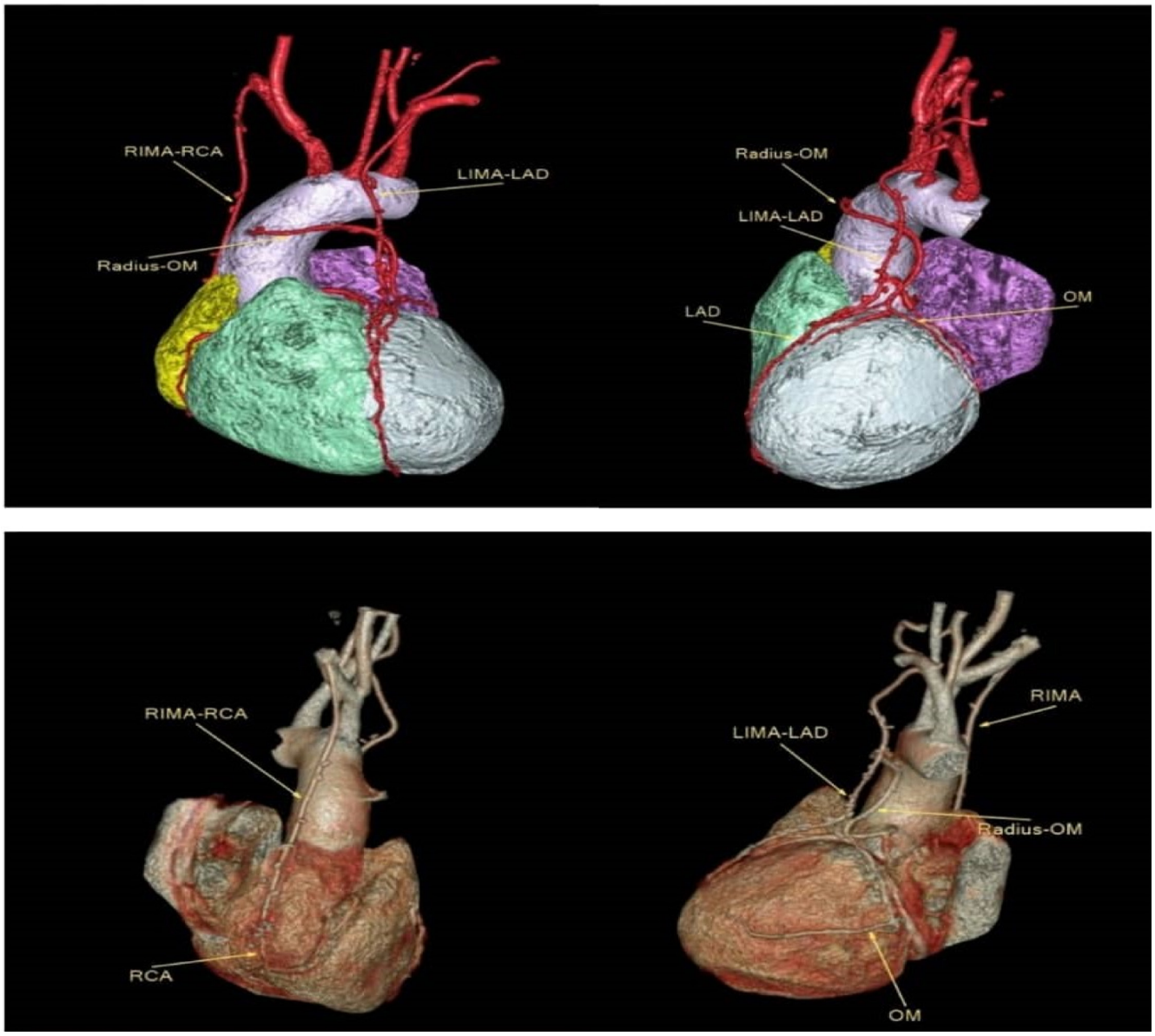

Fig. 1 – Complete revascularization after surgery using CT angiography.

coronary artery bypass grafting using radial artery grafts (**Table 5**).

Preoperative assessment revealed that the majority of patients had abnormal findings on electrocardiography (ECG) (21 patients, 95.5%), while only one patient (4.5%) demonstrated a normal ECG. Similarly, all participants (22 patients, 100%) had abnormal echocardiographic findings prior to surgery, indicating significant baseline cardiac dysfunction.

Postoperative assessments demonstrated marked improvement in cardiac function. All patients exhibited normal ECG and echocardiographic findings (22 patients, 100%). Additionally, postoperative Doppler ultrasonography of the upper limbs and abdominal ultrasonography were normal in all patients (100%), suggesting restoration of vascular integrity.

Regarding hospital stay, most patients were discharged within 10 days (13 patients, 59.1%), while a minority required hospitalization for more than 10 days (9 patients, 40.9%). These findings indicate that the surgical intervention resulted in substantial improvements in cardiac function, vascular status, and early postoperative recovery.

Mean differences in cardiac and vascular evaluations

Wilcoxon signed-rank test analysis demonstrated a statistically significant postoperative improvement in both ECG findings ($Z = -4.583$, $p < 0.001$) and echocardiographic parameters ($Z = -4.690$, $p < 0.001$), as summarized in **Table 6**. These results indicate a marked improvement in cardiac electrical and functional status following surgical intervention.

Post-operative outcomes

As shown in **Table 7**, it is noticed that in the early postoperative period (1 day to 3 months), the majority of patients

Table 4 – Success rate after surgery

Outcome	n	%
Success	20	90.9
Fail	2	9.1

Table 5 – Cardiac and vascular evaluations before and after surgery (N = 22)

Evaluation period	Variable	Category	n	%
Pre-surgery	ECG	Normal	1	4.5
		Abnormal	21	95.5
	Echocardiography	Normal	0	0.0
		Abnormal	22	100
Post-surgery	ECG	Normal	22	100
		Abnormal	0	0.0
	Echocardiography	Normal	22	100
		Abnormal	0	0.0
	Doppler U/S (upper limb)	Normal	22	100
		Abnormal	0	0.0
	Abdominal U/S	Normal	22	100
		Abnormal	0	0.0
	Hospital stays	≤10 days	13	59.1
		>10 days	9	40.9

Table 6 – Comparison of pre- and post-operative cardiac function (Wilcoxon test)

Variable	Z-value	*p*-value	Interpretation
ECG	–4.583	<0.001	Significant improvement
Echocardiography	–4.690	<0.001	Significant improvement

Table 7 – Post-operative outcomes

Category	Outcome	n	%
Early outcomes (1 day–3 months)	Clinical improvement	19	86.4
	Revascularization	2	9.1
	Irregular heartbeat	1	4.5
	Major complications	0	0
Medium-term outcomes (6 months)	Any complication	7	31.8
	Leg swelling	7	31.8
	Chest pain / MI / Stroke	0	0
Quality of life after surgery	Excellent	4	18.2
	Very good	17	77.3
	Good	1	4.5
	Fair / Poor	0	0
Overall, success rate	Successful	20	90.9
	Failed	2	9.1

Table 8 – Association between residence and surgical success

Residence	Success, n (%)	Failure, n (%)	χ^2	*p*-value
Urban	14 (63.6)	0 (0)	3.85	**0.050**
Rural	6 (27.3)	2 (9.1)		

Table 9 – Correlation between number of grafts and post-operative outcomes

Outcome variable	Pearson r	*p*-value
Hospital stays	0.177	0.431
Early outcomes (≤3 months)	0.000	1.000
Late outcomes (≥3 months)	**–0.836**	**<0.001**
Quality of life	–0.191	0.396

demonstrated favorable recovery. Clinical improvement was observed in 19 of the participants (86.4%), while revascularization was documented in 2 patients (9.1%). Only one patient (4.5%) experienced an irregular heartbeat, and there were no major complications during this interval, highlighting a generally positive short-term safety profile. At the medium-term follow-up at 6 months, 31.8% of patients (n = 7) reported complications, all of which were attributable to leg swelling; there were no events of chest pain, myocardial infarction, or stroke, indicating an absence of serious cardiopulmonary adverse outcomes in this cohort.

Assessment of quality-of-life following surgery revealed predominantly high patient-reported outcomes, with 4 patients (18.2%) rating their status as excellent, 17 (77.3%) as very good, and 1 (4.5%) as good; none of the patients reported fair or poor quality of life. Overall, the success rate of the surgical intervention was 90.9% (n=20), with a failure rate of 9.1% (n = 2), demonstrating a high level of clinical effectiveness within the studied sample.

Association between residence and surgical success

As noticed in **Table 8,** a statistically significant association was observed between place of residence and procedural success, with higher success rates among patients residing in urban areas ($\chi^2 = 3.85$, $p = 0.05$).

No significant associations were identified between procedural success and age, body mass index, marital status, educational level, smoking status, khat chewing, physical activity, or medication adherence.

Correlation between number of grafts and post-operative outcomes

As shown in **Table 9**, the findings of the Pearson correlation analysis demonstrated a strong negative correlation between the number of grafts implanted and late post-operative outcomes beyond three months ($r = –0.836$, $p < 0.001$). No significant correlations were observed between the number of grafts and hospital length of stay, early postoperative outcomes, or postoperative quality of life.

Discussion

Principal findings

In this prospective cohort study, use of the radial artery as a conduit for elective coronary artery bypass grafting (CABG) was associated with excellent short-term clinical outcomes, including significant postoperative improvements in objective cardiac function measures, a low incidence of perioperative and early postoperative complications, the absence of major adverse cardiac and cerebrovascular events, and substantial enhancement in patient-reported quality of life. These data provide compelling evidence for the safety, procedural success, and clinical effectiveness of radial artery grafting in contemporary CABG practice.

Interpretation in the context of existing evidence

The normalization of electrocardiographic and echocardiographic parameters observed postoperatively in this study indicates effective myocardial revascularization and early functional recovery, consistent with the known biological advantages of arterial over venous conduits. Arterial grafts such as the radial artery maintain endothelial integrity, preserve nitric oxide–mediated vasomotion, and demonstrate greater resistance to intimal hyperplasia and atherosclerotic degeneration compared with saphenous vein grafts, supporting mechanistic plausibility for superior outcomes with arterial conduit.[20,21,32]

Randomized controlled trials and large observational studies have consistently demonstrated higher patency rates and improved clinical outcomes with radial artery grafts relative to saphenous vein grafts.[9,24,33] Long-term analyses further suggest that the use of the radial artery is associated with improved survival and reduced need for repeat revascularization, particularly in younger patients and those with diabetes mellitus.[27] Although the present study focused primarily on short-term outcomes, the favorable early functional recovery observed may represent an important mechanistic link between superior graft biology and improved long-term prognosis.

The low incidence of postoperative complications and the absence of mortality, myocardial infarction, or stroke during follow-up further support the safety profile of radial artery grafting.[34] Earlier concerns regarding radial artery vasospasm, technical complexity, and increased operative time have been largely mitigated through advances in harvesting techniques, atraumatic conduit handling, and routine use of perioperative antispasmodic therapy.[9,22,23,35] The application of these contemporary strategies in the present cohort likely contributed to the observed low complication rates and favorable outcomes.

Quality of life and patient-centered outcomes

An important and clinically relevant finding of this study is the substantial improvement in postoperative quality of life, with most patients reporting very good or excellent outcomes. While much of the existing literature has focused on angiographic graft patency and survival, patient-reported outcomes have received comparatively less attention. Nevertheless, quality of life and functional recovery are increasingly recognized as critical endpoints in cardiovascular surgery, particularly in the context of elective revascularization.[7,36,37]

The observed improvement in quality of life likely reflects effective symptom relief, enhanced myocardial perfusion, improved cardiac function, and an uncomplicated postoperative course. These findings are consistent with prior studies suggesting that arterial revascularization strategies may translate into better functional status and patient satisfaction, beyond traditional hard clinical endpoints.[9,38] From a patient-centered perspective, these outcomes are highly relevant, as they directly influence return to daily activities, adherence to secondary prevention, and overall well-being.[39]

Clinical implications

The findings of this study add to the growing body of evidence supporting the radial artery as the preferred second arterial conduit in CABG, as increasingly recommended by contemporary international guidelines.[29,30] In appropriately selected patients, radial artery grafting appears to provide effective myocardial revascularization without increasing perioperative risk, while offering meaningful improvements in early functional and quality-of--life outcomes.[39] These results support broader adoption of arterial revascularization strategies, particularly in centers seeking to optimize short-term recovery and patient satisfaction following CABG.

The observed association between urban residence and procedural success may reflect differences in healthcare access, postoperative follow-up, health literacy, and adherence to guideline-directed medical therapy. Although this finding should be interpreted cautiously due to potential confounding factors, it underscores the importance of structured postoperative care pathways and equitable access to follow-up services to ensure optimal outcomes across diverse patient populations.

Limitations

Several limitations of this study should be acknowledged. The relatively small sample size and single-center design may limit the generalizability of the findings, while the exclusive inclusion of male patients restricts applicability to female populations. In addition, the follow-up duration was insufficient to evaluate long-term graft patency and survival outcomes, which have been emphasized in prior studies. Routine postoperative angiographic assessment was not performed in all patients, and residual unmeasured confounding cannot be excluded.

The modest sample size should be interpreted within the context of the study's prospective design and clinical setting. This investigation was conducted at a single tertiary cardiac surgery center in a low-resource, conflict-affected environment, where the volume of elective coronary artery bypass grafting is inherently limited. Furthermore, stringent inclusion and exclusion criteria were applied to ensure patient safety and cohort homogeneity, particularly regarding elective surgery, radial artery suitability, and preserved left ventricular function.

Despite these constraints, the prospective nature of the study, complete follow-up of all enrolled patients,

and use of paired pre- and postoperative assessments enhanced internal validity and statistical efficiency. The large and statistically robust effect sizes observed for key outcomes, including electrocardiographic and echocardiographic improvement, indicate adequate sensitivity to detect clinically meaningful short-term changes. Importantly, the study was designed as a descriptive and exploratory investigation aimed at evaluating early safety, feasibility, and functional outcomes of radial artery grafting in routine clinical practice rather than providing definitive comparative or long-term efficacy estimates.

Accordingly, the findings should be considered hypothesis-generating and context-specific, offering valuable prospective evidence from an underrepresented setting. Larger multicenter studies with extended follow-up are warranted to confirm these results and to assess long-term graft patency and survival outcomes.

Conclusion

This prospective study demonstrates that the use of the radial artery as a conduit in coronary artery bypass grafting is safe and effective in routine clinical practice. Radial artery grafting was associated with significant postoperative improvement in objective measures of cardiac function, a low incidence of perioperative and short-term complications, and substantial enhancement in patient-reported quality of life. No major adverse cardiac or cerebrovascular events were observed during follow-up.

These findings support the role of the radial artery as a preferred arterial conduit in appropriately selected patients undergoing elective CABG. When combined with careful patient selection, meticulous surgical technique, and structured postoperative care, radial artery grafting can achieve high procedural success without increasing perioperative risk.

Although the follow-up period was limited and the study population was relatively small, the results are consistent with existing evidence cited in this manuscript and contribute context-specific prospective data on short-term outcomes following radial artery use in CABG. Larger, multicenter studies with longer follow-up are warranted to further evaluate long-term graft durability and survival outcomes.

Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this study.

Ethical statement

The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the institutional review board of the study center.

Informed consent

Written informed consent was obtained from all participants prior to enrollment. Patient confidentiality and data protection were strictly maintained throughout the study.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. Due to ethical and privacy considerations, the data are not publicly available.

References

1. Roth GA, Mensah GA, Johnson CO, et al. Global Burden of Cardiovascular Diseases and Risk Factors, 1990–2019. J Am Coll Cardiol 2020;76:2982–3021.
2. Benjamin EJ, Muntner P, Alonso A, et al. heart disease and stroke statistics—2019 update: A report from the American Heart Association. Circulation 2019;139(10).
3. Giubilato S, Lucà F, Abrignani MG, et al. Management of residual risk in chronic coronary syndromes. Clinical pathways for a quality-based secondary prevention. J Clin Med 2023;12:5989.
4. Theuerle J, Farouque O, Clark D, et al. Is complex percutaneous coronary intervention associated with worse long-term mortality? Heart Lung Circ 2016;25:S179–S180.
5. EL-Andari R, Kang J, Fialka N, et al. Revascularization strategy for left main coronary artery disease comparing percutaneous coronary intervention versus coronary artery bypass grafting. Communications Medicine 2025;5(1).
6. Serruys PW, Cavalcante R, Collet C, et al. Outcomes After Coronary Stenting or Bypass Surgery for Men and Women with Unprotected Left Main Disease. JACC Cardiovasc Interv 2018;11:1234–1243.
7. Head SJ, Milojevic M, Daemen J, et al. Stroke rates following surgical versus percutaneous coronary revascularization. J Am Coll Cardiol 2018;72:386–398.
8. Loop FD, Lytle BW, Cosgrove DM, et al. Influence of the internal-mammary-artery graft on 10-year survival and other cardiac events. N Engl J Med 1986;314:1–6.
9. Gaudino M, Benedetto U, Fremes S, et al. Radial-Artery or saphenous-vein grafts in coronary-artery bypass surgery. N Engl J Med 2018;378:2069–2077.
10. Cameron A, Davis KB, Green G, Schaff HV. Coronary bypass surgery with internal-thoracic-artery grafts — effects on survival over a 15-year period. N Engl J Med 1996;334:216–220.
11. Goldstone AB, Chiu P, Baiocchi M, et al. Second arterial versus venous conduits for multivessel coronary artery bypass surgery in california. Circulation 2022;137:1698–1707.
12. Sajja LR, Kamtam DN, Sreeramula SK, Beri P. Current practice of saphenous vein graft harvesting in coronary artery bypass graft surgery: An Indian survey. Indian J Thorac Cardiovasc Surg 2022;39:115–124.
13. Back L, Ladwiniec A. Saphenous vein graft failure: Current challenges and a review of the contemporary percutaneous options for management. J Clin Med 2023;12:7118.
14. FitzGibbon GM, Leach AJ, Kafka HP, Keon WJ. Coronary bypass graft fate: Long-term angiographic study. J Am Coll Cardiol 1991;17:1075–1080.
15. Goldman S, Zadina K, Moritz T. Long-term patency of saphenous vein and left internal mammary artery grafts after coronary artery bypass surgery. ACC Curr J Rev 2005;14:50.
16. Heng EE, Wang H, Obafemi O, et al. The biomechanics and prevention of vein graft failure in coronary revascularization. Vessel Plus 2023;7:31.
17. Motwani JG, Topol EJ. Aortocoronary saphenous vein graft disease. Circulation 1998;97:916–931.
18. Alexander JH, Hafley G, Harrington RA, et al. Efficacy and safety of edifoligide, an {E2F} transcription factor decoy, for prevention of vein graft failure following coronary artery bypass graft surgery. JAMA 2005;294:2446–2454.
19. Gharibeh L, Ferrari G, Ouimet M, Grau JB. Conduits' biology regulates the outcomes of coronary artery bypass grafting. JACC Basic Transl Sci 2021;6:388–396.
20. Lüscher TF, Diederich D, Siebenmann R, et al. Difference between endothelium-dependent relaxation in arterial and in venous coronary bypass grafts. N Engl J Med 1988;319:462–467.

21. He GW, Yang CQ. Characteristics of adrenoceptors in the human radial artery: Clinical implications. J Thorac Cardiovasc Surg 1998;115:1136–1141.
22. Nappi F, Nassif A, Schoell T, Acar C. Radial artery used as conduit for coronary artery bypass grafting. Surgeries 2025;6(1):6.
23. Acar C, Jebara VA, Portoghese M, et al. Revival of the radial artery for coronary artery bypass grafting. Ann Thorac Surg 1992;54:652–660.
24. Desai ND, Cohen EA, Naylor CD, Fremes SE. A randomized comparison of radial-artery and saphenous-vein coronary bypass grafts. N Engl J Med 2004;351:2302–2309.
25. Tatoulis J, Schwann TA. Long term outcomes of radial artery grafting in patients undergoing coronary artery bypass surgery. Ann Cardiothorac Surg 2018;7:636–643.
26. Goldman S, McCarren M, Sethi GK, et al. Long-Term mortality follow-up of radial artery versus saphenous vein in coronary artery bypass grafting: A multicenter, randomized trial. Circulation 2022;146:1323–1325.
27. Tranbaugh RF, Dimitrova KR, Friedmann P, et al. Coronary artery bypass grafting using the radial artery. Circulation 2012;126(11_suppl_1).
28. Nappi F, Bellomo F, Nappi P, et al. The use of radial artery for {CABG}: An update. Biomed Res Int 2021;2021(1).
29. Neumann FJ, Sousa-Uva M, Ahlsson A, et al. 2018 {ESC}/{EACTS} Guidelines on myocardial revascularization. Eur Heart J 2018;40:87–165.
30. Lawton JS, Tamis-Holland JE, Bangalore S, et al. 2021 {ACC}/{AHA}/{SCAI} guideline for coronary artery revascularization. J Am Coll Cardiol 2022;79:e21–e129.
31. Ren J, Royse C, Royse A. Late clinical outcomes of total arterial revascularization or multiple arterial grafting compared to conventional single arterial with saphenous vein grafting for coronary surgery. J Clin Med 2023;12:2516.
32. Athanasiou T, Saso S, Rao C, et al. Radial artery versus saphenous vein conduits for coronary artery bypass surgery: forty years of competition — which conduit offers better patency? A systematic review and meta-analysis. Eur J CardioThorac Surg 2011;40:208–220.
33. Gaudino M, Benedetto U, Fremes S, et al. Association of Radial Artery Graft vs Saphenous Vein Graft With Long-term Cardiovascular Outcomes Among Patients Undergoing Coronary Artery Bypass Grafting. JAMA 2020;324:179.
34. Sato H, Fukada J, Iwashiro Y, Tamiya Y. Twenty-year outcomes of free and I-composite radial artery grafts for coronary artery revascularization. Surg Today 2023;53:1132–1138.
35. Qiao E, Wang Y, Yu J, et al. Short-term assessment of radial artery grafts with multidetector computed tomography. J Cardiothorac Surg 2021;16:93.
36. Jokinen JJ, Hippeläinen MJ, Turpeinen AK, et al. Health-Related Quality of Life After Coronary Artery Bypass Grafting: A Review of Randomized Controlled Trials. J Card Surg 2010;25:309–317.
37. Creber RM, Dimagli A, Spadaccio C, et al. Effect of coronary artery bypass grafting on quality of life: a meta-analysis of randomized trials. Eur Heart J Qual Care Clin Outcomes 2022;8:259–268.
38. Fleissner F, Engelke H, Rojas-Hernandez S, et al. Long-term follow-up of total arterial revascularization with left internal thoracic artery and radial artery T-grafts: survival, cardiac morbidity and quality of life. Eur J CardioThorac Surg 2016;49:1195–1200.
39. Dreyer RP, Dickson VV. Return to Work After Acute Myocardial Infarction. Circ Cardiovasc Qual Outcomes 2018;11(6).