

**Relationship Between Newly Diagnosed
Hypertension and P Wave and QT Dispersion**

العلاقة ما بين المرضى حديثي التشخيص بضغط الدم
والتشتت في الموجه (ب) و (ك ت) في تخطيط القلب

Abdulla S. Bin-Nabhan,
Rasheed Bamukhlal,
Nabeel Msean.

Faculty of Medicine – Hadhramout University



جامعة الأندلس
العلوم والتقنية

Alandalus University For Science & Technology

(AUST)

Relationship Between Newly Diagnosed Hypertension and P Wave and QT Dispersion

الملخص:

بعيادة خاصة في المكلا - حي السلام في الفترة ما بين الأول من يوليو والثلاثين من سبتمبر ٢٠١٣ . حيث التحق ٤٩٢ مريضاً، منهم ٢٤٢ مريضاً حديثي التشخيص بمرض ضغط الدم، حيث عمل لهم تخطيط قلب، وتم مقارنة تشتت موجات ب وك ت في المجموعتين.

النتيجة والخلاصة: تشتت موجات ب في تخطيط القلب لها علاقة إحصائية في المرضى حديثي التشخيص بضغط الدم، بينما تشتت ك ت أكثر طولاً في مرضى ضغط الدم حديثي التشخيص ولكن لا توجد أهمية إحصائية.

موجات تخطيط مرضى ضغط الدم الذين لا يستعملون العلاج تكون أكثر طولاً في المصابين بمرض الرجفان الأذيني. ومرضى ضغط الدم مع طول موجات ك ت في تخطيط القلب له علاقة بمرض الرجفان البطيني. ولكننا في دراستنا هذه سندرس العاملين السابقين في مرضى ضغط الدم حديثي التشخيص .

الأهداف: مقارنة تشتت موجات ب وك ت في تخطيط القلب لمرضى ضغط الدم حديثي التشخيص.

الطريقة: دراسة مقطعية لكل المرضى الراغبين في الدخول في الدراسة، وتتراوح أعمارهم بين ٣٠ - ٥٠ سنة، والتحقوا

Abstract :

Background: Non treated hypertensive individual had found from the standard ECG that maximum duration of the P wave and its dispersion were more prolonged in the patient with atrial fibrillation. Prolonged QT duration in hypertensive patient has relation with ventricular arrhythmia, and atrial fibrillation (AF) is the direct cause for P wave desperation (PwD)) but our study will deal with the relation of newly diagnosed hypertension and these ECG findings.

Objectives: To compare the prevalence of P wave and QT dispersion in both newly diagnosed hypertensive and control groups.

Method: This was a cross-sectional observation study in private clinic at Al Mukalla – Al Salam zoon, at the period

between 1st of July and 30 September 2013, were all cases came to clinic with the age between 30 and 50 years who are willing to participate, we measure there blood pressure (BP) and 12-leads ECG were done for them . There were 492 subjects recruited for this study 242 were newly diagnosed hypertensive's and another 250 were normal subjects. Then P wave and QT dispersion compared in the two groups.

Results and conclusion: P dispersion was significantly more prolonged in newly diagnosed hypertensive group. QT dispersion was more prolonged in newly diagnosed hypertensive group but not statistically significant.

Key wards: P wave and QT duration and newly diagnosed hypertension

Introduction :

The risk for cardiovascular disease increases progressively with every increment in blood pressure as documented in meta-analysis of multiple observational studies involving over 420,000 untreated persons (1). Data from the Framingham heart study suggested that effective prevention of CVD requires adequate control (2). Even for newly diagnosed hypertensive, studies have shown that treatment can reduce the occurrence of these cardiovascular events and progression to more severe hypertension. (3) Coexisting cardiac abnormalities, such as cardiac arrhythmias have been associated with enhanced risk of developing future CVD. Studies have shown that arrhythmias are present in early period of the disease. (4)

The onset of atrial fibrillation (AF) results in a significant increase in mortality and morbidity. The abnormal rhythm primarily exposes the patient to a significantly increased risk of thromboembolic disease (5). The risk factors involved in the onset of AF are well known, but the predictive clinical parameters for the onset of AF hypertensive patients have not been established. A study done by Ciaroni looking at never treated hypertensive individuals had found from the standered ECG that maximum duration of the P wave and its dispersion were more prolonged in the patient with AF. This study concluded that prolonged duration of the P wave and its dispersion were more prolonged in patients with AF. This study conclude that prolonged duration of the P wave is an independent predictor of the onset of AF in patients with essential hypertension (6). However this study did not look at newly diagnosed hypertensive subjects.

Although there is no information regarding abnormal p- wave dispersion and subsequent progression of atrial fibrillation in newly diagnosed hypertension is clearly provided in the literature, it is however important to investigate this parameter in the early stage

of the disease. This may contribute to the improvement in the prognosis. Therefore this study will look at the value and prevalence of P wave dispersion in the newly diagnosed hypertensive in comparison to the normal individuals.

The QT-interval and QT- dispersion are important electrophysiological features which may explain some aspects of the initiation of ventricular arrhythmia. It is believed that increased QT dispersion is a direct reflection of the disparity of ventricular recovery times (7). This feature measured as QT dispersion (QT maximum minus QT minimum on the standard 12-lead ECG reflects regional variation in the recovery of ventricular excitability (8). The method of measuring QT has been identified and validated (9). Prolonged QT dispersion has been found to exist in the early stage of hypertension. A study was done looking at the possible pathogenic role of QT dispersion on the ventricular arrhythmias newly diagnosed hypertensive patients. It was found that high grade ventricular ectopics (Lown's score > 3) were found in 43% of the subjects. Abnormal QT dispersion was also noted to be strongly correlated with severe ventricular arrhythmias (10).

Objectives :

1. To determine the prevalence of P wave and QT dispersion in newly diagnosed hypertensive patients of less than 6 months
2. To compare the prevalence of P wave and QT dispersion in both hypertensive and control groups.

Material and Methods :

This was a cross-sectional observation study in private clinic Almukalla –Alsalam zoon, at the period between 1st of July 30 September, were all cases came to internal medicine clinic with the age between 30 and 50 years who are willing to participate, we measure there BP and 12-leads ECG were done for them . There

were 492 subjects recruited for this study 242 were newly diagnosed hypertensive's within 6 months and another 250 were normal subjects.

Subjects were included in hypertensive group if they were men and women aged between 30 and 50 who had average systolic BP \geq 140 mmHg and / or diastolic BP \geq 90 mmHg at enrolment, or who had been diagnosed to have hypertension for less than 6 months prior to the recruitment. Subjects were included in control group if they were men and women aged between 30 and 50 who had normal BP at enrolment and were not known to have hypertension previously. Subjects were excluded if they had malignant or accelerated hypertension, significant valvular disease such as aortic stenosis, hypertrophic cardiomyopathy or ischemic heart disease arrhythmia and history of hypertension on treatment.

BP measured by using a mercury sphygmomanometer. The phase 1 Korotkoff sound was taken as systolic pressure and phase 5 as diastolic pressure after resting for 10 minutes in a seated position, BP was determined by calculating the mean of 3 replicated measurement taken 1 minute apart at the period between 1st. of July and 30th. Of September 2013. Hypertension is considered inpatient with systolic blood pressure 90 mm Hg or more or diastolic blood pressure 140 mm Hg. Or more

12-lead electrocardiography (ECG) was done and analyzed by the same investigator.

- (i) The technique of measurement of P-wave was measured from the onset of P to the return of terminal P wave to the iso-electric baseline. It was measured manually in as many of the 12 leads as possible. Two consecutive cycles were measured in each of the 12 ECG leads and from the two values a mean was calculated. P dispersion was measured by using the following formula:

P dispersion (msec.) = Maximum mean P – minimum mean P

(ii) QT interval was measured from the first deflection of the QRS complex to the point of T-wave off-set (defined by return of the terminal T wave to the isoelectric TP baseline). It was measured manually in as many of the 12 leads as possible. Two consecutive cycles were measured in each of the 12 ECG leads and from the two values a mean was calculated

QT dispersion was measured by using the following formula:

$$\text{QT dispersion (msec.)} = \text{Maximum mean QT} - \text{Minimum mean QT}$$

Results :

Total of 492 subjects were recruited, 237 were males and 255 were females, 242 subjects with SBP \geq 140 and / DBP were recruited in the newly hypertensive group, 141 were males and 101 were females and 250 subjects with normal BP, 97 were males and 153 were females. The mean systolic BP (SBP) in both newly diagnosed hypertensive and control groups were $141.6 \text{ mmHg} \pm 16.3 \text{ mmHg}$ and 114.9 ± 11.3 respectively, $p < 0.05$. the mean diastolic BP (DBP) in both groups were $90.9 \pm 11.3 \text{ mm Hg}$ and $72.9 \pm 7.6 \text{ mmHg}$ respectively, $p < 0.05$ (Table 1 and figure 1 and 2 a & 2 b).

Total 466 12-lead readable ECG were analyzed for P and QT dispersions by single investigator (The remaining 26 cases are not attend to do ECG). 225 ECGs were analyzed for newly diagnosed hypertensive group and 241 ECGs for control group. P dispersion was significantly more prolonged in newly diagnosed hypertensive group. 40 (10 -80)msec. ds. 30 (10-60) msec. $p < 0.05$ (table 2, figer2). P- wave dispersion showed positive correlation with SBP ($r = 0.116$, $p < 0.05$), DBP ($r = 0.117$, $p < 0.05$) (table 2)

QT dispersion was more prolonged in newly diagnosed hypertensive group, 60 (10- 140) msec. vs. 40 (10 – 80) msec., $p < 0.05$. There was no significant correlation between QT and age ($r = 0.079$, $p > 0.05$) (table 2).

Discussion :

In this cross-sectional study looking at newly diagnosed hypertensive, we wanted to investigate the presence of adverse ECG marker (P wave and QT dispersion).

Hypertensive patient are at risk of developing cardiac arrhythmias. We found that p- wave dispersion was significantly prolonged in hypertensive patients, 40 (10 -80) msec. Ciaroni S (29) looked at 97 never treated hypertensive with no documented atrial fibrillation, $p < 0.05$. He found in his study that p-wave dispersion were 36 ± 13 msec. in all patients eith sinus rhythm, $30 \pm$ msec. and $48 \pm$ msec. and 48 ± 14 msec. in patient with atrial fibrillation, $p < 0.05$. The subjects in this study however were chronic hypertensive and there were no normotensive subjects for comparison. By using this p – wave dispersion value of > 36 msec. (6), we found in our study that 55.3% in hypertensive and 48.7% in control group had P – wave dispersion of > 36 msec, $p < 0.05$. Therefore our study findings suggest that newly diagnosed hypertensive are at risk of developing atrial fibrillation.

Increased QT dispersion is one of the electrocardiographic measures of ventricular repolarization, and also risk markers for ventricular tachyarrhythmias. QT dispersion was significantly increased in hypertensive group in our study population, 60 msec. (10 – 140). Similar findings by Mayet J (11) who looked at 100 previously untreated hypertensive subjects in which the mean QTd was 64 ± 2 msec. By using 48.2 msec. (as in Mayet study) (13) as reference value, we found that 53.6% subjects in the hypertensive and 41.5 % subjects in the control groups had prolonged QT

dispersion, $p > 0.05$. Therefore prolonged QTd had no significant relation.

Conclusion and Recommendation :

P dispersion was significantly more prolonged in newly diagnosed hypertensive group. QT dispersion was more prolonged in newly diagnosed hypertensive group but not statistically significant.

Mass and multicenter study must be done in Hadhramout population wise rather than clinic wise .

Acknowledgments :

My praise to Allah sabhan wa talla for giving us the strength, patient and ability to complete this study.

We would thanks to our patient who agree to be recruited in our study, and the group of study.

References :

1. MacMahon S, Peto R, Cutler *J et al.* Blood pressure, stroke, and coronary heart disease. Part I, Prolong differences in blood pressure. Prospective observational studies corrected for the regression delution bias. *Lancet* 1990;765
2. Vasan RS, Massaro JM, Wilson PW *et al.* Antecedent blood pressure and risk of cardiovascular disease: the Framingham heart study. *Circulation* 2002;105:48.
3. Black ER. Treatment and control hypertension as preventive therapy. Primary Care. *Clinics in Office Practice* 16(1):49-62.
4. Lazutin VK, Nyachkhina TN, Litvinesve *et al* (Clinical significance of arrhythmias in patients with hypertension)(Russia). *Kardiologica* 1991;21(4):71-4.
5. Wolf PA, Abbott R, Kannel W. Atrial Fibrillation as an independent risk factors for stroke: the Framingham Study. *Stroke* 1991;22:983-88.
6. Ciaroni S Cuenoad I, Bloch A. clinical Study to investigate the Predictive Parameters for the onsent of atria Fibrillation in patients with Essential Hypertension *Am Heart J* 2000;139(5):814-819
7. SN Chugh. *Textbook of Clinical Electrocardiography*, Jaypee Brothers. New Delhi: 2006
8. Higham PD, Campbell RWF. QT dispersion. *BrHeart J.* 1994;71;508-510
9. Cowan JC, yusof K, Noore M et al. Importance of lead selection in QT measurement. *Am J Cardiol* 1988;61:83-87.
10. Saedah A, Evans S, James M *et al.* QTc dispersion and complex arrhythmias in untreated newly presented hypertensive patients. *Journal of Human hypertension* 1999;13 (10):665-9

11. Muda MN, Ng TC. Briding The Gap ECHO IJN, Department of Cardiology Institut Jantung Negara. July 2004
12. Mayet J, Shahi M, McGrath K et al. Left Ventricular Hypertrrophy QT Dispersion in Hypertension. Hypertension 1996;28(5):791-6.
13. Kahar AB, Yusoff K. Dispersion of QT interval and heart rate variability in newly diagnosed hypertensive. Masters of internal medicine dissertation 1998 (UKM).

Figures :

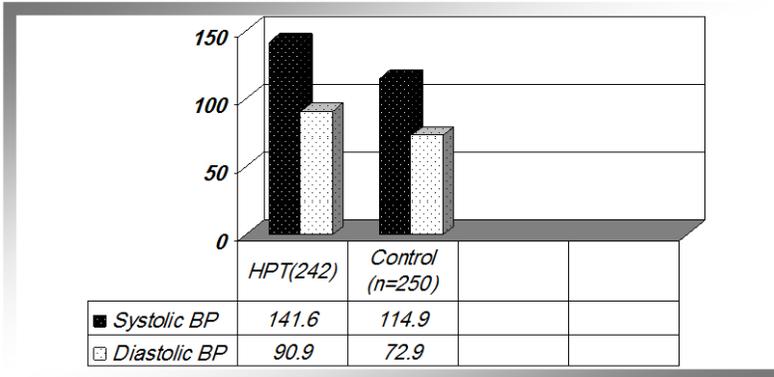


Fig.(1) comparison between newly diagnosed hypertension (NDHPT) & control group regarding systolic & diastolic blood pressure

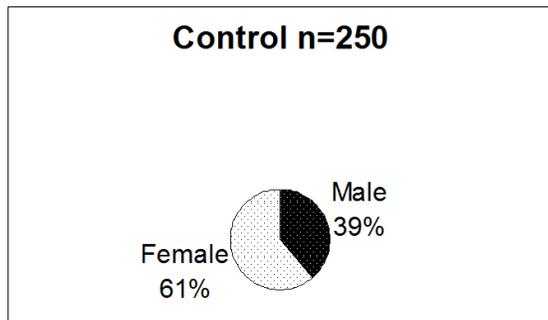


Fig.2(a) sex in control group

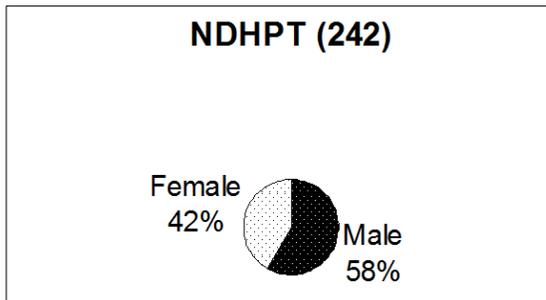


Fig. 2(b) sex in newly diagnosed hypertension (NDH)

Tables :

Table (1) Correlation between blood pressure and other parameters

Parameters		NDH	control	P value
Age		43.1 ± 5.6	42 ± 5.6	0.037
Systolic BP (mmHg)		141.6 ± 16.3	114.9 ± 11.3	< 0.001
Diastolic BP (mmHg)		90.9 ± 9.6	72.9 ± 7.6	<0.001
No of subjects	male	141 (58.3%)	97 (38.8%)	< 0.001
	female	101 (41.7%)	153 (61.2%)	

Table 2: Correlation between BP and age

Parameters	Correlation. r	P- value
Age (year)	0.045	0.169
SBP (mmHg)	0.166	0.008
DBP (mmHg)	0.117	0.007

Table 3: Correlation between P wave and QT dispersion

	HPT (n = 225)	CONTROL (n= 241)	P value
P dispersion (msec.)	40 (10- 80)	30 (10 – 60)	0.044
dispersion >36 msec. (%)	55.3 %	48.7%	0.045
QT dispersion (msec.)	60 (10- 140)	40 (10- 80)	0.013
QTd >48.2 msec.(%)	53.6%	41.5%	0.193