Results

Table (1) : Comparison of some clinical data of diabetics with autonomic neuropathy versus healthy controls

	Control	*Diabetics with A.N.*	*Significance*
Age (years)	52.3±4.5	55.6±6.1	N.S.
Systolic Bl. Pr. (mmHg).	122.6±10.8	124.19±13.7	N.S.
Diastolic Bl. Pr. (mmHg)	76.43±5.95	77.9±9.1	N.S.
Pulse (beat/min)	76.4±5.3	92.13±6.4	H.S.(P<0.001)

A.N. = Autonomic neuropathy

N.S. = Non significant

S = Significant

H.S. = Highly significant

Table (2) : Comparison of some clinical data of diabetics without autonomic neuropathy versus healthy controls

	Control	*Diabetics without A.N.*	*Significance*
Age (years)	52.3±4.5	55.57±7.1	N.S.
Systolic Bl. Pr. (mmHg).	122.6±10.8	131.3±13.3	S. P <0.05
Diastolic Bl. Pr. (mmHg)	76.43±5.95	81.0±7.6	N.S.
Pulse (beat/min)	76.7±5.3	83.27±3.4	N.S.

A.N. = Autonomic neuropathy

N.S. = Non significant

S = Significant

H.S. = Highly significant

Table (3) : Comparison of some clinical data of diabetics with autonomic neuropathy versus diabetics without autonomic neuropathy versus

	Diabetics with A.N.	*Diabetics without A.N.*	*Significance*
Age (years)	55.6±6.1	55.57±7.1	N.S.
Systolic Bl. Pr. (mmHg).	124.19±13.7	131.3±13.3	S (P <0.05)
Diastolic Bl. Pr. (mmHg)	77.9±9.1	81. ±7.6	N.S.
Pulse (beat/min)	92.13±6.4	83.27±3.4	H.S. (P<0.001)
duration of diabetes (years)	6.6±1.7	7.9±2.7	N.S.

A.N. = Autonomic neuropathy

N.S. = Non significant

S = Significant

H.S. = Highly significant

Table (5) : Compartive analysis of echo. findings of diabetics without autonomic neuropathy versus healthy controls

	Control	*Diabetics without A.N.*	*Significance*
LEDD	4.12±0.38	4.37±0.49	S (P<0.05)
LESD	2.7±0.026	2.8±0.23	N.S.
F.S. %	34.4±3.1	33.6±6.5	N.S.
E.F	0.71±0.04	0.69±0.08	N.S
SWT	0.76±0.11	1.01±0.11	S (P<0.05)
PWT	0.75±0.13	0.88±0.08	S (P<0.05)
LAD	3.5±0.38	3.4±0.39	N.S.
ARD	2.7±0.28	3.0±0.23	S (P<0.05)
RVD	1.4±0.2	1.7±0.3	S (P<0.05)

LEDD = Left ventricular end diastolic dimension

LESD = Left ventricular end systolic dimension

F.S.%= Percentage fraction shortening

E.F. = Ejection fraction

SW.T= Septal wall thickness.

PWT = Posterior wall thickness.

LAD = Left atrial dimension

ARD = Aortic root diameter

RVD = Right ventricular dimension

Table (6) : Compartive analysis of echo. findings of diabetics with autonomic neuropathy versus diabetics without autonomic neuropathy

	Diabetics with A.N.	*Diabetics without A.N.*	*Significance*
LEDD	4.5±0.49	4.37±0.49	N.S.
LESD	2.96±0.41	2.8±0.23	S (P <0.05)
F.S. %	32.8±4.5	33.6±6.5	N.S.
E.F	0.68±0.07	0.69±0.08	N.S.
SWT	1.04±0.11	1.01±0.11	N.S.
PWT	0.91±0.12	0.88±0.08	N.S.
LAD	3.5±0.26	3.4±0.39	N.S.
ARD	3.0±0.18	3.0±0.23	N.S.
RVD	1.8±0.1	1.7±0.3	N.S.

LEDD = Left ventricular end diastolic dimension

LESD = Left ventricular end systolic dimension

F.S.%= Percentage fraction shortening

E.F. = Ejection fraction

SW.T= Septal wall thickness.

PWT = Posterior wall thickness.

LAD = Left atrial dimension

ARD = Aortic root diameter

RVD = Right ventricular dimension

Table (7) : Compartive analysis of resting and exercise E.C.G. findings in diabetics with autonomic neuropathy versus healthy controls

	Control	*Diabetics with A.N.*	*Significance*
P-R (B)	0.18±0.04	0.17 ±0.03	N.S.
P-R (A)	0.17±0.02	0.18±0.03	N.S.
QTc (B)	0.39±0.01	0.44±0.02	S (P.<0.05)
QTc (A)	0.39±0.01	0.45±0.04	S (P.<0.05)
RW (B)	16.1±1.7	15.7±4.6	N.S.
RW (A)	14.5±2.1	15.4±4.9	N.S.
STSD mm	1	1.4±0.52	N.S.
STSD time (minutes)	3	5.3±0.67	S (P.<0.05)
Exercise duration (minutes)	8.86±1.2	4.84±1.7	H.S. (P<0.001)

B = Resting value

A = exercise value

RW = Rwave amplitude

STSD = S-T segment depression degree (mm).

Table (8) : Compartive analysis of resting and exercise E.C.G. findings in diabetics without autonomic neuropathy versus healthy controls

	Control	*Diabetics without A.N.*	*Significance*
P-R (B)	0.18±0.04	0.18±0.03	N.S.
P-R (A)	0.17±0.02	0.17±0.02	N.S.
QTc (B)	0.39±0.01	0.397±0.01	N.S.
QTc (A)	0.39±0.01	0.399±0.01	N.S.
RW (B)	16.1±1.7	16.9±3.2	N.S.
RW (A)	14.5±2.1	16.4±3.1	N.S.
STSD mm	1	1.25±0.5	N.S.
STSD time (minut.)	3	3.75±0.5	N.S.
Exercise duration (minut.)	8.86±1.2	5.47±2.1	H.S (P<0.001)

B = Resting value

A = exercise value

RW = Rwave amplitude

STSD = S-T segment depression degree (mm).

Table (9) : Compartive analysis of resting and exercise E.C.G. findings in diabetics with autonomic neuropathy versus diabetics without autonomic neuropathy

	Diabetic with A.N.	*Diabetics without A.N.*	*Significance*
P-R (B)	0.17±0.03	0.18±0.03	N.S.
P-R (A)	0.18±0.03	0.17±0.2	N.S.
QTc (B)	0.44±0.02	0.397±0.01	S (P<0.05)
QTc (A)	0.45±0.04	0.399±0.01	S (P<0.05)
RW (B)	15.7±4.6	16.9±3.2	N.S.
RW (A)	15.4±4.9	16.4±3.1	N.S.
STSD mm	1.4±0.5	1.25±0.5	N.S.
STSD time (minutes)	5.3±0.67	3.75±0.5	S (P<0.05)
Exercise duration (minutes)	4.84±1.7	5.47±2.1	N.S.

B = Resting value

A = exercise value

RW = Rwave amplitude

STSD = S-T segment depression degree (mm).

Table (10) : Compartive analysis of some hemodynamic parameters in diabetics with A.N. versus control group.

	Control	*Diabetics with A.N.*	*Significance*
H.R (B)	76.4±5.3	92.1±6.4	S. (P<0.001)
H.R (A)	152.4±8.9	150.1±5.6	N.S.
SBP (B)	122.6±10.8	124.2±13.7	N.S.
SBP (A)	190±11.4	177.1±19.1	S. (P<0.05)

B = Resting value

A = Exercise value

Table (11) : Compartive analysis of some hemodynamic parameters in diabetics without A.N. versus control group.

	Control	*Diabetics without A.N.*	*Significance*
H.R (B)	76.4±5.3	83.3±3.4	N.S.
H.R (A)	152.4±8.9	157±6.3	N.S.
SBP (B)	122.6±10.8	131.3±13.3	S. (P<0.05)
SBP (A)	190±11.4	186.7±16.7	N.S.

B = Resting value

A = Exercise value

Table (12) : Compartive analysis of some hemodynamic parameters in diabetics with A.N. versus diabetics without A.N.

	Diabetics with A.N.	*Diabetics without A.N.*	*Significance*
H.R (B)	92.1±6.4	83.3±3.4	H.S. (P<0.001)
H.R (A)	150.1±5.6	157±6.3	S. (P<0.05)
SBP (B)	124.2±13.7	131.3±13.3	S (P<0.05)
SBP (A)	177.1±19.1	186.7±16.7	N.S.

B = Resting value

A = Exercise value

Table (13) : Incidence of some clincal and electrocardiographic findings in the diabetics and control groups.

	Control group (21)	Diabetics without A.N. (30)	Diabetics with A.N. (31)
Chest pain	4.8% (1)	13.3% (4)	3.2% (1)
Dyspnoea	95.2% (20)	80% (24)	51.6% (16)
Fatigue	47.6% (10)	60% (18)	35.5% (11)
Claudication	14.3% (3)	30% (9)	19.4% (6)
Palpitation	-	-	12.9% (4)
Vertigo	4.8% (1)	-	6.5% (2)
Arrythmia	-	-	3.2% (1)
Sts depression	4.8% (1)	10% (3)	32.3% (10)
New U wave	-	3.3% (1)	9.7% (3)

Table (4) : Compartive analysis of echo. findings of diabetics with autonomic neuropathy versus healthy controls reveals:

- Non significant change in :
  - Fractional shortening.
  - Ejection fraction.
  - Left atrial dimension.
- Significant increase of the following parameters in the diabetics with autonomic neuropathy:
  - Left ventricular end diastolic dimension.
  - Left ventricular end systolic dimension.
  - Septal wall thickness.
  - Posterior wall thickness.
  - Aortic root diameter.
  - Right ventricular dimension.

Table (5) : Compartive analysis of echo. findings of diabetics without autonomic neuropathy versus healthy controls reveals :

- Non significant change in :
  - Left ventricular end systolic dimension
  - Fractional shortening.
  - Ejection fraction.
  - left atrial dimension.
- Significant increase of the following parameters in the diabetics without autonomic neuropathy:
  - Left ventricular end diastolic dimension.
  - Septal wall thickness.

- Posterior wall thickness.
- Aortic root diameter.
- Right ventricular dimension.

Table (6) : Compartive analysis of echo. findings of diabetics with autonomic neuropathy versus diabetics without autonomic neuropathy reveals:

- Non significant change in :-
  - left ventricular end diastolic dimension.
  - Fractional shortening.
  - Ejection fraction.
  - Septal wall thickness.
  - Posterior wall thickness.
  - Left atrial dimension.
  - Aortic root diameter.
  - Right ventricular dimension.
- Significant increase of left ventricular end systolic dimension in the diabetics with autonomic neuropathy.

Table (7) : Compartive analysis of resting and exercise E.C.G. findings in diabetics with autonomic neuropathy versus healthy controls reveals :

- Non significant change in resting and exercise P-R interval.
- Non significant change in resting and exercise R-wave amplitude.
- Significant increase of resting and exercise QTc interval in the diabetics with autonomic neuropathy.

- Non significant change in the degree of S-T segment depression.
- Significant increase of duration of S-T segment depression in the diabetics with autonomic neuropathy.
- Highly significant decrease of exercise duration in the diabetics with autonomic neuropathy.

Table (8): Comparative analysis of resting and exercise E.C.G. findings in diabetics without autonomic neuropathy versus healthy controls reveals :

- Non significant change in resting and exercise P-R interval.
- Non significant change in resting and exercise QTc interval.
- Non significant change in resting and exercise R wave amplitude.
- Non significant change in the degree of S-T segment depression.
- Non significant change in the duration of S-T segment depression.
- Highly significant decrease of exercise duration in the diabetic group.

Table (9) : Compartive analysis of resting and exercise E.C.G. findings in diabetics with autonomic neuropathy versus diabetics without autonomic neuropathy reveals :

- Non significant change in resting and exercise P-R interval.
- Significant increase of resting and exercise QTc interval in the diabetics with autonomic neuropathy.
- Non significant change in resting and exercise R-wave amplitude.
- Non significant change in degree of S-T segment depression.

- Significant increase of duration of S-T segment depression in diabetics with autonomic neuropathy.
- Non significant change in exercise duration.

Table (10) : Compartive analysis of some hemodynamic parameters in diabetics with A.N. versus control group reveals :

- Significant increase of resting heart rate in the diabetics with autonomic neuropathy.
- Non significant change in exercise heart rate.
- Non significant changes in resting systolic blood pressure.
- Significant increase of exercise systolic blood pressure in the control group.

Table (11) : Compartive analysis of some hemodynamic parameters in diabetics without A.N. versus control group reveals:

- Non significant change of resting and exercise heart rate.
- Significant increase of resting systolic blood pressure in diabetics without autonomic neuropathy.
- Non significant change in the exercise systolic blood pressure.

Table (12) : Compartive analysis of some hemodynamic parameters in diabetics with A.N. versus diabetics without A.N. reveals :

- Highly significant increase of resting heart rate in the diabetics with autonomic neuropathy.
- Significant decrease of exercise heart rate in the diabetics with autonomic neuropathy.

- Significant decrease of resting systolic blood pressure in the diabetics with autonomic neuropathy.
- Non significant change in exercise systolic blood pressure.

Table (13) : Incidence of some clincal and electrocardiographic findings in the diabetics and control groups reveals :

- The incidence of chest pain in the control group was 4.8% (one patient), in the diabetics without autonomic neuropathy was 13.3% (four patients) and in the diabetics with autonomic neuropathy was 3.2% (one patient).

- The incidence of S-T segment depression was 4.8% (one patient), 10% (three patients)and 32.3% (Ten patients) in the control, diabetics without and diabetics with autonomic neuropathy respectively.

- There was no palpitation or arrhythmia in the control and diabetics without autonomic neuropathy but in diabetics with autonomic neuropathy the incidence of palpitation was 12.9% (four patients) and of arrhythmia was 3.2% (one patient). The dyspnoea and fatigue have a higher incidence : in the control group, dyspnoea was 95.2% (Twenty patients) and fatigue was 47.6% (Ten patients) but in the diabetics without autonomic neuropathy, dyspnoea was 80% (Twenty four patients) and fatigue was 60% (eighteen patients) and in diabetics with autonomic neuropathy the dyspnoea was 51.6% (sixteen patients) and fatigue was 35.5% (eleven patients). There was

no vertigo in diabetics without autonomic neuropathy but its incidence was 4.8% (one patient) in the control group and 6.5% (Two patients) in the diabetics with autonomic neuropathy.

- The incidence of claudication was 14.3% (three patients), 30% (nine patients) and 19.4% (six patients) in the control group, diabeties without and diabetics with autonomic neuropathy respectively.

- There was no new U-wave in the contral group but its incidence in the diabetics without autonomic neuropathy was 3.3% (one patient) and in diabetics with autonomic neuropathy was 9.7% (three patients).

Fig. (1) : Incidence of chest pain and Sts depression in the studied groups

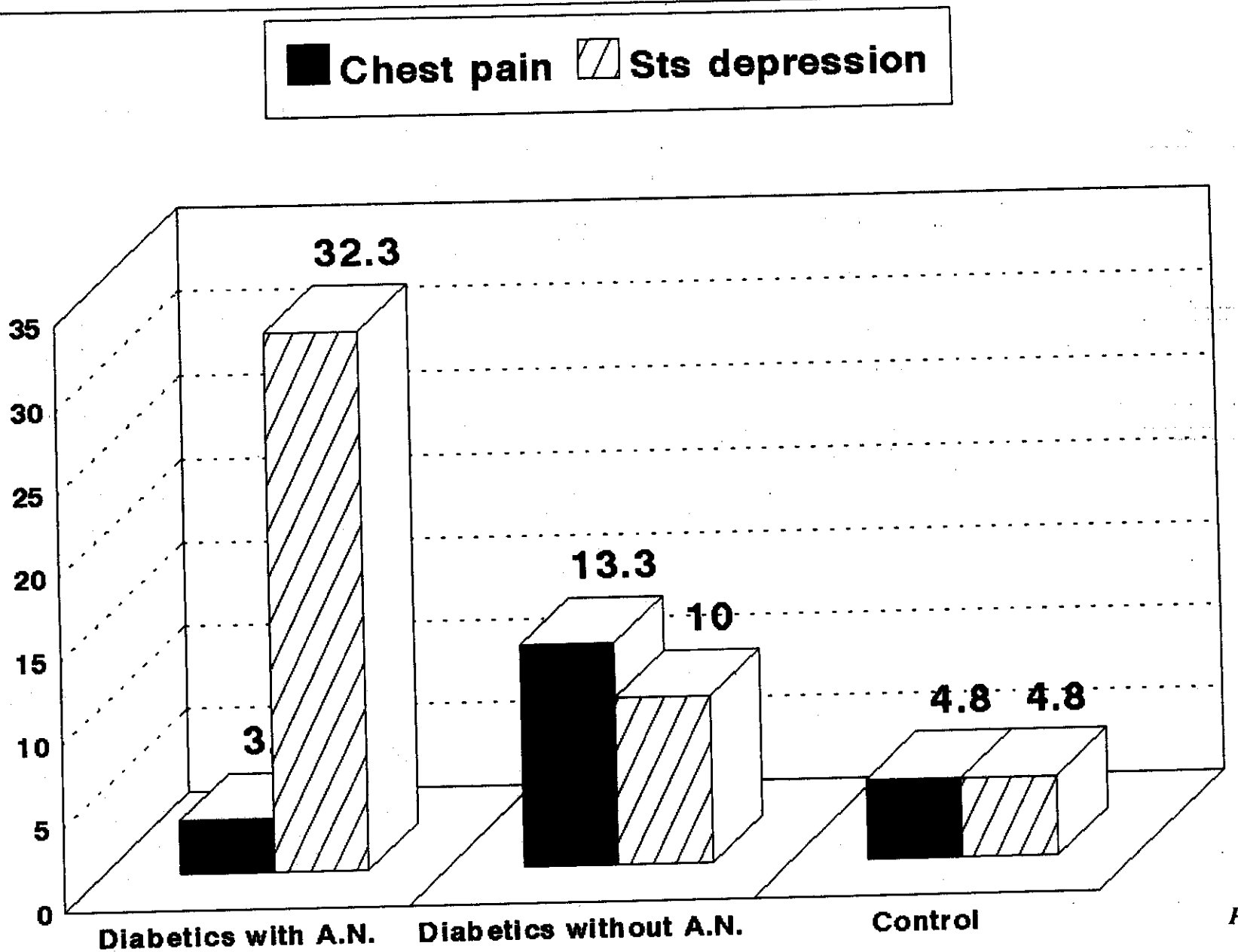


Fig. (2) : Resting heart rate in the studied groups

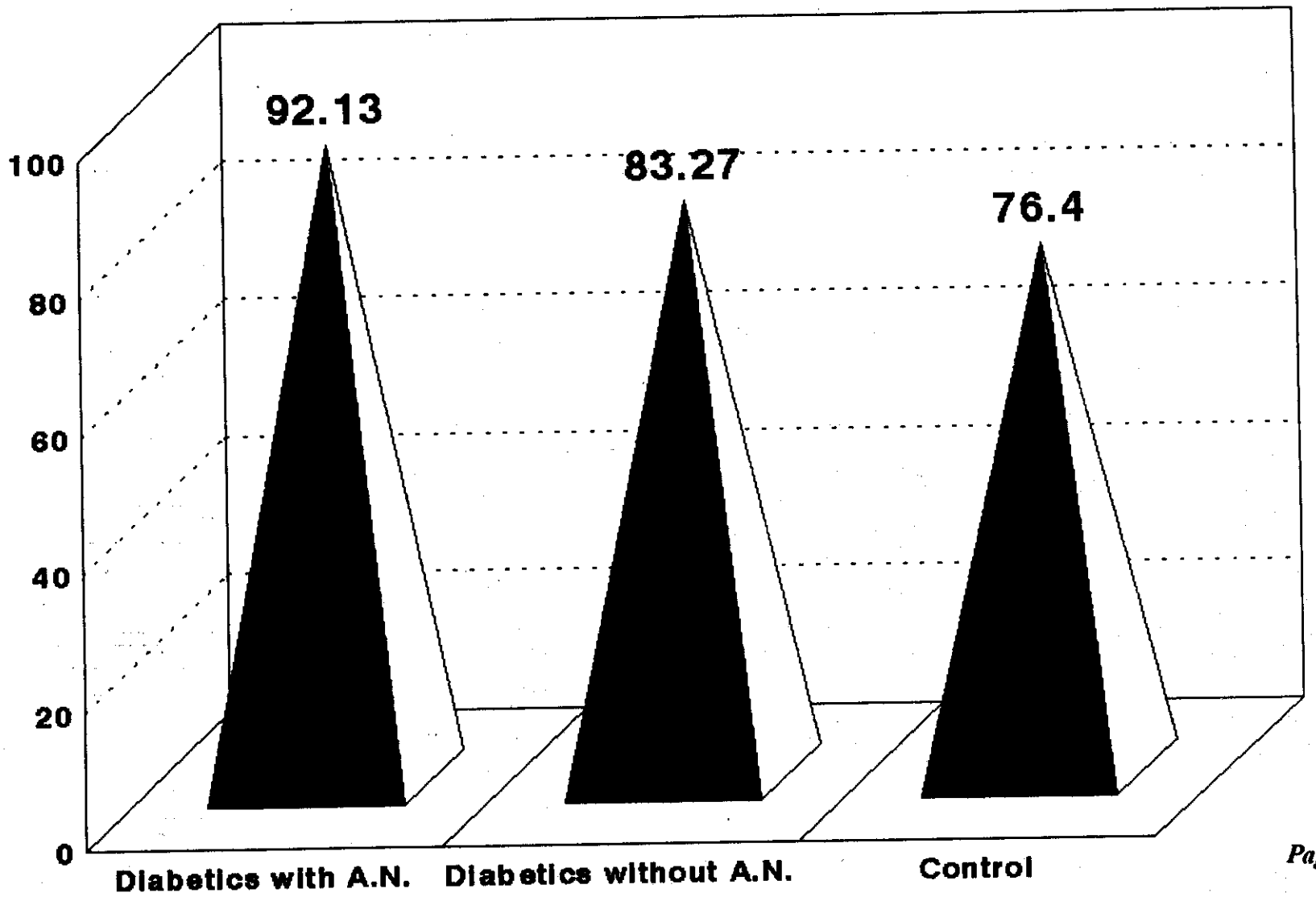


Fig. (3) : Resting QTc in the studied groups

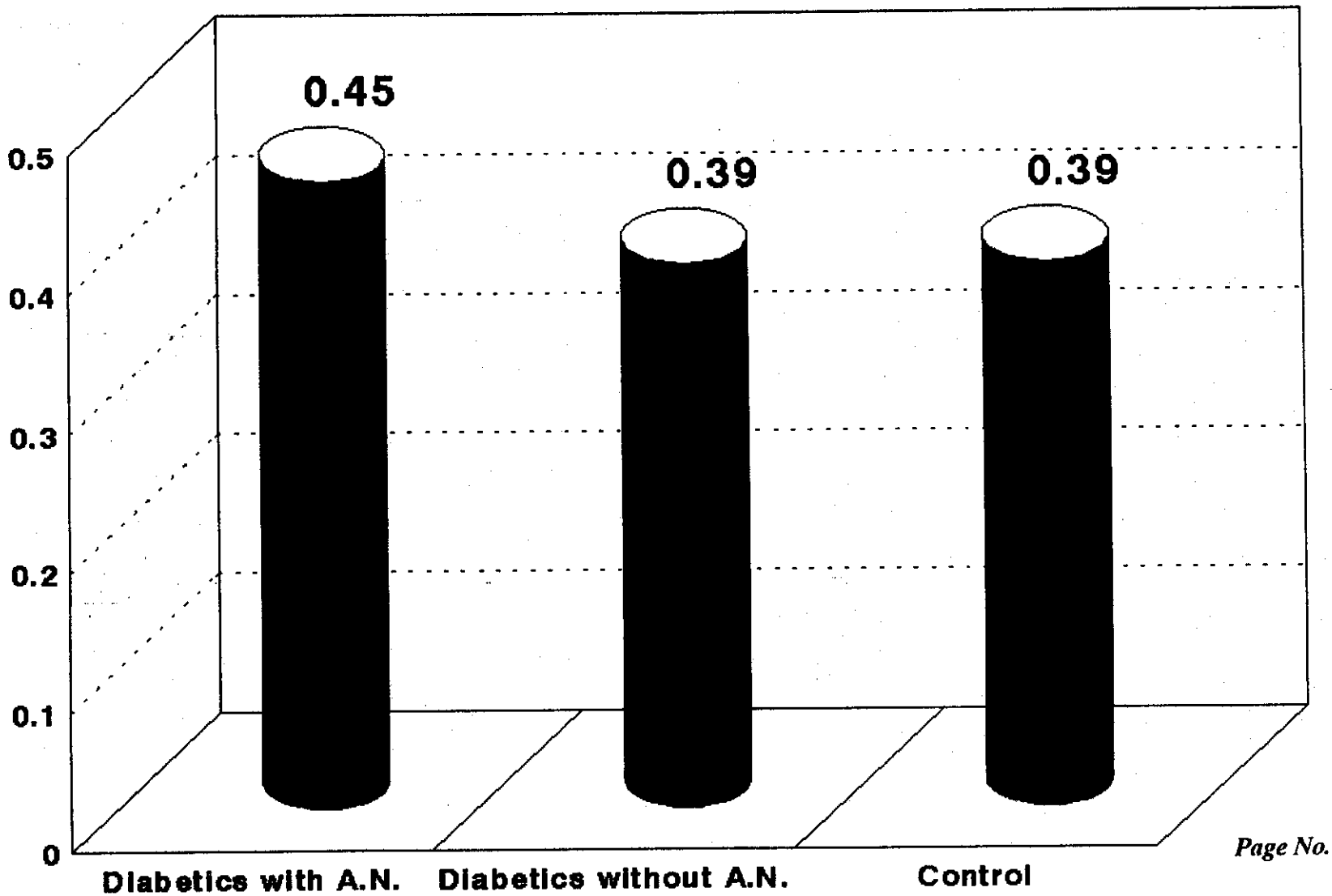


Fig. (4) : Exercise duration (minutes) in the studied groups

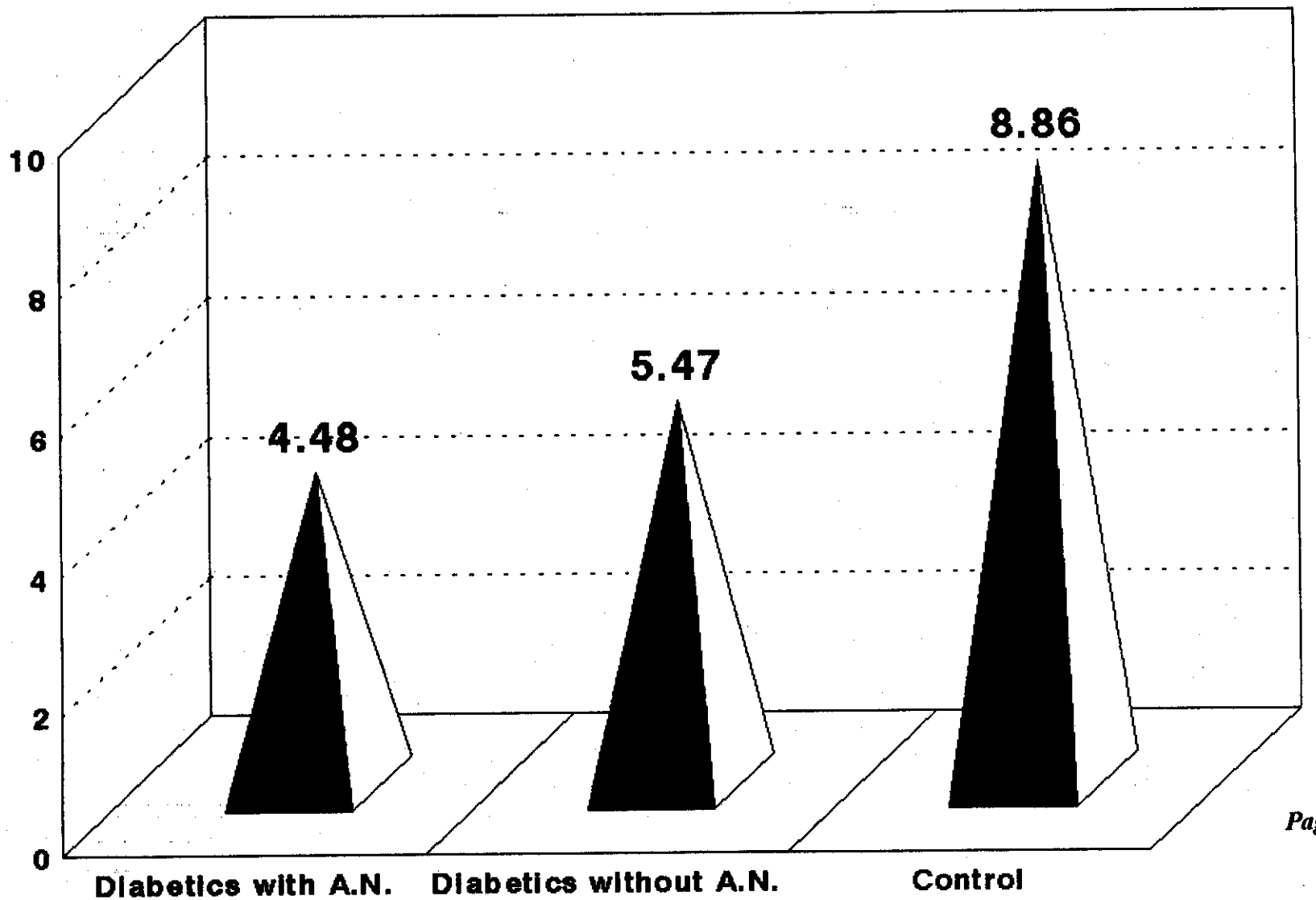
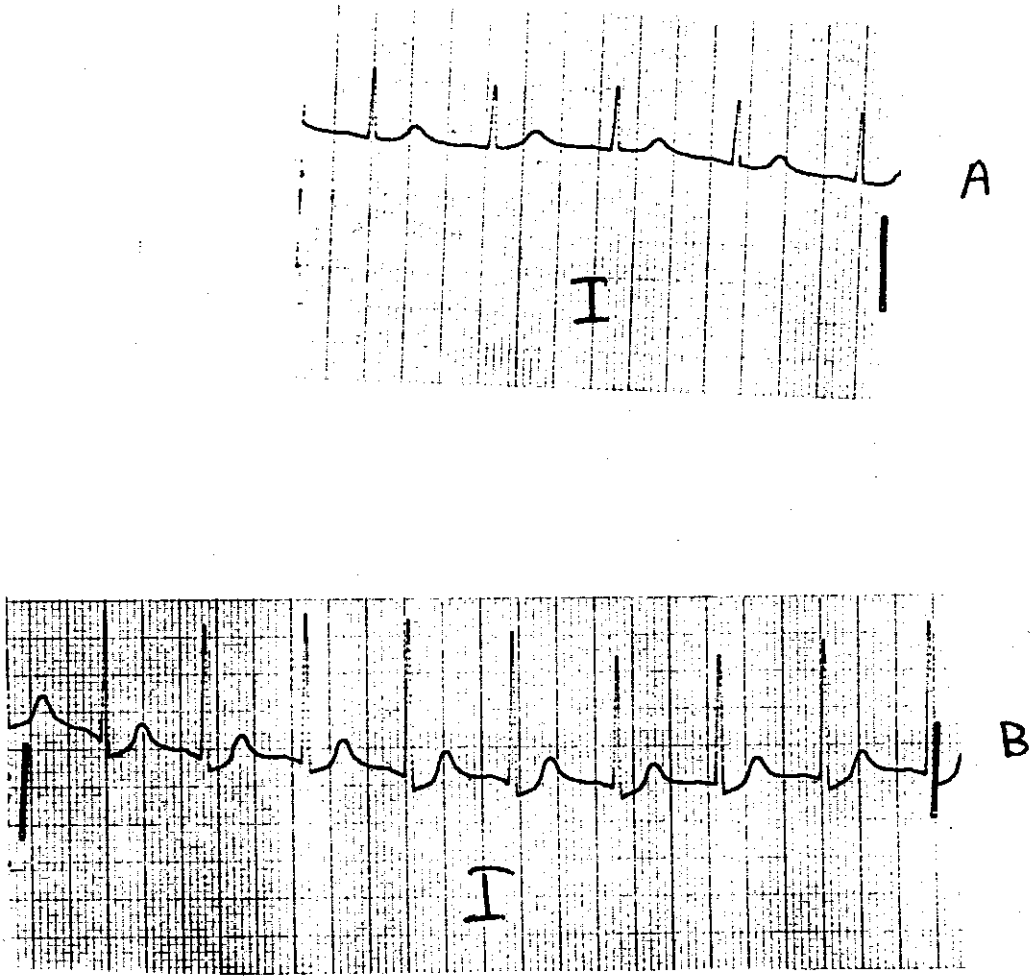


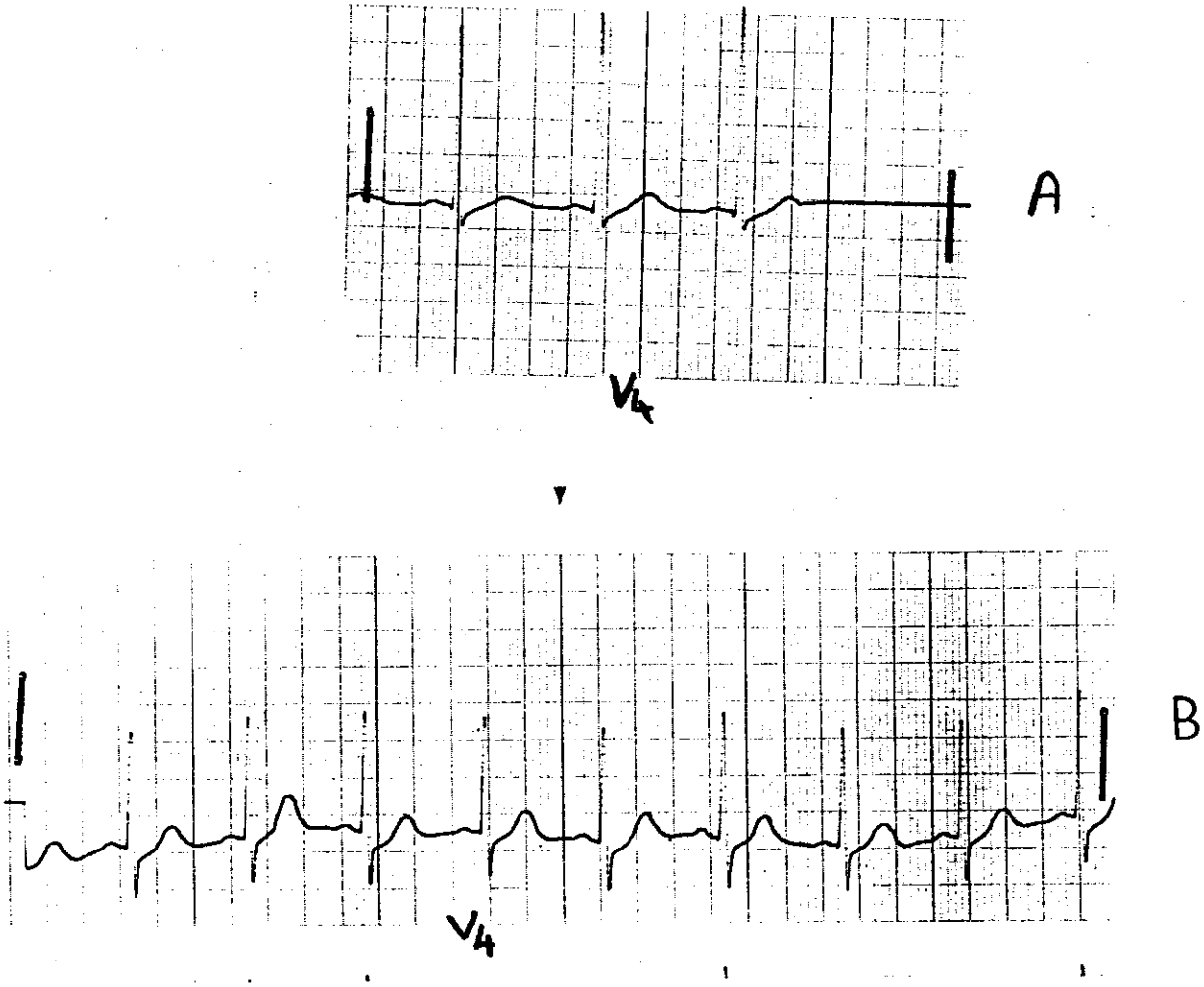
Fig. (5) : Electrocardiographic tracing of one of the diabetics without A.N. (case N. 9)



A : Resting E.C.G.

B : E.C.G. after exercise showing increase in R-wave ampitude and significant S-T segment depression.

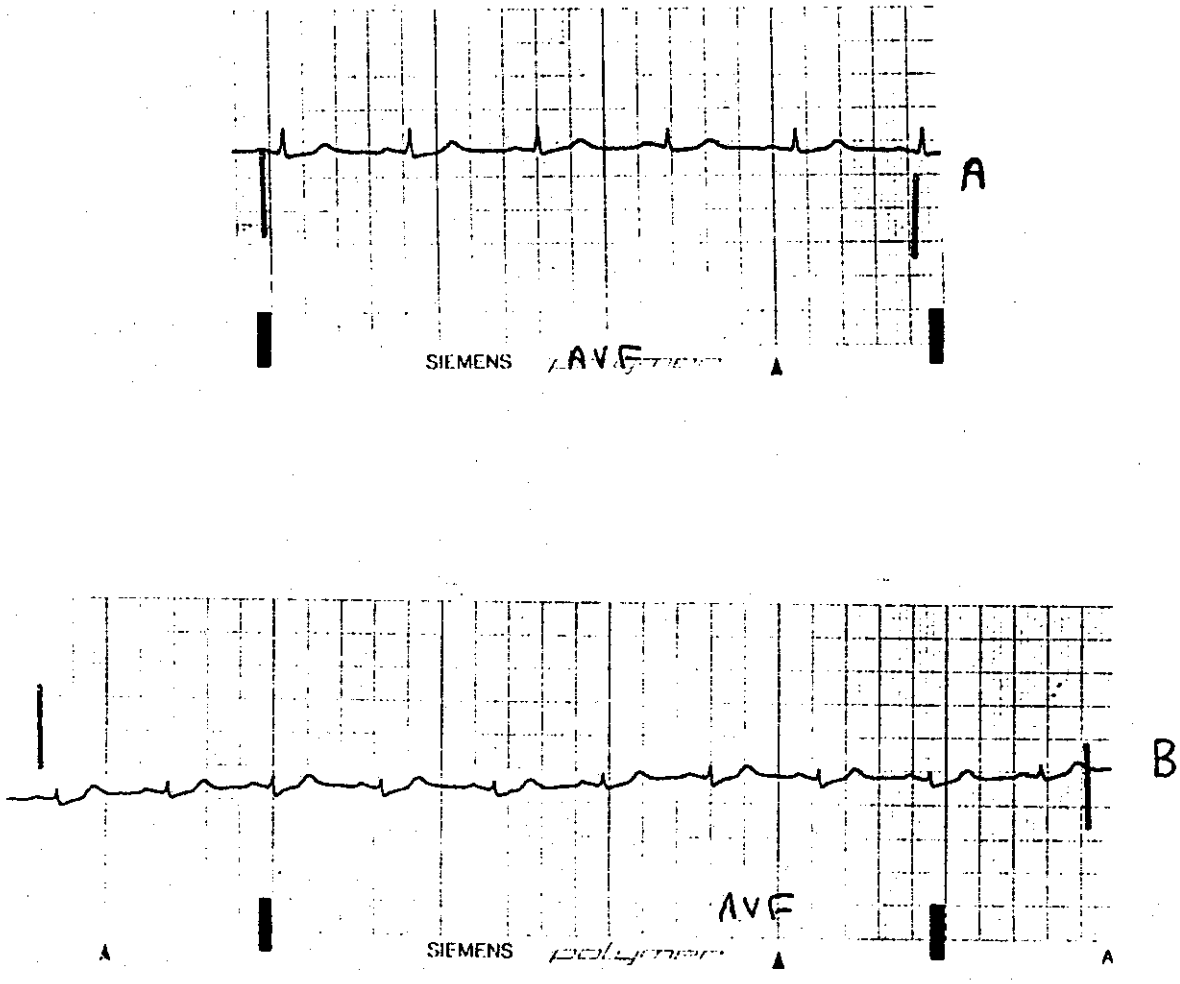
Fig. (6) : Electrocardiographic tracing of one of the diabetics with A.N. (case N. 16)



A : Resting E.C.G.

B : E.C.G. after exercise showing significant S-T segment depression.

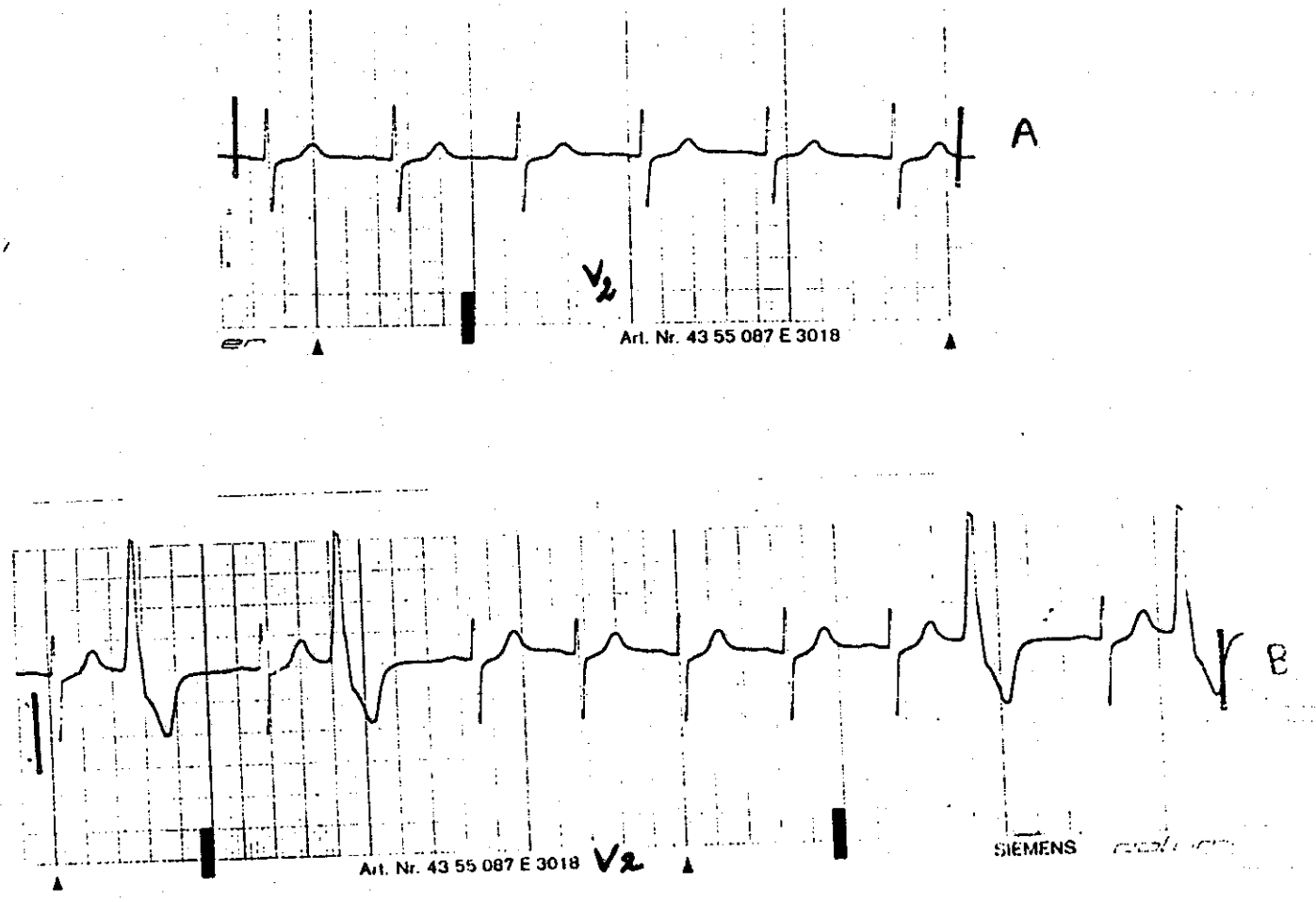
Fig. (7) : Electrocardiographic tracing of one of the control (case N. 17)



A : Resting E.C.G.

B : E.C.G. after exercise showing significant S.T segment depression.

Fig. (8) : Electrocardiographic tracing of one of the diabetics with A.N. (case N. 7)



A : Resting E.C.G.

B : E.C.G. after exercise showing multiple ventricular ectopics.