

Original

## Comparison between femoral and radial approach in invasive coronary procedures after coronary artery bypass grafting

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### ABSTRACT

**Background:** Invasive coronary procedures are common in patients with previous coronary artery bypass graft surgery. Data on the actual role and possible limitations of the radial approach in this subgroup of patients are sparse. The objective of this study was to evaluate the feasibility and safety of radial access in patients surgically revascularized and who underwent subsequent invasive diagnostic or therapeutic coronary procedures, comparing it to the femoral access.

**Methods:** Between May 2008 and November 2014, 959 procedures were included; 539 performed by radial access and 420 by femoral access. All operators were familiar with both vascular accesses, and the final decision on the route to be used was left to the operators discretion.

**Results:** The failure rate was 6.1% vs. 0.5% ( $p < 0.0001$ ), favoring the femoral approach. Major adverse cardiac events (0.4% vs. 0.7%) and vascular complications (1.5% vs. 1.9%) rates were low, with no difference between groups. The choice of the radial approach resulted in greater fluoroscopy time and crossover rate between access routes, especially in diagnostic procedures.

**Conclusions:** The radial approach was a safe and effective option for invasive coronary procedures in post-coronary artery bypass graft patients, especially for therapeutic procedures.

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## Comparação entre as vias de acesso femoral e radial em procedimentos coronários invasivos após cirurgia de revascularização miocárdica

### RESUMO

**Introdução:** Procedimentos coronários invasivos são comuns em pacientes com revascularização miocárdica cirúrgica prévia. Dados acerca do real papel e das possíveis limitações do acesso radial nesse subgrupo de pacientes são infrequentes. O objetivo deste estudo foi avaliar a factibilidade e a segurança do acesso radial em pacientes revascularizados cirurgicamente e que foram submetidos a procedimentos coronários invasivos diagnósticos ou terapêuticos subsequentes, comparando-o ao acesso femoral.

**Métodos:** Entre maio de 2008 e novembro de 2014, foram analisados 959 procedimentos, sendo 539 realizados pelo acesso radial e 420 pelo femoral. Todos os operadores estavam familiarizados com ambos os acessos vasculares, cabendo a eles a decisão final sobre a via a ser utilizada.

**Resultados:** A prevalência de insucesso foi de 6,1% vs. 0,5% ( $p < 0,0001$ ), favorecendo a técnica femoral. As taxas de eventos cardíacos adversos graves (0,4% vs. 0,7%) e de complicações vasculares (1,5% vs. 1,9%) foram baixas, sem diferença entre os grupos. A opção pela técnica radial implicou em maior tempo de fluoroscopia e necessidade de cruzamento entre vias de acesso, principalmente em procedimentos diagnósticos.

#### Palavras-chave:

Artéria radial

Artéria femoral

Cateterismo cardíaco

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Revascularização miocárdica

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**Conclusões:** O acesso radial representou uma opção segura e eficaz para a realização de procedimentos coronários invasivos em pacientes cirurgicamente revascularizados, notadamente para os procedimentos terapêuticos.

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## Introduction

Invasive coronary procedures are common in patients with a history of coronary artery bypass graft surgery (CABG), traditionally performed via femoral access. However, the radial technique has progressively gained wide acceptance because of its effectiveness in reducing vascular complications, with a potential prognostic impact, as well as offering earlier ambulation and/or hospital discharge.<sup>1-3</sup>

However, studies on the actual role and possible limitations of the radial approach in patients with a history of CABG are infrequent, since this represents a high-risk subgroup with diffuse atherosclerosis and complex lesions, and is usually excluded or poorly represented in comparative studies between access routes.<sup>4,5</sup>

This analysis aimed to evaluate the feasibility and safety of the radial approach in patients with history of CABG who underwent subsequent invasive diagnostic or therapeutic coronary procedures, comparing it to the femoral approach, with emphasis on technical aspects such as the need for crossover, procedure duration, fluoroscopy time, number of catheters used, and vascular complications.

## Methods

### Study population

This study retrospectively reviewed all patients with history of CABG referred for invasive coronary diagnostic or therapeutic procedures in the period between May 2008 and November 2014, in a single center. All surgeons were familiar with both vascular accesses, and the final decision regarding approach was left to their discretion.

### Procedures

The radial artery was punctured with a 20-22 Jelco catheter using the Seldinger technique or a modified Seldinger technique, using a short hydrophilic-coated 5F or 6F sheath. A solution containing 5,000 IU of unfractionated heparin (UFH) and 10 mg of isosorbide mononitrate was administered through an extension of the sheath, and the UFH dose was complemented to 100 IU/kg in the case of a percutaneous coronary intervention (PCI). At the end of the procedure, the sheath was immediately removed, and hemostasis was performed with a pressure dressing (a porous elastic adhesive bandage in diagnostic tests or a selective compressive bracelet in therapeutic interventions). Allen's test was not routinely performed.

After a subcutaneous infiltration with 15-20 mL of 2% xylocaine, the femoral artery was punctured below the inguinal ligament with an 18G needle, using the modified Seldinger technique, with insertion of a 5F or 6F sheath. 2,500 IU of UFH were administered through the sheath extension, and the dose was complemented to 100 IU/kg in the case of PCI. Hemostasis was obtained by manual compression 2 hours after the procedure, or in case of an activated clotting time < 180 seconds.

Coronary angiography was performed by Judkins technique, using preformed catheters for selective cannulation of coronary ar-

teries and surgical grafts. A pigtail catheter was systematically used for left ventriculography in femoral access, but not in radial access; in the latter case, a Tiger, Judkins right, or multipurpose catheter was preferably used, to avoid excessive handling and arterial spasm.

### Outcomes and definitions

The effectiveness of the study techniques was evaluated by the success rate of the procedure, defined as the completion of a coronary angiography and left ventriculography with adequate coronary and graft opacification; or, with respect to therapeutic interventions, obtaining a residual lesion < 20%, with no need to change the access port. The duration of the procedure and the fluoroscopy time were measured from the beginning of the arterial puncture to the removal of the last catheter.

Procedural safety was evaluated by the incidence of vascular complications related to the puncture site, including severe bleeding, hematoma > 5 cm, arteriovenous fistula, pseudoaneurysm, arterial occlusion, or the need for a reconstructive vascular surgery. Bleedings of type 3 or 5 were classified as severe events, according to the definition of the Bleeding Academic Research Consortium.<sup>6</sup>

### Statistical analysis

The qualitative variables were summarized in absolute frequencies and percentages. Quantitative data were expressed as means  $\pm$  standard deviations or medians (25<sup>th</sup> percentile – 75<sup>th</sup> percentile), according to the distribution of each variable. Comparisons between groups were performed through the Chi-squared test or Fisher's exact test for qualitative variables and Student's *t*-test or the Mann-Whitney test for quantitative variables. Results with  $p < 0.05$  were considered statistically significant.

## Results

Among 13,579 procedures performed, 959 (7.1%) involved patients with previous CABG; of these, 539 (56.2%) were performed by radial, and 420 (43.8%) by femoral access. Baseline clinical characteristics did not differ between groups and are summarized in Table 1. In this population, the high rates of comorbidities are noteworthy, such as diabetes mellitus, hypertension, dyslipidemia, and prior myocardial infarction. Stable coronary atherosclerosis was the predominant clinical presentation.

Diagnostic procedures accounted for 73.7% of the total, and were more commonly performed by femoral approach (Table 2). Elective percutaneous coronary interventions constituted 18.9% of the sample, and in these events the use of radial access prevailed. The overall failure rate was 6.1% vs. 0.5% ( $p < 0.0001$ ) favoring the femoral technique. During hospitalization, serious adverse cardiac events occurred in two patients (0.4%) of the radial group and in three (0.7%) of the femoral group, with no statistically significant difference ( $p = 0.66$ ). The prevalence of vascular complications was low and did not differ between groups (1.5 vs. 1.9%;  $p = 0.62$ ).

Table 3 illustrates the differences in procedure duration, fluoroscopy time, number of catheters used, and failure rate, stratified according to the type of procedure performed. The choice of the radial technique in diagnostic catheterizations was associated with a

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