

Radial Approach in Percutaneous Coronary Interventions: Current Status in Brazil

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Abstract

Background: Although the radial approach offers an unquestionable result in terms of reduction of vascular complications and occurrence of severe bleeding in comparison to the femoral approach, so far it has only been used in few centers which elected it as the preferential access.

Objective: To evaluate the current status of percutaneous coronary interventions in Brazil, as regards the use of the radial approach.

Methods: Analysis of data spontaneously recorded in *Central Nacional de Intervenções Cardiovasculares* - CENIC (National Center for Cardiovascular Interventions) from 2005 to 2008, in a total of 83,376 procedures.

Results: The radial approach was used in 12.6% of the procedures performed, and the femoral approach, in 84.3%. The remaining 3.1% corresponded to brachial artery dissection or puncture. With a success rate of 97.5%, the choice of the radial approach was associated with a significant reduction of vascular complications in comparison to the femoral approach (2.5% versus 3.6 %, $p < 0.0001$).

Conclusion: The radial approach remains uncommonly used in Brazil, and this is possibly explained by the lack of training programs, uncertainties regarding the learning curve, and the lack of large-scale studies corroborating the benefits demonstrated to date. (*Arq Bras Cardiol* 2011;96(4):312-316)

Keywords: Radial artery; femoral artery; angioplasty transluminal, percutaneous coronary/methods; medical records; Brazil.

Introduction

First described in 1948¹, the radial approach began to raise the interest of the cardiology community as from Campeau's² and Kiemeneij and Laarman's³ publications in 1989 and 1993, which corroborated the feasibility of the technique for the performance of diagnostic and therapeutic coronary procedures. Although the technique is fully developed today, with unquestionable results regarding the reduction of vascular complications and occurrence of severe bleeding in comparison to the femoral approach^{4,5}, its use remains restricted to few centers whose operators have chosen it as the preferential access.

In Brazil, data referring to the late 1990's showed that the femoral approach prevailed over the radial approach, since it was used in 90% of the procedures, whereas the radial approach was used in only 8% of the cases, with the remaining 2% represented by the Sones technique or brachial artery puncture⁶. However, the growing availability of new

and consistent evidence proving the benefits of the use of the radial approach for the performance of percutaneous coronary interventions (PCI), especially in the presence of acute ischemic syndromes, could have a positive impact translated into a more widespread use of this technique.

The objective of the present study was to present the results of PCI in Brazil, regarding the approach used, in the period from 2005 to 2008, according to data from *Central Nacional de Intervenções Cardiovasculares* - CENIC (National Center for Cardiovascular Interventions).

Methods

CENIC is the official agency of the Brazilian Society of Hemodynamics and Interventional Cardiology (SBHCI), created in 1991 to document the performance and evolution of the specialty in Brazil. It comprises a database of voluntary contribution from the full members of and applicants to this society accredited to perform PCI, and includes the five Brazilian geographic regions. In addition, its consistency may be verified by consulting previous publications⁷⁻⁹.

The coordinating center is located in SBHCI's headquarters in São Paulo, and their working method, based on electronic data collection in pre-specified telereports, identical for all

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participating centers, has been described before¹⁰. Data regarding PCI started to be collected in 1992. It is worth pointing out that novel percutaneous tools other than balloon coronary angioplasty have been incorporated as from the second semester of 1995.

For the analysis, we used data related to PCI performed between 2005 and 2008. The following criteria and definitions established by CENIC were used, but at the discretion of the operators: approach (femoral, radial, or brachial); procedural success (achieving residual lesion smaller than 50% in interventions without the use of coronary stents, and < 30% in those using endoprostheses); occurrence of serious adverse outcomes during hospitalization - death; acute vessel occlusion (detection of target vessel occlusion up to 24 hours after the procedure); reinfarction; emergency surgery (performed due to acute or subacute target-vessel occlusion within the first 24 hours after the procedure, or caused by other modalities of failed angioplasty, and accompanied by acute myocardial ischemia); and other complications (vascular complications with or without the need for blood transfusion, and stroke).

The statistical analysis was carried out using the SPSS software program version 12.0 (SPSS Inc., Chicago, IL, USA). Continuous variables were expressed as mean and standard deviation, and categorical variables as absolute numbers and percentages. Univariate analysis of categorical variables was carried out using the chi-square test or Fisher's exact test; continuous variables were analyzed using the Student's t test. P values ≤ 0.05 were considered significant.

Results

Between January 1st, 2005 and December 31, 2008 the number of PCI recorded each year was 27266, 19410, 21321

and 15379, respectively, in a total of 83376 procedures in the quadrennium.

The percentage of use of the radial approach in this period was 12.7% in 2005, 14.9% in 2006, 11.2% in 2007, and 14% in 2008, in a total of 10555 procedures (Figure 1). Of these, the success rate was 97.5%, with 2.5% of vascular complications, 0.4% of mortality, 0.3% of reinfarction, and 0.04% of emergency surgeries.

In comparison to the femoral approach for the performance of PCI, the radial approach was associated with a significant reduction of vascular complications, a finding that was consistent in the four years analyzed (Table 1), as well as among patients undergoing elective, primary or rescue PCI (Table 2).

The finding of a higher procedural success rate in the present case series - whether in elective or emergency procedures, and of reduced mortality when the radial approach was used possibly reflects the selection of patients with a lower degree of complexity and severity for the use of this technique.

The femoral approach remains preferential for the performance of PCI in Brazil, being used in 84.3% of the cases. Of these, 3.6% are vascular complications; 0.9%, mortality; 0.4%, reinfarction; and 0.06%, emergency surgery.

Discussion

The statistics regarding the period of 2005-2008 point to a slight increase in the percentage of use of the radial approach for the performance of PCI in Brazil, going from 8% to 12.6% of the procedures, with a concomitant decrease from 90% to 84.3% in the use of the femoral approach. They also corroborate the superiority of the radial approach

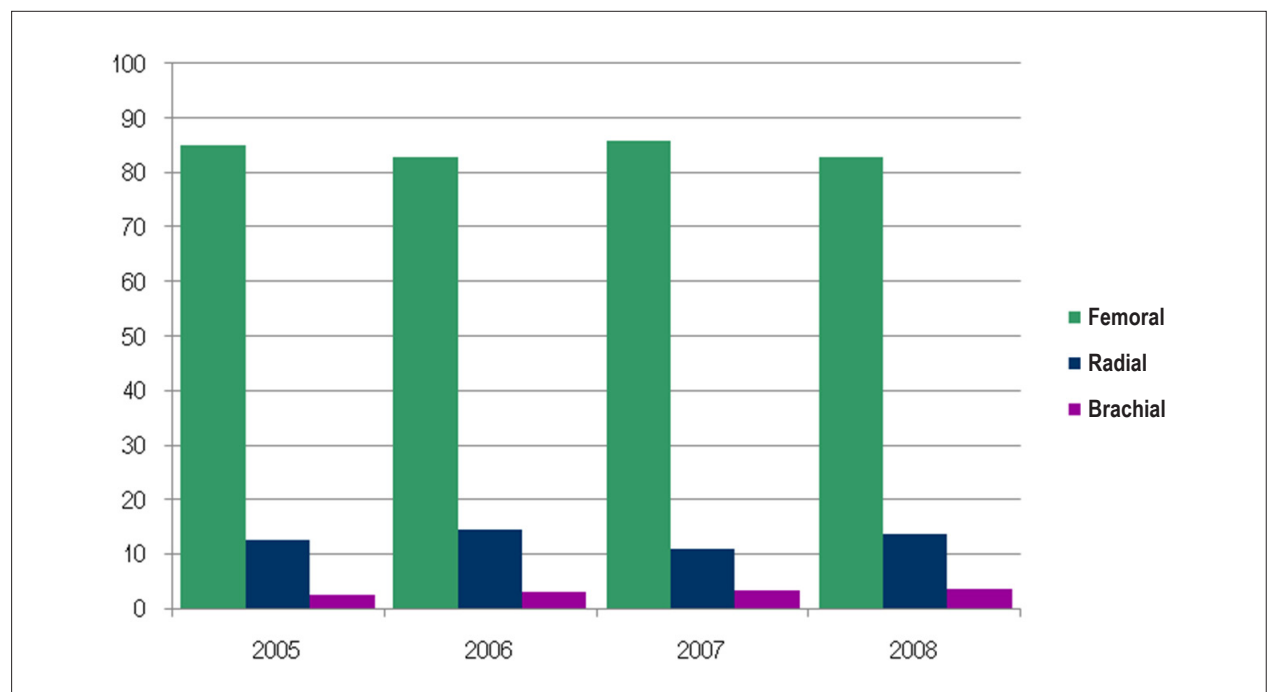


Figure 1 - Percentage of utilization of the radial approach in the period of 2005-2008.

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Table 1 - Clinical success and complications in PCI according to the approach used in the period of 2005-2008

Year	2005			2006			2007			2008		
	Femoral	Radial	p	Femoral	Radial	p	Femoral	Radial	p	Femoral	Radial	p
Total PCI % (n)	85.1 (23,212)	12.4 (3,367)		82.7 (16,044)	14.4 (2,794)		85.8 (18,283)	10.8 (2,311)		82.9 (12,747)	13.5 (2,083)	
Success % (n)	96.6% (22,421)	97.3% (3,277)	0.02	96.5% (15,487)	97.4% (2,721)	0.02	96.6% (17,659)	97.7% (2,258)	0.005	95.5% (12,175)	97.5% (2,031)	<0.0001
Mortality % (n)	0.6% (147)	0.2% (08)	0.007	0.9% (140)	0.5% (15)	0.08	1.0% (188)	0.8% (18)	0.30	1.1% (141)	0.2% (05)	0.0003
Reinfarction % (n)	0.3% (69)	0.3% (09)	0.89	0.4% (67)	0.4% (11)	0.98	0.5% (91)	0.2% (05)	0.08	0.3% (41)	0.4% (09)	0.54
Emergency surgery % (n)	0.06% (14)	0.06% (02)	0.98	0.07% (12)	0.07% (02)	0.95	0.07% (12)	0% (00)	0.43	0.05% (06)	0.05% (01)	0.98
Complications % (n)	3.4% (791)	2.7% (90)	0.02	3.5% (557)	2.6% (73)	0.02	3.4% (624)	2.3% (53)	0.005	4.5% (572)	2.5% (52)	<0.0001

PCI - percutaneous coronary interventions.

Table 2 - Comparison between the femoral and radial approaches in primary or rescue PCI between 2005-2008

	Femoral (n=8,612)	Radial (n=1,129)	p
Success % (n)	91.1 (7,847)	94.9 (1,129)	<0.0001
Complications % (n)	8.9 (765)	5.0 (60)	<0.0001
Mortality % (n)	4.6 (394)	2.4 (28)	0.0005

in the reduction of vascular complications, in conformity with large case series comparing the different approaches^{4,5}. The findings of a higher success rate and lower in-hospital mortality favorable to the radial technique reflect the possible presence of non-measurable factors in this analysis, such as the selection of less severely ill patients who presented with a lower degree of complexity of the procedure when the radial approach was chosen.

Thanks to the development of femoral closure devices, the use of narrower introducers and catheters, and the use of anticoagulation drugs with a better safety profile, the prevalence of vascular complications related to the performance of invasive coronary procedures using the femoral approach decreased in the past decade¹¹. Notwithstanding, this technique is similar to the radial approach, especially among women, the elderly, patients with chronic renal disease, and patients undergoing PCI for acute ischemic syndromes.

It is known that the occurrence of severe bleeding has a close prognostic correlation due to higher early and late mortalities¹², and that complications related to the arterial approach are among the major causes of severe bleeding in PCI and acute ischemic syndromes¹³. Choosing the radial approach would be a simple and effective measure to reduce this outcome. In fact, a meta-analysis involving 7020 patients showed a significant reduction by 73% in the occurrence of severe bleeding in comparison to the femoral approach (0.05

versus 2.3%, $p < 0.01$)⁵. Similar findings were reported in a Canadian registry assessing 38872 PCI, in which the radial approach provided a significant reduction in the need for transfusion (1.4% versus 2.8%, $p < 0.01$), as well as in the 30-day and one-year mortality (RR = 0.83, 95% CI: 0.71-0.98)¹⁴.

In addition to benefits in the reduction of vascular complications, severe bleeding and need for transfusion, the radial approach is also associated with more comfort and patient preference, possibility of early walking, and reduction of the length of hospital stay as well as of costs¹⁵.

In view of the exposed, what would be the reasons for the current low utilization of the radial approach? Data from the National Cardiovascular Data Registry (NCDRC), which includes more than 2400 North-American hospitals, show that this technique was used in 1.32% of the cases in the period between 2004 and 2007¹⁶, and in only 2.3% between 2005 and 2009¹³. Possible explanations for these statistical findings are: lack of training programs and dissemination of knowledge on the technique targeted at practicing and future interventionists¹⁷; uncertainties regarding the learning curve¹⁸, which, in turn, would be associated with a higher failure rate of the technique and greater radiation exposure¹⁹; and lack of large-scale multicenter studies able to reproduce the excellent results obtained in centers highly experienced with this approach.

Based on these data, we can say that, in addition to the reformulation of professional qualification programs administered by training centers duly registered and accredited, further large randomized studies with proper case series and able to demonstrate reductions in mortality and ischemic events with the use of the radial approach are required to implement changes in the profile of the current interventionist practice.

Limitations

The CENIC registry allows for the analysis of a large consecutive number of patients undergoing PCI in Brazil.

However, since it is only a registry, it has some limitations: data inclusion is spontaneous, because it does not include all the procedures performed in the period, although the great number of interventions recorded - more than 83000, validates the study as being representative of the real world in Brazil. Other limitations may be mentioned: despite the existing standardization, data are filled out at the discretion of the operator; variables related to the clinical and anatomical complexity of the cases were not considered, thus making it impossible to carry out a judicious comparison as regards the procedural success and the occurrence of adverse outcomes.

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Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any post-graduation program.