An Electrocardiographic Survey of Elderly Thai People in the Rural Community

PRASERT ASSANTACHAI, M.D. FRCP. (London)*,
PRADIT PANCHAVINNIN, M.D.**,
DUJPRATANA PISALSARAKIJ, B.Sc.*

Abstract

Electrocardiographic findings in the elderly reflect both common cardiac diseases and physiologic ageing change. This cross-sectional population-based study explored the prevalence of various abnormalities in the electrocardiograms of active older people and those who are free from any cardiac pathology and determined their relationship to age and gender in a rural area of Thailand. Nine hundred and sixty three people aged 60 years or more were recruited. The electrocardiographic prevalence of ischemic heart disease, atrial fibrillation, left axis deviation and conduction defect were 5.5 per cent, 2.2 per cent, 2.5 per cent and 3.1 per cent respectively. After excluding diseases potentially affecting the heart, the prevalence of atrial fibrillation, left axis deviation and conduction defect decreased to 1.3 per cent, 2.0 per cent and 2.2 per cent. The prevalence of atrial fibrillation and ischemic heart disease were significantly less ($p = 0.015$ and 0.003) in the 80+ year old group. Regarding gender difference, only left axis deviation was found significantly more frequently in older men with an odds ratio of 5.23 (95% confidence interval, 1.28-30.29) in those who were free from diseases potentially affecting the heart.

In conclusion : Atrial fibrillation should not be regarded as degenerative change, but the result of cardiac pathology instead. The most common electrocardiographic abnormality in normal older men was left axis deviation and was found consistently more often than in older women. Therefore, it is appropriate to investigate for any reversible causes of atrial fibrillation while it is not so for left axis deviation in older men.

Key word : Thai Elderly Person, Rural Community, Electrocardiography

**ASSANTACHAI P,
PANCHAVINNIN P, PISALSARAKIJ D
J Med Assoc Thai 2002; 85: 1273-1279**

* Department of Preventive & Social Medicine, Division of Geriatric Medicine,
** Department of Medicine, Division of Cardiology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

Various kinds of diseases of the cardiovascular system are prevalent among older people as well as being the all-time number-one killer among this particular age group which has the highest mortality compared with their younger counterparts[1]. What tends to complicate the problem is that elderly patients are either unable to provide an accurate medical history or suffer multiple concomitant diseases which exhibit symptom complexes overlapping those attributable to cardiovascular disease[2] and underutilization of electrocardiography in this specific group [3]. Ischemic heart disease, arrhythmia and cardiac hypertrophy are common cardiac diseases in older people and can be simply detected by 12-lead electrocardiography. On the other hand, the concept of changes to the electrocardiogram as a result of the normal ageing process may produce confusion when interpreting true underlying coronary heart disease [4]. A cross-sectional survey was, therefore, designed to explore the electrocardiographic findings in this group of older people, in order to study the epidemiology of underlying cardiac pathology in this group and to investigate whether there were any findings that could be related to the degenerative process of aging rather than to underlying cardiac pathology. In turn, this may assist appropriate investigation of the patient who has an "abnormal" electrocardiogram.

MATERIAL AND METHOD

Approximately one hundred older people were selected from each district out of two districts in five provinces stretching from the north to the south of the central part of Thailand giving a total of 963 cases. The authors contacted senior citizen's clubs organized by the local community hospitals in the ten selected districts. The names of the subjects were randomly selected from the lists of members of each senior citizen club. The study was given approval by the Department of Disease Prevention and Control, Ministry of Public Health to be conducted at each local community hospital.

After history taking regarding the basic background, activity of daily living and medical history, each subject was physically examined to detect valvular heart disease and other relevant physical findings by one of the authors (P.A. and P.P.). All the electrocardiographic recordings were performed by the same trained nurse and interpreted by the author (P.P.). The Minnesota Coding was used to classify the electrocardiograms while the Whitehall Criteria were used to classify the electrocardiograms into probable ischemic or coronary heart disease (Minnesota Codes 1.1, 1.2) or possible disease (Minnesota Codes 1.3, 4.1-4.4, 5.1-5.3, 7.1)[5,6].

Subjects with ischemic heart disease were identified firstly by a history of heart disease plus those taking nitrates regularly. This was confirmed by the subject pointing out a sample of drugs from a variety shown indicating that this was their regular medication. Secondly, in cases where no drugs were being taken, those with a history of heart disease and a typical history of angina pectoris were included and finally cases with electrocardiographic findings suggesting ischemic heart disease were also included in this group.

Normal healthy older subjects were defined as those without ischemic heart disease, a history of hypertension or lung disease and by the absence of a heart murmur suggesting valvular heart disease, which could significantly affect the electrocardiogram. However, in cases with a systolic murmur at the aortic area without the character of pulsus parvus et tardus at the common carotid artery usually found in aortic stenosis were still included in the normal group as this finding is compatible with aortic sclerosis as a result of ageing.

The Chi-square test was employed to determine differences in dichotomous variables (Fisher's exact test in case of an expected cell value of less than 5). Differences were accepted significantly significant if p-value was less than 0.05.

RESULTS

The mean age was 69.19 ± 6.31 years old ranging from 60-93 years old. There were 95 cases of ischemic heart disease : 52 cases had electrocardiographic evidence of ischemic heart disease, 26 cases had a history of ischemic heart disease with a confirmed history of treatment with nitrates and 17 cases had a history of heart disease as well as a typical history of angina pectoris. 241 cases had a history of hypertension, 46 cases suffered from chronic lung disease and 83 cases had significant valvular heart disease. However, some subjects experienced more than one abnormal condition. Thus, the number of normal healthy elderly people was 591 out of 963 cases (61.37% of the total sample population). This group represents the group in which changes of the electrocardiogram represent the "physiological" changes of ageing.

The prevalence of various electrocardiographic abnormalities in older Thais is shown in Table 2. Regarding the type of abnormality reported, conduction defect includes right bundle branch block, left bundle branch block, complete heart block and sinus arrest while the category "Other abnormalities" includes premature ventricular contraction, premature atrial contraction, sinus bradycardia, atrial enlargement and undetermined axis. Some subjects had more than one type of electrocardiographic abnormalities.

The prevalence of atrial fibrillation was 2.2 per cent in the total study population, 1.8 per cent among the older men and 2.3 per cent among the older women (Table 2). The prevalence was highest in the 70-79 years group (4.0%) while it was found in only 1.1 per cent of the young old group (60-69 years). There was a significant difference in the prevalence of atrial fibrillation between the three age groups ($p = 0.015$) (Table 3). Regarding electrocardiographic evidence of ischemic heart disease, the prevalence was 4.0 per cent among the older men and 6.1 per cent among the older women giving rise to a total of 5.5 per cent in the total study population. Likewise, the prevalence within the oldest group (aged ≥ 80 years) was less than their younger counterparts which is statistically significant ($p = 0.003$). As far as gender differences are concerned, electrocardiographic evidence of ischemic heart disease and atrial fibrillation were found more frequently among the older women (6.1% and 2.3%) than the older men (4.0% and 1.8%) respectively. On the other hand, left axis deviation and conduction defect were more common among the older men (4.6% and 4.3%) than the older women (1.4% and 2.5%) respectively. However, the prevalence of the left axis deviation and conduction defect were not different between the three age groups ($p = 0.496$ and 0.099) (Table 3). Interestingly, according to Table 2, the percentage of those with normal electrocardiographic findings was found to be much the same between older men (83%) and women (84.7%).

Left axis deviation was the most common electrocardiographic abnormality found among normal older men with a prevalence of 4.1 per cent, followed by conduction defect 3.6 per cent (Table 4). Yet there was no relationship with increasing age as shown in Table 5 ($p = 0.262$ and 0.153). Apart from left axis deviation in the older men, the people aged 80 years or more tended to be free from obvious electrocardiographic abnormalities in both males and females. Likewise, the 70-79 year old group tended to experience more electrocardiographic abnormalities than the younger group (60-69 years) both in males and females. Atrial fibrillation, which tended to be more common among women in the total study population, was found in much the same proportion in men and women in the "normal" subpopulation (1.4% and 1.3%). On the other hand, there was no relationship between atrial fibrillation and age as shown in Table 5 ($p = 0.078$). The prevalence of normal electrocardiographic finding was around 90 per cent in both males and females. When the prevalence of various electrocardiographic abnormalities was compared to the gender differences, only left axis deviation was found to be significantly more frequent among the older men than the older women with an odds ratio of 5.23 (95% CI: 1.28-30.29).

DISCUSSION

Approximately 84 per cent of the total study population revealed no significant electrocardiographic abnormality, whereas, it was around 95 per cent among the general population in another study indicating an age-related change[7]. Electrocardiographic

Table 1. Demographic data of both the overall population and the normal healthy elderly.

	Overall population						Normal population					
	Male		Female		Total		Male		Female		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
	324	100	639	100	963	100	220	100	371	100	591	100
60-69 years	185	57.1	353	55.2	538	55.9	130	59.1	205	55.3	335	56.7
70-79 years	119	36.7	233	36.5	352	36.6	77	35.0	142	38.3	219	37.1
80+ years	20	6.2	53	8.3	73	7.6	13	5.9	24	6.5	37	6.3
Mean age	68.9 ± 5.5		69.3 ± 6.7		69.2 ± 6.3		68.7 ± 5.4		69.1 ± 6.4		68.98 ± 6.05	

Table 2. The prevalence of electrocardiographic abnormalities in the total study population according to age group and gender.

	Male								Female							
	60-69		70-79		80+		All		60-69		70-79		80+		All	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	185	100	119	100	20	100	324	100	353	100	233	100	53	100	639	100
Left ventricular hypertrophy	0	0	2	1.7	0	0	2	0.6	3	0.8	2	0.9	1	1.9	6	0.9
Ischemic heart disease	5	2.7	7	5.9	1	5.0	13	4.0	17	4.8	14	6.0	9	15.1	40	6.1
Atrial fibrillation	2	1.1	4	3.3	0	0	6	1.8	4	1.1	10	4.3	1	1.9	15	2.3
Left axis deviation	7	3.8	6	5.0	2	10.0	15	4.6	4	1.1	4	1.7	1	1.9	9	1.4
Conduction defect	6	3.2	8	6.7	0	0	14	4.3	5	1.4	8	3.4	3	5.7	16	2.5
Other abnormalities	5	2.7	6	5.0	0	0	11	3.4	15	4.2	6	2.6	1	1.9	22	3.4
Normal	162	87.6	90	75.6	17	85.0	269	83.0	308	87.3	193	82.8	40	75.5	541	84.7

NB. "Other abnormalities" includes premature ventricular contraction, premature atrial contraction, sinus bradycardia, atrial enlargement and undetermined axis.

Table 4. Electrocardiographic findings in the "normal" elderly.

	Male								Female							
	60-69		70-79		80+		all		60-69		70-79		80+		all	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	130	100	77	100	13	100	220	100	205	100	142	100	24	100	371	100
Atrial fibrillation	1	0.8	2	2.6	0	0	3	1.4	1	0.5	4	2.8	0	0	5	1.3
Left axis deviation	4	3.1	3	3.9	2	15.4	9	4.1	1	0.5	2	1.4	0	0	3	0.8
Conduction defect	3	2.3	5	6.5	0	0	8	3.6	2	1.0	3	2.1	0	0	5	1.3
Other abnormalities	3	2.3	4	5.2	0	0	7	3.2	10	4.9	6	4.2	0	0	16	4.3
Normal	119	91.5	64	83.1	11	84.6	194	88.2	191	93.2	127	89.4	24	100	342	92.2

* "Other abnormalities" includes premature ventricular contraction, premature atrial contraction, sinus bradycardia, atrial enlargement and undetermined axis.

Table 3. Chi-square test of electrocardiographic abnormalities and the age group difference in the total study population.

	Atrial fibrillation		Ischemic heart disease		Left axis deviation		Conduction defect	
	n	%	n	%	n	%	n	%
	21	100	53	100	24	100	30	100
Aged 60-69	6	28.6	22	41.5	11	45.8	11	36.7
Aged 70-79	14	66.7	21	39.6	10	41.7	16	53.3
Aged 80+	1	4.8	10	18.9	3	12.5	3	10.0
P-value	0.015		0.003		0.496		0.099	

Table 5. Comparison between age groups and various electrocardiographic abnormalities in the "normal" elderly.

	Atrial fibrillation			Left axis deviation			Conduction defect		
	Yes		No	Yes		No	Yes		No
	n	%	n	n	%	n	n	%	n
	8	100	583	12	100	579	13	100	578
Aged 80+	0	0	37	2	16.7	35	0	0	37
Age 70-79	6	75	213	5	41.7	214	8	61.5	211
Aged 60-69	2	25	333	5	41.7	330	5	38.5	330
P-value	0.078			0.262			0.153		

evidence of ischemic heart disease was found in 4.0 per cent of males and 6.1 per cent of females or overall 5.4 per cent. This corresponds with that found by Woo et al in Hong Kong where the prevalence of ischemic heart disease diagnosed by electrocardiogram was 6 per cent for men and 7 per cent for women[8]. The prevalence of ischemic heart disease in the 60-69 years group was statistically significantly higher than the oldest group (Table 3). A possible explanation might be the early death of the younger elderly people suffering from the disease so that the oldest group represents "survivors" of a group in which some have already died as a result of ischemic heart disease. Those aged 80 years or more tended to be free from obvious electrocardiographic abnormalities in both men and women (Table 4) suggesting that those with the best electrophysiology live longer than the others.

The prevalence of atrial fibrillation was 2.2 per cent which was about half of that reported by Frishman et al (4%)[9]. Among the subjects with neither clinical nor subclinical cardiovascular disease (Table 4), the prevalence of atrial fibrillation was only 1.3 per cent similar to that reported by Furberg et al [10] who reported numbers of 1.6 per cent. Furthermore, the present results revealed that although there was a relationship between the prevalence of atrial fibrillation and age group (p-value 0.015) in the total population studied (Table 3) this was not so in those who were free from cardiac pathology (p-value 0.078) (Table 5). This important finding suggests that atrial fibrillation in the Thai elderly is the result of associated cardiac pathology rather than the ageing process per se i.e. increasing age does not necessarily bring about more atrial fibrillation. According to Table 2, the prevalence of both atrial fibrillation and ischemic heart disease is quite high in the age groups of 60-69 years and 70-79 years, the latter condition may be the important cause of atrial fibrillation. As atrial fibrillation is the most important arrhythmia in older people and is associated with a significantly increased mortality in older people[11], the patient should be promptly examined for any underlying reversible causes.

Some studies have demonstrated an age-related trend towards left axis deviation[12], the present results did not show a trend with increasing age according to Table 3 (p = 0.496) and Table 5 (p =

0.262). Interestingly, male gender was a significant risk factor for left axis deviation with an odds ratio of 5.23 (95% CI: 1.28-30.29) for those who were free from any cardiac pathology. Moreover, it was also the most common electrocardiographic abnormality found among older men who were free from any cardiac pathology in Table 4. Therefore, it should not prompt the physician to over-investigate in such a situation. Left axis deviation should not be regarded as a significant finding in an older person as isolated left axis deviation does not carry an adverse prognosis[13].

ACKNOWLEDGEMENT

This study was fully supported by the World Health Organization in collaboration with the Department of Disease Prevention and Control, Ministry of Public Health.

(Received for publication on April 16, 2002)

REFERENCES

1. Wenger NK. Cardiovascular disease in the elderly. Current Problems in Cardiology 1992; 17: 609-90.
2. Rodstein M. Characteristics of nonfatal myocardial infarction in aged. Arch Intern Med 1956; 98: 84.
3. Ryall AH, Abdulah DR, Rios D, Wei JY, Hausdorff JM. Undertreatment of cardiovascular disease in ethnically diverse older adults: Who should receive an electrocardiogram. J Am Geriatr Soc 2001; 49: 1573-4.
4. Mihalick MJ, Fisch C. Electrocardiographic findings in the aged. Am Heart J 1974; 87: 117-28.
5. Rose GA, Blackburn H. Cardiovascular survey methods. World Health Organization monograph series No. 56. Geneva: WHO, 1982: 123-43.
6. Rose GA, Hamilton PJS, Keen H, Reid DD, McCartney P, Jarrett RJ. Myocardial ischaemia, risk factors and death from coronary heart disease. Lancet 1977; i: 105-9.
7. De Bacquer D, De Backer G, Kornitzer M. Prevalences of ECG findings in large population based samples of men and women. Heart 2000; 84: 625-33.
8. Woo J, Ho SC, Lau J, Yuen YK, Chan SG, Masarei J. Cardiovascular symptoms, electrocardiographic abnormalities, and associated risk factors in an elderly Chinese population. Int J Cardiol 1993; 42: 249-55.
9. Frishman WH, Heiman M, Karpenos A, et al. Twenty-four-hour ambulatory electrocardiography in elderly subjects: Prevalence of various arrhythmias and prognostic implications (report from the Bronx Longitudinal Aging Study). Am Heart J 1996; 132 (2 Pt 1): 297-302.
10. Furberg CD, Pasty BM, Manolio TA, Gardin JM, Smith VE, Rautaharju PM. Prevalence of atrial fibrillation in elderly subjects (the Cardiovascular Health Study). Am J Cardiol 1994; 74: 236-41.
11. Tervahauta M, Pekkanen J, Punsar S, Nissinen A. Resting electrocardiographic abnormalities as predictors of coronary events and total mortality among elderly men. Am J Med 1996; 100: 641-5.
12. Bachman S, Sparrow D, Smith LK. Effect of ageing on the electrocardiogram. Am J Cardiol 1981; 48: 513-6.
13. Caird FI, Campbell A, Jackson TFM. Significance of abnormalities of electrocardiogram in old people. Br Heart J 1974; 36: 1012-8.

การสำรวจคลื่นไฟฟ้าหัวใจในผู้สูงอายุไทย

ประเสริฐ อัสสันตชัย, พ.บ., FRCP. (LONDON),*
*ประดิษฐ์ ปัญจวีณิน, พ.บ.**, ดุจปรารถนา พิศาลสารกิจ, วท.บ.**

ผลการตรวจคลื่นไฟฟ้าหัวใจในผู้สูงอายุอาจเกิดจากพยาธิสภาพที่หัวใจหรือการเปลี่ยนแปลงจากความชราเอง การศึกษานี้จึงมุ่งสำรวจความผิดปรกติของคลื่นไฟฟ้าหัวใจชนิดต่าง ๆ ในผู้สูงอายุปรกติในชุมชนและในกลุ่มที่ปราศจากพยาธิสภาพต่าง ๆ ที่อาจมีผลต่อคลื่นไฟฟ้าหัวใจ รวมทั้งความสัมพันธ์กับอายุและเพศของผู้สูงอายุ มีผู้เข้าร่วมการศึกษา 963 ราย พบความชุกโรคหลอดเลือดหัวใจ atrial fibrillation, left axis deviation, conduction defect เท่ากับร้อยละ 5.5, 2.2, 2.5 และ 3.1 ตามลำดับ เมื่อได้คัดเฉพาะผู้สูงอายุที่ปราศจากพยาธิสภาพที่อาจมีผลต่อคลื่นไฟฟ้าหัวใจพบความชุกของ atrial fibrillation, left axis deviation, conduction defect เหลือราวร้อยละ 1.3, 2.0, 2.2 ความชุกของ atrial fibrillation และ โรคหลอดเลือดหัวใจในกลุ่มอายุ 80 ปี หรือมากกว่าน้อยกว่ากลุ่มอายุอื่นอย่างมีนัยสำคัญทางสถิติ ส่วน left axis deviation พบในผู้สูงอายุชายมากกว่าหญิงอย่างมีนัยสำคัญด้วย odds ratio 5.23 (95% confidence interval: 1.28–30.29) เมื่อคิดจากเฉพาะกลุ่มที่ปราศจากพยาธิสภาพที่อาจมีผลต่อคลื่นไฟฟ้าหัวใจ กล่าวโดยสรุป atrial fibrillation ในผู้สูงอายุไทยเกิดจากพยาธิสภาพต่าง ๆ มากกว่าการเปลี่ยนแปลงจากความชราเอง ส่วนความผิดปรกติที่พบบ่อยที่สุดในผู้สูงอายุชายปรกติ คือ left axis deviation และพบมากกว่าผู้สูงอายุหญิงอย่างมีนัยสำคัญ กรณีเช่นนี้จึงไม่มีความจำเป็นที่ต้องสืบค้นหาสาเหตุทางพยาธิสภาพซึ่งตรงข้ามกับ atrial fibrillation

คำสำคัญ : คลื่นไฟฟ้าหัวใจ, ผู้สูงอายุไทย, ชนบท

ประเสริฐ อัสสันตชัย, ประดิษฐ์ ปัญจวีณิน, ดุจปรารถนา พิศาลสารกิจ
จดหมายเหตุทางแพทย์ ฯ 2545; 85: 1273–1279

* ภาควิชาเวชศาสตร์ป้องกันและสังคม, สาขาวิชาเวชศาสตร์ผู้สูงอายุ,
** ภาควิชาอายุรศาสตร์, สาขาวิชาหทัยวิทยา, คณะแพทยศาสตร์ศิริราชพยาบาล, มหาวิทยาลัยมหิดล, กรุงเทพ ฯ 10700