Effects Of Intravenous Verapamil On Ventricular Rate And 'R-R' Interval In Cases Of Atrial Fibrillation

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Introduction

Atrial fibrillation is one of the commonest form of arrhythmia met with in clinical practice. Diagnosis is clinically based on finding an irregularly-irregular pulse, absence of 'a' wave in JVP, varying intensity of 1st heart sound and a pulse deficit. Electro Cardiogram (E.C.G.) confirms the diagnosis on the basis of—

- (A) Absence of 'P' wave
- (B) Presence of rapid undulations of the base line (f) waves at a rate of 350 to 600 per minute.
- (C) An irregularly-irregular ventricular rhythm.

Verapamil decreases the ventricular rate (Bender 1970, Schamroth 1971, Antani et al 1972, Khalilullah et al 1977, Rao et al 1980.) With the reduction in the rate, it also increases the 'R-R' interval and regularises the ventricular rhythm. (Schamroth 1971, Schamroth et al 1972, Khalilullah et al 1977).

Materials & Methods

50 cases of uncomplicated atrial fibrillation of varied etiologies (Rheumatic Heart Disease, Ischaemic Heart Disease, Chronic Obstructive Pulmonary Disease, Idiopathic) were selected from the indoor wards of Dept. of Medicine P. M. C. H. Patna. 30 cases were males while 20 were females ranging from 18 to 80 years. Thorough clinical examination with special reference to cardiovascular system was carried out. Finding of an

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irregularly-irregular pulse deficit of more than 10 beats per minute suggested atrial fibrillation.

A 12 lead E. C. G. confirmed atrial fibrillation. Long Lead II was taken. Then Verapamil (5mgm) was injected undiluted, slowly intravenously over a period of one minute. Long Lead II at 1 minute, 10 minute and 30 minute were taken after the completion of injection. From the tracings mean ventricular rate and mean 'R-R' interval were analysed.

Observation

Out of 50 cases studied 30 were males and 20 were females.

TABLE - I

Showing Mean and Standard Deviation (S. D.) of Ventricular Rate (Beats/Min) of the patients studied.

MVR Pre-Verapamil		Post Verapamil MVR		
		1 min	10 min	30 min
Mean	119.0	89.9	82.9	85.2
S. D.	23.4	17.4	16.0	16.5

Table shows gradual reduction in MVR from 119 ± 23.4 to 82.9 ± 16.0 beats/min. Maximum reduction occurred at 10 min.

(Note:- MVR is mean ventricular rate.)

TABLE - II

Percentage Reduction in Mean Ventricular Rate (MVR)

Pre-Verapamil	Post Verapamil		
M. V. R.	1 min	10 min	30 min
119.0	24.4	30.2	28.4

Maximum reduction occurred at 10th minute (30.2%).

TABLE - III

Showing Mean and Standard Deviation (S. D.) of 'R-R' Interval (mm).

	Pre-Verapamil	Post-Verapamil		
		1 min	10 min	30 min
Mean	12.4	15.0	18.1	16.8
S. D.	2.4	2.7	2.7	2.8

Maximum increase in 'R-R' interval at 10 minutes.

TABLE - IV

Showing the effects of Verapamil on MVR.

Particulars	Degree of Freedom	't'	p
Pre-Verapamil MVR & Post-Verapamil MVR after 1 min	98	6.9	0.001*
Pre & Post Verapamil MVR after 10 mins	98	8.8	0.001*
Pre & Post Verapamil MVR after 30 mins	98	8.2	0.001*

Table shows that the effect of Verapamil on MVR after 1 min, 10 mins, 30 mins was highly significant and as the value of 't' after 10 minutes was the maximum (8.8) the effect of verapamil was maximum after 10 min.

TABLE - V

Showing the effect of Verapamil on 'R-R' interval

Particulars	Degree of Freedom (v)	't'	p
Pre & Post Verapamil after 1 min	98	5.1	0.001*
Pre & Post Verapamil after 10 mins	98	10.9	0.001*
Pre & Post Verapamil after 30 mins	98	8.1	0.001*

* Highly significant

Table shows that the effect of Verapamil on 'R-R' interval after 1, 10 & 30 mins was highly significant. As the value of 't' after 10 minutes was the maximum (10.9) the effect thus was maximum after 10 minutes.

Discussion

50 cases of uncomplicated atrial fibrillation in the age group of 16 to 80 years (Mean=32.6, Median=31.5) with a mean ventricular rate of 119 ± 23.4 beats/min and Mean 'R-R' interval of 12.4 ± 2.4 were given 5mgm each of undiluted Verapamil intravenously over a period of one minute.

Verapamil led to the reduction in MVR from 119 ± 23.4 to 89.9 ± 17.4 , 82.9 ± 16.0 and 85.2 ± 16.5 beats/min after 1 min, 10 min and 30 min of injection. Maximum reduction in MVR was seen after 10 min of the injection, which can well be compared with the result of Khalilullah et al (1977), Rao et al (1980), Schamroth (1971) and Schamroth et al (1972).

Following injection the mean 'R-R' interval increased from the pre-verapamil state of 12.4 ± 2.4 to 18.1 ± 2.7 at 10th minute. This gradually decreased to 16.8 ± 2.8 at 30th minute. This effect was seen in all the 50 cases. This result is comparable to the results of Khalilullah et al (1977). Together with the increase in the mean 'R-R' interval there was decrease in the variability of the ventricular response - Aregularisation effect. It was seen in 30 (60%) of the 50 cases and this is comparable with the Schamroth (1971).

According to Schamroth (1971) Atrial fibrillation is associated with second degree A-V block and the irregularity of the ventricular response is due to variations in the magnitude of the second degree A-V block. These variations result from

1. *Fluctuating autonomic effect*

Varying vagal and/or sympathetic effect will cause fluctuations of the A-V nodal refractory period and hence varying and irregular A-V transmission.

2. *Concealed conduction*

Incomplete penetration of the supraventricular impulses into the A-V node will effect complex states of unequal refractoriness within the A-V node and lead to marked irregularity of A-V conduction.

The regularising effect of verapamil could be due to

- (1) A relative insensitivity of A-V nodal refractoriness to autonomic effect.
- (2) An increase in the absolute refractory period at the expense of the relative refractory period. Atrial impulses would therefore tend to be either conducted or blocked but varying conduction times would not occur.
- (3) There are probably several levels of conduction delay within the A-V node. Verapamil would theoretically synchronize or equalize the refractory periods of both levels.

There was no change in the blood pressure.

Summary

Verapamil is an anti-anginal drug with an anti-arrhythmic property. 5mgm of undiluted Verapamil was given intravenously in each case of atrial fibrillation. It reduces the MVR by 24.4% to 30.2%. Maximum reduction taking place at 10 min. There was significant increase in Mean 'R-R' interval from 12.4 ± 2.4 to 18.1 ± 2.7 Maximum effect seen at 10 minute. There was regularisation of ventricular rate in 60% cases.

References

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