Aspiration thrombectomy for patients with acute coronary syndromes and culprit lesions located in coronary bypass grafts. Data from the PL-ACS registry

Paweł Tyczyński[1], Mariusz Gąsior[2], Kamil Bujak[2], Adam Witkowski[1], Łukasz Pyka[2], Marek Gierlotka[3], Krzysztof Milewski[4], Jarosław Hiczkiewicz[5], Grzegorz Sobieszek[6], Marek Styczkiewicz[7], Zbigniew Chmielak[1]

[1]Department of Interventional Cardiology and Angiology, National Institute of Cardiology, Warszawa, Poland
[2]3rd Department of Cardiology, Faculty of Medical Sciences in Zabrze, Medical University of Silesia, Katowice, Poland
[3]Department of Cardiology, University Hospital, Institute of Medical Sciences, University of Opole, Opole, Poland
[4]2nd Department of Cardiology, American Heart of Poland, Bielsko-Biała, Poland
[5]Clinical Department of Cardiology, Nowa Sol Multidisciplinary Hospital, Nowa Sol, Poland
[6]Department of Cardiology, 1st Military Clinical Hospital with the Outpatient Clinic, Lublin, Poland
[7]Department of Cardiology, The Pope John Paul II Province Hospital of Zamość, Zamość, Poland

Correspondence to:
Paweł Tyczyński, MD, PhD, Department of Interventional Cardiology and Angiology, National Institute of Cardiology, Alpejska 42, 04–628 Warszawa, Poland, phone: +48 22 343 42 72, e-mail: medykpol@wp.pl

DOI: 10.33963/KP.a2022.0169

Received:
April 7, 2022

Accepted:
July 13, 2022

Early publication date:
July 18, 2022

INTRODUCTION

The majority of coronary grafts, which undergo percutaneous coronary intervention (PCI) are saphenous vein grafts (SVG) [1]. PCI of SVG has worse immediate and long-term results than PCI of native coronary arteries. Similarly, PCI for acute coronary syndrome (ACS) of the culprit lesion located in SVG has been associated with poor procedural results and poor short-term and long-term outcomes compared to primary PCI of culprit lesions located in native coronary arteries [2]. The issue of performing aspiration thrombectomy (AT) of a culprit lesion in SVG during ACS is still a matter of debate.

Unfavorable results of large and randomized trials: TASTE and TOTAL assessing AT in native coronary arteries have prompted experts from the European and American Societies of Cardiology to discourage the routine use of AT during primary PCI [3, 4]. However, these trials have excluded patients with culprit lesions located in SVG. The aforementioned guidelines do not differentiate between culprit vessels (native coronaries versus SVG) while considering AT. However, based on evidence these AT recommendations should only apply to native coronary arteries and not to SVG. Characteristics of thrombus located in SVG may differ compared to thrombus seen in native coronaries. Thus, the efficacy of AT in SVG may also be different.

In summary: (1) Little is known about the efficacy of AT in the restoration of thrombolysis in myocardial infarction (TIMI) 3 flow in SVG, as well as the long-term follow-up of ACS patients who underwent PCI of SVG; (2) As stated in the 2021 American guidelines for coronary revascularization, additional dedicated studies focusing on the selective use of AT in patients with high thrombus burden are needed.

Aim

To assess immediate and mid-term results of AT for culprit lesion in coronary grafts during ACS.

METHODS

We performed a retrospective analysis of the data obtained from the PL-ACS registry (Polish Registry of Acute Coronary Syndromes) of all ACS patients who underwent primary PCI for culprit lesions located in coronary grafts in the studied period. The rationale and methodology of PL-ACS were described in detail previously [5]. The study protocol was approved by the ethics committee, and all patients provided written, informed consent to participate in the study.

Patients

In the current analysis, 630 patients who underwent PCI of coronary grafts (majority

of them- SVG) for ACS between January 2017 and May 2020 were included. Patients with missing data on AT (n = 5), undetermined culprit lesion or culprit lesion located in other vessels than SVG (n = 149), and patients who received PCI of more than one SVG (n = 43) were excluded. Patients were further divided into two groups based on whether or not they underwent AT, i.e. the AT group (n = 51) and the non-AT group (n = 579). The AT and non-AT groups were matched 1:2 for clinically relevant variables that might influence the decision on performing AT using propensity scores. More details on methods, including statistical analysis, are provided in the Supplementary materials — Methods.

RESULTS AND DISCUSSION

Baseline characteristics, treatment, and in-hospital outcomes of the unmatched populations are presented in Supplementary material, *Table S1*. Patients treated with AT were more often male (94.1% vs. 80.1%; *P* = 0.01), more often presented with ST-segment elevation myocardial infarction (STEMI) (27.5% vs. 15.7%; *P* = 0.03), had lower median systolic and diastolic blood pressure on admission (125 mm Hg vs. 138 mm Hg; *P* = 0.01 and 72 mm Hg vs. 80 mm Hg; *P* = 0.01, respectively), were more quickly transferred to cath-lab (median door-to-catheter time: 1.2 hours vs. 4.7 hours; *P* = 0.001), were characterized by worse contrast flow in the culprit vessel as expressed by the TIMI score (median TIMI flow 0: 36.0% vs. 10.2%; *P* = 0.001), were more often treated with glycoprotein IIb/IIIa inhibitors 50.0% vs. 21.0%; *P* <0.001), and the final TIMI 3 flow after PCI was less frequently achieved (68.6% vs. 90.0%; *P* <0.001), compared to the patients, who were treated with PCI exclusively (the non-AT group).

After propensity-score matching of these patients, there were no differences between the groups (Supplementary material, *Table S2*), including TIMI3 flow in the culprit vessel after PCI and other in-hospital outcomes.

Follow-up data for all-cause mortality were available for 147 of 153 patients in the matched cohorts (median [interquartile range, IQR], 429 [245–701] days). There were no significant differences in the one-year all-cause mortality rates between the non-AT and AT groups (11.7% and 8.2%, respectively; *P* = 0.72), Figure 1.

Our study shows the results from available data from the PL-ACS registry and confirms previous observations (which are very limited) concerning the lack of effectiveness of AT in culprit coronary grafts in the settings of ACS, compared to the matched non-AT control group. This is valid for both peri-procedural results, as well as follow-up all-cause mortality. However, its safety and effectiveness remain questionable. In the retrospective study by Jim et al., adjunctive manual AT failed to reduce the filter no-reflow phenomenon in SVG. Importantly, no detailed data regarding the clinical presentations of these patients on admission have been provided there [6]. Furthermore, a multicenter study using X-SIZER AT (eV3, White Bear Lake, MN, US) in 797 patients (85% with unstable angina) with 839 diseased SVG or thrombus-containing native coronaries (73% in SVG), found, that this strategy did not reduce peri-procedural myocardial infarction (MI), or major adverse cardiovascular events at 30 days and one year compared to PCI alone, although the rate of large MI was reduced [7]. Single reports have shown AT to be effective in the restoration of TIMI3 flow in SVG [8]. Finally, Januszek et al. [9] published peri-procedural results of all PCI performed in Poland between January 2015 and December 2016 based on data gathered in the Polish National Registry (ORPKI). Presented data of that registry included 2616 PCI of SVG, among them 667 SVG PCI for non-ST-segment elevation myocardial infarction (NSTEMI) and 273 SVG PCI for STEMI. Thrombectomy was used during 114 (4.35%) SVG PCI. The only predictors of an increased rate of no-reflows in SVG were AT, ACS, and past cerebral stroke. The ORPKI registry enrolled more ACS patients, in whom AT in SVG was used compared to our PL-ACS registry. Nonetheless, those results were limited only to peri-procedural outcomes (not even in-hospital complications). Our data show both in-hospital outcomes, as well as the follow-up for all-cause mortality. Moreover, the PL-ACS registry and ORPKI registries differ, among other things, in terms of the period covered by the registry and clinical presentation of patients, which might explain different results.

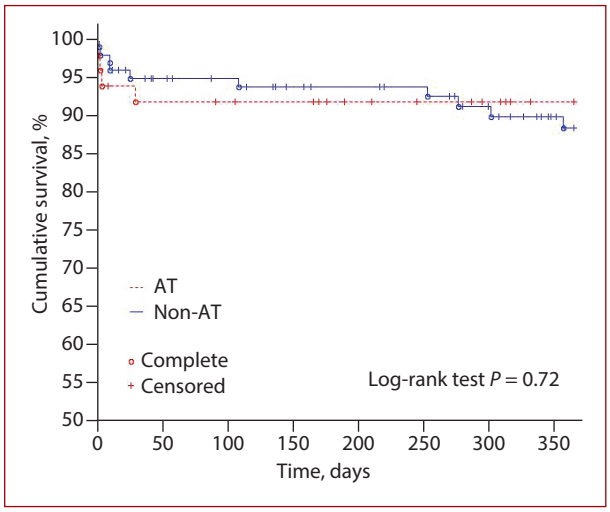

Figure 1. The Kaplan-Meier one-year survival rate analysis performed for the matched groups

Abbreviation: AT, aspiration thrombectomy

In summary, ACS patients with culprit lesions located in coronary grafts are at high risk of peri-procedural complications and poor follow-up outcomes. Nonetheless, selected patients with large thrombus burden in SVG might still benefit from the use of AT.

Limitations

Our study was not free from limitations. Firstly, it had a retrospective design. Secondly, we included a limited number of patients; still, our group represents one of the

major studied cohorts with AT in culprit coronary grafts during ACS. Thirdly, it was impossible to extract the type of coronary grafts (SVG versus internal mammary artery grafts vs. radial artery grafts) from the PL-ACS registry. However, as mentioned before, the majority of coronary grafts which undergo PCI are SVG and not arterial grafts [1]. Thus, we assume that also the PL-ACS registry included mainly data from SVG PCI and not PCI of arterial grafts. Fourth, angiographic analysis of the treated coronary grafts was not performed (including differentiation between thrombus and soft plaque). Fifth, we do not have the data regarding the use of embolic protection devices during PCI. Finally, we present only all-cause mortality at follow-up and not the more specific data (repeated ACS and repeated PCI of coronary grafts, stroke, etc.).

CONCLUSIONS

Firstly, the use of AT in the culprit coronary graft of ACS patients did not result in the improvement of the restoration of TIMI 3 flow. Secondly, there were no significant differences in one-year all-cause mortality rates between the non-AT and AT groups.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/kardiologia_polska.

Article information

Conflict of interest: None declared.

Funding: None.

REFERENCES

1. Yeo KK, Azarbal F, Zakroysky P, et al. Differential longitudinal outcomes following percutaneous coronary intervention to the left internal mammary artery and other bypass grafts of the LAD: findings from the NCDR. J Invasive Cardiol. 2020; 32: E143–E150.
2. Brodie BR, VerSteeg DS, Brodie MM, et al. Poor long-term patient and graft survival after primary percutaneous coronary intervention for acute myocardial infarction due to saphenous vein graft occlusion. Catheter Cardiovasc Interv. 2005; 65(4): 504–509, doi: 10.1002/ccd.20392, indexed in Pubmed: 15988742.
3. Collet JP, Thiele H, Barbato E, et al. ESC Scientific Document Group. 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. Eur Heart J. 2021; 42(14): 1289–1367, doi: 10.1093/eurheartj/ehaa575, indexed in Pubmed: 32860058.
4. Lawton JS, Tamis-Holland JE, Bangalore S, et al. 2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation. 2022; 145(3): e18–e114, doi: 10.1161/CIR.0000000000001039, indexed in Pubmed: 34882436.
5. Poloński L, Gasior M, Gierlotka M, et al. Polish Registry of Acute Coronary Syndromes (PLACS). Characteristics, treatments and outcomes of patients with acute coronary syndromes in Poland. Kardiol Pol. 2007; 65: 861–864, indexed in Pubmed: 17853315.
6. Jim MH, Yiu KH, Ko RLY, et al. Manual aspiration prior to stenting does not reduce the incidence of filter no reflow in saphenous vein graft lesions protected by FilterWire EX/EZ. Acute Card Care. 2010; 12(3): 92–95, doi: 10.3109/17482941.2010.490194, indexed in Pubmed: 20677906.
7. Stone GW, Cox DA, Babb J, et al. Prospective, randomized evaluation of thrombectomy prior to percutaneous intervention in diseased saphenous vein grafts and thrombus-containing coronary arteries. J Am Coll Cardiol. 2003; 42(11): 2007–2013, doi: 10.1016/j.jacc.2003.10.001, indexed in Pubmed: 14662267.
8. Akcay M. Successful treatment of a huge thrombotic saphenous vein graft occlusion with aspiration thrombectomy: a case report. J Tehran Heart Cent. 2020; 15(2): 69–72, doi: 10.18502/jthc.v15i2.4186, indexed in Pubmed: 33552197.
9. Januszek RA, Dziewierz A, Siudak Z, et al. Predictors of periprocedural complications in patients undergoing percutaneous coronary interventions within coronary artery bypass grafts. Cardiol J. 2019; 26(6): 633–644, doi: 10.5603/CJ.a2018.0044, indexed in Pubmed: 29671862.