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HEMOSTASE DA ARTERIA RADIAL DEPOIS DE ANGIOGRAFIA CORONARIA: PROTOCOLO DE SCOPING REVIEW
HEMOSTASIS OF THE RADIAL ARTERY AFTER CORONARY ANGIOGRAPHY: A SCOPING REVIEW PROTOCOL
HEMOSTASIS DE LA ARTERIA RADIAL DESPUÉS DE ANGIOGRAFÍA CORONARIA: PROTOCOLO DE SCOPING REVIEW

David Rodrigues¹  <https://orcid.org/0000-0003-3879-2122>

César Teixeira²  <https://orcid.org/0000-0002-2407-8238>

Vitor Parola³  <https://orcid.org/0000-0002-0050-5004>

Paulo Marques⁴  <https://orcid.org/0000-0001-6855-9634>

¹ Centro Hospitalar e Universitário do Porto, Porto, Portugal

² Hospital Universitario Donostia, Donostia-San Sebastián, Spain | Red de Investigación Nacional de Enfermería en Hemodinámica, Spain; Assistant professor – University Francisco de Vitoria, Madrid, Spain

³ Higher School of Health Fernando Pessoa, Porto, Portugal | Health Sciences Research Unit: Nursing, Nursing School of Coimbra, Portugal | Portugal Centre for Evidence-Based Practice: a Joanna Briggs Institute Centre of Excellence, Portugal

⁴ Porto Nursing School, Porto, Portugal | Center of Health Technology and Services Research (CINTESIS/NursID)/Nursing School of Porto (ESEP), Poero, Portugal | Portugal Centre for Evidence Based Practice – PCEBP, Portugal

David Rodrigues - davidrodrigues.cardiologia@chporto.min-saude.pt | César Teixeira - cesarmonteiroteixeira@mail.com |
Vitor Parola - vitor.parola@hotmail.com | Paulo Marques - paulomarques@esenf.pt



Corresponding Author

David Rodrigues

Centro Hospitalar Universitário do Porto

4099-001 Porto - Portugal

davidrodrigues.cardiologia@chporto.min-saude.pt

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RESUMO

Introdução: Atualmente, um elevado número de intervenções coronárias percutâneas são realizadas via artéria radial ocasionando um aumento da variabilidade de métodos, dispositivos e protocolos de hemóstase.

Objetivo: Mapear a evidencia disponível permitir-nos-á melhorar a prática diária. De momento não há evidencia de revisões publicadas sobre este tema.

Métodos: Esta revisão segue a metodologia do Joanna Briggs Institute para scoping reviews. Dois revisores independentes selecionarão os estudos elegíveis. Os dados extrair-se-ão usando uma ferramenta criada ad hoc para reportar os objetivos e as questões de revisão. A análise será apresentada em formato tabular e sumário narrativo. Se reportarão os resultados segundo as guias Preferred Reporting Items for Systematic Reviews and Meta-Analysis com a extensão para scoping reviews. Realizar-se-á uma pesquisa numa seleção de bases de dados eletrónicas relevantes e de literatura cinzenta. Serão considerados estudos com participantes de ambos sexos, submetidos a angiografia coronária via artéria radial. Todos os estudos desde 1989 serão incluídos, ano em que se descreveu por primeira vez o acesso radial para uma intervenção coronária percutânea.

Resultados: Mapear a evidencia contribuirá para identificar o foco do estudo, a hemóstase da artéria radial depois de angiografia coronária.

Conclusão: Espera-se que esta revisão sirva de apoio a futuros estudos que permitam melhorar a prática clínica diária.

Palavras-chave: hemorragia; bandagens compressivas; angiografia coronária; hemostasia; artéria radial

ABSTRACT

Introduction: Nowadays, a great number of interventional cardiology procedures are made via radial artery, which has increased the variability of hemostasis methods, devices, and protocols.

Objective: The focus of this scoping review is to map the literature on hemostasis of the radial artery after coronary angiography. To date, no previous reviews addressing this purpose have been found.

Methods: This review follows the Joanna Briggs Institute methodology for scoping reviews. Two reviewers will independently perform the study selection regarding their eligibility. Data extraction will be accomplished using a researcher's developed tool to address the objectives and reviews questions. Any disagreements arisen between the reviewers will be resolved by discussion or consulting a third reviewer. Data synthesis will be presented in tabular form and a narrative summary that align with the review's objective. Preferred Reporting Items for Systematic Reviews and Meta-Analysis extension to scoping reviews guidelines will be used to report the results. A set of relevant electronic databases and grey literature will be searched.

Results: Mapping the evidence will contribute to identifying the focus of the study, the hemostasis of the radial artery after coronary angiography.

Conclusion: It is expected that this review serves as a support to the development of future studies that will improve daily practice.

Keywords: bleeding; compression bandages; coronary angiography; hemostasis; radial artery

RESUMEN

Introducción: Hoy día, un gran número de intervenciones coronarias percutáneas son realizadas vía arteria radial razón para el incremento de la variabilidad de métodos, dispositivos y protocolos de hemostasia.

Objetivo: Mapear la evidencia disponible nos permitirá mejorar la práctica diaria. Al presente, no hay constancia de revisiones publicadas sobre este tema.

Métodos: Esta revisión sigue la metodología del Joanna Briggs Institute para scoping reviews. Dos revisores independientemente realizarán la selección de estudios elegibles. Los datos se extraerán usando una herramienta *ad hoc* de manera a reportar los objetivos y las cuestiones de revisión. El análisis será presentado en formato tabular y sumario narrativo. Se reportarán los resultados usando las guías Preferred Reporting Items for Systematic Reviews and Meta-Analysis con la extensión para scoping reviews. Se hará una búsqueda en una selección de bases de datos electrónicas relevantes y de literatura gris. Serán considerados estudios en los que hayan participado pacientes de ambos sexos, sometidos a una angiografía coronaria vía arteria radial. Todos los estudios desde 1989 serán incluidos, el año en que el acceso transradial se describió por primera vez para una intervención coronaria percutánea.

Resultados: El mapeo de la evidencia contribuirá a la identificación del foco principal de estudio, la hemostasia de la arteria radial post angiografía coronaria.

Conclusión: De esta revisión se espera que sirva de apoyo al desarrollo de futuros estudios que mejoren la práctica clínica diaria.

Palabras Clave: hemorragia; vendajes de compresión; angiografía coronaria; hemostasis; arteria radial

INTRODUCTION

The cardiac catheterization history is one filled with innovation and taking a step further over unexplored terrain. Ever since the first recorded self-catheterization performed by Werner Forßmann – aided by the operating-room nurse Gerda Ditzen – until the most recent advances in percutaneous structural heart interventions (such as transcatheter aortic valve replacement - TAVR), the main focus of the catheterization laboratory (cath lab, for short) practice was to improve the number and range of performed interventions.¹ One of those is the coronary angiography, consisting on the injection of a contrast medium through a coronary artery, under the use of x-ray, to assess its anatomy. An arterial (or venous) access is needed to perform a cardiac catheterization, as it is known from Werner Forßmann's personal experience. This technique has been used and perfected over the past decades and is essential for a great number of percutaneous cardiac interventions. The first access that was used, and the one that is still preferred for complex interventions such as TAVR, mechanical circulatory support and chronic total occlusion angioplasty, is the femoral artery approach.² However, there is a shift towards the radial artery (RA) approach due to the reduced risk for vascular and bleeding complications and the verified survival benefit in ST-segment–elevation myocardial infarction patients who undergo primary percutaneous coronary intervention (PCI).² In 1947, Radner first reported an aortography via RA and since then, until Campeau (1989) and Kiemeneij (1993) started diffusing this approach, a case favoring the radial access has been made.³ The past decade has given a solid body of evidence in favor of the RA approach, mostly because of the results of trials like RIVAL (2011), RIFLE-STEACS (2012), STEMI-RADIAL (2014) and MATRIX (2015), which certified the benefits of the radial vs femoral artery access.³ The RA has some distinctive characteristics that made it eligible for use in the field of interventional cardiology (IC). On the one hand, it is a superficial artery, easily palpable and compressible, with sufficient diameter (2.69 ± 0.40 mm in men and 2.43 ± 0.38 mm in women (range 1.15 mm to 3.95 mm)) to perform diagnostic and interventional procedures, and isolated from major nerves and veins. On the other hand, its limited diameter, tortuosity and higher reactivity for spasm render a steeper learning curve. In addition to the latter, there is the possibility of radial artery occlusion (RAO), which will compromise future interventions on this access site. This is a serious concern, given that the ageing of the population comes with a larger propensity for chronic diseases, multimorbidity, and the possibility for multiple interventions, given state of the art in IC. According to the PROPHET and PROPHET-II studies, patent hemostasis and prophylactic ulnar compression reduce RAO.³ Furthermore, a shorter duration of the RA compression and the use of anticoagulants – local or systemic – and locally administered vasodilators proved effective at reducing RAO.³ Resolving these problems may allow an early patient discharge allowing a more significant number of procedures, improving its cost-effectiveness, and assuring better patient satisfaction by limiting the length of stay.

In this evolving landscape, the industry never failed to provide solutions to new ideas or perfect old ways with better materials. Apart from the tools needed to perform the vascular access, its closure is also an issue. When it comes to hemostatic devices, the RA takes the win, with solutions that range from hemostatic patches to compression devices, in multiple shapes and manners.⁵ On the one hand, there is the manual compression, consisting of applying constant pressure over the puncture site until bleeding is stopped, followed by applying a compression bandage – two or more strips of elastic material - over said site. On the other hand, the mechanical or device focused one, e.g., TR-BAND® (Terumo®, Japan), consists of applying pressure over the puncture site. The use of devices allows reallocating valuable and differentiated human resources. The hemostasis protocol has varied since it first appeared, and from one cath lab to another. Several methods have been tried, to balance adequate hemostasis while avoiding RAO, using different inflation times, time to first deflation and total weaning, and non-fractionated heparin doses in-procedure. Here we must take into account that TR-BAND is the most widely used and studied pneumatic compression device⁶. Despite Terumo itself now recommending the permeable hemostasis protocol requiring that the blood flow through the RA is maintained while the hemostasis occurs – patent hemostasis, there is no standard protocol for total time of compression nor weaning times.^{6,7} The last review of the protocol by Terumo, as well as the lack of a standardized protocol, have sparked our interest in what else has changed concerning state of the art on RA hemostasis.

Thus, the authors aim to map the available evidence on the previous subject by conducting a preliminary search of MEDLINE (PubMed), the Cochrane Database of Systematic Reviews, the *JBI Evidence Synthesis*, PROSPERO and Open Science Framework (OSF).

No current or underway scoping reviews or systematic reviews were identified. Therefore, this scoping review attempts to:

1. Systematically map the literature of the RA hemostasis after coronary angiography since the approach was first described.^{8,9,10}
2. Identify the research gaps in the literature in order to define further research and determine the value of undertaking a systematic review.

Review question(s):

- i. What are the hemostasis methods used for the radial artery after a coronary angiography?
- ii. What are the characteristics of the hemostasis methods?
- iii. How are the results of hemostasis methods evaluated?
- iv. What hemostasis protocols are associated?

Inclusion criteria:

1) Participants:

The feasibility and safety of the RA approach in children and adolescents, as well as the use of hemostasis methods and associated protocols, makes a case for including them as participants, thus this scoping review will include research studies that include all patients, of all ages and of both sexes, who underwent coronary angiography¹¹.

2) Concept:

This review will consider research studies that explore hemostasis methods used after a coronary angiography via radial artery puncture.

3) Context:

This review will consider original research studies and review articles including systematic reviews, meta-analysis, meta-synthesis, narrative reviews, mixed-methods reviews and qualitative reviews that refer to coronary angiographies performed via radial artery.

4) Types of sources

This scoping review will consider quantitative, qualitative and mixed methods study designs for inclusion, as well as grey literature sources. In addition, systematic reviews will be considered for inclusion in the proposed scoping review.

1. METHODS

Given all the various approaches available for reviewing the literature: a) scoping review versus b) systematic review – a scoping review is the most suitable one, because of the object of this work. The first goal is to produce an overall map of what evidence has been produced, which contrasts with the latter’s that is to find a solid defined answer to a question related to practice.

Thus, the proposed scoping review protocol will be conducted in accordance with the Joanna Briggs Institute (JBI) methodology latest guidance.^{10,12}

Search strategy

The search strategy aims to locate both published and unpublished primary studies, reviews. The search strategy was developed by two reviewers and peer-reviewed by the experienced third one. An initial limited search of MEDLINE (PubMed) and CINAHL (EBSCO) was undertaken to identify articles on the topic. Thus, the text words contained in the titles and abstracts of relevant articles, and the index terms used to describe the articles were used to develop a full search strategy for MEDLINE (PubMed) (see Table 1). The search strategy will be adapted for each included information source. The reference lists of articles included in the review will be screened for additional papers.

All Articles published from 1989, since the transradial method was described by Campeau, to the present day will be included to obtain the latest evidence in radial artery hemostasis methods.¹³

The databases to be searched include MEDLINE (PubMed), CINAHL complete (EBSCO), the Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials and Scopus. The search for unpublished studies will include: OpenGrey (OpenGrey.eu), DART-Europe and publications of interventional cardiology reference sites (European Association of Percutaneous Cardiovascular Interventions, European Journal of Cardiovascular Nursing, CathLab Digest, The Cardiac Society of Australia and New Zealand and Asociación Española de Enfermería en Cardiología).

Table 1 - Search strategy – query made in Medline (PubMed) on the 29th June 2021.

Search	Query	Records retrieved
#1	coronary angiography	95,979
#2	“coronary angiography”	82,360
#3	(“coronary angiography”[Text Word])	82,355
#4	(coronary angiography [MeSH Terms])	67,749
#4	(coronary angiography[Title/Abstract])	33,556
#5	Angiography, coronary	95,979
#6	“angiography, coronary”	376
#7	("angiography, coronary"[Text Word])	376
#8	(angiography, coronary [MeSH Terms])	67,749
#9	(angiography, coronary [Title/Abstract])	376
#10	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10	95,980
#11	Radial artery	14,505
#12	“radial artery”	10,979

Search	Query	Records retrieved
#13	(radial artery [Text Word])	10,979
#14	(radial artery [MeSH Terms])	6,865
#15	(radial artery [Title/Abstract])	8,020
#16	#11 OR #12 OR #13 OR #14 OR #15	14,505
#17	Hemostasis	154,308
#18	"hemostasis"	50,550
#19	(hemostasis[Text Word])	44,697
#20	(hemostasis[MeSH Terms])	116,120
#21	(hemostasis[Title/Abstract])	29,156
#22	Hemorrhage	5,091,704
#23	"hemorrhage"	296,634
#24	(hemorrhage[Text Word])	296,615
#25	(hemorrhage[MeSH Terms])	339,929
#26	(hemorrhage[Title/Abstract])	161,233
#27	Bleeding	543,465
#28	"bleeding"	216,445
#29	(bleeding[Text Word])	216,186
#30	(bleeding[MeSH Terms])	339,929
#31	(bleeding[Title/Abstract])	215,105
#32	#17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31	5,198,950
#33	Compression bandage*	3,742
#34	"Compression bandage*"	1,625
#35	(Compression bandage*[Text Word])	1,623
#36	(Compression bandage*[MeSH Terms])	2,682
#37	(Compression bandage*[Title/Abstract])	636
#38	Compression Wrap*	632
#39	"Compression Wrap*"	62
#40	(Compression Wrap*[Text Word])	62
#41	(Compression Wrap*[MeSH Terms])	0
#42	(Compression Wrap*[Title/Abstract])	62
#43	Elastic Bandage*	1,268
#44	"Elastic Bandage*"	400
#45	(Elastic Bandage*[Text Word])	400
#46	(Elastic Bandage*[MeSH Terms])	1,295
#47	(Elastic Bandage*[Title/Abstract])	400
#48	Elastic Compression Wrap*	92
#49	"Elastic Compression Wrap*"	2
#50	(Elastic Compression Wrap*[Text Word])	2
#51	(Elastic Compression Wrap*[MeSH Terms])	0
#52	(Elastic Compression Wrap*[Title/Abstract])	2
#53	#33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52	6,372
#54	#10 AND #16 AND #32 AND #53	33
#55	("1989"[Date - Publication] : "3000"[Date - Publication])	24,060,585
#56	#54 AND #55	33

Study/Source of evidence selection

Following the search, all identified records will be collated and uploaded into Mendeley version 1.19.4 (Elsevier, NL) and duplicates removed.¹⁴ Following a pilot test, titles and abstracts will then be screened by two independent reviewers for assessment against the inclusion criteria for the review. Pilots of 50 records will continue until at least 80% consensus has been reached. Potentially relevant papers will be retrieved in full. Their citation details are imported into the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI; JBI, Adelaide, Australia).¹⁵ The full text of selected citations will be assessed in detail against the inclusion criteria by two independent reviewers. Reasons for excluding full-text papers that do not meet the inclusion criteria will be recorded and reported in the scoping review. Finally, the references of all the included studies on the review will be hand searched. When there is ambiguity, the reviewers will always choose to include studies for the next phase. Any disagreements that arise between the reviewers at each stage of the selection process will be resolved through discussion or with a third reviewer. The search results will be reported in full in the final scoping review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses for Scoping Reviews (PRISMA-ScR) flow diagram.¹⁶

Data extraction

Data will be extracted from papers included in the scoping review by two independent reviewers using a data extraction tool developed by the reviewers aligned with the objectives and research questions. The data extracted will include specific details about the population, concept, context, methods, and key findings relevant to the review question.¹⁴ A draft extraction tool is provided (see Table 2). The draft data extraction tool will be modified and revised as necessary during the process of extracting data from each included paper. Modifications will be detailed in the full scoping review. Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer. Authors of papers will be contacted to request missing or additional data, where required. In case of data duplication reviewers will choose to report the primary study.

Table 2 - Data extraction instrument.

Scoping review details	
Scoping review title	Hemostasis of the radial artery after coronary angiography: a scoping review.
Review objective(s)	The focus of this scoping review is to map the literature of hemostasis of the radial artery after coronary angiography.
Review question(s)	i. What are the hemostasis methods used for the radial artery after a coronary angiography? ii. What are the characteristics of the hemostasis methods? iii. How are the results of hemostasis methods evaluated? iv. What hemostasis protocols are associated?
Inclusion/exclusion criteria	
Population	This scoping review will include research studies that include all patients, of all ages and of both sexes, who underwent coronary angiography.
Context	This review will consider original research studies and review articles including systematic reviews, meta-analysis, meta-synthesis, narrative reviews, mixed-methods reviews and qualitative reviews that refer to coronary angiographies performed via radial artery.
Concept	This review will consider research studies that explore hemostasis methods used after a coronary angiography via radial artery puncture.
Types of evidence source	This scoping review will consider quantitative, qualitative and mixed methods study designs for inclusion, as well as grey literature sources in addition, systematic reviews will be considered for inclusion in the proposed scoping review.
Evidence source details and characteristics	
Type of article	
Author(s)	
Year of publication	
Origin/country of origin (where the source was published or conducted)	
Aims/purpose	
Population and sample size within the source of evidence (if applicable)	
Details/Results extracted from source of evidence (in relation to the concept of the scoping review)	
Method for hemostasis used	
Characteristics of the hemostasis methods	
Results of hemostasis methods	
Hemostasis protocol used (if applicable)	

Data analysis and presentation

The data collected will be presented as a narrative synthesis and tabular or diagrammatic form, depending on which is more appropriate to this review's objective.

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