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AUTONOMIC FUNCTIONS AND AUDIOVISUAL REACTION TIME IN HEROIN ADDICTS

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Abstract : Radial pulse rate, systolic BP (SBP), diastolic BP (DBP), initial GSR_0), GSR after 5 minutes of relaxation (GSR_5), auditory reaction time (ART) and visual reaction time, (VRT) were measured in 30 male heroin addicts and compared with 25 male control subjects of similar age group. In heroin addicts DBP was significantly low (71.73 mmHg±7.42, $P<0.05$); while SBP although being low (106.13 mmHG±10.08) was not significant. However, radial pulse was significantly higher. GSR_0 was significantly higher ($P<0.001$) but GSR_5 was not significantly higher in these addicts, suggesting less sympathetic activity. In a separate group of ten heroin addicts effect of change in posture from supine to erect on BP was studied. This did not produce any rise in SBP or DBP at 1 and 2 min, suggesting probably inibition of baroreceptor reflex. Auditory reaction time (ART) and visual reaction time (VRT) were significantly prolonged ($P<0.001$ for each) in addicts, indicating deterioration of processing capability of CNS, or poor sensory-motor performance, or both.

Key words : Heroin addiction, galvanic skin resistance, autonomic functions, audiovisual reaction time

INTRODUCTION

Heroin addiction is a world-wide problem. Heroin a semisynthetic opiate (Diacetylmorphine) is derived from morphine. The heroin used by the addicts (Street Heroin) is not pure, with many adulterants mixed in it. Opiates have sedative effect on central nervous system causing inability to concentrate, drowsiness and inducing sleep (1). The effects of heroin on central nervous system are quick and severe as compared to those produced by morphine (2, 3). The skin resistance changes a simple and instantaneous indicator of sympathetic activity have not been reported in heroin addicts except for a single study (4). Though some neurological complications (5, 6) and subclinical changes in peripheral nervous system have been reported in heroin addicts, the reaction time which is an indicator of processing capability of CNS and sensory motor performance has not been studied. This initiated the present study the autonomic functions and audiovisual reaction time in heroin addicts.

METHODS

Thirty male heroin addicts were taken from the OPD of Drug De-addiction Centre 'Ashiana' and Smt. S. K. Hospital. All the subjects had developed physical dependance to 'street heroin'. The addicts contacted the OPDs of above mentioned centre or hospital for de-addiction treatment. Drug history was recorded in detail in terms of quantity of drug chased daily (according to quantity purchased), duration of drug-use in years, quantity of heroin used before coming to the hospital and time gap between the last dose and the reporting time to the hospital (Table I). Heroin addicts included in the study had not started the de-addiction treatment as yet. They had chased the drug within 6 hours before coming to the OPD. All the addicts were clinically healthy. Socio-economic status was that of lower middle class. Twenty five healthy male subjects of similar age group who had never consumed heroin were selected for the control study. Consent for the study was taken from each subject.

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TABLE I : Drug history of 'Street heroin' addicts (n = 20).

Parameters	*Mean±SD*	*Range*
Quantity of drug used per day (gm)	1.41±0.81	0.5-4.0
Duration of drug use (yr)	5.8±2.51	1-10
Time gap between low dose and testing (hr)	4.5±1.65	2-6
Quantity of last dose before testing (gm)	0.383±0.205	0.25-10

Radial pulse, systolic blood pressure (SBP), diastolic blood pressure (DBP), initial galvanic skin resistance (GSR_0), GSR after five minutes of relaxation (GSR_5), auditory reaction time (ART) and visual reaction time (VRT) were measured in a quiet room between 10 AM and 12 noon. Subjects were asked to sit comfortable on a chair. Radial pulse was counted for 30 seconds in each subject. Blood pressure was recorded with sphygomomanometer and GSR recorded on GSR apparatus supplied by Medicaid systems Chandigarh. GSR_0 and GSR_5 were measured by fixing the electrodes on index finger and ring finger. GSR_0 was recorded immediately after fixing the electrodes and GSR_5 recorded after five minutes of quiet relaxation. During relaxation subjects were instructed to rest with eyes closed and a thoughtless mental state.

ART and VRT were measured by reaction time instrument supplied by Medicaid Systems, Chandigarh. This instrument is equipped with very sensitive quartz clock which can measure upto 1/10th of msec. Accuracy of this instrument is ±one digit. Before measuring the parameters each subject had been made familiar with reaction time instrument and the procedures to alleviate any fear or apprehension. Care was taken that known factors like sex (7, 8), limb used (7), sports (9) and acute mental stress (10) would not affect the reaction time in the study conducted. All subjects were right handers and used their right hand to press the switch to stop the quartz clock of the apparatus. Before measuring the visual reaction time each subject was asked to identify the flashing of red light. He was instructed to press the red switch with finger already on it to stop the clock as soon as he saw the red light. Before giving the sound signal he was asked to concentrate to hear the sound. After hearing the sound signal, he was supposed to press immediately the blue switch on which he had the finger to put off the quartz clock. From the auto display reaction time was noted. After giving enough trials three reading were recorded and the lowest was taken as the reaction time. The study was conducted in the months of May and June. All the data were statistically analysed by using unpaired 't' test. In a separate group of ten heroin addicts SBP and DBP were recorded by sphygmomanometer in supine posture and 1 min and 2 min after change of posture from supine to erect (quiet standing).

RESULTS

Fig. 1 and Table II show that data in heroin

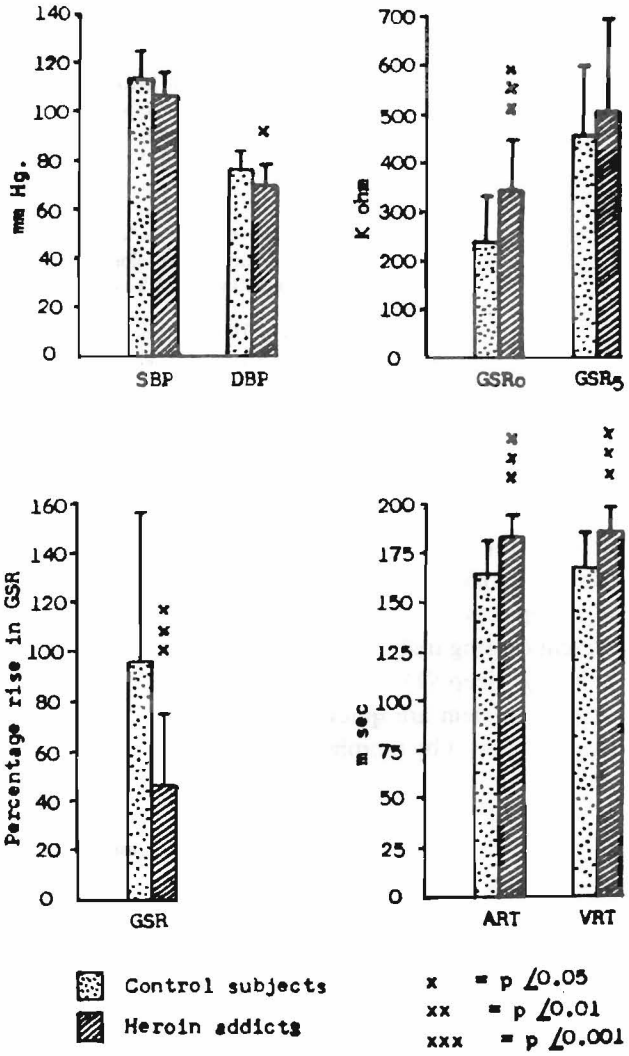

Fig. 1 : Comparison of SBP, DBP, GSR_0, GSR_5, percentage rise in GSR with 5 minutes relaxation, ART and VRT of control subjects and drug addicts.

TABLE II : Data with statistical analysis of control subjects and heroin addicts.

Parameters	*Control subjects (n = 25) Mean±SD*	*Heroin addicts (n = 30) Means±SD*	*P value*
Age (yr)	28.12±8.51	27.2±55.06	NS
Pulse (per min)	77.37±8.32	87.2±12.34	< 0.001
SBP (mg HG)	112.16±10.89	106.73±10.08	NS
DBP (mm Hg)	76.16±7.26	71.73±7.42	< 0.05
GSRo (kilo ohm)	238.72±92.96	344.26±100.21	< 0.001
GSR5 (kilo ohm)	456.16±191.78	507.00±187.38	NS
Percentage change is GSR	96.28±60.33	45.92±28.72	< 0.001
ART (msec)	163.61±16.87	182.7±10.3	< 0.001
VRT (msec)	167.36±18.73	186.7±12.9	< 0.001

(SBP = Systolic BP, DBP = Diastolic BP, GSR_0 = Basal GSR, GSR_5 = GSR after five minutes of relaxation, ART = Auditory Reaction Time and VRT = Visual Reaction Time).

addicts and normal (control) subjects alongwith statistical analysis. Low SBP, statistically insignificant and significantly low DBP (P<0.05) were recorded in drug addicts as compared to controls. However radial pulse rate was significantly higher (P<0.001) in addicts. There was no rise in SBP and DBP after 1 min and 2 min of change of posture from supine to erect (Table III) in another group of ten heroin addicts. GSR_0 was significantly higher in addicts (P<0.001) (Table II). After 5 min of relaxation, although the level of GSR was higher in addicts, it was not significant by so as compared to GSR_5 of control subjects. The percentage rise in GSR after 5 min of relaxation was less in addicts than in control subjects and the differences were statistically significant (P<0.001 for each) (Table II).

TABLE III : Blood pressure changes in heroin addicts with change of posture. (n = 10. Age 28.49±5.16)

Parameters measured	*Supine position Mean±SD*	*1 min after quiet standing Means±SD*	*2 min after quiet standing Mean±S.D.*
SBP (mm Hg)	119.8±10.92	99.8±9.82	103.2±11.55
DBP (mm Hg)	71.2±5.43	69.2±4.02	70.4±4.79

DISCUSSION

In the present study low SBP but statistically insignificant and significantly low DBP were recorded in 'street heroin' addicts. This is probably due to inhibitory effects of heroin on vasomotor centre resulting in a significant fall in DBP because of vasodilation (5, 11). Higher pulse rate in addicts may reflect an inhibition of cardioinhibitory centre as well. GSRo was significantly higher in addicts as compared to controls. It suggests lower sympathetic activity in addicts as compared to normal subjects. Similar findings regarding GSR_0 have been observed in an another study on heroin addicts (4). After 5 minutes of relaxation GSR increased in addicts as well as in controls from its initial value, statistically the differences in GSR_5 of the two groups were not significant. However the percentage rise in GSR from its baseline value was significantly less in addicts as compared to control subjects. This is probably due to higher baseline values in heroin addicts, indicate deterioration of processing capability of central nervous system and possibly poor sensory-motor performance (12). The depressant effects of heorinon CNS and some subclinical changes (13) in peripheral nervous system may be the cause. Neurological complications e.g. polyneurities, myelitis and ischameic neuritis have also been reported (5, 6). From the present study, it may be concluded that heroin addiction causes decrease in sympathetic activity, inhibition of baroreceptor reflexes, and prolongation in the auditory and visual reaction times.

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