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Cardiac arrhythmias in IHD as detected by Holter monitoring

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Key word : diabetes mellitus, ischemic heart disease, cardiac arrhythmia .Holter monitoring, myocardial infarction, chronic stable angina, atria fibrillation, ventricular ectopic ,cardiomyopath, ECG, CAD

Abstract

A retrospectives study for selected 96 patients with chronic IHD (chronic stable angina and old MI) referred to Holter unit in AL-Hussein teaching hospital between 20th June 2014 to 20th March 2015 for 24 hour ECG monitoring for different symptoms and 102 healthy control individuals .The age ,sex and the findings of Holter monitoring of control individuals are recorded .The age ,sex, smoking history, referred symptoms and findings of Holter monitoring are recorded. ECG findings of Holter are classified according to specific criteria.

Results and discussion;

In this study , IHD are common in male sex in comparison to control individuals[55% to 47%] and most patient with IHD aged more than 40 and 45% of them above 60, this agree with fact that the prevalence of IHD is higher in men than that in women, this partly due to protective effect of estrogen , Older patients, particularly beyond 70 years of age, have a higher risk for coronary disease and higher risk for adverse outcomes. Sinus tachycardia seen in 51% of control group and 1% of IHD group,[p value less than 0.05] This is usually either catecholamine mediated in response to a physiologic state (e.g., exercise, anemia, hypotension, pain, fever, thyrotoxicosis) or pharmacologically induced by administration of exogenous stimulants or inhibitors of vagal tone (e.g., β-agonists, catecholamines, theophylline, cocaine, caffeine, atropine. Non-sustained AF is seen in34 patients [33%] of IHD and only in 6 [5%] of control group so there is significant correlation between IHD and AF [p value less than 0.05], some author describe that IHD is most common cause of atrial fibrillation (2) , mechanism behind that ventricular ischemia cause increased intra-atrial pressure and cause AF or less commonly due to atrial ischemia causing AF

In this study: total PVC are significantly related to IHD [50 patient 53%] while it present in 18 individuals of control group [17%] and the frequent PVC are seen commonly in IHD than control group [26 patients (27%) to 10

individuals (9%).[p value less than 0.05 In the absence of underlying cardiac disease, VPCs are probably of no prognostic importance. In the presence of cardiac disease, especially ischemic cardiac disease, VPCs predict an increased risk of cardiac death.[12]. However, no study has documented that elimination of VPCs with antiarrhythmic drug therapy reduces the risk of arrhythmic death in patients with severe structural heart disease. In fact, drug therapies that slow myocardial conduction and/or enhance dispersion of refractoriness can actually increase the risk of life-threatening arrhythmias (drug-induced QT prolongation and TDP) despite being effective at eliminating VPCs .Ventricular tachycardia [VT] are closely related to IHD [4 patients (4%)] to non of control group [p value less than 0.05]. In some patients who have non sustained VTs initially, sustained episodes or ventricular fibrillation later develop(s). More than 50% of patients treated for symptomatic recurrent VT have ischemic heart disease. The next largest group has cardiomyopathy ,with lesser percentages divided among those with primary electrical disease, such as inherited ion channel abnormalities , mitral valve prolapse, valvular heart disease, congenital heart disease, and miscellaneous causes. Most patients with IHD in this study have old MI [64 (66%)] and 32 are have chronic stable angina [33%]. Non-sustained AF , PVC and non-sustained VT are frequently seen in those with old MI [25%,34% and 4% respectively] than with stable angina [10%,19% and 0% respectively]P value less than 0.05,patient with a history of previous MI at high risk of sudden arrhythmic due to a combination of scar-related arrhythmia and ischemia. Patients at greatest risk are those with poor left ventricular function.[2] .AF increasing as age advance as seen in table 4 [19% for those 60 and above and 16% for those less than 60 with p value 0.05]Atrial fibrillation is a common arrhythmia that is found in 1 percent of persons older than 60 years to more than 5 percent of patients older than 69 years]Atrial arrhythmia are common seen in female with IHD[PAC 3% and AF in 22%] while ventricular arrhythmia are common seen in male sex[PVC in 34% and VT in 4%] Estimates are that 2.2 million Americans have atrial fibrillation, which occurs more commonly in men than in women. The prevalence of premature V complexes increases with age; they are associated with male gender and a reduced serum potassium concentration. PVCs are more frequent in the morning in patients after myocardial infarction, but this circadian variation is absent in patients with severe LV dysfunction]

Introduction

Ischemic heart disease (IHD) is a disease in which there is an inadequate supply of blood to a portion of the myocardium. it typically occurs when there is an imbalance between myocardial oxygen supply and demand. The most common cause of myocardial ischemia is atherosclerosis of one coronary artery or more sufficient to cause a regional

reduction in myocardial blood flow.[1]IHD is the most common form of heart disease and the single most important cause of premature death in Europe , north and south America ,Australia and new Zealand by 2020It is estimated that it will be the major cause of death in all region of the world. In UK 1 in3 men and 1 in 4 women die from CAD, an estimated 330,000 people have a myocardial infarct and approximately 1.3 million have angina .IHD can be present in different clinical manifestation

1- Stable angina which caused by fixed atheromatous stenosis of one or more coronary arteries.

2- 2-Unstable angina which caused by dynamic obstruction of a coronary artery due to plaque rupture or erosion with superimposed thrombosis.

3- -Myocardial infarction is a myocardial necrosis caused by acute occlusion of a coronary artery due to plaque rupture or erosion with superimposed thrombosis.

4- Heart failure is a myocardial dysfunction due to infarction or ischemia.

5- Arrhythemia is caused by altered conduction due to ischemia or infarction.

6- Sudden death which caused by ventricular arrhythmia, a systole or massive myocardial infarction.(2}

.A cardiac arrhythmia is a disturbance of the electrical rhythm of the heart. Arrhythmias are often a manifestation of structural heart disease but may also occur in the context of an otherwise normal heart. Arrhythmias can cause palpitation, dizziness, syncope, chest discomfort or breathlessness, and can trigger heart failure or even sudden death. Some arrhythmias occur in patients with apparently normal hearts, and in others arrhythmias originate from scar tissue as a result of underlying structural heart disease. When myocardial function is poor, arrhythmias tend to be more symptomatic and are potentially life-threatening[3]

IHD and arrhythmias :Owing to limited energy expenditure, conduction tissue is more resistant to ischemia than is contractile tissue. Nonetheless, the conduction system of the heart is susceptible to ischemic injury. Ischemia results in altered ionic transport, altered autonomic tone, and structural injury to the conduction system, resulting in a variety of ischemia-induced arrhythmias and conduction abnormalities.(1)Frequent V. ectopic often occur during acute MI but need no treatment. persistent, frequent (over10/hour) VEBs in patient who survived the acute phase of MI indicate a poor long term prognosis..[2] VT can occur in several forms: short, asymptomatic, non sustained episodes; sustained, hemodynamically stable events, generally occurring at slower rates or in otherwise normal hearts; or unstable

runs, often degenerating into ventricular fibrillation .In some patients who have non sustained VTs initially, sustained episodes or ventricular fibrillation later develop(s).More than 50% of patients treated for symptomatic recurrent VT have ischemic heart disease. The next largest group has cardiomyopathy (both congestive and hypertrophic), with lesser percentages divided among those with primary electrical disease, such as inherited ion channel abnormalities, mitral valve prolapsed , valvular heart disease, congenital heart disease, and miscellaneous causes. LV hypertrophy can lead to ventricular arrhythmia[4]

AF is the most common sustained arrhythmia. It is marked by disorganized, rapid, and irregular atrial activation. The ventricular response to the rapid atrial activation is also irregular. In the untreated patient, the ventricular rate also tends to be rapid and is entirely dependent on the conduction properties of the AV junction. Although typically the rate will vary between 120 and 160 beats/min, in some patients it can be >200 beats/min. In other patients, because of heightened vagal tone or intrinsic AV nodal conduction properties, the ventricular response is <100 beats/min and occasionally even profoundly slow.(1AF is associated with significant morbidity and mortality. The annual incidence of ischemic stroke in patients with AF is 5%, which is two to seven times higher than the incidence in the general population. In addition, the mortality in patients with AF is approximately twice that of patients without AF. AF frequently leads to reduced functional capacity, dyspnea, palpitations, fatigue, tachycardia-induced cardiomyopathy, heart failure, and angina, significantly impairing quality of life.(5)

Aim of study

1-To evaluate the frequency and the type of cardiac arrhythmia in patients with IHD in comparison to healthy control individuals.

2-to study of all type of arrhythmia with many patient variable like age and sex

Patients and methods

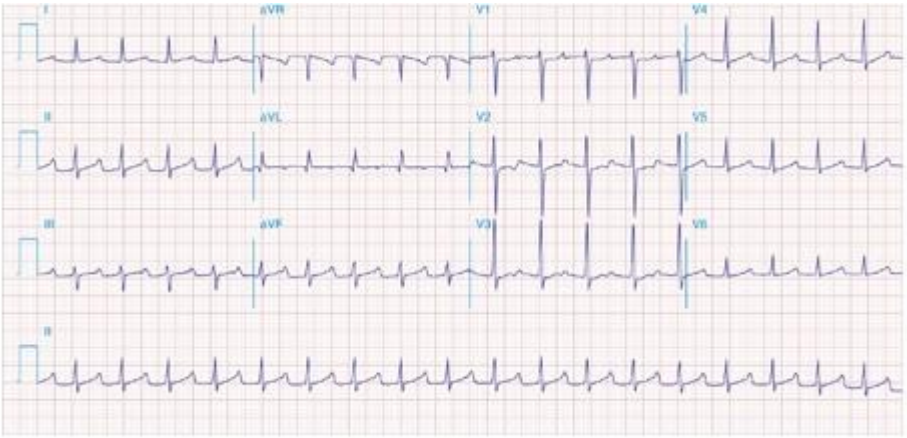
A retrospective study for a 96 patients with chronic IHD (chronic stable angina and old MI) referred to the Holter unit in the Al-Hussein Teaching Hospital between 20thof June 2014 to 20th of March 2015 for 24 hour ECG monitoring for different symptoms compared 102 healthy control.individuals.

All patients with chronic IHD [old MI and chronic stable angina] that refer to Holter excluded those admitted to hospital with acute coronary syndrome and those with any structural or functional cardiac disease [WPW,

valvular or congenital heart disease] The age ,sex and the findings of Holter monitoring of control individuals are recorded. The age ,sex, smoking history, referral symptoms and findings of Holter monitoring are recorded. The ECG findings of Holter were classified according to specific criteria

1-Sinus Tachycardia

Sinus tachycardia generally has a gradual onset and termination. The P-P interval can vary slightly from cycle to cycle, especially at slower rates. P waves have a normal contour.[4]



2-premature atrial complex

The diagnosis of premature atrial complexes (PACs)) is made on the ECG by the presence of a premature P wave with a PR interval of 120 milliseconds (except in Wolff-Parkinson-White [WPW]

syndrome,.

3-Atrial fibrillation

. Atrial fibrillation should be suspected when the ECG shows supraventricular complexes at an irregular rhythm and no obvious P waves.

4 –Premature Ventricular Complexes

A PVC is characterized by the premature occurrence of a QRS complex that is abnormal in shape and has a duration usually exceeding the dominant QRS complex, generally longer than 120 milliseconds. The T wave is usually large and opposite in direction to the major deflection of the QRS. The QRS complex is not preceded by a premature P wave but can be preceded by a non conducted sinus P wave occurring at its expected time.

5-Ventricular Tachycardia

The electrocardiographic diagnosis of VT is suggested by the occurrence of a series of three or more consecutive, abnormally shaped PVCs whose duration exceeds 120 milliseconds, with the ST-T vector pointing opposite the major QRS deflection. The R-R interval can be exceedingly regular or can vary[4].

Results

In IHD group; number of male is52 (55%) and number of female is 44 (45%) with ratio equal to 1.2:1 while in control group , number of male is 50 (47%) and number of female is 54(53%) with ratio equal to 1:1.1

blue=male :red =female left-IHD group, right-control group

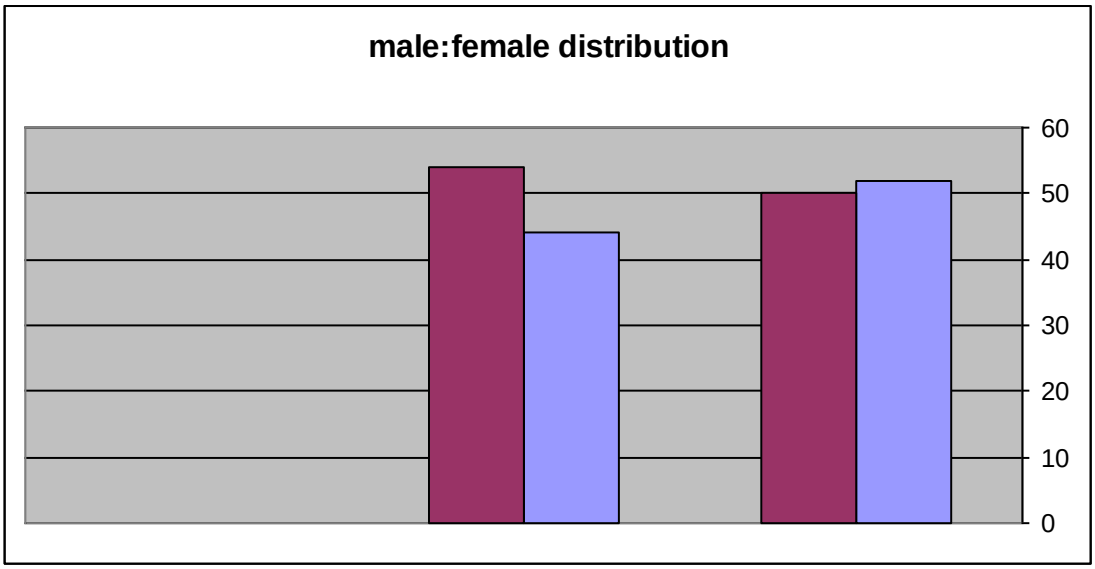


Fig.1:distribution of sex in IHD and control group.

p value > 0.05

table 1: Age distribution between control and IHD group P value < 0.1

Age-year	Control	IHD
Less than20	12	2
20-39	60	2
40-59	30	50
60 or more	2	44

In this study: most patients with IHD [45%] aged 60 and above while most of control [60 (59%)] are in range 20-39 years

In this study: in control group; sinus tachycardia seen in 56 , atrial premature complex in 26 and atrial fibrillation [non-sustained] in 6 individuals while in IHD group ;sinus tachycardia in 2 only, atria premature complex in 6 and non-sustained atrial fibrillation in 34 patients

Table:2 Supra ventricular cardiac arrhythmias in IHD group and Control

p value < 0.05

Arrhythmia type	Control group	IHD group	otal
Sinus tachycardia	56	2	58
atrial ectopic	26	6	32
Non-sustained AF	6	34	40

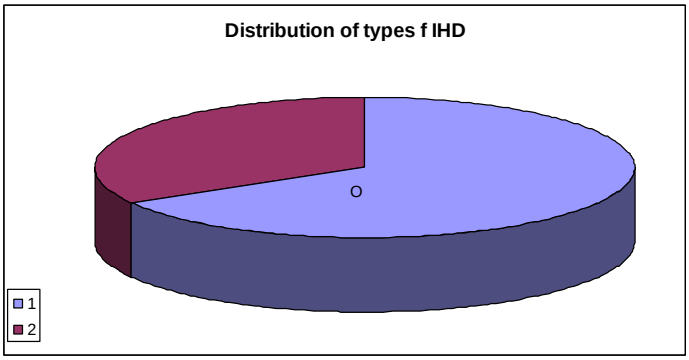
In this study: in IHD group , total ventricular premature complex is 50 patient [few v. complex is 24 while the frequent is 26] and non-sustained ventricular tachycardia is 4 while in control group ;total number of V . premature complex is18 [the few is 8 while the frequent is 10] and no one with non-sustained Ventricular tachycardia .

Table 3: ventricular arrhythmia in IHD group and control group

Cardiac arrhythmia	IHD group	Control group	total
Total V.ectopic	50	18	68
Few v. ectopic	24	8	
Frequent v.ectopic	26	10	
Non-sustained V.tachycardia	4	0	4

P value < 0.05

In this study; number of patients in IHD group with old MI 64 [66.6%] while those with chronic stable angina is 32[33.3%]



=\old MI: 2-chronic stable angina

Fig.2: distribution of old MI and stable angina in IHD group

In IHD group; non-sustained atrial fibrillation seen more with old MI [24] than with stable angina [10], total ventricular premature complex more in old MI [32] than stable angina [18] and non- sustained ventricular tachycardia in[4] with old and non-instable angina as seen below.

Table 4: distribution of cardiac arrhythmias and type of IHD[P value less than 0.05]

	Old MI	Stable angina
Sinus tachycardia	0	2
	24	10
Atrial premature complex	4	2
Ventricular premature complex	32	18
Non-sustained VT	4	0

In IHD group; atrial fibrillation [non-sustained] seen more in those 60 years and old [18] while seen in [16] of those with less than 60.

Table 5;type of arrhythmias in IHD and age distributionP value < 0.05 Q square=49.6

age	VT	Non VT	total	age	AF	Non AF	total
<60	2	50	52	< 60	16	36	52
>=60	2	42	42	>=60	18	26	44

Ventricular premature complex seen more in those younger than 60 [30 patients] and[20] in stable angina while the same frequency of non-sustained VT as seen below

In IHD group; non-sustained AF is seen in [22] females while seen only [12] males

،ventricular ectopic seen more in males [34] and less in female [18] and non-sustained VT only seen in male [4] as seen below

Table 6: distribution of cardiac arrhythmia in IHD group according to sex

P value < 0.05

sex	PVC	Non sustained AF	Non-sustained VT
male	34	12	4
female	18	22	0

Discussion

In this study , IHD are common in male sex in comparison to control individuals[55% to 47%] and most patient with IHD aged more than 40 and 45% of them above 60, this agree with fact that the prevalence of IHD is higher in men than that in women, this partly due to protective effect of estrogen , women with suspected ACS less often have epicardial coronary artery disease than do men with similar clinical presentations; such disease, when present, tends to be less severe.(6).In this study 44 patients with IHD are above 60 while no one with control group p value less than0.05. Older patients, particularly beyond 70 years of age, have a higher risk for coronary disease and higher risk for adverse outcomes.(7]

Sinus tachycardia seen in 51% of control group and only 1% of IHD group,[p value less than 0.05] This is usually either catecholamine mediated in response to a physiologic state (e.g., exercise, anemia, hypotension, pain, fever, thyrotoxicosis) or pharmacologically induced by administration of exogenous stimulants or inhibitors of vagal tone (e.g., β-agonists, catecholamines, theophylline, cocaine, caffeine, atropine)(8]

Chronic inappropriate sinus tachycardia (also known as the syndrome of inappropriate sinus tachycardia) has been described in otherwise healthy persons, possibly secondary to increased automaticity of the sinus node or an automatic atrial focus located near the sinus node Inappropriate Sinus Tachycardia.

An infrequent but troublesome problem, inappropriate sinus tachycardia (IST) appears to be a true syndrome with cardiac, neurologic, and psychiatric components. It affects women more often than men. Structural heart disease is generally absent. In one series of 475 patients, IST was the indication for catheter ablation in 2.3%[11]

In patients with structural heart disease, sinus tachycardia can result in reduced cardiac output or angina or can precipitate another arrhythmia, in part related to the abbreviated ventricular filling time and compromised coronary blood flow

Non-sustained AF is seen in34 patients [33%] of IHD and only in 6 [5%] of control group so there is significant correlation between IHD and AF [p value less than 0.05], some author describe that IHD is most common cause of atrial fibrillation (2) , mechanism behind that ventricular ischemia cause increased intra-atrial pressure and cause AF or less commonly due to atrial ischemia causing AF(4]

In this study: total PVC are significantly related to IHD [50 patient 53%] while it present in 18 individuals of control group [17%] and the frequent PVC are seen commonly in IHD than control group [26 patients (27%) to 10 individuals (9%).[p value less than 0.05 PVCs occur in patients with and without structural heart disease. Holter monitoring)

reveals at least one PVC in 40 to 75% and complex ventricular ectopic in 5 to 10% of normal adults. PVCs occur with greater frequency and complexity in patients with structural heart disease especially IHD and valvular heart disease and idiopathic cardiomyopathy[9]

In the absence of underlying cardiac disease, VPCs are probably of no prognostic importance. In the presence of cardiac disease, especially ischemic cardiac disease, VPCs predict an increased risk of cardiac death.[12]. However, no study has documented that elimination of VPCs with antiarrhythmic drug therapy reduces the risk of arrhythmic death in patients with severe structural heart disease. In fact, drug therapies that slow myocardial conduction and/or enhance dispersion of refractoriness can actually increase the risk of life-threatening arrhythmias (drug-induced QT prolongation and TDP) despite being effective at eliminating PVC [1]

Ventricular tachycardia [VT] are closely related to IHD [4 patients (4%)] to non of control group [p value less than 0.05

In some patients who have non sustained VTs initially, sustained episodes or ventricular fibrillation later develop(s). More than 50% of patients treated for symptomatic recurrent VT have ischemic heart disease. The next largest group has cardiomyopathy ,with lesser percentages divided among those with primary electrical disease, such as inherited ion channel abnormalities , mitral valve prolapse, valvular heart disease, congenital heart disease, and miscellaneous causes.[10]

Most patients with IHD in this study have old MI [64 (66%)] and 32 are have chronic stable angina [33%] .[Non-sustained AF and PVC and non-sustained VT are frequently seen in those with old MI [25%,34% and 4% respectively] than with stable angina [10%,19% and 0% respectively]

P value less than 0.05,patient with a history of previous MI at high risk of sudden arrhythmic due to a combination of scar-related arrhythmia and ischaemia. Patients at greatest risk are those with poor left ventricular function.[2]

AF increasing as the age advance [19% for those 60 years and old and 16% for those less than 60][p value less than 0.05]significant difference of cardiac arrhythmia regarding the

Atrial fibrillation is a common arrhythmia that is found in 1 percent of persons older than 60 years to more than 5 percent of patients older than 69 years , Ventricular ectopy is exceedingly rare in infants but increases in frequency with age [3]

Atrial arrhythmia are common seen in female with IHD[PAC 3% and AF in 22%] while ventricular arrhythmia are common seen in male sex[PVC in 34% and VT in 4%]

Estimates are that 2.2 million Americans have atrial fibrillation, which occurs more commonly in men than in women. The

prevalence of premature V complexes increases with age; they are associated with male gender and a reduced serum potassium concentration. PVCs are more frequent in the morning in patients after myocardial infarction, but this circadian variation is absent in patients with severe LV dysfunction.[4]

CONCLUSION

1- cardiac arrhythmias are more common in patients with IHD than general population.

2- non sutianed AF is most common tachyarrhythmia in patients with IHD and this taken in part risk of converted to persistent or permanent and risk of thrombo-embolism when treat it .

3- ventricular arrhythmias are more common in IHD and carry poor prognosis.

4- old patient with old MI more likely arrhythmia than patient with chronic stable angina

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ملخص

عدم انتظام ضربات القلب عند مرضى قصور الشرايين التاجية الكشف عنها بواسطة رصد الهولتر

بحث الدكتور عباس فاضل كلية الطب

دراسة لاختيار ٩٦ مريضا يعاني من امراض شرايين القلب (الذبحة الصدرية المستقرة المزمنة واحتشاء عضلة القلب القديم) المحالين الى وحدة الهولتر في مستشفى الحسين التعليمي بين ٢٠ يونيو ٢٠١٤ إلى ٢٠ مارس ٢٠١٥ لمراقبة تخطيط القلب ٢٤ ساعة لأعراض مختلفة و ١٠٢ لا أفراد اصحاء. يتم تسجيل العمر والجنس ونتائج رصد الهولتر للمرضى المصابين، يتم تسجيل العمر والجنس ونتائج رصد الهولتر للأصحاء. يتم تصنيف النتائج ECG من الهولتر وفقا لمعايير محددة

النتائج والمناقشة:

في هذه الدراسة، امراض شرايين القلب شائعة في جنس الذكور مقارنة بالأصحاء [٥٥٪ إلى ٤٧٪] ومعظم مرضى شرايين القلب أعمارهم أكثر من ٤٠ و ٤٥٪ منهم فوق ٦٠سنة، وهذا يتفق مع حقيقة أن انتشار امراض القب التاجية أعلى في الرجال عنه في النساء و يرجع ذلك جزئيا إلى تأثير وقائي من الاستروجين.

المرضى من كبار السن، وخاصة ما بعد ٧٠ سنة من العمر، لديهم مخاطر الإصابة بأمراض الشريان التاجي، . التسارع الجيبي الطبيعي شوهدت في ٥١٪ من الاصحاء و ١٪ فقط من مرضى شرايين القلب، [ص قيمة أقل من

٠.٠٥] هذا هو عادة بسبب الكاتيكولامين يزداد عند الاستجابة إلى حالة الفسيولوجية (على سبيل المثال، ممارسة الرياضة، وفقر الدم، انخفاض ضغط الدم، والألم، والحمى، والانسمام الدرقي) أو التي يسببها دواء من مثبطات لهجة العصب الحائر (على سبيل المثال، β-منبهات، الكاتيكولامينات، الثيوفيلين، الكوكايين، والكافيين، الأتروبين) (٨)

الارتجاف الاذيني الغير مستدام شوهد في ٣٤ مريض من مرضا الشرايين القلبية {٣٣%} وفقط في ٦ من الاشخاص الاصحاء {٥%}.يتضح من ذلك وجود علاقة ذات قيمة بين الاصابة بأمراض الشرايين التاجية وحدوث الارتجاف الاذيني ،وبعض الباحثين يعد تلك الامراض سبب رئيسي لارتجاف الاذيني .

في هاذه الدراسة يظهر ان وجود الضربات البطينية الهاجرة متعلق بوجود الاصابة بأمراض الشرايين التاجية {٥٣% مقارنة ب ١٧%عند الاصحاء}

شوهد التسارع البطيني في {٤%}من المرضى المصابين بأمراض الشرايين التاجية بينما لم يلاحظ اي حالة عند الاصحاء يثبت ذللك وجود علاقة قيمة بين التسارع البطيني وضربات البطينية الهاجرة وامراض شرايين القلب التاجية .

في هاذه الدراسة ثلثان من المرضى يعانون من احتشاء عضلة القلب القديم بينما يعاني الثلث الاخير من ذبحة صدري مزمنة ومستقرة .

حالات الارتجاف الاذيني والتسارع البطيني وضربات البطينية الهاجرة تكثر عند المرضى المصابين باحتشاء العضلة القلبية القديم {٢٥%،٤٣%،٤%} من مرضى الذبحة الصدرية المستقرة {١٠%،١٩%،٥%} وذلك بسب عملان هما

١-وجود تليف في عضلة القلب

٢- قلة وصول الدم لعضلة القلب

الارتجاف الاذيني يزداد حصوله مع زيادة العمر {١٩% عند الاعمار ٦٠ فمأفوف و ١٦ عند الاعمار دون الستين سنة } وهاذا يتماشى مع النتائج السابقة ؟

في هاذه الدراسة لوحظ ان عدم انتظام ضربات القلب الاذينية النشاء اكثر عند النساء منه عند الرجال عند مرضا شرايين القلب التاجية مثال ارتجاف الاذيني اكثر في النساء منه الى الرجال .