LUMEN ET VIRTUS
ISSN: 2177-2789

COMPLICATIONS AFTER PERCUTANEOUS CORONARY INTERVENTION: AN INTEGRATIVE REVIEW

https://doi.org/10.56238/levv15n41-014

Submitted on: 02/09/2024 **Publication date:** 02/10/2024

Ianne Stéfani Angelim Vieira[1], Angela Carolina Medeiros Alves Simões[2], Izamara dos Santos Nogueira Martins[3], Thaynara Henrique Maia[4], Ana Clara de Sousa Cavalcanti[5], Rafaela Christiny Dantas de Medeiros[6], Ana Lorrany da Silva Santos[7] and Glaucia Cristina Leandro Borges[8]

ABSTRACT

Introduction: Coronary artery bypass grafting and percutaneous coronary intervention are procedures widely used in the treatment of coronary artery disease, in conjunction with drug therapy. Although the morbidity and mortality rates associated with PCI are low, complications can occur both intraoperatively and postoperatively, ranging from mild adverse events to severe complications. Objective: To search and review the scientific literature on the main complications after percutaneous coronary intervention. Methods: This is an integrative review, formulated according to the Population, Variables and Outcomes (PVO) strategy. The consultations were carried out in the following databases

[1] Master in Collective Health with emphasis on Women's and Children's Health
ITEC College
E-mail: iannevieira.enf@gmail.com
ORCID: https://orcid.org/0000-0002-9987-8651
[2] Post-graduate in Teaching
ITEC College
E-mail: angelacsimooes@gmail.com
ORCID: https://orcid.org/0009-0001-2271-4018
[3] Post-graduate in Dermatological Nursing
ITEC College
E-mail: isnm84@gmail.com
ORCID: https://orcid.org/0009-0004-2826-8911
[4] Postgraduate in Urgency, Emergency and ICU
ITEC College
E-mail: thaynarahmaia@gmail.com
ORCID: https://orcid.org/0000-0001-9809-4751
[5] Post-graduate degree in Women's Health
ITEC College
E-mail: anaclaraacavalcanti@gmail.com
ORCID: https://orcid.org/0000-0003-3086-6182
[6] Post-graduate degree in Urgency and Emergency
E-mail: rafaelachristinydantas@gmail.com
ORCID: https://orcid.org/0009-0009-1859-9545
[7] Graduated in Nursing
ITEC College
E-mail: a.lorranydasilva@gmail.com
ORCID: https://orcid.org/0000-0002-6045-5854
[8] Post-graduate degree in Urgency and Emergency
ITEC College
E-mail: glauciaenfermagem@hotmail.com
ORCID: https://orcid.org/0009-0008-1204-9959

and libraries: Latin American and Caribbean Literature on Health Sciences (LILACS), Virtual Health Library (VHL), Medical Literature Analysis and Retrieval System Online (MEDLINE), Scopus, Web of Science and Embase. Results: A total of 6 articles were included in the sample, including national and international articles. The main complications found were mortality, stroke, cardiac arrest, acute heart failure, ventricular arrhythmia, bleeding, hematoma, and acute kidney injury. Conclusions: The studies found emphasized the importance of identifying complications in order to create care protocols that prevent adverse events, highlighting the relevance of these studies to improve post-procedure care of percutaneous coronary intervention.

Keywords: Cardiovascular Diseases. Acute Myocardial Infarction. Interventions. Complications. Coronary Diseases.

INTRODUCTION

Cardiovascular diseases (CVDs) are the main causes of morbidity and mortality in Brazil and worldwide, with coronary artery disease (CAD) standing out as the one with the highest incidence. Among CVDs, acute myocardial infarction (AMI) is the most frequent occurrence in developing countries (BIENERT *et al.*, 2017).

Coronary artery disease (CAD) is defined as the result of the process of atherosclerosis in the coronary arteries, which causes obstruction in the lumen of the arteries, leading to an imbalance between the supply and demand of oxygen in the myocardial tissue. This obstruction can be partial or total, and is considered critical when it reaches ≥ 70% (COSTA *et al.*, 2016). CAD presents several clinical manifestations, requiring careful evaluation for its confirmation. The main signs and symptoms include severe obstructions in the coronary arteries, stable angina, unstable angina, acute myocardial infarction (AMI) and nonspecific chest pain (SOUSA *et al.*, 2014). Both stable and frightening angina can lead to prolonged ischemia, resulting from the rupture of the atheromatous plaque, resulting in Acute Myocardial Infarction (AMI) (TREVISOL *et al.*, 2012).

Early treatment of acute myocardial infarction (AMI) aims at pain relief and coronary recanalization, using thrombolytics or mechanical techniques. Among the mechanical techniques available are angioplasty and coronary artery bypass grafting (CABG). Angioplasty is considered the best reperfusion technique, as long as it is started within 90 minutes after diagnosis, as recommended by the Brazilian and International Guidelines (COSTA et al., 2016).

Coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) are widely used procedures in the treatment of coronary artery disease (CAD), in conjunction with drug therapy (FURTADO *et al.*, 2017). After cardiac catheterization, if a coronary obstruction is provided, angioplasty is indicated based on other clinical variables of the patient and on the medical decision. PCI is recommended for patients with single- or multivessel diseases, depending on the type of artery affected, symptoms, degree of obstruction, risk of cardiac surgery, and the risk-benefit ratio of angioplasty (TREVISOL *et al.*, 2012).

PCI is a highly complex endovascular procedure, which consists of the introduction of a catheter with a balloon at the distal end. When the balloon is inflated, it compresses the atheromatous plaque, significantly restoring normal blood flow. At this moment, a stent, which is a small metal prosthesis in the shape of a tube, is positioned (BUSSOLO, 2018).

Although the morbidity and mortality rates associated with PCI are low, complications can occur both intraoperatively and postoperatively, ranging from mild adverse events to severe complications such as acute myocardial infarction (AMI) and death. The main complications include myocardial ischemia, bleeding, hematomas, pseudoaneurysm formation, arterial occlusion, arteriovenous fistula formation, and acute kidney injury (SANTOS *et al.*, 2017).

Nursing professionals must be trained to provide care throughout the perioperative period, in addition to being able to prevent, identify and treat possible complications. Early intervention by nurses can minimize and reduce injuries, improving patient comfort and safety (SANTOS *et al.*, 2017)

In view of the need for knowledge, especially on the part of nursing professionals, about the aforementioned theme, the question to be investigated arises: what are the complications found in patients undergoing percutaneous coronary intervention already documented in the literature? Since in-depth knowledge on the subject can enable the nursing team to provide high-quality care to patients who present such complications.

In view of the above, this study aimed to search and review the scientific literature on the main complications after percutaneous coronary intervention.

METHODS

It is an integrative review, elaborated from six different stages: 1) elaboration of the research question; 2) determination of databases and criteria for inclusion and exclusion of studies; 3) definition of the information to be extracted from the selected studies; 4) evaluation of the studies to be included in the review; 5) interpretation of the results and 6) presentation of the review/synthesis of knowledge (SOUZA; SILVA; CARVALHO, 2010).

The research question was formulated according to the *Population, Variables and Outcomes* (PVO) strategy, and based on the verification of the Health Sciences Descriptors (DeCS) and *Medical Subject Headings* (Mesh). In this sense, the following question was formulated: what are the complications found in patients undergoing percutaneous coronary intervention? The descriptors were combined with the Boolean connector OR, within each set of terms of the PVO strategy, and then crossed with the Boolean connector AND, the search equations were formed, as shown in Chart 1.

Chart 1 - Controlled and uncontrolled descriptors used in the search strategy for problems, variables and results.

	P	V	Or
Extraction	Patients undergoing coronary intervention	Coronary heart disease	Complications

Conversion	“Patients undergoing coronary intervention”	“Coronary diseases”	Complications
Combination	“Patients undergoing coronary intervention” OR “Coronary intervention”	“Coronary diseases” OR “Coronary” OR “Diseases”	“Complications”
Use	“Patients undergoing coronary intervention” OR “Coronary intervention” AND “Coronary diseases” OR “Coronary” OR “Diseases” AND “Complications”		

Source: Prepared by the authors themselves

The research took place in June and July 2024, through virtual access to databases and libraries: Latin American and Caribbean Literature on Health Sciences (LILACS), through consultation of the Virtual Health Library (VHL); *Medical Literature Analysis and Retrieval System Online* (MEDLINE), accessed through the PubMed portal; Scopus (Elsevier); Web of Science and Embase (Elsevier).

The inclusion criteria were: articles from national and international journals, published in any language, with no restriction of temporality describing the complications presented by the patients after percutaneous coronary intervention. Reviews (systematic or integrative), dissertations and theses, as well as duplicate articles or studies that were not aligned or even did not answer the research question were excluded.

To ensure a broad search, the databases were accessed through the journal portal of the Coordination for the Improvement of Higher Education Personnel (CAPES). The collected data were organized and listed in a specific script, containing information deemed relevant to meet the eligibility criteria of the article, meeting the objectives of the study. The script included information on: author, year, objective, main results and conclusions.

RESULTS

A total of 6 articles were included in the sample, including national and international articles. Regarding the study sites, it was found that: three studies were developed in Brazil; two were held in the United States and one in Mexico.

The research carried out was carried out in public and private hospitals, emergency rooms and in the mobile emergency service (SAMU). Related to the year of publication, three were published in 2024, one in 2022, one in 2018 and one in 2012. Chart 2 describes the summarization of the results selected for this study, based on the year, author, objective, design, and conclusions.

Chart 2 - Summary of the studies found.

Author and Year	Objective	Main results	Conclusions
Quintana-Ortiz, *et al.*, 2024.	To investigate the clinical and procedural features and cardiovascular outcomes of PCI from unprotected traumatic brain injury (TBI).	During follow-up, 19 had major cardiovascular and cerebral adverse events (26%), of which cardiac death occurred in 13%, non-cardiovascular death in 5%, non-fatal acute myocardial infarction in 1%, cerebrovascular event in 2%, and revascularization of the treated vessel in 4%.	A frequency similar to that observed in other studies of cardiovascular events was observed, especially in intermediate-risk patients, which corroborates the increasing use of percutaneous intervention in this population.
Paganin, *et al.*, 2018.	OBJECTIVE: To analyze vascular complications in patients undergoing endovascular cardiological procedures in a hemodynamics laboratory of three reference centers.	The overall incidence of vascular complications (major and minor) in the first 48 hours was lower than that described in many international referral centers. There was no occurrence of pseudoaneurysm, retroperitoneal hematoma, or arteriovenous fistula in the present study. As for the other complications, the highest incidence was vagal and allergic reactions.	The findings of this study bring benefits to professionals in the area due to the knowledge of complications in patients undergoing cardiac endovascular procedures, aiming at the planning of pre- and post-procedure care.
Sekerak, *et al.*, 2024.	To evaluate the experience in a single ultra-low contrast percutaneous coronary intervention (PCI) center in patients with chronic kidney disease and characterize the results at 1 year.	At 1 year, 8% of patients died, 11% required RRT, and 33% had major adverse cardiac events (MACE). The median time to start renal replacement therapy was 7 months after PCI. Forty-four patients were undergoing kidney transplant evaluation, of whom 17 (39%) received a transplant.	In patients with advanced CKD, ultra-low contrast PCI is feasible and safe with minimal need for periprocedural RRT. In addition, ultra-low contrast PCI may allow the preservation of renal function in anticipation of renal transplantation.
Antia, *et al.*, 2024.	To analyze hospital outcomes and trends of patients with autoimmune diseases (IDA), including rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), and inflammatory bowel disease (IBD)	The odds of mortality were lower among IBD patients, but RA patients were more likely to have major compound complications [including stroke, cardiac arrest, acute heart failure (ACF), ventricular arrhythmia (AV), major bleeding, and acute kidney injury (AKI)]. Our SLE cohort had higher rates of stroke and AKI. Our IBD cohort had lower rates of cardiac arrest but had longer hospital stays and incurred higher hospital expenses	This study describes the immediate adverse outcomes observed in patients with IDA undergoing PCI. In contrast to those without AID, our cohorts with RA exhibited worse outcomes, as indicated by the higher odds of major complications. IBD is associated with lower risks of adverse hospital outcomes, but with greater resource utilization.

	undergoing percutaneous coronary intervention (PCI).	compared to the non-IBD cohort.	
Gomes Junior, *et al.*, 2012.	To assess the risk of vascular bleeding in patients undergoing early coronary intervention after thrombolysis	A total of 199 patients were evaluated, of whom 193 did not present vascular bleeding and 6 evolved with this complication. According to the BARC criteria, 1 patient had type 3a bleeding (hematoma in the inguinal region with a drop in hemoglobin), 2 patients had type 3b bleeding (1 not related to vascular access and 1 retroperitoneal hematoma, with a drop in hemoglobin), and the others had type 1 bleeding (small hematomas in the inguinal region). In this group, two blood transfusions were required. None of the patients had a death related to the post-intervention vascular complication.	In our study, early femoral catheterization as part of a pharmaco-invasive strategy, using TNK as fibrinolytic, presented a low rate of vascular bleeding, comparable to that of elective angioplasties.
Cardoso; Silva, 2022.	To describe the main complications after primary angioplasty in a university hospital.	The main complications found were hematoma (17.9%), contrast-induced nephropathy (12.8%), and urinary retention (5.1%). The most prevalent major adverse cardiac events were coronary restenosis (7.7%), cardiac death (3.8%), acute myocardial infarction (1.3%), and emergency coronary artery bypass grafting (1.3%).	The identification of complications after primary angioplasty can offer subsidies to qualify care through the creation of prevention protocols and early intervention for adverse events in patients undergoing the procedure.

Source: Prepared by the authors themselves

All articles managed to achieve the proposed objectives. It is worth noting that the article by Paganin *et al.* (2018) obtained different results compared to the other articles. However, it is important to always evaluate the different methodologies used and the populations studied.

DISCUSSION

The articles found address aspects involving the complications of patients undergoing percutaneous coronary intervention in different sectors, namely: public and private hospitals, emergency care and in the mobile emergency service. In addition, these complications were evaluated in patients with different diagnoses, such as: traumatic brain

injury, chronic kidney disease, autoimmune diseases (AID) (including rheumatoid arthritis (RA), systemic lupus erythematosus (SLE) and inflammatory bowel disease), cardiac disorders and those after thrombosis.

Regarding the complications found in the study by Quintana-Ortiz *et al.*, (2024) when comparing the frequency of cardiovascular events in patients undergoing PCI, fewer events of cardiovascular death and non-fatal acute myocardial infarction were observed. This could be explained by the fact that the study registry involved less critical patients.

Sekerak *et al.* (2024) points out that in patients with advanced chronic kidney disease, PCI is viable and safe. In addition, PCI may allow the preservation of renal function in anticipation of renal transplantation. In addition, Paganin *et al.* (2018) emphasize that the findings of research on post-PCI complications bring benefits to professionals in the area due to the knowledge of complications in patients undergoing endovascular procedures, aiming at the planning of pre- and post-procedure care.

In the study comparing complications by Antia *et al.* (2024), the odds of mortality were lower among patients with inflammatory bowel disease, but patients with rheumatoid arthritis had higher odds of having major complications (including stroke, cardiac arrest, acute heart failure, ventricular arrhythmia, major bleeding, and acute kidney injury). In the systemic lupus erythematosus cohort, there were higher rates of stroke and acute kidney injury. In the cohort with inflammatory bowel disease, the patient had lower rates of cardiac arrest, but had a longer hospital stay compared to the cohort without inflammatory bowel disease.

Finally, Cardoso and Silva (2022) point out that the identification of post-procedure complications of percutaneous coronary intervention can offer subsidies to qualify care through the creation of prevention protocols and early intervention for adverse events in patients undergoing the procedure. In the meantime, it is possible to affirm the importance of this study to support strategies to combat the complications presented by patients after percutaneous coronary intervention procedures.

CONCLUSION

According to studies found in the literature, vascular complications of PCI were the most addressed, followed by nephropathy. In addition to the proposed objective, risk factors that may lead the patient to develop complications related to PCI.

The reviewed articles explore complications in patients undergoing percutaneous coronary intervention (PCI) in different health settings. Patients with various conditions, such as chronic kidney disease, autoimmune diseases, and heart problems, were studied.

In addition, a lower frequency of serious cardiovascular events has been described in patients undergoing PCI, thus supporting the feasibility and safety of the procedure. In the meantime, the studies found emphasized the importance of identifying complications in order to create care protocols that prevent adverse events, highlighting the relevance of these studies to improve post-PCI care.

REFERENCES

1. Antia, A., et al. (2024). In-hospital outcomes and trends of patients with autoimmune diseases undergoing percutaneous coronary intervention: A nationwide analysis. *Cardiovascular Revascularization Medicine*, March 2024.

2. Bienert, I. R. C., et al. (2017). Avaliação temporal dos procedimentos de revascularização coronariana pelo sistema único de saúde (SUS) no Brasil: Um panorama de 20 anos. *International Journal of Cardiovascular Sciences*, 30(5), 380-390.

3. Bussolo, P. (2018). Validação de checklist sobre os cuidados de enfermagem pré-operatórios na angioplastia percutânea (Trabalho de conclusão de curso). Universidade Federal de Santa Catarina, Florianópolis.

4. Cardoso, K. J., & Silva, D. M. (2022). Complicações locais e sistêmicas em pacientes pós-angioplastia coronariana transluminal percutânea primária. *Journal of Nursing and Health*, 12(3), 23 dezembro 2022.

5. Costa, F. A. A., et al. (2016). Fatores de risco cardiovasculares em lesões coronarianas críticas: mito ou realidade?. *International Journal of Cardiovascular Sciences*, 29(5), 378-384.

6. Furtado, M. V., et al. (2017). Efetividade da terapia medicamentosa e dos procedimentos de revascularização como estratégia inicial na doença arterial coronariana estável: estudo de coorte. *International Journal of Cardiovascular Sciences*, 30(5), 408-415.

7. Gomes Junior, M. P. M., et al. (2012). Complicações vasculares em pacientes submetidos a intervenção coronária percutânea precoce por via femoral após fibrinólise com tenecteplase: registro de 199 pacientes. *Revista Brasileira de Cardiologia Invasiva*, 20(3), 274-281.

8. Paganin, A. C., et al. (2018). Vascular complications in patients who underwent endovascular cardiac procedures: multicenter cohort study. *Revista Latino-Americana de Enfermagem*, 26.

9. Quintana-Ortiz, E. U., et al. (2024). Desenlaces clínicos de intervención percutânea sobre tronco coronário izquierdo no protegido. *Rev Med Inst Mex Seguro Soc*, 2024.

10. Santos, A. F. S., et al. (2017). Assistência de enfermagem a pacientes submetidos à angioplastia coronária: uma revisão de literatura. *Cadernos de graduação ciências biológicas e da saúde*, 4(1), 191-201.

11. Sekerak, R., et al. (2024). Outcomes of ultra-low contrast percutaneous coronary intervention in patients with advanced chronic kidney disease. *Catheterization and Cardiovascular Interventions*, June 2024.

12. Sousa, S. M., et al. (2014). Perfil de pacientes submetidos ao cateterismo cardíaco: subsídio para prevenção de fatores de risco cardiovascular. *Revista Cogitare Enfermagem*, 19(2), 304-308.

13. Souza, M. T., Silva, M. D., & Carvalho, R. (2010). Revisão integrativa: o que é e como fazer. *Einstein*, São Paulo.

14. Trevisol, D. J., et al. (2012). Análise de sobrevida em pacientes submetidos à angioplastia coronariana com stent em um hospital da região sul de Santa Catarina. *Scientia Medica*, 22(2), 91-96.