INADEQUATE POSTPRANDIAL COMPENSATORY TACHYCARDIA IN ELDERLY PEOPLE

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The effects of aging on cardiovascular and autonomic systems were evaluated through postprandial baroreceptor activity comparison between a group of young adults (n=20) and a group of elderly subjects (n=50) through measurements of pulse rate, which is an indicator of baroreceptor activity. Significant rise of pulse rate was observed in the young adults at 15, 30, 45 and 60 minutes after meal, while similar postprandial compensatory tachycardia was not found in the elderly group. The mean differences in pulse rate in young adult group at 15, 30, 45 and 60 minutes after meal were 2.05 ±0.28, 5.90 ±0.37, 5.95 ±0.37 and 3.60 ±0.42 beats /minute respectively, while the same values at the same time intervals in elderly subjects were 0.48±0.31, 1.14±0.54, 0.06 ±0.34 and -0.36±0.26 beats/minute respectively. Highly significant differences (p <0.001) were observed in the values at all postprandial time intervals between the two groups.

INTRODUCTION

Ingestion of meal in normal subjects has very modest effect on blood pressure, while in persons who have some degree of autonomic dysfunction, there may be a marked reduction in blood pressure after ingestion of meal'. For blood pressure homeostasis the arterial baroreceptor control system is the most rapidly acting mechanism which functions to regulate minute to minute, second to second, or even more rapidly occurring variations in the arterial pressure [2]. These receptors are stimulated by stretch of the wall of the artery [3]. There are four classical effects of stimulation of baroreceptors:

1. Arterial dilatation.
2. Venous dilatation.
3. Reduction in force of myocardial contraction.
4. Reduction in heart rate.

Out of these, the change in heart rate is the one which can be most easily and precisely measured [4]

The baroreceptor sensitivity has been reported to be decreased in elderly people [5.]

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After ingestion of meal the splanchnic flow has been reported to increase 35- 50% above normal postprandial level [6]. The homeostasis of blood pressure in young adults appears to be die result of sympathetic stimulation alter postprandial increased splanchnic blood flow, which should be evidenced by tachycardia. This study was designed to evaluate the degree of tachycardia to compensate the fall in blood pressure due to postprandial increased splanchnic blood flow in elderly people.

MATERIALS AND METHODS

A total of 70 normal male subjects were examined. The test subjects were divided into the following two groups:

1. Young adults, between 20-30 years of age (n=20).
2. Elderly subjects, aged 60 years and above (n=50).

3. All the subjects were randomly selected from the general population of Karachi after thorough clinical examination to exclude any subject suffering from acute or chronic disease. All the subjects were briefed about the purpose and method of study before the start of the tests and their formal consent was taken. One day before the examination, the subjects were advised not to take anything by mouth after 12 midnights and to come for examination with empty stomach at 7 a.m. on the next morning. All the examinations and experiments were carried out in the Department of Physiology, Basic Medical Sciences Institute, Jinnah Postgraduate Medical Centre, Karachi. All the subjects were allowed to rest for a while and then the blood pressure and heart rate were

measured according to the recommendations of the American Heart Association[7] Then each subject was given a standard breakfast consisting of two slices of bread, one scrambled egg, one teaspoonful of jelly, one teaspoonful of butter and 200 ml of milk.

The subjects were advised to take the breakfast within 15 minutes. Blood pressure and heart rate measurements were repeated at 15, 30, 45 and 60 minutes after the start of meal.

RESULTS

The mean preprandial pule rate in young adult group was 68.20±1.28 beats/minute. The mean values for postprandial pulse rates at 15, 30, 45 and 60 minutes after meal were 70.25 ±1.24, 74.10±1.21, 74.15± 1.20 and 71.80 ±1.19 beats/minute respectively (Table-1). The increases in pulse rates at 30 and 45 minutes postprandially were highly significant ($p < 0.01$), while the increase at 60 minutes postprandially was also significant ($p < 0.05$).

TABLE-1: PREPRANDIAL AM) POSTPRANDIAL PULSE RATES (BE ATS/MI NOTE ± SEM)

GROUP	PRE-PRANDIAL	POSTPRANDIAL 15min	30min	45min	60min
YOUNG ADULTS (N=20)	68.20±1.28	70.25 ±1.24	74.10** ±1.21	74.15** ±1.20	71.80* ±1.19
ELDERLY SUBJECTS (N=50)	74.14±1.44	74.62 ±0.59	75.28 ±0.67	74.20 ±0.58	73.78 ±0.54

* p<0.05 ** p<0.01

The mean preprandial pulse rate in elderly subjects was 74.14 ±1.44 beats/minute. The mean values for postprandial pulse rate at 15, 30, 45 and 60 minutes after meal were 74.62 ±0.59, 75.28±0.65, 74.20±0.58 and 73.78±0.54 beats/minute respectively. There was no significant difference between the mean values for pulse rates before and after meal.

0. The mean differences in pulse rate in young adult group at 15, 30, 45 and 60 minutes after meal were 2.05±0.28, 5.90±0.37, 5.95±0.37 and 3.60±0.42 beats/minute respectively, while tile same values at the same time intervals in elderly subjects were 0.48±0.31, 1.14±0.54, 0.06 ±0.34 and -0.36± 0.26 beats/minute respectively. Highly significant differences ($p < 0.001$) were observed in the values at all postprandial time intervals between the two groups (Table-2 & Fig. 1).

TABLE-2: DIFERENCES IN PUUSE RATES AFTER MEALS IN THE YOUNG ADULTS AND ELDERLY SUBJECTS

Values are expressed as difference of means (beats/minute) ± SEM

GROUP	POSTPRANDIAL 15 min	30 min	45 min	60 min
YOUNG ADULTS (N=20)	+2.05 ±0.28	+5.90 ±0.37	+5.95 ±0.37	+3.60 ±0.42
ELDERLY SUBJECTS (N=50)	+0.48* ±0.31	+1.14* ±0.54	+0.06* ±0.34	-0.36* ±0.26

* p<0.00l

+ & - sign with mean indicates increase & decrease respectively as compared to the preprandial level.

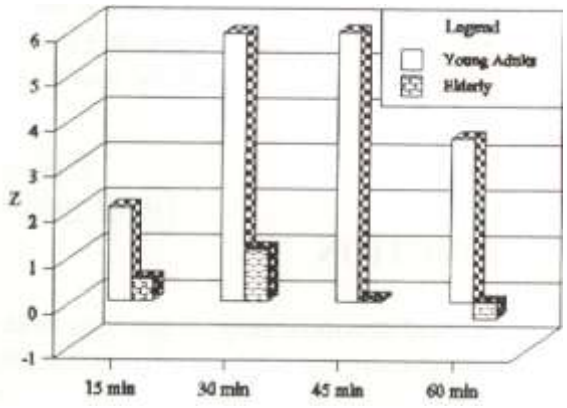

Fig. I: Magnitude of difference after meals in mean pulse rates of young adults and elderly subjects

DISCUSSION

The postprandial heart rate changes in young adults have the appearance of stimulation of sympathetic nervous system, similar to that which occur during the assumption of upright posture. The sympathetic nervous stimulation mediated through baroreceptor reflexes result in increased peripheral resistance and heart rate. But in elderly people, the baroreceptor activity is reported to be reduced. Gribbin *et al* [8] demonstrated that a significant and progressive decrease in baroreceptor sensitivity occurs with increasing age. Sundlof and Wallin [5] also reported reduction in baroreceptor activity with increasing age. This may occur either because of reduced distensibility of the vessel walls in the baroreceptor areas[9]or baroreceptor degeneration with increasing age [10] or both. This may be the reason that the elderly subjects of our study showed no compensatory increase in the pulse rate in response to postprandial decline in blood pressure due to increased splanchnic circulation. Blunted baroreceptor mediated cardioacceleration in response to hypotensive stimuli during assumption of upright posture

[11] and blunted cardiac slowing in well described in healthy elderly subjects. Postural hypotension occurs frequently in elderly people due to absence of this compensatory tachycardia, and this postural hypotension may be more marked after meals in these people, as reported by Roberton *et al* [1] Pancreatic hormone insulin has been proved to reduce baroreceptor sensitivity m elderly people. In our study, the blunted baroreceptor mediated tachycardia in elderly people may partly be due to insulin induced reduction of baroreceptor sensitivity.

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