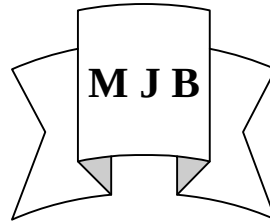


Atrial Fibrillation in Acute Myocardial Infarction

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Abstract

The aim of this study is to assess the incidence and prognosis of atrial fibrillation (AF) during the first 72 hours among six hundred patients admitted to coronary care unit with acute myocardial infarction (AMI) in Diwaniyah Teaching Hospital from April 2004 to May 2006 ; and to determine the characteristics of the myocardial infarction – induced AF .

Full history and physical examination was taken and patients were followed in the coronary care unit (CCU) by monitoring and ECG facilities during the first 72 hours of onset . Atrial fibrillation was found in 96 patients (16%) , 32 females and 64 males.

AF occurred in the first 24 hours in 56 patients (58%) , recurrent in 24 patients (25%) and was transient (lasted less than 24 hours) in 80 patients (83%). Compared with patients without AF , those with this arrhythmia were older , had a higher frequency of heart failure (75% vs.50%) particularly in anterior myocardial infarction (94% vs. 54%) and of pericarditis (25% vs. 7%) and had a higher CCU mortality (38% vs. 15%) .

As opposed to death rates close to (44%) among patients with anterior infarction , the presence of AF did not affect the mortality among patients with inferior infarction (17%).

Absence of heart failure , persistent arrhythmia (longer than 24 hours) , ventricular rate (higher than 120 beats per minute) and recurrence of arrhythmia were not associated with increased mortality , while late onset AF after 48 hours were associated with higher mortality.

It is concluded that AF is not an uncommon arrhythmia after myocardial infarction and that its occurrence should signify a more guarded prognosis.

الخلاصة :

هدف هذا البحث هو لتقييم نسبة حدوث والتكهنات حول ارتجاج الأذنين خلال 72 ساعة الأولى لـ (600) مريض قد تم إدخالهم الى وحدة العناية المر كزه لمستشفى الديوانية التعليمي وذلك لأصابتهم بأحشاء العضلة القلبية الحاد للفترة لشهر نيسان 2004 ولغاية شهر نيسان 2006 ولدراسة خواص أحشاء العضلة القلبية الذي يؤدي الى حدوث ارتجاج الأذنين .

التاريخ المرضي والفحص السريري تم أجراه لكل مريض في وحدة العناية الطبية المركزة مع تخطيط القلب المستمر خلال 72 الساعة الأولى . ارتجاج الأذنين وجد في 96 مريض (16%) 32 (إناث) و64 (ذكور) ارتجاج الأذنين حدث خلال 24 ساعة الأولى 56 مريض (58%) ومتكرر في 24 مريض (25%) وعابر (أقل من 24 ساعة) في 80 مريض (83%) مقارنة مع المرضى بدون ارتجاج الأذنين مع عدم اتساق النبض كانوا أكبر سناً ولديهم نسبة عجز أعلى (75% مقارنة 50%) خصوصاً بأحشاء الجدار الأمامي للعضلة القلبية (94% مقارنة 54%) ومع التهاب شغاف القلب (25% مقارنة 7%) وكان لهم نسبة الوفيات في وحدة إنعاش القلب أعلى (38% مقارنة 15%) مقارنة لنسبة الوفيات قريباً 44% بين مرضى احتشاء الجدار الأمامي للقلب وجود ارتجاج الأذنين لم يؤثر على الوفيات بين مرضى احتشاء الجدار السفلي (17%) غياب عجز القلب وعدم اتساق النبض المستمر (أكثر من 24 ساعة) معدل سرعة البطينين (أعلى من 120 ضربة في الدقيقة) مع تكرار عدم اتساق النبض لم تكن تزامن نسبة زيادة الوفيات بينما حدوث ارتجاج الأذنين بعد 48 ساعة كان مرافقاً لزيادة الوفيات .

يستنتج من ذلك أن ارتجاج الأذنين لم تكن غير شائعة بعد احتشاء العضلة القلبية وحدثها يدل على تكهن متسم بالحذر .

Introduction

AF is the most common sustained cardiac arrhythmia, with an overall prevalence of 0.5% in the adult

population, rising to 10% or more in those over 75 years. In this arrhythmia the atria beat rapidly, chaotically and ineffectively; the ventricles respond at irregular intervals giving the characteristic irregularly irregular

pulse. The ECG shows normal but irregular QRS complexes; there are no P waves but the base line may show irregular fibrillation waves. The onset of AF can cause palpitation and may precipitate or aggravate cardiac failure in patients with abnormal heart.

Continuous ECG monitoring in acute myocardial infarction (AMI) has provided considerable information on the incidence of arrhythmias in this condition ¹. AF is the most common atrial dysarrhythmia complicating myocardial infarction ^{2,3}. Although the role of ventricular arrhythmias associated with AMI is well appreciated ², controversy continues regarding the prognostic significance of AF. Some investigators found no increase in mortality related to the presence of AF ^{4,7}, while other studies showed a greater overall early mortality rate in patients with anterior myocardial infarction ^{8,9}.

In AMI atrial fibrillation frequently transient and may not require treatment. However, if the arrhythmia causes a rapid ventricular rate with severe hypotension or circulatory collapse, cardioversion by means of an immediate synchronized DC shock should be considered. AF is often a feature of impending or overt left ventricular failure, and therapy may be ineffective if heart failure is not recognized and treated appropriately. AMI often develops at rest or with normal activity. In many cases, it is the patient's first clinical manifestation of coronary heart disease. Large databases have demonstrated a diurnal pattern of onset, with peak occurrence about 6 a.m. Clinical experience holds and evidence supports that vigorous physical exertion, especially in an otherwise sedentary individual, can contribute to triggering of AMI, as can emotional stresses such as anger.

Patients and Methods:

From April 2004 to May 2006 six hundred patients with AMI were admitted consecutively to CCU at Diawaniya Teaching Hospital. The diagnosis of AMI was based on the presence of at least two of the following three criteria ¹⁰⁻¹⁴.

- 1- Clinical history of chest pain, typically AMI results in severe chest pain lasting more than 30 minutes and unrelieved by sublingual nitroglycerin.
- 2- ECG criteria of AMI or evolving infarction, the earliest ECG change is usually ST elevation, later on there is diminution in the size of the R wave, and in transmural (full thickness) infarction a Q wave begins to develop.
- 3- AMI causes a detectable rise in the plasma concentration of enzymes and proteins that are normally concentrated within cardiac cells, the most widely used enzyme in detection of MI is creatine kinase (CK), a more sensitive and cardiac specific isoform of this enzyme (CK-MB), and the cardiac specific proteins troponins T and I (which were not available in our hospital), other enzymes are Aspartate aminotransferase (AST) and lactate dehydrogenase (LDH) ¹⁴.

Anterior infarction was defined by the presence of ECG changes in leads I, AVL, V₁-V₆ on the standard 12 lead ECG. Inferior infarction was defined by changes in lead II, III, AVF, true posterior infarction defined by R/S in lead V₁ greater than 1.0 was included with inferior myocardial infarction. Combined referring to involvement of inferior plus anterior, lateral or septal wall ¹². All patients were admitted within 24 hours of symptoms onset; the mean arrival time being six hours thirty minutes. Twelve lead ECG were recorded daily or whenever the patients had a new event or chest pain, in addition to continuous ECG monitoring for at least 72 hours and for 24 hours after the arrhythmia has stopped. A diagnosis of AF was made

on the bases of a 12 lead ECG, by the absence of P wave and a variable degree of baseline fibrillary activity with the R-R intervals showing no ordered pattern¹⁵, A clinical diagnosis of heart failure was established according to Framingham's criteria with at least one major and two minor criteria. The major criteria include (paroxysmal nocturnal dyspnea, neck vein distention, rales, cardiomegaly, acute pulmonary edema, S₃ gallop, increased venous pressure, positive heptojuglar reflux). The minor criteria include (lower extremity edema, night cough, dyspnea on exertion, hepatomegaly, pleural effusion, vital capacity reduced by one third from normal, tachycardia)¹⁶. Pericarditis was defined by the detection of a pericardial friction rub during hospitalization¹².

Patients who had AF on admission were included in this study but those known to have chronic AF were excluded as well as patients in whom AF was induced by DC shock for treatment of arrhythmias.

Statistical analysis was done using X² test with Yate's continuity correction to test the presence of association. Z test for the difference between two proportions was also used. Relative risk and confidence limit interval was calculated¹⁷.

Results

A six hundred patients with AMI were included, their ages ranged between (33-85) years with a mean of (58.7±9.8) years. Four hundred twenty two patients were male and 178 were females the male to female ratio was 2.8: 1. AF was recorded in 96 patients (16%), their ages ranged between (48-70) years with a mean of (60.8±6.3) years 64 of them were male and 32 of them were females making a male to female of 2:1. Table 1 shows that patients with an age of ≥ 60 years had a significantly 2.4 times risk of having AF than the younger ones (p < 0.05)

In 56 cases (58%) AF was either present on admission or began within 24 hours of the estimated time of infarct and 74 (77%) within 48 hours. Ten cases of AF occurred on the 3rd and 4th day after infarction. The cases lasted less than 24 hours were 80 (83%), out of them 56 (58%) lasted less than six hours. 16 cases had persistent AF (i.e. > 24 hours). 61 patients (63%) had AF with a ventricular rate more than 120/min, 24 with a rate of 80-120/min and 12 with a rate less than 80/min. In 24 cases (25%) recurrent episodes of AF were recorded, twenty developed a second episode of AF within the first 24 hours. As shown in Table 2, there was no significant difference in the frequency of AF in relation to the location of AMI. Heart failure was more common among patients with AF than in remainder (75% vs. 50%), (p < 0.025). Heart failure was noted in almost all patients (94%) with anterior myocardial infarction and AF, as compared with those without AF, the difference is highly significant (p < 0.005) while in those with inferior infarction and AF heart failure was less frequent (33%) an incidence comparable to those without AF. There was a significantly increased frequency of AF in patients with pericarditis compared to those without pericarditis (25% vs. 7%), (p < 0.005), Table 2 also demonstrates that the CCU mortality in patients with AF was significantly higher than those without AF (38% vs. 15%), (p < 0.01).

Relating the mortality rate to the location of infarction, we found that AF significantly increases the mortality rate in patients with anterior myocardial infarction (44% vs. 16%), (p < 0.025) while on the contrary AF did not affect the mortality in patients with inferior myocardial infarction. Table 3 shows that AF in the presence of heart failure carried a significantly higher risk of death when compared to the patients with heart failure

but without AF ($p < 0.025$), on the other hand AF did not significantly affect mortality in patients without heart failure .

Table 4: demonstrates the mortalities according to certain characteristics of the AF . It is obvious that the patients with late onset AF (> 48 hours) are significantly 3 times ($p < 0.01$) more liable to die than those with early onset AF . Although the patients with persistent AF (more than 24 hours) had a risk of death of 2.5 times , however, it is not significant statistically ($p < 0.05$). Ventricular rate more than 120/min, and recurrence of the arrhythmia did not affect the mortality .

Discussion

The incidence of AF of 16% in the present series of 600 patients admitted with AMI corresponds to the upper range of other reported series (7 -20%)^(1-3,8,13, 18-22) . AF is more common with increasing age²³ . The present study reported a higher incidence of AF in the older age group, which is in accordance the results of previous studies.^{19,20, 22}

This is probably explained by the collagenous septa that develop in the atria with advancing age lead to no homogeneities in conduction and refractoriness which favor re-entry²³ . The time of onset of AF in relation to onset of infarction is difficult to assess because it is difficult to determine precisely when the infarction occurs. When both occur before the patient reaches the hospital, it is difficult to determine whether the AF may have present before the infarction , but yet, the transitory nature of the arrhythmia suggested that previously undiagnosed chronic AF was unlikely . In this study 58% of the episodes began during the first 24 hours from the onset of symptoms with decreasing frequency throughout the next hours of monitoring .

These result were similar to the results found by Klass and Haywood¹⁸ and also agreed with Antman and Braunwald results

⁹. the higher incidence of AF during the first 24 hours could be explained by the fact that during the process of cell death there will be an increase in the release of catecholamine with electrolytes disturbances especially hypokalemia and hypomagnesaemia; this process ceases with the maturation of infarction²⁴. Hod et al²¹ investigated the pathogenesis of AF in the early hours of an AMI in the population of patients who were admitted within three hours of the onset AMI. They suggested that acute left atrial ischemia is the path physiological mechanism of early AF. The majority of episodes (83%) of AF in our patients lasted less than 24 hours and usually less than six hours (58%), by this we concurred with Stannard¹ and Klass¹⁸ who reported that AF complicating AMI is usually transient. In this study , there was no

relation of AF to the site of infarction . Others^{1, 4, 13, 18} have also demonstrated an equal distribution between anterior and posterior infarcts associated with AF , Robert and Kelly²⁵ mentioned that atrial arrhythmias are more common with inferior infarction particularly with right ventricular involvement .

Others^{9, 26} stated that AF occurs more frequently following anterior than inferior infarcts. Our data and previously reported studies^{8, 10, 26} point to the fact that AF is in most cases a pump failure arrhythmia. Left ventricular failure appears to be an attractive mechanism of AF in anterior myocardial infarction , as almost all patients (94%) with anterior myocardial infarction and AF having left ventricular failure , which in turn results in acute left atrial hypertension and distention^{18, 26} . The increased atrial size would permit the coexistence many re-entrant circuits and is an important factor for the occurrence and maintenance of AF²³ . From this we postulate that AF is secondary to failure rather than its cause, and the grave

prognosis of these cases is due to the homodynamic derangement.

The present study , however was unable to determine the temporal association of AF with congestive heart failure , and whether or not AF preceded or followed the development of heart failure . The observation that the appearance of AF during inferior wall infarction did not affect the prognosis supports the assumption that another , more benign mechanism may be responsible for the development of the arrhythmia in some cases .

The association between AF and pericarditis following AMI has been noted previously^{2, 12, 27}. It is unclear whether pericarditis itself precipitates the arrhythmia or whether the associated large infarct size and chamber dilatation is responsible¹². In contrast to the generalized distribution of pericarditis of other etiologies, the pericarditis following infarction is typically localized to the site overlying infarction and thus unlikely to affect to affect the sinus or atrioventricular nodes¹².

The poorer prognosis of late onset AF (>48 hours) in the 25 cases reported in this study was attributed to other complications of myocardial infarction (shock and \or sever congestive heart failure) and the AF may have only been secondary to these insults.

We found that there was no correlation between the duration of AF and the prognosis ; a finding that differs from other previous reports^{1, 18} . The discrepancy noted between the relative risk (2.5) and the p value(> 0.05) in cases of persistent AF is due to a fewer number of patients involved .

Our data and previously reported studies^{1, 8, 18-20} showed that patients with AF tended to have a higher mortality . Both Stanard and Stomman¹, and Klass and Haywood¹⁸ indicated that AF is in itself a Benign complication of myocardial infarction and that its prognostic significance relates to the severity of concurrent complications. Cristal

et al⁸ indicated that there is no cause and effect relationship between AF and the high mortality associated with it and the prognosis is related to the mechanism of production of AF and not to the arrhythmia itself. On the other hand , Helmers et al¹⁹ considered AF an objective factor pointing to high risk patients

Conclusion

In our opinion AF is not an uncommon arrhythmia (16%) that complicates myocardial infarction early in the disease, and its development in the setting of acute anterior myocardial infarction or after the second day of infarction , predicts a poor prognosis and demands careful therapeutic intervention . Further study to assess the affect of therapeutic intervention on the mortality , in the above mentioned situations are recommended . Other associated complications of myocardial infarction were more common in the presence of AF , and their recognition can put the patients in a better clinical situations . So AF is not an uncommon arrhythmia after myocardial infarction and that its occurrence should signify a more guarded prognosis.

References

1. Stannard M, Slman J. Atrial fibrillation in acute myocardial infarction Med J Aust 1967 ; 1 : 1250 .
2. Liberthson RR ,Salisbury KW , Hutter AM, D esantis RW .Atrial tachyarrhythmias in acute myocardial infarction . Am j Med 1997;60: 956.
3. Hurst JW, King 111SB, Friesinger GC Water PF, Morris DC. Atherosclerotic coronary heart disease :recognition, prognosis and treatment. In :Hurst J Wed. The heart, sixteen ED. New York . McGraw-Hill inc . 1996; 882-1008 .
4. Julian DG , Vanlentine PA, Miller GG. Disturbance of the rate , rhythm and

conduction in acute myocardial infarction. Am J Med 1994; 37:915.

5. Meltzer LE, Kitchell JB . The incidence of arrhythmia associated with acute myocardial infarction. Prog Cardvasc Disease 1996; 9:50.

6. Fluck D, Olsen E, Pentcost BL, et al. Natural history and clinical significance of arrhythmias after myocardial infarction . Br Heart J 1997; 29 :170.

7. Jewitt DE, Balcon R. Raftery EB, et al . Incidence and management of supraventricular arrhythmia after acute myocardial infarction . Lancet 1996; 2:734.

8. Cristal N, Peterburg I Zwarberg J. AF developing in the acute phase of myocardial infarction : Prognostic implication. Chest 1997: 70: 8.

9. Antman EM, Braunald E. Arrhythmia in acute myocardial infarction . In Braunwald E ed. Heart disease A textbook of cardiovascular medicine. 4th ed. Philadelphia. W. B . Saunder' s Co. 1992, pp 1239-1249.

10. Cristal N , Zwarberg J, Gueron M . Supraventricular arrhythmias in acute myocardial infarction . Ann Intern Med 1997; 82:35.

11. Ryan TJ, Anderson JL, Antman E Metal. ACC/AHA Guidelines for management of patients with acute myocardial infarction . JACC 1996; 28: 1328-1428.

12. Geoffery H, Tofler MB , James E, et al . Pericarditis in acute myocardial infarction : Characterization and clinical significance. Am Heart J 1998;117:86.

13. Makkiya SA, Janabi HK. Supraventricular arrhythmias in acute myocardial infarction . Athesis submitted to the scientific council of medicine /college of medicine \Baghdad. March 1995 .

14. Sodani MH, Janabi HK . Ventricular arrhythmias complicating acute Q wave myocardial infarction . Athesis submitted to the scientific council of

medicine / College of medicine / Baghdad 1997.

15. Gilligan DM, Ellenbogen KA, Epstein AF. The management of atrial fibrillation .Am J Med 1999; 101 :413.

16. Braunwald E. Normal and abnormal myocardial function . In : Harrison 's, Principles of internal medicine . 15th ED , New York, McGraw-Hill 2002; 1278-1298.

17. Kirkwood BR . Essentials of medical statistics, 1st ed Oxford, Blackwell Scientific Publication. 1998 , pp 76-93, 173-183.

18. Klass M , Haywood LJ. AF associated with acute myocardial infarction . A study of 34 cases . Am Heart J 1990;79: 752.

19. Helmers C, Lundman T, Mogenson L, Orimius E, Sjogren A, and Wester PO. Atrial fibrillation in acute myocardial infarction . Acta Med Scand 1993; 193:39.

20. Hunt D, Sloman G, Penington C. Effect of AF on prognosis of AMI . Br Heart J 1998; 40 :303.

21. Hod H, Lew AS, Keltal M, et al . Early AF during evolving myocardial infarction : a consequence of impaired left atrial perfusion . Circulation 1997; 75(1): 146.

22. Goldberg RJ, Seely D, Becker RC , et al. Impact of AF on the in-hospital and long term survival of patients with AMI: A community wide perspective. Am Heart J 1999: 119 :996.

23. Janse MJ :Why does AF occur ? Euro HJ 1997; 18 :12-18.

24. Lawson DH Current medicine, 2nd ed , Edinburg, Churchill Livingstone, 1999: 35-40.

25. Roberts R, AMI . In : Kelleyd, Textbook of Internal medicine. New York . J.B Lippincott Co. 1998 , pp 152-168.

26. Desantis RW, Block p, Hutter AM : Tachyarrthmia in myocardial infarction. Circulation 1992; 45: 681.

27 .Liem KL, Lie KI, Durrer D,
Wellens HJJ. Pericarditis in acute myocardial

infarction . Lancet 1997 , 22: 1004.

Table 1: Incidence of AF according to age in 600 patients

Age(years)	Total No.	AF%	RR	95% C.I.-RR	P-Value
≥ 60	300	11.4	2.4	1.1-5.4	< 0.05
< 60	300	4.7	-	-	-

RR: Relative risk

CI –RR = Confidence interval for the relative risk.

Table 2: Study subjects with and without AF (n =600) according to the incidence, associated morbidity and mortality and to the site of AMI.

Site Infarction																				
	Anterior N =352				Inferoposterior N=192				Combined N=24				Non-Qwave N =32				Total N=600			
	With		Without		With		Without		With		Without		With		Without		With		Without	
Atrial Fibrillation	No. 64 .	%	No. 288	%	No .24	%	No. 168	%	No.4	%	No .20	%	No.4	%	No 28	%	No. 96	%	No. 504	%
Heart Failure	60	94%	156	54%	8	33%	64	38%	4	100%	18	90%	0	0%	14	50%	72	75%	252	50%
Pericarditis	16	25%	18	6%	8	33%	12	7%	0	0%	6	25%	0	0%	4	14%	24	25%	40	7%
C CU Mortality	28	44%	50	17%	4	17%	16	9%	4	100%	10	50%	0	0%	8	28%	29	38%	84	16%

Table 3: Mortality of 600 patients with AMI in relation to heart failure and AF.

		Total no .	Mortality rate (%)	R R	95 % C.I.- RR	P value
With Heart Failure	AF + ve	72	44 %	2.5	1.2-5.2	< 0.025
	AF - ve	252	16%	-	-	-
Without Heart Failure	AF + ve	24	16%	1.4	0.3-6.8	N.S.*
	AF - ve	252	12%	-	-	-

N.S.=Non significant

Table 4: Mortality of 96 patients with AF according to the certain characteristics of the AF .

Atrial Fibrillation		Total no.	Mortality rate (%)	R R	95% C.I-RR	P- value
Onset (Hours)	>48	25	80	3	1.18.1	< 0.01
	≤ 48	71	26.3	-	-	-
Duration (Hours)	>24	24	75	2.5	0.8-7.5	N.s.
	≤ 24	72	30	-	-	-
Ventricular Rate(bpm) *	> 120	58	40	1.2	0.6-2.2	N.s.
	≤ 120	38	33.3	-	-	-
No. Of Episodes	Recur.	24	50	1.5	0.6-4	N. s.
	Single	72	33.3	-	-	-

b.p.m. =beats per minutes