Comparison of the Thai Version of the Rose Questionnaire for Angina Pectoris with the Exercise Treadmill Test

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Abstract

Prior to exercise treadmill testing (ETT), 157 patients (92 males and 65 females) were interviewed twice separately, using a Thai version of the Rose questionnaire for angina pectoris. One interview was conducted by a physician and the other by a nurse.The questionnaire responses were compared with ETT results. Based on physician-conducted interview, the Rose questionnaire had a sensitivity of 30.3 per cent, a specificity of 83.9 per cent, a positive predictive value of 35.3 per cent, a negative predictive value of 81.9 per cent, and the total accuracy of 72.6 per cent. There were gender differences in the validity of the questionnaire, with higher specificity, higher positive predictive value, and lower negative predictive value in males than in females. The sensitivity and accuracy were not different between the two sexes. In 87.9 per cent of cases, responses to physician-conducted and nurse-conducted interview were the same. There were no significant differences between responses to the questionnaires by the physicians and by the nurses.

Key word : Angina, Exercise Test, Questionnaire, Rose Questionnaire

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Angina pectoris is a major symptom of ischemic heart disease. Determination of the prevalence of angina pectoris in a population by individual clinical assessment is laborious and costly, thereby making it rather impractical. The London School of Hygiene Cardiovascular questionnaire (Rose questionnaire) was developed by Dr. Geoffrey A. Rose in 1962 as a diagnostic tool in epidemiological studies of the prevalence of angina pectoris[1]. Early validation studies in the general popula-

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tion comparing angina pectoris diagnosed by the Rose questionnaire with physician's diagnosis revealed high sensitivity and specificity, up to 83 per cent and 97 per cent respectively[1,2]. However, in studies using objective methods of ischemic heart disease detection as well as in post myocardial infarction patients, the questionnaire was not as promising as it was in the general population[3-6]. In addition, the validity of the questionnaire was different between males and females[4,5]. Nevertheless, the Rose questionnaire has widely been accepted and used as a tool for diagnosis of angina pectoris in epidemiological studies since its introduction[7-17]. It has also been validated in the non-English version[18,19]. The Thai version of the questionnaire was found to have a very low sensitivity when compared with an abnormal resting electrocardiogram[19]. Validation of the questionnaire in the Thai version using the exercise treadmill test for comparison has never been studied before.

In an epidemiological study utilizing a questionnaire, different personnel may be involved as interviewers. A patient may respond to the questionnaire differently if the interview is conducted by different interviewers. There is evidence that determination of angina pectoris by the Rose questionnaire is only moderately reproducible[2,20-23]. The difference in response to the Thai version of the Rose questionnaire interviewed by different personnel has also never been studied.

The objectives of this study were (1) to determine the validity of the Thai version of the Rose questionnaire in detection of ischemic heart disease when compared with the exercise treadmill test, (2) to determine gender difference in this comparison, and (3) to evaluate the difference in response to the questionnaire interviewed by different personnel.

METHOD

Subjects

One hundred and fifty-seven consecutive patients who were referred for exercise treadmill test at Her Majesty's Cardiac Center, Faculty of Medicine Siriraj Hospital, Mahidol University from January to August 1997 were enrolled in the study.

The Rose Questionnaire

The Thai version of the Rose questionnaire was used. It was translated directly from the English version[24] without significant modification. Since the exercise treadmill test cannot detect prior myocardial infarction, only the section of chest pain on effort in the Rose questionnaire was used for analysis. Before starting the exercise treadmill test, each patient was interviewed twice separately within an hour apart. The patients were not aware that there were two interviews. One interview was conducted by a physician, the cardiologist responsible for the exercise treadmill test, and the other by a nurse assisting in the test, Either the physician or the nurse was randomly assigned to be the first interviewer. The questionnaire was filled in by the interviewer, not by the patient. Attempts were not made to control the style of interview of each interviewer. There were 6 cardiologists and 3 nurses involved during the study period. The questionnaire and the criteria of angina pectoris are shown in the appendix.

Exercise protocol

Standard or modified Bruce protocol with 12- lead ECG monitoring was used. The procedure was proceeded in the usual fashion. A positive test result was determined by at least 1 mm of horizontal or downsloping ST-segment depression, or at least 1.5 mm of upsloping ST- segment depression at 80 milliseconds after the J point, compared to baseline tracing. If in a particular case the maximum heart rate during exercise was less than 85 per cent of predicted maximum heart rate for age, the result was classified as inadequate and was analyzed together with the negative test result.

Statistical analysis

The principal data used for analysis were those obtained from the physician's interview. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of the Rose questionnaire compared with the exercise treadmill test were calculated. The differences of validity of the questionnaire between males and females were evaluated using Z-test of proportion. The difference in the questionnaire responses was determined by comparing the response to the questionnaire interviewed by the physician and the nurse from the same patient. In a particular case where different responses existed, the responses were compared to the exercise treadmill test result to determine the accuracy of each category of interview.

RESULTS

There were 157 patients. Ninety-two (58.6%) were male and 65 (41.4%) were female. The mean (±SD) age was 53.3 (±12.7) years with the range of 17-82 years. One hundred and thirty-two patients (84.1%) were evaluated for chest pain or dyspnea on exertion. The indications for exercise treadmill test are shown in Table 1.

There were 30 patients (19.1%) with angina pectoris by the Rose questionnaire (Rose angina), while there were 33 patients (21%) with positive exercise treadmill test (Table 2). The results in males and females were different. The prevalence of Rose angina was higher in females than in males (24.6% *vs*15.2%, p=0.11). On the other hand, the prevalence of positive exercise treadmill test was higher in males than in females (29.3% *vs* 9.2%, p = 0.002).

The sensitivity, specificity, positive predictive value, negative predictive value and total accuracy of the Rose questionnaire in detection of positive exercise treadmill test are shown in Table 3. The specificity and positive predictive value were higher in males than in females, whereas, the negative predictive value was higher in females than in males. The sensitivity and accuracy of the questionnaire in males and females were not different.

One hundred and thirty-eight patients (87.9%) responded to the Rose questionnaire interviewed by physicians and nurses similarly (Table 4). In the remaining 19 cases (12.1%) there was disagreement of the responses. In these 19 cases there were 10 cases diagnosed as angina by physician's interview but no angina by nurse's interview. Another 9 cases had no angina by physician's interview but angina by nurse's interview. The response to the physician's interview was consistent with the exercise treadmill test result (positive Rose angina with positive exercise treadmill test and negative Rose angina with negative exercise treadmill test) in 9 of 19 cases, and the response to the nurse's interview was consistent with the exercise treadmill test result in 10 of 19 cases.

Table 1. Indications for exercise treadmill test.

indications	no. of patients	%
chest pain	87	55.4
dyspnea on exertion	45	28.7
post MI risk stratification	5	3.2
syncope/presyncope	1	0.6
evaluation of treatment (post PTCA, CABG)	10	6.4
palpitation and arrhythmia	9	5.7
total	157	100

Table 2. Comparison of Rose angina* and exercise treadmill test result.

Rose angina		exercise treadmill test result		total
		positive	negative or inadequate	
positive	male	8	6	14
	female	2	14	16
	total	10	20	30
negative	male	19	59	78
	female	4	45	49
	total	23	104	127
total		33	124	157

* data from physician's interview

Table 3. Validity of the Rose questionnaire compared with exercise treadmill test result (number presented in per cent).

	total group (n=157)	males (n=92)	females (n=65)	p value*
sensitivity	30.3	29.6	33.3	0.154
specificity	83.9	90.8	76.3	0.003
positive predictive value	35.3	57.1	12.5	0.0005
negative predictive value	81.9	75.6	91.8	0.002
accuracy of the questionnaire	72.6	72.8	72.3	0.224

* difference between males and females

Table 4. Agreement of response to the questionnaire interviewed by a physician and a nurse from the same patient.

response to physician's interview	response to nurse's interview		total
	angina	no angina	
angina	20	10	30
no angina	9	118	127
total	29	128	157

DISCUSSION

In this study the sensitivity of the Rose questionnaire to detect ischemic heart disease determined by a positive exercise treadmill test was low. One of the likely explanations lies in the nature of the study population. In patients with typical angina pectoris the diagnosis is straightforward and they usually are not referred for exercise treadmill test. Patients with atypical chest pain or dyspnea on exertion without chest pain are more likely to be referred for this population because it comprises questions about typical symptoms of angina pectoris. Most of the patients in this study were referred for evaluation of chest pain or dyspnea on exertion.

The validity of the Rose questionnaire has varied among many studies, depending on the population studied and methods used as gold standards for detection of coronary artery disease. In the general population, the questionnaire had a high sensitivity and specificity when compared with physician diagnosis of angina pectoris[1,2]. A subsequent study found that the questionnaire had a lower sensitivity (59.7%) to detect angina in post myocardial infarction patients[3]. Comparing the questionnaire with other methods which are more objective in detection of ischemia than clinical diagnosis, the validity was not as promising as it seemed to be when using clinical diagnosis for comparison. In the 1 st National Health Examination Survey of Thailand held in 1991, the Thai version of the Rose questionnaire had a sensitivity of 6.7 per cent, a specificity of 94.9 per cent, a positive predictive value of 1.4 per cent, and a negative predictive value of 99 per cent to predict an abnormal resting ECG suggestive of ischemic heart disease[19]. The Rose questionnaire had a sensitivity of 57 per cent, a specificity of 47 per cent and a predictive value of 19 per cent when compared with exercise electrocardiography in 67 male patients who refused angiography[25]. In studies comparing the Rose questionnaire angina with exercise thallium scintigraphy in patients with chest pain, the questionnaire was found to have a sensitivity of 43-44 per cent, a specificity of 65-72 per cent, a positive predictive value of 52-67 per cent, and a negative predictive value of 50-56.7 per cent[4,5]. A few studies have used coronary angiography for comparison. Eriksen et al[25] found that angina by the questionnaire was highly sensitive but poorly specific when compared with coronary angiography. In another study the Rose questionnaire had a sensitivity of 17.4 per cent, a specificity of 81.1 per cent, a positive predictive value of 63.2 per cent and a nagative predictive value of 34.5 per cent to detect significant coronary artery stenosis[6]. In the use of the Rose questionnaire to identify cases of coronary artery disease, it has to be assumed that angina pectoris reflects underlying myocardial ischemia and/or coronary artery disease[6]. This is true in some cases but not in others. Angina pectoris, myocardial ischemia, and coronary artery disease are interrelated but are not necessarily the same thing[26]. This can partly explain the differences in sensitivity and specificity of the Rose questionnaire among many studies.

In this study, we found that there were gender differences in validity of the questionnaire. The sensitivity of the questionnaire was not different between the sexes, whereas, the specificity was higher in males than in females. The positive predictive value was higher in males indicating that the false positive rate was higher in females than in males. The accuracy of the questionnaire in males and females was the same. Our results were consistent with the study of Garber CE et al[4]. Bass EB et al found that the sensitivity of the Rose questionnaire compared with exercise thallium scintigraphy was higher in females than in males, whereas, the specificity was higher in males than in females, with the same accuracy in both sexes[5]. It is well known that the prevalence of angina pectoris due to causes other than coronary artery disease is higher in females than in males, especially in the younger age group[27]. This causes a high false positive rate when Rose angina is compared with objective determination of myocardial ischemia in female subjects.

In 12.1 per cent of cases whose responses to the questionnaire by the physician and the nurse were different, the rate of consistency between responses to the questionnaire and the exercise treadmill test result were similar in both categories of interviewers (9/19 for physicians' interview *vs* 10/19 for nurses' interview). This suggested that there would be no significant differences in the response to the questionnaire by different personnel. Training interviewers in administration of the questionnaire to the same standard is more important than who the interviewers are. In the original paper in the development of the questionnaire[1], Rose stated that the questions must be put to the subject exactly as they were printed and any effort to alter the

conduct of the interview was not suggested. However, he also suggested that supplementary questions could be asked after the basic portion of the questions depending on the specific interest of the investigator(1).

Study limitations

There were some limitations in this study. Firstly, the population in the study was cases seeking medical attention for many reasons. They did not represent the general population. Care must be taken in extrapolation of the results of this study to a healthy general population. Secondly, interviewers in the study were not systematically trained in the administration of the questionnaire, so standardization could not be ascertained. Lastly, an exercise treadmill test is not an ideal gold standard for determination of myocardial ischemia. The test itself has a moderate sensitivity and specificity when compared with coronary angiography(28). Cases with false positive and false negative exercise treadmill test result could occur and affect the results of the study. However, the test is inexpensive, easy to perform, and not invasive.

SUMMARY

The Thai version of the Rose questionnaire has a low sensitivity and moderately high specificity when compared with the exercise treadmill test in detection of myocardial ischemia. In this population the majority of which presented with chest pain or dyspnea on exertion, the questionnaire had a low positive predictive value and moderately high negative predictive value. The overall accuracy of the questionnaire was 72.6 per cent. There were gender differences in the validity of the questionnaire. It had lower specificity, lower positive predictive value and higher negative predictive value in females than in males with the same accuracy in both sexes. There were no significant differences in the response to the questionnaire by different personnel.

Taking these results into consideration, should the questionnaire be recommended further might depend on the purpose of users. If they are dealing with "angina pectoris" then the questionnaire may still be appropriate. However, if they are studying "myocardial ischemia" or "coronary artery disease", the Rose questionnaire may be far inferior to what the ideal study tool should be.

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Appendix

The Rose Questionnaire (Thai version)

1. ท่านเคยมีอาการเจ็บแน่น/จุก/อืดอัดบริเวณหน้าอก (หรือคางหรือคอ) มาก่อนหรือไม่
   [ ] 1. เคย [ ] 2. ไม่เคย (หยุดถาม)
2. อาการที่ว่านี้เกิดขึ้นขณะรีบเร่ง/ออกกำลังกาย/เดินเร็วๆ/เดินขึ้นบันไดหรือที่สูงหรือไม่
   [ ] 1. ใช่ [ ] 2. ไม่ใช่ [ ] 3. ไม่เคยเดินเร็วหรือเดินขึ้นบันได/ที่สูง
   [ ] 0. ข้ามข้อนี้ไป
3. ท่านเคยมีอาการดังกล่าวเมื่อเดินตามปกติบนพื้นราบหรือไม่
   [ ] 1. มี [ ] 2. ไม่มี [ ] 0. ข้ามข้อนี้

ถ้าคำตอบข้อ 2 และ 3 ตอบว่า "ไม่ใช่" แล้ว "ไม่มี" ให้หยุดถาม

4. เมื่อเกิดอาการดังกล่าวท่านทำอย่างไรเพื่อให้อาการดีขึ้น
   [ ] 1. หยุดพักหรือเดินช้าลง/ชะลอ [ ] 2. เดิน/ทำงานต่อในอัตราเดิม
   [ ] 3. อมยาใต้ลิ้น [ ] 0. ข้ามข้อนี้

ถ้าเดิน/ทำงานต่อในอัตราเดิมโดยอมยาใต้ลิ้น ให้ตอบในช่อง 1

5. เมื่อท่านหยุดพัก (หรือชะลอลงหรืออมยาใต้ลิ้น) อาการดังกล่าวจะ
   [ ] 1. ดีขึ้น [ ] 2. ไม่ดีขึ้น [ ] 0. ข้ามข้อนี้ไป
6. อาการที่เกิดขึ้นนี้จะมีอยู่นานกี่นาที
   [ ] 1. เจ็บแปลบชั่วครู่ (ประมาณ 1-2 วินาที) แล้วหายไป
   [ ] 2. 10 นาทีหรือเร็วกว่านั้น [ ] 3. นานกว่า 10 นาที [ ] 0. ข้ามข้อนี้
7. กรุณาชี้ตำแหน่งที่เกิดอาการเจ็บแน่น/อืดอัด/จุก
   บันทึกตำแหน่งที่ผู้ให้สัมภาษณ์ชี้
8. อาการเช่นนี้ร้าวไปที่ใดหรือไม่
   [ ] 1. มี (กรุณาระบุ).....
   [ ] 2. ไม่มี [ ] 0. ข้ามข้อนี้

เกณฑ์การวินิจฉัยว่ามีภาวะ angina pectoris คือผู้ให้สัมภาษณ์ตอบคำถามทุกข้อดังต่อไปนี้

ข้อ 1 ตอบ 1

ข้อ 2 และ 3 ข้อใดข้อหนึ่งตอบ 1 หรือตอบ 1 ทั้ง 2 ข้อ

ข้อ 4 ตอบ 1 หรือ 3

ข้อ 5 ตอบ 1

ข้อ 6 ตอบ 2

ข้อ 7 ตอบ บริเวณคาง หรือคอ หรือ หน้าอกตรงกลาง

หรือข้อ 7 ตอบ บริเวณหน้าอกด้านซ้าย ร่วมกับ ข้อ 8 ตอบ ไหล่ซ้าย หรือแขนซ้าย หรือไหล่ทั้ง 2 ข้าง หรือคอ หรือกราม

The Rose questionnaire (English translation from the Thai version used in this study)

1. Have you ever had any pain or discomfort in your chest or anterior neck or jaw?
   [ ] 1. yes [ ] 2. no (stop the interview)
2. Does the pain or discomfort occur when you hurry, or exert, or walk rapidly, or walk upstairs or uphill?
   [ ] 1. yes [ ] 2. no
   [ ] 3. never hurry, or walk rapidly, or walk upstairs or uphill [ ] 0. omit this question
3. Does the pain or discomfort occur when you walk at an ordinary pace on the level?
   [ ] 1. yes [ ] 2. no [ ] 0. omit this question

If the answers to both question 2 and 3 are "no", stop the interview.

4. What do you do to relieve the symptom when it occurs?
   [ ] 1. stop or slow down [ ] 2. continue in the same manner
   [ ] 3. take sublingual nitrates [ ] 0. omit this question

Check 1 if the answer is "continue in the same manner after taking sublingual nitrates"

5. If you stop or slow down or taking sublingual nitrates, what happens to the symptom?
   [ ] 1. relieved [ ] 2. not relived [ ] 0. omit this question
6. For how long does the symptom last?
   [ ] 1. just a few seconds [ ] 2. not longer than 10 minutes
   [ ] 3. longer than 10 minutes [ ] 0. omit this question
7. Please show me where it was.
   Record all areas mentioned
8. Does the symptom radiate to anywhere else?
   [ ] 1. yes (please describe) [ ] 2. no [ ] 0. omit this question

Angina pectoris is diagnosed if the answers are as follows:

question 1 check 1

either question 2 or 3 check 1

question 4 check 1 or 3

question 5 check 1

question 6 check 2

question 7 check central chest area, or anterior neck , or jaw or question 7 check left anterior chest area and question 8 check left or both shoulders, or left arm, or anterior neck, or jaw

The Rose Questionnaire (original English version)

Questions	possible response	required response for positive angina
Have you ever had any pain or discomfort in your chest?	yes/no	yes
Do you get it when you walk uphill or hurry?	yes/no/never hurries or walks uphill	yes to either question 2 or
Do you get it when you walk at an ordinary pace on the level?	yes/no	3
What do you do if you get it while you are walking?	stop or slow down/carry on	stop or slow down or carry on after taking nitroglycerin
If you stand still, what happens to it?	relieved/not relieved	relieved
How soon?	10 minutes or minutes	10 minutes or less
Will you show me where it was?	recorded all areas mentioned	(a) sternum or (b) left anterior chest and left arm

การศึกษาเปรียบเทียบแบบสอบถามอาการเจ็บหน้าอกภาคภาษาไทยกับผลการตรวจคลื่นไฟฟ้าหัวใจโดยการออกกำลังกาย

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ผู้ป่วย 157 ราย (ชาย 92 ราย, หญิง 65 ราย) ที่มาตรวจคลื่นหัวใจโดยการเดินสายพานได้รับการสัมภาษณ์โดยใช้แบบสอบถามอาการเจ็บหน้าอกภาคภาษาไทยก่อนการตรวจรายละ 2 ครั้ง. เป็นการสัมภาษณ์โดยแพทย์ 1 ครั้ง และพยาบาลอีก 1 ครั้ง. ผลการสัมภาษณ์นำไปเปรียบเทียบกับผลการตรวจคลื่นไฟฟ้าหัวใจโดยการเดินสายพาน. เมื่อใช้ผลการสัมภาษณ์โดยแพทย์เป็นเกณฑ์พบว่า แบบสอบถามอาการเจ็บหน้าอกภาคภาษาไทยมีความไวร้อยละ 30.3, ความจำเพาะร้อยละ 83.9, positive predictive value ร้อยละ 35.3, negative predictive value ร้อยละ 81.9, และความแม่นยำร้อยละ 72.6. ค่าความจำเพาะและ positive predictive value จะสูงกว่าในเพศชายในขณะที่ negative predictive value จะสูงกว่าในเพศหญิง. ส่วนความไวและความแม่นยำไม่แตกต่างกันในทั้งสองเพศ. ผลการสัมภาษณ์โดยแพทย์และพยาบาลในผู้ป่วยรายเดียวกันเหมือนกันถึงร้อยละ 87.9. ในรายที่ผลไม่เหมือนกันนั้นเมื่อเปรียบเทียบกับผลการตรวจคลื่นไฟฟ้าหัวใจโดยการเดินสายพานแล้ว ความถูกต้องของผลการสัมภาษณ์โดยแพทย์และพยาบาลไม่มีความแตกต่างกันอย่างมีนัยสำคัญ

คำสำคัญ : อาการเจ็บหน้าอก, คลื่นไฟฟ้าหัวใจ, แบบสอบถาม, การออกกำลัง

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