The efficacy of interventions for back pain in patients after transfemoral coronary angiography: A rapid systematic review

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Coronary angiography is a gold standard tool for diagnosis of coronary artery disease. After this test, patients are restricted in bed to prevent vascular complications. Immobilization and bed rest can cause back pain in these patients. The objective of this rapid systematic review is to assess the efficacy of interventions for reducing back pain after transfemoral coronary angiography. All published, peer-reviewed, English-language interventional studies from 1990 to 2017 were identified in a search of Scopus, PubMed, and CINAHL databases. Relevant studies were surveyed with experimental and quasiexperimental designs that assessed the interventions for reducing back pain after coronary angiography. Data were extracted from studies and assessed. Totally 9 studies with 1062 participants which evaluated the interventions for reducing back pain after coronary angiography were included. The findings of these studies suggest that early ambulation and modified positioning were effective to reduce back pain in patients undergoing coronary angiography. The use of early ambulation 2–4 hours after angiography and changing the patients' position along with modified positioning cause a reduction in the back pain of the patients. (J Vasc Nurs 2018;37:52-57)

Cardiovascular diseases are the most common causes of mortality and morbidity around the world.[1] Coronary artery disease is the most common disease among cardiovascular diseases.[2] Coronary angiography (CAG) is a gold standard tool widely used for diagnosis in patients with coronary artery disease.[3] Transfemoral approach is a routine procedure in this test because of its advantages compared with the transradial approach. In this procedure, similar to any other invasive procedures, patients suffer from complications.[4] After the procedure, patients should be restricted in bed for 4 to 24 hours.[5,6] Restriction and bed rest for long time and with sand bag on the affected leg is difficult for many patients.[7,8] Studies in this field show that back pain is a common problem in patients undergoing CAG.[9] Pain can lead to hemodynamical instability in these patients. Stress, anxiety, release of epinephrine, increase in heart rate and blood pressure, and also increase in cardiac load are associated with pain and exacerbation of myocardial ischemia in these patients.[5,7–9]

Various studies have made an attempt to reduce this problem in patients undergoing CAG, focusing on early ambulation and positioning on back pain. Regarding the importance of this problem and need to such interventions for reducing this unpleasant problem, this study aimed to determine the best protocol for reducing back pain in patients after CAG.

METHODS

The objective of this rapid systematic review study was to determine the efficacy of the interventions on back pain of patients having undergone CAG. A rapid systematic review was used in this study. This study aimed to present a critique about the efficacy of the interventions regarding reduction of back pain after CAG.

Search strategy

All published, full-text, English-language articles within databases of CINAHL, Scopus, Medline, and ScienceDirect were searched for. Our strategy for searching relevant articles was only nonpharmacological interventions used for reducing back pain after CAG. Studies published during 1990–2017 were searched. Key search terms included back pain, coronary angiography, cardiac catheterization, nursing interventions, and patients' education. These keywords were searched separately or in combination with each other. The results of searches were imported into EndNote X7 for assessing from duplication and reference management. All included studies are summarized in a sheet with following information: 1) authors' name, 2) year, 3) country, 4) study design, 5) participants, 6) intervention, 7) tool for pain assessment, and 8) main finding.

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TABLE 1

CHARACTERISTICS OF REVIEWED STUDIES

Author	Year	Country	Design	Participants	Intervention	Outcome Measure and Tool	Findings
Rezaei-Adaryani et al[7]	2009	Iran	quasiexperimental	105; 35 in each group: A, B, and C	Group A: modified positioning and a pillow under their body. Group B: modified positioning. Group C: routine care	Back pain: numerical rating scale	Statistically significant difference between the six time points within each group ($P < .05$)
Pooler-Lunse et al[16]	1996	Canada	Pilot study	29; group 1: 14; group 2: 15	Group 1: modified positioning. Group 2: nonmodified positioning	Back pain: McGill pain questionnaire	Statistically significant difference between the two groups ($P < .02$)
Chair et al[9]	2003	Hong Kong	Experimental	419; group 1: 213; group 2: 206	Group 1: Usual care, remaining supine and flat for 8–24 hours, with the affected leg straight. Group 2: changed their body position hourly, varying between supine, right side lying, and left side lying during the first 7 hours	Back pain: Numeric Pain Intensity Scale	Pain differed significantly across the five time periods between the two groups ($P < .001$).
Bakhshi et al[15]	2011	Iran	Randomized controlled trial	80; group 1: 40; group 2: 40	Group 1: 6 to 24 hours of bed rest in the supine position with the affected leg fixed straight and immobilized. Group 2: allowed to ambulate without restriction 6 hours after catheterization.	Back pain: visual analogue scale	Statistically significant difference between the two groups regarding back pain at the second, third, and sixth hour after catheterization ($P < .001$)

TABLE 1

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Author	Year	Country	Design	Participants	Intervention	Outcome Measure and Tool	Findings
Hoglund et al[14]	2008	Sweden	Randomized trial, pilot study	104; group 1: 52; group 2: 52	Group 1: 1.5-hour bed rest, 1 hour of femoral pressure, and 30 minutes of bed rest. Group 2: 3 hours of femoral pressure and 2 hours of supine bed rest	Back pain: cisual analogue scale	Statistically significant difference between the two groups regarding back pain ($P < .05$)
Chair et al[5]	2007	Hong Kong	Randomized trial	86; group 1: 43; group 2: 43	Group 1: ambulated after four hours of bed rest after cardiac catheterization. Group 2: ambulated the morning after the procedure, 12–24 hours after bed rest	Back pain: visual analogue scale	Statistically significant difference between the two groups regarding back pain ($P < .001$).
Abdollahi et al[13]	2012	Iran	Randomized trial	140; group 1: 35; group 2: 35; group 3: 35; group 4: 35	Group 1: supine position for 6 hours without a movement. Group 2: change of position was applied. Group 3: early ambulation was applied. Group 4: both early ambulation and change of position were applied	Back pain: Numerical Rating Scale	Significant difference between the studied groups in the mean of pain intensity at the fourth hour ($P = .001$)
Fathi et al[11]	2017	Iran	Quasiexperimental	60; group 1: 30; group 2: 30	Group 1: Take off the sand bag from the insertion site at the third hour. Group 2: Take off the sand bag from over the insertion site at the sixth hour.	Back pain: visual analogue scale	Significant difference between the studied groups in the average incidence of back pain ($P = .00$)

(Continued)

TABLE 1

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Author	Year	Country	Design	Participants	Intervention	Outcome Measure and Tool	Findings
Barkman et al[12]	1994	Canada	Experimental	39; group 1: 20; group 2: 19	Group 1: ambulated at 3 hours after cardiac angiogram. Group 2: ambulated at 6 hours.	Back pain: Melzack's Present Pain Intensity Scale	Patients ambulating early had significantly less pain overall ($P < .005$) and less back pain at 4 and 7 hours after angiogram ($P < .05$).

Eligibility criteria

Studies with experimental and quasiexperimental designs of interventions conducted to reduce back pain after CAG were selected to be included in this rapid systematic review. Eligibility criteria for study selection based on population, intervention, comparison and outcome model were as follow:

1) Population: all patients undergoing CAG via transfemoral approach.
2) Intervention: protocols used for reducing back pain after CAG.
3) Comparison: routine care versus modified positioning or early ambulation.
4) Outcome: the only outcome was back pain intensity.

Study selection

All studies were assessed by two researchers. Nine studies were included and retrieved. Data of all the retrieved articles were extracted. The quality of studies was assessed based on an appraisal checklist, and finally 9 studies were included in the analysis. For critical appraisal of studies, we used the Down and Black check list.[10]

RESULTS

In primary search, we identified 26 articles for potential inclusion. Finally, 9 studies conducted across 5 countries (Iran [4 studies], Hong Kong [2 studies], Canada [2 studies], Sweden [1 study]) were included in the analysis. In these studies, 1062 participants were included. Characteristics of the studies are shown in Table 1.

As shown in Table 1, four studies were randomized controlled trials, one study was quasiexperimental, one was experimental, and one study was a pilot study. All studies used one or more interventions for reducing back pain. Interventions used in these studies were grouped into two categories: 1) early ambulation and 2) modified positioning.

The only outcome for analyzing by authors was back pain. The most common tool for assessing back pain in these studies was the visual analogue scale. Other tools included the numerical pain intensity scale and McGill pain questionnaire.

Early ambulation

There were 6 studies with 509 participants which used an early ambulation intervention for reducing back pain in patients having undergone CAG.[5,11-15] From the 6 studies, 2 evaluated the early ambulation in combination with changing patients' position on back pain.[14,15] These studies reported the positive effects of early ambulation in reducing back pain.[5,11-15] Abdollahi et al[13] (2012) evaluated early ambulation separately and in combination with positioning and found significant decreases in the mean of pain intensity. Chair et al[5] (2007) evaluated two protocols of early ambulation (ambulation after four-hour bed rest vs ambulation after 12–24 hours after bed rest). She concluded that early ambulation (four-hour bed rest) caused a statistically significant reduction in back pain in comparison with long-term bed rest. Hoglund et al[14] (2008) showed that early ambulation causes lower back pain scores. The majority of these studies used the visual analogue scale for assessing back pain.[5,11,12,14] Abdollahi et al[13] (2012) was the only study that used numerical rating scale for assessing back pain. Barkman and Lunse[12] (1994) used Melzack's Present Pain Intensity Scale for assessing the back pain of patients.

Positioning

Three studies with 553 participants assessed various methods of positioning for decreasing back pain of the patients who had undergone CAG.[7,9,16] Methods of positioning in these studies included modified positioning; modified positioning and pillow

under the body; and changing the body position on a hourly basis varying between supine, right side lying, and left side lying positions.[7,9,16] All studies reported a statistically significant reduction in back pain scores after applying modified positioning.[7,9,16] Rezaei-Adaryani et al[7] (2009) evaluated three methods of positioning in a quasiexperimental design. He used modified positioning, modified positioning with pillow under the body, and routine care (12- to 24-hour bed rest). The results of Rezaei-Adaryani et al.'s study showed that modified positioning methods caused a reduction in back pain scores.[7] In a study by Pooler et al[16] (1996), applying modified positioning showed a reduction in back pain scores assessed by the McGill pain questionnaire. The majority of these studies used the numerical rating scale and numerical pain intensity scale for measurement of back pain.[7,9]

DISCUSSION

This rapid systematic review examined the effectiveness of interventions in reducing back pain in patients having undergone coronary artery angiography. The results of this study showed that early ambulation and changing the patients' position were effective in reducing back pain.

Early ambulation after coronary artery angiography compared with the common and routine protocols of complete and long-term bed rest showed a decrease in the score for back pain in patients.[5,11–15] All the reviewed studies emphasized the efficacy of early ambulation after angiography in reducing back pain.[5,11–15] Despite the effectiveness of early ambulation in reducing back pain in patients after coronary artery angiography, several points should be considered. First, the protocols used in early ambulation differ in different studies. For example, in the study of Chair et al,[5] 4 hours after the angiography, and in the study of Bakhshi et al,[15] 6 hours after the angiography, the patients were allowed to ambulate early on. Second, the patients' underlying differences in tolerance, back pain, and other factors involved in the incidence of low back pain were not considered. Third, differences in postangiographic care, weight, and type of device used in homeostasis after angiography can also be effective in reducing back pain in patients. In addition, the difference in the definition of early ambulation in various studies makes it difficult to interpret the results of the studies and compare them with each other. The results of the studies show a more effective impact of early ambulation in the first 4 hours after angiography than that in the subsequent hours.

One of the other interventions for reducing back pain after CAG was positioning and modified positioning. Modified positioning or changing the patients' position in various studies has shown that in comparison with the routine protocol (absolute rest without movement), it reduces back pain in patients. The method used to change the patients' position has been reported different in various studies.

In some studies, changing the patients' position with the placement of a pillow under the patient's body;[7] a change in the patient's position varying between the supine, right side lying, and left side lying;[9] and the change of position with early ambulation[13] have been reported. In addition to different methods for changing position, various instruments have been used to measure pain in various studies. Despite the efficacy

mentioned in all the reviewed studies, the effectiveness of the modified positioning and modalities of positioning on the reduction of back pain in patients after coronary artery angiography should be considered. First, the differences in the design of these studies and the method of changing the position make it difficult to compare the results of different studies with each other. Second, differences in patients' underlying variables, the hospital care protocols, methods of changing patients' position, and other underlying conditions can make comparison of the results harder.

One of the main strengths of this study was the inclusion of all studies in the use of interventions to reduce back pain in patients after angiography. All studies from various databases were included in this study. Differences in the design of different studies, low sample size, and the use of different interventions can be mentioned as limitations of this study.

CONCLUSION

Early ambulation and changing the patients' position after coronary artery angiography is one of the effective ways to reduce back pain. According to the results of this study, these two interventions can be used to reduce back pain after CAG compared with routine methods. The use of early ambulation 2–4 hours after angiography and changing the patients' position along with modified positioning cause a reduction in the back pain of the patients.

ACKNOWLEDGMENTS

REFERENCES

1. Loucks EB, Lynch JW, Pilote L, et al. Life-course socioeconomic position and incidence of coronary heart disease: the Framingham Offspring Study. Am J Epidemiol 2009; 169(7):829-36.
2. Woods SL, Froelicher ES, Motzer SA, et al. Cardiac nursing. Philadelphia, PA: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2010.
3. Jolly SS, Yusuf S, Cairns J, et al. Radial versus femoral access for coronary angiography and intervention in patients with acute coronary syndromes (RIVAL): a randomised, parallel group, multicentre trial. Lancet 2011;377(9775): 1409-20.
4. Berry C, Kelly J, Cobbe SM, et al. Comparison of femoral bleeding complications after coronary angiography versus percutaneous coronary intervention. Am J Cardiol 2004; 94(3):361-3.
5. Chair SY, Thompson DR, Li SK. The effect of ambulation after cardiac catheterization on patient outcomes. J Clin Nurs 2007;16(1):212-4.

6. Boztosun B, Güneş Y, Yildiz A, et al. Early ambulation after diagnostic heart catheterization. Angiology 2008;58(6):743-6.

7. Rezaei-Adaryani M, Ahmadi F, Mohamadi E, et al. The effect of three positioning methods on patient outcomes after cardiac catheterization. J Adv Nurs 2009;65(2):417-24.

8. Steffenino G, Dutto S, Conte L, et al. Vascular access complications after cardiac catheterisation: a nurse-led quality assurance program. Eur J Cardiovasc Nurs 2006;5(1):31-6.

9. Chair SY, Taylor Piliae RE, Lam G, et al. Effect of positioning on back pain after coronary angiography. J Adv Nurs 2003;42(5):470-8.

10. Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. J Epidemiol Community Health 1998;52(6):377-84.

11. Fathi M, Valiee S, Mahmoodi P. Effect of changing the duration of keeping sandbag over catheter insertion site on the coronary angiography acute complications: a controlled clinical trial. J Vasc Nurs 2017;35(4):193-200.

12. Barkman A, Lunse CP. The effect of early ambulation on patient comfort and delayed bleeding after cardiac angiogram: a pilot study. Heart Lung 1994;23(2):112-7.

13. Abdollahi AA, Mehranfard S, Behnampour N, et al. Effect of positioning and early ambulation on coronary angiography complications: a randomized clinical trial. J Caring Sci 2015;4(2):125.

14. Höglund J, Stenestrand U, Tödt T, et al. The effect of early mobilisation for patient undergoing coronary angiography; a pilot study with focus on vascular complications and back pain. Eur J Cardiovasc Nurs 2011;10(2):130-6.

15. Bakhshi F, Namjou Z, Andishmand A, et al. Effect of positioning on patient outcomes after coronary angiography: a single-blind randomized controlled trial. J Nurs Res 2014;22(1):45-50.

16. Pooler-Lunse C, Barkman A, Bock BF. Effects of modified positioning and mobilization on back pain and delayed bleeding in patients who had received heparin and undergone angiography: a pilot study. Heart Lung 1996;25(2):117-23.