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ARYA Atherosclerosis

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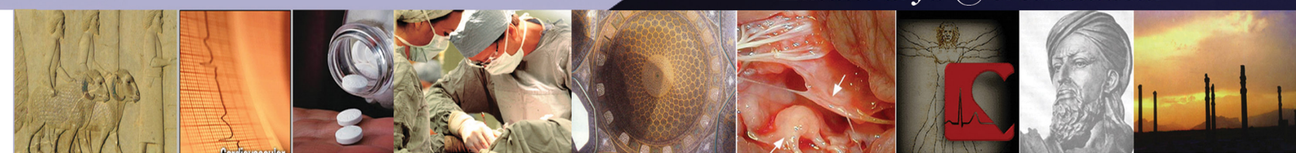

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* All the words of the article containing the references; each table is considered as 300 words.

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Table of Contents

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Bridging the theory-practice gap in Iranian emergency nursing education

Shima Safazadeh[(1)], Alireza Irajpour[(2)], Nasrollah Alimohammadi[(3)], Fariba Haghani[(4)]

Original Article

Abstract

BACKGROUND: The theory-practice gap is one of the important challenges of treatment, health, and educational systems. It is affected by different factors like students, teachers, and the clinical environment. This gap has consequences for education, as well as the treatment and health services systems. Thus, it is necessary to find effective strategies to reduce it. Therefore, the present study was conducted with the aim to find strategies to reduce the theory-practice gap in emergency nursing education in the view of stakeholders.

METHODS: A qualitative research was conducted, including 18 semi-structured interviews and 3 focus group sessions with the stakeholders in a school of nursing and an educational hospital. Content analysis method was used to analyze the collected data.

RESULTS: The strategies to reduce the theory-practice gap in emergency nursing education were divided into 6 primary categories, 2 main categories and 1 theme of action to change. From among the 69 strategies presented to the focus groups, the participants acknowledged 28 strategies as practical and effective. Furthermore, the participants held that it was necessary to have reformative and developmental actions in line with care, supervision, evaluation, and educational processes in order to reduce the gap between theory and practice in emergency nursing education.

CONCLUSION: The theory-practice gap is affected by many different factors. Thus, the people involved must pay attention to every influential factor in order to reduce the consequences, and use effective cooperative strategies by taking into consideration the human resources, infrastructures, processes, and the administrative culture in faculty and clinical environments.

Keywords: Qualitative Research, Nursing Education, Emergency Department

Date of submission: 06 Jan. 2018, ***Date of acceptance:*** 21 Mar. 2018

Introduction

The nursing profession is comprised of the two main domains of theoretical and practical; the first one represents knowledge, and the latter is focused on clinical skills.[1] By the late 20th century in the Western world, traditional nursing education at hospitals was transferred to universities which led to a theory-practice gap.[2] The literature showed that there is a clear gap between what is taught in the classroom and what the student nurses experience in the clinical area.[1] The gap has always been a crucial problem in nursing, and as experts believe, it is not presently getting its due attention.[3] The discrepancy between theoretical education and nurses' performance in clinical settings leads to the uselessness of their knowledge, prevention of scientific progress in theory, the prioritization of traditional common methods, decline in the quality of their work, and even resignation.[4] The reactions of students can be summed up as incompatibility with the clinical environment, anxiety, feeling of incapability, depression, and insecurity due to lack of proficiency,[5] and the newly graduated would experience transition shock.[6]

According to Iranian researchers, the reasons for this gap are dearth of philosophical thinking, mission, and written educational goals in Iran's nursing educational programs, ignorance of students' professional interests, shortage of relevance between theoretical and practical courses,

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development of a relative and mostly by-the-book knowledge in the students,[7] lack of balance between the proportion of theoretical and practical courses, insufficiency of appropriate facilities in hospitals, rarity of an active engagement of teachers and students of higher education in the clinical settings and their incapability due to lack of necessary theoretical and practical skills, and excess of routine-based approaches.[8] Hence, to find strategies to reduce the gap, Iranian nursing researchers, have focused on the assessment of problems in effective theoretical and practical teaching and training, assessment of different teaching methodologies and their cognitive, motivational, and behavioral outcomes in students' actions, assessment of instructors and clinical environment,[9] and the change in nursing programs and curriculums.[10]

However, the importance of society's expectations of the health system to provide services based on observation and scientific methods,[11] the need for analytical and creative nurses for clinical situations in complex health systems of the 21st century,[12] and nurses' passion to bridge the gap and provide high quality care[9] necessitates a local examination of the impacts of the gap and the strategies to reduce them based on the existing facilities. Thus, the researchers decided to use their clinical and educational experiences and conduct a study to find the strategies to reduce the theory-practice gap in emergency nursing education.

Materials and Methods

This qualitative study was conducted to find strategies to reduce the theory-practice gap in emergency nursing education. The qualitative method relies on the context and allows the researcher to take into consideration the daily lives of a group of people in different circumstances[13] in order to recognize their various behavioral aspects.[14] The multidimensional, unremitting nature of this method helped researchers recognize solutions to reduce the gap between theory and practice in emergency nursing education, which is a multi-factorial concept itself. This study was more than just a solution-seeking practice; it was concerned with how things occur, how people make sense of things, and how issues unfold in the real-world of the faculty and emergency department. By using this method, the research team can reach "deeper data" to find new solutions to decrease the gap, so the qualitative research becomes increasingly valuable.

The participants in this study were theoretical and clinical instructors of a nursing board in the School of Nursing and Midwifery at Isfahan University of Medical Sciences, Iran, students, nurses, and physicians of the emergency department of an affiliate educational hospital with 100 beds and about 150 nurses, and some of the executive managers in both administrations. The clinical instructors were 2 board members and 4 postgraduate nursing students, 2 of whom had been working in the emergency department.

In addition to willingness to participate, the inclusion criteria for the study were at least a bachelor's degree and 1 year of service in the emergency department in rotational shifts for nurses, attendance in emergency education for nursing students, and at least 1 year of cooperation as an instructor in the emergency department board for clinical instructors. Those who did not want to participate, had stopped working in the emergency department, or had stopped studying nursing (for students) were excluded from the research project.

Isfahan University Ethics Committee has approved this research. Moreover, to adhere to ethical principles in this study, the researchers obtained the oral consent of the head-nurse and nursing instructors upon entry to the department, provided the participants with an introduction and explanation on the aims of the study before the interviews and focus groups, obtained informed consent from the interviewees for audio recordings, assured the interviewees that their participation would have no effects on their jobs, and used codes instead of their names in all related documents of the study. In order to improve the quality of service, the results of the study were also sent to the Committee for Quality Improvement and Certification, the Emergency Services Improvement Committee, and the Teaching Council of the Faculty. The ninth university ethics committee and research council approved the performance of this study.

Data collection started with 18 semi-structured interviews in December 2016 and lasted for 7 months followed by 3 focus groups in 2 months. The most important feature of focus group is the interaction between the members which incites them to produce deep, accountable data.[15] All of the participants were selected through purposive sampling in order to obtain maximum variation and the views of those with expertise in this certain area.

During the interviews, the researchers paid attention to the participants' tone and body language, and wrote the asserted points. If necessary, a shorter interview could be held for further elaborations.

Table 1. The selection criteria for strategies and their definitions

Criteria	Definition
Focus on the problem	Its implementation will be the most effective in reducing the theory-practice gap, in emergency nursing education.
Practicality in terms of time and cost	The chosen strategy will be performed in the shortest possible amount of time and with the least cost.
Measurability	There is a practical method for measuring the existing and future situation, for example, questionnaires or checklists.
Effectiveness	Considering all of the existing aspects and potentials, the strategy is the most effective in reducing the gap.

The interviews were continued until data saturation. Some of the questions asked were: "In your opinion, what is your role in the reduction of the theory-practice gap?" and "What do you suggest for its reduction?"

Since the implementation of all the suggested strategies was not possible financially, the researchers (S, I, and A) and the stakeholders decided to hold focus groups to choose practical and effective strategies. By considering the most common selection criteria, nature of the obstacles, and existing strategies, and after the unanimous vote of the participants, the 4 criteria of focus on the problem, practicality in terms of time and cost, measurability, and effectiveness were determined (Table 1). A 9-point Likert scale was used to prioritize the strategies in the two committees of the faculty and the emergency department; scores of 1-3 show the least importance and scores of 7-9 represent the highest priority for the reduction of the gap. The emergency department committee had 12 members and the faculty committee had 10.

It was possible that the decisions of these two committees would not cover all the conditions in both the faculty and emergency departments; thus, a committee of chief directors including executive managers of the faculty and emergency department was formed. Strategies allowed in the committee of chief directors had the average scores of 7-9 in the 4 criteria. In this committee, 5 experts categorized the strategies of reducing the theory-practice gap into 5 priorities from 1-5. The omitted strategies had a score of less than 3.5. All steps of the study were summarized in a vertical chevron list (Figure 1).

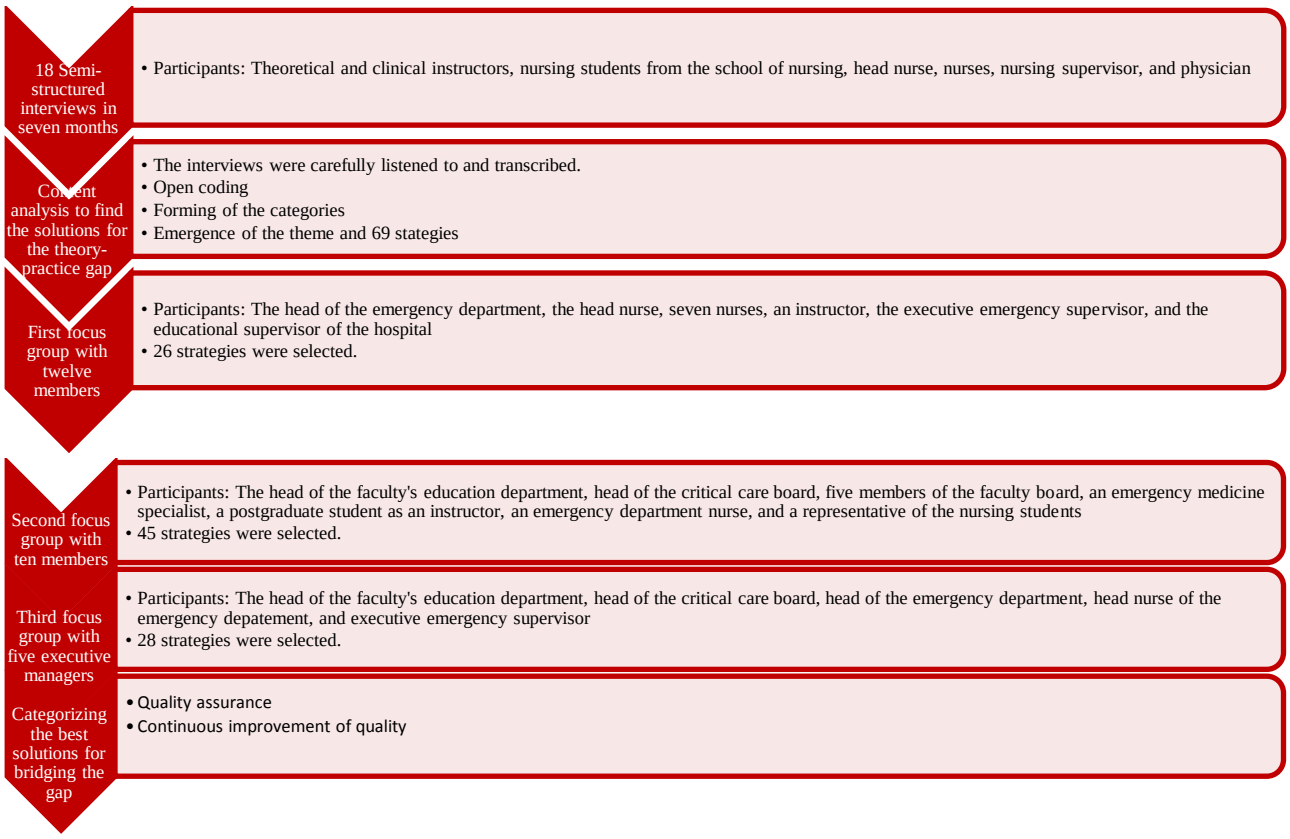

Figure 1. 6 steps to find the best solution to decrease the theory-practice gap in emergency nursing education

Table 2. A summary of the categories and themes

Themes	Main categories	Primary categories
Action for change	Quality assurance	Educational processes reform
		Care processes reform
		Supervision and evaluation processes reform
	Continuous improvement of quality	Development of educational processes
		Development of care processes
		Development of supervision and evaluation processes

To analyze the data from the interviews, the inductive content analysis method of Elo and Kyngas, which included the 3 steps of open coding, creating categories, and abstraction, was used.[16] The interviews were carefully listened to and transcribed word by word. To get the main idea of the texts, they were read fast, then, read again, this time with extra care to highlight the important sentences. At this point, open coding was executed. Similar codes were put together and formed categories. Finally, 6 primary categories, 2 main categories, and 1 theme were recognized by abstraction.

To improve the validity and integrity of the data, experienced colleagues in qualitative research were asked to control them, the participants were also carefully described, and supplementary comments were heard from experienced educational liaisons, the participants were diversely chosen, the transcribed interviews were shown to the participants, the comments of the quality improvement committee members were heard, and meetings were held with faculty and hospital members as well as chief directors. The researchers tried to achieve validity by careful description of the data collection process and data analysis methodology. Furthermore, the raw written data including the interviews and notes from focus groups were saved and carefully documented for verification in order to improve the validity.

Results

The results of this study were summarized in identifying the strategies to reduce the gap and choosing practical, effective strategies.

The researchers conducted 18 interviews and 3 focus groups with average time of 63 minutes and 90 minutes, respectively. Analysis of the data from the study showed that the strategies to reduce the theory-practice gap in emergency nursing education could be divided into 6 primary categories, 2 main categories, and 1 theme including action for change. Table 2 provides a summary of the categories and themes.

Action for change: In the participants' views, the suggested strategies were a starting point for change and movement forward in order to reduce the gap; the aforementioned strategies were summed up as quality assurance and continuous improvement of quality. The category of quality assurance included strategies that were then exerted in the faculty and emergency departments, but were not effective enough. Thus, reforming them was essential to quality assurance. The participants' new strategies were also introduced as the continuous improvement of quality programs because, by implementing them, the people involved in the process could actually witness the action to improve.

Quality assurance: The participants believed that the existing educational, care, supervision, and evaluation processes for quality assurance needed a reform. Their suggested strategies were using experienced instructors more in the emergency department and clinical examples during theoretical education, scrutinizing the clinical instructors' selection more, providing emergency teachings based on existing clinical processes, supporting the students during care, and holding teaching methodology workshops for instructors. One interviewee said: 'Instructors should be selected correctly. Most of the time, they have no other choice. We have untrained personnel and we have to get them to work. We are short on personnel. I think we should have a better instructor selection program' (P3).

To keep emergency department nurses' clinical skills and knowledge up to date, the greater familiarization of instructors with care processes, greater supervision on the performance of departments' nurses, bonuses for educational personnel, greater attention to effective refresher courses for nurses, use of intra-department education to empower the nurses, and greater scrutiny in the selection of emergency department nurses were suggested for care processes. On nurses' education, one participant commented: 'They hold a class and explain everything in a rush. People do not learn. To work with the ventilator, I have to explain some tips repeatedly, so that they learn gradually' (P1).

For quality assurance in supervision and evaluation processes, participants suggested more accurate use of the logbook, students' self-evaluation at the beginning of the training course, the instructor's higher supervision to sustain the educational criteria in the hospital as well as acknowledgment of the problems, and more use of nurses' supervisory role over the students. One participant's view about the logbook was that 'It should not be just for ticking items. The instructor has to have enough time to complete the logbook as the student does a procedure' (P4).

Continuous improvement of quality: Strategies for continuous improvement of quality referred to developmental strategies that had not been implemented in the hospital and faculty, and in the participants' views must be used in educational, care, supervision, and evaluation processes. Some suggested strategies for educational processes development were to hold nursing students' theoretical classes in the hospital, students' presence in the Morbidity and Mortality Review Committee, to assess students' needs before the training course to work more on the weaknesses, to have plans to teach how to work with the important care equipment on the first day, to hold a one-day workshop before the training course or to give students the emergency cares and skills' pamphlets, and to use clinical teachers as members of hospitals' committees. A participant commented: 'Students should be in the Morbidity and Mortality Review Committee. This way they understand the gravity of the situation. They will know, then, how important the care is' (P5).

New strategies for care processes were to make hospitalization information directly accessible to students and teachers, to allocate a place for educational purposes in the emergency department, and to enact a process through which the emergency nursing board would be informed of the changes in the department, including the rules, guidelines, and even equipment. A participant said: 'There must be a place with the monitor and defibrillator machine, where students can work with them first hand, but unfortunately the current situation will not allow that. The problem is the lack of a class in the emergency department' (P4).

The participants also believed that in order to develop the supervision and evaluation processes, the faculty was required to take theory and practice exams for students to begin their courses, and use postgraduate students to assess students' problems and oversee the educational issues in the hospital. One of the participants remarked: 'There must be an entrance exam for the training course, and their entry grade must be high, so that anybody with any grade cannot attend the course' (P7).

Stage Two: Selection of Effective and Practical Strategies: In the first stage, content analysis revealed 69 strategies. After 3 focus groups for 7 hours and based on the 4 criteria, the number of strategies were decreased. In doing so, 45 strategies from the faculty committee and 26 strategies from the emergency department committee received scores above 7. These 38 strategies were successfully approved by participants in the two committees; they were then presented to the committee of chief directors and only28 of them were recognized as practical and effective. The selected strategies are shown in tables 3, 4, and 5.

Discussion

This study was conducted to recognize the effective strategies to reduce the theory-practice gap in emergency nursing education. The participants in this study held that it was necessary to have reformative and developmental actions in line with care, supervision, evaluation, and educational processes in order to bridge the theory-practice gap in emergency nursing education.

Table 3. Some strategies in educational processes for quality assurance

Strategies	Primary categories	Main categories
Reviewing of theoretical content by students and holding a workshop before they go to the emergency department	Educational processes	Quality assurance
Providing an introductory pamphlet on the emergency department		
Providing clinical instructors and emergency nurses with updates on new equipment		
Holding regular, seasonal meetings between the emergency care board, the head nurse, and the head of the emergency department		
Using clinical experience and examples in teaching of theory		
Reforming the emergency training lesson plan		

Table 4. Some strategies in supervision and evaluation processes for quality assurance

Strategies	Primary categories	Main categories
Regular, accurate supervision of the faculty on trainings and students' presence Higher supervision of teachers on students' performance through keen observations and feedbacks, in case of teachers' absence Preceptors must oversee students' performance for more accordance with lesson plans Changes must be made in the structure of the logbook.	Supervision and evaluation processes	Quality assurance

The strategies suggested by the participants were a need-based reformation and improvement of educational processes, provision of necessary human resources and equipment, effective use of encouraging tools, and reformation of the presentation of theoretical and clinical education and selection of an appropriate time for it. As in the study by Beverley, the participants in this study believed the use of real-life events and scenarios would help students have a deeper understanding of patients' care and complex needs.[17] They believed that clinical settings were the best place to learn; however, the experience opportunities were not always available for every skill.[17] The participants in this study believed that some of the theory in emergencies must be taught by clinical teachers. There was even a talk about members of the board being 'transferable' between the faculty and the emergency department. This has also been asserted by Benner et al., who believe that, logically, learning in the class and clinical settings would merge effectively when the theoretical teachers also take the clinical courses, but due to the extreme shortage of nursing teachers, this does not often happen.[18] Some other researchers hold that theoretical teachers should maintain their clinical abilities through constant teaching in clinical settings or laboratories, having temporary responsibilities, keeping contact with the clinical settings, or participating in the clinical experiences. The clinical teachers should also have a copy of the contents and curriculum of the theoretical lessons, and they can be invited to attend theoretical classes.[19] To reduce the gap, it has always been asserted necessary to have open channels between theoretical and clinical instructors,[1] to engage teachers in clinical teaching, and to give joint appointments to theoretical teachers in clinical settings.[20] The use of experienced teachers or educating the existing ones was another suggested strategy; due to shortage of human resources, the committee of chief directors decided to hold classes for existing teachers accompanied by experienced ones to improve their competence. In some studies, the clinical coordinators introduced new clinical teachers to policies, procedures, evaluation methods, and lesson plans of theoretical and clinical courses; they also held joint meetings at the beginning and end of each semester.[19] The empowerment of efficient human resources in educating students was an effective and applicable strategy.

Reform in the emergency course plan and even nursing educational program with more focus on new educational approaches and the hidden educational program was among the suggested strategies by the participants. The emergency nursing program in Iran is not decentralized, so making changes in it is administratively impossible, but participants emphasized the need for reforms in the training course plan and its accordance with theoretical courses, as well as a daily lesson plan to improve students' and preceptors' awareness of the activities and goals of the training. This was another effective strategy mentioned by the participants.

Table 5. Some strategies in educational, supervision, and evaluation processes for continuous quality improvement

Strategies	Primary categories	Main categories
Assessment of needs by teachers on the first day of training Use of daily lesson plans for emergency trainings New instructors accompanied by experienced ones for the few first days	Educational processes	Continuous quality improvement
Annual surveys on activities in the logbook from students' views Preceptors' right to complete and sign the logbook		Supervision and evaluation processes

In some researchers' views, students will be less stressed and more efficient in service, if the course plan designing team took into account the potential influence of the hidden lesson plan and introduced students to the challenges of decision making in nursing. In addition, the faculty must lead its current educational and learning models towards self-guidance approaches based on problem-solving.[21] Others suggested a revision in lesson plans, presentation of clinic points in teaching theory, and a quest for new course plans.[22] Students, according to the participants in this study, can improve their clinical qualifications through getting feedbacks from clinical teachers and preceptors. As a matter of fact, students learn in clinical situations, when they understand what is right or wrong; this would be possible through clinical nurses' feedbacks to students.[23] A good relationship with the preceptor, to get feedback and learn without deadline pressure, to talk about the expectations, experiences, and goals of students, and preceptors' responsibility for planning, guidance, support, and innovation of learning activities are all deemed important in the works of some researchers on learning processes.[24] At the time of this study, there were 6 preceptors in the emergency department, actively participating in students' education. Considering the high number of training courses, 6 preceptors were not enough. Students, in some cases during the afternoon and night shifts, worked alongside nurses who were not aware of the responsibilities and duties of a preceptor. Their presence, however, was often facilitating, according to the students.

Some researchers have suggested the use of the clinical teaching associate model in teaching students for its improvement in students' clinical outcomes and nurses' increased sense of satisfaction.[25] One of the themes in the study by Beverley was the role of nurses as preceptors which was, according to the students, facilitating in clinical settings, since they could share their experiences.[17] On the contrary, students in some cases received less support and sympathy from their own preceptor.[26] In other studies, students had considered the non-restrictive atmosphere and feedbacks by encouraging preceptors as a positive experience.[15] The allocation of resources and cooperation between the faculty and the hospital was, one of the suggestions to reduce the theory-practice gap. The nurses' capabilities were used to teach and improve students' skills; by creating a unique clinical learning environment and supporting the students, their competence and confidence was enhanced.[6,27] When students, as learners, are treated like members of the team and valuable people, they feel empowered in the clinical settings; this will affect their learning and their consistency in following the educational programs.[28] Ajani and Moez have categorized the strategies to reduce the gap into 3 main sets; reconstruction of resources, redesigning the education, and a change in rules. For reconstruction of resources, it has been suggested to clarify the responsibilities of students, nurses, and nurse assistants. This means that students should not be considered the providers of nursing services, because they have particular educational goals to achieve in the clinical settings. The redesigning of the education is based on the change in the concept of 'everybody can be a teacher' and asserts the necessity of students' learning from elite, qualified teachers. Replacement of rules basically refers to the temporary use of university professors in the hospital.[21]

Most of the selected strategies, as can be seen in table 3, focused on educational processes, in doing so, the participants tried to reform and improve the activities related to the theoretical sector in order to reduce the gap. In addition to educational issues, there were yet other factors involved in the formation of the gap.

The participants' suggested strategies to reform and improve the care processes, emphasized on knowledge-based care, replacement of routine-based care with standards, and the use of qualified nurses to teach and provide care in the emergency department. The formulation of guidelines and executional procedures was one of the strategies to reduce the gap. One of the themes from the study by Bvumbwe was observation-based nursing performance. Furthermore, the academic-clinical partnership method provided teachers and nurses in the clinical settings with opportunities to research, leading to the promotion of a learning culture, and this results in the increased use of observations in the clinical settings.[27] To increase the effectiveness of nurses' education, the participants also emphasized the education within the department, instead of the usual group classes. Ansari et al. believe that despite its importance and obligatory nature, education has a small impact on nurses' performance. Thus, it is necessary to focus on other managerial and pre-professional factors.[29] The nursing teachers can also share their experimental knowledge to ensure that nurses have up-to-date, verified, and valid knowledge.[3] The most reported

method for learning about preceptorship, in one study, was training and workshop. Increased educational experiences of participants led to increased knowledge about the position of a preceptor.[30] Finally, focus on constant education of nurses, was among other suggested strategies by some researchers. These programs can help nurses keep up with the existing changes in the health care system.[21]

The preceptors who participated in this study had experienced problems such as high number of working shifts, shortage of time to teach the students due to emergency department pressures, and the feeling of disrespect from others. Their love for teaching and their hope for promotion, however, helped them tolerate those problems with more ease. Parallel to this issue, some researchers believe that, due to their multiple roles, preceptors must be given more attention, so that they can provide an appropriate environment for the students.[15] In other studies, the joint partnership of the hospital and the faculty created an opportunity for the people involved in the process to show their capacities. Clinical preceptors' capacity for research is improved when they work with students; this also leads to the professional development of nurses.[27] To facilitate the participation of students in care services, participants believed that there should be better communication between students and other service providers like nurses and supervisors. The suggested strategies for this were meetings with emergency nurses to understand how to deal with students, assistance in teaching, and clarification of students' limits of activity. In other studies, one of the suggested strategies was the improvement of respectful communication between people involved in the process in both the faculty and clinical environment. This way, the attitude of nurses towards students would improve, and common values and interests would form a mutual respect and trust. This kind of communication is possible through the concerns of executive managers and decision makers of parties, joint meetings, development of commitment, sharing knowledge, and respect for all the members.[27] Students, in other studies, wanted to have more support[1] and emphasized that presence in the clinic as an active member helped them trust their knowledge and skills and feel more like nurses.[17] In the meantime, the heavy work load of the staff and supervision of different preceptors brought about a stressful experience for students.[24]

Although the suggested strategies of this matter were given high scores in the hospital committee, they were not approved as the final effective strategies by the committees of the faculty and chief directors. This shows that nurses have always tried to find an opportunity to express their most crucial issues. A realistic attitude towards the nursing condition in Iran, though its problems in some cases are universal, would reveal that at the present situation and without taking into consideration the necessary infra-structures, implementation of some strategies is impossible. For example, it is not currently possible to increase the number of emergency nurses according to domestic standards, to set particular criteria for the hiring of emergency nurses by chief directors of nursing, to formulate and implement treatment and care guidelines in the emergency department, and to include bonuses and benefits for nurses who teach, like fewer shifts or patients to attend in a working shift. Conclusively, the disallowance of all care processes strategies is evidence enough that the theory-practice gap in the clinical settings is still existent; thus, it requires nurses' and chief directors' attention.

The participants' suggested strategies to reform and improve supervision and evaluation processes, and emphasized faculty's supervision on the quality of training courses and regular attendance of students, presence of an educational colleague in case of teachers' absence, and modification of the logbook. Alavi and Irajpour suggested the expansion of evaluation approaches to all clinical qualification dimensions, which would be the result of an effective interaction between clinical teachers, students, physical and sociocultural environment of education, and clinical evaluation.[31] Some researchers believe that supervision on students must be based on their personal performances of each skill, and the feedbacks must be combined with inquisitive questions on students' logic about skills and activities they present in different care situations for a patient.[32] Some of the overruled strategies for this section were written self-evaluations by students, formulation of a program to have supervision on students in evening and night shifts, an entrance exam of theory and practical items for training courses, higher teachers' supervision for completion of the logbook, and the use of 360 degrees method to evaluate students' performance in the emergency training course. The study also showed that supervision and evaluation were challenging for the management and influential on the theory-practice gap; it was still problematic to implement cooperative strategies to reduce the gap.

The present study has relied only on qualitative methodology of data collection and is, therefore, restrictive. A more quantitative methodology of data collection should be undertaken in the future to provide a wider perspective on the present study. The sample for the present study comprised of 18 interviewees and 22 participants in focus groups that is only a very small proportion of all the stakeholders. Consequently, the researchers suggested sharing the strategies with more stakeholders to create an environment conducive to effective stakeholder interaction and more practical solutions.

Conclusion

The results of this study showed that to bridge the theory-practice gap in emergency nursing education, it was important to consider all the influential factors such as students, human resources of the faculty and the hospital, the facilities and equipment, culture, and the administrative processes. Thus, practical, effective strategies were compatible with processes, equipment, existing hardware and software capabilities, and even the governing administrative culture in the hospital and the faculty environment, and were also accepted by the people involved in the process. In conclusion, the use of cooperative methods and a concern for the existing conditions and infrastructure is necessary to recognize, implement, and evaluate such strategies.

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Conflict of Interests

Authors have no conflict of interests.

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Association between sleep duration and electrocardiographic ischemic changes in middle-aged population: Isfahan Healthy Heart Program

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Original Article

Abstract

BACKGROUND: Recent studies examining the association between sleep duration and cardiovascular disease (CVD) showed inconsistent results. The aim of our study was to evaluate the association between self-reported night sleep duration and ischemic changes in electrocardiography (ECG).

METHODS: We conducted this cross-sectional study on 3513 participants from Iranian middle-aged population as a part of Isfahan Healthy Heart Program (IHHP), Isfahan, Iran. Sleep duration was obtained by questioning participants. The frequency of electrocardiographic ischemic changes was calculated using ECG Minnesota coding system.

RESULTS: Short sleep duration was associated with increased frequency of electrocardiographic ischemic changes. In a fully adjusted multiple logistic regression analysis, the odds ratio (OR) for short sleep duration less than 5 hours per night was 1.501 [95% confidence interval (CI) for OR: 1.085-2.076] compared to 8 hours of sleep. After stratifying the study population into sex groups, the association remained significant only in women. The OR for short sleep less than 5 hours per night was 1.565 (95% CI for OR: 1.052-2.329) and 1.455 (95% CI for OR: 0.833-2.539) in women and men, respectively. There was no association between long sleep duration and electrocardiographic ischemic changes in men and women.

CONCLUSION: We concluded that there is a positive association between short sleep duration and frequency of electrocardiographic ischemic changes in middle-aged women. This association suggests that short sleep duration may increase the risk of ischemic heart disease (IHD) in women, and this need to be evaluated in further studies.

Keywords: Myocardial Ischemia, Electrocardiography, Sleep Deprivation

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Introduction

Ischemic heart disease (IHD) is the leading cause of death worldwide.[1] Recent studies suggest that sleep duration is related to cardiovascular mortality and morbidity.[2]

There are also many studies showing the association between sleep duration and cardiovascular risk factors such as diabetes, hypertension, obesity, and metabolic syndrome.[3-6] Prospective and cross-sectional studies which examined the association of sleep duration with cardiovascular disease (CVD) showed inconsistent results.

Some studies reported only short sleep duration, and some others reported long sleep duration as a risk factor for CVD.[7-10] Some other studies suggest a U-shaped association between short and long sleep duration with CVD;[11,12] moreover, there are some studies that claim no direct association between sleep duration and CVD, or suggest that the effect may be caused by other covariates.[13-15]

As we know, there is no study evaluating the relation between sleep duration and IHD in Iranian population. In this study we aimed to evaluate the association between habitual nocturnal sleep

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duration and frequency of ischemic changes in electrocardiography (ECG) in a middle-aged Iranian general population.

Materials and Methods

This cross sectional study was conducted as a part of Isfahan Healthy Heart Program (IHHP), Isfahan, Iran. Details of IHHP are published elsewhere.[16]

Individuals from urban and rural communities of three provincial cities of Isfahan, Najafabad, and Arak chosen by multistage cluster sampling were included. Inclusion criteria of our study were 35 to 60 years of age, Iranian nationality, history of residing in the above cities for at least 10 years, and absence of hemorrhagic disease and mental retardation. The study participants consisted of 3513 individuals based on inclusion and exclusion criteria.

Sociodemographic data were recorded by trained interviewers in door-to-door visits. Participants were asked to go to IHHP clinical centers and after signing informed written consent, medical history was taken and physical examinations were done for each individual. Fasting blood sugar (FBS) and lipid profile were measured by standard laboratory tests.

Twelve-lead ECG was taken by trained staff using Hewlett-Packard ECG machine from all participants. All the electrocardiograms were studied by the same cardiologists, and their corresponding codes were calculated. Ischemic changes were identified according to Minnesota coding system. We included four levels of ischemia in our outcomes: definite myocardial infarction (MI) which is defined by Minnesota codes 1.1, 1.2.1 and 1.2.2; possible MI represented by codes 1.2.7, 1.2.8, 1.3; definite ischemia equates codes 4.1 and 5.1; and possible ischemia which is diagnosed by codes 4.2, 5.2 and 5.3.[17]

Sleep duration time was obtained by the question "How many hours of sleep do you get per night usually?" Responses were categorized into 6 groups: less than 5 hours, 5 hours, 6 hours, 7 hours, 8 hours, and 9 hours and more.

Other covariates included in the analysis were: age by years, sex (men and women), body mass index (BMI) which was calculated as weight/height^2 (kg/m^2) and categorized into 30 ≤ and < 30 groups, physical activity measured by validated Baecke questionnaire of habitual physical activity and stratified into two groups of active and inactive, smoking status (never, past smoker, current smoker),[16,18] metabolic syndrome components defined as following: 1- central obesity as the waist circumference > 102 cm in men and >88 cm in women; 2- fasting plasma triglycerides ≥ 150; 3- low high-density lipoprotein (HDL) cholesterol with fasting HDL cholesterol < 40 mg/dl in men and < 50 mg/dl in women; 4- hypertension with systolic blood pressure ≥ 130 mmHg and/or diastolic blood pressure ≥ 85 mmHg and/or antihypertensive agents; 5- hyperglycemia with fasting plasma glucose ≥ 100 mg/dl and/or hypoglycemic medications.[19]

The variables were reported as number (percentage) or mean [± standard deviation (SD)] as appropriate. We compared the characteristics of participants in different sleep duration groups, and also in two groups of individuals with and without ischemic changes in ECG by using chi-square test for categorical variables and analysis of variance (ANOVA) for continuous variables.

We used multiple logistic regression analysis to assess the impact of sleep duration on frequency of ischemic changes in ECG "defined by Minnesota codes". Odds ratios (OR) with 95% confidence interval (CI) were calculated for sleep groups using 8 hours of night sleep as the reference category, and 3 models were used for analysis: in the first model, we calculated OR for each group of sleep without any adjustment; in the second model, results were adjusted for age and sex; and in the third model results were additionally adjusted for BMI, smoking status, physical activity (active or Inactive), and metabolic syndrome components (5 groups having 1, 2, 3, 4 or 5 of the components).[19] In a second analysis, we stratified the study population into sex groups and calculated the OR for men and women separately. We chose 8 hours as the reference group because it had the lowest frequency of ischemic changes between sleep groups in our study, and also it is recommended as the optimal sleep duration time for middle-aged adults.[20] Statistical analysis was performed using SPSS software (version 15, SPSS Inc., Chicago, IL, USA). The study was approved by Ethics Committee of Isfahan Cardiovascular Research Center.

Results

In total, 3513 individuals aged 35 to 60 years participated in the study. Mean age of study population was 44.8 ± 6.8 years, 52.6 percent were women, and significant differences in age and sex were seen between sleep groups. Frequency of electrocardiographic ischemic changes according to ECG Minnesota coding was 21.4 %, and average sleep duration was 6.85 ± 1.48 hours. Characteristics of each sleep group are showed in table 1.

Table 1. Study population characteristics by sleep duration.

Sleep duration (hour per night)	< 5 hours	5 hours	6 hours	7 hours	8 hours	9 hours<	P*
Characteristic							
Number of participants	249	319	763	807	1133	234	
ECG ischemic changes	72 (28.9)	65 (20.3)	158 (20.7)	174 (21.6)	229 (20.2)	53 (22.6)	0.035
Women	148 (59.4)	149 (46.7)	394 (51.6)	439 (54.4)	583 (51.5)	128 (54.7)	0.043
BMI ≥ 30	56 (23.6)	78 (26.2)	202 (27.6)	190 (24.1)	264 (23.7)	58 (25.1)	0.491
BMI < 30	181 (76.4)	220 (73.8)	530 (72.4)	599 (75.9)	849 (76.3)	173 (74.9)	
Current smoking	36 (14.5)	59 (18.5)	98 (12.9)	107 (13.3)	153 (13.5)	44 (18.8)	0.051
Physical activity (inactive)	143 (57.4)	197 (61.8)	447 (58.6)	468 (58.0)	643 (56.8)	131 (56.0)	0.695
Age (year)	47.4 ± 6.7	46.0 ± 6.8	45.1 ± 6.8	44.2 ± 6.8	44.3 ± 6.8	43.9 ± 7.0	< 0.001
BMI (kg/m^2)	27.3 ± 4.3	27.3 ± 4.4	27.5 ± 4.5	27.2 ± 4.4	27.0 ± 4.4	26.8 ± 4.6	0.151
Metabolic syndrome (number of components)							
0	26 (10.6)	43 (13.7)	113 (15.0)	137 (17.1)	193 (17.2)	34 (14.5)	0.058
1	72 (29.4)	93 (29.5)	188 (24.9)	190 (23.8)	266 (23.6)	55 (23.5)	
2	63 (25.7)	84 (26.7)	240 (31.8)	259 (32.4)	347 (30.8)	73 (31.2)	
3	52 (21.2)	57 (18.1)	149 (19.8)	142 (17.8)	226 (20.1)	50 (21.4)	
4	28 (11.4)	35 (11.1)	50 (6.6)	64 (8.0)	72 (7.3)	17 (7.3)	
5	4 (1.6)	3 (1.0)	14 (1.9)	7 (0.9)	11 (1.0)	5 (2.1)	

Data are given as n (%) or mean ± standard deviation (SD)
* P-value calculated using chi-square test or ANOVA as appropriate.
ECG: Electrocardiography; BMI: Body mass index

Table 2 presents the characteristics of the study participants in two groups of with and without ischemic changes in ECG. The group with ischemic changes in ECG were more likely to be older, women, inactive, to sleep less, to have higher BMI and higher prevalence of metabolic syndrome components, but were less likely to smoke.

Compared to those who sleep 8 hours per night, individuals with short sleep duration (less than 5 hours) had increases in the frequency of ischemic changes (Table 3). In model 1 for those who sleep less than 5 hours OR was 1.606 (95% CI: 1.178-2.189); in model 2 adjusted for age and sex, OR was 1.410 (95% CI: 1.025-1.940). After adjustment for additional covariates in model 3, the OR was 1.501 (95% CI: 1.085-2.076). In subgroup analysis the association remained significant in women but not in men, the OR for < 5 hours of sleep in women and men were 1.565 (95% CI: 1.052-2.329) and 1.455 (95% CI: 0.833-2.539), respectively. (Table 4).

Table 2. Comparing variables in groups with and without ischemic changes in electrocardiography (ECG)

Variable	With ischemic changes in ECG	Without ischemic changes in ECG	P*
Number of participants	752	2761	
Sleep duration (hour)	6.74 ± 1.49	6.87 ± 1.47	0.046
Age (year)	45.80 ± 6.80	44.50 ± 6.80	< 0.001
Women (%)	66.2	47.0	< 0.001
BMI ≥ 30 (%)	26.5	22.1	0.002
Current smoking (%)	9.9	13.8	0.001
Physical activity (inactive) (%)	63.0	58.3	0.004
Metabolic syndrome components (%)			
0	10.7	15.3	0.001
1	21.1	24.5	
2	29.1	29.6	
3	22.7	20.1	
4	13.6	8.6	
5	2.8	1.9	

Data are given as percent or mean ± standard deviation (SD)
* P-value calculated using chi-square test or ANOVA as appropriate
ECG: Electrocardiography; BMI: Body mass index

Table 3. Association between sleep duration and ischemic changes in electrocardiography (ECG)

Sleep duration (hour)	Persons at risk	Model 1* OR (95% CI)	Model 2** OR (95% CI)	Model 3§ OR (95% CI)
Less than 5	249	1.606 (1.178-2.189)	1.410 (1.025-1.940)	1.501 (1.085-2.076)
5	319	0.991 (0.727-1.351)	0.990 (0.721-1.359)	0.947 (0.681-1.316)
6	763	1.031 (0.821-1.294)	1.010 (0.801-1.273)	1.022 (0.808-1.294)
7	807	1.085 (0.869-1.355)	1.059 (0.845-1.328)	1.063 (0.846-1.336)
8£	1133	1	1	1
9 and more	234	1.156 (0.824-1.622)	1.136 (0.804-1.605)	1.136 (0.800-1.600)

* Analysis without adjustment for covariates; ** Analysis adjusted for age and sex; § Analysis adjusted for age, sex, body mass index (BMI) (< 30, 30 ≤), smoking (past, never, current), physical activity (inactive, active), metabolic syndrome (number of components)
£ Reference group; OR: Odds ratio; CI: Confidence interval

Discussion

In this study, we observed that short sleep duration of less than 5 hours per night compared to 8 hours of sleep was associated with increased frequency of electrocardiographic ischemic changes in Iranian middle-aged women but not in men. This association was independent of age, smoking, BMI, physical activity, and metabolic syndrome components. We did not find any association between long sleep duration and ischemic changes.

Association of short sleep duration with IHD was reported in previous studies in other countries.[2,8,21-24] Meisinger et al. examined association between sleep duration and incidence of MI in Monica Augsburg cohort study. They stratified the subjects in sex groups and after adjustment for possible confounders the hazard ratio (HR) of MI in women sleeping ≤ 5 hours was 2.98 (95% CI, 1.48-6.03) compared with women sleeping 8 hours; the corresponding HR in men was 1.13 (95% CI, 0.66-1.92); thus, a positive association between short sleep duration and incidence of MI among middle-aged women but not in men was observed.[8] Their results were similar to our findings. Aggarwal et al. in a cross sectional study from the National Health and Nutrition Examination Survey of noninstitutionalized United States (US) civilians found that there was significant increase in MI prevalence in those with less than 6 hours of sleep and increase in coronary artery disease (CAD) prevalence in those with more than 8 hours of sleep.[25] Cappuccio et al. reported in their meta-analysis that both short and long sleep duration was associated with coronary heart disease (CHD).[26]

The possible mechanisms of association between short sleep duration and CVD are largely described in previous studies. These mechanisms include changes in appetite regulating hormones which lead to increased calorie intake,[27,28] increased sympathetic system activity,[29,30] dysregulation of endocrine system causing impaired glucose tolerance and increased cortisol secretion.[31,32] Another possible mechanism is due to inflammation process which promotes atherosclerosis.[33,34]

Table 4. Association between sleep duration and ischemic changes in electrocardiography (ECG) by sex groups

Sex group	Sleep duration (hour)	Persons at risk	Model 1* OR (95% CI)	Model 3** OR (95% CI)
Women	Less than 5	148	1.550 (1.054-2.277)	1.565 (1.052-2.329)
	5	149	1.050 (0.699-1.577)	1.002 (0.657-1.529)
	6	394	1.108 (0.831-1.478)	1.097 (0.819-1.470)
	7	439	1.257 (0.955-1.655)	1.242 (0.939-1.642)
	8£	583	1	1
	9 and more	128	1.119 (0.730-1.717)	1.134 (0.737-1.743)
Men	Less than 5	101	1.494 (0.866-2.576)	1.455 (0.833-2.539)
	5	170	0.995 (0.607-1.630)	0.860 (0.509-1.456)
	6	369	0.905 (0.615-1.332)	0.898 (0.603-1.338)
	7	368	0.738 (0.492-1.108)	0.765 (0.507-1.154)
	8£	550	1	1
	9 and more	106	1.156 (0.653-2.047)	1.181 (0.662-2.108)

* Analysis without adjustment for covariates; ** Analysis adjusted for age, body mass index (BMI) (< 30, 30 ≤), smoking (past, never, current), physical activity (inactive, active), metabolic syndrome (number of components)
£ Reference group; OR: Odds ratio; CI: Confidence interval

Studies which reported the association between long sleep duration and CVD were unable to find any specific mechanism for explaining the association. One hypothesis is that long sleep duration correlates by other comorbidities and underlying health issues that may cofound with CVD.[35-37] As comorbidities are more prevalent in elderly individuals, the association of long sleep duration with CVD should mostly be observed in old population and this can explain the absence of this association in our study of middle-aged population.

The gender-specific association between short sleep duration and electrocardiographic ischemic changes that we found is in concordance with some previous studies; Ikehara et al. conducted a cohort study to observe the association between sleep duration and mortality from CVD and other causes in Japan; and they found that the association between short sleep duration and IHD was only significant in women.[38]Also in Monica Augsburg cohort study this association was significant only in women.[8] There is no accurate explanation for this gender discrepancy, some different mechanisms may play role in the effect of sleep on IHD in women; women have different sleep patterns and sleep disorders,[39,40] some CVD risk factors that may interact with the association between sleep and CVD have different significances in women;[41,42] there are reports that show an association between short sleep duration and hypertension only in women.[43-45] All of these differences may reinforce the impact of short sleep on IHD in women and these gender differences need to be evaluated in further studies.

Our study had some limitations; first of all, the cross sectional design of study makes us unable to observe the causality and direction of association between sleep duration and IHD. Another limitation that also has been addressed in many previous studies is the subjective evaluation of sleep duration which may not be very accurate but it is still useful and reliable according to some researches.[46-48] We did not evaluate other sleep parameters like sleep disturbances, difficulty falling sleep, and sleep quality which seem to be important in interpreting the effect of sleep on CVD.

In this study, we performed ECG in all participants, which led in finding even asymptomatic patients with ischemia, although ECG is not enough criteria for diagnosing IHD. We adjusted the analysis for common IHD risk factors. We did not have data of sleep apnea in our population, but we tried to modify its effect by adjusting the analysis for BMI groups of 30 ≤ and 30 >.

Conclusion

In conclusion, this cross-sectional study of Iranian middle-aged population showed that short sleep duration may increase the risk of IHD in women, and this should be evaluated in further prospective studies.

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Conflict of Interests

Authors have no conflict of interests.

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Serum interleukin-18 and extent of coronary artery disease in unstable angina

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Original Article

Abstract

BACKGROUND: Interleukin-18 (IL-18) is an inflammatory marker with challenging role in atherosclerosis. The present study was carried out aiming to evaluate the association between IL-18 serum level and extent and severity of atherosclerosis among young patients with unstable angina (UA) who underwent coronary angiography.

METHODS: This cross sectional study was performed from July to October 2015 in Chamran heart center, Isfahan, Iran. 180 patients with UA in the age range of below 50 years entered the study. All demographic, past history, physical examination, electrocardiogram (EKG or ECG), and transthoracic echocardiogram (TTE) data were collected. Serum level of IL-18 was measured using enzyme-linked immunosorbent assay (ELISA) method. A coronary angiography was performed on all patients to evaluate the presence and the incidence rate of coronary artery disease (CAD).

RESULTS: Mean age of the patients was 46.0 ± 4.6 years [47.4 ± 4.3 and 45.9 ± 4.9 among patients with CAD and normal coronary, respectively (P = 0.040)]. Rate of severe CAD was greater among men compared to women with values 67.8% and 51.8%, respectively (P = 0.032). The median [interquartile range (IQR)] value of serum IL-18 among patients with CAD [192.86 (128.03,325.75)] was higher than normal coronary subjects [172.81 (139.77,243.21)], however it was not significant (198.4 ± 93.5, P = 0.287). A significant difference between serum IL-18 level and number of stenosis vessels was detected only among women (P = 0.032).

CONCLUSION: Serum IL-18 level can predict the number of coronary arteries with significant stenosis among women with unstable angina.

Keywords: Interleukin-18, Unstable Angina, Atherosclerosis, Angiography

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Introduction

Coronary artery disease (CAD) is the main cause of mortality in developed and under developing countries.[1] With increasing age, atherosclerosis is aggravated and finally causes clinical scenarios like stable and unstable angina (UA) and acute myocardial infarction (MI). It is estimated that atherosclerosis will be the first cause of death in the entire world by 2020.[2] Atherogenesis is a lifelong process.[3,4] It is documented that atherosclerosis and its most dramatic consequence, MI , is an inflammatory process.[5,6]

Beside traditional risk factors and behavioral factors like stress, inflammatory markers have recently been proposed to have diagnostic and prognostic role in atherosclerosis and their association with CAD severity is controversial.[7-9] Interleukin-18 (IL-18), of the cytokine family, is a proinflammatory cytokine which is expressed mainly by macrophages and acts on its receptor on the membrane of endothelial cells, lymphocytes, smooth muscle cells (all components of the atherosclerotic plaque) and induces Interferon-gamma (IFN-γ) production, endothelial dysfunction and plaque instability.[10,11] Some studies have shown increased IL-18 mRNA expression in carotid unstable plaques and it has been shown that increased serum level of IL-18 is associated with

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increased carotid intima media thickness (CIMT).[12,13] In a prospective study, IL-18 was independent predictor of cardiovascular mortality with 3.3 fold increased risk of death among stable and unstable patients with high level of serum IL-18.[14]

Regarding the lack of data on the role of IL-18 in severity of atherosclerosis, the authors in the present study aimed to evaluate the association of serum IL-18 level with CAD presence and extent among young patients with UA.

Materials and Methods

This was a cross sectional study performed from July to October 2015 in Chamran heart center, Isfahan, Iran. The inclusion criteria were patients younger than 50 years old referring to the hospital with diagnosis of UA. UA diagnosis was defined as the new-onset angina pectoris during the recent 4 weeks, angina pectoris lasting more than 10 minutes at rest or with minimal exertion, and crescendo pattern of known previous stable angina, all with or without dynamic ST segment depression or T wave inversion in electrocardiogram (EKG or ECG).

Patients with any history of MI, coronary artery bypass graft (CABG), percutaneous coronary intervention (PCI), severe valvular heart disease (VHD), sever uncontrolled systemic hypertension (systolic blood pressure ≥ 220 mmHg, diastolic blood pressure ≥ 130 mmHg), severe pulmonary arterial hypertension (PAH) (mean pulmonary artery pressure > 40 mmHg), and history of chronic heart failure or acute heart failure were excluded. The study was approved by the Institutional Bioethics Committee (IEC), and informed written consent was obtained from all the patients. All patients meeting the inclusion and exclusion criteria entered the study protocol. All patients underwent complete history taking, physical examination, and transthoracic echocardiogram (TTE) by a cardiologist. Serial ECGs (each 30 minutes up to 3 times and during chest pain) were taken and interpreted by the same cardiologist. 5 ml of blood was taken via a peripheral venous line from all patients before catheterization procedure. After separation of serum, it was transmitted to the -70 °C laboratory medium to measure the level of IL-18 with enzyme-linked immunosorbent assay (ELISA) method (using Humal IL18 ELISA BMS 267.2 and BMS 267.2 ten, Mender med system).

Hypertension was defined as having systolic blood pressure at least 140 mmHg, and/or diastolic blood pressure at least 90 mmHg, or being on antihypertensive drugs.[15] Fasting blood glucose ≥ 126 mg/dl or 2-hour postprandial plasma glucose ≥ 200 mg/dl or using anti-diabetic agents was defined as diabetes mellitus (DM).[7] Dyslipidemia was signified as total cholesterol > 200 mg/dl, triglyceride > 150 mg/dl, low-density lipoprotein (LDL) > 100 mg/dl, or high-density lipoprotein (HDL) < 35 mg/dl.7 Patients who smoked daily were considered as current smokers.[16]

According to the American college of cardiology (ACC)/American heart association (AHA) guidelines for management of patients with non ST elevation acute coronary syndrome (NSTE-ACS), all the patients in the present study underwent coronary angiography via right femoral artery approach with Siemens system.[17] Angiography film was reported with two cardiologists who were blinded about the patient history and study protocol in different times.

In case of the lack of stenosis among patients, they were placed into the CAD-free group. Extent of CAD was defined as more than 75% stenosis of any of coronary arteries or branches and ≥ 50% stenosis of left main coronary artery (LMCA).[18]

The data were reported as rate (%) and mean ± standard deviation (SD) or median [interquartile range (IQR)] for qualitative and quantitative data, respectively. Kolmogorov- Smirnov (K-S) test was performed to check the assumption of normality of distribution of the quantitative variables. Mann-Whitney test, independent sample t-test, and Kruskal-Wallis test were performed to assess the group differences in quantitative variables (where appropriate) and the chi-square test was used to evaluate and perform comparisons among the qualitative variables. Multinomial logistic regression model was performed to evaluate IL-8 quartile changes (trend of quartiles) among patients with different number of involved vessels in comparison to participants without any involved vessels. Statistical analysis was performed with SPSS software (version 15.0, SPSS Inc., Chicago, IL, USA). The results were assumed to be statistically significant if $P \leq 0.050$.

Results

In this study, 180 patients with UA underwent coronary angiography. Patients were divided into two groups based on presence of CAD. 107 (59.9%) and 69 (40.1%) of the subjects had CAD and normal coronary angiogram, respectively. Mean age of the patients was 46.0 ± 4.6 years (47.4 ± 4.3 and 45.9 ± 4.9, P=0.040 among patient with and without CAD, respectively). Severity of CAD was greater among men than women (P = 0.032).

Table 1. Demographic characteristics of subjects

Variables	CAD (n = 107)	CAD-free (n = 73)	P
Age (years) [mean ± SD]	47.4 ± 4.3	45.9 ± 4.9	0.040*
Men [n (%)]	59 (57.3)	28 (40.6)	0.032**
Hypertension [n (%)]	38 (36.9)	16 (23.2)	0.058**
DM [n (%)]	29 (28.2)	7 (10.2)	0.004**
Dyslipidemia [n (%])	50 (48.5)	20 (29.0)	0.010**
Smokers [n (%)]	35 (34.0)	14 (20.3)	0.051**
Family history of CAD [n (%)]	55 (53.4)	39 (56.5)	0.687**

SD: Standard deviation; DM: Diabetes mellitus; CAD: Coronary artery disease
* Independent t-test; ** Chi-Square test

Table 1 shows the incidence of cardiovascular risk factors in both groups. There was no significant difference in atherogenic risk factors like hypertension, smoking habits, and family history of CAD between the two groups. However, the incidence of DM and dyslipidemia was greater in CAD group (P < 0.050).

Median (IQR) of serum IL-18 (picog/ml) in CAD group was higher in comparison with the CAD-free group. This difference was not significant [192.9 (128.0,325.7) vs 172.8 (139.8,243.2), P = 0.287].

There was no significant difference in median (IQR) of serum IL-18 (picog/ml) levels based on the atherosclerotic risk factors except in participants with no family history of CAD (P = 0.027) (Table 2).

The serum level of IL-18 (picog/ml) differed significantly based on the number of involved vessels in women, but not in overall nor in men (Table 3).

Odds ratios 95% confidence interval [OR (95% CI)] of IL-8 quartile changes among patients with different number of involved vessels in comparison to those without any involved vessels was shown in table 4. There was no significant difference between OR (95% CI) of IL8 quartile changes among patients with different involvement in comparison to normal participants, in addition, adjustment for age, sex, DM, hypertension, dyslipidemia was performed (Table 4).

Discussion

This study showed that the serum level of IL-18 among patients with UA had significant relation with the number of coronary artery stenosis among women. In a basic animal study in 2002, Elhage et al. had noted IL-18 as a risk factor for atherosclerosis.[19] Chen et al. had shown that there was a direct relationship between serum IL-18 level and CAD severity among patients with UA as defined with a validated score.[20] Positive family history was correlated significantly to serum level of IL-18 among patients with CAD. This was in contradiction with the present study as there was no significant correlation between cardiovascular risk factors and IL-18. Blankenberg et al. in a prospective 5-year study on 10600 European men documented that serum IL-18 at baseline was a predictor for cardiovascular events and angina pain.[21] Although this study was performed only among men, it provided strong evidence for prognostic value of IL-18 as an inflammatory marker for cardiovascular events.

Table 2. Median interquartile range (IQR) for serum level of interleukin-18 (IL-18) (picog/ml) based on atherosclerotic risk factors among patients with and without unstable angina (UA)

Risk factors	CAD	CAD-free	P*
Hypertension	206.5 (136.6, 333.5)	230.4 (164.6, 305.2)	0.992
Lack of hypertension	178.1 (122.8, 308.4)	166.6 (130.5, 222.9)	0.373
DM	226.5 (129.5, 337.9)	170.7 (137.0, 286.6)	0.754
Lack of DM	186.7 (126.8, 292.8)	173.3 (140.4, 239.3)	0.441
Dyslipidemia	201.9 (130.5, 326.2)	170.2 (143.4, 250.5)	0.463
Lack of dyslipidemia	179.1 (125.5, 314.2)	173.8 (131.3, 242.1)	0.517
Smoking	179.1 (120.6, 343.9)	170.7 (143.0, 289.7)	0.737
Lack of smoking	195.5 (131.0, 313.5)	173.3 (122.5, 231.6)	0.195
Family history of CAD	162.9 (122.1, 247.1)	169.7 (143.8, 249.9)	0.470
Lack of family history of CAD	237.9 (138.1, 432.7)	181.2 (103.6, 243.2)	0.027

DM: Diabetes mellitus; CAD: Coronary artery disease
* Mann-Whitney U test

Table 3. Median interquartile range (IQR) of serum level of interleukin-18 (IL-18) (picog/ml) based on the number of vessels involved and sex

Sex	Involvement	Median (IQR)	P*
Men	Normal vessels	173.3 (142.6, 270.1)	0.962
	One vessel	178.6 (117.7, 310.6)	
	Two vessels	159.8 (131.0, 327.6)	
	Three vessels	203.7 (123.2, 270.1)	
Women	Normal	168.6 (117.7, 233.7)	0.032
	One vessel	218.8 (138.5, 331.2)	
	Two vessels	261.3 (180.1, 338.5)	
	Three vessels	131.0 (114.1, 156.4)	
Total	Normal	172.8 (139.7,243.2)	0.284
	One vessel	196.1 (126.5,328.5)	
	Two vessels	206.5 (141.2,333.5)	
	Three vessels	137.3 (122.5,231.9)	

* Kruskal-wallis test
IQR: Interquartile range

Corson reported the relationship of IL-18 with cardiovascular events as well.[22] Interleukin-6 (IL-6), another inflammatory marker from cytokines family, was evaluated in the study by Gotsman et al.[23] They stated that there was significant correlation between serum level of IL-6 and CAD severity. However, they did not evaluate the number of diseased epicardial vessels in contrast to the present study. IL-6 and IL-18 are from the same cytokines family, hence the results of the former study may be expanded to other interleukins (ILs). Mallat et al. evaluated the role of IL-18 in a wider group of patients with acute coronary syndrome (ACS) including UA and patients with acute MI.[24] They confirmed elevated level of IL-18 among these patients and showed its strong direct relationship with severity of left ventricular systolic dysfunction. Ridker and Silvertown proposed that inflammatory markers had significant effect on progression of CVD and taking strategies to reduce these markers would decrease their burden in the future.[25]

Conclusion

Serum IL-18 level can predict the number of coronary arteries with significant stenosis among women with UA. We recommend a larger trial in both sexes in a longitudinal cohort study that can predict estimation power of IL-18 for cardiovascular events.

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Conflict of Interests

Authors have no conflict of interests.

Table 4. Odds ratios 95% confidence interval [OR (95% CI)] of interleukin-18 (IL-18) (picog/ml) quartile changes among patients with different number of involved vessels in comparison to those without any involved vessels

Involvement	Crude		Adjust 1		Adjust 2	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Normal vessels	1*	-	1*	-	1*	-
One vessel	1.14 (0.84-1.56)	0.386	1.13 (0.82-1.57)	0.440	1.06 (0.75-1.5)	0.718
2 vessels	1.29 (0.83-2.006)	0.258	1.30 (0.83-2.03)	0.245	1.20 (0.75-1.92)	0.432
3 vessels	0.87 (0.52-1.43)	0.593	0.86 (0.51-1.44)	0.578	0.81 (0.48-1.37)	0.444

* Participants without any involved vessels are considered as the reference group.
OR (95% CI): Odds ratios 95% confidence interval; Crude: Without adjustment; Adjust 1: Age-sex adjustment; Adjust 2: Age-sex-diabetes-hypertension-dyslipidemia adjustment;
Multinomial logistic regression analysis was performed.

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Transulnar versus transradial approach for coronary angiography and angioplasty: Considering their complications

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Original Article

Abstract

BACKGROUND: Transulnar approach was introduced as an alternative procedure for transradial coronary angiography (CAG) due to its safety and feasibility. The present study was accomplished with the aim to compare major and minor complications of these two upper extremity approaches in the population under study.

METHODS: In this prospective observational study, 216 patients who underwent CAG and/or angioplasty via radial (111 cases) or ulnar artery (105 cases) were observed and followed for 6 months and were evaluated for major adverse cardiac events (MACEs), minor and major neurovascular events (access related) of the arm including paresthesia/pain, pseudoaneurysm, artery spasm, arterial occlusion, large hematoma, and necessity for amputation or emergency surgery.

RESULTS: The majority of patients were men (62.1%) with a mean age of 59.98 ± 9.74 years old. No MACEs and major life threatening vascular complication like large hematoma, need for amputation or surgery, and hand ischemia were occurred. There was no significant difference in minor complications, except for arterial occlusion 9.0 % vs 1.0 % and artery spasm 12.6 % vs 1.9 % in transradial and transulnar approaches, respectively ($P < 0.05$).

CONCLUSION: This study suggested that both transradial and transulnar approaches were safe and feasible for CAG and/or angioplasty. However, regarding minor complications, arterial spasm and occlusion were significantly more common in transradial approach.

Keywords: Radial Artery, Ulnar Artery, Coronary Angiography, Complication

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Introduction

Coronary angiography (CAG) is known as a gold standard diagnostic approach for atherosclerotic coronary artery diseases (CADs).[1-3] Transfemoral artery approach is a common and routine method for CAG and percutaneous coronary intervention (PCI). Moreover, transradial approach is known as a safe alternative method with lesser access site bleeding, patient satisfaction, and preference and early ambulation.[4,5] Some limitations of transradial approach are small size artery, radial artery anatomic variations (radial loop, highly take off, tortuosity), radial artery harvesing for coronary artery bypass grafting (CABG), radial artery occlusion (RAO), and radial artery spasm.[6-8] Accordingly, transulnar approach was performed since more than a decade ago by Terashima et al.[9] Although several studies suggested that transulnar approach is a safe and feasible method for coronary angiography and angioplasty,[6-9] higher cross over rate, access failure, and possibility of ulnar nerve trauma are challenging.[10] However, the authors in the present study believe that the odds of these side effects are negligible when this method is performed by experienced operators. Therefore, the present study was carried out to assess the transradial versus transulnar access-related complications in our center, two hospitals of Isfahan University of Medical Sciences (Shahid Chamran Heart Center and Noor

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Materials and Methods

In this prospective observational study, 231 patients candidate for CAG or angioplasty were examined from July 2016 to Dec 2016. The patients were admitted to two hospitals of Isfahan University of Medical Sciences (Shahid Chamran Heart Center and Noor Hospital). Inclusion criteria were age > 18 years old, indication for CAG and angioplasty, and written informed consent to participate in the study. Patients with acute coronary syndrome (ACS), cardiogenic shock and/or hemodynamic instability, chronic hemodialysis, dermal myoskeletal forearm deformities, history of CABG, patients with planned elective femoral approach, and patients with abnormal Allen and reverse Allen Test were excluded from the study. The patients were randomly divided into two groups tolerating transradial and transulnar approaches with 118 and 113 cases, respectively. All procedures were performed by single interventional cardiologist expert in transradial and ulnar approaches.

Allen and the reverse Allen tests for assessment of deep palmar arch perfusion were performed for all of the patients. After prep and drep, 2 cc of lidocaine 2% was injected subcutaneously at the planned puncture site (3 cm above proximal wrist crease). Following puncture with fine needle, radial sheath (5-6 French) was inserted over hydrophilic guidewire. A cocktail which contained 20 cc of normal saline, 200 microgram nitrate and 2.5 mg verapamil, flushed through 5-6 French hydrophilic sheath. Unfractionated heparin (5000 units) was also injected systemically.[11] Over the 0.035-inch guide wire, the diagnostic catheter (Tiger 5-6 French) was inserted. EBU and Judkins catheters were used for angioplasty and TR band was used for final hemostasis.

In this study, the incidence of death, myocardial infarction (MI), stroke, and urgent target vessel revascularization (TVR) as major adverse cardiac events (MACEs) within the hospital and during the 6 months after the procedure were assessed.

Major and minor neurovascular events (access related) of the arm including pain/motor paralysis/paresthesia, large hematoma, pseudoaneurysm, artery spasm, arterial occlusion, and necessity for amputation or emergency surgery were also recorded. The hematoma grading was according to the classification proposed in the study by Bertrand et al.[12,13] This scale included a hematoma < 5 cm, 5-10 cm, > 10 cm, proximal to the elbow hematoma, and compartment syndrome as grade I, grade II, grade III (grade I to III were distal to the elbow, grade IV, and grade V, respectively.[12,13] The follow up data were obtained by an interventional cardiologist in two separate clinic visits in 3 and 6 months after the procedure. Demographic data included age, gender, and CAD risk factors like diabetes mellitus (DM), smoking, dyslipidemia, hypertension, and history of old MI. The data were collected through the data gathering forms.

Pearson's chi-square test and Fisher's exact test were considered for analyzing categorical data. Statistical analysis of data was carried out using the statistical program for social sciences (SPSS) software (version 15.0, SPSS Inc., Chicago, IL, USA). All differences were considered as statistically significant at a P value less than 0.050.

Results

Four patients excluded from the study because of uncooperation. Failure to puncture (3 and 5 cases in radial and ulnar approaches, respectively) and failure to wire cross (3 cases in radial approach) were the result of unsuccessful procedures. Finally, 216 patients including 111 and 105 cases respectively in transradial and transulnar approaches were analyzed. The majority of the subjects were men (62.1%) with a mean age of 59.98 ± 9.74 years old. There was no significant difference between the groups in terms of the demographic and clinical data (Table 1).

Table 1. Demographic and clinical characteristics of the study subjects

Demographic and clinical variables	Transradial approach (n = 111)	Transulnar approach (n = 105)	P
Age (mean ± SD)	59.55 ± 10.26	60.32 ± 9.20	0.622
Gender (men) [n (%)]	69 (62.1)	63 (60.0)	0.745
Hypertension [n (%)]	21 (18.9)	23 (21.9)	0.586
DM [n (%)]	16 (14.4)	22 (20.9)	0.207
Dyslipidemia [n (%)]	22 (19.8)	28 (26.6)	0.233
Previous MI [n (%)]	14 (12.6)	9 (8.5)	0.336
Current smoker [n (%)]	13 (11.7)	9 (8.5)	0.446
Angiography [n (%)]	69 (62.1)	83 (79.0)	0.007
Angioplasty [n (%)]	42 (37.8)	22 (20.9)	0.007

SD: Standard deviation; DM: Diabetes Mellitus; MI: Myocardial infarction

Table 2. Comparison of minor and major complications of transradial versus transulnar approach in coronary artery angiography and angioplasty

Complication	Transradial approach (n = 111)	Transulnar approach (n = 105)	P
MACEs	0 (0.0)	0 (0.0)	-
Hematoma	11 (9.9)	11 (10.4)	0.893
Paresthesia/pain	13 (11.7)	12 (11.4)	0.948
Artery spasm	14 (12.6)	2 (1.9)	0.002
Pseudoaneurysm	0 (0.0)	0 (0.0)	-
Arterial occlusion	10 (9.0)	1 (0.9)	0.006
Amputation/emergency surgery/large hematoma	0 (0.0)	0 (0.0)	-

MACEs: Major adverse cardiac events

No MACEs were occurred in both groups. In addition, no major access-related complications such as grade 5 hematoma, necessity for amputation or surgery were occurred (Table 2). Comparing the minor complications indicated that there was not significant differences in paresthesia/pain and hematoma (P = 0.948 and P = 0.893, respectively) (Table 2). Local pain and/or paresthesia was treated with analgesic (ibuprofen or steroid). Local hematoma was controlled with compression bandage and ice bag. All hematomas were grade 1-3, except 1 patient in transulnar group who developed to grade 4. All hematomas were controlled with the above-mentioned conservative management. In contrast to the above, differences in arterial occlusion and artery spasm were significant between the two groups (P < 0.050) (Table 2). Arterial occlusion was significantly higher in transradial approach (9.0% vs 1.0%, P = 0.006), which was diagnosed by physical examination and documented by Doppler sonography (absent pulses). As there was no significant ischemia associated with this complication, no further treatment was performed. Arterial spasm was also significantly higher in transradial group (12.6% vs 1.9%, P = 0.002) and was treated with systemic nitrate. No pseudoaneurysm was occurred in both groups.

Most of these complications were observed during the first week, while hematoma occurred in the first 24 hours.

Mean time of procedure (from arterial puncture till reaching to ascending aorta) was 20 ± 8 and 21 ± 11 minutes in transradial and transulnar approaches, respectively (P = 0.723).

Discussion

This study showed that both transradial and transulnar approaches are safe and feasible alternatives for femoral CAG and angioplasty regarding to the MACEs and access site complications. Regarding the difficulties with transradial approach including radial artery anatomic variations and complications including RAO and spasm, ulnar artery contained positive aspects like less anatomic variations and larger artery size, preventing arterial spasm, which were the purpose and necessity of this study. The transulnar CAG safety and feasibility was shown in few recent studies;[7-9] although Hahalis et al. questioned the feasibility of transulnar approach in comparison to transradial approach. They found higher cross-over rates in transulnar approach in comparison to transradial procedure.[10] No MACEs or necessity for amputation and emergency surgery were observed in the present study as shown previously in similar ones.[6-9] Considering minor complications (transulnar approach), pain and/or paresthesia was complained by 11.4% of the patients in the present study; this rate is close to the result of the study by Roghani-Dehkordi et al. as 11.0%,[7] or even lower than the rate reported by Sallam et al. as 15.5%.[14] This variation may be related to the sensitivity of the patient and/or population to the pain and also somehow to the accuracy of the observer to pick out this complication. However, it should be emphasized that puncturing by the skilled individuals and decreasing puncture time as low as possible will decrease pain/paresthesia. Hematoma (not life and limb threatening) was occurred in 10.5% of the patients participating in this study with transulnar approach, this is in agreement with other studies.[7-12] Spasm was significantly higher in transradial approach compared to transulnar approach with 12.6% and 1.9%, respectively as shown in other studies, for instance the studies carried out by Hahalis et al.[10] and Louvard and Lefevre.[15] This may be related to smaller size of radial artery and also its tortuosity causing prone it to spasm. Decreasing puncture time, flushing with cocktail (including nitrate and/or verapamil) and gentle handling of wire and catheter decrease arterial spasm.[16] In the present study, RAO was significantly more than ulnar artery occlusion with 9.0% and 1.0%, respectively. Several studies also showed similar values.[7,13,17] Lower rate of ulnar artery

occlusion most probably results from higher size of ulnar artery, and also deep location of ulnar artery which inhibited complete occlusion of artery during hemostasis in comparison to the radial approach.[10,14]

Conclusion

As shown in the present study, transulnar CAG was safe and feasible as transradial approach regarding to MACEs and vascular (access site) complications. However, minor complications like RAO and artery spasm were more common in transradial approach.

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Conflict of Interests

Authors have no conflict of interests.

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Physicians' knowledge, attitudes, and practice for hypertension management: A cross-sectional study in Hormozgan province, Iran

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Original Article

Abstract

BACKGROUND: Hypertension is a common risk factor for developing cardiovascular, brain, and kidney disorders; and today, it affects about one billion people worldwide. Insufficient clinical knowledge of the practitioners and family physicians and not following the guidelines has led to the improper control of hypertension. This study intended to investigate the knowledge, attitude, and practice of general practitioners (GPs) about hypertension in Hormozgan province, Iran.

METHODS: This cross-sectional study used consecutive sampling method. A three-part researcher-made questionnaire was used to collect data on demographic, attitude, knowledge, and practice information from 220 GPs working in Hormozgan province.

RESULTS: The mean and standard deviation (SD) of scores on knowledge, practice, and attitude of GPs about hypertension management were (5.00 ± 0.5٠), (10.00 ± 0.02) and (9.00 ± 0.15), respectively; which present a proper state. Attending training courses and increased work experience have statistically significant effects on the knowledge and attitude of GPs ($P < 0.050$). The only exception was the area of practice, where there was no significant relationship between the practitioners' work experience and their practice ($P = 0.266$).

CONCLUSION: The results of this study can be utilized by decision-makers and general medicine curriculum designers to plan effective training courses for medical graduates to be used in clinical settings for health promotions.

Keywords: Hypertension, Attitude, Knowledge, Practice, General Practitioner

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Introduction

Hypertension is one of the most common risk factors for cardiovascular, brain, and kidney disorders. Unfortunately, it affects about one billion people worldwide. Hypertension directs attention to itself not only due to its prevalence but also down to the fact that it is asymptomatic, has diverse drugs and treatment procedures, requires long time drug therapy, and demands to be followed up by the medical staff.[1,2]

According to Joint. National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII),[3] hypertension is defined as systolic blood pressure (BP) level above 140 mmHg and diastolic BP level of 90 mmHg, under standard conditions. Therefore, the prevalence of hypertension varies slightly between societies; however, in most cases it is reported to be between 20% and 24% of the total population.[3] In Iran, its prevalence is reported to be between 22% and 24% among the people over 20 years of age.[4] Almost the same figure has been reported in Hormozgan province, Iran.[5]

The impact of hypertension treatment on the reduction of mortality rate has been long proved. Yet, the figures provided by different countries indicate insufficient control of BP levels (about 120 mmHg for systolic BP level and 80 mmHg for diastolic BP level). For instance, figures specify a 54% control rate in the United States (U.S.),[6] and

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about 50% in European countries;[7] in other areas such as Africa,[8] Middle East,[9] and China[10] figures point out even worse conditions.

One of the main factors for the proper control of hypertension is increasing the knowledge of general practitioners (GPs) and family physicians about their duties. A study in Italy revealed that not many physicians are informed enough to assess the risk factors associated with hypertension.[11] The same pattern was observed among physicians in Bahrain, in terms of treatment procedures. Another study conducted in Qazvin, Iran, presented that only 61% of the physicians ask for diagnostic tests during the first visit, and others cannot properly examine the patients.[12]

Considering the role of hypertension in the development of other chronic and deadly diseases, and the impact of knowledge, attitude, and practice of GPs, as the first step for health providing care, this study investigated the knowledge, attitude, and practice of GPs of Hormozgan province about hypertension. Obviously, the results of this study can be utilized by decision-makers and general medicine curriculum designers for the most effective training programs in the form of Continuous Medical Education (CME) for medical graduates to be used prospectively in clinical settings and for health promotions.

Materials and Methods

This cross-sectional, descriptive-analytical study included 850 GPs working in Hormozgan province, with the mean and standard deviation (SD) of 5.12 ± 0.3 years of work experience. The sample size was estimated as 300 individuals using Morgan table. Based on the total number of physicians in each city, through proportional sampling method, the sample of GPs was selected randomly from each city.

A three-part researcher-made questionnaire was used to collect data. Reliability and validity of questionnaire was checked and confirmed. First, a preliminary pool of 66 items was developed by a review of existing clinical knowledge related to hypertension management by GPs. These items encompassed three domains: knowledge, attitude, and practice (clinical scenarios). Second, the comprehensiveness, relevance, and clarity of these items were assessed by an expert panel composed of 2 cardiologists, 2 health educationists, and 1epidemiologist. Based on their responses and comments, a modified pool of 40 items was developed by writing additional items, excluding irrelevant items, and combining items. Thus, the questionnaire was made with three domains: attitude (10 questions), knowledge (15 questions), and practice (15 questions).

In order to investigate the reliability of the questionnaire, 15 senior medical interns and 10 GPs were asked to fill out the questionnaire twice with the interval of 10 days. The final reliability was confirmed through estimating Pearson correlation coefficient for each domain (knowledge domain's $r = 0.74$, attitude domain's $r = 0.80$, and practice domain's $r = 0.89$). The process led to the displacement of 4 questions in the area of knowledge and awareness, as well as revising two questions in the area of attitude and practice.

Each participant had a chance to present his/her attitude choosing one of the choices of "Yes", "No Idea", and "No" which were graded from 0-2. The minimal and maximal grades on the attitude section were 0 and 20, respectively. The items investigating knowledge and practice were designed as multiple choice items. The obtained grades for the items on knowledge and practice ranged from 0-15.

The questionnaire was distributed among the participants through email, office automation system, and Telegram program. Of the 300 participants, 220 individuals (32% men and 68% women) completed the questionnaire, and 80 persons refused to participate in the study. The reason for the drop out of some of the participants was that 21 individuals moved to other cities before the end of the project, 27 ones did not participate due to their lack of time, and 32 others decided not to take part in the research project for no known reason.

Continuous and categorical data were reported as mean ± SD and absolute number (percent), respectively. Independent t-test was applied in order to determine the statistically meaningful significance between the means of obtained knowledge, attitude, and practice questioning from different groups. In an attempt to determine the most significant influencing factor on the three areas under research, multiple regression test was applied. The statistically meaningful significance was considered less than 0.05 for all the tests. The collected data were analyzed utilizing SPSS software (version 20, IBM Corporation, Armonk, NY, USA).

Results

The mean and SD of GPs' scores in the areas of attitude, knowledge, and practice on hypertension were 5.00 ± 0.50, 10.00 ± 0.02 and 9.00 ± 0.15, respectively.

Table 1. The mean and standard deviation of general practitioners' scores in the areas of attitude, knowledge, and practice, in terms of gender

Areas	Gender	n (%)	Mean ± SD	P*
Attitude	Women	70 (32)	4.50 ± 0.50	0.098
	Men	150 (68)	4.82 ± 0.50	
Knowledge	Women	70 (32)	10.20 ± 0.02	0.083
	Men	150 (68)	11.00 ± 0.02	
Practice	Women	70 (32)	8.50 ± 0.25	0.332
	Men	150 (68)	8.20 ± 0.10	

* Used independent t-test; SD: Standard deviation

The mean and SD of GPs' scores in the areas of attitude, knowledge and practice on hypertension, based on their gender, history of attending training courses, and work experience are presented in tables 1, 2, and 3, respectively. Accordingly, no relation between GPs' scores in the areas of attitude, knowledge, and practice on hypertension and gender was found (Table 1). History of attending training courses during the last two years had positive meaningful effects on the knowledge and attitude of GPs (P = 0.003 and 0.005, respectively) (Table 2). Table 3 shows that work experience has also positive meaningful effects on the knowledge and attitude of GPs (P = 0.003 and 0.001, respectively). However, the history of attending training courses and work experience have no effect on the practitioners' practice (P = 0.266 and 0.332, respectively).

Multiple regression analysis was also used to determine the most important factor affecting the attitude, knowledge, and practice of GPs. In this sense, the relationships between obtained scores in each of the three areas were investigated separately and the relationships between the dependent variable and other factors such as work experience, history of the last training course, and gender were also investigated. The results are presented in table 4.

Table 4 shows the relationship between the attitude, knowledge, and practice of GPs with their gender, work experience, and history of attending training courses. Gender and work experience have not significant relationship with attitude, knowledge, and practice (P > 0.050). However, having passed courses in increasing attitude in hypertension has significant relationship with increasing attitude (β = 0.420, P = 0.017). Similarly, having passed course in increasing knowledge and practice for controlling hypertension has significant relationship with posttest knowledge and practice (P = 0.018, P = 0.021, respectively).

Discussion

Nowadays, due to significant medical advances, especially in the areas of medication and surgical interventions, a majority of diseases have become treatable or their incidence rates have decreased. Hypertension, unfortunately, has been an exception and is not appropriately controlled worldwide. In European, American, and some Asian countries, hypertension control rates are to some extent acceptable;[13,14] however, undesirable figures have been reported in other countries.[15-17] In some cities of Iran, Isfahan for instance, there has been continuous community plans with convincing results aiming at controlling hypertension through the enhancement of individuals' awareness and knowledge.[18]

Factors such as long-term medication use, medication complications, high treatment costs, unhealthy lifestyles, occupational and familial stress, alcohol use, and smoking have made hypertension difficult to control. During the process of

Table 2. The mean and standard deviation of general practitioners' scores in the areas of attitude, knowledge, and practice, in terms of history of attending training courses in the last two years

Areas	History of attending related continuous medical education courses in the last two years	n (%)	Mean ± SD	P*
Attitude	Positive	125 (56)	5.50 ± 0.05	0.005
	Negative	95 (43)	4.12 ± 0.50	
Knowledge	Positive	125 (56)	11.20 ± 0.24	0.003
	Negative	95 (43)	9.00 ± 0.32	
Practice	Positive	125 (56)	8.50 ± 0.25	0.266
	Negative	95 (43)	8.20 ± 0.10	

* Used independent t-test; SD: Standard deviation

Table 3. The mean and standard deviation of general practitioners' scores in the areas of attitude, knowledge, and practice in terms of work experience

Areas	Work experience (year)	n (%)	Mean ± SD	P*
Attitude	≤ 3	106 (48)	4.20 ± 0.05	0.001
	> 3	114 (52)	5.82 ± 1.50	
Knowledge	≤ 3	106 (48)	10.10 ± 0.13	0.003
	> 3	114 (52)	11.00 ± 1.12	
Practice	≤ 3	106 (48)	9.50 ± 1.55	0.563
	> 3	114 (52)	8.12 ± 1.11	

* Used independent t-test; SD: Standard deviation

hypertension diagnosis and treatment, medical personnel who are mostly GPs constitute the main element.[2] Therefore, their medical awareness, appropriate communication skills with the patients, and sufficient knowledge of the disease are essential for hypertension control.

The present study investigated the mean score of GPs' knowledge about various aspects of prevention, diagnosis, and treatment of hypertension which showed undesirable results. The reason could be explained through poor levels of work experience and not having attended any training courses. The same finding was observed in some other studies[16,17] in different parts of the world as well.

In addition, the mean score of GPs' practice measured based on the evaluation of 15 written clinical scenarios related to hypertension which examined various diagnostic and therapeutic aspects of practitioners' work, was 0.15 and had no significant relationship with their work experience.[9] This finding suggests that the need for updating knowledge has not been properly institutionalized among GPs. Meanwhile, some physicians in their written comments expressed lack of proper communication between provincial health centers, health departments, and healthcare networks with physicians who are directly in contact with patients. For example, more than half of the physicians stated that they had never received any hypertension treatment guideline approved by the Ministry of Health and Medical Education, or declared their unawareness of the existence of such guidelines.

In a somewhat similar study, the same results as those of the present study were achieved. A cross-sectional study was conducted on 1000 GPs in urban areas of Pakistan. Thirty six percent of the GPs used an improper classification to diagnose hypertension among patients less than 60 years of age and those over 60 years old. Out of the whole participants, 34.7% performed good practices for hypertension treatment for the elderly patients.[17]

Moreover, in another study conducted in Shanghai, the knowledge and practice of 160 GPs on hypertension was studied. The findings indicated poor levels of knowledge and practice of the urban physicians on hypertension; thus, the study revealed an urgent need for conducting continuous education courses on high BP levels.[16]

A retrospective study, the results of which were consistent with the present study, was conducted in 15 health centers in Bahrain. 115 GPs (including 77 family physicians and 38 general physicians) participated in the study who accounted for 74% of all GPs in Bahrain. In general, 1266 diabetic patients with high BP levels were examined.

Table 4. The relationship between the attitude, knowledge, and practice of general practitioners with their gender, work experience, and history of attending training courses

Dependent Variables	Independent Variables	β	SE (β)	P*
Attitude	Gender (reference category: women)	0.040	0.020	0.123
	History of attending training courses (reference category: no attending)	0.420	0.380	0.017
	Work experience (year)	0.040	0.010	0.189
Knowledge	Gender (reference category: women)	0.030	0.010	0.117
	History of attending training courses (reference category: no attending)	0.490	0.360	0.018
	Work experience (year)	0.030	0.010	0.082
Practice	Gender (reference category: women)	0.090	0.010	0.160
	History ofattending training courses (reference category: no attending)	0.390	0.300	0.021
	Worke experience (year)	0.040	0.020	0.205

SE: Standard error

The most common drugs included angiotensin converting enzyme (ACE) inhibitors (37.9%) and beta-blockers (38.3%). Calcium channel blockers were prescribed by one-third of physicians; and generally, a significant number of physicians prescribed drugs without reviewing available standard guidelines.[19] This is worth mentioning that in the study from Bahrain, a checklist was handed out to the physicians to assess their pharmaceutical choice from a list of related drugs and their contraindications.

Another consistent study was performed in Egypt to evaluate the knowledge and practice of primary health care (PHC) physicians for the identification and treatment of hypertension and other risk factors of cardiovascular diseases (CVDs). The study included a four-part questionnaire, an interview for each physician, and a checklist of their daily activities. Based on the results, dealing with hypertension was a primary problem for two-thirds (62.9%) of the physicians and only 19% had the relevant guideline. The level of knowledge of physicians in different areas was evaluated as follows: regarding the definition of BP (61.3%: good), measurement method (43.5%: poor), referral cases (43.5%: poor), consultation with patients (61.3%: good) and effectiveness of treatment methods (59.8%: good).[20]

In another study conducted in 47 health centers in Spain with an intention of determining the extent of disease control, BP levels of 4049 patients were measured. Forty two percent of the patients had a desirable BP (140/90). Thirteen percent of the diabetic patients and seventeen percent of renal patients had a desirable BP (130/80).[21]

Another study was conducted in the U.S. to evaluate the knowledge, attitude, and practice of 10000 cardiologists, internal medicine specialists, and GPs in the area of patients with hypertension. Emails were sent to the physicians and 1023 of them sent back their answers. Only 37.3% of them answered to all the four questions of knowledge correctly, where cardiologists acquired the highest scores.[22]

A cross-sectional study was conducted in Fars province, Iran, to evaluate the knowledge, attitude, and practice of 300 GPs in the area of treatment and complications of high BP levels, which revealed that 99% of the physicians believed in the importance of hypertension as a public health condition, 12% requested proper tests, and 20% properly controlled patients. Only 45% of the GPs had measured their own BP the same year. Based on the findings, the physicians' improper attitude toward the significance of the disorder was reported;[23] therefore, the same results as those of the present study were achieved.

A cross-sectional study was conducted in Saudi Arabia to evaluate the compliance of treatment methods used by GPs with hypertension treatment guidelines. In this study, the need for conducting continuous education courses, on the basis of available guidelines, for GPs was proposed.[24]

In an intervention study in Italy, it was shown that increasing the knowledge of GPs about available guidelines was associated with an increase in controlling BP levels.[25]

In two intervention studies conducted in Pakistan and Spain, results showed that an increase in the knowledge of GPs could be effective in controlling BP levels.[26,27] Over a six-year period of community interventions through 10 research projects which were carried out in Isfahan, it was detected that the extent of awareness and disease control had increased compared with other parts of the country that did not gain any interventions.[18]

One of the main findings of this study is the physicians' improper attitude toward treatment and disease control which reduces their tendency for self-promotions through attending training courses.[27-30] The physicians' attitude and willingness for participation in training courses have also been evaluated in Qazvin, Iran.[12]

In the present study, no significant difference was observed in the levels of attitude of GPs with higher work experience, compared to those with lower work experience. On the other hand, an improvement was observed in the attitude of those with a history of attending retraining courses. This issue highlights the important role of retraining courses in the improvement of attitude of physicians for the diagnosis, treatment, and prevention of hypertension, and can be considered as the first step toward treating the disease.

The limitation of this study include: no question was designed to determine the alternative guideline used by the physicians once they complain of the inaccessibility of the treatment guideline provided by the Ministry of Health. Due to the prolonged process of data collection, the researchers did not manage to substitute more participants for the ones who had dropped out. This might have influenced processing the data and in turn the findings.

Conclusion

The results of this study highlight the improvements in all areas of knowledge, attitude,

and practice of physicians, after attending retraining educational courses. Providing guidelines and holding regional workshops and seminars on the utilization of the guidelines will improve physician's practice. In Iran's vast healthcare network, GPs are among the first levels of communication; therefore, it is suggested to organize retraining courses to upgrade their levels of knowledge, skills, and attitudes, and to consider BP control as a priority in the Ministry of Health.

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None.

Conflict of Interests

Authors have no conflict of interests.

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Gerbode type defect after trans-septal puncture for ablation of left-sided accessory pathway

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Case Report

Abstract

BACKGROUND: Trans-septal puncture (TSP) is a safe and effective method to approach left atrium and ventricle. Nowadays, cardiac electrophysiologists perform this procedure routinely to treat left-sided arrhythmias.

CASE REPORT: A 45-year-old man was referred to our center due to Wolff-Parkinson-White (WPW) syndrome. After trans-septal puncture, contrast injection into the sheath showed that it was in the left ventricle (LV) rather than left atrium. Trans-esophageal echocardiography confirmed left ventricle outflow tract to right atrial (RA) jet. Follow-up echocardiography showed that the tract was present up to 18 months, but considering that the patient was asymptomatic, endovascular or surgical closure was not done.

CONCLUSION: Our case with an 18-month follow-up period, highlights the conservative approach in asymptomatic patients with this complication.

Keywords: Radiofrequency Catheter Ablation, Adverse Effects, Punctures

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Introduction

Trans-septal puncture (TSP) is a safe and effective method to approach left atrium and ventricle. Nowadays, cardiac electrophysiologists perform this procedure routinely to treat left sided arrhythmias.[1] Although pericardial effusion and tamponade are among the most serious complications of TSP,[2] complications such as inadvertent puncture of aorta, and even aorto-right atrial shunt are rarely reported.[3,4]

Herein, we illustrate the occurrence of a rare TSP complication, and our approach to handle it.

Case Report

A 45-year-old man was referred to our center due to Wolff-Parkinson-White (WPW) syndrome for radiofrequency ablation. General physical examination was normal. Electrocardiography (ECG) showed pre-excitation in favor of left posterior accessory pathway (AP). Echocardiography was also normal.

Guided by fluoroscopy, right atrium (RA), right ventricle, and coronary sinus catheters were introduced into the corresponding heart chambers. Basic electrophysiology study confirmed that AP was located in the posterior part of mitral valve ring; so we decided for TSP. This was the first time we used HeartSpan Steerable (Merit Medical Systems, South Jordan, UT, United States) sheath and the needle for TSP; in the previous TSP procedures, we used the Agilis™ sheath (Abbott, Saint Paul, MN, United States). Withdrawal of trans-septal sheath from superior vena cava into RA after 2 jumps usually places the introducer system in the fossa ovalis; but in this patient, this maneuver did not work despite several attempts. Finally, we could place the sheath into lower part of the interatrial septum, just above coronary sinus catheter in left anterior oblique projection. Jerky puncture with the needle was done and small amount of contrast injection showed that the needle has traversed the interatrial septum. So, we advanced the steerable sheath over the needle to the left side, and then the needle was withdrawn. However, to our surprise, contrast injection into the side branch of the sheath showed that it was in the left ventricle (LV) rather than the left atrium (Figure 1-A). We advanced the 0.032" guidewire through the sheath to LV, and retracted the sheath to RA. Continuous arterial blood pressure monitoring did not show hemodynamic compromise, nor did echocardiography show pericardial effusion; so we

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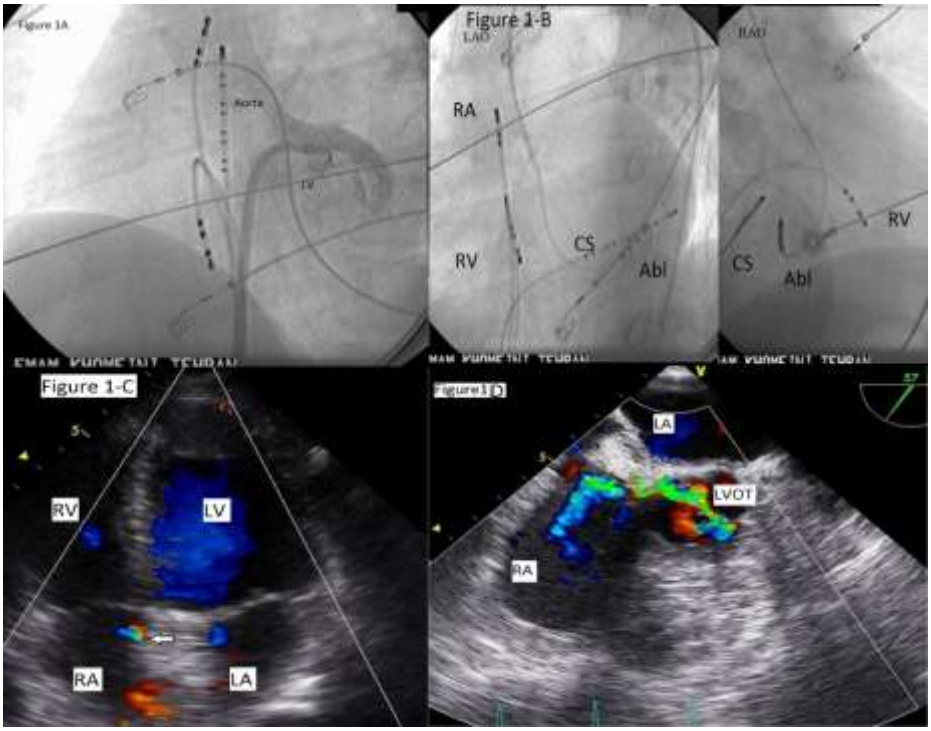

Figure 1. A: Contrast injection after trans-septal puncture through the sheath shows that LV is penetrated. B: RAO and LAO projections at the site of successful ablation (posterior of mitral valve ring). C: TTE shows abnormal flow in the RA. D: TEE shows LV outflow tract to RA flow.
Abl: Ablation catheter; CS: Coronary sinus; LA: Left atrium; LAO: Left anterior oblique; LV: Left ventricle; RA: Right atrium; RAO: Right anterior oblique, RV: Right ventricle; TEE: Trans-esophageal echocardiography; TTE: Transthoracic and echocardiography

decided to perform radiofrequency ablation of AP via the retrograde trans-aortic approach that was successful (Figure 1-B).

We transferred the patient to coronary care unit (CCU) for better hemodynamic monitoring. On the next day, transthoracic and trans-esophageal echocardiography showed LV outflow tract to RA jet (Figure 1-C and 1-D respectively). The patient was discharged uneventfully. Follow-up echocardiography showed that the tract was present for up to 18 months without any evidence of cardiac enlargement (Figure 2). Since the patient was asymptomatic, endovascular or surgical closure was not attempted.

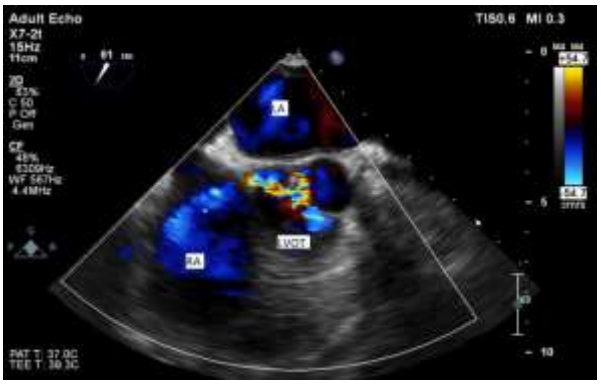

Figure 2. Persistent LV to RA fistula 18 months later
LA: Left atrium; LV: Left ventricle; RA: Right atrium; LVOT: Left ventricular outflow tract

Discussion

Our case is unique in two aspects; first, a very rare complication of TSP, RA to LV penetration (Gerbode) and fistula formation, but more interestingly is the second, persistence of this fistula over 18 months of medical follow-up without any intervention usually needed in similar symptomatic cases.[5]

Can et al. presented a case with Gerbode type defect after ablation of atrioventricular node from the LV to RA. They stated that radiofrequency ablation was uncomplicated and at 5-month routine medical follow up, they found a LV to RA fistula. At 14-month follow-up, the size of defect did not show any progression; so they did not perform any intervention.[6]

The most similar article to ours was presented by Chavarria and Goldbarg.[7] They presented left ventricular penetration detected during trans-septal puncture of interatrial septum for ablation of left posterior accessory pathway. After discovering the complication in the catheterization laboratory, they postponed the definite procedure to another day. They addressed that the patient was asymptomatic during several weeks follow-up.

In our case, we speculated that the superior part of membranous septum was punctured inadvertently, and a Gerbode-like defect with flow from the LV to the RA was made. It is predictable that if intracardiac echocardiography was available in our electrophysiology laboratory, this complication could be avoided. Our case, with 18-month follow-up, highlights the conservative approach in asymptomatic patients with this complication.

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Conflict of Interests

Authors have no conflict of interests.

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Combined association of liver and renal injury by intra-aortic balloon pump malposition

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Case Report

Abstract

BACKGROUND: We report an unusual visceral complication of intra-aortic balloon pump (IABP) due to the malpositioning of the catheter in the aorta.

CASE REPORT: A 55-year-old man with severe left ventricular dysfunction underwent coronary artery bypass grafting (CABG) with the preoperative use of an intra-aortic balloon pump. Postoperative course was complicated by renal and hepatic failure. The early occurrence of complications during 36 hours after operation exhibited a serious vascular complication. The combination of acute renal and hepatic failure led to the suspension to occlusive effect of intra-aortic balloon pump catheter on ostium of the aforementioned organs. The intra-aortic balloon pump was removed, and urine output immediately restored. Thereafter, daily slop dawn serum levels of aminotransferases were started, and became normal at the 10th day of operation.

CONCLUSION: This is an exceptional case that shows how intra-aortic balloon pump may be contributed to mechanical aortic side branches obstruction. A high index of suspension is mandatory in the diagnosis of such bizarre complications.

Keywords: Liver, Ventricular Dysfunction, Coronary Artery Bypass

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Introduction

The intra-aortic balloon pump (IABP) is a method of temporary mechanical circulatory support used in the management of candidates for cardiac surgery with following risk factors of refractory arrhythmia or angina, or congestive heart failure as the result of acute myocardial infarction or its complication (acute mitral regurgitation, post myocardial infarction ventricular septal defect), postcardiotomy stunning, or low cardiac output syndrome.[1]

We report an exceptional case of combined acute renal and hepatic injury resulting from both organ hypoperfusion caused by catheter low-lying or malpositioning of the IABP.

Case Report

A 55-year-old man, with severe left main coronary artery disease (CAD), and with short stature (150 cm height) and 76 kg weight, was referred to our center for coronary artery bypass grafting (CABG). The patient scheduled for off-pump CABG (OPCAB).

Due to unstable hemodynamic condition, an IABP catheter (Datascope, procure, state, dual lumen, 9.5F, 34 ml, Datascope Inc., Montreal, NJ, United States) was inserted percutaneously through the right femoral artery, and was attached to the Datascope system via a console. Immediately after device insertion, with a counter pulsation and 100% augmentation, and a ratio of 1:1, the systolic blood pressure increased up to 90 mmHg, and urine output increased.

The patient underwent an OPCAB operation using conventional grafts such as the left internal thoracic artery and saphenous vein grafts. Following the extubation, urine output was decreased that managed by diuretic and fluid therapy. Although, laboratory examination showed abrupt increasing of the following test: blood urea nitrogen (BUN): 70 mg/dl, creatinine (CR): 1.6 mg/dl, aspartate transaminase (AST): 80 IU, alanine aminotransferase (ALT): 70 IU, and acetate dehydrogenase (LDH): 350 IU. AST, ALT, and LDH values elevated seriously to 1200, 3500, and 5500 IU, respectively. The BUN and creatinine also increased to 80 and 2.1 mg/dl, respectively. The mean elevation of total bilirubin was also noted (total bilirubin: 2.5 mg/dl).

The distension caused the failure of Doppler to

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reveal the condition of portal and liver venous and arterial flow blood flow, but showed the reduction of renal arterial blood flow. However, in a thoracic X-ray catheter's tip was not detected, and an abdominal X-Ray showed that the balloon pump catheter's tip was displaced distally; uncovering of catheter dressing in right thigh revealed loosing of fixation suture of catheter to the skin in its correct position (Figure 1).

Figure 1. The displacement of catheter tip (black arrow)

The improper mismatching of the IABP catheter size with the patient length may be another possible cause of the liver, renal, and mesenteric arterial malperfusion in this specific case. After IABP removal, the patient urine output was abruptly increased on the following hours. Then, the liver function tests, including ALT, AST, LDH, total bilirubin, and prothrombin time continued to reduce, and recovered drastically at the 10th day of catheter removal; liver function tests returned to normal value at time of hospital discharge, too.

Discussion

The use of the larger catheter and displacement of the catheter distally by the loosening of fixation suture may lead to other unwanted complications. The sole way to avoid the visceral ischemia is proper selection of catheter size to the patient's body mass index (BMI); but catheter-induced ischemia is still considered as an important factor in premature device removal in a huge number of subjects.[2] Displacement or improper location of the IABP device, however, may result in a reduction in the visceral blood supply. These exacerbating ischemia is poorly tolerated by these critically ill patients. However, we consider the proper location of the proximal catheter tip at the lower or at the level of the aortic arch or in the lower aspect in the 2nd or 3rd intercostal space.

Sirbu et al. reported at least an important lower extremity complication in 38 of 509 patients, while visceral ischemia were reported in 4 cases.[3] In Moulopoulos et al. report, the major vascular complication of IABP was poorly tolerated in these critically ill cases with a low cardiac output syndrome, and marginal respiratory renal reserve.[4] Kantrowitz et al. reported that a mismatch between the length of the aorta and the balloon could result in visceral arterial branch obliteration and abdominal ischemia.[5] Arafa et al. showed that inferior mesenteric artery obliteration radiologically occurred in 30% of patients with the use of a large size balloon catheter.[6] Gol et al. found that senile collapse and degeneration and shortening of the vertebral body height led to the shortening of the aortic long axis, which might be an important contributor to mismatch of balloon and aorta in elderly cases.[7]

In Creswell et al. study, by autopsy of patients with cardiac surgery, IABP insertion was an important risk factor for the occurrence of fatal visceral ischemia.[8] Aside from diastolic malperfusion, plaque debris emboli due to the mechanical effects of balloon on intra-luminal atherosclerotic plaque may be related to abdominal ischemia. However, the augmentation produced by a smaller balloon is less than that provided by normal-sized balloons; but in Creswell et al. study, this difference does not seem to be clinically important. They reported that preventive measure was a reduction of IABP assisting ratio from 1:1 to 1:3. The ischemic time was reduced simply by lagging the time interval, in which the device remained in an inflated phase.[8]

Seeing the inability to insert a catheter from femoral artery due to obstruction of aorto-iliac vessel, or to avoid complication related to balloon, it could be possible to insert the balloon surgically from ascending aorta proximally into the aortic arch. However, Creswell et al.[8] believed that this solution would be an undesirable alternative method in critically ill patients. No alternative way is presented for IABP insertion, because this approach may be associated with compromising of aortic arch vessels flow or aortic plaque embolization into cerebral arteries.

In Urban et al. study, by autopsy of patients with cardiac surgery, IABP insertion was an important risk factor for the occurrence of fatal visceral

ischemia.[9] Aside from diastolic malperfusion, plaque debris immobile due to the mechanical effects of balloon on intra-luminal atherosclerotic plaque may be related to abdominal ischemia.[10]

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Conflict of Interests

Authors have no conflict of interests.

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The importance of screening sleep disorders in outpatient cardiac rehabilitation programs in Iran

Habibolah Khazaie[(1)], Saeid Komasi[(2)]

Letter to Editor

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Dear Editor-in-Chief

Sleep is one of the essential needs that have a significant impact on the health of the community.[1] Although proper and comfortable sleep is needed for a healthy life, sleep disorders are among the common health problems that threaten the quality of life of the general and clinical population of various communities.[2] These disorders include insomnia, sleep-related breathing disorders (obstructive sleep apnea, central sleep apnea syndrome, and snoring), central disorders of hypersomnolence (narcolepsy and hypersomnia), circadian rhythm sleep-wake disorders, parasomnias, and sleep-related movement disorders. The prevalence of these disorders is 0.4-48 percent in the United States,[3] and 8.8-59.2 percent in the general population of Iran.[2,4] Meanwhile, only about 7% of the general population in Iran has good sleep hygiene,[1] and more than 27% of the community is in danger of developing some sleep disorders.[5]

Sleep disturbances are the causes of somatic and fatal illnesses such as cardiovascular diseases (CVDs).[6] According to recent reports, sleep disturbances are associated with CVDs risk factors,[7] and significantly increase the chance of developing cardiac events.[6] In addition, these disorders are common in 30-38 percent of patients with coronary artery disease (CAD), or chronic heart failure (CHF), and can lead to a decrease of 12-10 percent in ejection fraction.[8] On the other hand, sleep disturbances in patients with established CVDs have several serious consequences.[6] However, their treatment has a significant role in controlling cardiovascular risk factors such as obesity, diabetes, hypertension, dyslipidemia, metabolic malfunctions, and mortality due to CVDs.[9]

Despite the importance of the aforementioned issue, screening of sleep disorders is not a standard part of the protocol for outpatient cardiac rehabilitation (CR) programs in Iran. Obviously, timely screening of these problems, along with other physical and psychosocial risk factors, can lead to a significant increase in peak oxygen consumption, maximal workload, and exercise capacity before starting aerobic exercise during CR.[10] Considering the above points and the acceptable effects of CR on physical and mental health,[11-13] we recommend that outpatient CR centers in Iran also add screening of sleep disorders to the routine assessment of the course. It is expected that timely referral of patients with sleep problems to an expert can reduce the potential risk of heart consequences, and increase the health outcomes of CR programs.

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Conflict of Interests

Authors have no conflict of interests.

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