

Comparing single-catheter transradial approach and transfemoral approach in acute coronary syndromes

Comparação entre acesso radial com cateter único e acesso femoral em síndromes coronárias agudas

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ABSTRACT – Background: The transradial approach is currently the first option for percutaneous coronary procedures, whether diagnostic or therapeutic, particularly in patients with acute coronary syndromes. However, there is limited data in the literature comparing the use of a universal catheter from a radial approach versus the transfemoral approach. The purpose of this study was to demonstrate the feasibility of the single-catheter radial approach compared with the transfemoral approach.

Methods: A retrospective assessment of cases of acute coronary syndrome undergoing invasive risk stratification and *ad hoc* percutaneous coronary intervention by transradial or transfemoral approach. In the transradial group, we selected cases in which one single guiding catheter was used in the procedure. **Results:** Between November 2011 and January 2013, we investigated 198 patients who met the selection criteria. Except for the higher mean age observed in the transradial group (63.5 vs. 59.2; $p=0.002$), there were no differences in clinical characteristics. In addition, there were no differences in clinical presentation, culprit vessel, number and size of the stents used, or final angiographic success rate. The number of vascular complications was higher, particularly hematomas <5cm, in the transfemoral group. **Conclusion:** The use of single-catheter transradial approach is feasible, safe and effective in managing patients with acute coronary syndrome.

Keywords: Vascular access devices; Catheters; Patient safety; Percutaneous coronary intervention

RESUMO – Introdução: O acesso radial atualmente é a primeira opção para procedimentos coronários percutâneos, sejam eles diagnósticos ou terapêuticos, especialmente em pacientes com síndromes coronárias agudas. No entanto, na literatura, há poucos dados comparando o uso de cateter universal pela via radial em relação ao acesso femoral. O objetivo do presente estudo foi demonstrar a factibilidade da abordagem pela via radial com cateter único comparada com a via femoral.

Métodos: Análise retrospectiva de casos de síndrome coronária aguda submetidos à estratificação de risco invasiva e à intervenção coronária percutânea *ad hoc*, por via radial ou femoral. No grupo radial, foram selecionados os casos em que foi feito uso de um único cateter-guia para a realização do procedimento. **Resultados:** De novembro de 2011 a janeiro de 2013, analisamos 198 pacientes que satisfaziam os critérios de seleção. Exceto pela maior média de idade observada no grupo radial (63,5 vs. 59,2; $p=0,002$), não houve diferenças quanto às características clínicas. Não houve diferenças na apresentação clínica, no vaso culpado, no número e no tamanho dos stents utilizados ou na taxa de sucesso angiográfico final. Foi maior o número de complicações vasculares, sobretudo hematomas <5cm, no grupo femoral. **Conclusão:** O emprego do acesso radial com cateter único é factível, seguro e eficaz no tratamento de pacientes com síndrome coronária aguda.

Descritores: Dispositivos de acesso vascular; Cateteres; Segurança do paciente; Intervenção coronária percutânea

INTRODUCTION

The transradial approach (TRA) was introduced by Campeau, in 1989, initially as an alternative access for diagnostic coronary angiography.¹ Later on, TRA was also

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adopted for percutaneous coronary interventions (PCI), and is now the usual vascular approach for coronary, carotid, cerebral and peripheral vascular interventions.²⁻⁴

Among its main advantages, TRA is associated with lower rates of bleeding and vascular complications when compared with the transfemoral approach (TF), especially in acute coronary syndrome (ACS) patients.⁵⁻¹² It also leads to improved quality-of-life indicators and decreased costs when compared with TF.^{6,9,13-15} TRA currently features in the latest guidelines as the preferred vascular approach, particularly in ACS.¹⁶⁻²⁰

The use of the Ikari® Left 3.5 (Terumo Corporation, Tokyo, Japan) (Figure 1), a universal transradial catheter (with one single format for the right and left coronary arteries) for both diagnostic and therapeutic procedures, has been previously studied,²¹ even in patients with ST-elevation acute myocardial infarction (STEMI)²²



Figure 1. Ikari® Left 3.5 catheter (Terumo Medical, Tokyo, Japan).

The main objective of our study was to demonstrate the feasibility of using the Ikari® universal catheter by transradial approach in patients with ACS.

METHODS

After the approval by the Institutional Review Board of the Hospital Agamenon Magalhães (CAAE: 28863419.5.0000.5197), we searched the database of our institution and identified 198 cases of patients admitted with diagnosis of ACS, undergoing coronary angiography and immediate PCI, by TRA or TF approach, between 2011 and 2013. The charts associated with these procedures were retrieved, and retrospectively reviewed.

The information available on clinical and procedural characteristics were described, as well as the occurrence of complications during examinations. Data such as left ventricular function, time of procedure, and total fluoroscopy time, could not be retrieved. The choice of the vascular approach was determined by the operator, and cases were performed according to the recommendations in current guidelines.

Continuous variables were expressed as mean and standard deviation, and categorical variables, as frequency and percentage. Clinical and procedural characteristics were compared between the groups using Pearson's chi-square test and Student's *t* test. The significance level was set at $p < 0.05$. The statistical analyses were performed using the software Statistical Package for Social Science, version 17.0.

RESULTS

We identified 198 patients admitted with an ACS diagnosis, who underwent invasive risk stratification followed by *ad hoc* PCI. Patients were divided into two groups, according to the vascular approach used in the procedure, i.e., TRA Group or TF Group. Except for the higher mean age observed in the TRA Group (63.5 years vs. 59.2 years; $p = 0.002$), there were no differences in clinical characteristics, male gender was more prevalent, and 33% of patients were diabetic (Table 1). The most frequent clinical presentation was non-ST-segment elevation myocardial infarction (NSTEMI) (54%).

Table 1. Clinical characteristics of patients

Variable	TRA Group (n=94)	TF Group (n=104)	p-value
Age, years	63.5	59.2	0.002
Sex			0.767
Male	58.5	60.6	
Female	41.5	30.4	
Diabetes mellitus	31.9	34.6	0.687
Hypertension	63.8	67.3	0.607
Dyslipidemia	46.8	48.0	0.858
Smoking	31.9	33.6	0.795
Prior myocardial infarction	22.3	24.0	0.778
Prior coronary angioplasty	12.7	12.9	0.955
Unstable angina	22.3	14.4	0.149
Non-ST-segment elevation myocardial infarction	54.3	54.8	0.938
ST-segment elevation myocardial infarction	23.4	30.8	0.245

Results expressed in means or %.
TRA: transradial; TF: transfemoral.

The characteristics of the procedures are displayed in table 2. The most prevalent culprit vessel was the left anterior descending artery (51%), with a high rate of angiographic success (95%). Bare-metal stents were used in 89% of cases. Glycoprotein IIb/IIIa receptor inhibitors were used in 17.7% of cases, with no need to crossover between approaches.

Table 2. Angiographic and procedural characteristics

Variable	TRA Group (n=94)	TF Group (n=104)	p-value
Coronary angiography	100.0	100.0	1.000
<i>ad hoc</i> PCI	100.0	100.0	1.000
6F diameter	100.0	100.0	1.000
Sedation	42.6	43.3	0.919
IIb/IIIa GPI	19.1	16.3	0.606
Culprit lesion			0.787
LMCA	1.1	0.0	
Left anterior descending	52.1	50.0	
Circumflex artery	6.4	8.7	
Right coronary artery	40.4	41.3	
Number of stents	1.6±0.3	1.5±0.3	0.687
Stent diameter	3.3±0.4	3.5±0.3	0.767
Bare-metal stent	88.3	89.4	0.801
Drug-eluting stent	11.7	10.6	0.938
Crossover	0.0	0.0	1.000
Angiographic success	95.7	94.2	0.751

Results expressed in % or mean±standard deviation.

TRA: transradial; TF: transfemoral; PCI: percutaneous coronary intervention; LMCA: left main coronary artery; GPI: glycoprotein inhibitors.

There were no intraprocedural major adverse cardiovascular events (Table 3), and a higher prevalence of access site hematomas was found in the TF Group, particularly <5cm (31.7% vs. 1.1%; $p<0.001$). Seven patients of the TF Group (6.7%) required surgical repairs of femoral artery pseudoaneurysms.

Table 3. Vascular complications at the puncture site and intraprocedural major adverse cardiovascular events

Variable	TRA Group (n=94)	TF Group (n=104)	p-value
Access site hematoma, cm			<0.001
<5	1.1	31.7	
≥5	0.0	6.7	
Major bleeding	0.0	1.0	1.000
Transfusion	0.0	1.0	1.000
Cardiovascular death	0.0	0.0	-
Stroke	0.0	0.0	-

Results expressed in %.

TRA: transradial; TF: transfemoral.

DISCUSSION

Our findings suggest that the use of a universal catheter to manage patients with ACS by transradial approach is feasible, safe and effective. In the study population, representative of the real world in a public service in Brazil, this strategy enabled the conduction of procedures with

a high rate of success and a lower prevalence of puncture site complications.

The use of one single radial catheter to reduce time of procedure, radial artery spasm and, potentially, costs, has been previously explored. In the RAPID study, the use of 3.5 MAC® (Multi-Aortic Curve, Medtronic, Inc.; Minneapolis, MN, USA) radial catheter decreased the time from cath lab door to ballooning of the culprit vessel by 2.4 minutes, the total time of procedure by 3.8 minutes, and the fluoroscopy time by 0.8 minute, with no difference in the rate of cardiac adverse events when compared to controls using the Tiger II (Terumo Corporation, Tokyo, Japan) catheter for diagnosis and a therapeutic guiding catheter, according to the anatomy found.²³ In another case series, the use of the 3.5 Ikari® Left catheter for diagnosis and *ad hoc* PCI when indicated had a success rate similar to that of traditional guiding catheters, even in complex procedures, such as chronic total occlusions (16.3%), use of intravascular ultrasound (14%), and rotational atherectomy (0.8%).²⁴

The transradial approach decreases hospital costs^{15,25} and length of stay, and allows for earlier return to work.²⁶ Furthermore, the safety of the transradial approach is broadly supported in the medical literature, with lower rates of vascular and hemorrhagic complications, which certainly leads to decreased health care costs.²⁵ In our study population there were no vascular complications in the TRA Group, whereas in the TF Group, seven patients required surgical repair of pseudoaneurysms.

The use of one single catheter for the diagnostic procedure and therapeutic intervention, in the context of ACS, in addition to potentially reducing the time of procedure, an important variable in these cases, also reduces costs relative to the use of additional catheters to perform the procedures, with potential cost-effectiveness benefits.

The main limitations of our study include its retrospective and single-center nature, the small number of patients, the impossibility of retrieving complete information about the procedure, and the absence of a cost-effectiveness analysis.

CONCLUSION

The adoption of the single-catheter transradial approach in patients with acute coronary syndrome is feasible, safe and effective. This strategy can bring benefits in reducing vascular complications, in addition to reducing health care costs. Our findings should give rise to questions of this sort and encourage the development of prospective and randomized studies designed to answer them.

SOURCE OF FINANCING

None.

CONFLICTS OF INTEREST

The authors declare there are no conflicts of interest.

CONTRIBUTION OF AUTHORS

Conception and design of the study: MAAAML and HNM; data collection: JMJ and CMGA; data interpretation: SL and HNM; writing of the text: HNM and MM; approval of the final version to be published: MAAAML.

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