RESULTS

The present study included two main groups :

I- THE EFFECTS OF CORONARY LIGATION FOR 6 HOURS:

The parameters included were: The T wave voltage (mv), The T wave area (mm^2), the serum creatine phosphokinase (S CPK) (u/L) and the area of infarction as percent of left ventricle (% LV).

1- Control group (5 rats)

2- The effects of calcium channel blocker (verapamil) at a dose of 0.01 mg/100 gm rat body weight given intravenously as one bolus, immediately after coronary ligation on the changes induced by coronary ligation for 6 hours.

3- The effects of calcium gluconate given intraperitoneally in a dose of 0.12 mg/100 gm rat body weight immediately after coronary ligation on the changes induced by coronary ligation for 6 hours.

4- The effects of PGF2α at a dose of 0.015 mg/100 gm rat body weight given intraperitoneally immediately after coronary ligation on the changes induced by coronary

5- The effects of indomethacin treatment given intravenously in a dose of 0.06 mg/100 gm rat body weight (Triphathi & Kaushal, 1988), immediately after coronary ligation on the changes induced by coronary artery occlusion for 6 hours.

II- THE EFFECTS OF REPERFUSION AFTER CORONARY LIGATION:

The same parameters as group I were studied. This group was further subdivided according to the time interval between occlusion of the coronary artery and the onset of reperfusion into the following subgroups:

A) The reperfusion started 30 minutes after coronary occlusion.

B) The reperfusion started 60 minutes after the onset of coronary artery occlusion.

C) The reperfusion started 90 minutes after the onset of coronary artery occlusion.

D) The reperfusion started 2 hours after ligation of the coronary artery occlusion.

E) The reperfusion started 3 hours after ligation of the coronary artery.

Each of these subgroups was further devided into:

1- Effect of reperfusion.

2- Effect of reperfusion and calcium channel blocker.

3- Effect of reperfusion and calcium gluconate.

4- Effect of reperfusion and PGF$_{2\alpha}$.

5- Effect of reperfusion and indomethacin.

GROUP I:

1- The effects of left coronary artery ligation for 6 hours on the T wave voltage (mv), T wave area (mm^2), creatine phosphokinase (u/L) and infarction size (% LV):

The results are shown in Table 1 and Figures 1a & 1b. It can be seen that in this group the main left coronary artery was ligated for 6 hours. Before coronary ligation, the T wave voltage ranged between 0.15 and 0.20mv and the mean value was 0.166 ± 0.023 mv. After 30 minutes of coronary ligation the T wave voltage ranged between 0.28 and 0.40 mv, the mean value of T wave voltage was 0.342 ± 0.051 mv showing a significant increase compared with the value before coronary ligation ($P < 0.002$). After 60 minutes the T wave voltage ranged between 0.30and 0.45 mv and the mean value was increased to 0.38 ± 0.057 mv showing a significant increase compared with the value at 30 minutes ($P < 0.03$). 120 minutes after coronary

Table (1): The effects of ligation of the main left coronary artery on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV).

	T wave voltage (mv)					T wave area (mm^2)					S CPK level	Infarct area
	Time in mintes					Time in minutes					after	after
No.	0	30 L	60 L	120 L	360 L	0	30 L	60 L	120 L	360 L	6 hr	6 hr.
1	0.15	0.28	0.30	0.30	0.25	6	12	14	16	11	19980	60.0
2	0.15	0.30	0.35	0.35	0.25	5	10	16	15	11	21123	66.3
3	0.18	0.35	0.40	0.25	0.20	6	14	16	12	10	20135	70.2
4	0.20	0.40	0.40	0.30	0.23	8	17	18	13	11	21113	58.1
5	0.15	0.38	0.45	0.20	0.18	5	16	18	10	8	19889	60.0
Mean	0.166	0.342*	0.38**	0.28***	0.222*	6	13.8*	16.4**	13.2***	10.2*	20448	62.92
S.D	0.023	0.051	0.057	0.057	0.031	1.2	2.86	1.67	2.39	1.30	617.92	5.116
P<		0.002	0.03		0.05		0.002	0.05		0.002		

* Compared with the values before coronary ligation (time 0)

** Compared with the values at 30 minutes after coronary ligation (Time 30 L).

*** Compared with the values at 60 minutes after coronary ligation. (Time 60 L).

L = After coronary ligation.

Table (1a) : S CPK (u/L) in a group of normal rats.

No.	S CPK level u/L
1	300
2	288
3	320
4	276
5	334
MEAN	303.6 *
S.D	23.51

* When compared with the value of S CPK after 6 hours in rats subjected to permanent coronary occlusion P value was < 0.0001

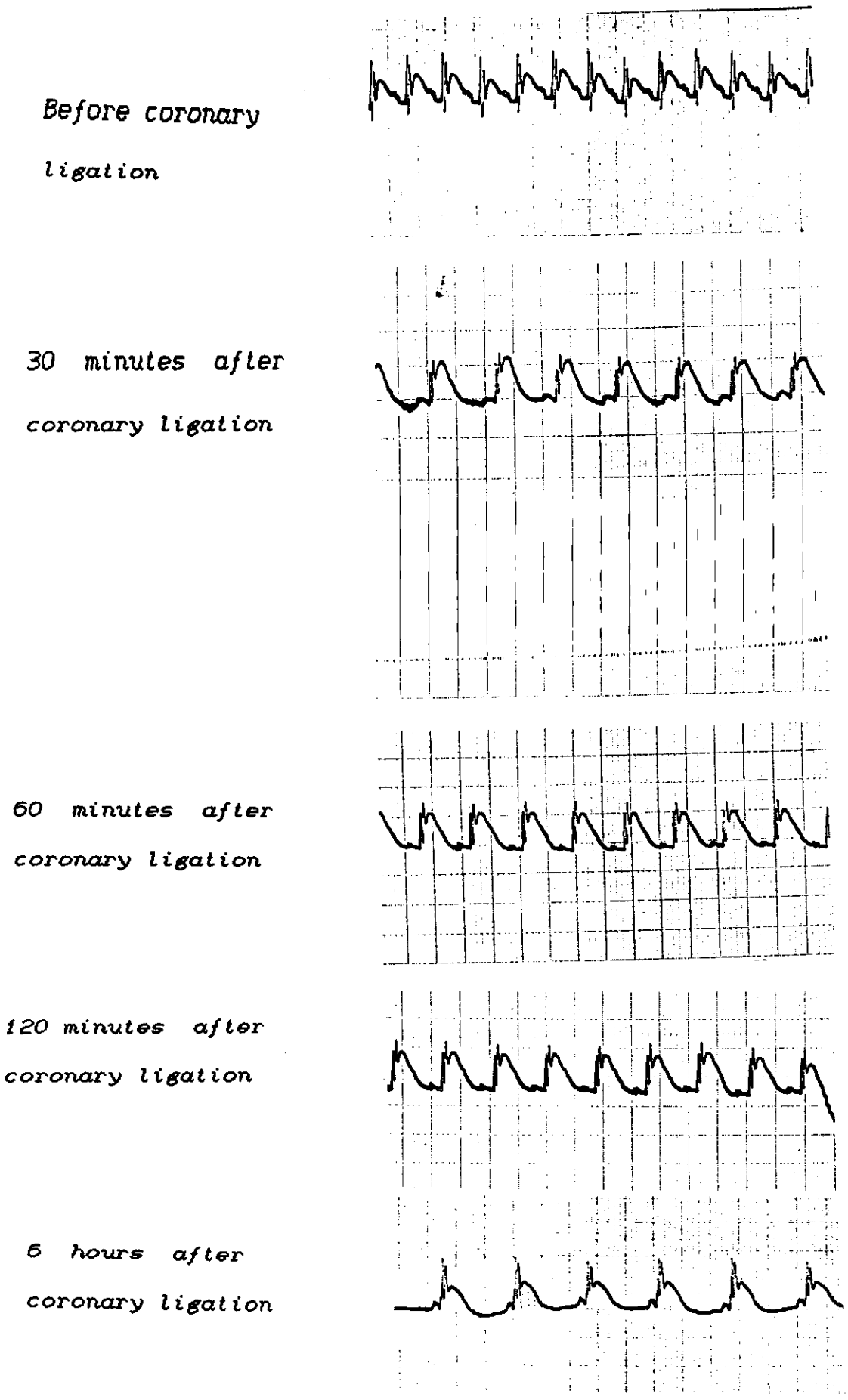
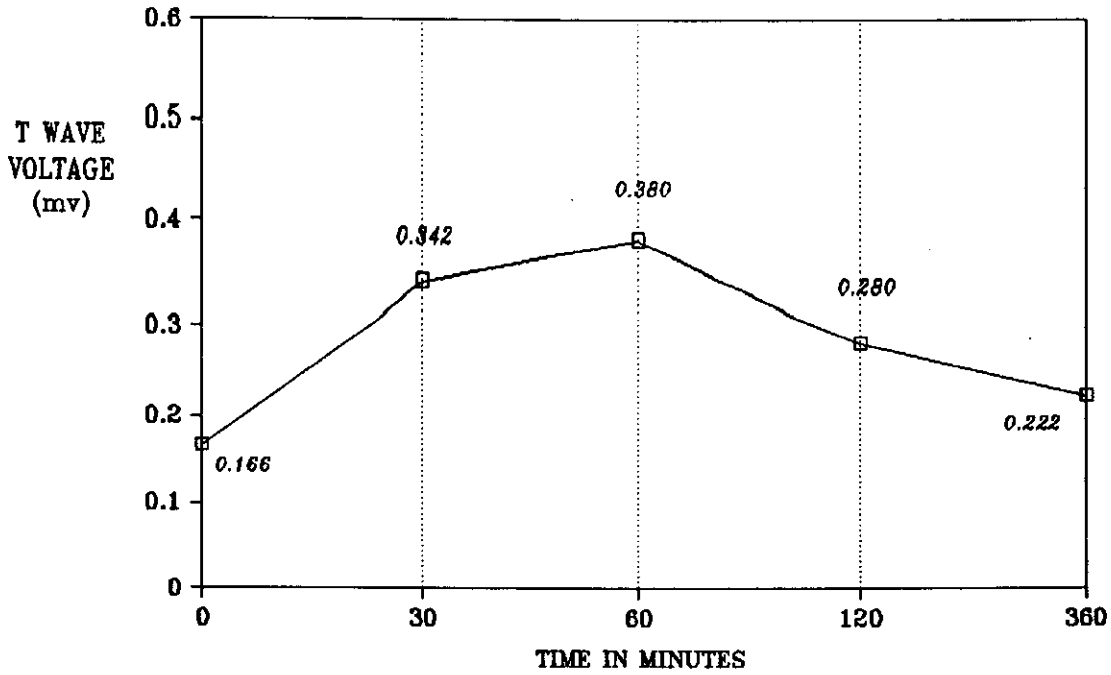


Figure (1a): *T wave amplitude and T wave area in rats subjected to main left coronary artery*

THE EFFECTS OF LIGATION OF THE MAIN LEFT CORONARY ARTERY ON T WAVE VOLTAGE AND T WAVE AREA



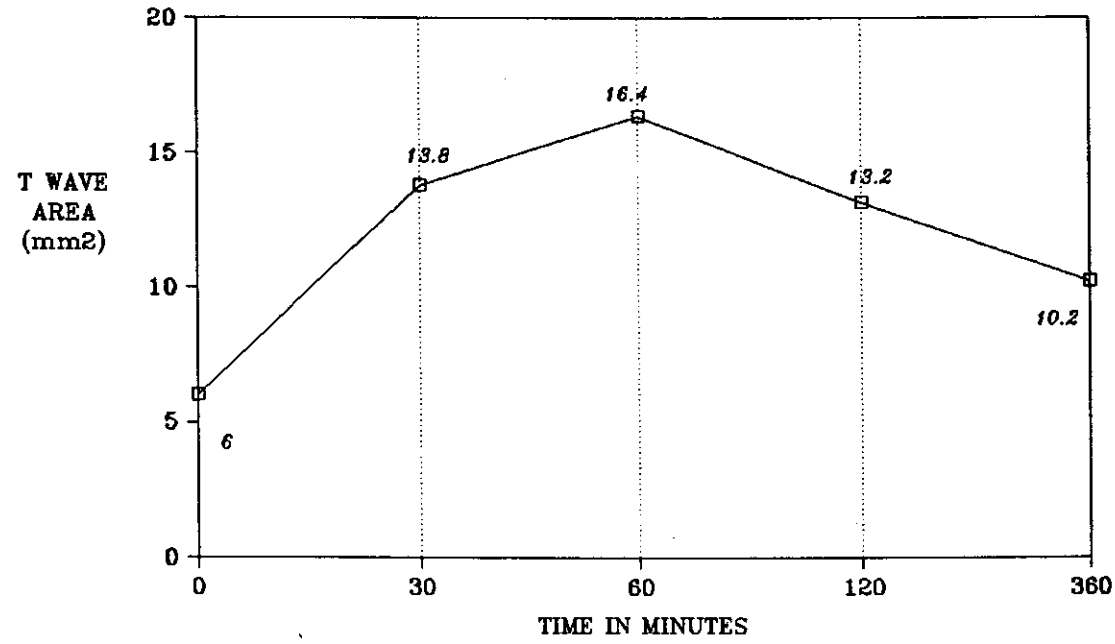


FIGURE 1b

ligation, the T wave voltage ranged from 0.2 to 0.35 mv and the mean value was 0.28 ± 0.057 mv. This value was not different from that at 60 minutes.At 6 hours of coronary ligation the T wave voltage ranged from 0.18 to 0.25 mv, while the mean value was 0.222 ± 0.031 mv, which was significantly higher than that before coronary ligation ($P < 0.05$). but significantly lower than the values 30 & 60 minutes after coronary ligation.

The T wave area showed similar pattern as the T wave voltage. Before coronary ligation, the T wave area ranged from 5 to 8 mm^2, the mean value was 6 ± 1.2 mm^2. The T wave area increased after 30 minutes to a value of 13.8 ± 2.86 mm^2 ($P < 0.002$), (the range was between 12 and 16 mm^2). After 60 minutes the T wave area ranged between 14 and 18 mm^2 with a mean value of 16.4 ± 1.67 mm^2. Comparing the values at 30 minutes and 60 minutes of coronary ligation, the area was found to be significantly increased($P < 0.05$). After 120 minutes of coronary ligation the T wave area ranged between 10 and 16 mm^2, the mean value was 13.2 ± 2.39 mm^2 which was not significantly different from the value at 60 minutes of coronary ligation ($P > 0.05$). At 6 hours of coronary ligation the T wave area ranged from 8 to 11 mm^2, the mean value was 10.2 ± 1.30 mm^2 which was significantly higher than the initial value before coronary ligation

(P < 0.002). As shown in Table (1) the serum creatine phosphokinase enzyme in this group of rats ranged from 19889 to 21123 u/L. The mean value was 20448 ± 617.92 u/L. This value is significantly high when compared with the value of S CPK in normal rats (P< 0.0001), Table (1a). The infarction size in this group of rats after 6 hours of coronary ligation ranged from 58.1 - 70.2 %LV. The mean value was 62.92 ± 5.116% LV.

2- The effects of the calcium channel blocker (verapamil) given at a dose of 0.01 mg/100 gm rat body weight intravenously immediately after coronary ligation:

The results are shown in Table (2) and Figures 2a & 2b. It can be seen that the T wave voltage, before coronary ligation, ranged between 0.15 and 0.23 mv, the mean value was 0.182± 0.034 mv. After 30 minutes of coronary ligation, the range was between 0.28 and 0.60mv, the mean value was 0.462 ± 0.133 mv, showing a significant increase when compared with the value before coronary ligation (P < 0.01). After 60 minutes, the range was between 0.30 and 0.65 mv, the mean value was 0.494 ± 0.141 mv. Comparing values at 30 and 60 minutes, no significant change was observed (P > 0.05). 120 minutes after coronary ligation, the T wave voltage ranged from

Table (2): The effects of calcium channel blocker (verapamil) at a dose of 0.01 mg/100 gm rat body weight (i.v.) given immediately after coronary ligation, on T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary artery occlusion for 360 minutes.

	T wave voltage (mv)					T wave area (mm^2)					S CPK level	Infarct area
	Time in mintes					Time in minutes					after 6 hr	after 6 hr.
No.	0	0 L	60 L	120 L	360 L	0	30 L	60 L	120 L	360 L		
1	0.18	0.60	0.65	0.70	0.15	6	18	24	32	13	19120	60.2
2	0.15	0.38	0.40	0.50	0.18	5	18	25	30	10	19356	61.0
3	0.15	0.28	0.30	0.30	0.25	5	20	24	32	12	18450	58.0
4	0.23	0.48	0.55	0.43	0.13	8	16	23	31	12	21301	57.5
5	0.20	0.57	0.57	0.55	0.15	7	19	25	30	11	20332	59.3
Mean	0.182	0.462 "	0.494 ""	0.496 """	0.172 "	6.2	18.2 "	24.2 ""	31 """	11.6 "	19711.6	59.2
S.D	0.034	0.133	0.141	0.148	0.047	1.3	1.48	0.84	1	1.14	1115.7	1.47
P <		0.01					0.001	0.001	0.001	0.001		

" Compared with the values before coronary ligation (time 0)

"" Compared with the values at 30 minutes after coronary ligation. (Time 30 L).

""" Compared with the values at 60 minutes after coronary ligation. (Time 60 L).

L = After coronary ligation.

i.v.= intravenously

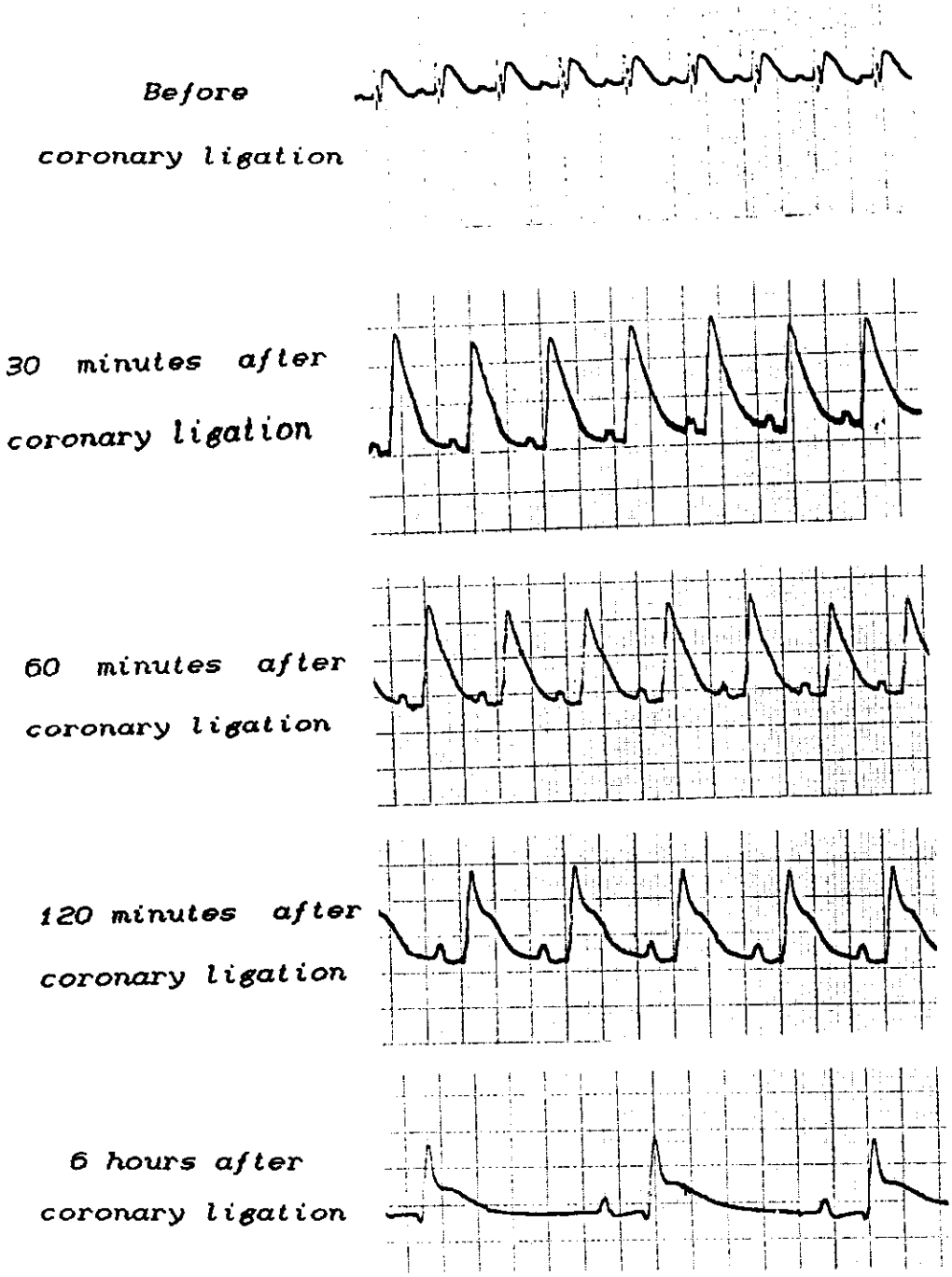
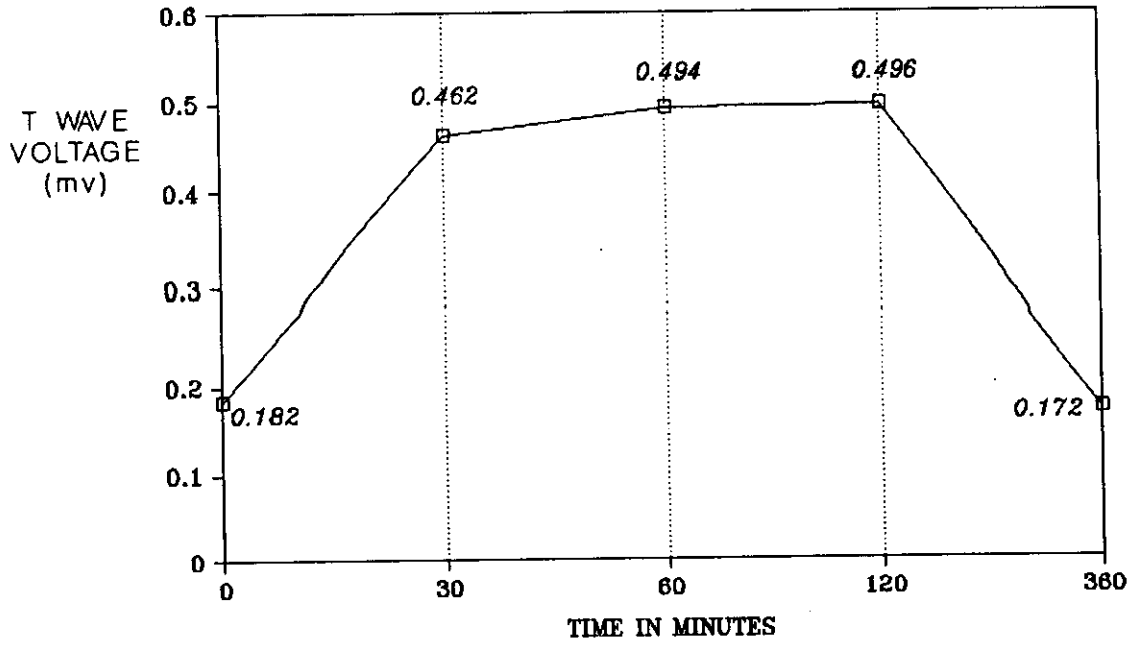
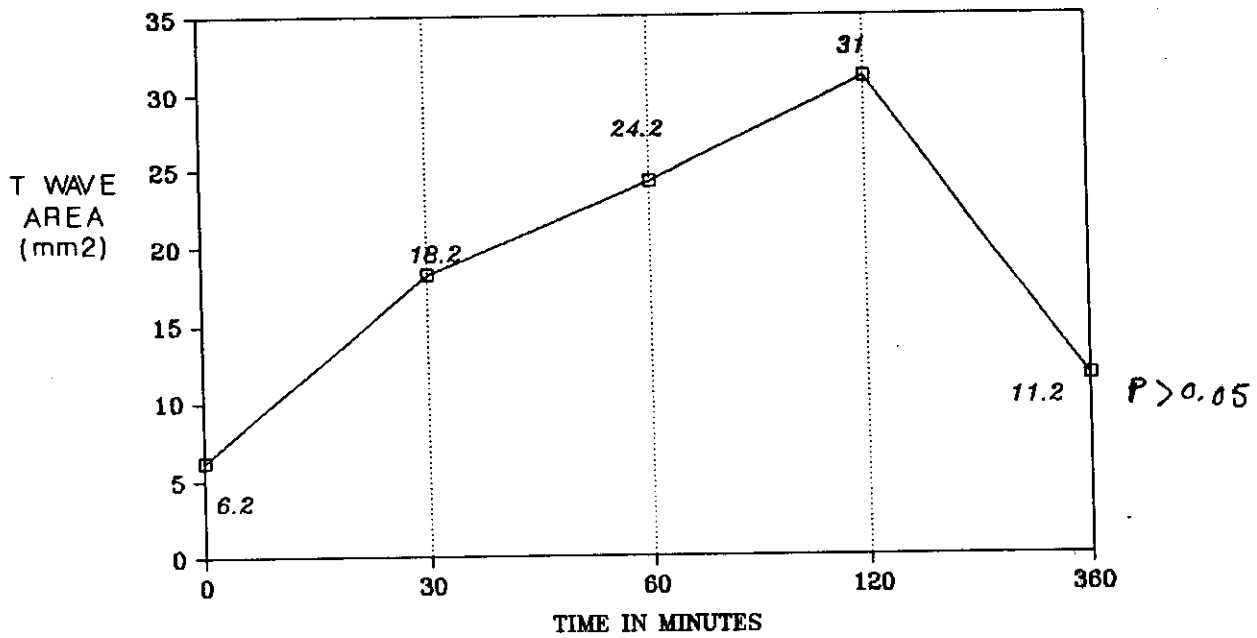


Figure (2a): *Effects of calcium channel blocker (verapamil) on T wave voltage, T wave area in rats subjected to coronary artery ligation for 6 hours.*

THE EFFECTS OF CALCIUM CHANNEL BLOCKER (VERAPAMIL) ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO CORONARY ARTERY OCCLUSION FOR 6 HOURS





$P > 0.05$

FIGURE 2b

0.30 to 0.70 mv, the mean value was 0.496 ± 0.148 mv which was not significantly different from that at 60 minutes of coronary ligation. After 6 hours, the T wave voltage ranged between 0.13 and 0.25 mv, the mean value was 0.172 ± 0.047 mv which was not different from the value before coronary ligation ($P > 0.05$).

The T wave area, before coronary ligation, ranged between 5 and 8 mm^2, the mean value was 6.2 ± 1.30mm^2. 30 minutes after coronary ligation, the range was between 16 and 20 mm^2, the mean value was 18.2 ± 1.48 mm^2 showing a significant increase compared with the value before coronary ligation ($P < 0.001$). 60 minutes after coronary ligation, the area ranged between 23 and the 25 mm^2, the mean value was 24.2 ± 0.84 mm^2,showing a significant increase compared with the value at 30 minutes of coronary ligation ($P < 0.001$). 120 minutes after coronary ligation the T wave area ranged from 30 to 32 mm^2 the mean value was 31 ± 1 mm^2. This value was significantly high when compared with corresponding value at 60 minutes of coronary ligation ($P < 0.001$). After 6 hours of coronary ligation, the range of the T wave area was between 10 and 13 mm^2, the mean value was 11.6 ± 1.14 mm^2 which was still significantly higher than the value before coronary ligation ($P < 0.002$).

As shown from Table (2), the S CPK in this group ranged between 18450 - 21301 u/L with a mean value 19711.8 ± 1115.7 u/L

The infarction size ranged between 57.5 - 61% LV with a mean value 59.2 ± 1.47%.

3- The effects of calcium gluconate given at a dose of 0.12 mg/100 gm rat body weight injected intra-peritoneally:

The results are shown in Table (3) and Figures(3a & 3b). It can be seen that the T wave voltage, before coronary ligation, ranged between 0.13 and 0.20mv, the mean value was 0.162 ± 0.028mv. After 30 minutes of coronary ligation, the T wave voltage ranged between 0.30 and 0.55 mv, the mean value was 0.46 ± 0.096 mv, showing a significant increase compared with the value before coronary ligation ($P < 0.005$) . 60 minutes after coronary ligation, the range of the T wave voltage was between 0.35 and 0.65 mv, the mean value was 0.516 ± 0.116mv. Comparing values at 30 and 60 minutes of coronary ligation the T wave voltage showed no change ($P > 0.05$). 120 minutes after coronary ligation the T wave voltage ranged from 0.30 to 0.60 mv, the mean value was 0.48 ± 0.11 mv, this value was significantly lower than

Table (3): The effects of calcium gluconate (0.12 mg/100 gm rat body weight given I.P immediately after the coronary ligation) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary ligation for 6 hours.

	T wave voltage (mv)					T wave area (mm^2)					S CPK level	Infarct area
	Time in mintes					Time in minutes					after 6 hr	after 6 hr.
No.	0	30 L	60 L	120 L	360 L	0	30 L	60 L	120 L	360		
1	0.18	0.30	0.35	0.30	0.30	6	16	18	16	15	19800	55.0
2	0.15	0.45	0.48	0.48	0.48	5	13	13	19	19	20132	58.0
3	0.15	0.55	0.60	0.55	0.50	5	24	22	21	20	21135	63.0
4	0.13	0.50	0.65	0.60	0.40	4	23	30	25	18	21311	60.0
5	0.20	0.50	0.50	0.48	0.38	8	19	22	20	16	19500	59.5
Mean	0.162	0.46 "	0.516 ""	0.48 """	0.412 "	5.6	19 "	21 ""	20.2 """	17.6 "	20375.6	59.1
S.D	0.028	0.096	0.116	0.11	0.081	1.5	4.64	6.24	3.27	2.07	807.62	2.92
P <		0.005		0.01	0.005		0.002		0.03	0.002		

" Compared with the values before coronary ligation (time 0)

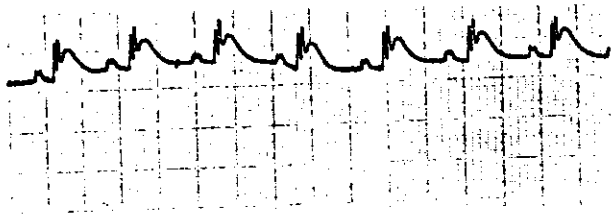
"" Compared with the values at 30 minutes after coronary ligation. (Time 30 L).

""" Compared with the values at 60 minutes after coronary ligation. (Time 60 L).

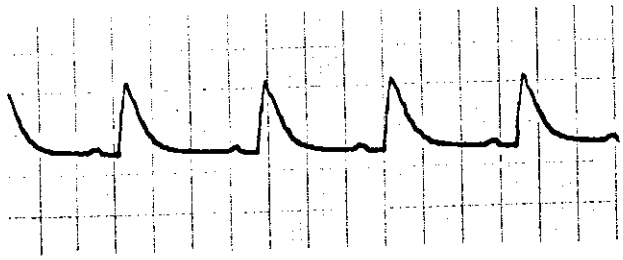
L = After coronary ligation.

I.P = Intraperitoneally.

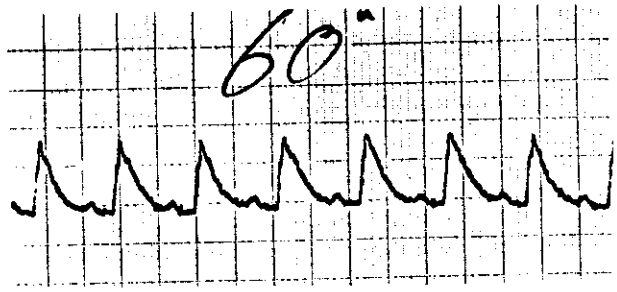
Before coronary ligation



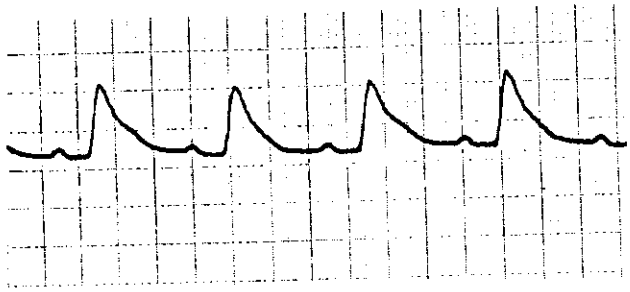
30 minutes after coronary ligation



60 minutes after coronary ligation



120 minutes after coronary ligation



6 hours after coronary ligation

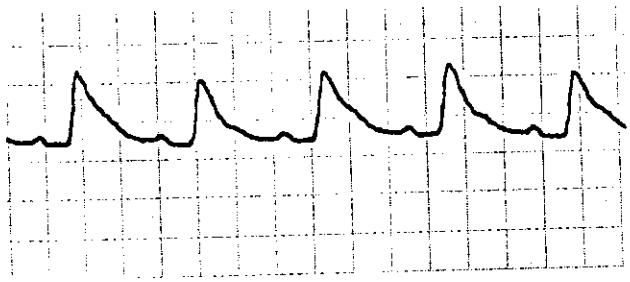
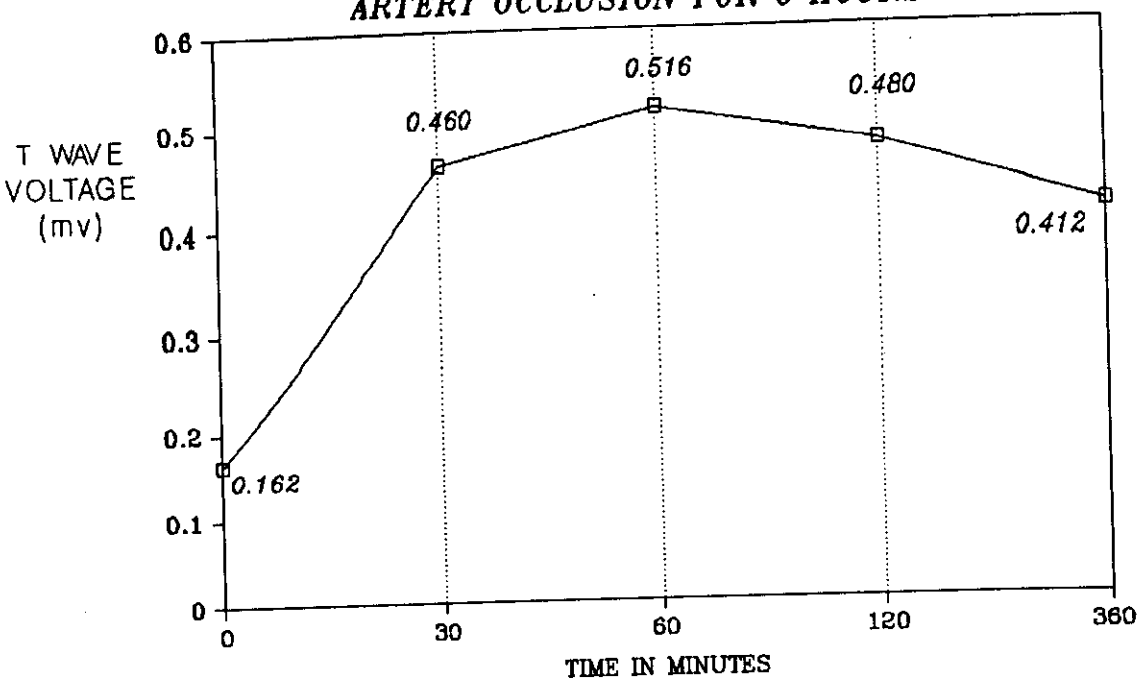


Figure (3a): *Effects of calcium gluconate on T wave voltage, T wave area in rats subjected to coronary artery ligation for 6 hours.*

THE EFFECTS OF CALCIUM GLUCONATE ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO CORONARY ARTERY OCCLUSION FOR 6 HOURS



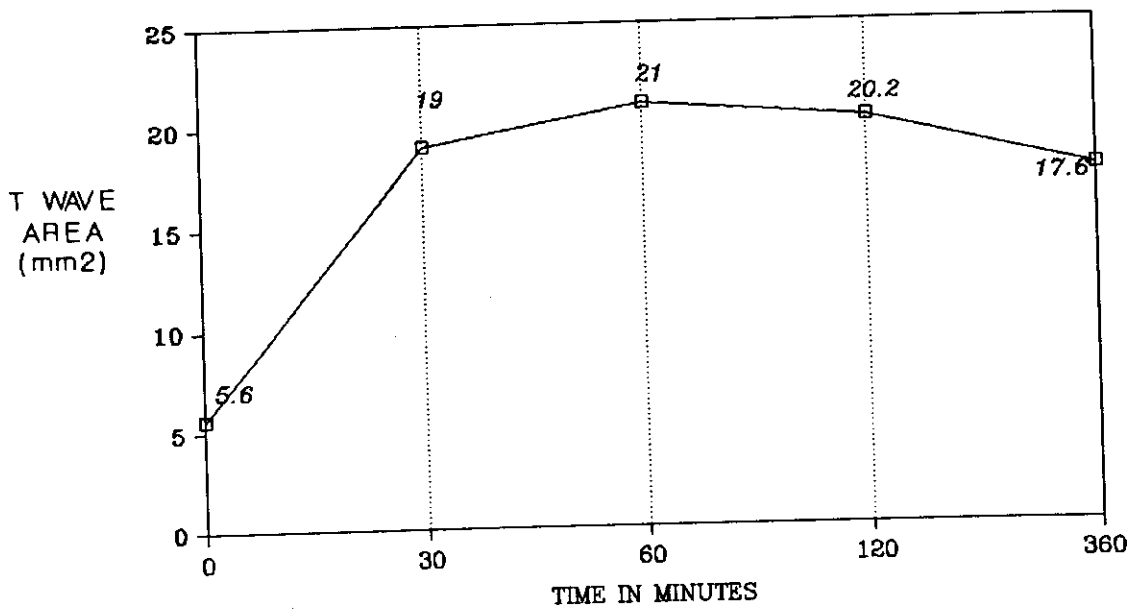


FIGURE 3b

that at 60 minutes ($P < 0.01$). Six hours of coronary ligation, the range of the T wave voltage was between 0.30 and 0.50 mv, the mean value was 0.412 ± 0.081 mv which was significantly higher than the value before coronary ligation ($P < 0.005$).

The T wave area, before coronary ligation, was ranging between 4 and 8 mm^2, the mean value was 5.6 ± 1.5 mm^2. After 30 minutes of coronary ligation, the range was between 13 and 24 mm^2, the mean value was 19.0 ± 4.64 mm^2, showing a significant increase compared with the value before coronary ligation ($P < 0.002$). 60 minutes after coronary ligation, the range was between 13 and 30 mm^2 with a mean value of 21 ± 6.24 mm^2 which was not different from that value at 30 minutes of coronary ligation ($P > 0.05$). 120 minutes after coronary ligation the T wave area ranged from 16 to 25 mm^2, the mean value was 20.2 ± 3.27 mm^2. This value was significantly lower than the corresponding value at 60 minutes of coronary ligation ($P < 0.03$). 6 hours after coronary ligation, the T wave area ranged between 15 and 20 mm^2, the mean value was 17.6 ± 2.07 mm^2 which was significantly higher than the value before coronary ligation ($P < 0.002$).

The serum CPK in this group ranged between 19500 - 21311 u/L with a mean value 20375.6 ± 807.62 u/L. While the infarction size ranged between 55 - 63% LV with a mean value 59.1 ± 2.92% LV.

4- The effects of PGF2α (0.015 mg/100 gm rat body weight injected intraperitoneally immediately after coronary ligation in rats subjected to left coronary artery occlusion:

The results are shown in Tabel (4) and Figures (4a & 4b). It can be seen that in this group before coronary ligation the T wave voltage ranged between 0.10 and 0.20 mv, the mean value was 0.152 ± 0.040 mv. After 30 minutes of coronary ligation, the range was between 0.30 and 0.50 mv, the mean value was 0.386 ± 0.077 mv showing a significant increase when compared with the value before coronary ligation ($P < 0.0001$). 60 minutes after coronary ligation, the range was between 0.40 and 0.50 mv, the mean value was 0.426 ± 0.043 mv. This value was

Table (4): The effects of pretreatment with PGF2α (0.015) mg/100 gm rat body weight given I.P. immediately after coronary ligation) on T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary occlusion for 360 minutes.

	T wave voltage (mv)					T wave area (mm^2)					S CPK level	Infarct area
	Time in mintes					Time in minutes					after	after
No.	0	30 L	60 L	120 L	360 L	0	30 L	60 L	120 L	360	6 hr	6 hr.
1	0.15	0.50	0.50	0.43	0.18	5	15	18	13	6	19900	58.7
2	0.13	0.33	0.40	0.33	0.20	4	12	12	8	7	19002	61.2
3	0.20	0.40	0.40	0.38	0.20	6.5	14	13	10	6	19988	63.0
4	0.10	0.30	0.40	0.38	0.18	3	11	13	10	4	20100	65.0
5	0.18	0.40	0.43	0.40	0.25	5	14	13	12	8	20870	61.3
Mean	0.152	0.386 "	0.426 ""	0.384 """	0.202 "	4.7	13.2 "	13.8 ""	10.6 """	6.2 "	19972	61.84
S.D	0.040	0.077	0.043	0.036	0.029	1.3	1.64	2.39	1.95	1.48	665.04	2.34
P <	0.0001		0.03			0.0001		0.01				

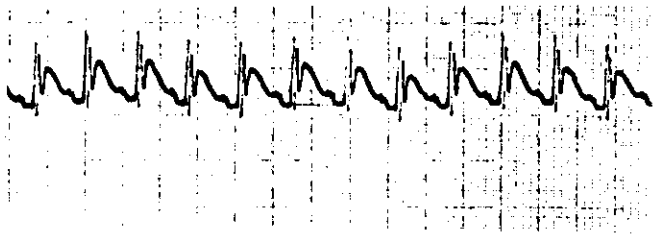
" Compared with the values before coronary ligation (time 0)

"" Compared with the values at 30 minutes after coronary ligation. (Time 30 L).

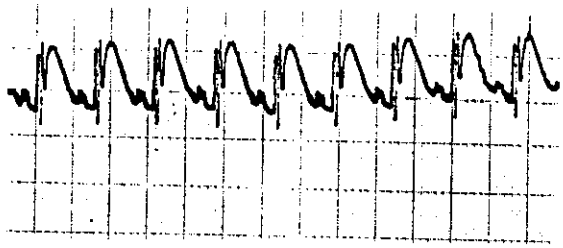
""" Compared with the values at 60 minutes after coronary ligation (Time 60 L).

L = After coronary ligation.

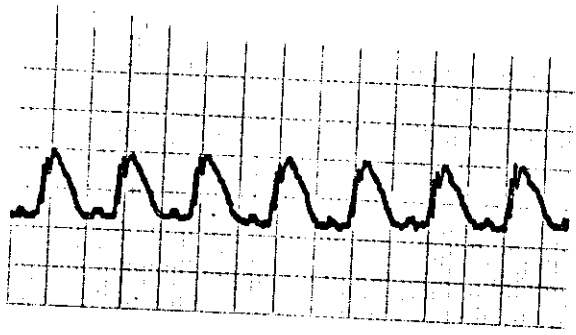
Before coronary ligation



30 minutes after coronary ligation

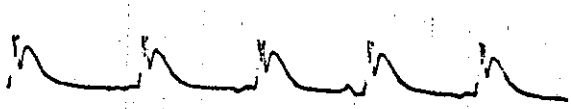


60 minutes after coronary ligation

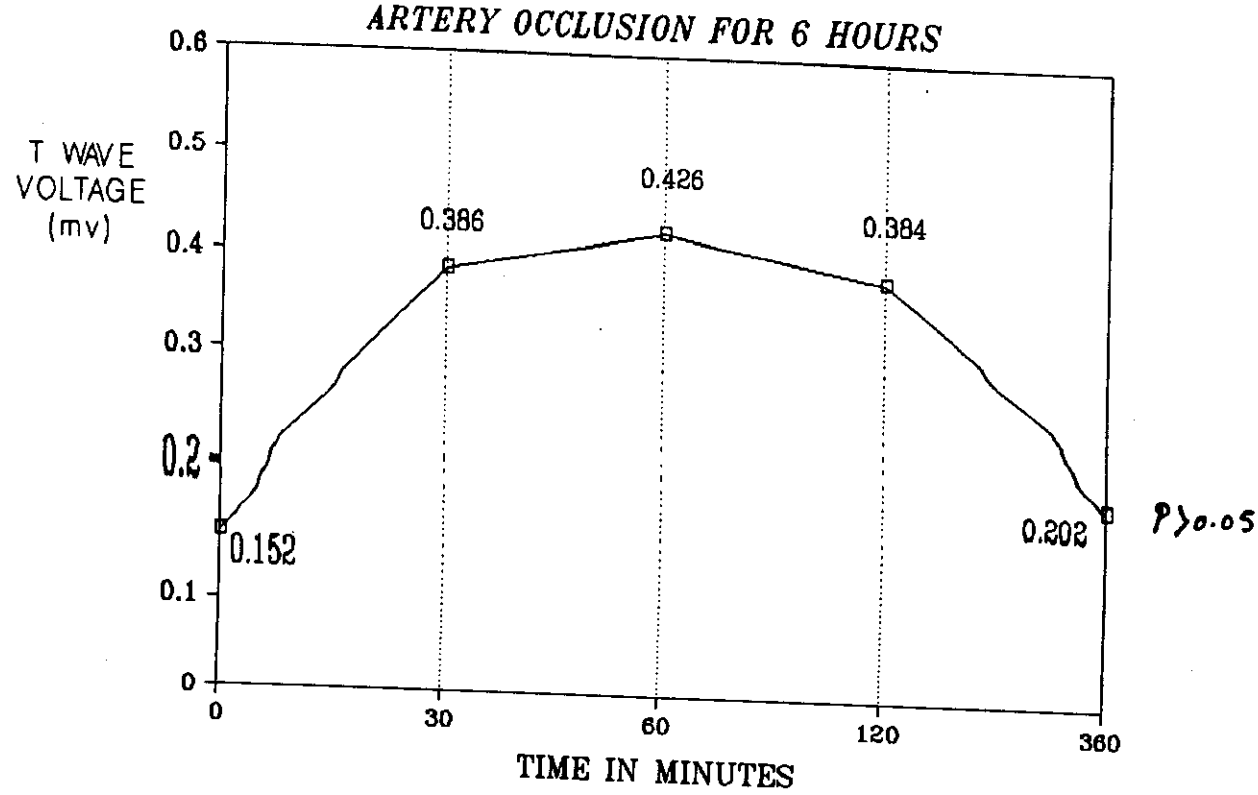


120 minutes after coronary ligation

6 hours after coronary ligation



THE EFFECTS OF PGF2α ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO CORONARY ARTERY OCCLUSION FOR 6 HOURS



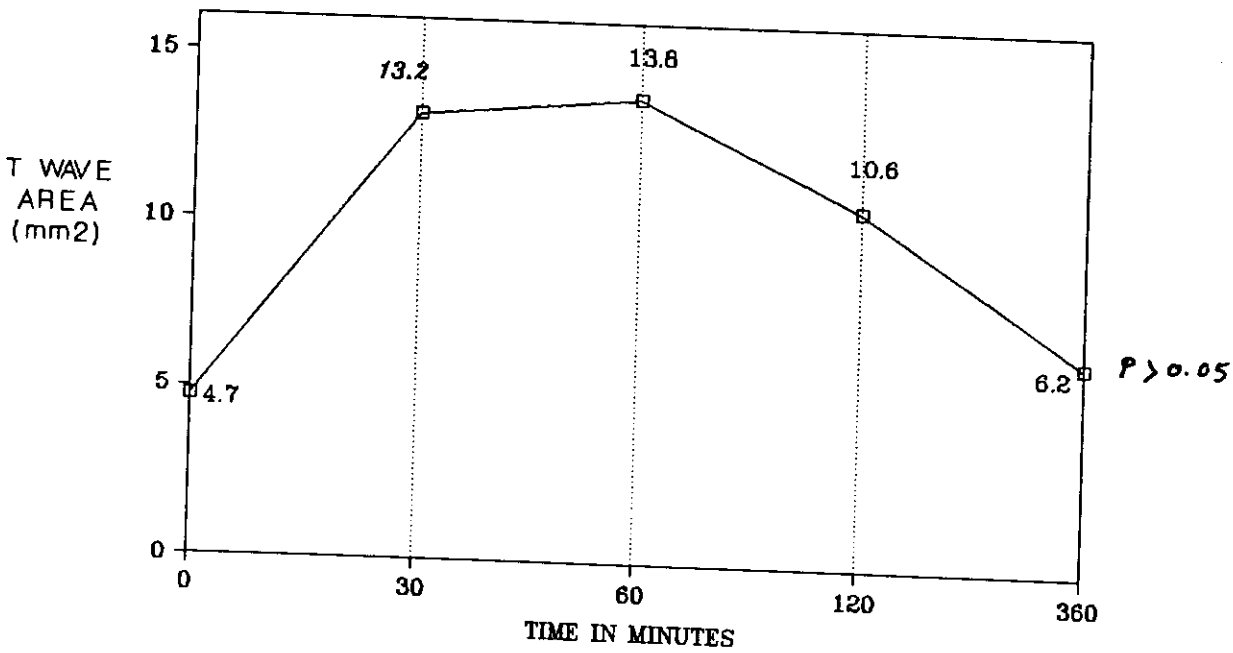


FIGURE 4b

between 0.18 and 0.25 mv, the mean value was 0.202 ± 0.029 mv. This value was not different from that before coronary ligation ($P > 0.05$).

The T wave area, before coronary ligation, ranged between 3 and 6.5 mm^2, the mean value was 4.7 ± 1.30 mm. After 30 minutes of coronary ligation the range was 11 to 15 mm^2, the mean value was 13.2 ± 1.64 mm^2, showing a significant increase when compared with the value before coronary ligation ($P < 0.0001$). 60 minutes after coronary ligation, the range was between 12 and 18 mm^2, the mean value was 13.8 ± 2.39 mm^2. This value was not different from that at 30 minutes of coronary ligation ($P > 0.05$). Two hours after coronary ligation, the range was between 8 and 13 mm^2, the mean value was 10.6 ± 1.95 mm^2, showing a significant decrease when compared with the corresponding value at 60 minutes of coronary ligation ($P < 0.01$). 6 hours after coronary ligation the range was between 4 and 8 mm^2, the mean value was 6.2 ± 1.48 mm^2. This value was not different from that before coronary ligation ($P > 0.05$)

The S CPK levels ranged between 19002 & 20870, with a mean value 19972 ± 665.04 u/L. While the

infarction size ranged between 58.7 & 65% LV with a mean value 61.84 ± 2.34% LV.

5- The effects of indomethacin given intravensously at a dose 0.06 mg/100 gm rat body weight immediately after coronary ligation :

The results are shown in Table (5) and Figures(5a & 5b). It can be seen that in this subgroup of permanent coronary ligation the T wave voltage, before coronary ligation, ranged between 0.13 and 0.23 mv, the mean value was 0.178 ± 0.039 mv. After 30 minutes of coronary ligation, the T wave voltage ranged between 0.40 and 0.55 mv, the mean value was 0.462 ± 0.057 mv showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). After 60 minutes of coronary ligation, the range was between 0.43 and 0.55 mv, the mean value was 0.476 ± 0.049 mv which was not different from that value at 30 minutes ($P > 0.05$). 2 hours after coronary ligation, the range was between 0.43 and 0.50 mv, the mean value was 0.456 ± 0.026 mv which was not different from that value at 60 minutes ($P > 0.05$). 6 hours after coronary ligation the values did not differ from those at 2 hours i.e. the range of the T wave voltage was between 0.43 and 0.50 mv, the mean value was 0.456 ± 0.026 mv . However, this value was

Table (5): The effects of pretreatment with indomethacin (0.06mg/100 gm rat body weight given i.v. immediately after coronary ligation) on T wave voltage (mv), T wave area (mm^2), S CPK (u/L) in rats subjected to coronary occlusion for 6 hours.

	T wave voltage (mv)					T wave area (mm^2)					S CPK level after 6 hr.	Infarct area after 6 hr.
	Time in mintes					Time in minutes						
No.	0	30 L	60 L	120 L	360 L	0	30 L	60 L	120 L	360		
1	0.20	0.55	0.55	0.50	0.50	7	22	26	25	30	27000	74.0
2	0.15	0.40	0.43	0.43	0.43	5	17	22	22	27	26363	76.0
3	0.18	0.45	0.45	0.45	0.45	7	21	24	24	27	26495	73.0
4	0.23	0.48	0.50	0.45	0.45	8	22	28	27	28	25981	71.0
5	0.13	0.43	0.45	0.45	0.45	4	20	25	27	30	26202	76.5
Mean	0.178	0.462 "	0.476 ""	0.456 """	0.456 "	6.2	20.4 "	25 ""	25 """	28.4 "	26408.2	74.1
S.D	0.039	0.057	0.049	0.026	0.026	1.6	2.07	2.23	2.12	1.52	382.37	2.25
P <		0.001			0.0001		0.0001	0.001		0.0001		

" Compared with the values before coronary ligation (time 0)

"" Compared with the values at 30 minutes after coronary ligation (Time 30 L).

""" Compared with the values at 60 minutes after coronary ligation (Time 60 L).

L = After coronary ligation.

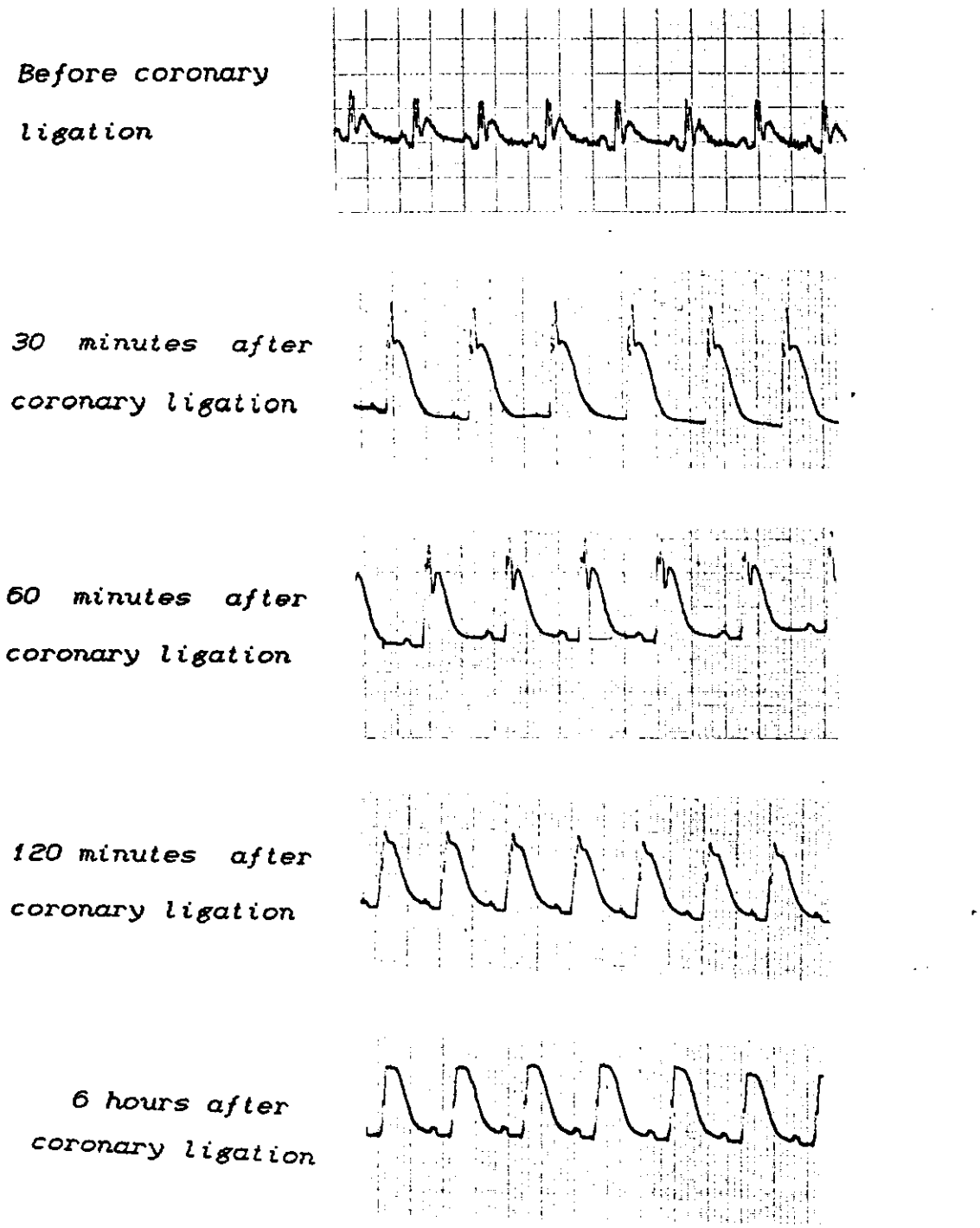
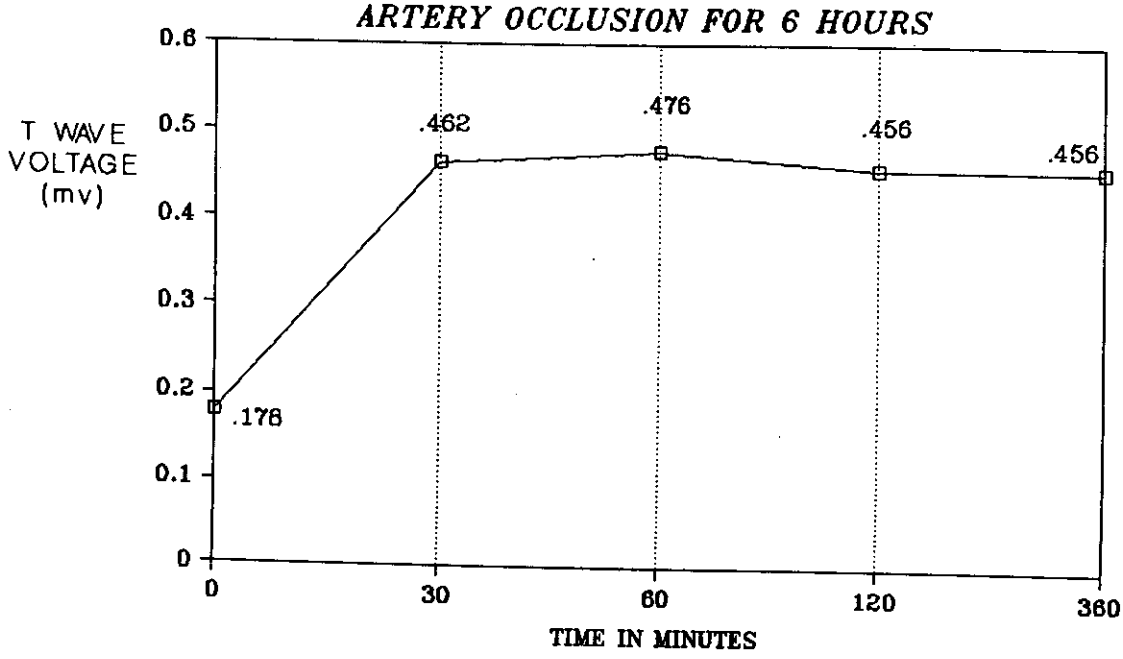


Figure (5a): *Effects of indomethacin on T wave amplitude, T wave area in rats subjected to coronary artery ligation for 6 hours.*

THE EFFECTS OF INDOMETHACIN ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO CORONARY ARTERY OCCLUSION FOR 6 HOURS



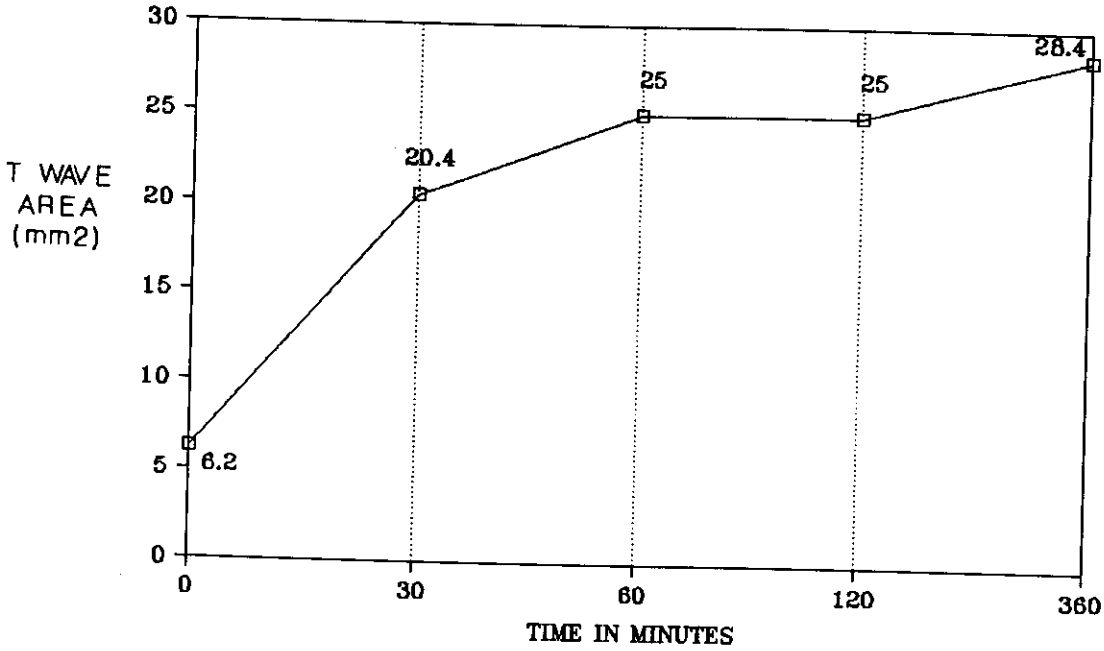


FIGURE 6b

significantly higher than the initial value before coronary ligation ($P < 0.0001$).

The T wave area, before coronary ligation, ranged between 4 and 8 mm^2, the mean value was 6.2 ± 1.6 mm^2. 30 minutes after coronary ligation, the range was between 17 and 22 mm^2, the mean value was 20.4 ± 2.07 mm^2 showing a significant increase when compared with the value before coronary ligation ($P < 0.0001$). After 60 minutes of coronary ligation, the range was between 22 and 28 mm^2, the mean value was 25 ± 2.23 mm^2 which was significantly higher than that at 30 minutes of coronary ligation($P < 0.001$). Two hours after coronary ligation, the range of the area was between 22 and 27 mm^2, the mean value was 25 ± 2.12 mm^2 which was not different from that value at 60 minutes of coronary ligation ($P > 0.05$). Six hours after coronary ligation, the range was between 27 and 30 mm^2 with a mean value of 28.4 ± 1.52 mm^2.This value was significantly higher than the initial value before coronary ligation ($P < 0.0001$).

The S CPK level in this indomethacin treated rats ranged between 25981 & 27000 u/L with a mean value 26408.2 ± 382.37 u/L. The infarction size in this group

ranged between 71 & 76.5% LV with a mean value of 74.1 ± 2.25% LV.

Table 6 compares the means and standard deviations of the results of all the subgroups included in group I. It shows that in calcium channel blocker treated group there was a significant increase in T wave area at 30 , 60 and 120 minutes when compared with the non treated group ($P < 0.05$). Also the Table 6 shows that in calcium gluconate treated group there was a significant increase in both the T wave voltage and area at 30, 60, 120 minutes and 6 hours ($P < 0.05$). In the $PGF_{2\alpha}$ treated group there was a significant increase in T wave voltage at 120 minutes while it caused a significant decrease in T wave area at 6 hours from coronary occlusion. In indomethacin treated group there was a significant increase in T wave voltage and area at 30, 60, 120 minutes and 6 hours from coronary ligation ($P < 0.05$). Also indomethacin caused a significant increase in both S CPK and infarction size after 6 hours of coronary occlusion ($P < 0.05$) (see Figure 6).

Table (6): Means & standard deviation of T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in all subgroups included in group I .

Subgroup	T wave voltage (mv)					T wave area (mm^2)					S CPK (u/L)	Inf. size (%LV)
	Time after coronary ligation					Time after coronary ligation						
	0	30 min	60 min	2 hrs.	6 hrs.	0	30 min	60 min	2 hrs.	6 hrs.	after 6 hrs.	
Non treated rats	0.166 ± 0.023	0.342 ± 0.051	0.380 ± 0.057	0.280 ± 0.057	0.222 ± 0.031	6.00 ± 1.20	13.80 ± 2.86	16.40 ± 1.67	13.20 ± 2.39	10.20 ± 1.30	20448.0 ± 617.92	62.92 ± 5.116
C.C.B pretreated rats	0.182 ± 0.034	0.462 ± 0.133	0.494 ± 0.141	0.496* ± 0.148	0.172 ± 0.047	6.20 ± 1.30	18.20* ± 1.48	24.20* ± 0.84	31.00* ± 1.00	11.60 ± 1.14	19711.8 ± 1115.7	59.20 ± 1.470
Calcium Gl pretreated rats	0.162 ± 0.028	0.460* ± 0.096	0.516* ± 0.116	0.480* ± 0.110	0.412* ± 0.081	5.60 ± 1.50	19.00* ± 4.64	21.00* ± 6.24	20.20* ± 3.27	17.60* ± 2.07	20375.6 ± 807.62	59.10 ± 2.920
PGF2α pretreated rats	0.152 ± 0.040	0.386 ± 0.077	0.426 ± 0.043	0.384* ± 0.036	0.202 ± 0.029	4.70 ± 1.30	13.20 ± 1.64	13.80 ± 2.39	10.60 ± 1.95	6.20* ± 1.48	19972.0 ± 665.04	61.84 ± 2.340
Indometh. pretreated rats	0.178 ± 0.039	0.462* ± 0.057	0.476* ± 0.049	0.456* ± 0.026	0.456* ± 0.026	6.20 ± 1.60	20.40* ± 2.07	25.00* ± 2.23	25.00* ± 2.12	28.40* ± 1.52	26408.2* ± 382.37	74.10* ± 2.250

Inf. = Infarction

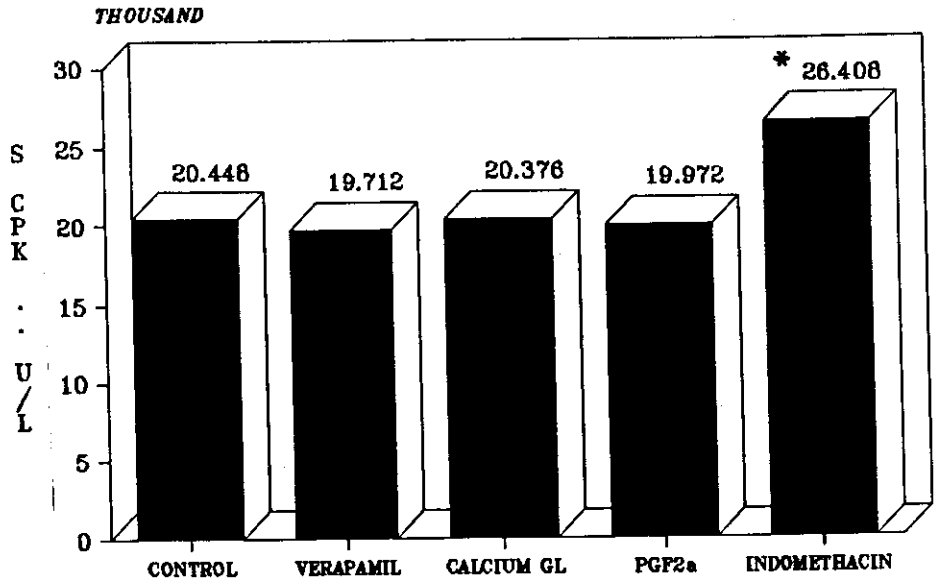
C.C.B. = Calcium channel blocker "verapamil"

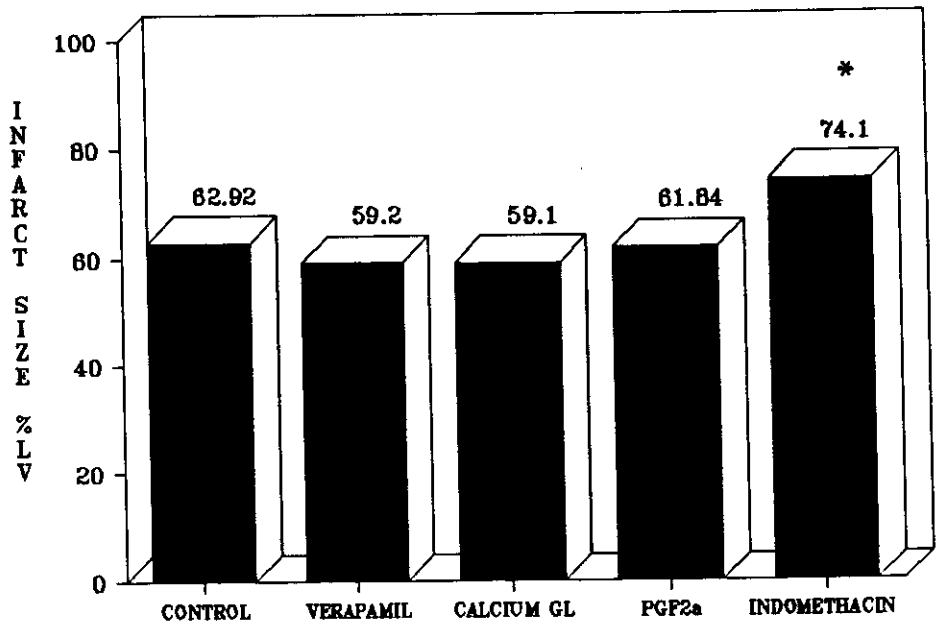
Calcium Gl. = Calcium gluconate

Indometh. = Indomethacin.

* = $P < 0.05$.

S CPK AND INFARCTION SIZE AFTER 6 HOURS IN RATS SUBJECTED TO CORONARY OCCLUSION FOR 6 HOURS





* = $P<0.05$

FIGURE 6

II- The Effects of Reperfusion of the Cardiac Muscle on the Coronary Artery Occlusion-Induced Changes in T Wave Voltage, T Wave Area, S CPK and Infarction Size:

According to the time interval between coronary ligation & onset of reperfusion this group was subdevided into:

A) Reperfusion started 30 minutes after ligation.

B) Reperfusion started 60 minutes after ligation.

C) Reperfusion started 90 minutes after ligation.

D) Reperfusion started 2 hours after ligation.

E) Reperfusion started 3 hours after ligation.

A) Effects of Reperfusion Started 30 Minutes After Ligation:

This group was further subdivided into:

A1) The effects of reperfusion without drug therapy:

The results are shown in Table (7) and Figures (7a & 7b). It can be seen that the T wave voltage ranged between 0.13 and 0.18 mv. The mean value was 0.148 ± 0.02 mv. After 30 minutes of coronary ligation, the T wave was very high ranging from 0.30 to 0.45 mv, the mean value was 0.37 ± 0.067 mv. This value was significantly higher than the value before coronary ligation ($P < 0.002$).After 30 minutes of reperfusion the T wave voltage ranged from 0.35 mv to 0.5 mv with a mean

Table (7): The effects of reperfusion of the cardiac muscle 30 minutes after occlusion of the main left coronary artery on the ischemia-induced changes in T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV)

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	30 L	30 R	360 R	0	30 L	30 R	360 R	6 hr.	6 hr,R
1	0.15	0.30	0.35	0.10	6	13	15	4	9860	65.9
2	0.13	0.45	0.50	0.25	4	21	23	15	8900	55.2
3	0.18	0.40	0.45	0.23	6	16	18	12	11100	60.8
4	0.15	0.40	0.40	0.20	5	19	21	11	9880	70.0
5	0.13	0.30	0.40	0.28	4	14	21	15	9961	68.3
Mean	0.148	0.37"	0.395""	0.21"	5	16.6"	19.6""	11.4"	9940.2	64.04
S.D.	0.020	0.067	0.064	0.062	1	3.36	3.13	4.51	780.65	6.037
P <		0.002	0.05			0.003	0.05			

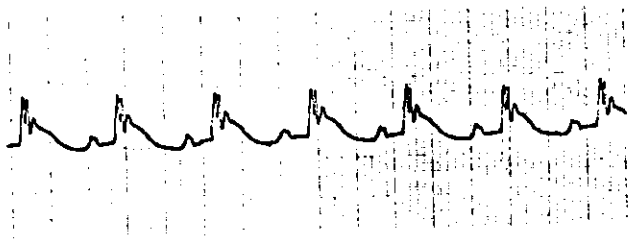
" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 30 minutes after coronary ligation (Time 30 L).

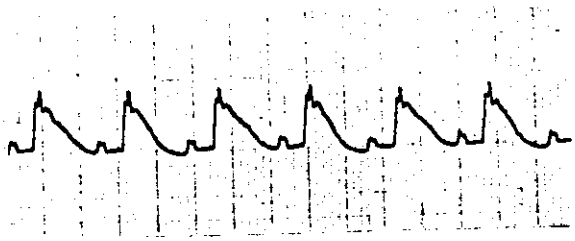
L = After coronary ligation

R = After coronary reperfusion.

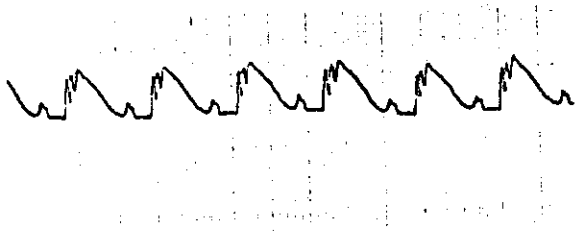
Before coronary ligation



30 minutes after coronary ligation



30 minutes after onset of reperfusion



6 hours after onset of reperfusion

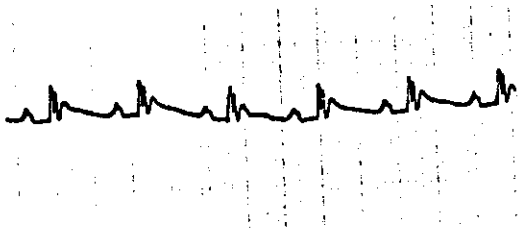
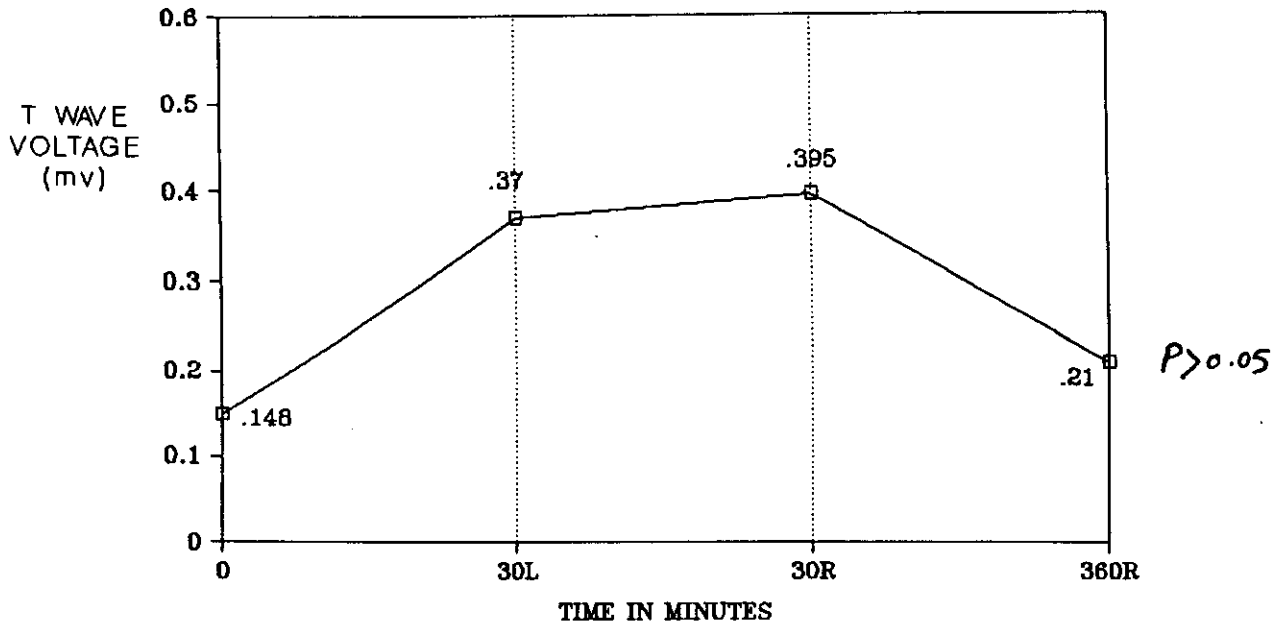


Figure (7a): *Effects of reperfusion started 30 minutes after onset of coronary ligation on T wave amplitude and T wave area .*

THE EFFECTS OF REPERFUSION AFTER 30 MIN OF CORONARY OCCLUSION ON T WAVE VOLTAGE AND T WAVE AREA



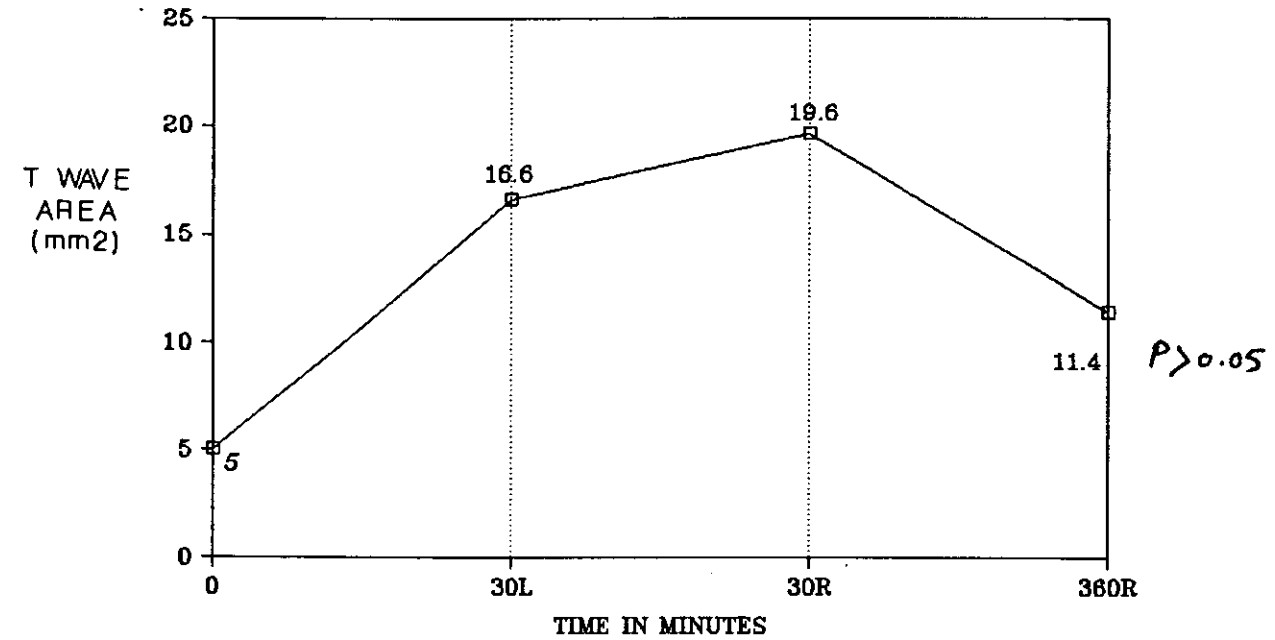


FIGURE 7b

value of 0.395 ± 0.064 mv which was significantly higher when compared with the value at 30 minutes of coronary ligation i.e. immediately before reperfusion ($P < 0.05$).

6 hours after reperfusion the T wave voltage decreased to a mean value of 0.21 ± 0.062 mv, while the range was between 0.1 and 0.28 mv. The change from the corresponding value before coronary ligation is not significant ($P > 0.05$).

Before coronary ligation, the T wave area ranged between 4 and 6 mm^2, the mean value was 5 ± 1 mm^2 .After 30 minutes of coronary ligation the T wave area ranged from 13 mm^2 to 21 mm^2. The mean value was 16.6 ± 3.36 mm^2, showing a significant increase compared with the value before coronary ligation ($P < 0.003$) After 30 minutes of reperfusion, the T wave area ranged from 15 to 23 mm^2 with a mean value of 19.6 ± 3.130 mm^2. This increase was found to be statistically significant ($P<0.05$) when comparing with the value immediately before reperfusion. After 6 hours of reperfusion, the T wave area ranged from 4 to 15 mm^2 with a mean value of 11.4 ± 4.51 mm^2. Comparing this value with that before coronary ligation the change was not significant ($P > 0.05$).

The serum CPK after 6 hours of reperfusion in this subgroup ranged between 8900 - 11100 u/L. The mean value as observed from Table (7) was 9940.2 ± 780.65 u/L. This value is significantly lower than the corresponding value where the coronary artery was occlused for 6 hours with no reperfusion (Table 1) (P <0.0001).

The infarction size after 6 hours of reperfusion ranged between 55.2 - 70% LV. The mean value was 64.04 ± 6.037 % LV. Which is not significantly different from the corresponding value in the ligated non reperfused ventricle (Table 1) (P >0.05).

A2) **The effects of reperfusion of the cardiac muscles 30 minutes after coronary occlusion in rats receiving the calcium channel blocker (verapamil) at a dose of 0.01 mg/100 gm rat body weight given intravenously, 15 minutes before onset of reperfusion.**

The results are shown in Table (8) and Figures (8a & 8b). In this subgroup the T wave voltage ranged between 0.15 and 0.25 mv before coronary ligation, with a mean value of 0.18 ± 0.044 mv. After 30 minutes of coronary ligation, the T wave voltage ranged from 0.38 to 0.55 mv with a mean value of 0.446 ± 0.065 mv showing

Table (8): The The effects of pretreatment with the calcium channel blocker, verapamil (at a dose of 0.01 mg/100 gm rat body weight given i.v, 15 minutes before onset of reperfusion), on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary occlusion for 30 minutes before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	30 L	30 R	360 R	0	30 L	30 R	360 R	6 hr	6 hr R
1	0.15	0.45	0.43	0.2	6	18	15	11	780	39
2	0.20	0.38	0.30	0.15	8	15	9	6	890	35
3	0.15	0.55	0.50	0.20	6	18	15	8	902	42
4	0.15	0.45	0.42	0.15	5	18	14	6	770	36
5	0.25	0.40	0.38	0.20	8	16	14	9	788	38
Mean	0.18	0.446"	0.406""	0.18"	6.6	17"	13.4""	8"	826	38
S.D.	0.044	0.065	0.073	0.027	1.34	1.41	2.51	2.12	64.36	2.738
P <		0.005	0.03			0.002	0.01			

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 30 minutes after coronary ligation (Time 30 L).

L = After coronary ligation.

R = After coronary reperfusion.

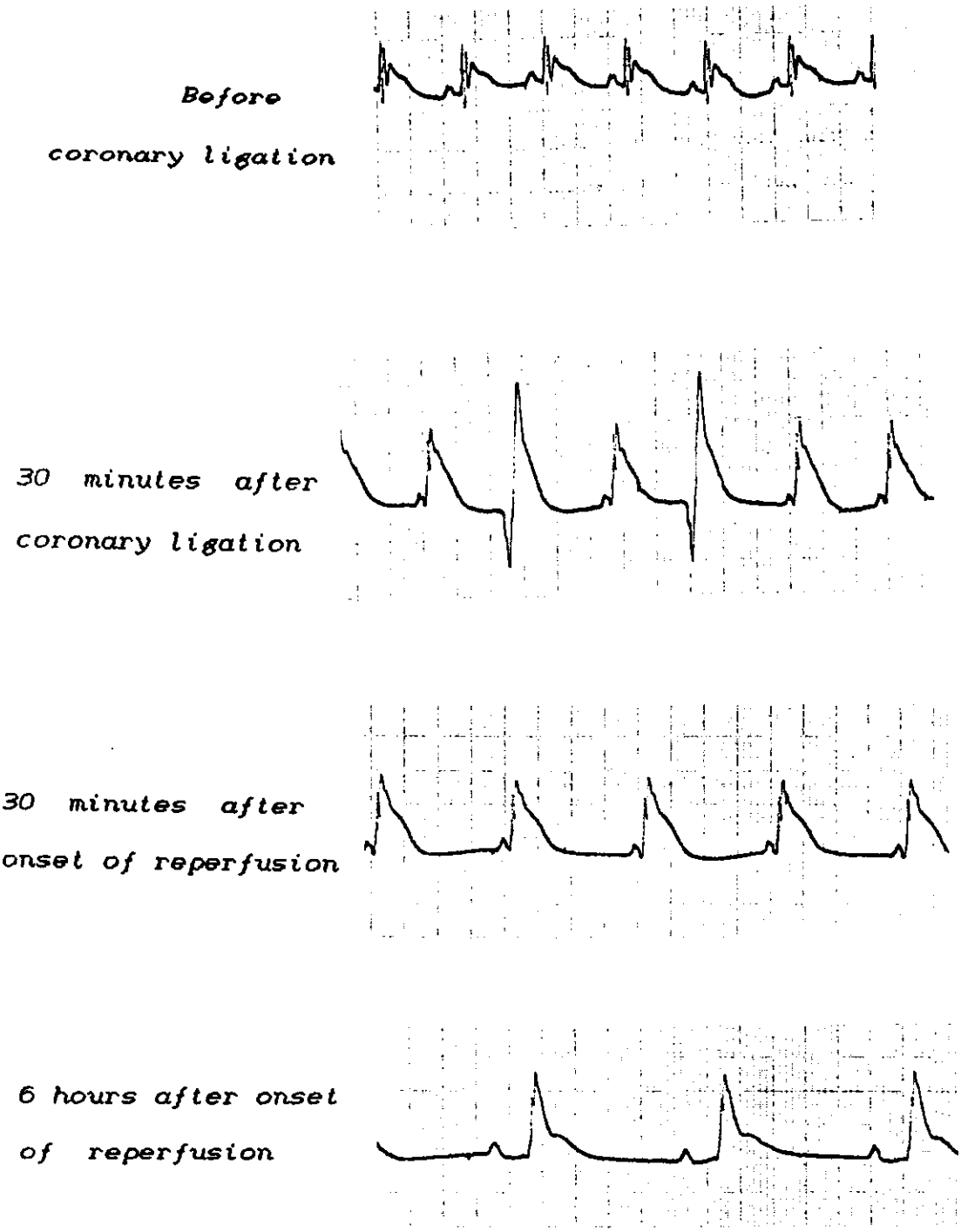
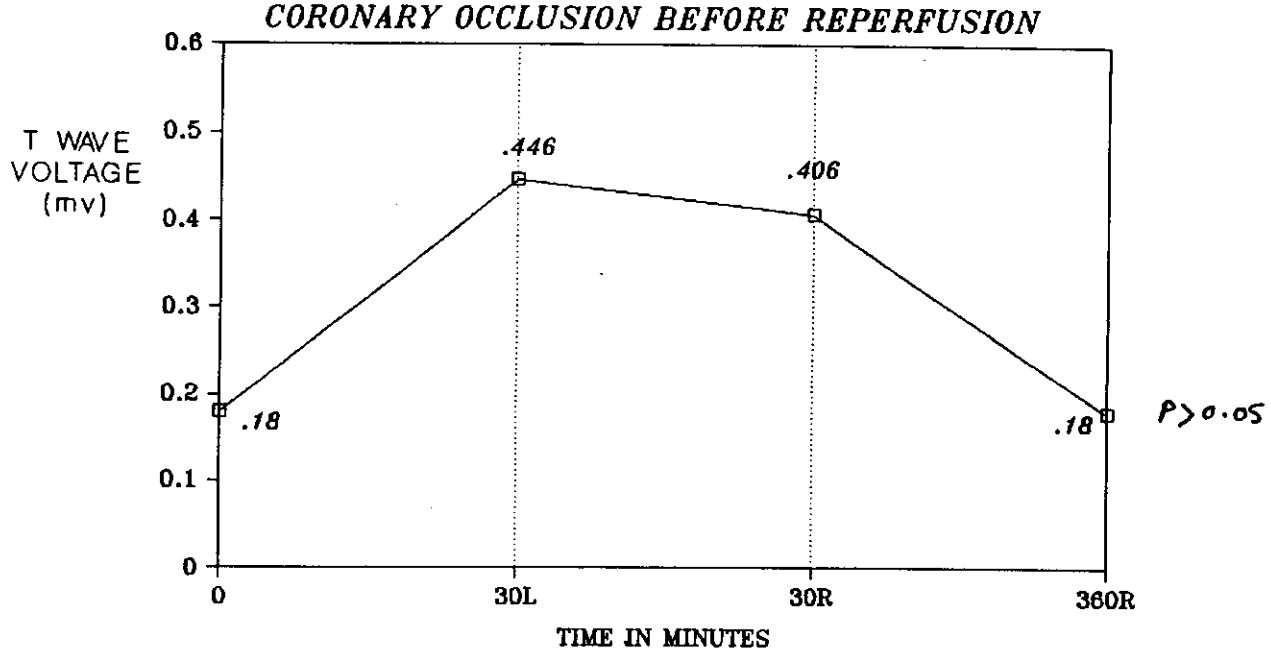
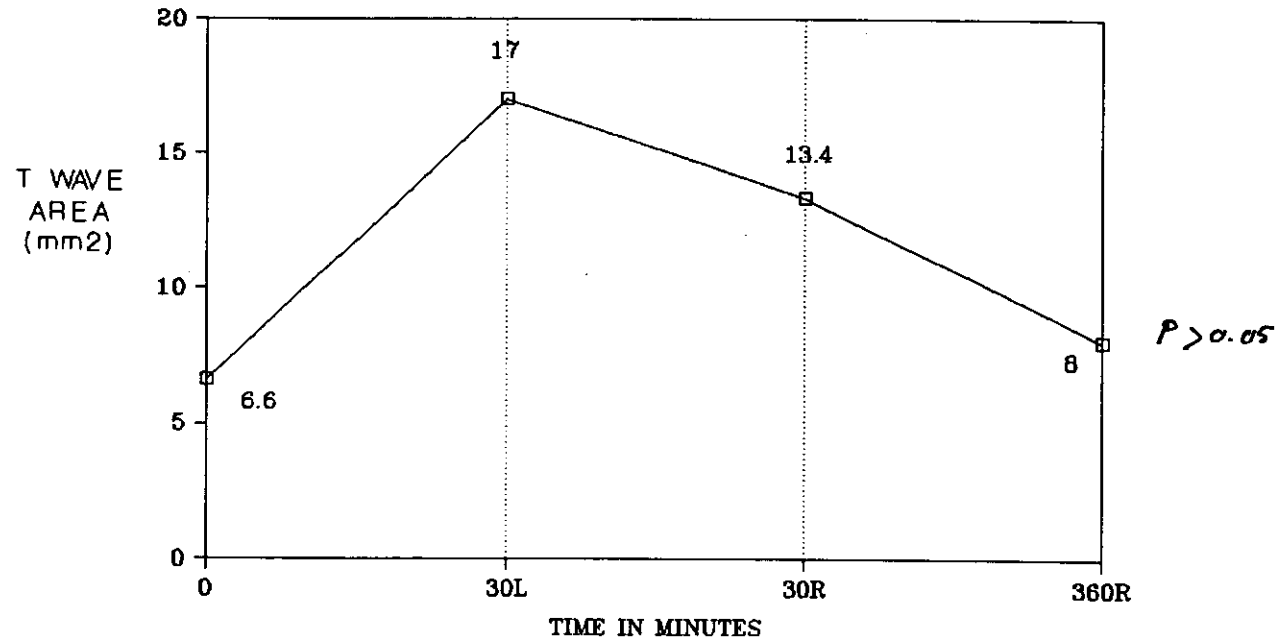


Figure (8a): *Effects of calcium channel blocker (verapamil) on T wave voltage and T wave area in rats subjected to 30 minutes of coronary occlusion followed by reperfusion for 6 hours.*

THE EFFECTS OF PRETREATMENT WITH VERAPAMIL ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO 30 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



$P > 0.05$



$P > 0.05$

FIGURE 8b

a significant increase compared with the value before coronary ligation ($P < 0.005$). After 30 minutes of reperfusion the T wave voltage ranged from 0.3 to 0.5 mv with a mean value of 0.406 ± 0.073, showing a significant decrease compared with the value before reperfusion ($P < 0.03$). At 6 hours after reperfusion the T wave voltage ranged from 0.15 to 0.20 mv with a mean value of 0.18 ± 0.027 mv. This value was not different from that before coronary ligation ($P > 0.05$)

The T wave area, before coronary ligation, ranged from 5 to 8 mm^2 with a mean value of 6.6 ± 1.34 mm^2. After 30 minutes of coronary ligation, the T wave area ranged from 15 to 18 mm^2 with a mean value of 17 ± 1.41 mm^2, showing a significant increase when compared with the value before coronary ligation ($P < 0.002$). After 30 minutes of reperfusion the T wave area ranged between 9 and 15 mm^2, the mean value was 13.4 ± 2.51 mm^2, showing a significant decrease when compared with the value before reperfusion ($P < 0.01$). After 6 hours of reperfusion the area ranged between 6 and 11 mm^2, the mean value was 8 ± 2.12 mm^2, that was not different from the value before coronary ligation ($P > 0.05$).

The S CPK in this subgroup after 6 hours of reperfusion ranged between 770 & 902 u/L, the mean value

was 826 ± 64.36 u/L. Comparing this value with that in the rats receiving calcium channel blocker with no reperfusion (Table 1), there was a significant decrease ($P < 0.0001$) the infarction size in this group ranged between 35 - 42% of LV. The mean value was 38 ± 2.738% LV.

A3) The effect of reperfusion started 30 minutes after coronary ligation in calcium gluconate treated rats (0.012 mg/100 gm rat body weight given intraperitoneally 30 minutes before reperfusion):

The results are shown Table (9) and Figures (9a & 9b). It can be observed from Table 9 that in this subgroup, the T wave voltage before coronary ligation was ranging between 0.13 and 0.20 mv, the mean value was 0.158 ± 0.031 mv. After 30 minutes of coronary ligation, the T wave voltage ranged from 0.40 to 0.60 mv, the mean value was 0.48 ± 0.076 mv showing a significant increase compared with the value before coronary ligation ($P < 0.001$) . After 30 minutes of reperfusion the range was between 0.45 and 0.60 mv, the mean value was 0.52 ± 0.057 mv, showing a significant increase when compared with the value at 30 minutes after coronary ligation ($P < 0.02$). At 6 hours of reperfusion the range was between

Table (9): The effects of pretreatment with calcium gluconate (0.12 gm/100 gm rate body weight given I.P., 30 minutes before onset of reperfusion) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to 30 minutes coronary occulsion before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	30 L	30 R	360 R	0	30 L	30 R	360 R	6 hr.R	6 hr.R
1	0.15	0.45	0.50	0.48	5	24	24	20	10000	59.0
2	0.18	0.40	0.45	0.43	5	20	18	16	9500	62.2
3	0.18	0.50	0.55	0.50	8	26	28	28	9871	58.0
4	0.20	0.60	0.60	0.45	8	28	28	23	10020	60.0
5	0.13	0.45	0.50	0.43	6	23	25	21	9990	55.0
Mean	0.158	0.48"	0.52""	0.458"	6.4	24.2"	24.6""	21.6"	9876.2	58.84
S.D.	0.031	0.076	0.057	0.031	1.52	3.03	4.10	4.39	218.24	2.65
P <		0.001	0.02	0.0001		0.0001		0.001		

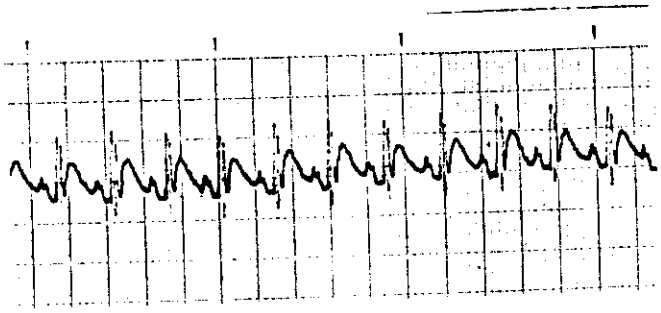
" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 30 minutes after coronary ligation (Time 30 L).

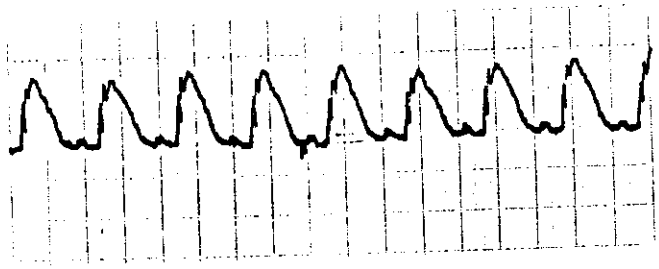
L = After coronary ligation

R = After coronary reperfusion.

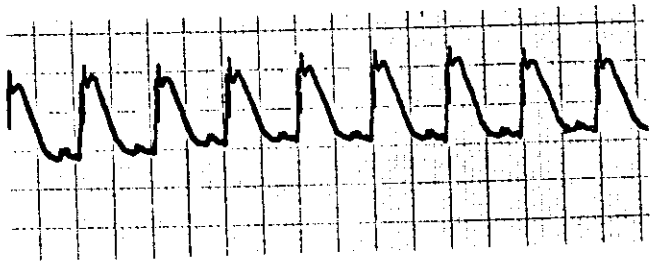
Before coronary ligation



30 minutes after coronary ligation



30 minutes after onset of reperfusion



6 hours after onset of reperfusion.

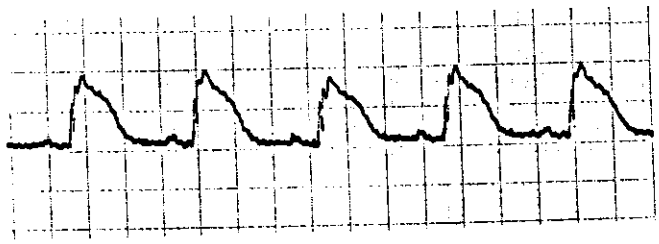
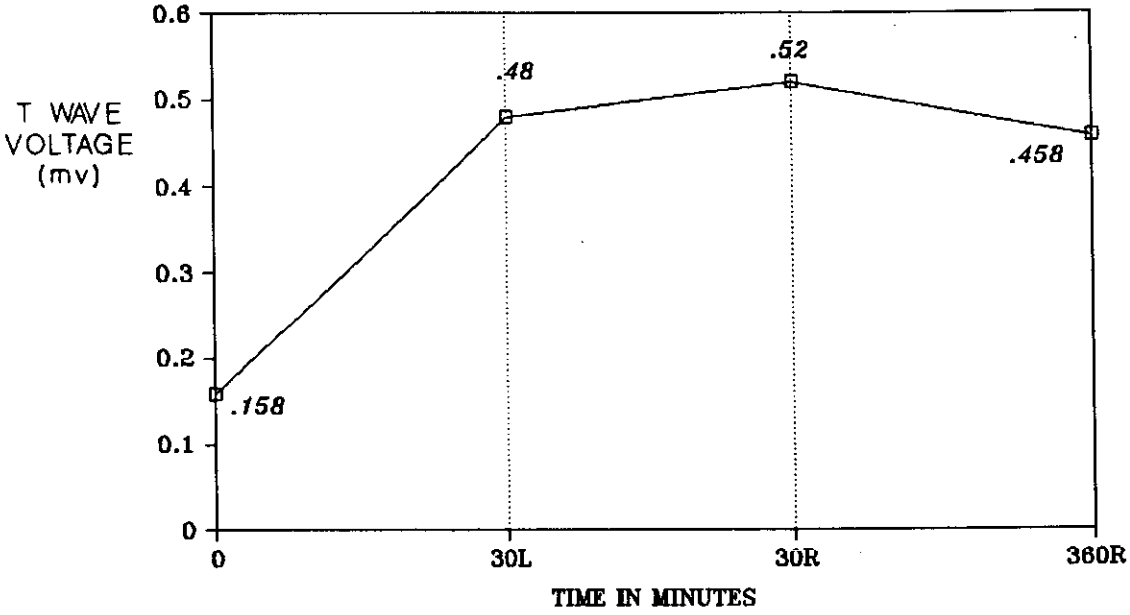


Fig. (9a): *The effect of calcium gluconate on T wave voltage and T wave area in rats subjected to 30 minutes of coronary occlusion before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH CALCIUM GLUCONATE ON T WAVE VOLTAGE AND AREA IN RATS SUBJECTED TO 30 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



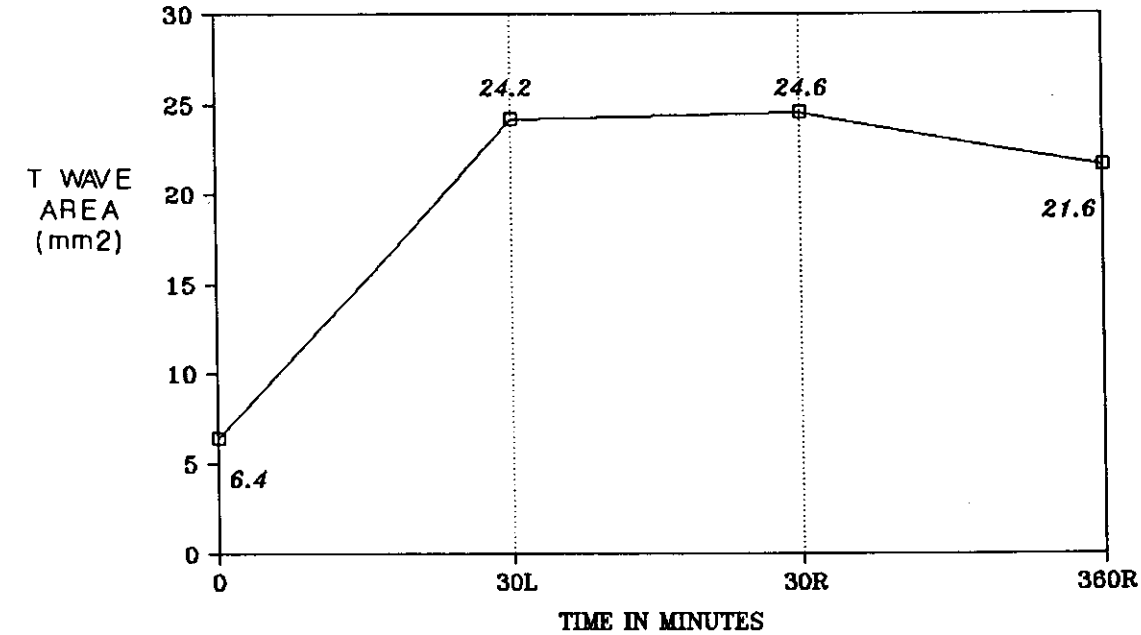


FIGURE 9b

0.43 and 0.50 mv, the mean value was 0.458 ± 0.031 mv which was significantly higher than the value before coronary ligation ($P < 0.0001$)

The T wave area, before coronary ligation ranged between 5 and 8 mm^2, the mean value was 6.4 ± 1.52 mm^2. 30 minutes after coronary ligation, the T wave area ranged between 20 and 28 mm^2, the mean value was 24.2 ± 3.03 mm^2, showing a significant increase compared with the value before coronary ligation ($P < 0.0001$) . 30 minutes after reperfusion, the T wave area ranged between 18 and 28 mm^2 with a mean value of 24.6 mm^2 ± 4.10 mm^2 showing no change from the value before reperfusion ($P > 0.05$). 6 hours after reperfusion the T wave area was ranging between 16 and 28 mm^2, the mean value was 21.6 ± 4.39 mm^2 which was significantly higher than the value before ligation of the main left coronary artery ($P < 0.001$).

As also noted from Table (9), the S CPK in this subgroup of rats, ranged between 9500 & 10020 u/L, the mean value being 9876.2 ±218.24 u/L. The infarction size ranged between 55 & 62.2% LV. The mean value was 58.84 ± 2.65% LV.

A4) The effects of reperfusion of the cardiac muscle started 30 minutes after coronary artery occlusion in rats receiving PGF2α at a dose of 0.015 mg/100 gm rat body weight given intraperitoneally, 30 minutes before onset of reperfusion.

The results are shown in Table (10) and Figure (10a & 10b). As observed from Table (10) in this subgroup, the the T wave voltage ranged between 0.13 and 0.20mv, the mean value was 0.158 ± 0.031 mv. 30 minutes after coronary ligation, the T wave voltage ranged between 0.28 and 0.4 mv, the mean value was 0.358 ± 0.047 mv, showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). After 30 minutes of reperfusion, the range was between 0.20and 0.33 mv, the mean value decreased to 0.262 ± 0.053 mv. This decrease was statistically significant when comparing the values before and 30 minutes after coronary reperfusion ($P < 0.003$). 6 hour after reperfusion the range was between 0.10 and 0.15 mv, the mean value was 0.132 ± 0.020 mv. This value was not different from that before coronary ligation ($P > 0.05$).

Table (10): The effect of pretreatment with PGF$_{2\alpha}$ (0.015 mg/100 gm rat body weight given I.P 30 minutes before onset of reperfusion) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary occlusion for 30 minutes before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	30 L	30 R	360 R	0	30 L	30 R	360 R	6 hr.R	6 hr.R
1	0.13	0.28	0.20	0.10	5	12	9	3	5080	40.1
2	0.18	0.38	0.30	0.13	6	14	12	2.5	5760	42.0
3	0.15	0.35	0.25	0.13	5	13	11	2	4890	43.5
4	0.13	0.38	0.23	0.15	4.5	15	11	3	4510	47.0
5	0.20	0.40	0.33	0.15	6	14	13	3	6001	40.0
Mean	0.158	0.358"	0.262""	0.132"	5.3	13.6"	11.2""	2.7"	5248.2	42.52
S.D.	0.031	0.047	0.053	0.020	0.67	1.14	1.48	0.45	618.50	2.89
P <		0.001	0.003			0.001	0.01			

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 30 minutes after coronary ligation (Time 30 L).

L = After coronary ligation.

R = After coronary reperfusion.

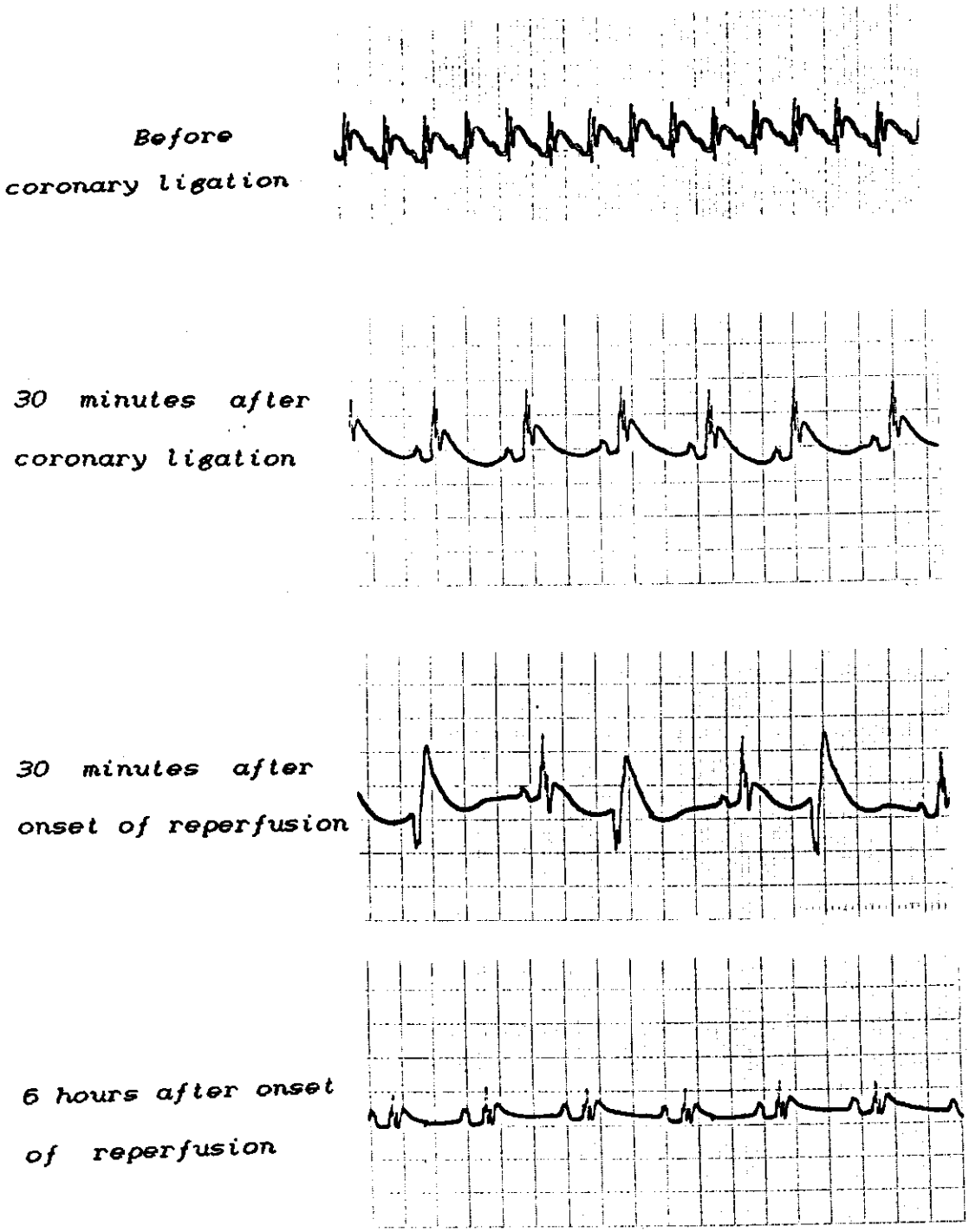
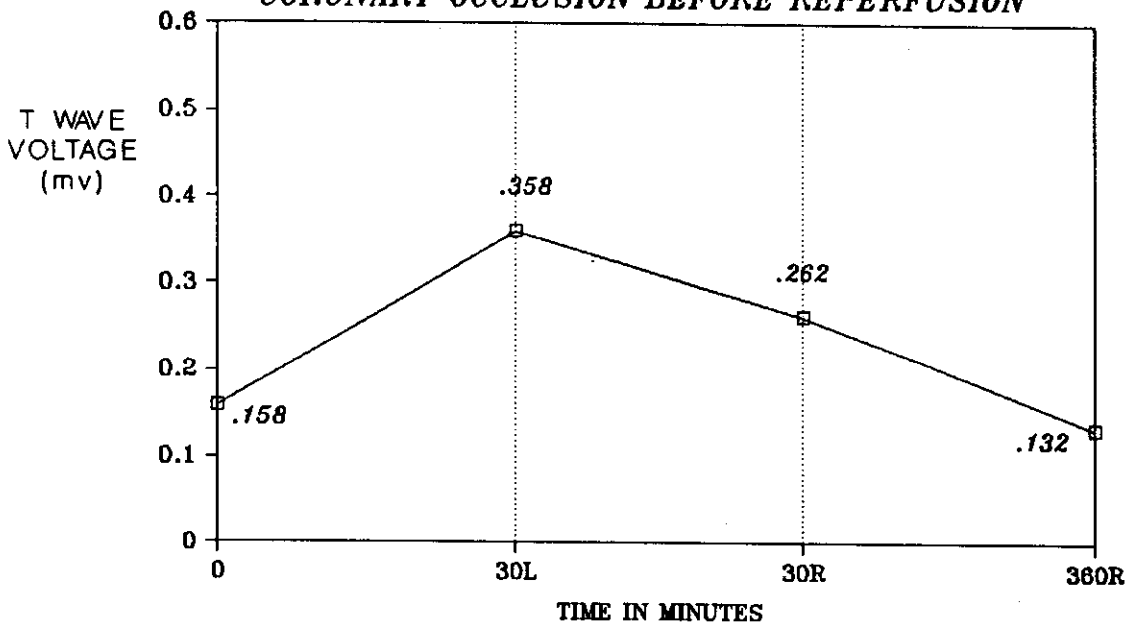


Fig. (10a): *The effects of PGF2α on T wave voltage and T wave area in rats subjected to 30 minutes of coronary occlusion before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH PGF2α ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO 30 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



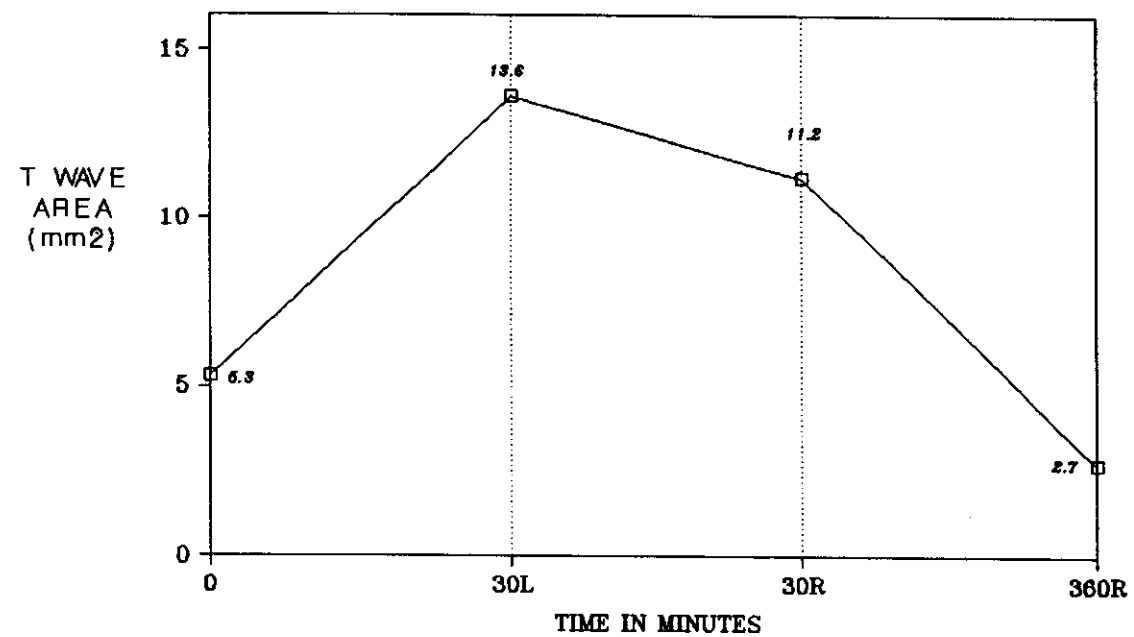


FIGURE 10b

The T wave area, before coronary ligation, ranged between 4.5 and 6 mm^2 with a mean value of 5.3 ± 0.67 mm^2. After 30 minutes of coronary ligation, the range was between 12 and 15 mm^2, the mean value was 13.6 ± 1.140 mm^2, showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). 30 minutes after reperfusion, the range was between 9 and 13 mm^2, the mean value was decreased to 11.2 ± 1.48.mm^2. This decrease was statistically significant when comparing with values before reperfusion ($P< 0.01$). 6 hours after reperfusion, the T wave area ranged between 2 and 3 mm^2 with a mean value of 2.7 ± 0.45 mm^2. This value was not different from that before coronary ligation ($P > 0.05$).

The serum S CPK in this subgroup of rats (receiving PGF2α), 6 hours after reperfusion ranged between 4510 & 6001 u/L. The mean value was 5248.2 ± 618.5 u/L. The infarction size ranged between 40 & 47% LV. The mean value as observed from Table (10) was 42.52 ± 2.89% LV.

A5) The effects of reperfusion of the cardiac muscel started 30 minutes after left coronary occlusion in rats receiving indomethacin at a dose 0.06 mg/100 gm rat body weight given intravenously, 15 minutes before onset of reperfusion:

The results are shown in Table (11) and Figures (11a & 11b). It can be noted that the T wave voltage, before coronary ligation, ranged between 0.13 and 0.20 mv, the mean value was 0.168 ± 0.028 mv. 30 minutes after coronary ligation, the range was between 0.35 and 0.50 mv, the mean value was 0.42 ± 0.057 mv,showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). 30 minutes after reperfusion, the values of the T wave voltage ranged between 0.42 and 0.55 mv, the mean value was 0.48 ± 0.065 mv showing a significant increase when compared with the value before reperfusion ($P < 0.02$). 6 hours after reperfusion, the T wave voltage ranged between 0.40 and 0.60 mv, the mean value was 0.49 ± 0.082 mv. This value was significantly higher that the initial value before coronary ligation ($P < 0.001$).

Table (11): The effects of pretreatment with indomethacin (0.06 mg/100 gm rat body weight given intravenously 15 minutes before onset of reperfusion) on T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to 30 minutes coronary occlusion before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	30 L	30 R	360 R	0	30 L	30 R	360 R	6 hr.R	6 hr.R
1	0.18	0.50	0.55	0.55	7	19	33	35	14123	77.0
2	0.20	0.45	0.55	0.60	6	18	22	24	13989	70.4
3	0.13	0.40	0.42	0.40	4	17	19	22	14003	72.0
4	0.15	0.35	0.43	0.45	5	16	21	26	13133	73.0
5	0.18	0.40	0.45	0.45	6	19	24	28	13982	71.5
Mean	0.168	0.42"	0.48""	0.49"	5.6	17.8"	23.8""	27"	13846	72.78
S.D.	0.028	0.057	0.065	0.082	1.14	1.30	5.45	5	402.71	2.54
P <		0.001	0.02	0.001		0.0001	0.05	0.001		

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 30 minutes after coronary ligation (Time 30 L).

L = After coronary ligation

R = After coronary reperfusion.

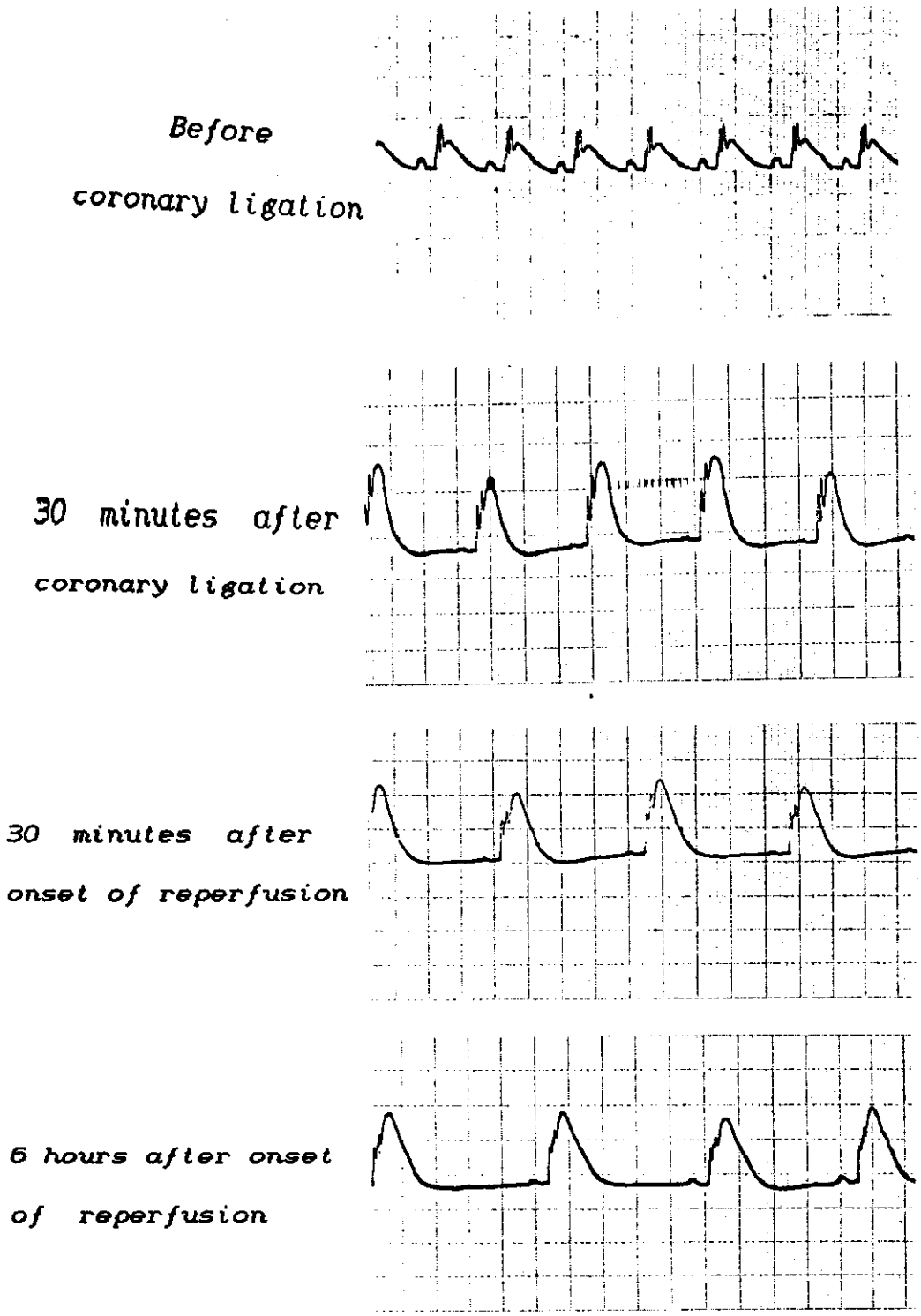
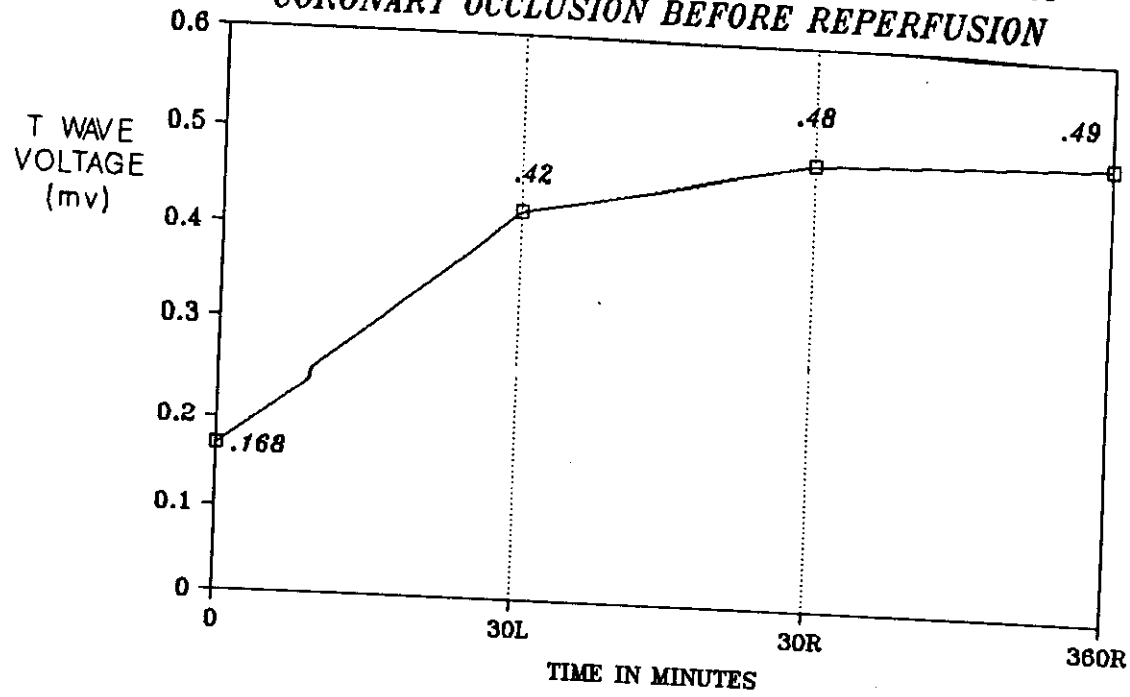


Fig. (11a): *The effects of indomethacin on T wave voltage and T wave area in rats subjected to 30 minutes of coronary occlusion before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH INDOMETHACIN ON T WAVE VOLTAGE AND AREA IN RATS SUBJECTED TO 30 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



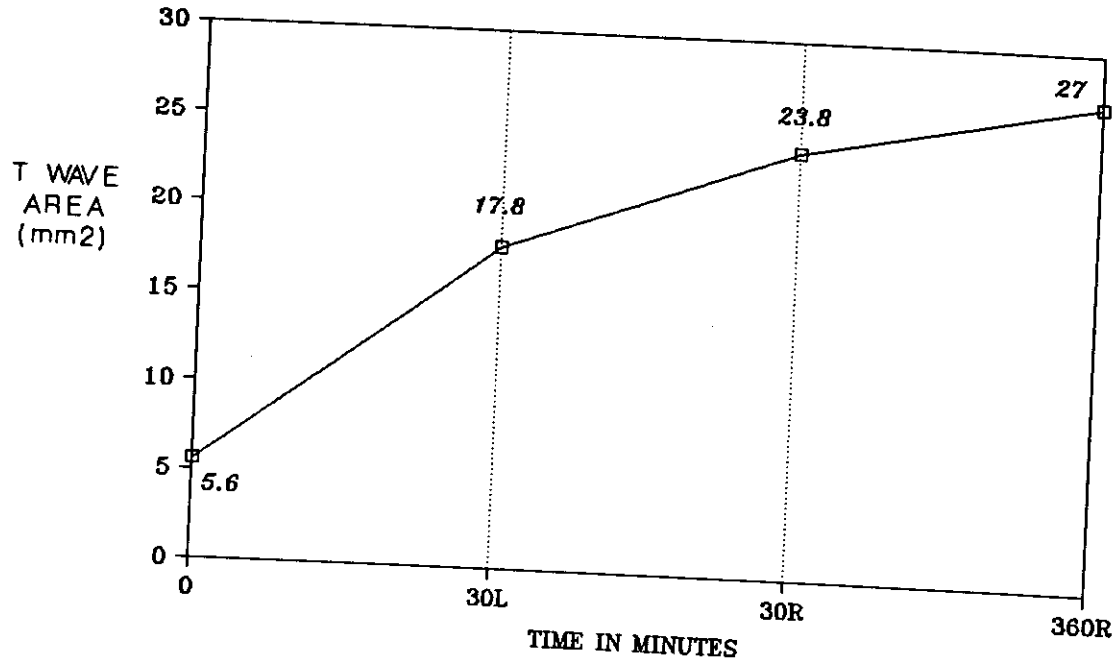


FIGURE 11b

The T wave area, before coronary ligation, ranged between 4 and 7 mm^2, the mean value was 5.6 mm^2 ± 1.140 mm^2. 30 minutes after coronary ligation the range was between 16 and 19 mm^2, the mean value was 17.8 ± 1.30 mm^2 showing a significant increase when compared with the value before coronary ligation($P < 0.0001$). After 30 minutes of reperfusion, the range was between 19 and 33 mm^2 and the mean value was 23.8 ± 5.15 mm^2 showing a significant increase when compared with the value before reperfusion ($P < 0.05$). 6 hours after reperfusion the range was between 22 and 35 mm^2, the mean value was 27 ± 5 mm^2 . This value was significantly higher than the initial value before coronary ligation ($P < 0.001$).

As also noted from Table (11) the S CPK in this subgroup of rats ranged between 13133 & 14123 u/L. The mean value was 13846 ± 402.71 u/L.The infarction size ranged from 70.4 to 77% LV. The mean value was 72.78 ± 2.54.

Table (12) compares the values of T wave voltage, T wave area, S CPK and infarction size in all the subgroups included in group A (reperfusion 30 minutes after left coronary occlusion). The treated subgroups compared to the non treated one.

Table (12) : Means & standard deviations of the T wave voltage (mv), T wave area (mm^2) S CPK (u/L) & infarction size (%LV) in all subgroups of rats subjected to 30 minutes of coronary occlusion before onset of reprefusion.

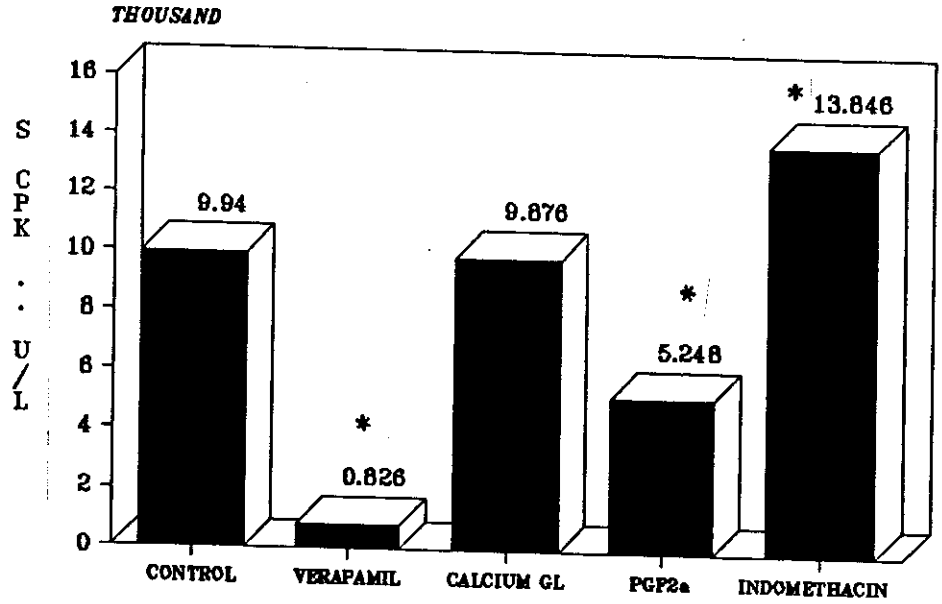
SUBGROUP	T WAVE VOLTAGE (mv)				T WAVE AREA (mm^2)				S CPK (u/L)	Inf. size (%lv)
	TIME				TIME					
	Before co. lig.	30 min after co lig.	30 min after reperf.	6 hours after reperf.	before co. lig.	30 min after co lig.	30 min after reperf.	6 hours after reperf.	6 hours after reperf.	6hours after reperf
Reperf. with no drugs (A_1)	0.148 ± 0.020	0.370 ± 0.067	0.395 ± 0.064	0.210 ± 0.062	5.00 ± 1.00	16.60 ± 3.36	19.60 ± 3.31	11.40 ± 4.51	9940.20 ± 780.65	64.040 ± 6.037
Reperf. and CCB (A_2)	0.180 ± 0.044	0.446 ± 0.065	0.406 ± 0.073	0.180 ± 0.027	6.60 ± 1.34	17.00 ± 1.41	13.40* ± 2.51	8.00 ± 2.12	826.00* ± 64.36	38.00* ± 2.738
Reperf. and Ca gl. (A_3)	0.158 ± 0.031	0.480* ± 0.076	0.520* ± 0.057	0.458* ± 0.031	6.40 ± 1.52	24.20* ± 3.03	24.60 ± 4.10	21.60* ± 4.39	9876.20 ± 218.24	58.840 ± 2.640
Reperf. and PGF2α (A_4)	0.158 ± 0.031	0.358 ± 0.047	0.262* ± 0.053	0.132* ± 0.020	5.30 ± 0.67	13.60 ± 1.14	11.20* ± 1.48	2.70* ± 0.45	5248.20* ± 618.50	42.52* ± 2.850
Reperf. and Indometh acin (A_5)	o.168 ± 0.028	0.420 ± 0.057	0.480 ± 0.065	0.490* ± 0.065	5.90 ± 1.14	17.80 ± 1.30	23.80 ± 5.45	27.00* ± 5.00	13846.00* ± 402.71	72.78* ± 2.540

Co. lig. = Coronary ligation.

reperf. = Reperfusion.

* = $P < 0.05$

S CPK AND INFARCTION SIZE AFTER 6 HOURS IN RATS SUBJECTED TO CORONARY OCCLUSION FOR 30 MINUTES BEFORE REPERFUSION



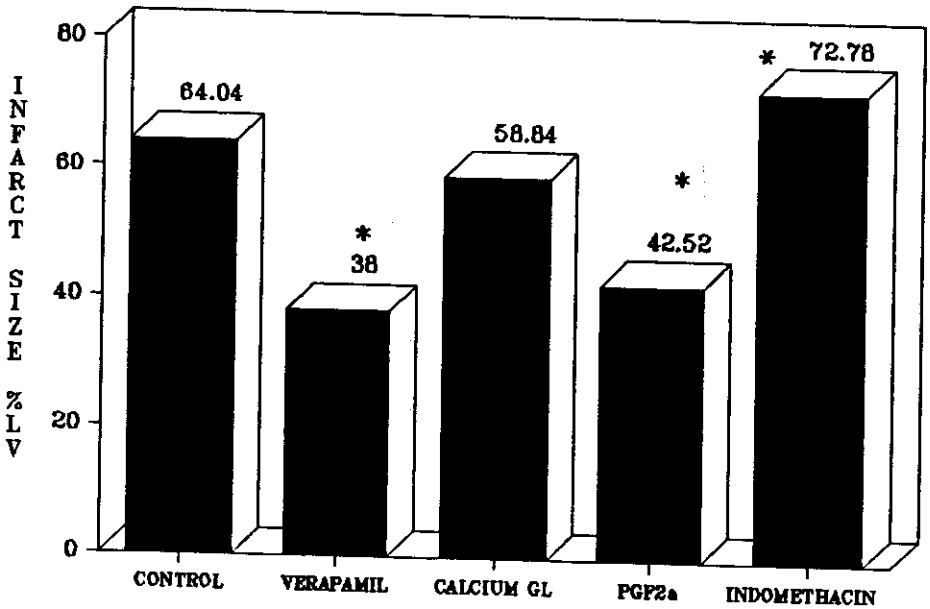


FIGURE 12

* = *P<0.05*

It shows that in calcium channel blocker treated group there was a significant decrease in T wave area after 30 minutes of reperfusion ($P < 0.05$). Also calcium channel blocker, verapamil, caused a significant decrease in both S CPK and infarction size after 6 hours of reperfusion ($P < 0.05$). In calcium gluconate treated group there was a significant increase in T wave voltage at 30 minutes after coronary ligation and also at 30 minutes and 6 hours after coronary reperfusion ($P < 0.05$). The T wave area showed a significant increase at 30 minutes after coronary ligation and after 6 hours of coronary reperfusion ($P < 0.05$). In PGF2α treated group there was a significant decrease in T wave voltage and area at 30 minutes and 6 hours after reperfusion ($P < 0.05$). Also PGF2α caused a significant decrease in S CPK and infarction size after 6 hours of coronary reperfusion ($P < 0.05$). In indomethacin treated group there was a significant increase in both the T wave voltage and area after 6 hours of reperfusion ($P < 0.05$). Also it showed a significant increase in the S CPK and infarction size ($P < 0.05$).

B) The Effects of Reperfusion of the Cardiac Muscles 60 Minutes After occlusion of the Left Coronary Artery on the Ischemia-Induced Changes in T Wave Voltage (mv), T wave area (mm^2), S CPK (u/L) and Infarction Size (% LV):

B1) The effects of reperfusion with no drug administration :

The results are shown in Table (13) and Figures (13a & 13b). It can be seen that, before coronary ligation, the T wave voltage ranged from 0.15 to 0.25 mv, the mean value was 0.19 ± 0.042 mv. After 60 minutes of coronary ligation a significant increase in the T wave voltage was observed, it ranged from 0.35 to 0.7 mv with an increased mean value of 0.456 ± 0.150 mv ($P < 0.03$).After 30 minutes of reperfusion, the T wave voltage ranged from 0.3 to 0.65 mv and the mean value was decreased to 0.406 ± 0.150 mv showing a significant increase compared with the value before coronary reperfusion. ($P < 0.01$). After 6 hours of reperfusion the T wave voltage ranged from 0.18 to 0.35 mv, the mean value was 0.236 ± 0.069 mv,which was not different from the value before coronary ligation ($P > 0.05$)

Table (13): The effects of reperfusion of the cardiac muscle 60 minutes after occlusion of the main left coronary artery on the ischemia induced changes in T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV)

No.	T wave voltage (mv)				T wave area(mm^2)				S CPK level after 6 hr.	Infarct area after 6 hr.R
	Time in minutes				Time in minutes					
	0	60 L	30 R	360 R	0	60 L	30 R	360 R		
1	0.15	0.70	0.65	0.35	5	31	30	18	8995	68.3
2	0.20	0.35	0.30	0.20	8	18	17	9	9880	51.9
3	0.15	0.35	0.33	0.18	6	14	12	8	10125	53.0
4	0.20	0.50	0.45	0.25	7	22	21	12	11123	60.0
5	0.25	0.38	0.30	0.20	10	17	14	10	9980	55.2
Mean	0.19	0.456"	0.406""	0.236"	7.2	20.4"	18.8""	11.4"	10020.6	57.68
S.D.	0.042	0.150	0.150	0.069	1.9	6.58	7.12	3.97	758.2	6.7
P <		0.03	0.01			0.003	0.02			

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 60 minutes after coronary ligation (Time 60 L).

L = After coronary ligation.

R = After coronary reperfusion.

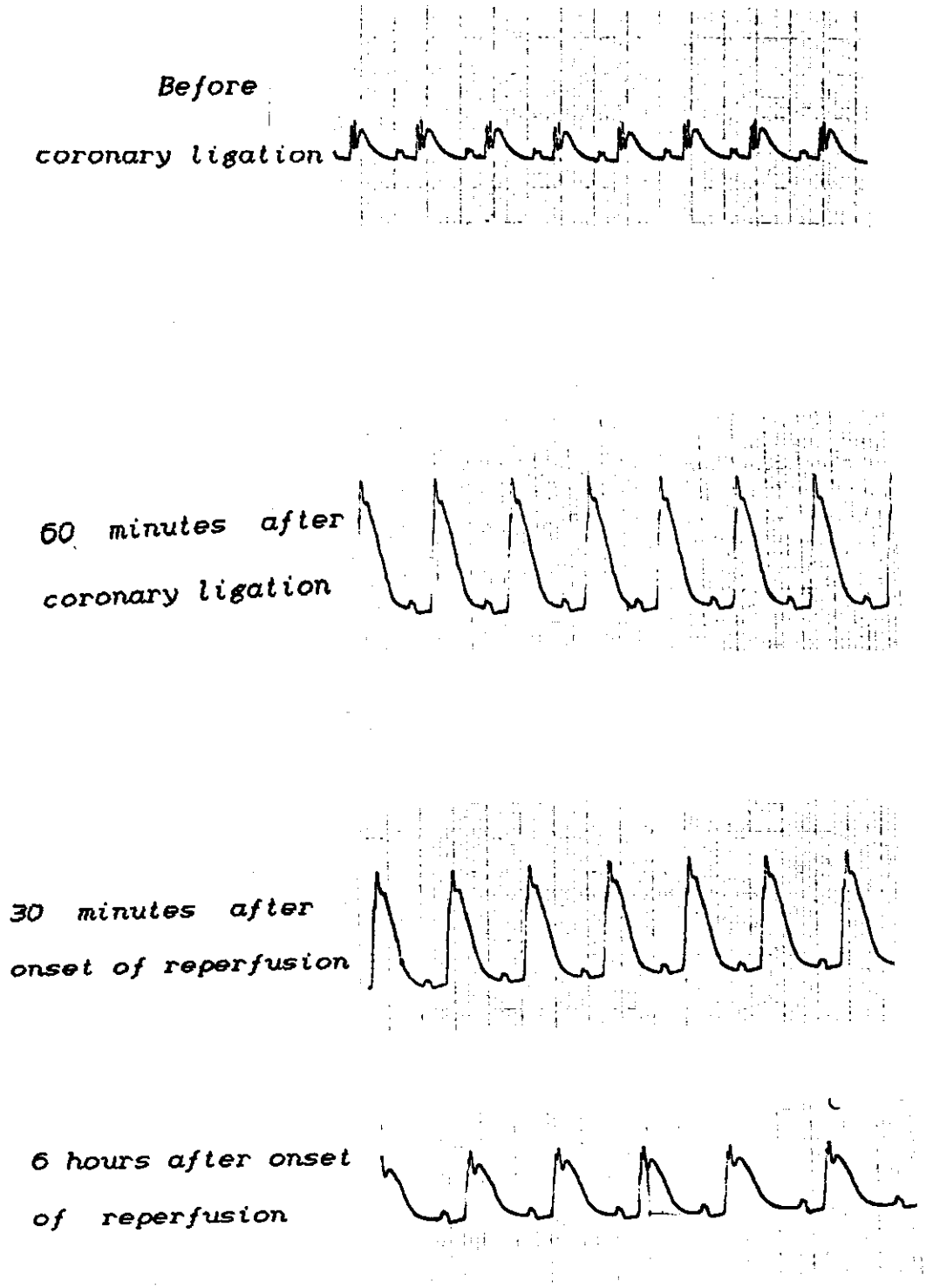
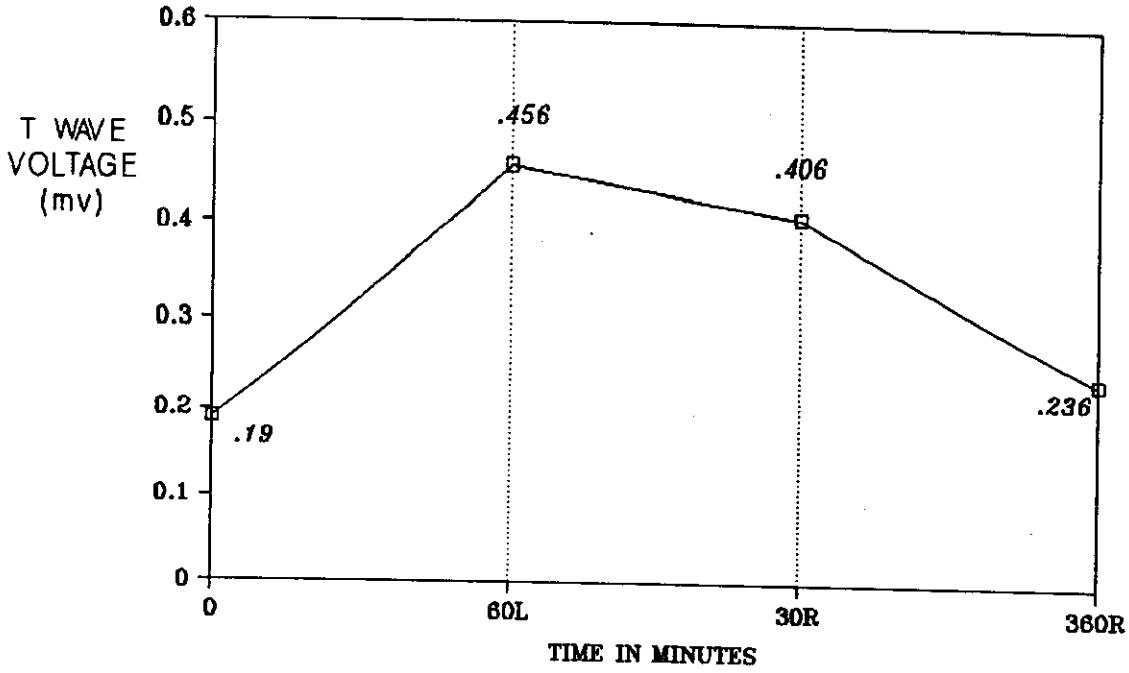
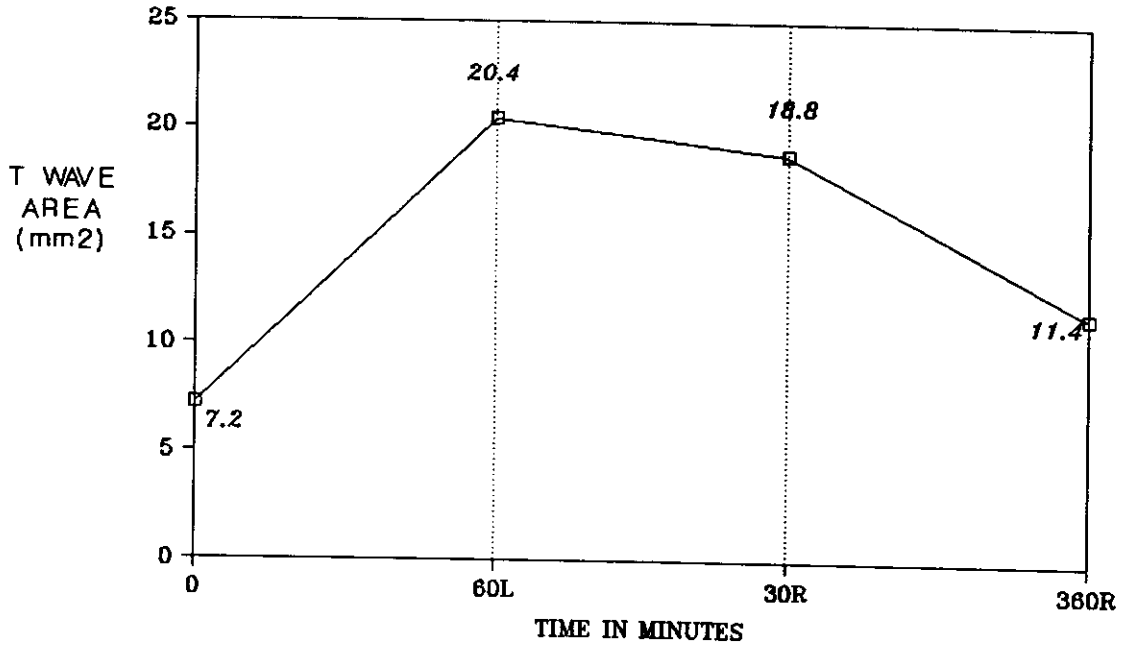


Figure (13a): *Effects of reperfusion of the cardiac muscle60 minutes after occlusion of the left coronary artery on the ischemia induced changes in T wave voltage and T wave area*

THE EFFECTS OF REPERFUSION AFTER 60 MIN OF CORONARY OCCLUSION ON T WAVE VOLTAGE AND T WAVE AREA



P > 0.05



P > 0.05

FIGURE 13b

The T wave area, before coronary ligation, ranged from 5 to 10 mm^2 with a mean value of 7.2 ± 1.9 mm^2. After 60 minutes of coronary ligation, the range of the T wave area was between 14 and 31 mm^2, the mean value was 20.4 ± 6.58 mm^2 , showing a significant increase when compared with the value before coronary ligation ($P < 0.003$). After 30 minutes of reperfusion the T wave area ranged from 12 mm^2 to 30 mm^2 with a mean value of 18.8 ± 7.12 expressing a significant decrease when compared with the value before reperfusion ($P < 0.02$). After 6 hours of reperfusion the T wave area ranged from 8 to 18 mm^2, the mean value was 11.4 ± 3.97 mm^2. This value was not different from that before coronary ligation($P > 0.05$).

As observed from Table (13), the serum CPK, 6 hours of reperfusion in this subgroup ranged between 8995 - 11123 u/L with a mean value 10020.6± 758.2 u/L while the infarction size ranged between 51.9 & 68.3% LV, the mean value being 57.68 ± 6.7% LV.

B2) The effects of reperfusion of cardiac muscle 60 minutes after left coronary artery occlusion in rats treated with the calcium channel blocker (verapamil) given intravenously, 15 minutes before reperfusion in a dose of 0.01 mg/100 gm rat body weight:

The results are shown in Table 14 and Figure (14a & 14b). In this subgroup, the T wave voltage, before coronary ligation, ranged between 0.1 and 0.2 mv, the mean value was 0.156 ± 0.038 mv. After 60 minutes of coronary ligation the T wave voltage ranged between 0.40 and 0.50 mv, the mean value was 0.46 ± 0.04 mv showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). After 30 minutes of reperfusion, the T wave voltage ranged between 0.30 and 0.40 mv, the mean value was 0.34 ± 0.05 mv. Comparing with the values at 60 minutes coronary ligation, this decrease was found to be significant ($P < 0.001$). After 6 hours of reperfusion the T wave voltage ranged from 0.13 to 0.18 mv, the mean value was 0.154 ± 0.025 mv, which was not different from that before coronary ligation ($P > 0.05$).

Table (14): The The effects of pretreatment with the calcium channel blocker, verapamil, on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary occlusion for 60 minutes before onset of reperfusion.

No.	T wave voltage (mv) Time in minutes				T wave area (mm^2) Time in minutes				S CPK level after	Infarct area after
	0	60 L	30 R	360 R	0	60 L	30 R	360 R	6 hr	6 hr. R
1	0.15	0.45	0.30	0.13	5	21	15	6	801	45
2	0.18	0.45	0.30	0.15	6	20	16	8	880	46
3	0.15	0.50	0.40	0.18	5	22	20	7	805	43
4	0.10	0.50	0.40	0.13	4	25	22	5	863	42
5	0.20	0.40	0.30	0.18	7	21	18	7	802	40
Mean	0.156	0.46"	0.34""	0.154"	5.4	21.8"	18.8""	6.6"	830.2	43.2
S.D.	0.038	0.04	0.05	0.025	1.14	1.92	3.11	1.14	38.21	2.387
P <		0.001	0.001			0.001	0.005			

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 60 minutes after coronary ligation (Time 60 L).

L = After coronary ligation.

R = After coronary reperfusion.

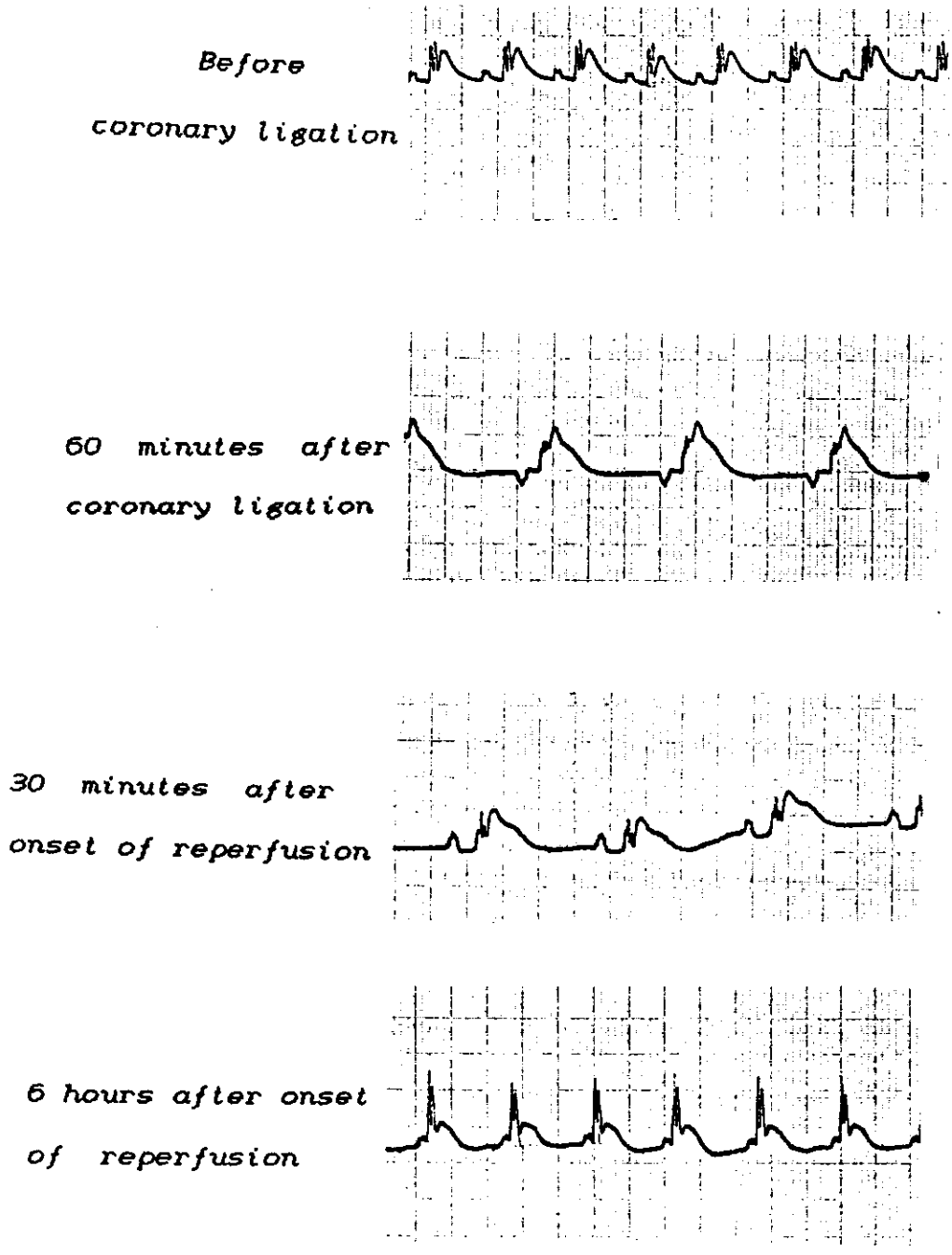
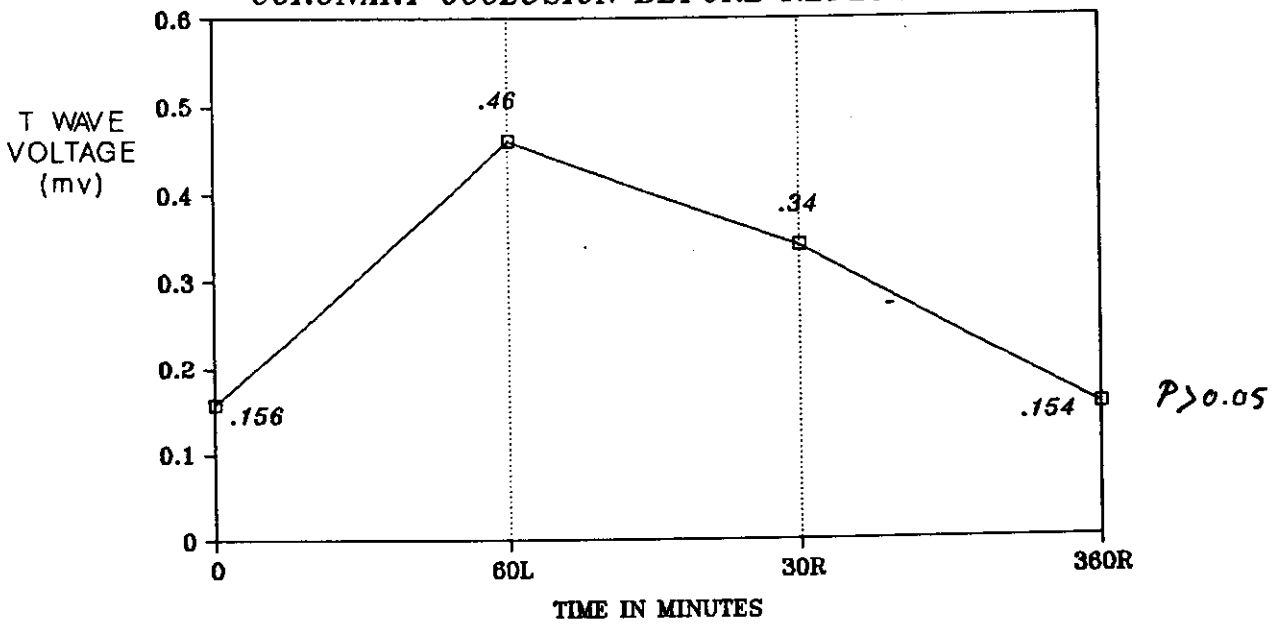
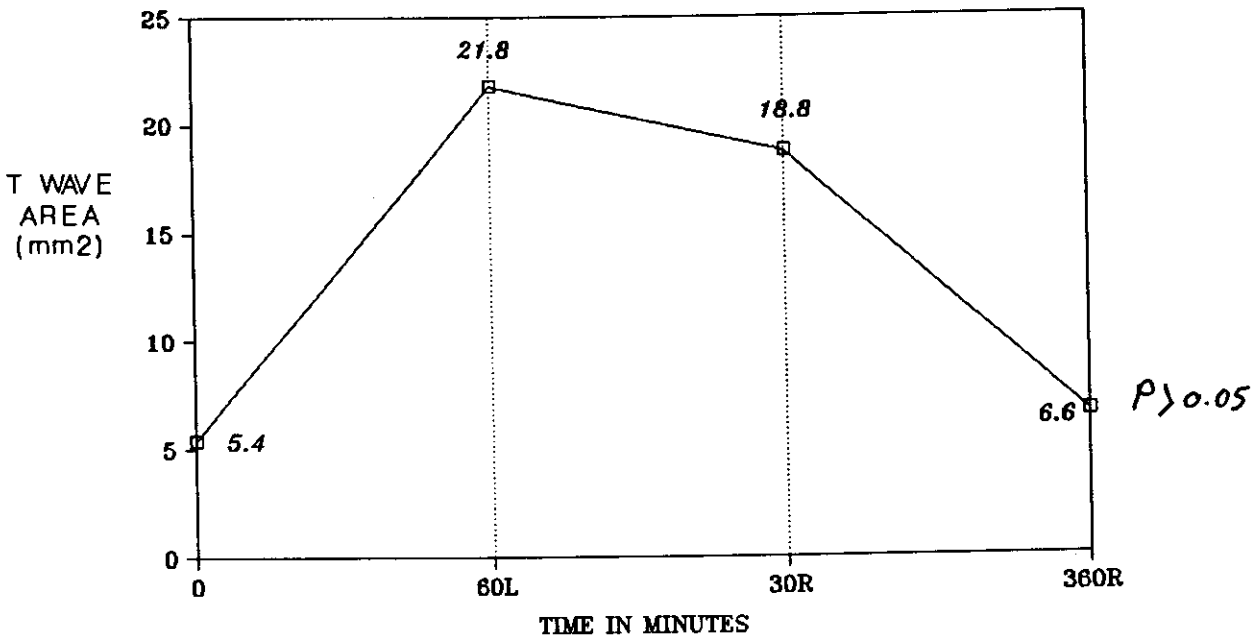


Figure (14a): *The effects of pretreatment with the calcium channel blocker "verapamil" on T wave voltage and T wave area in rats subjected to coronary artery occlusion for 60 minutes before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH VERAPAMIL ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO 60 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



P > 0.05



P > 0.05

FIGURE 14b

The T wave area before coronary ligation, ranged from 4 to 7 mm^2, the mean value was 5.4 ± 1.14 mm^2. After 60 minutes of coronary ligation the T wave area ranged from 20 to 25 mm^2, the mean value was 21.8 ± 1.92 mm^2, showing a significant increase compared with the value before coronary ligation ($P < 0.001$). After 30 minutes of reperfusion, the T wave area ranged from 15 to 22 mm^2 with a mean value of 18.8 ± 3.11 mm^2. Comparing these values with those at 60 minutes of coronary ligation(i.e. immediately before reperfusion) it was found that this decrease in the T wave area was statistically highly significant ($P < 0.005$). After 6 hours of reperfusion the T wave area ranged between 5 and 8 mm^2 with a mean value of 6.6 ± 1.14 mm^2 that was not different from that before coronary ligation ($P > 0.05$).

The S CPK in this subgroup of rats ranged between 801 & 880 u/L, with a mean value 830.2 ± 38.21 u/L. The infarction size as seen from Table (14) ranged from 40 - 46% LV with a mean value 43.2 ± 2.387% LV.

B3) The effects of reperfusion of cardiac muscle 60 minutes after main left coronary artery occlusion in rats treated with calcium gluconate given intraperitoneally, 60 minutes before reperfusion in a dose of 0.12 mg/100 gm rat body weight:

The results are shown in Table (15) and Figure (15a & 15b). It can be observed that the T wave voltage, before coronary ligation, ranged between 0.10 to 0.18 mv, the mean value was 0.138 ± 0.029 mv. After 60 minutes of coronary ligation, the T wave voltage ranged between 0.25 and 0.50 mv, the mean value was 0.442 ± 0.108 mv, showing a significant increase compared with the value before coronary ligation ($P < 0.002$). 30 minutes after reperfusion, the T wave voltage ranged between 0.28 and 0.55 mv, the mean value was 0.462 ± 0.105 mv which was not different from that immediately before reperfusion ($P > 0.05$). 6 hours after reperfusion, the range was between 0.15 and 0.35 mv, the mean value was 0.25 ± 0.08 mv which was significantly higher than the value before coronary ligation ($P < 0.05$).

The T wave area before coronary ligation ranged between 6 and 9 mm^2, the mean value was 7.6 ± 1.14 mm^2.

Table (15): The effects of pretreatment with calcium gluconate (0.12 mg/100 gm rate body weight given I.P., 30 minutes before onset of reperfusion) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to 60 minutes coronary occulsion before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	60 L	30 R	360 R	0	60 L	30 R	360 R	6 hr.R	6 hr.R
1	0.10	0.25	0.28	0.35	6	8	7	13	10220	58.0
2	0.15	0.50	0.50	0.30	8	14	14	12	11200	60.0
3	0.18	0.48	0.50	0.25	8	18	14	12	9895	61.3
4	0.13	0.48	0.48	0.20	7	14	14	11	10112	55.2
5	0.13	0.50	0.55	0.15	9	18	14	11	9950	57.0
Mean	0.138	0.442"	0.462""	0.25"	7.6	14.4"	12.6""	11.8"	10275.4	58.3
S.D.	0.029	0.108	0.105	0.08	1.14	4.10	3.13	0.84	532.74	2.412
P <		0.002		0.05		0.01		0.01		

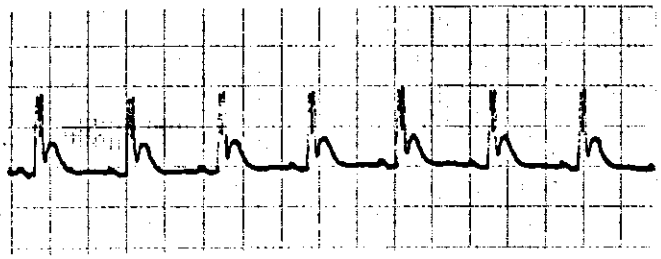
" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 60 minutes after coronary ligation (Time 60 L).

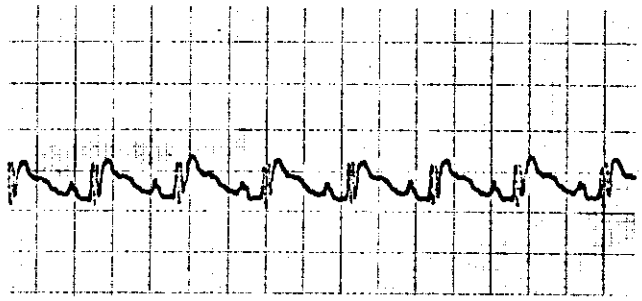
L = After coronary ligation.

R = After coronary reperfusion.

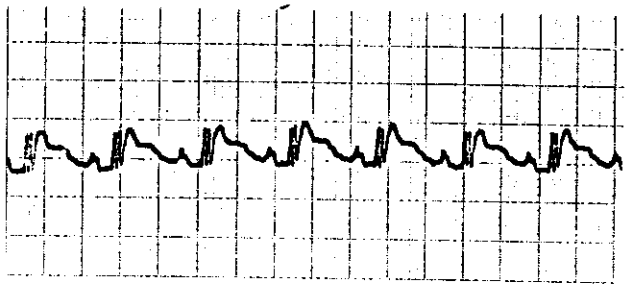
Before coronary ligation



60 minutes after coronary ligation



30 minutes after onset of reperfusion



6 hours after onset of reperfusion

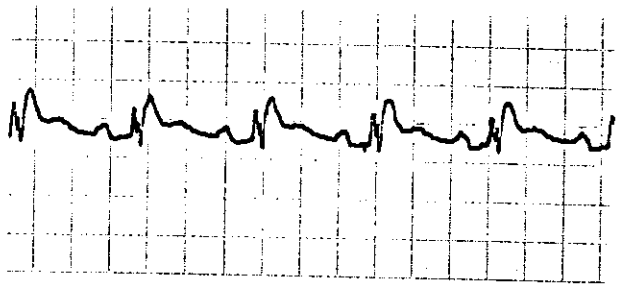
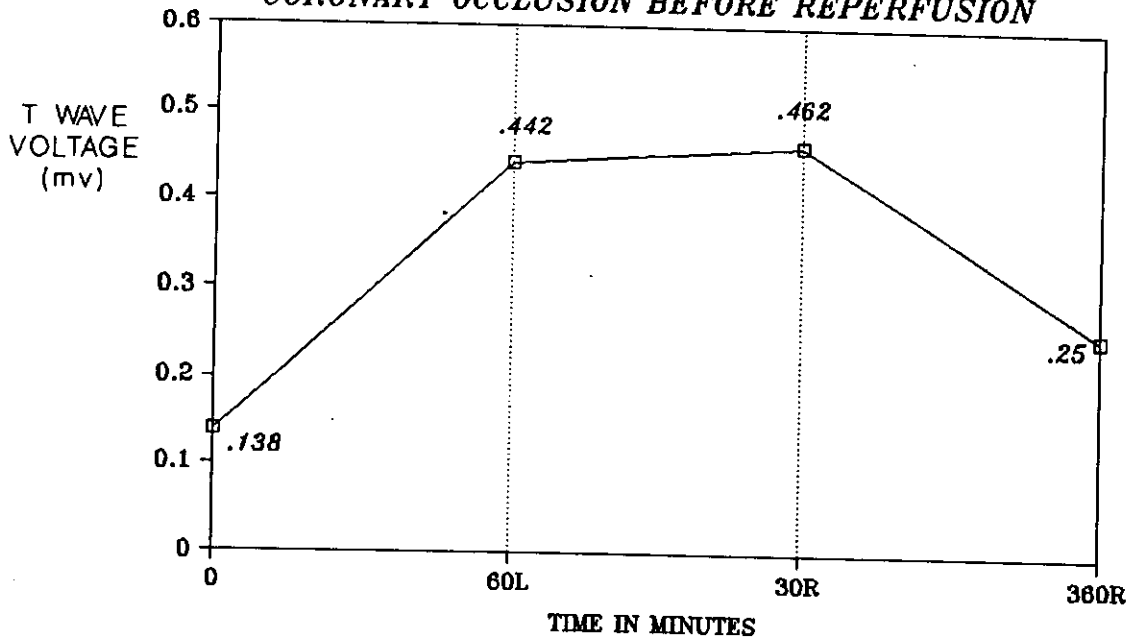


Figure (15a): *The effects of pretreatment with calcium gluconate on T wave voltage and T wave area in rats subjected to coronary artery occlusion for 60 minutes before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH CALCIUM GLUCONATE ON T WAVE VOLTAGE AND AREA IN RATS SUBJECTED TO 60 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



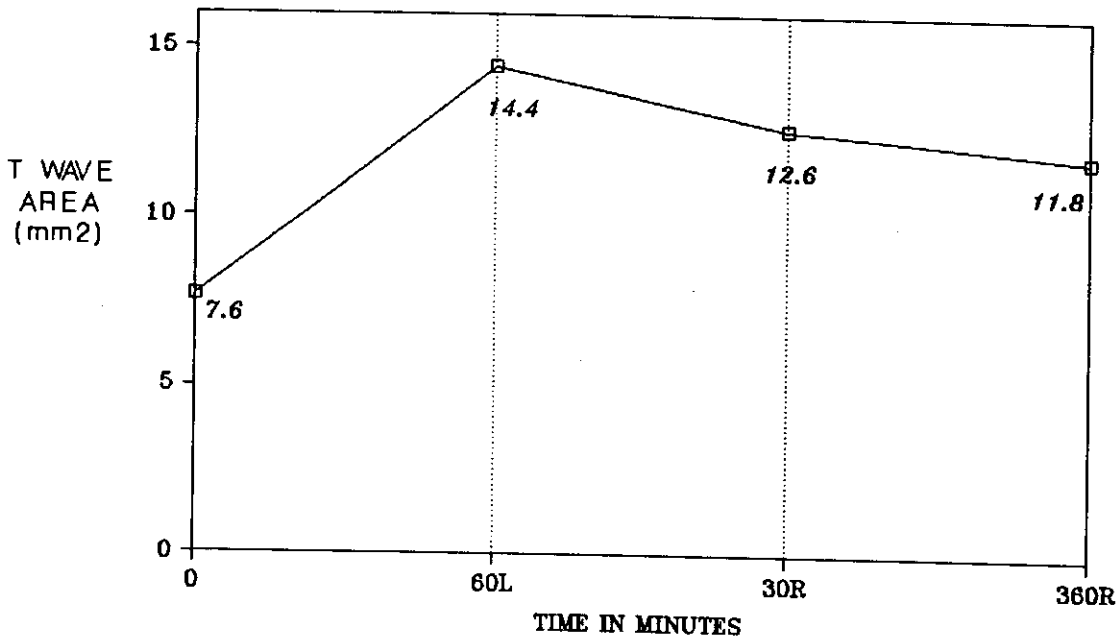


FIGURE 15b

60 minutes after coronary ligation, the range of the T wave area was 8 to 18 mm^2, the mean value was 14.4 ± 4.1 mm^2 showing a significant increase compared with the value before coronary ligation ($P < 0.01$). After 30 minutes of reperfusion, the range was from 7 to 14 mm^2, the mean value was 12.6 ± 3.13 mm^2. This value was not significantly different from that immediately before reperfusion ($P > 0.05$). After 6 hours of reperfusion, the range was between 11 and 13 mm^2 and the mean value was 11.8 ± 0.84 mm^2 which was significantly higher than the value before coronary ligation ($P < 0.01$).

As also shown from Table (15), the S CPK, 6 hours after reperfusion in this subgroup of experiments ranged from 9895 to 11200 u/L. The mean value of S CPK was 10275.4 ± 532.74 u/L. The infarction size in this subgroup of rats (pretreated with calcium gluconate ranged between 55.2 - 61.3% LV, with a mean value 58.3 ± 2.412% LV.

B4) The effects of reperfusion of cardiac muscle 60 minutes after main left coronary artery occlusion in rats treated with PGF2α, given intraperitoneally, 30 minutes before reperfusion in a dose of 0.015 mg/100 gm rat body weight:

The results are shown in Table (16) and Figures (16a & 16b). As observed from Table (16), the T wave voltage, before coronary ligation ranged between 0.13 and 0.20 mv. The mean value was 0.158 ± 0.031 mv. After 60 minutes of coronary ligation, the T wave voltage ranged between 0.35 and 0.50 mv, the mean value was 0.442 ± 0.058 mv, showing a significant increase when compared with the value before coronary ligation ($P < 0.0001$). After 30 minutes of reperfusion the range was between 0.30 and 0.45 mv, the mean value was 0.386 ± 0.055 mv. This value was significantly lower than that at 60 minutes after coronary occlusion and immediately before reperfusion ($P < 0.02$). 6 hours after reperfusion, the range was between 0.10 and 0.18, the mean value was 0.152 ± 0.032 mv. This value was not different from that before coronary ligation ($P > 0.05$).

Table (16): The effect of pretreatment with $PGF_{2\alpha}$ (0.015 mg/100 gm rat body weight given I.P 30 minutes before onset of reperfusion) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary occlusion for 60 minutes before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	60 L	30 R	360 R	0	60 L	30 R	360 R	6 hr.R	6 hr.R
1	0.15	0.45	0.38	0.10	6	16	11	3.5	6010	43.0
2	0.18	0.50	0.40	0.15	7	18	17	5	5988	42.0
3	0.13	0.35	0.30	0.18	5	15	10	6	5500	45.0
4	0.13	0.43	0.40	0.18	5	15	11	6	4902	45.0
5	0.20	0.48	0.45	0.15	6	18	16	4	5876	41.3
Mean	0.158	0.442 "	0.386 ""	0.152 "	5.84	16.4 "	13 ""	4.9 "	5655.2	43.26
S.D.	0.031	0.058	0.055	0.032	0.84	1.52	3.24	1.14	468.19	1.70
P <		0.0001	0.02			0.0001	0.05			

" Compared with the values before coronary ligation (Time 0).

" Compared with the values at 60 minutes after coronary ligation (Time 60 L).

L = After coronary ligation.

R = After coronary reperfusion.

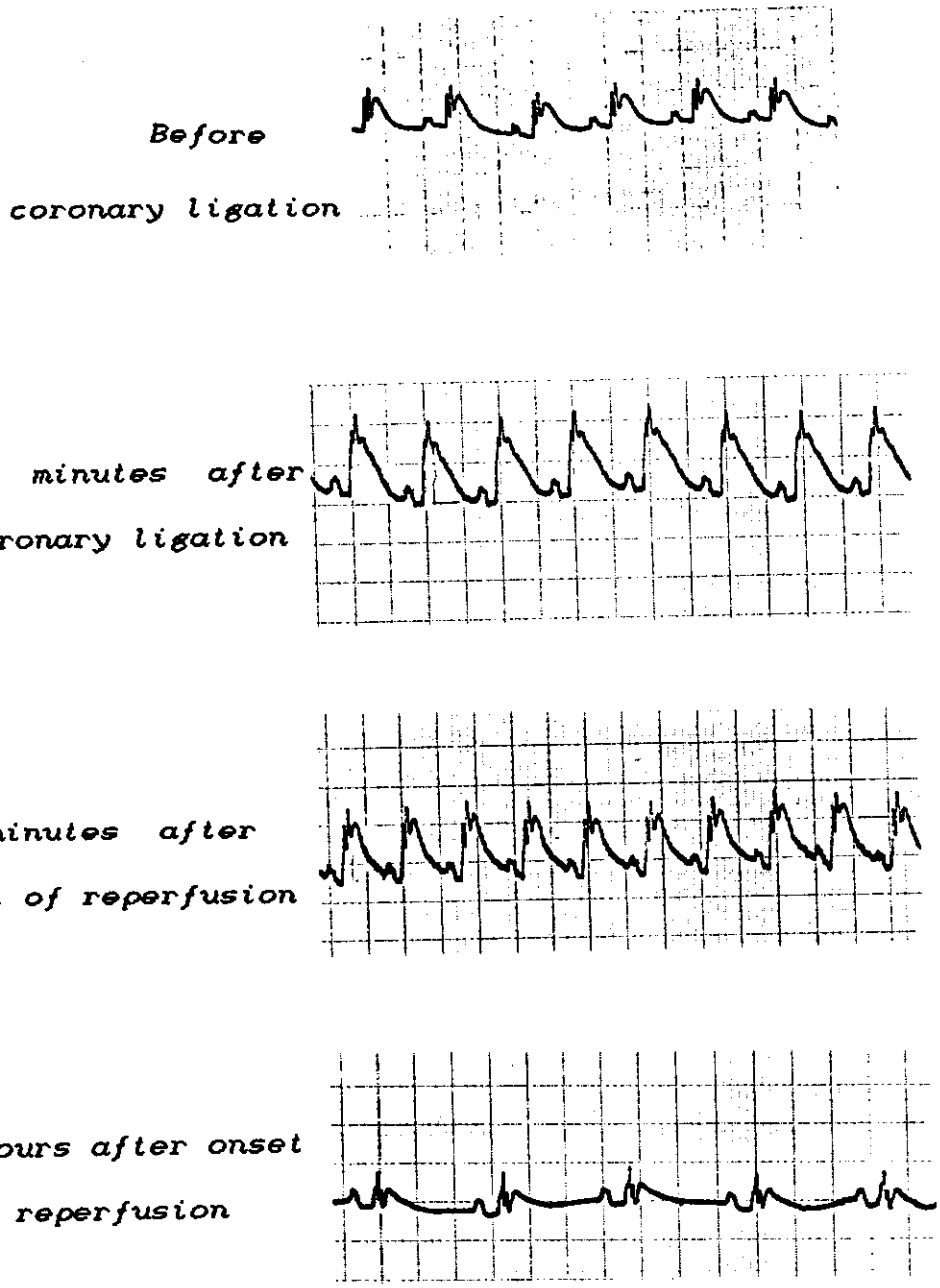
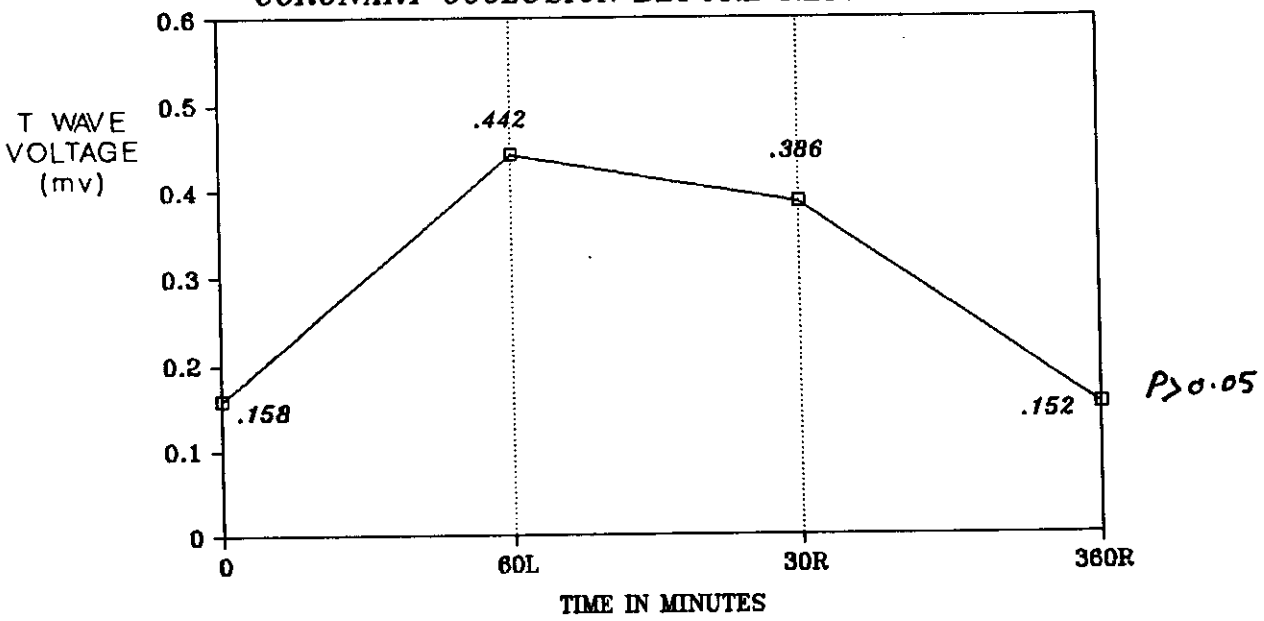
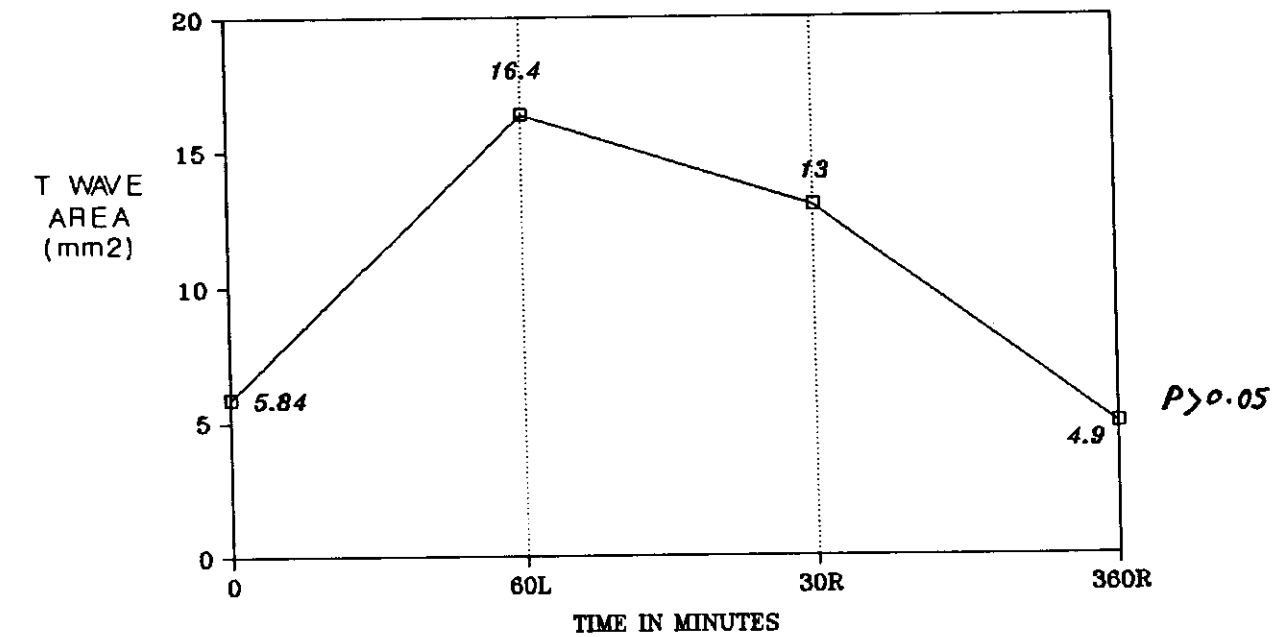


Figure (16a): *The effects of pretreatment with PGF2α on T wave voltage and T wave area in rats subjected to coronary artery occlusion for 60 minutes before onset of reper- fusion.*

THE EFFECTS OF PRETREATMENT WITH PGF2α ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO 60 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



P>0.05



P>0.05

FIGURE 16b

The T wave area, before coronary ligation, ranged between 5 and 7 mm^2, the mean value was 5.84 mm^2 ± 0.84 mm^2. After 60 minutes of coronary ligation, the area ranged between 15 and 18 mm^2, the mean value was 16.4 ± 1.52 mm^2 showing a significant increase when compared with the value before coronary ligation ($P < 0.0001$). 30 minutes after reperfusion, the area of the T wave ranged between 10 and 17 mm^2, the mean value was decreased to 13 ± 3.24 mm^2. This value was significantly lower than that immediately before reperfusion ($P<0.05$). 6 hours after reperfusion, the area ranged betwen 3.5 and 6 mm^2, the mean value was 4.9 ± 1.14 mm^2. This value was not different from that before coronary ligation ($P > 0.05$).

The S CPK in this subgroup of rats (pretreated with $PGF_{2\alpha}$ and subjected to main left coronary artery occlusion for 60 minutes before the onset of reperfusion), 6 hours after the onset of reperfusion ranged between 4902 - 6010 u/L, with a mean value 5655.2 ± 468.19 u/L. The corresponding infarction size was 43.26 ± 1.7% LV (the range being 41.3 - 45% LV).

B5) The effects of reperfusion of cardiac muscle 60 minutes after main left coronary artery occlusion in rats treated with indomethacin, injected intravenously, 15 minutes before onset of reperfusion, in a dose of 0.06 mg/100 gm rat body weight:

The results of this group of experiments carried out on rats pretreated with indomethacin (0.06 mg/100 gm rat body weight i.v., 15 minutes before reperfusion) and subjected to left main coronary artery occlusion for 60 minutes before reperfusion was started are shown in Table (17) and Figure (17a & 17b). It can be seen that the T wave voltage, before coronary ligation, ranged between 0.13 and 0.23 mv, the mean value was 0.178 ± 0.040mv. 60 minutes after coronary ligation, the range was between 0.40 and 0.50 mv, the mean value was 0.436 ± 0.042 mv, showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). 30 minutes after reperfusion, the range was between 0.43 and 0.50 mv, the mean value was 0.462 ± 0.028 mv, showing a significant increase when compared with the value immediately before reperfusion ($P < 0.05$). 6 hours after reperfusion, the range of the T wave voltage was between 0.40 and 0.50 mv, the mean value was 0.456 ± 0.038 mv . This value was significantly higher than the initial value before coronary ligation ($P < 0.001$).

Table (17): The effects of pretreatment with indomethacin (0.06 mg/gm rat body weight given intravenously 15 minutes before onset of reperfusion) on T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to 60 minutes coronary occlusion before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	60 L	30 R	360 R	0	60 L	30 R	360 R	6 hr.R	6 hr.R
1	0.15	0.50	0.50	0.50	5	23	27	32	15313	71.0
2	0.23	0.43	0.45	0.45	8	21	27	30	14900	69.0
3	0.18	0.45	0.48	0.48	7	26	30	32	15131	68.3
4	0.20	0.40	0.43	0.40	7	23	26	27	14321	72.5
5	0.13	0.40	0.45	0.45	4	25	26	29	14892	67.9
Mean	0.178	0.436"	0.462""	0.456"	6.2	23.6"	27.2""	30"	14911.4	69.74
S.D.	0.04	0.042	0.028	0.038	1.64	1.95	1.64	2.12	373.69	1.95
P <		0.001	0.05	0.001		0.0001	0.02	0.001		

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 60 minutes after coronary ligation (Time 60 L).

L = After coronary ligation.

R = After coronary reperfusion.

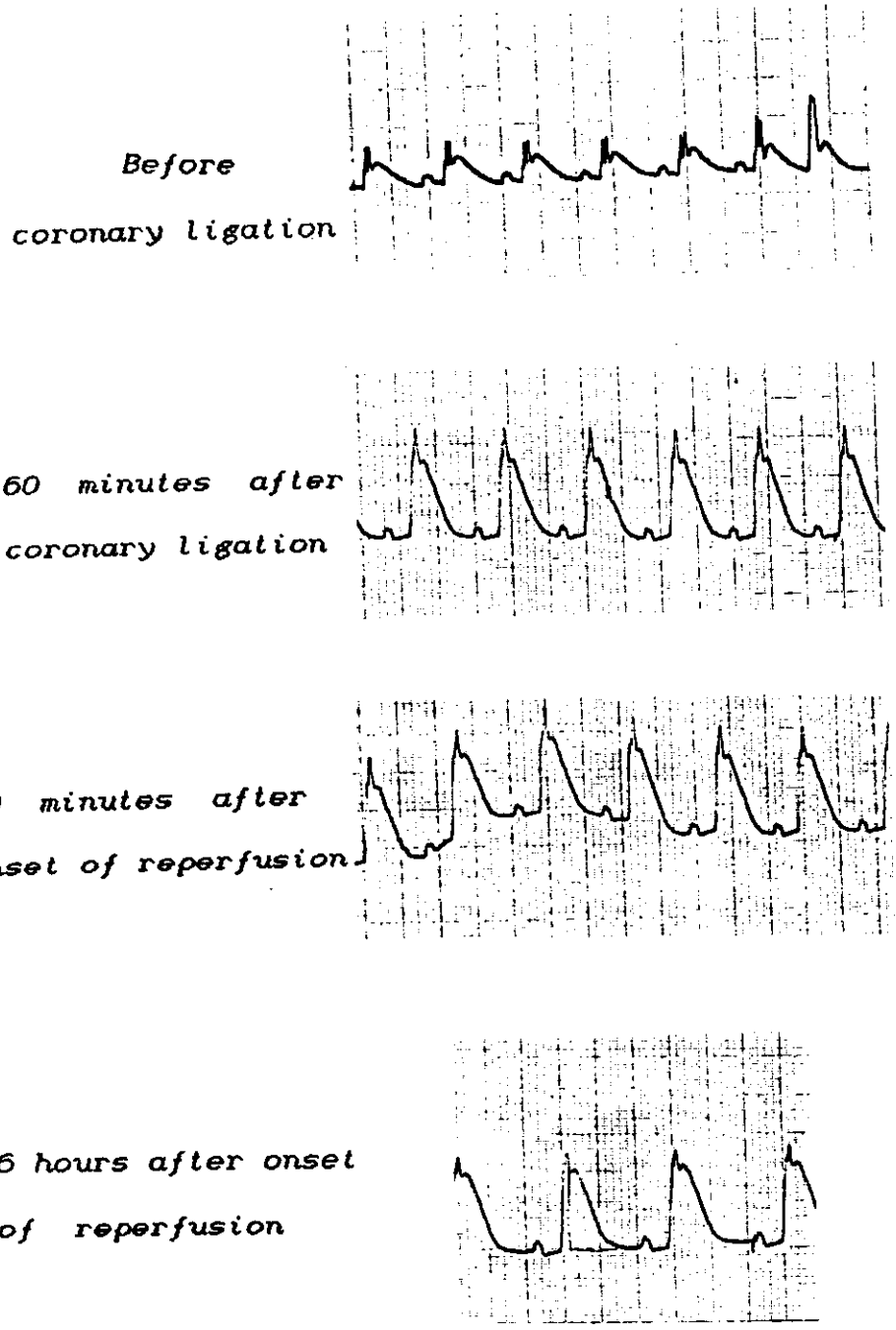
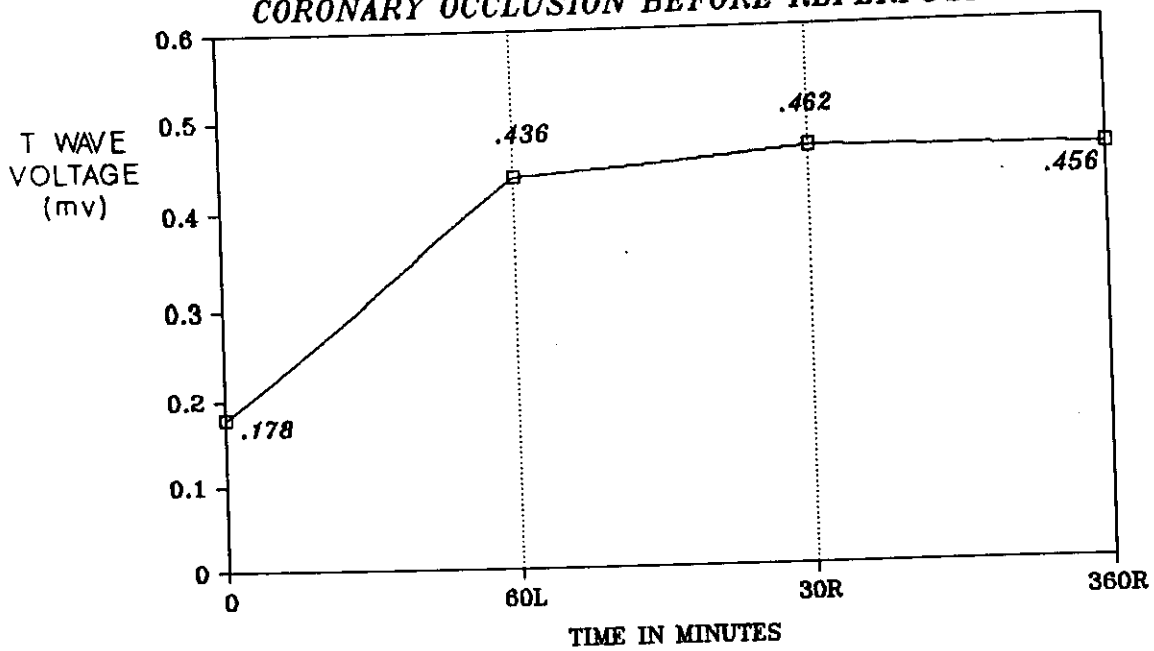


Figure (17a): *The effects of pretreatment with indomethacin on T wave voltage and T wave area in rats subjected to coronary artery occlusion for 60 minutes before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH INDOMETHACIN ON T WAVE VOLTAGE AND AREA IN RATS SUBJECTED TO 60 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



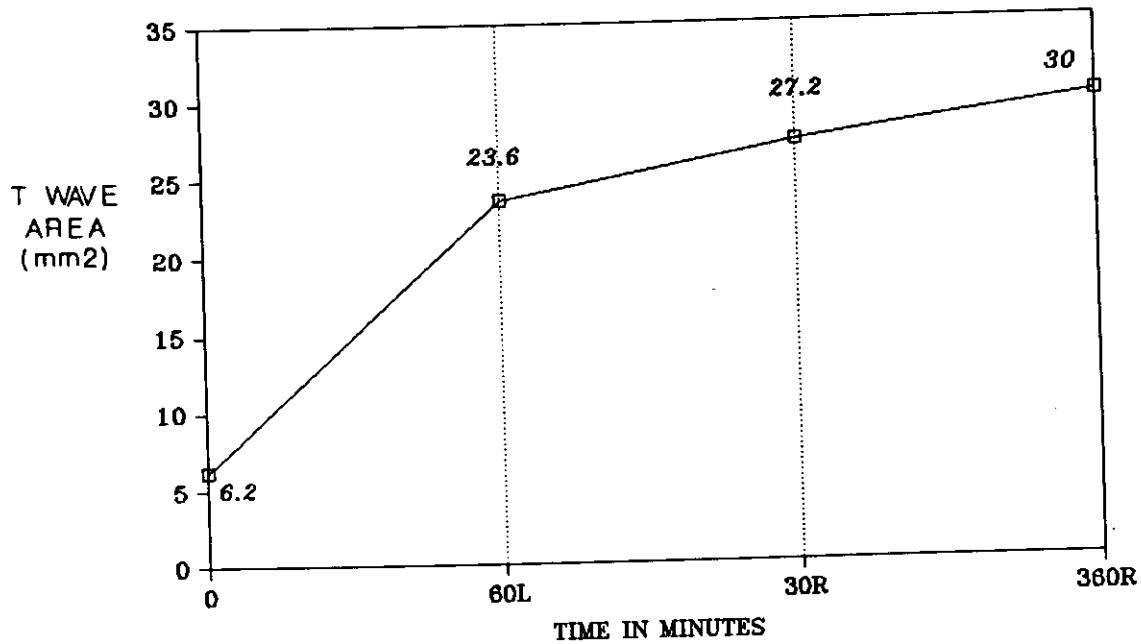


FIGURE 17b

The T wave area before coronary ligation ranged between 4 and 8 mm^2, the mean value was 6.2 ± 1.64 mm^2. 60 minutes after coronary ligation, the range was between 21 and 26 mm^2, the mean value was 23.6 ± 1.95 mm^2 showing a significant increase when compared with the value before coronary ligation ($P < 0.0001$). 30 minutes after reperfusion, the area ranged between 26 and 30 mm^2, the mean value was 27.2 ± 1.64 mm^2 which was significantly higher than the value at 60 minutes of ligation ($P < 0.02$). 6 hours after reperfusion, the range was between 27 and 32 mm^2, the mean value was 30 ± 2.12 mm^2 . This value was significantly higher than the initial value before coronary ligation ($P < 0.001$).

6 hours after reperfusion as also seen from Table (17), the S CPK in this subgroup rats ranged between 14321 and 15313 u/L with a mean value 14911.4 ± 373.69 u/L. While the infarction size ranged between 67.9 - 72.5% LV with a mean value of 69.74 ± 1.95% LV.

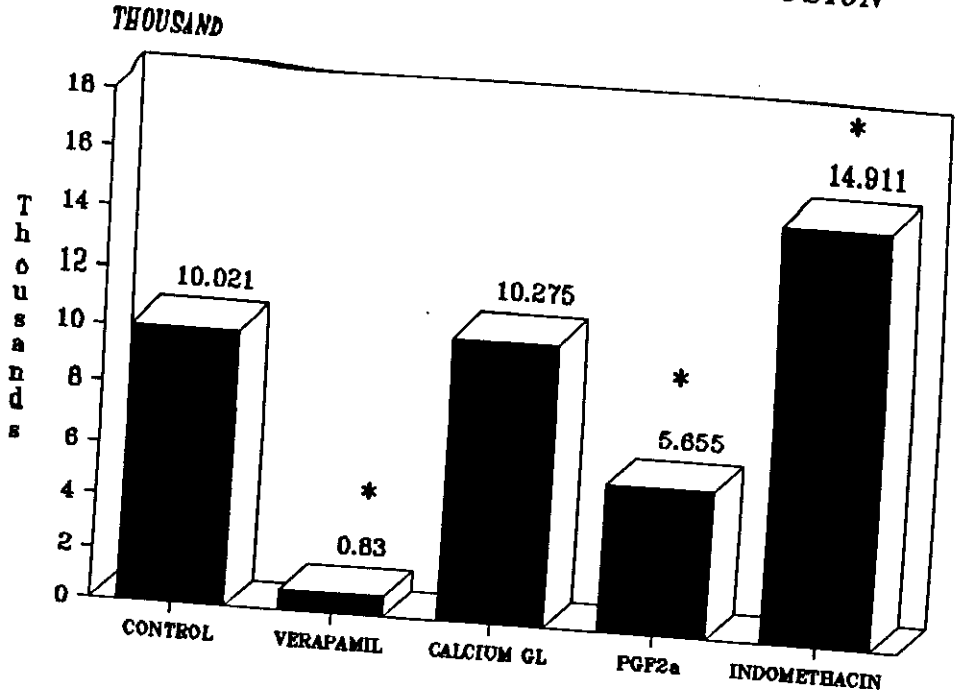
Table 18 compares the results of the 5 subgroups included in this group of rats subjected to main left coronary artery occlusion for 60 minutes before the onset of reperfusion. The treated subgroups are compared with the non treated one.

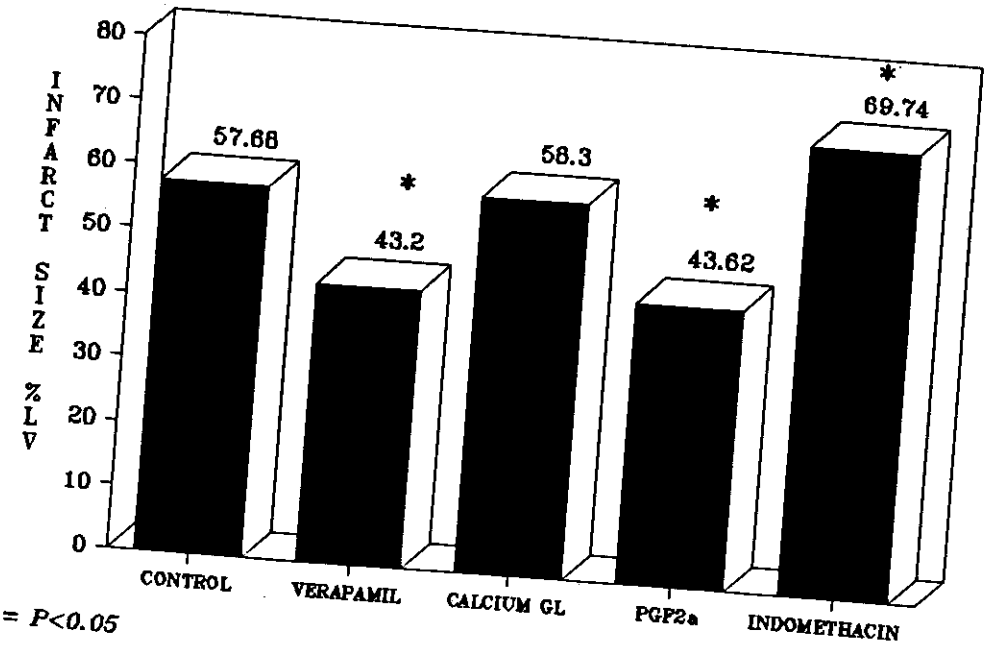
Table (18): Means & standard deviation of the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in the group rats subjected to coronary occlusion for 60 minutes before onset of reperfusion.

SUBGROUP	T WAVE VOLTAGE (mv)				T WAVE AREA (mm^2)				S CPK (u/L)	inf. size (% LV)
	TIME				TIME					
	Before co. lig.	60 min after co lig.	30 min after reperf.	6 hours after reperf.	before co. lig.	60 min after co lig.	30 min after reperf.	6 hours after reperf.	6 hours after reperf.	6 hours after reperf
Non treated rats B1	0.190 ± 0.042	0.456 ± 0.150	0.406 ± 0.150	0.236 ± 0.069	7.20 ± 1.90	20.40 ± 6.58	18.80 ± 7.12	11.40 ± 3.97	10020.60 ± 758.20	57.680 ± 6.700
C.C.B pretreated rats B2	0.156 ± 0.038	0.460 ± 0.040	0.340 ± 0.050	0.154* ± 0.025	5.40 ± 1.14	21.80 ± 1.92	18.80 ± 3.11	6.60* ± 1.14	830.20* ± 38.12	43.20* ± 2.387
Calcium Gl pretreated rats B3	0.138 ± 0.029	0.442 ± 0.108	0.462 ± 0.105	0.250 ± 0.080	7.60 ± 1.14	14.40 ± 4.10	12.60 ± 3.13	11.80 ± 0.84	10275.40 ± 532.74	58.300 ± 2.412
PGF2α pretreated rats B4	0.158 ± 0.031	0.442 ± 0.058	0.386 ± 0.055	0.152* ± 0.032	5.48 ± 0.84	16.40 ± 1.52	13.00 ± 3.24	4.90* ± 1.14	5655.20* ± 468.19	43.26* ± 1.700
Indometh. pretreated rats B5	0.178 ± 0.040	0.436 ± 0.042	0.462 ± 0.028	0.456* ± 0.038	6.20 ± 1.64	23.60 ± 1.95	27.20* ± 1.64	30.00* ± 2.12	14511.40* ± 373.19	69.74* ± 1.95

* = $P < 0.05$

S CPK AND INFARCTION SIZE AFTER 6 HOURS IN RATS SUBJECTED TO CORONARY OCCLUSION FOR 60 MINUTES BEFORE REPERFUSION





* = $P<0.05$

FIGURE 18

It shows that in calcium channel blocker treated subgroup there was a significant decrease in the T wave voltage and area after 6 hours of reperfusion ($P < 0.05$). Also there was a significant decrease in the S CPK and infarction size after 6 hours of coronary reperfusion ($P < 0.05$). In PGF2α treated subgroup there was a significant decrease in the T wave voltage, T wave area, S CPK and infarction size after 6 hours of coronary reperfusion ($P < 0.05$). In indomethacin treated group there was a significant increase in the T wave voltage, T wave area, S CPK and infarction size after 6 hours of coronary reperfusion ($P < 0.05$). Also indomethacin increased significantly the T wave area at 30 minutes after reperfusion ($P < 0.05$). (See Fig. 18)

C) The Effects of Reperfusion of the Cardiac Muscle 90 Minutes After Main Left Coronary Occlusion on the Ischemia-Induced Changes in T Wave Voltage (mv), T Wave Area (mm^2), S CPK (u/L) and Infarction Size (% LV).

C1) The effects of reperfusion with no drug administration:

The results are shown in Table (19) and Figure (19a & 19b). It can be seen that in this subgroup, i.e. the

animals which underwent coronary ligation of the main left coronary artery for 90 minutes followed by reperfusion for 6 hours, the T wave voltage, before coronary ligation, ranged from 0.13 to 0.2 mv while the mean value was 0.168 ± 0.028 mv. After 90 minutes of coronary ligation the T wave voltage ranged from 0.35 to 0.40 mv while the mean value was 0.37 ± 0.027 showing a significant increase when compared with the value before ligation of the coronary artery ($P < 0.001$) . After 30 minutes of reperfusion the T wave voltage ranged from 0.30 to 0.38 mv while the mean value was 0.334 ±0.032 mv which was significantly lower than that immediately before reperfusion ($P < 0.01$). After 6 hours of reperfusion the range of the T wave voltage was 0.075 to 0.2 mv, the mean value was 0.115 ± 0.049 mv, which was not significantly different from the mean value before coronary ligation ($P > 0.05$).

Before coronary ligation the area under the T wave ranged from 4.5 to 7 mm^2 and the mean value was 6.1 ± 1.025 mm^2. After 90 minutes of coronary ligation it ranged from 14 to 20 mm^2, the mean value was 17.4 ± 2.410 mm^2. showing a significant increase when compared with the value before coronary ligation ($P < 0.001$) After 30 minutes of reperfusion the area under T wave

Table (19): The effects of reperfusion of the cardiac muscle 90 minutes after occlusion of the main left coronary artery on the ischemia-induced changes in T wave voltage (mv), T wave area (cm^2), S CPK (u/L) and infarction size (% LV)

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	90 L	30 R	360 R	0	90 L	30 R	360 R	6 hr.R	6 hr.R
1	0.15	0.35	0.30	0.075	6	14	7	5	13112	54.5
2	0.18	0.40	0.35	0.10	6	18	12	9	12210	62.3
3	0.13	0.35	0.33	0.10	4.5	16	13	10	13500	52.1
4	0.20	0.35	0.31	0.10	7	20	11	9	11124	57.0
5	0.18	0.40	0.38	0.20	7	19	10	8	11998	69.9
Mean	0.168	0.37"	0.334""	0.115"	6.1	17.4"	10.6""	8.2"	12388.8	59.16
S.D.	0.028	0.027	0.032	0.049	1.025	2.41	2.30	1.92	941.04	7.096
P <		0.001	0.01			0.001	0.002			

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 90 minutes after coronary ligation (Time 90 L).

L = After coronary ligation.

R = After coronary reperfusion.

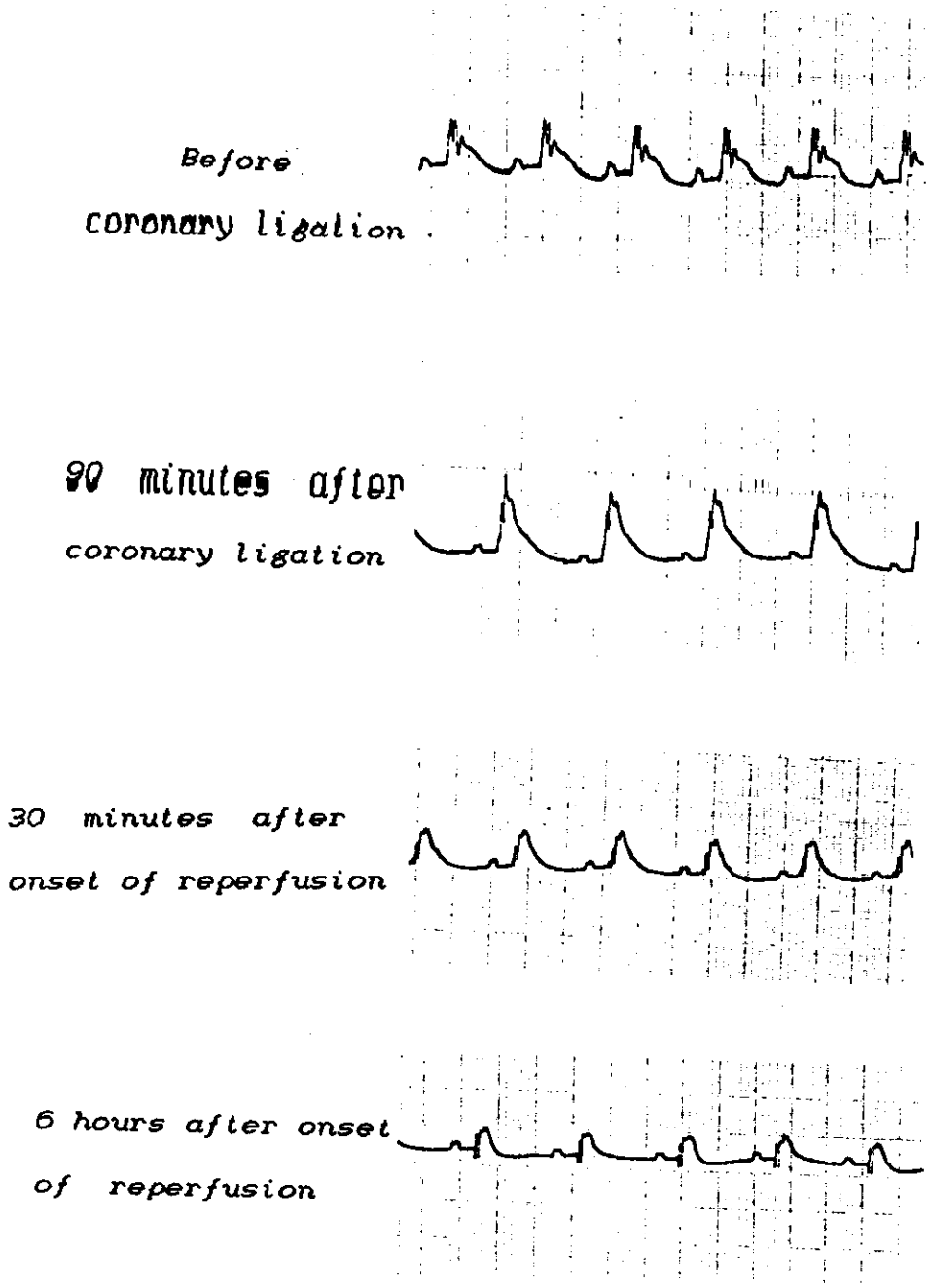
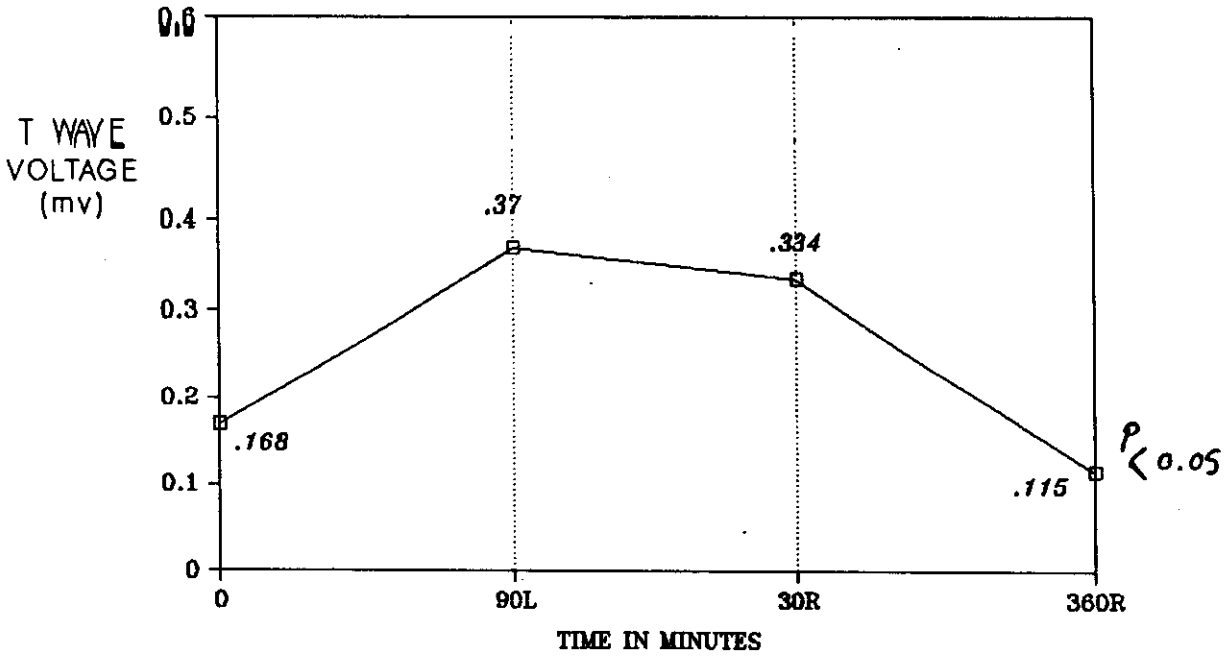


Figure (19a): *The effects of reperfusion of cardiac muscle 90 minutes after occlusion of the main left coronary artery on ischemia-induced changes in T wave voltage and T wave area.*

THE EFFECTS OF REPERFUSION AFTER 90 MIN OF CORONARY OCCLUSION ON T WAVE VOLTAGE AND T WAVE AREA



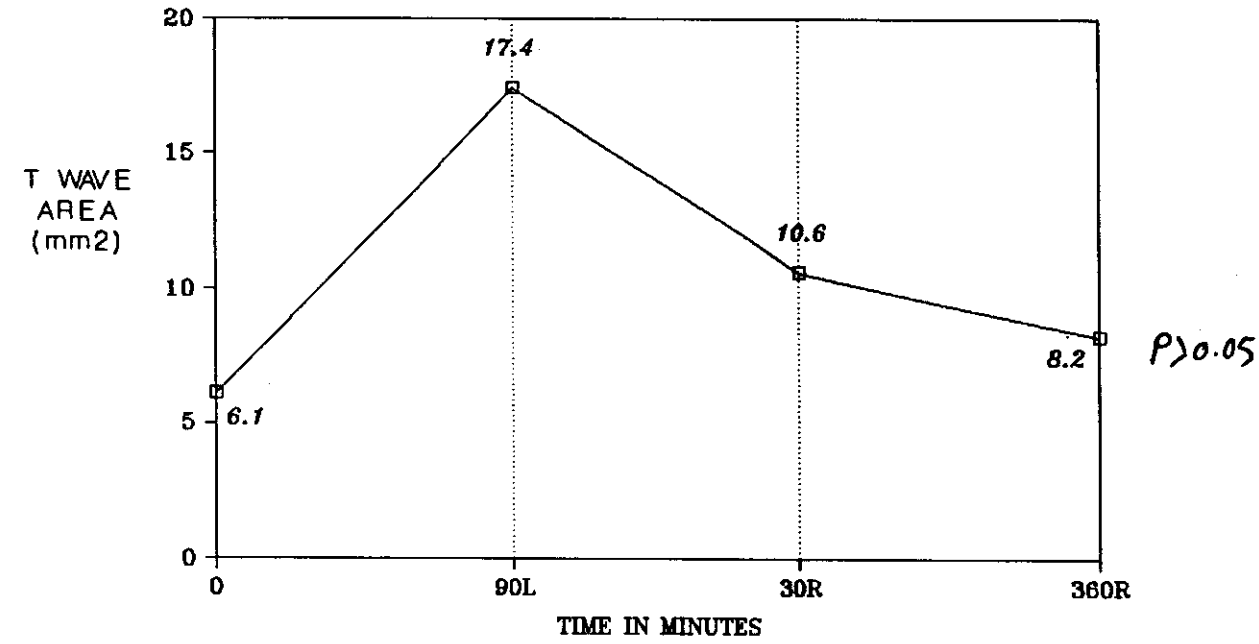


FIGURE 19b

ranged from 7 to 13 mm^2 with mean value of 10.6 ± 2.30 mm^2 i.e. it was significantly decreased when compared with the value immediately before reperfusion ($P < 0.002$). After 6 hours of reperfusion the area under the T wave ranged from 5 to 10 mm^2 with a mean value of 8.2 ± 1.92mm^2, which was not significantly different from the value before coronary ligation ($P > 0.05$).

As also observed from Table (19), the S CPK in this subgroup of rats, 6 hours after reperfusion ranged between 11124 and 13500 u/L, the mean value being 12388.8 ± 941.04 u/L. The corresponding infarction size was of a mean value 59.16 ± 7.096% LV (the range as noticed from Table 19 was 52.1 - 69.9% LV).

(c2) The effects of reperfusion after 90 minutes of main left coronary artery occlusion in rats pretreated with the calcium channel blocker (verapamil) injected intravenously, 15 minutes before onset of reperfusion in a dose of 0.01 mg/100 gm rat body weight:

The results are shown in Table (20) and Figures(20a & 20b). It can be seen that in this subgroup, the T wave voltage, before coronary ligation, ranged between 0.15 and 0.2 mv, the mean value was 0.176 ± 0.025 mv. After 90 minutes of coronary ligation the T wave voltage

Table (20): The The effects of pretreatment with the calcium channel blocker, verapamil, (at a dose of 0.01 mg/100 gm rat body weight given i.v, 15 minutes before onset of reperfusion) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary occlusion for 90 minutes before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	90 L	30 R	360 R	0	90 L	30 R	360 R	6 hr	6 hr.R
1	0.15	0.45	0.38	0.15	5	25	20	8	802	40.3
2	0.18	0.65	0.55	0.20	6	32	26	6	850	45.0
3	0.20	0.38	0.28	0.18	6	23	18	4	790	39.0
4	0.15	0.55	0.58	0.13	5	24	20	5	820	43.3
5	0.20	0.70	0.60	0.20	8	34	28	7	798	44.0
Mean	0.176	0.546"	0.462""	0.162"	6	27.6"	22.4""	6"	812	42.32
S.D.	0.025	0.134	0.130	0.037	1.22	5.03	4.34	1.58	23.92	2.55
P <		0.005	0.001			0.001	0.001			

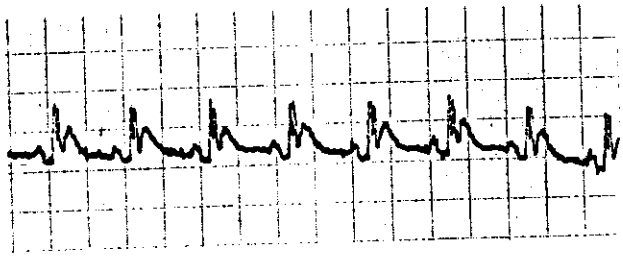
" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 90 minutes after coronary ligation (Time 90 L).

L = After coronary ligation.

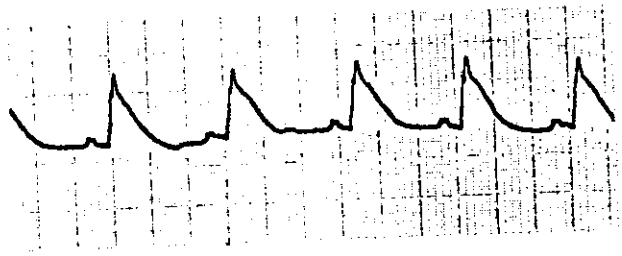
R = After coronary reperfusion.

Before coronary ligation



90 minutes after coronary ligation

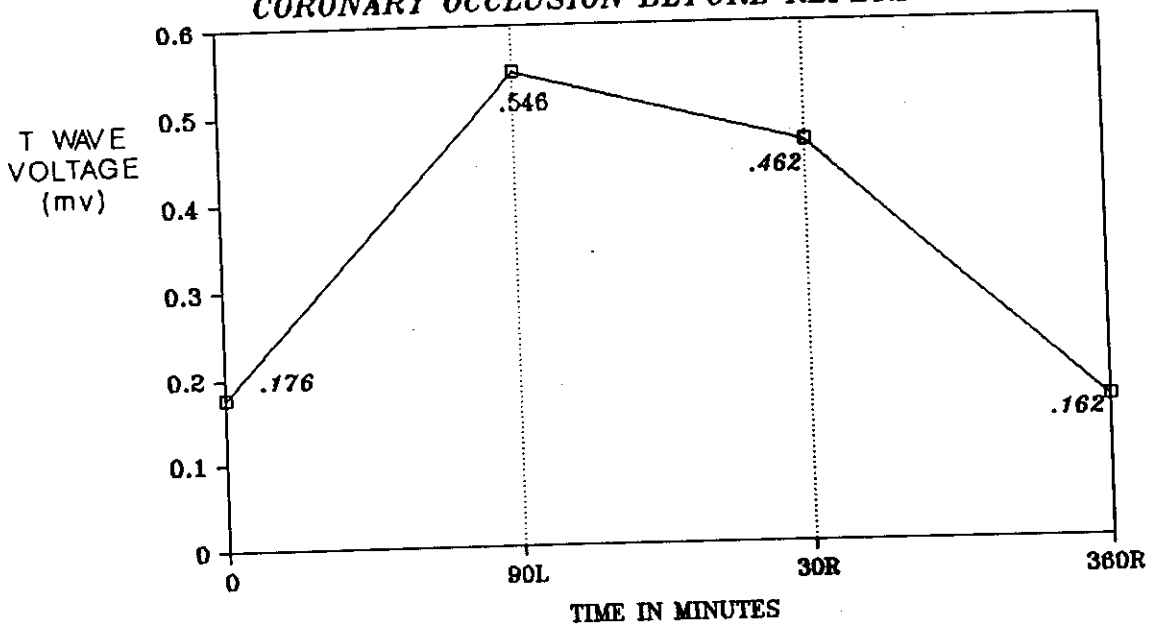
30 minutes after onset of reperfusion



6 hours after onset of reperfusion

Figure (20a): *The effects of pretreatment with the calcium channel blocker verapamil, on the T wave voltage and T wave area in rats subjected to coronary occlusion for 90 minutes before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH VERAPAMIL ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO 90 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



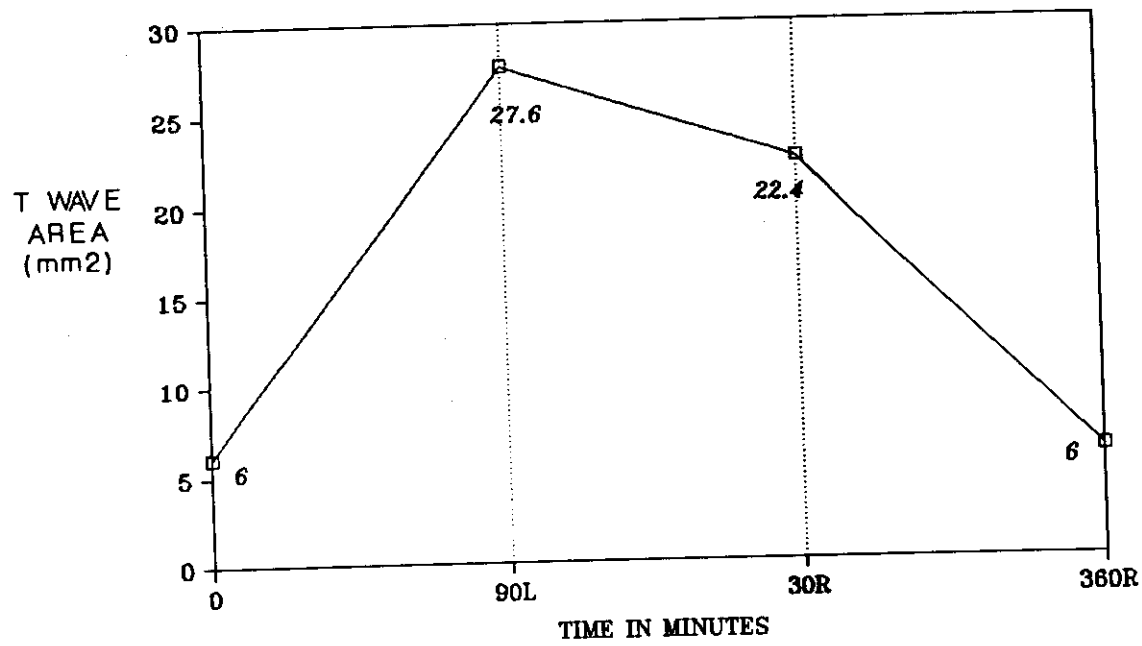


FIGURE 20b

ranged from 0.38 to 0.70 mv, the mean value was 0.546 ± 0.134 mv, showing a significant increase compared with the value before coronary ligation ($P < 0.005$). After 30 minutes of reperfusion, the T wave voltage ranged between 0.28 and 0.60 mv, the mean value was 0.462 ± 0.13 mv. Comparing this value with that immediately before reperfusion, a significant decrease was observed ($P < 0.001$). After 6 hours of reperfusion, the voltage ranged from 0.13 to 0.20 mv with a mean value of 0.162 ± 0.037 mv which was not different from the value before coronary ligation ($P > 0.05$).

The T wave area, before coronary ligation, ranged from 5 to 8 and the mean value was 6 ± 1.22 mm^2. 90 minutes after coronary ligation the T wave area ranged between 23 and 34 mm^2 and the mean value was significantly increased to 27.6 ± 5.03 mm^2 ($P < 0.001$). 30 minutes after reperfusion the T wave area ranged from 18 to 28 mm^2 and the mean value was significantly decreased to 22.4 ± 4.34 mm^2 when compared with the value immediately before reperfusion ($P < 0.001$). After 6 hours of reperfusion the T wave area ranged from 4 to 8 mm^2, the mean value was 6 ± 1.58 mm^2 that was not significantly different from the value before coronary ligation ($P > 0.05$)

It is also noted from Table (20) that the S CPK 6 hours after the onset of reperfusion in this subgroup of rats ranged from 790 to 850 u/L with a mean value 812 ± 23.92 u/L.

The infarction size in this subgroup 6 hours after reperfusion ranged from 39 to 45% LV, with a mean value 42.32 ± 2.55% LV.

C3) The effects of reperfusion of the cardiac muscle 90 minutes after main left coronary artery occlusion in rats pretreated with calcium gluconate injected intraperitoneally 30 minutes before reperfusion, in a dose of 0.12 mg/100 gm rat body weight:

The results are shown in Table (21) and Figures (21a & 21b). It can be seen that in this subgroup, the T wave voltage, before coronary ligation, ranged between 0.15 and 0.20 mv, the mean value was 0.176 ± 0.025 mv. After 90 minutes of coronary ligation, the range was between 0.45 and 0.50 mv, the mean value was 0.482 ± 0.020 mv showing a significant increase compared with the value before coronary ligation ($P < 0.0001$) . After 30 minutes of reperfusion, the T wave voltage ranged between 0.45 and 0.55 mv, the mean value was 0.510 ±

Table (21): The effects of pretreatment with calcium gluconate (0.12 mg/100 gm rate body weight given I.P., 30 minutes before onset of reperfusion) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to 90 minutes coronary occulsion before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	90 L	30 R	360 R	0	90 L	30 R	360 R	6 hr.R	6 hr.R
1	0.15	0.50	0.55	0.25	5	24	24	11	13020	56.2
2	0.15	0.50	0.55	0.25	5	25	23	10	12900	60.0
3	0.20	0.48	0.50	0.30	6	23	21	11	13501	62.0
4	0.20	0.45	0.45	0.25	6	21	21	10	11910	55.4
5	0.18	0.48	0.50	0.23	5.5	25	25	12	12670	56.0
Mean	0.176	0.482*	0.510**	0.256*	5.5	23.6*	22.8**	10.8*	12800.2	57.92
S.D.	0.025	0.020	0.042	0.026	0.50	1.67	1.79	0.84	582.84	2.90
P <		0.0001	0.05	0.005		0.0001		0.001		

* Compared with the values before coronary ligation (Time 0).

** Compared with the values at 90 minutes after coronary ligation (Time 90 L).

L = After coronary ligation.

R = After coronary reperfusion.

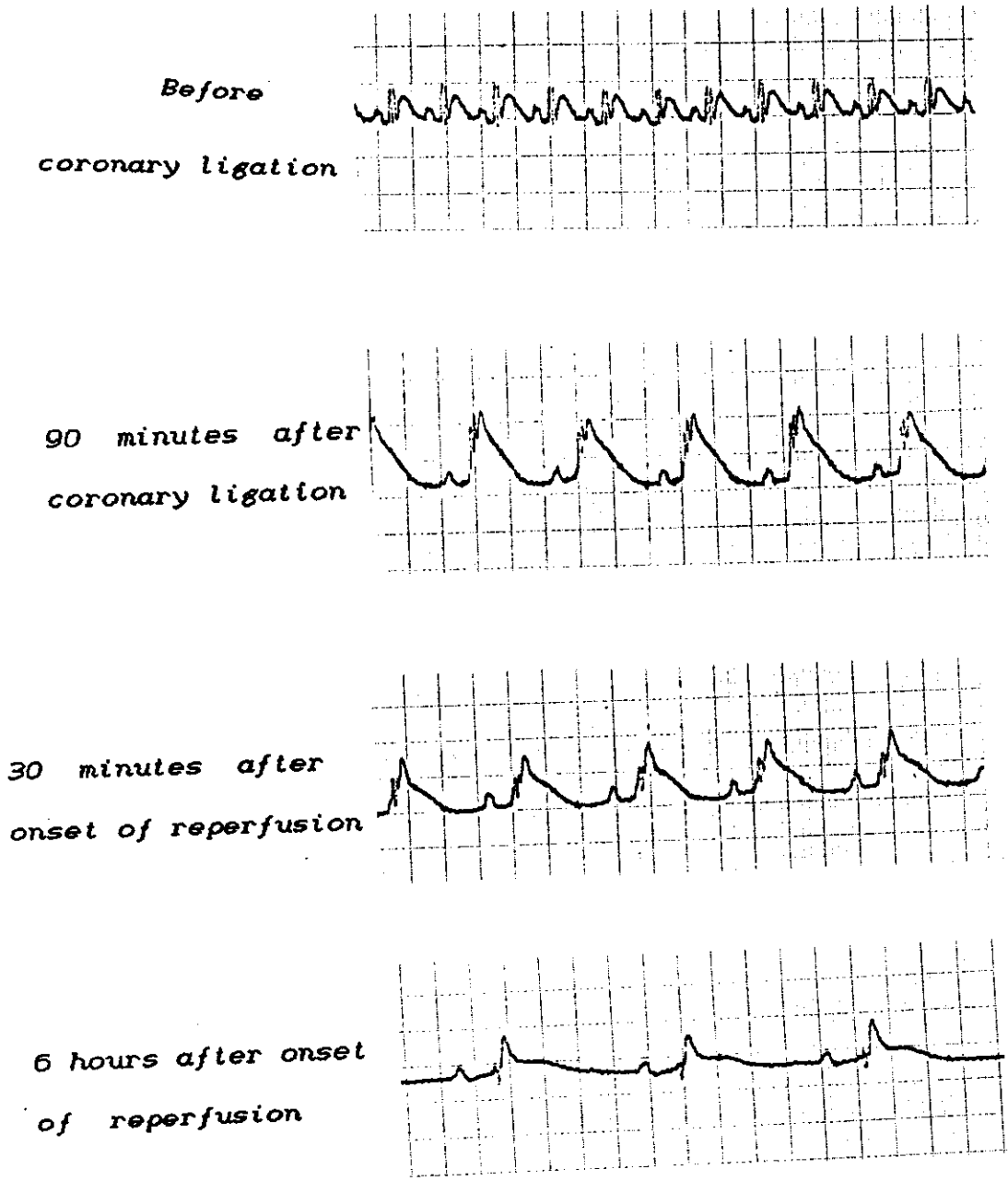
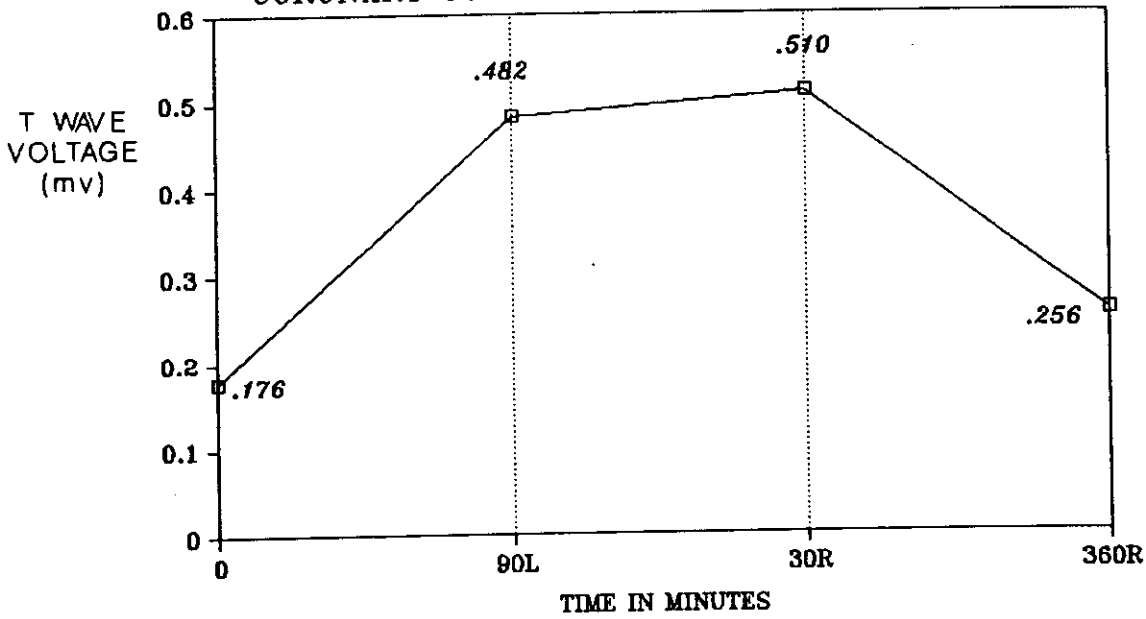


Figure (21a): *The effects of pretreatment with calcium gluconate, on the T wave voltage and T wave area in rats subjected to coronary occlusion for 90 minutes before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH CALCIUM GLUCONATE ON T WAVE VOLTAGE AND AREA IN RATS SUBJECTED TO 90 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



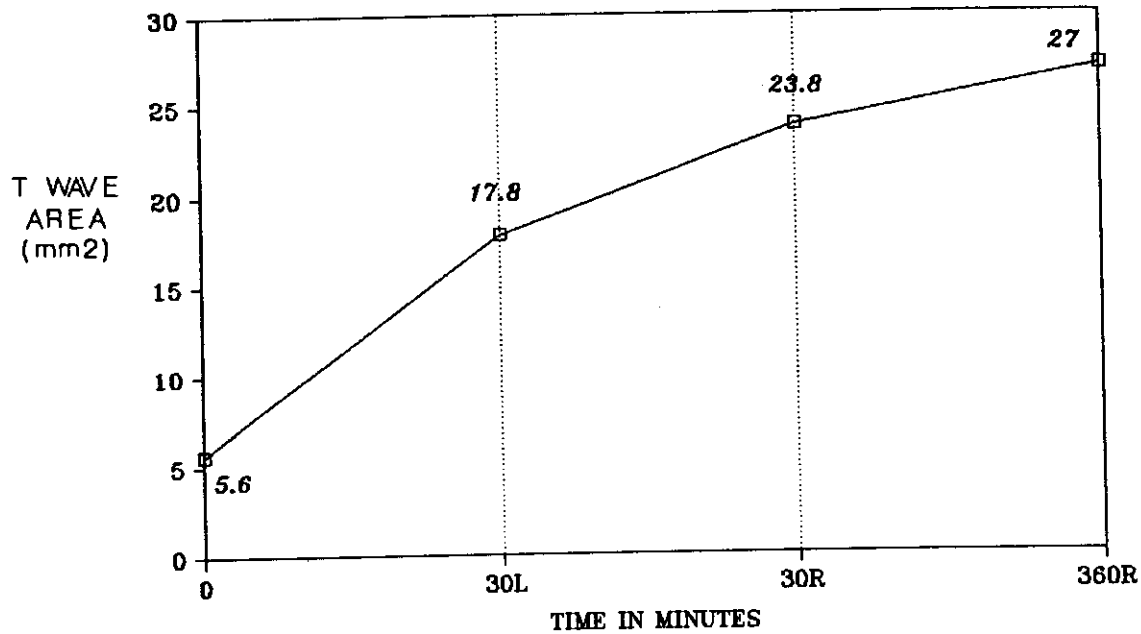


FIGURE 21b

0.042 mv. Comparing this value with the value at 90 minutes coronary ligation i.e. immediately before reperfusion, the T wave voltage was found to be significantly increased ($P < 0.05$). 6 hours after reperfusion, the values of the T wave voltage ranged from 0.23 to 0.30 mv, the mean value was 0.256 ± 0.026 mv which was significantly higher than the value before coronary ligation ($P < 0.005$).

The T wave area before coronary ligation ranged between 5 and 6 mm^2, the mean value was 5.5 ± 0.50 mm^2. After 90 minutes of coronary ligation the range was between 21 and 25 mm^2, the mean value was 23.6 ± 1.67 mm^2, showing a significant increase, when compared with the value before coronary ligation ($P < 0.0001$). After 30 minutes of reperfusion, the range was between 21 and 25 mm^2, the mean value was 22.8 ± 1.79 mm^2, showing no change from that value immediately before reperfusion ($P > 0.05$). 6 hours after reperfusion, the area ranged between 10 to 12 mm^2, the mean value was 10.8 ± 0.84 mm^2 which was significantly higher than that value before coronary ligation ($P < 0.001$).

It is also seen from Table (21) that the S CPK, 6 hours after reperfusion in this subgroup of rats ranged

between 11910 - 13501 u/L; the mean value being 12800.2 ± 582.84 u/L.

The infarction size 6 hours after reperfusion ranged from 55.4 to 62% LV with a mean value 57.92 ± 2.9% LV.

C4) The effects of reperfusion of the cardiac muscle 90 minutes after coronary artery occlusion in rats pretreated with PGF2α injected intraperitoneally 30 minutes before onset of reperfusion in a dose of 0.015 mg/100 gm rat body weight:

The results are shown in Table (22) and Figures (22a & 22b). It can be seen that before coronary ligation in this subgroup, the T wave voltage ranged between 0.13 and 0.18 mv, the mean value was 0.148 ± 0.02 mv. After 90 minutes of coronary ligation, the range was between 0.30 and 0.48 mv, the mean value was 0.402 ± 0.075 mv showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). After 30 minutes of reperfusion, the range of the T wave voltage was between 0.25 and 0.44 mv, the mean value decreased to 0.354 ± 0.077 mv. This value was significantly lower than that immediately before

Table (22): The effect of pretreatment with PGF$_{2\alpha}$ (0.015 mg/100 gm rat body weight given I.P 30 minutes before onset of reperfusion) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary occlusion for 90 minutes before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	90 L	30 R	360 R	0	90 L	30 R	360 R	6 hr.R	6 hr.R
1	0.13	0.30	0.25	0.18	5	12	10	4	7010	45.0
2	0.13	0.35	0.30	0.20	5	14	12	4	6801	43.0
3	0.18	0.43	0.38	0.28	7	15	13	9	6900	48.0
4	0.15	0.45	0.40	0.15	6	18	15	3	5987	41.0
5	0.15	0.48	0.44	0.13	6	20	17	2	6000	38.5
Mean	0.148	0.402$^{"}$	0.354$^{""}$	0.188$^{"}$	5.8	15.8$^{"}$	13.4$^{""}$	4.4$^{"}$	6539.6	43.1
S.D.	0.020	0.075	0.077	0.058	0.84	3.19	2.70	2.7	503.99	3.65
P <		0.001	0.0001			0.002	.0001			

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 90 minutes after coronary ligation (Time 90 L).

L = After coronary ligation.

R = After coronary reperfusion.

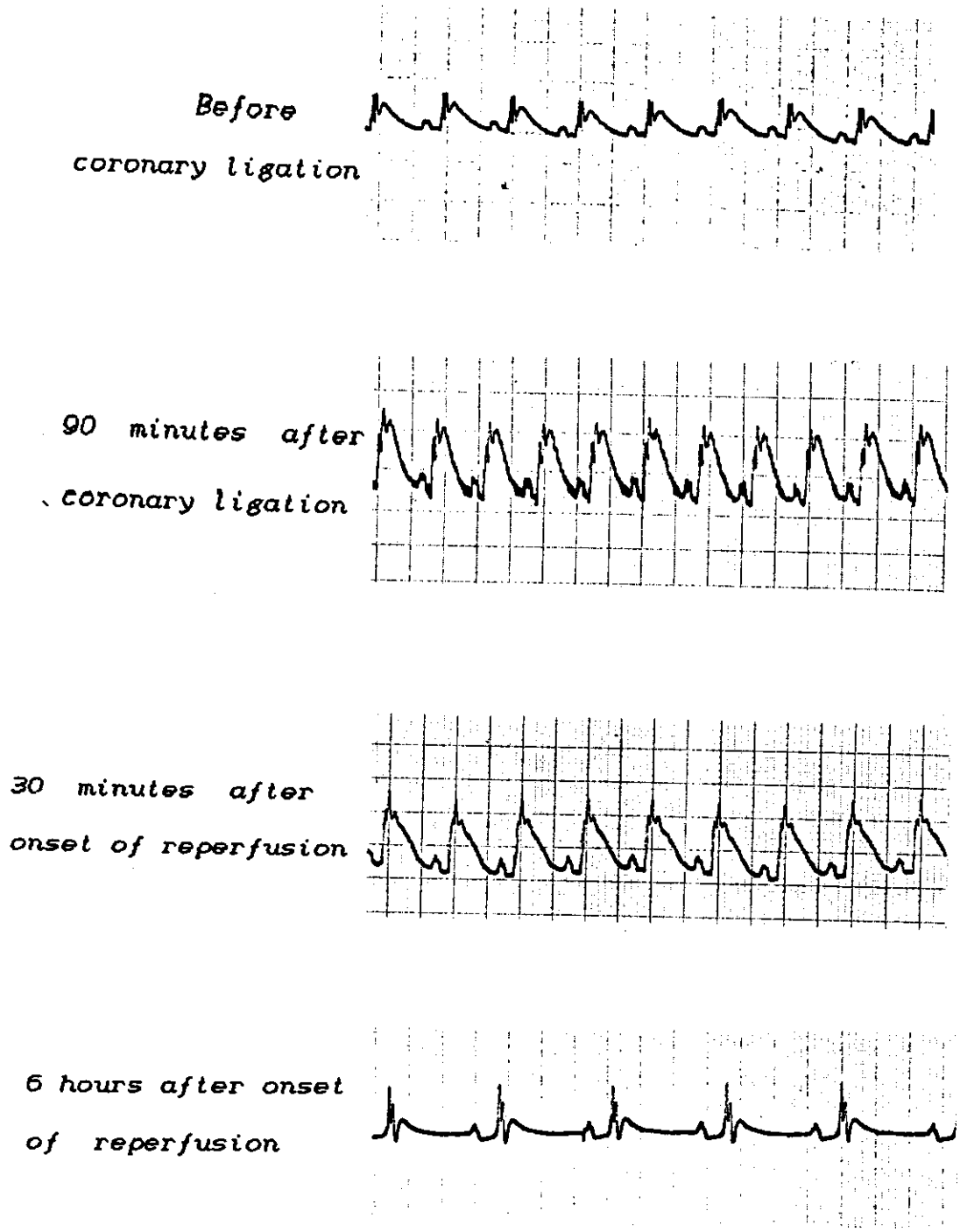
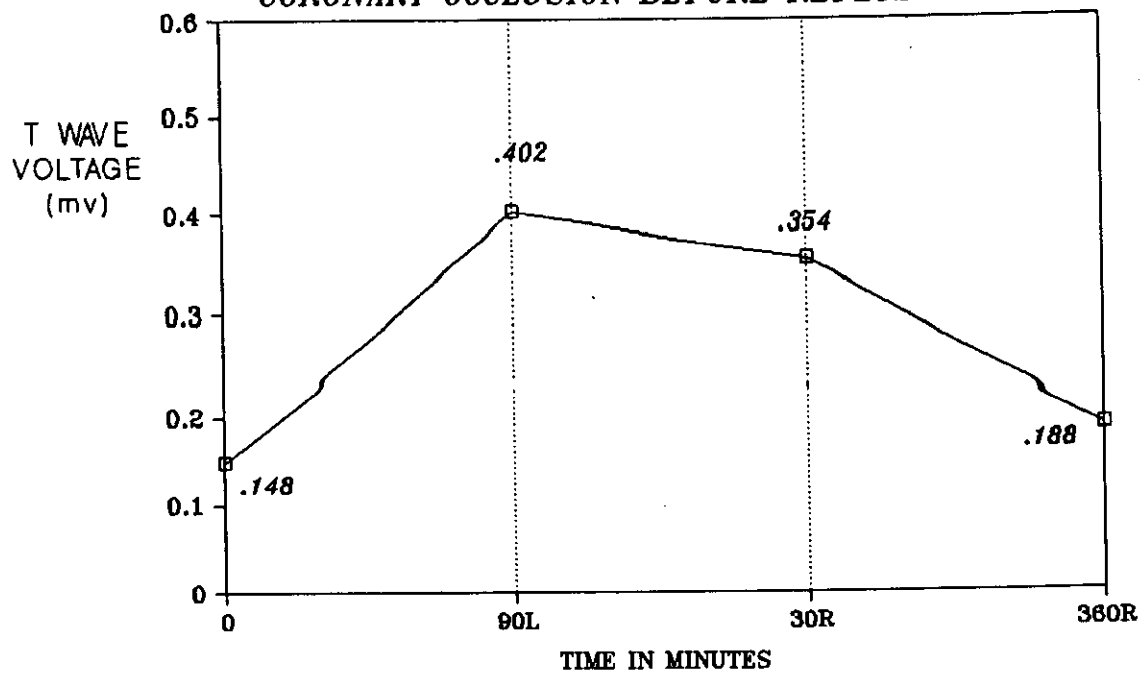
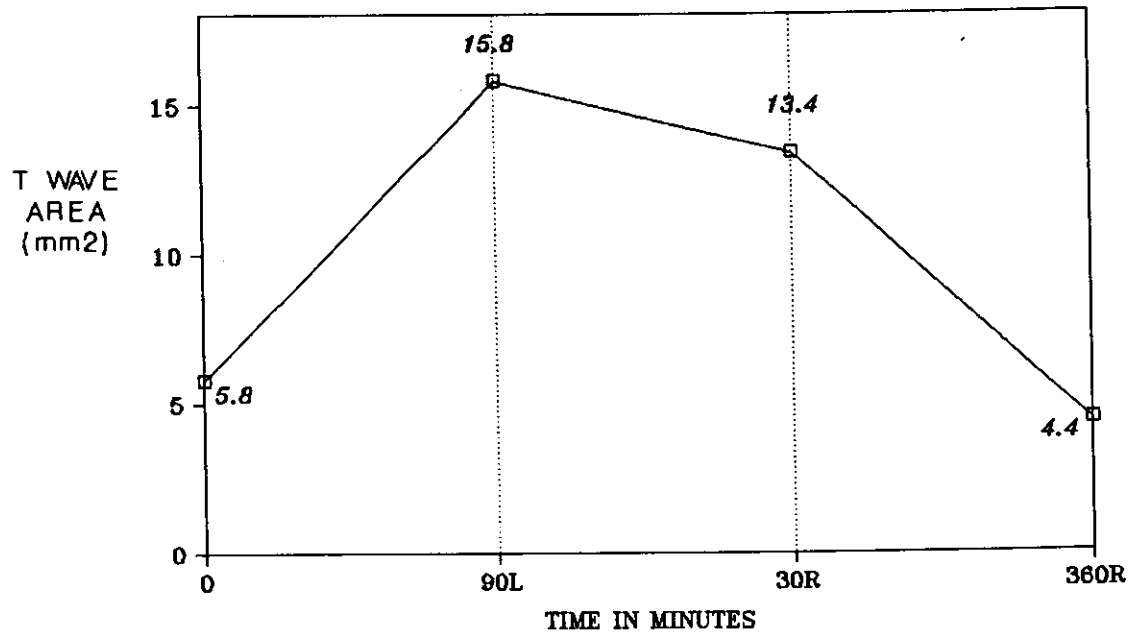


Figure (22a): *The effects of pretreatment with PGF2α, on the T wave voltage and T wave area in rats subjected to coronary occlusion for 90 minutes before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH PGF2α ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO 90 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



P > 0.05



P > 0.05

FIGURE 22b

reperfusion ($P < 0.0001$). 6 hours after reperfusion the T wave voltage ranged between 0.13 and 0.28 mv, the mean value was 0.188 ± 0.058 mv. This value was not different from that before coronary ligation ($P > 0.05$).

The T wave area, before coronary ligation, was ranging between 5 and 7 mm^2, the mean value was 5.8 mm^2 ± 0.84 mm^2. After 90 minutes of coronary ligation, the range was between 12 and 20 mm^2, the mean value was 15.8 ± 3.19 mm^2, showing a significant increase when compared with the value before coronary ligation ($P < 0.002$) . 30 minutes after reperfusion, the T wave voltage ranged between 10 and 17 mm^2, the mean value was 13.4 ± 2.7 mm^2. This value was significantly lower than that immediately before reperfusion ($P < 0.0001$). 6 hours after reperfusion, the area ranged between 2 and 9 mm^2, the mean value was 4.4 ± 2.7 mm^2. This value was not different from that before coronary ligation ($P > 0.05$)

In this group of rats, as seen from Table (22), the S CPK 6 hours after reperfusion ranged from 5987 to 7010 u/L. The mean value was 6539.6 ± 503.99 u/L. The infarction size was of a mean value of 43.1 ± 3.65% LV (the range being 38.5 - 48% LV).

(5) The effects of reperfusion of the cardiac muscle 90 minutes after main left coronary ligation in rats pretreated with indomethacin injected intravenously 15 minutes before onset of reperfusion in a dose of 0.06 mg/100 gm rat body weight:

The results are shown in Table (23) and Figures (23a & 23b). It can be seen that in this subgroup, the T wave voltage, before coronary ligation, ranged between 0.10 and 0.23 mv, the mean value was 0.152 ± 0.048 mv. After 90 minutes of coronary ligation, the range was between 0.40 and 0.50 mv, the mean value was 0.43 ± 0.044 mv showing a significant increase when compared with the value before coronary ligation ($P < 0.002$). 30 minutes after reperfusion, the range of the T wave voltage was between 0.43 and 0.55 mv, the mean value was 0.468 ± 0.055 mv, showing a significant increase when compared with the value immediately before reperfusion ($P < 0.002$). 6 hours after reperfusion, the range was between 0.40 and 0.45 mv, the mean value was 0.41 ± 0.022 mv . This value was significantly higher than the initial value before coronary ligation ($P < 0.001$).

Table (23): The effects of pretreatment with indomethacin (0.06 mg/100 gm rat body weight given intravenously 15 minutes before onset of reperfusion) on T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to 90 minutes coronary occlusion before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	90 L	30 R	360 R	0	90 L	30 R	360 R	6 hr.R	6 hr.R
1	0.10	0.45	0.50	0.40	4	24	30	25	15891	75.0
2	0.13	0.50	0.55	0.45	5	23	33	30	16131	73.4
3	0.15	0.40	0.43	0.40	5	20	25	24	16317	63.0
4	0.23	0.40	0.43	0.40	8	24	25	24	15214	65.5
5	0.15	0.40	0.43	0.40	5	22	24	25	15993	70.0
Mean	0.152	0.43"	0.468""	0.41"	5.4	22.6"	27.4""	25.6"	15909.2	69.38
S.D.	0.048	0.044	0.055	0.022	1.52	1.67	3.91	2.51	420.16	5.10
P <		0.002	0.002	0.001		0.0001	0.05	0.0001		

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 90 minutes after coronary ligation (Time 90 L).

L = After coronary ligation.

R = After coronary reperfusion.

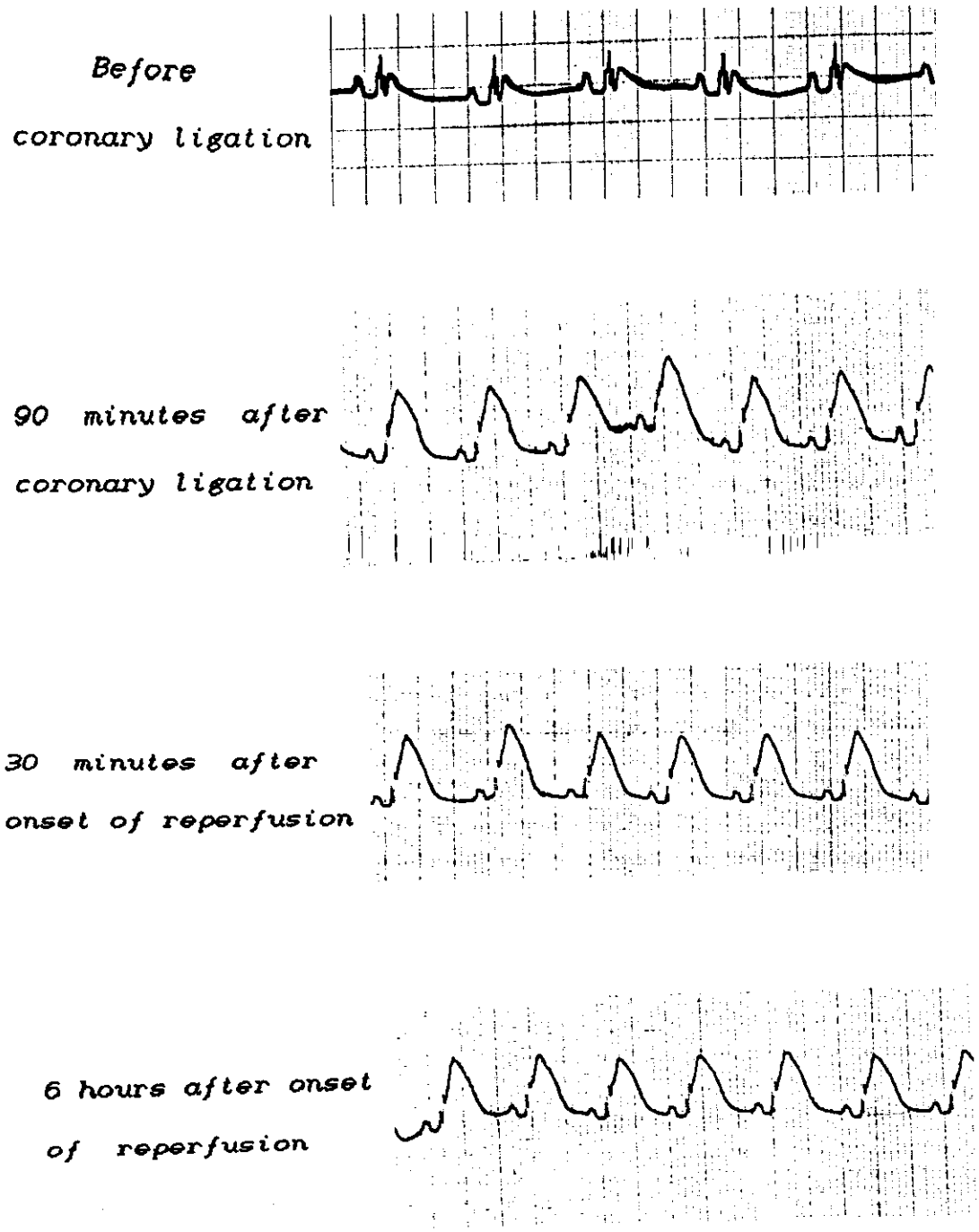
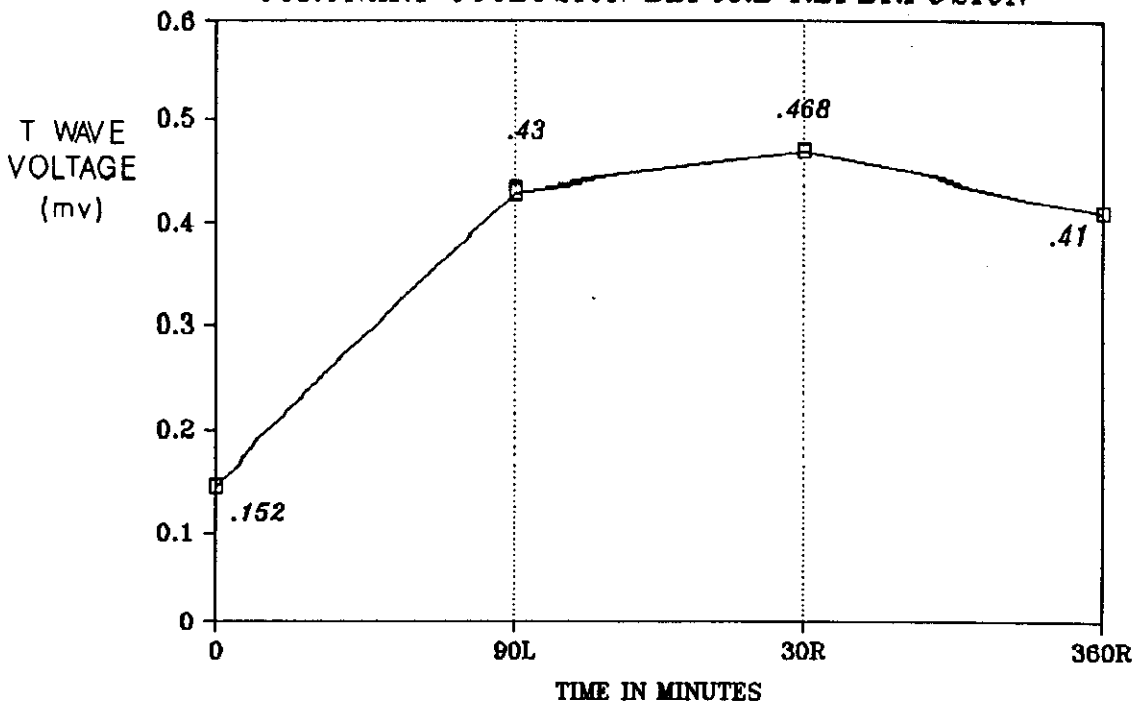


Figure (23a): *The effects of pretreatment with indomethacin, on the T wave voltage and T wave area in rats subjected to coronary occlusion for 90 minutes before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH INMDOMETHACIN ON T WAVE VOLTAGE AND AREA IN RATS SUBJECTED TO 90 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



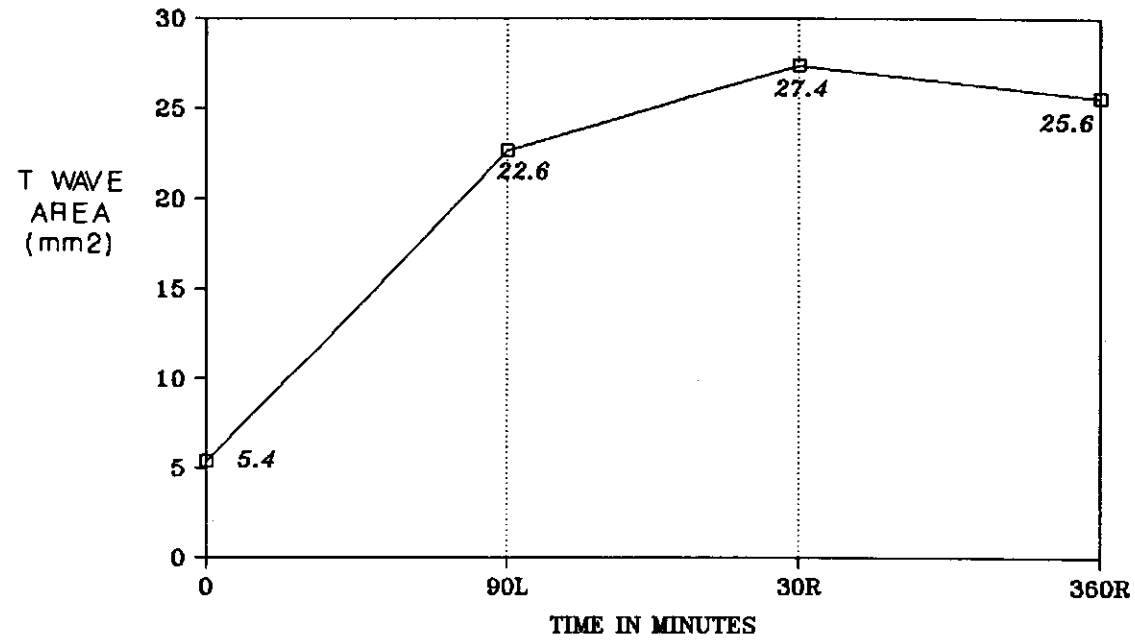


FIGURE 23b

The T wave area, before coronary ligation, ranged between 4 and 8 mm^2, the mean value was 5.4 ± 1.52 mm^2. After 90 minutes of coronary ligation, the range was between 22 and 24 mm^2, the mean value was 22.6 ± 1.67 mm^2 showing a significant increase when compared with the value before coronary ligation ($P < 0.0001$). 30 minutes after reperfusion, the range was between 24 and 33 mm^2, the mean value was 27.4 ± 3.91 mm^2, showing a significant increase when compared with the value immediately before reperfusion ($P < 0.05$). 6 hours after reperfusion, the range was between 24 and 30 mm^2, the mean value was 25.6 ± 2.51 mm^2 . This value was significantly higher than the initial value before coronary ligation ($P < 0.0001$).

The S CPK (u/L) in this group of rats 6 hours after reperfusion ranged between 15214 - 16317 u/L, the mean value as seen from Table (23) was 15909.2 ± 420.16 u/L. The corresponding mean value of the infarction size was 69.38 ± 5.10% LV (the range was 63 - 75% LV)

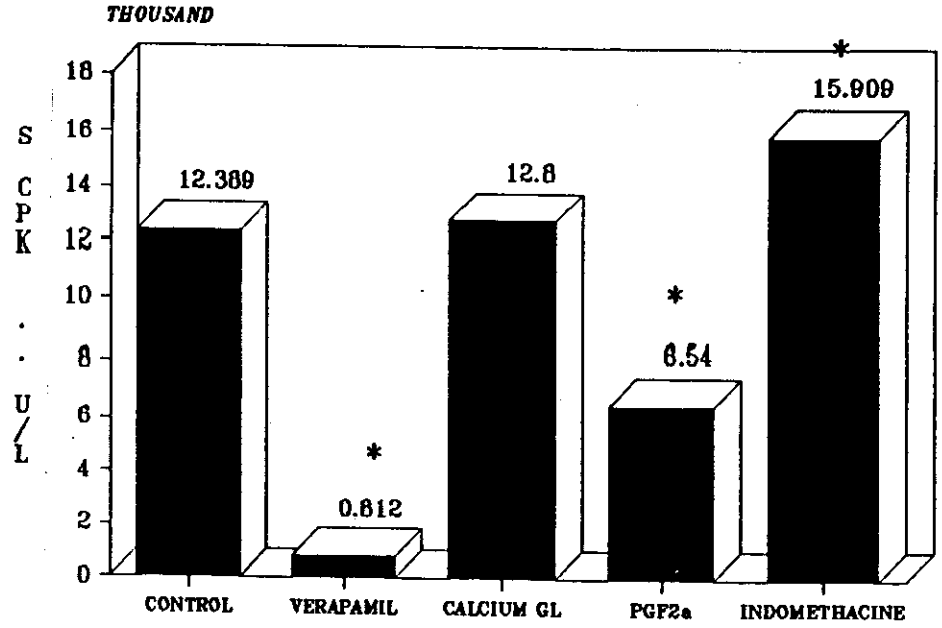
Table (24) compares the means and standard deviations of all the results of the T wave voltage, T wave area, S CPK and infarction size in all subgroups of

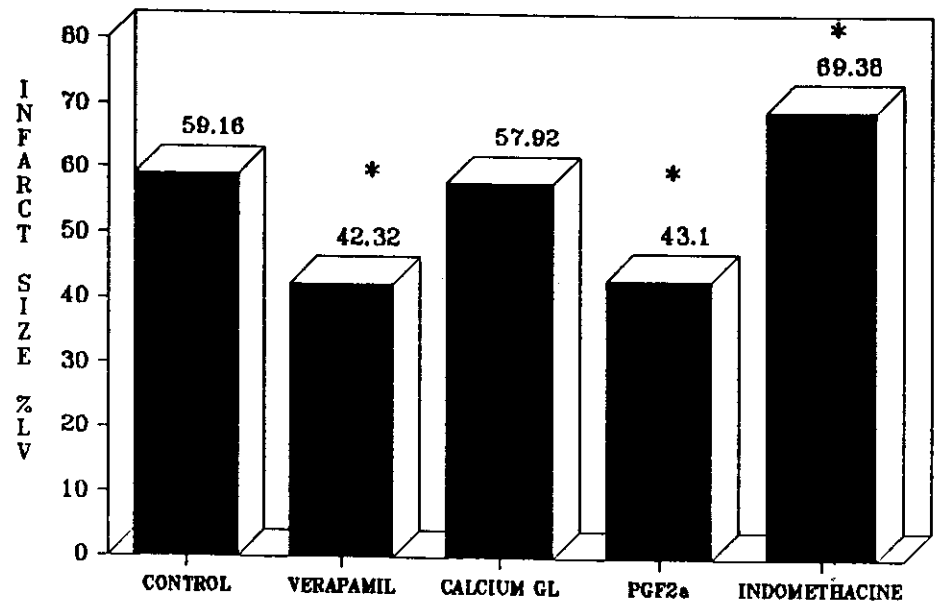
Table (24): Means & standard deviation of the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in the group of rats subjected to 90 minutes of coronary ligation before onset of reperfusion.

SUBGROUP	T WAVE VOLTAGE (mv)				T WAVE AREA (mm^2)				S CPK (u/L)	inf. size (% LV)
	TIME				TIME					
	Before co. lig.	90 min after co lig.	30 min after reperf.	6 hours after reperf.	before co. lig.	90 min after co lig.	30 min after reperf.	6 hours after reperf.	6 hours after reperf.	6 hours after reperf
Non treated rats C1	0.168 ± 0.028	0.370 ± 0.027	0.334 ± 0.032	0.115 ± 0.049	6.10 ± 1.025	17.40 ± 2.41	10.60 ± 2.30	8.20 ± 1.92	12388.80 ± 941.04	59.16 ± 7.096
C.C.B. pretreated rats C2	0.176 ± 0.025	0.546* ± 0.134	0.462 ± 0.130	0.162 ± 0.037	6.00 ± 1.22	27.60* ± 5.03	22.40* ± 4.34	6.00 ± 1.58	812.00* ± 23.92	42.32* ± 2.55
Calcium G1 pretreated rats C3	0.176 ± 0.025	0.482* ± 0.020	0.510* ± 0.042	0.256* ± 0.026	5.50 ± 0.50	23.60* ± 1.67	22.80* ± 1.79	10.80* ± 0.84	12800.20 ± 582.84	57.92 ± 2.90
PGF2α pretreated rats C4	0.148 ± 0.020	0.402 ± 0.075	0.354 ± 0.077	0.188 ± 0.058	5.80 ± 0.84	15.80 ± 3.19	13.40 ± 2.70	4.40* ± 2.70	6539.60* ± 503.99	43.10* ± 3.65
Indometh. pretreated rats C5	0.152 ± 0.048	0.430* ± 0.044	0.468* ± 0.055	0.410* ± 0.022	5.40 ± 1.52	22.60* ± 1.67	27.40* ± 3.91	25.60* ± 2.51	15909.20* ± 420.16	69.38* ± 5.10

* = $P < 0.05$

S CPK AND INFARCTION SIZE AFTER 6 HOURS IN RATS SUBJECTED TO CORONARY OCCLUSION FOR 90 MINUTES BEFORE REPERFUSION





* = $P<0.05$

FIGURE 24

rats subjected to coronary artery occlusion for 90 minutes before the onset of reperfusion. The treated subgroups are compared to the non treated one.

Table (24) shows that calcium channel blocker, verapamil, caused a significant increase in the T wave voltage and area at 90 minutes after ligation. After 30 minutes of reperfusion, the T wave area was significantly higher than that in the untreated group ($P < 0.05$).S CPK and infarction size were significantly decreased ($P< 0.05$). In calcium gluconate treated subgroup there was a significantt increase in both the T wave voltage and area at 90 minutes after ligation and 30 minutes and 6 hours, after reperfusion ($P < 0.05$). In $PGF_{2\alpha}$ treated subgroup there was a significant decrease in T wave area at 6 hours after reperfusion ($P < 0.05$). Also the S CPK and infarction size show a significant decrease ($P < 0.05$). In indomethacin treated subgroup there was a significant increase in T wave voltage and area at 90 minutes after coronary ligation, 30 minutes and 6 hours after coronary reperfusion ($P < 0.05$). Also the S CPK and infarction size were significantly increased ($P < 0.05$). (Fig. 24).

D) The Effects of Reperfusion of the Cardiac Muscle on T Wave Amplitude (mv), T Wave Area (mm^2), S CPK (u/L) and Infarction Size in Rats Subjected to Coronary Artery Occlusion for 2 Hours before Onset of Reperfusion:

In this group of rats, the time interval between ligation of the main left coronary artery and the onset of reperfusion was prolonged to 2 hours. Similar to the previous subgroups. This subgroup was divided according to the drug received by the rats before coronary reperfusion into :

D1) The effects of reperfusion with no drug administration.

The results are shown in Table (25) and Figures (25a & 25b). It can be seen that in this subgroup of animals which underwent ligation of the main left coronary artery for 2 hours followed by reperfusion for 6 hours, the T wave voltage before coronary ligation ranged between 0.15 to 0.2 mv and the mean value was 0.166 ± 0.023 mv. After 2 hours of coronary ligation the T wave voltage ranged between 0.3 and 0.45 mv while the mean value was 0.37 ± 0.067 mv, showing a significant increase compared with the value before coronary ligation ($P < 0.005$). After 30 minutes of reperfusion

Table (25): The effects of reperfusion of the cardiac muscle 120 minutes after occlusion of the main left coronary artery on the ischemia induced changes in T wave voltage (mv), T wave area (cm^2), S CPK (u/L) and infarction size (% LV)

No.	T wave voltage (mv) Time in minutes				T wave area (mm^2) Time in minutes				S CPK level after 6 hr.R	Infarct area after 6 hr.R
	0	120 L	30 R	360 R	0	120 L	30 R	360 R		
1	0.20	0.30	0.25	0.10	7	15	12	4	14000	55
2	0.15	0.30	0.25	0.18	5	12	12	7	14652	62
3	0.18	0.45	0.35	0.20	7	21	16	8	13501	66
4	0.15	0.40	0.25	0.15	6	16	11	6	14211	56
5	0.15	0.40	0.35	0.13	5	16	14	5	14320	58
Mean	0.166	0.37"	0.29""	0.152"	6	16"	13""	6"	14136.8	59.4
S.D.	0.023	0.067	0.055	0.040	1	3.24	2	1.58	426.45	4.56
P <		0.005	0.02			0.002	0.05			

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 120 minutes after coronary ligation (Time 120 L).

L = After coronary ligation.

R = After coronary reperfusion.

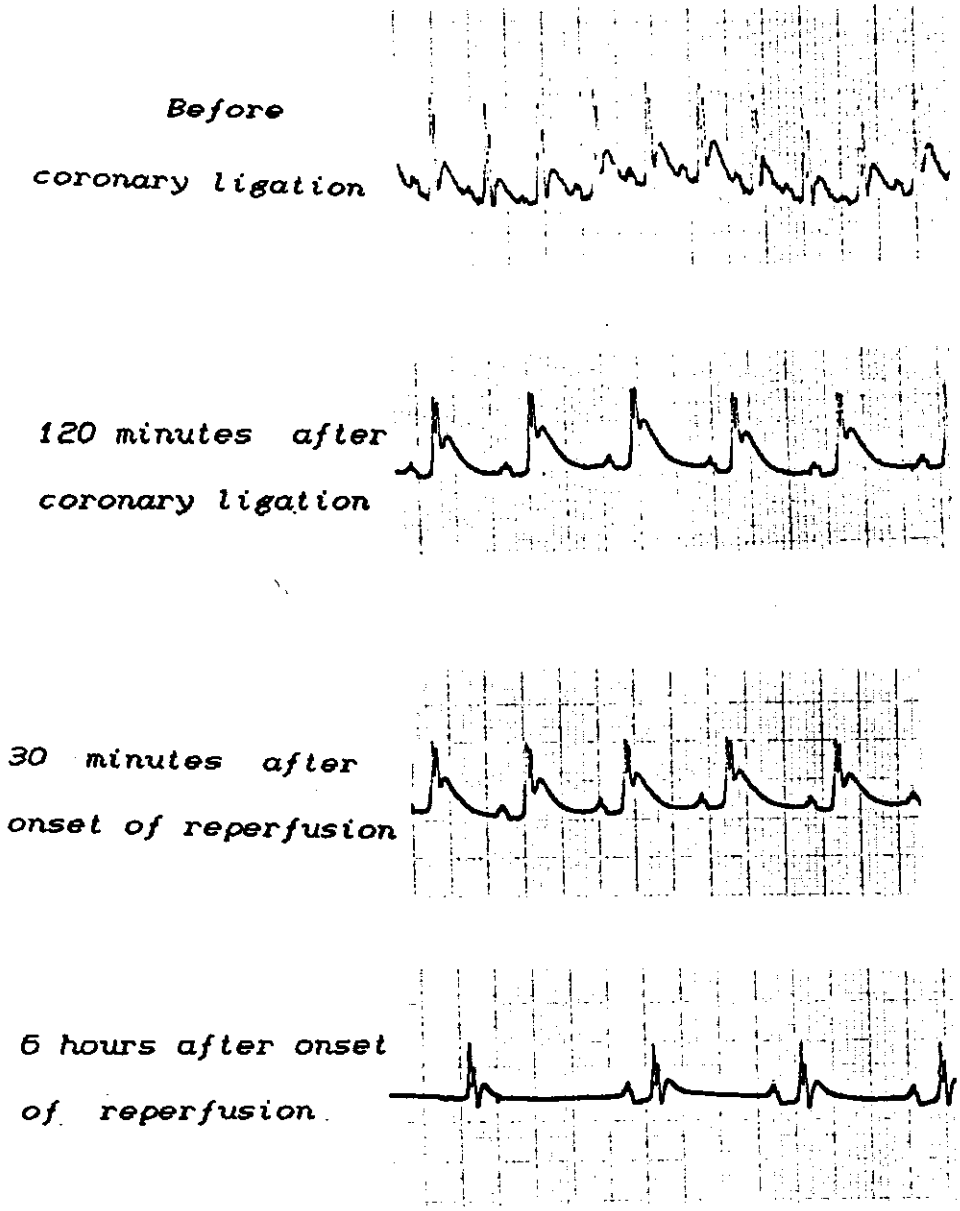
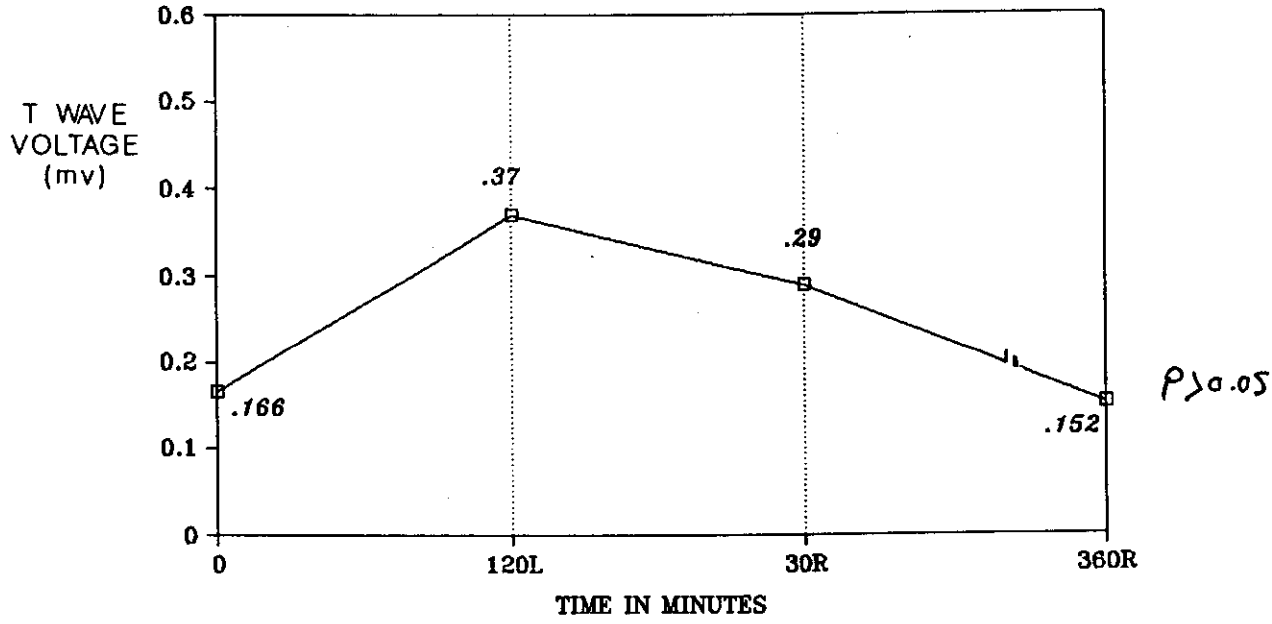


Figure (25a): *The effects of reperfusion of the cardiac muscle 120 minutes after occlusion of the main left coronary artery on the ischemia-induced changes in T wave voltage and T wave area.*

THE EFFECTS OF REPERFUSION AFTER 120 MIN OF CORONARY OCCLUSION ON T WAVE VOLTAGE AND T WAVE AREA



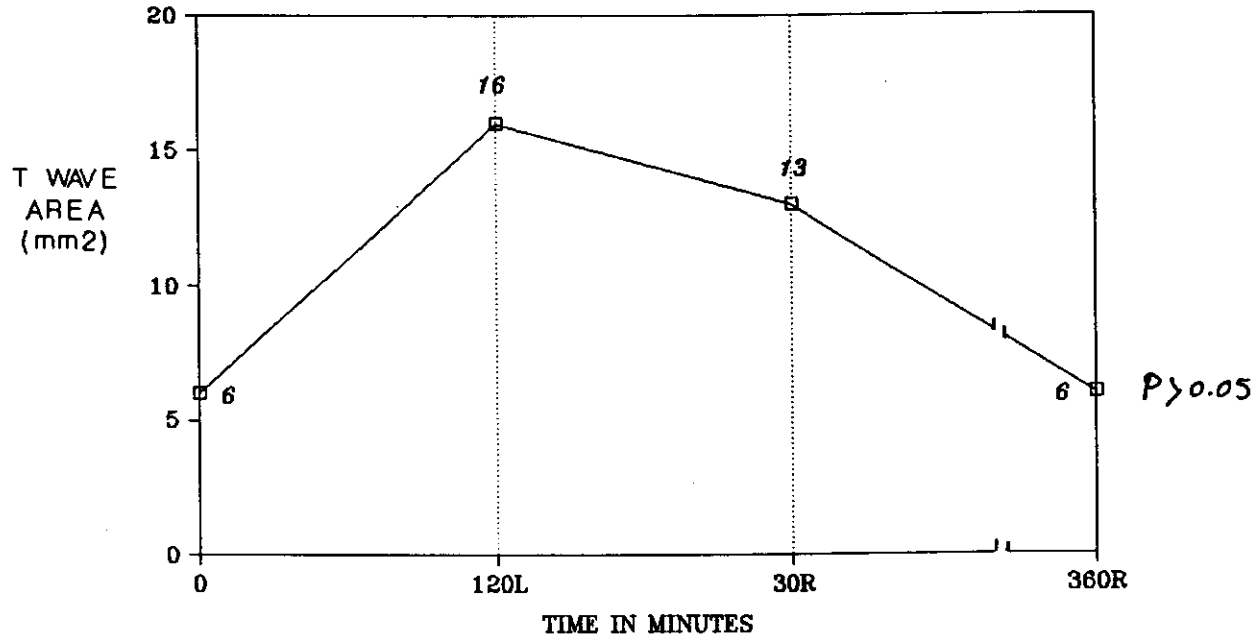


FIGURE 25b

the T wave voltage ranged between 0.25 and 0.35 mv, the mean value was 0.29 ± 0.055 mv, showing a significant decrease compared with the value immediately before reperfusion ($P < 0.02$). By the end of 6 hours of reperfusion, the T wave voltage ranged from 0.1 to 0.20 while the mean value was 0.152 ± 0.040 mv. This value was not significantly different from the value before coronary ligation. ($P > 0.05$)

The T wave area before coronary ligation ranged between 5 and 7 mm^2 with a mean value of 6 ± 1 mm^2. After 2 hours of coronary ligation, the T wave area ranged between 12 and 21 mm^2 with a mean value of 16 ± 3.24 mm^2 showing a significant increase compared with the value before ligation of the coronary artery ($P < 0.002$). 30 minutes after reperfusion the T wave area ranged between 12 and 16 mm^2 with a mean value of 13 ± 2 mm^2. This value of T wave area after reperfusion was significantly lower than the value of the T wave area immediately before coronary reperfusion ($P < 0.05$). After 6 hours of reperfusion the T wave area ranged from 4 to 8 mm^2 with a mean value of 6 mm^2 ± 1.58 mm^2 which was not significantly different from the normal value before coronary ligation ($P > 0.05$).

The S CPK in this subgroup of rats, 6 hours after the onset of reperfusion (Table 25) ranged from 13501 to 14652 u/L. The mean value was 14136.8 ± 426.45 u/L. the corresponding infarction size ranged from 56 to 66% LV, the mean value was 59.4 ± 4.56% LV.

D2) The effects of pretreatment with the calcium channel blocker (verapamil) at a dose of 0.01 mg/100 gm rat body weight, injected intravenously 15 minutes before onset of reperfusion :

The results are shown in Table (26) and figures (26a & 26b). It can be seen from Table 26 that the T wave voltage, before coronary ligation, ranged from 0.15 mv to 0.20mv, the mean value was 0.172 ± 0.022 mv. After 2 hours of coronary ligation the T wave voltage ranged from 0.30to 0.55 mv, the mean value was 0.436 ± 0.113 mv showing a significant increase when compared with the value before coronary ligation ($P<0.01$).After 30 minutes of reperfusion the T wave voltage ranged from 0.25 to 0.40 mv and the mean value was decreased to 0.346 ± 0.075 mv. This value was significantly lower than that at 2 hours of coronary ligation i.e. immediately before reperfusion ($P< 0.01$). 6 hours after the onset of reperfusion, the T wave voltage ranged from 0.15 to

Table (26): The effects of pretreatment with the calcium channel blocker, verapamil, (at a dose of 0.01 mg/100 gm rat body weight given i.v., 15 minutes before onset of reperfusion) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary occlusion for 120 minutes before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	120 L	30 R	360 R	0	120 L	30 R	360 R	6 hr	6 hr.R
1	0.18	0.50	0.40	0.15	6	14	12	4	13105	55.2
2	0.20	0.50	0.40	0.18	8	25	19	6	14034	57.0
3	0.15	0.30	0.25	0.15	6	16	14	8	14731	56.3
4	0.18	0.33	0.28	0.18	7	15	13	8	14538	52.4
5	0.15	0.55	0.40	0.15	8	23	20	10	13600	50.0
Mean	0.172	0.436"	0.346""	0.162"	7	18.6"	15.6""	7.2"	14001.6	54.18
S.D.	0.022	0.113	0.075	0.016	1	5.03	3.65	2.28	668.2	2.92
P <		0.01	0.01			0.005	0.02			

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 120 minutes after coronary ligation (Time 120 L).

L = After coronary ligation.

R = After coronary reperfusion.

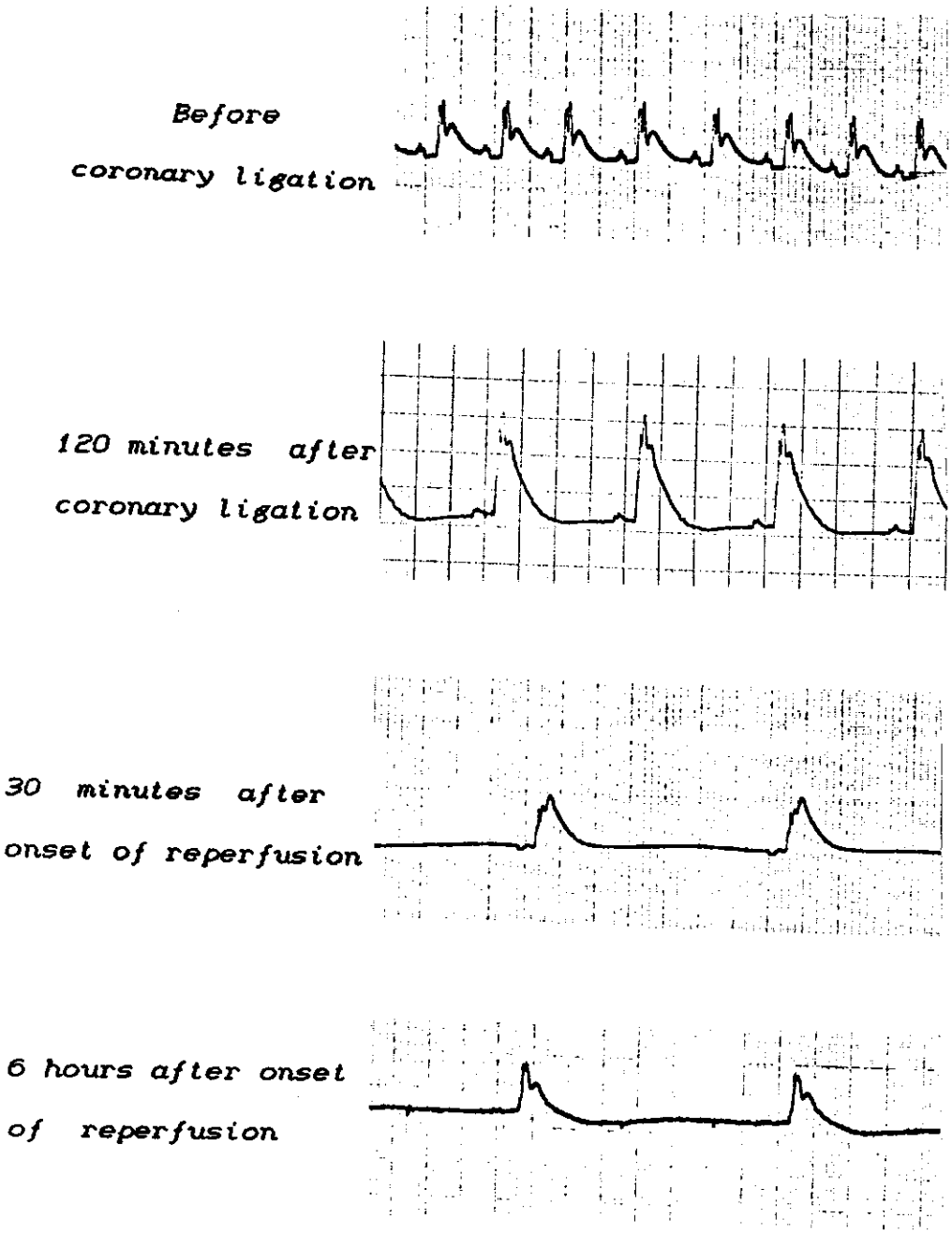
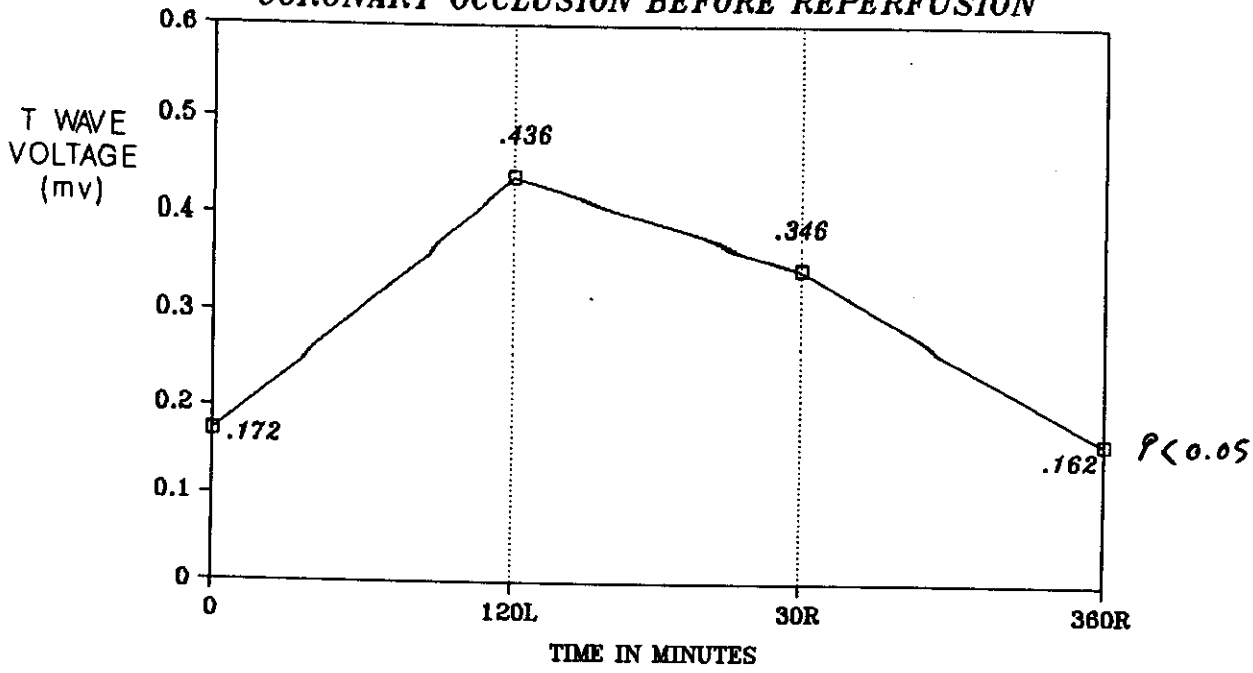


Figure (26a): *The effects of pretreatment with the calcium channel blocker, verapamil, on the T wave voltage and T wave area in rats subjected to coronary occlusion for 120 minutes before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH VERAPAMIL ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO 120 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



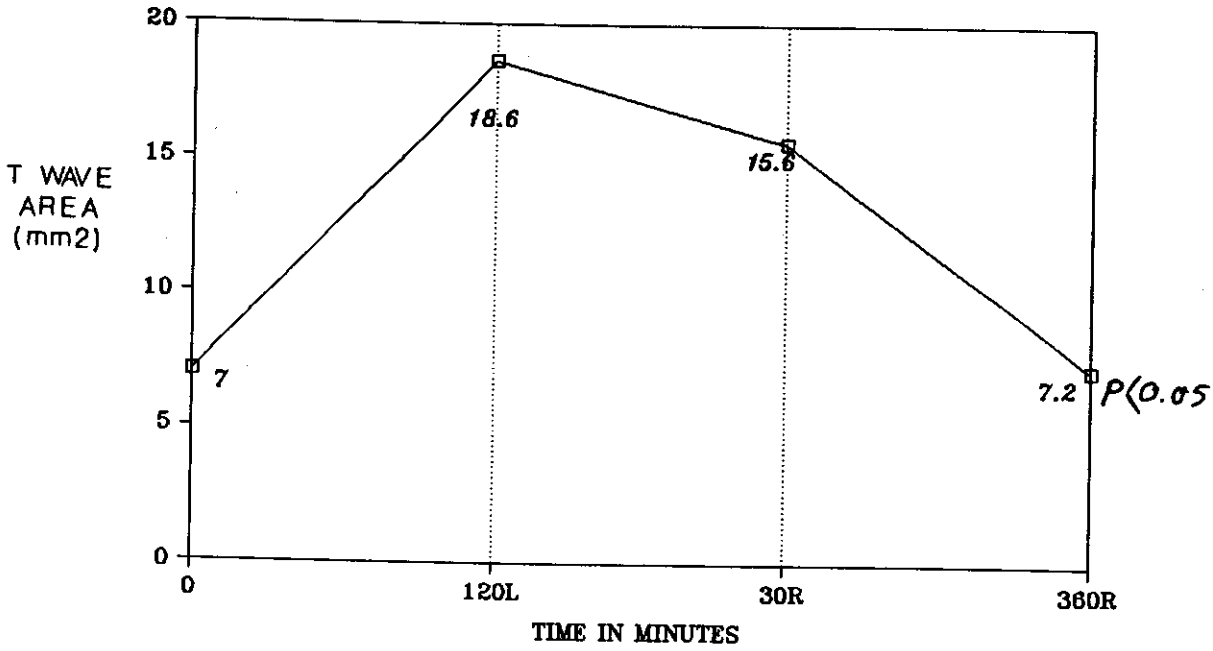


FIGURE 26b

0.18 mv, the mean value was 0.162 ± 0.016 mv which was not different from that before ligation of the coronary artery ($P > 0.05$).

The T wave area showed a pattern similar to that of the T wave voltage. Before coronary ligation, the T wave area ranged between 6 and 8 mm^2 with a mean value of 7 ± 1 mm^2. 2 hours after coronary ligation, the T wave area ranged between 14 and 25 mm^2, the mean value was 18.6 ± 5.03 mm^2 showing a significant increase compared with the value before coronary ligation ($P < 0.005$). 30 minutes after reperfusion, the area ranged between 12 and 20 mm^2 and the mean value was significantly decreased to 15.6 ± 3.650 mm^2 when compared with the value immediately before reperfusion ($P < 0.02$). After 6 hours of reperfusion, the T wave area ranged between 4 and 10 mm^2, the mean value was 7.2 ± 2.28 mm^2 which was not different from the value before coronary ligation ($P > 0.05$).

The S CPK after 6 hours after reperfusion in this subgroup of rats (pretreated with the calcium channel blocker [verapamil] and subjected to coronary artery occlusion for 2 hours before the onset of reperfusion) as seen from Table (26) ranged between 13105 - 14731 u/L,

the mean value was 14001.6 ± 668.2 u/L. The corresponding infarction size ranged from 50 - 57% LV. The mean value was 54.18 ± 2.92% LV.

D3) The effects of pretreatment with calcium gluconate (0.12 mg/100 gm rat body weight intraperitoneally 30 minutes before onset of reperfusion). The time of coronary ligation before the onset of reperfusion was 2 hours:

The results are shown in table (27) and Figures (23a & 23b). In this subgroup, before coronary ligation, the T wave voltage ranged between 0.13 and 0.25 mv, the mean value was 0.158 ± 0.052 mv. After 2 hours of coronary ligation, the T wave voltage ranged between 0.40 and 0.80 mv, the mean value was 0.512 ± 0.164 mv, showing a significant increase compared with the value before coronary ligation ($P < 0.005$). After 30 minutes of reperfusion, the T wave voltage ranged between 0.45 and 0.70 mv, the mean value was 0.492 ± 0.120 mv showing no change from that value immediately before reperfusion ($P > 0.05$). 6 hours after reperfusion, the range was between 0.18 and 0.75 mv, the mean value was 0.43 ± 0.205 mv which was significantly higher than the value before coronary ligation ($P < 0.02$).

Table (27): The effects of pretreatment with calcium gluconate (0.12 mg/100 gm rate body weight given I.P., 30 minutes before onset of reperfusion) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to 120 minutes coronary occulsion before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	120 L	30 R	360 R	0	120 L	30 R	360 R	6 hr.	6 hr.
1	0.25	0.80	0.70	0.75	10	24	24	25	15000	50.0
2	0.13	0.45	0.45	0.18	5	18	18	8	14890	56.0
3	0.15	0.48	0.48	0.40	6	20	20	16	14500	61.0
4	0.13	0.43	0.45	0.40	5	17	18	14	13980	59.0
5	0.13	0.40	0.45	0.40	5	18	18	15	15001	58.8
Mean	0.158	0.512 $^{"}$	0.492 $^{""}$	0.430 $^{"}$	6.2	19.4 $^{"}$	19.6 $^{""}$	15.6 $^{"}$	14674.2	56.96
S.D.	0.052	0.164	0.120	0.205	2.17	2.79	2.61	6.11	439.25	4.279
P <		0.005		0.02		0.0001		0.01		

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 120 minutes after coronary ligation (Time 120 L).

L = After coronary ligation.

R = After coronary reperfusion.

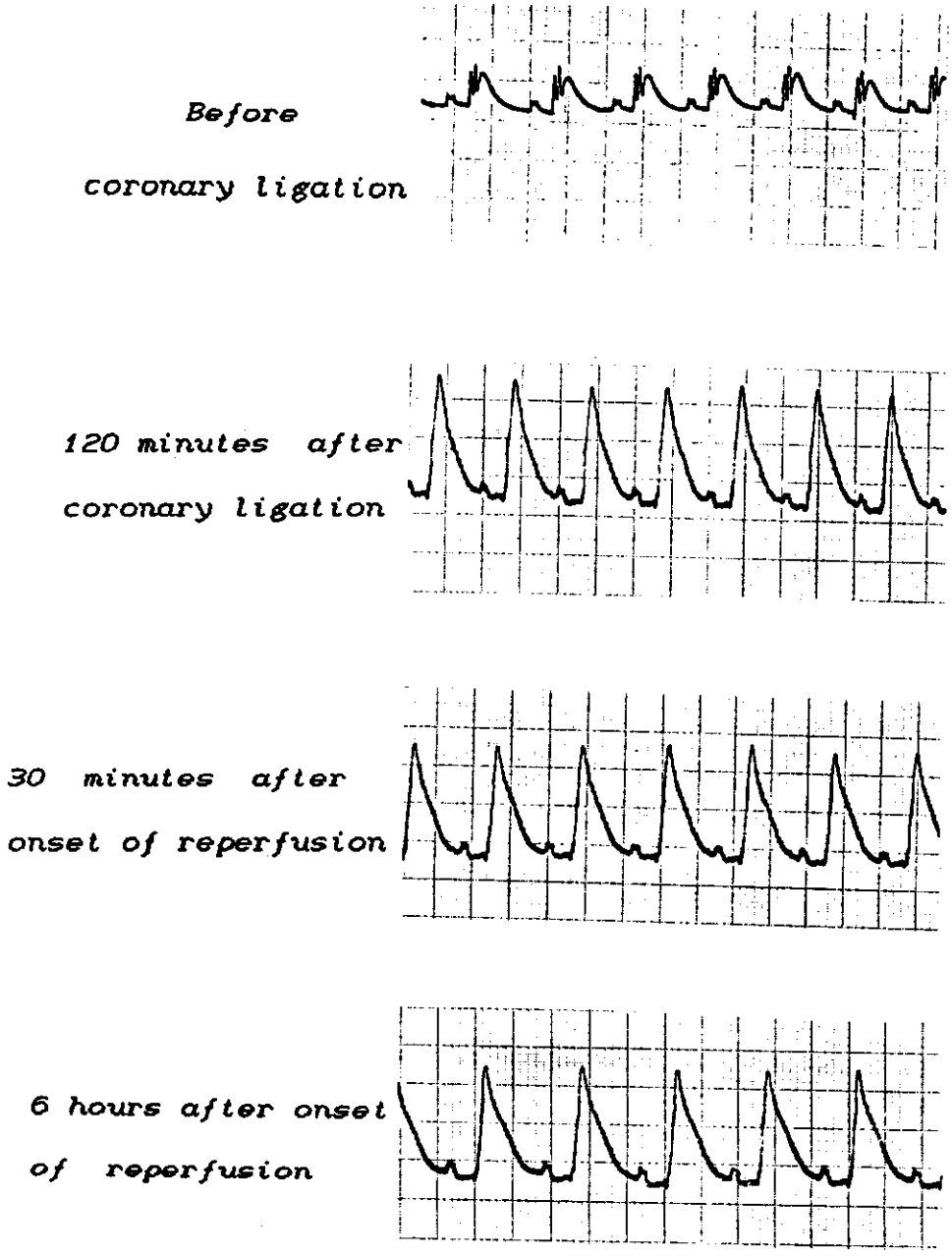
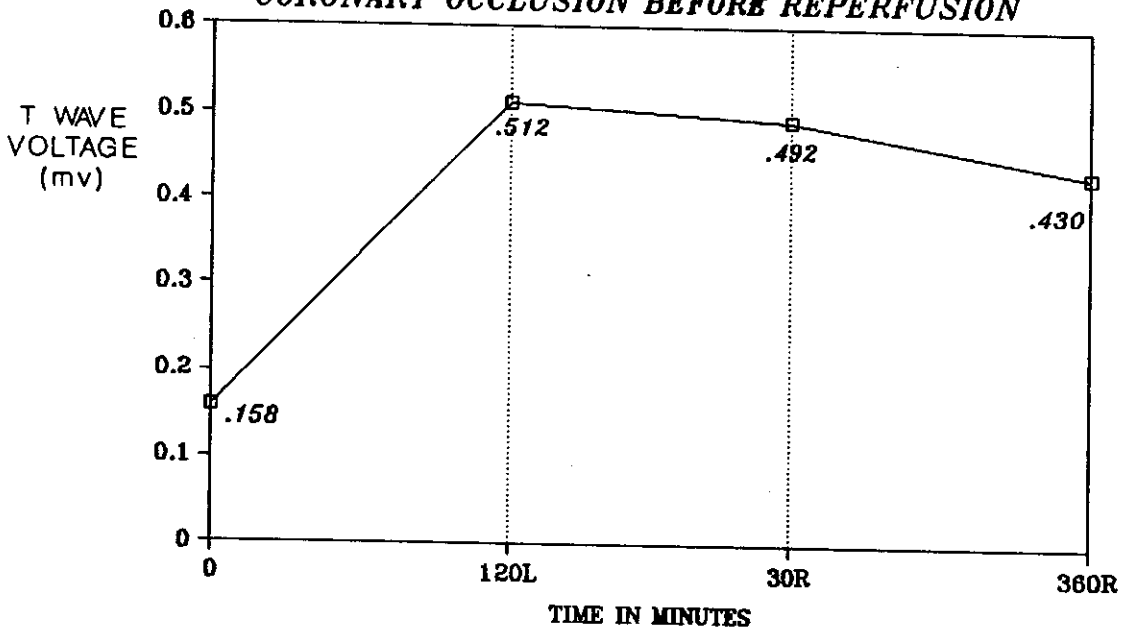


Figure (27a): *The effects of pretreatment with calcium gluconate, on the T wave voltage and T wave area in rats subjected to coronary occlusion for 120 minutes before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH CALCIUM GLUCONATE ON T WAVE VOLTAGE AND AREA IN RATS SUBJECTED TO 120 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



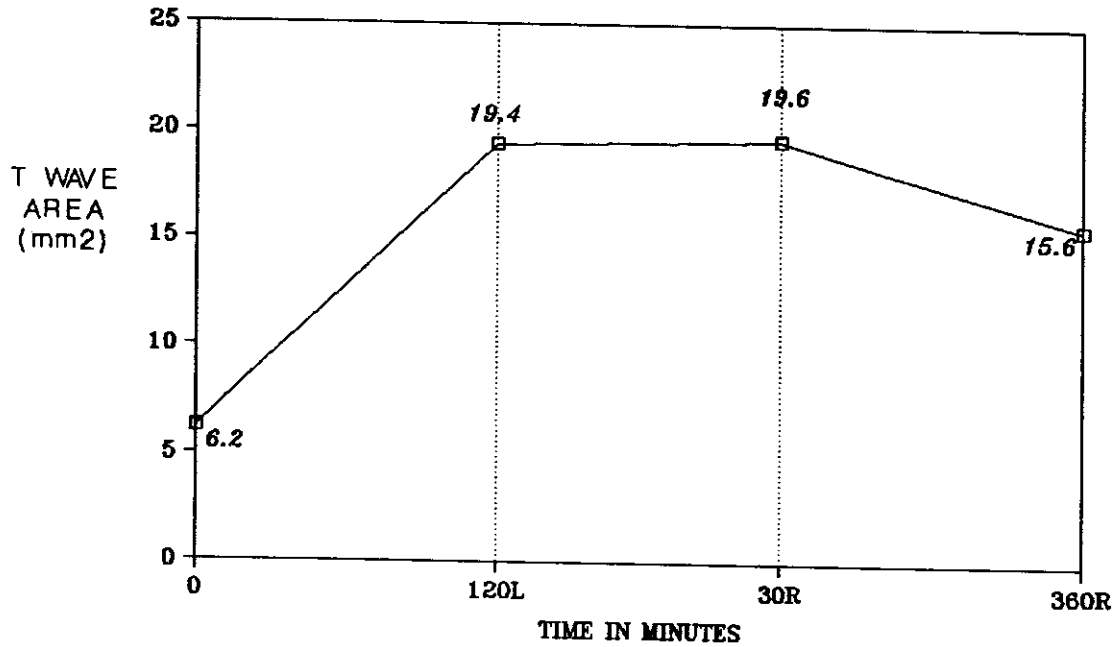


FIGURE 27b

The area of the T wave, before coronary ligation, ranged between 5 and 10 mm^2, the mean value was 6.2 ± 2.17 mm^2. Two hours after coronary ligation the range was between 17 and 24 mm^2, the mean value was 19.4 ± 2.79 mm^2, showing a significant increase compared with the value before coronary ligation ($P < 0.0001$). After 30 minutes of reperfusion, the range was between 18 and 24 mm^2, the mean value was 19.6 ± 2.61 mm^2 which was not different from that immediately before reperfusion ($P > 0.05$). After 6 hours of reperfusion, the range was between 8 and 25 mm^2, the mean value was 15.6 ± 6.11 mm^2 which was significantly higher than the value before coronary ligation ($P < 0.01$).

It is also seen from Table (27) that 6 hours after the onset of reperfusion, the S CPK was of a mean value 14674.2 ± 439.25 u/L (the range being 13980 - 15001 u/L), the mean infarction size was 56.96 ± 4.279% LV (the range being 50 - 61% LV).

D4) The effects of pretreatment with PGF2α at a dose of 0.015 mg/100 gm rat body weight (injected intraperitoneally 30 minutes before the onset of reperfusion). The time of coronary ligation before reperfusion was 2 hours:

The results are shown in Table (28) and Figures (28a & 28b). It can be seen that in this subgroup, the T wave voltage, before coronary ligation, ranged between 0.13 and 0.20 mv, the mean value was 0.162 ± 0.028 mv. 2 hours after coronary ligation, the range was between 0.40 and 0.50 mv, the mean value was 0.432 ± 0.041 mv shoving a significant increase when compared with the value before coronary ligation ($P < 0.0001$). 30 minutes after the onset of reperfusion, the T wave voltage was between 0.35 and 0.43 mv, the mean value was 0.392 ± 0.029 mv, showing a significant increase when compared with the value immediately before reperfusion ($P < 0.02$). After 6 hours of reperfusion, the T wave voltage ranged between 0.10 and 0.20 mv, the mean value was 0.152 ± 0.040 vm. This value was not different from that before coronary ligation ($P > 0.05$).

The T wave area, before coronary ligation, ranged between 5 and 8 mm^2, the mean value was 6.4 ± 1.14 mm^2. After 2 hours of coronary ligation, the range was

Table (28): The effect of pretreatment with PGF2α (0.015 mg/100 gm rat body weight given I.P 30 minutes before onset of reperfusion) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary occlusion for 120 minutes before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	120 L	30 R	360 R	0	120 L	30 R	360 R	6 hr.R	6 hr.R
1	0.13	0.40	0.38	0.10	5	17	14	3	13800	50.0
2	0.20	0.50	0.43	0.13	8	21	17	4	15100	65.0
3	0.18	0.40	0.35	0.15	7	17	14	3	13801	60.0
4	0.15	0.43	0.40	0.20	6	20	18	4	13800	58.8
5	0.15	0.43	0.40	0.18	6	22	18	3	14100	56.0
an	0.162	0.432"	0.392""	0.152"	6.4	19.4"	16.2""	3.4"	14120.2	57.96
D.	0.028	0.041	0.029	0.040	1.14	2.3	2.05	0.55	562.89	5.51
P <	0.0001		0.02		0.001		0.002			

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 120 minutes after coronary ligation (Time 120 L).

L = After coronary ligation.

R = After coronary reperfusion.

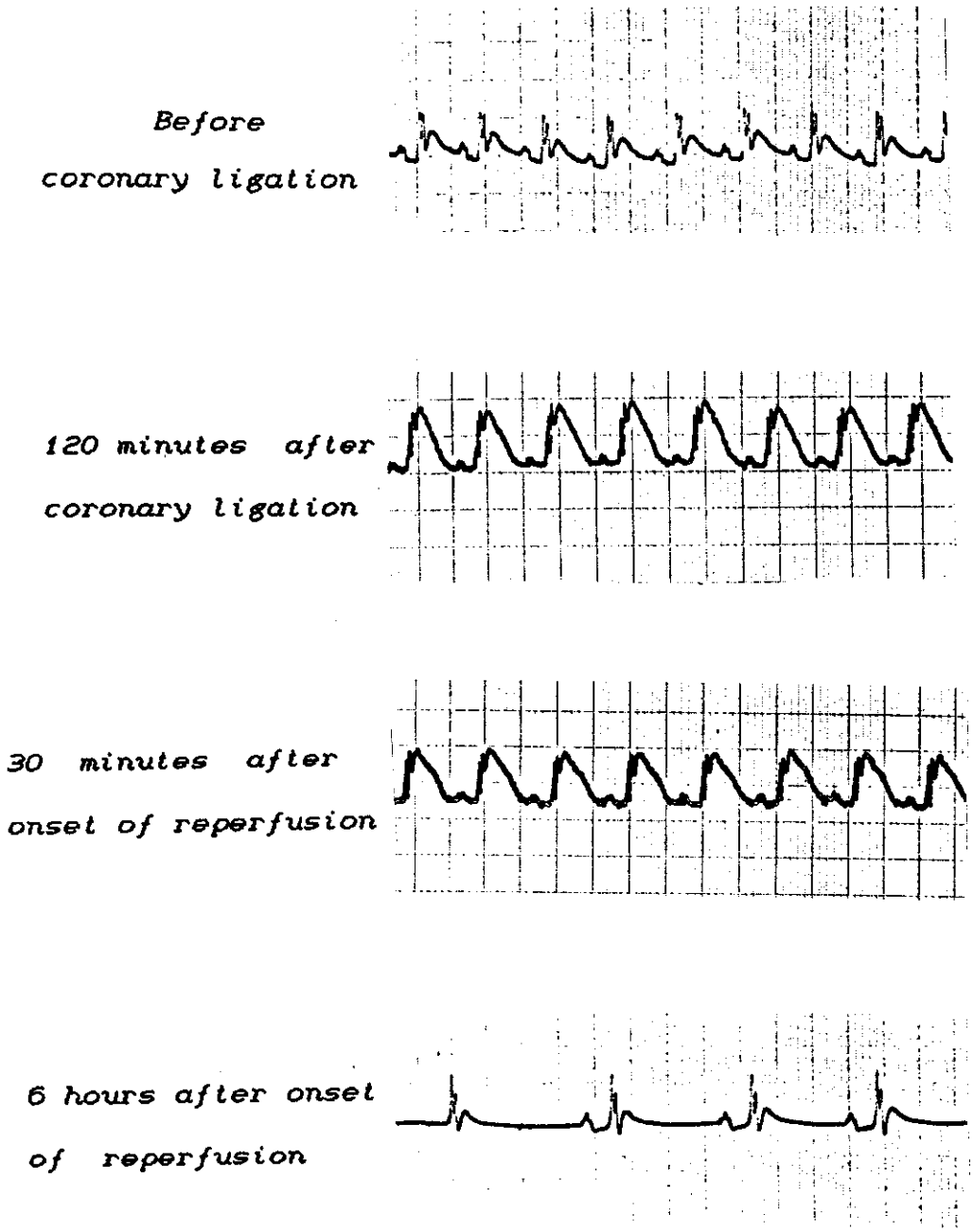
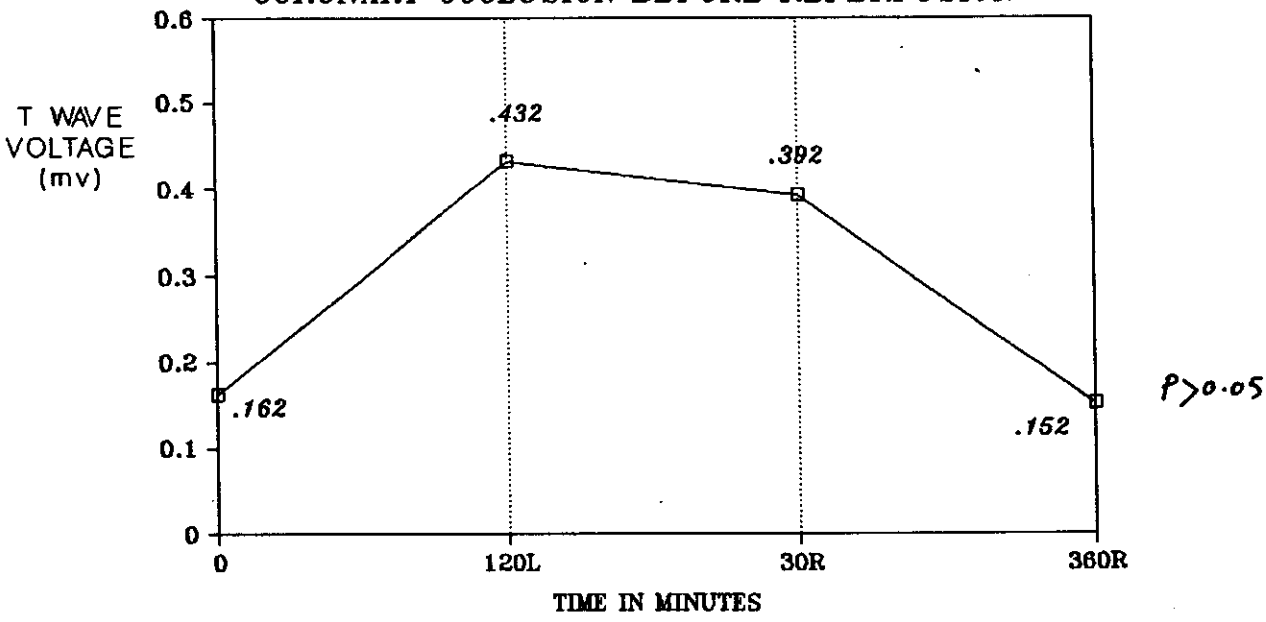
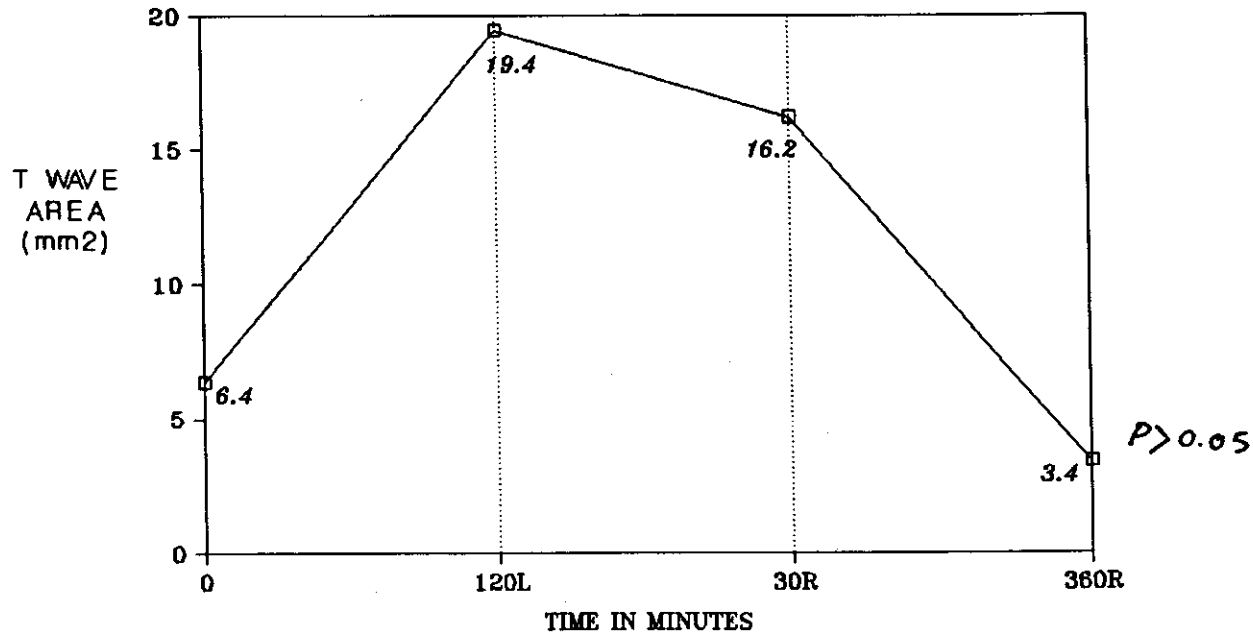


Figure (28a): *The effects of pretreatment with PGF2α, on the T wave voltage and T wave area in rats subjected to coronary occlusion for 120 minutes before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH PGF2α ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO 120 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



$P > 0.05$



$P > 0.05$

FIGURE 28b

between 17 and 22 mm^2, the mean value was 19.4 ± 2.3 mm^2, showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). 30 minutes after reperfusion, the range was between 14 and 18 mm^2, and the mean value decreased significantly to a value of 16.2 ± 2.05 when compared with that immediately before reperfusion ($P < 0.002$) . After 6 hours of reperfusion, the range was between 3 and 4 mm^2, the mean value was 3.4 ± 0.55 mm^2. This value was not different from that before coronary ligation ($P > 0.05$)

As also seen from Table (28), the S CPK in this subgroup of rats (pretreated with PGF2α) 6 hours after the onset of reperfusion ranged from 13800 to 15100 u/L, the mean value was 14120.2 ± 562.89 u/L, the infarction size ranged between 50 - 65% LV, the mean value was 57.96 ± 5.51% LV.

D5) The effects of pretreatment with indomethacin (0.06 mg/100 gm rat body weight, given intravenously 15 minutes before coronary reperfusion in rats subjected to 2 hours of coronary ligation before onset of reperfusion:

The results are shown in Table (29) and Figures (29a & 29b). As seen from Table (29), before coronary

ligation,the the T wave voltage, ranged between 0.10 and 0.20 mv, the mean value was 0.142 ± 0.046 mv. After 2 hours of coronary ligation, the T wave voltage ranged between 0.4 and 0.45 mv, the mean value was 0.420± 0.027 mv, showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). 30 minutes after onset of reperfusion, the range of T wave voltage was between 0.42 and 0.48 mv, the mean value was 0.452 ± 0.028 mv showing a significant increase when compared with the value immediately before onset reperfusion ($P < 0.05$). After six hours of coronary reperfusion, the range of T wave voltage was 0.38 to 0.40 mv, the mean value was 0.392 ± 0.011 mv . This value was significantly higher than the initial value before coronary ligation ($P < 0.001$).

The T wave area, before coronary ligation, ranged between 3.5 and 7 mm^2, the mean value was 5.04 ± 1.52 mm^2. Two hours after coronary ligation, the T wave area ranged between 17 and 23 mm^2, the mean value was 19.8 ± 2.28 mm^2 showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). 30 minutes after onset of reperfusion, the range of T wave area was 20 to 29 mm^2, the mean value was 24.2 ± 3.42 mm^2 showing a significant increase when compared with

Table (29): The effects of pretreatment with indomethacin (0.06 mg/gm rat body weight given intravenously 15 minutes before onset of reperfusion) on T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to 120 minutes coronary occlusion before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	120 L	30 R	360 R	0	120 L	30 R	360 R	6 hr.	6 hr.
1	0.18	0.40	0.43	0.40	6	19	23	24	15880	70.0
2	0.20	0.40	0.45	0.40	7	19	26	25	16561	65.0
3	0.10	0.45	0.48	0.38	4	23	29	25	16328	77.0
4	0.10	0.40	0.42	0.38	3.5	17	20	23	15789	72.0
5	0.13	0.45	0.48	0.40	5	21	23	25	16878	63.5
Mean	0.142	0.420 *	0.452 **	0.392 *	5.04	19.8 *	24.2 **	24.4 *	16287.2	69.5
S.D	0.046	0.027	0.028	0.011	1.52	2.28	3.42	0.89	458.17	5.45
P <		0.001	0.05	0.001		0.001	0.01	0.0001		

* Compared with the values before coronary ligation (Time 0).

** Compared with the values at 120 minutes after coronary ligation (Time 120 L).

L = After coronary ligation.

R = After coronary reperfusion.

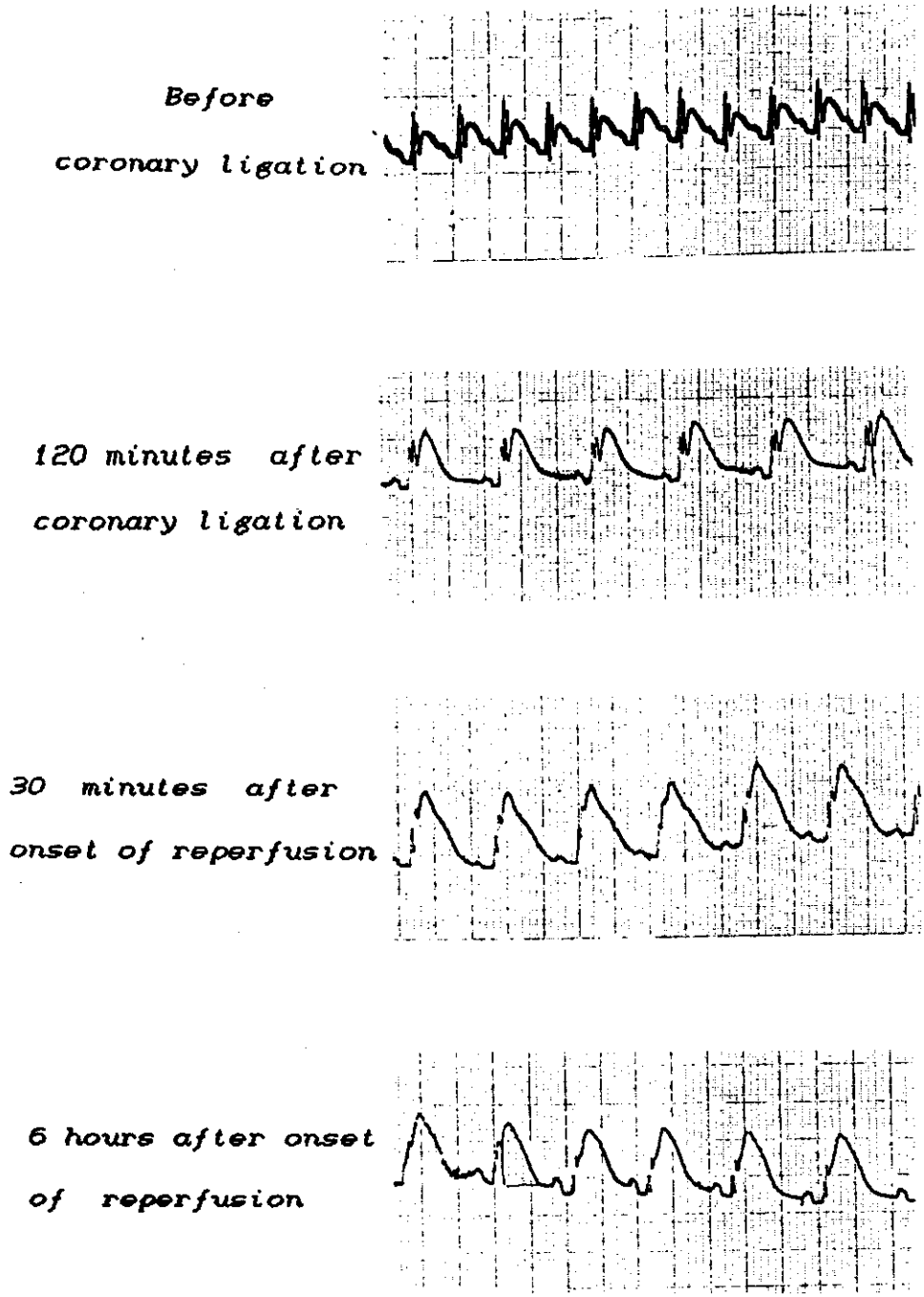
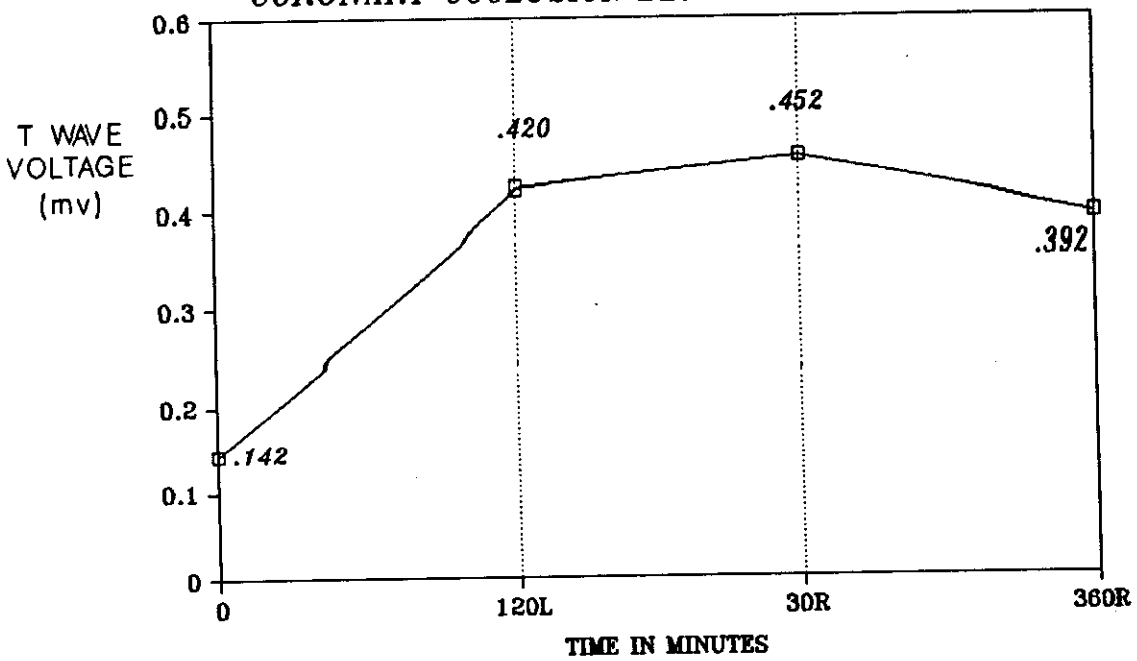


Figure (29a): *The effects of pretreatment with indomethacin, on the T wave voltage and T wave area in rats subjected to coronary occlusion for 120 minutes before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH INDOMETHACIN ON T WAVE VOLTAGE AND AREA IN RATS SUBJECTED TO 120 MINUTES OF CORONARY OCCLUSION BEFORE REPERFUSION



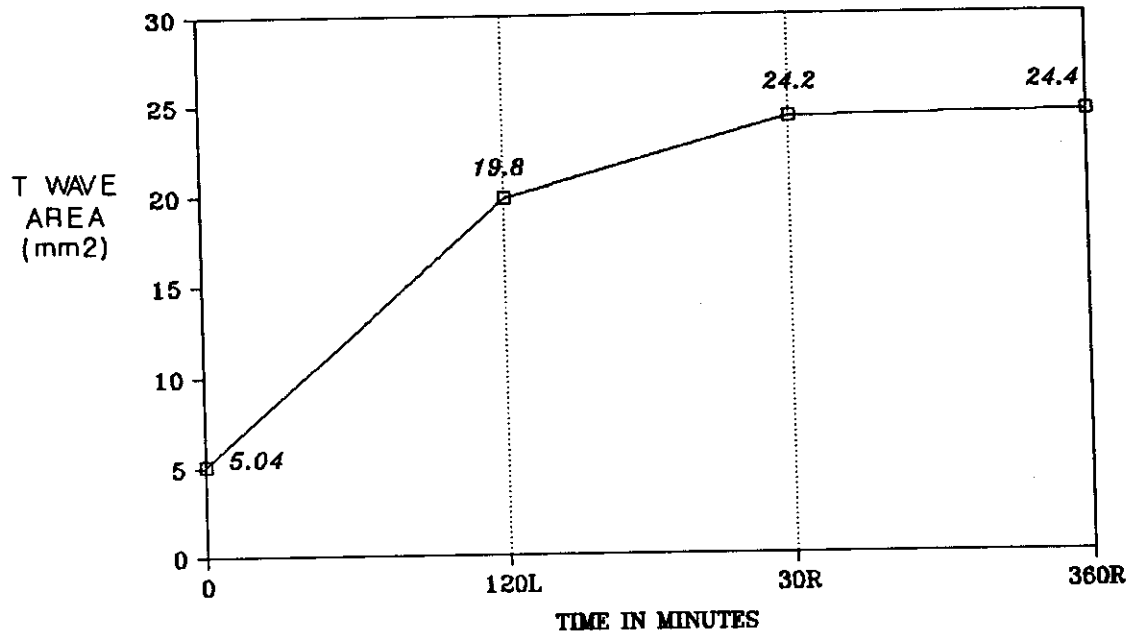


FIGURE 29b

the value immediately before reperfusion ($P < 0.01$). Six hours after onset of reperfusion, the corresponding range was between 23 and 25 mm^2, the mean value was 24.4 ± 0.89 mm^2 . This value was significantly higher than the values before coronary ligation ($P < 0.0001$) and after 2 hours of coronary ischemia.

It is also seen from Table (29) that in this subgroup of rats 6 hours after onset of reperfusion, S CPK ranged from 15789 to 16878 u/L. The mean value was 16287.2 ± 458.17 u/L. The infarction size measured 6 hours after the onset of reperfusion ranged from 63.5 to 77% LV with a mean value 69.5 ± 5.45% LV.

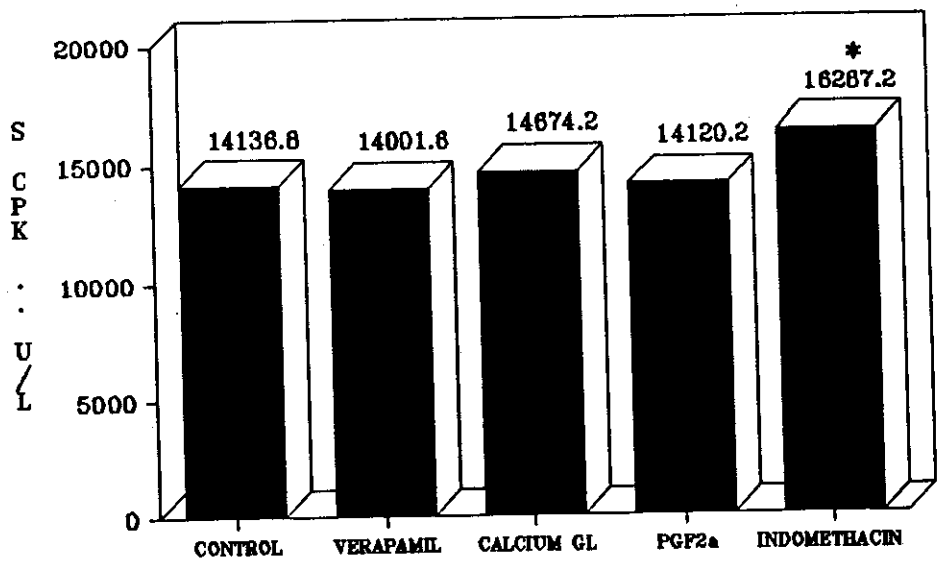
Table (30) shows the mean values and standard deviations of all the results of the T wave voltage, T wave area, S CPK and infarction size in all subgroups of rats subjected to left coronary artery occlusion for 2 hours before the onset of reperfusion. The treated subgroups are compared with the non treated one. It can be seen that in calcium gluconate treated subgroup there was a significant increase in the T wave voltage and area at 30 minutes and 6 hours after coronary reperfusion ($P < 0.05$). In $PGF_{2\alpha}$ treated subgroup there was a significant increase in the T wave voltage and T wave area at 30

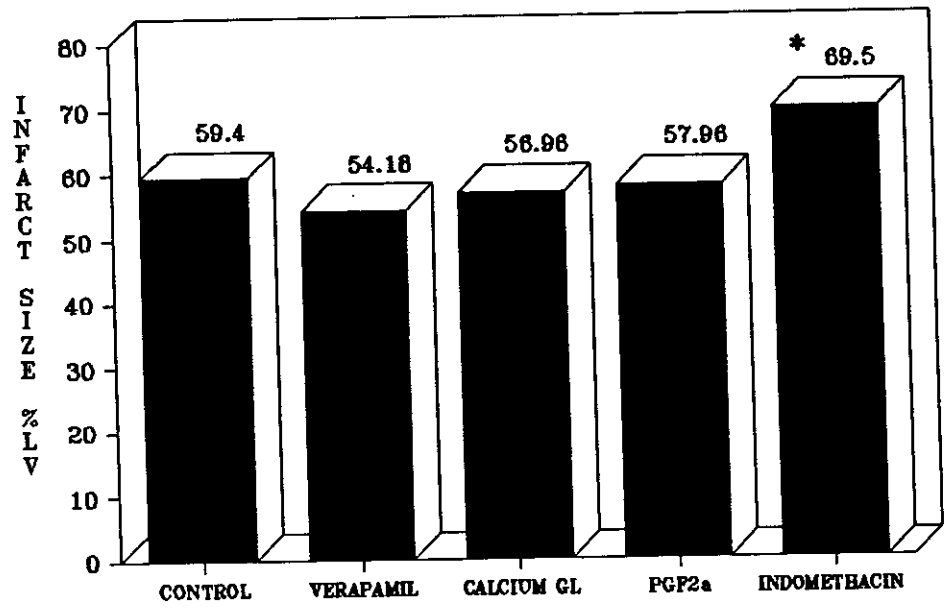
Table (30): Means & standard deviation of the T wave voltage (mv), T wave area (mm^2) S CPK (u/L) & infarction size (%LV) in the group of rats subjected to coronary artery occlusion for 2 hours before onset of reperfusion.

SUBGROUP	T WAVE VOLTAGE (mv)				T WAVE AREA (mm^2)				S CPK (u/L)	inf. size (%LV)
	TIME				TIME					
	Before co. liq.	2 hours after co liq.	30 min after reperf.	6 hours after reperf.	before co. liq.	2 hours after co liq.	30 min after reperf.	6 hours after reperf.	6 hours after reperf.	6 hours after reperf
Non treated rats D1	0.166 ± 0.023	0.370 ± 0.067	0.290 ± 0.055	0.152 ± 0.040	6.00 ± 1.00	16.00 ± 3.24	13.00 ± 2.00	6.00 ± 1.58	14136.80 ± 426.45	59.400 ± 4.56
C.C.B pretreated rats D2	0.172 ± 0.022	0.436 ± 0.113	0.346 ± 0.075	0.162 ± 0.016	7.00 ± 1.00	18.60 ± 5.03	15.60 ± 3.65	7.20 ± 2.28	14001.60 ± 668.26	54.180 ± 2.920
Calcium Gl pretreated rats D3	0.158 ± 0.052	0.512 ± 0.164	0.492* ± 0.120	0.430* ± 0.205	6.20 ± 2.17	19.40 ± 2.79	19.60* ± 2.61	15.60* ± 6.11	14674.20 ± 439.25	56.960 ± 4.279
PGFzα pretreated rats D4	0.162 ± 0.028	0.432 ± 0.041	0.392* ± 0.029	0.152 ± 0.040	6.40 ± 1.14	19.40 ± 2.30	16.20* ± 2.05	3.40* ± 0.55	14120.20 ± 562.89	57.960 ± 5.510
Indometh. pretreated rats D5	o.142 ± 0.046	0.420 ± 0.027	0.452* ± 0.028	0.392* ± 0.011	5.04 ± 1.52	19.80 ± 2.28	24.20* ± 3.42	24.40* ± 0.89	16287.20* ± 458.17	69.50* ± 5.450

* = $p < 0.05$

S CPK AND INFARCTION SIZE AFTER 6 HOURS IN RATS SUBJECTED TO CORONARY OCCLUSION FOR 120 MINUTES BEFORE REPERFUSION





* = $P<0.05$

FIGURE 30

minutes after reperfusion ($P < 0.05$). The T wave area was significantly lower at 6 hours after reperfusion ($P < 0.05$).In indomethacin treated subgroup, there was a significant increase in the T wave voltage and area at 30 minutes and 6 hours after reperfusion ($P < 0.05$). The S CPK and infarction size after 6 hours of reperfusion were significantly higher than in the non treated subgroup. ($P < 0.05$). (See Fig. 30).

E) The Effects of Reperfusion of the Cardiac Muscle on T Wave Voltage(mv), T Wave Area (mm^2), the Serum Creatine Phosphokinase (u/L) and Infarction Size (% of Left Ventricle) in Rats Subjected to Ligation of the Main Left Coronary Artery for 3 hours before the Onset of Reperfusion:

Similar to the previous subgroups included in group II, this subgroup (E) was divided into:

E1: Rats subjected to coronary occlusion for 3 hours followed by reperfusion for 6 hours with no premedications.

E2: Rats pretreated with the calcium channel blocker (verapamil) before the onset of reperfusion.

E3: Rats pretreated with calcium gluconate before the onset of coronary reperfusion.

E4: Rats pretreated with PGF2α before the onset of coronary reperfusion.

E5: Rats pretreated with indomethacin before the onset of reperfusion.

E1) The effects of coronary artery ligation for 3 hours before the onset of reperfusion on T wave voltage, T wave area , S CPK and infarction size:

The results are shown in Table (31) and Figures (31a & 31b). It can be observed that the T wave voltage, before coronary ligation, ranged between 0.15 and 0.25 mv with a mean value of 0.192 ± 0.037 mv. After 3 hours of coronary ligation, the T wave voltage ranged between 0.35 and 0.5 mv with a mean value of 0.42 ± 0.057 mv, showing a significant increase compared with the value before coronary ligation ($P < 0.002$). After 30 minutes of reperfusion the T wave voltage ranged between 0.35 and 0.5 mv the mean value was not changed i.e. 0.42 ± 0.057 mv. Thus we can conclude that in this subgroup the reperfusion for 30 minutes had no effect on the voltage

Table (31): The effects of reperfusion of the cardiac muscle 180 minutes after occlusion of the main left coronary artery on the ischemia induced changes in T wave voltage (mv), T wave area (cm^2), S CPK (u/L) and infarction size (% LV)

No.	T wave voltage (mv) Time in minutes				T wave area(mm^2) Time in minutes				S CPK level after 6 hr.	Infarct area after 6 hr.
	0	180 L	30 R	360 R	0	180 L	30 R	360 R		
1	0.25	0.40	0.40	0.28	7	33	30	15	16021	63.0
2	0.20	0.50	0.50	0.25	6	27	27	12	15562	64.0
3	0.15	0.40	0.40	0.20	6	18	17	10	15123	59.4
4	0.18	0.45	0.45	0.20	7	21	21	10	15331	55.0
5	0.18	0.35	0.35	0.18	7	16	16	8	15401	63.2
Mean	0.192	0.42"	0.42""	0.222"	6.6	23"	22.2""	11"	15487.6	60.92
S.D.	0.037	0.057	0.057	0.04	0.548	6.96	6.14	2.65	337.27	3.75
P <		0.002		0.05		0.01		0.03		

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 180 minutes after coronary ligation (Time 180 L).

L = After coronary ligation.

R = After coronary reperfusion.

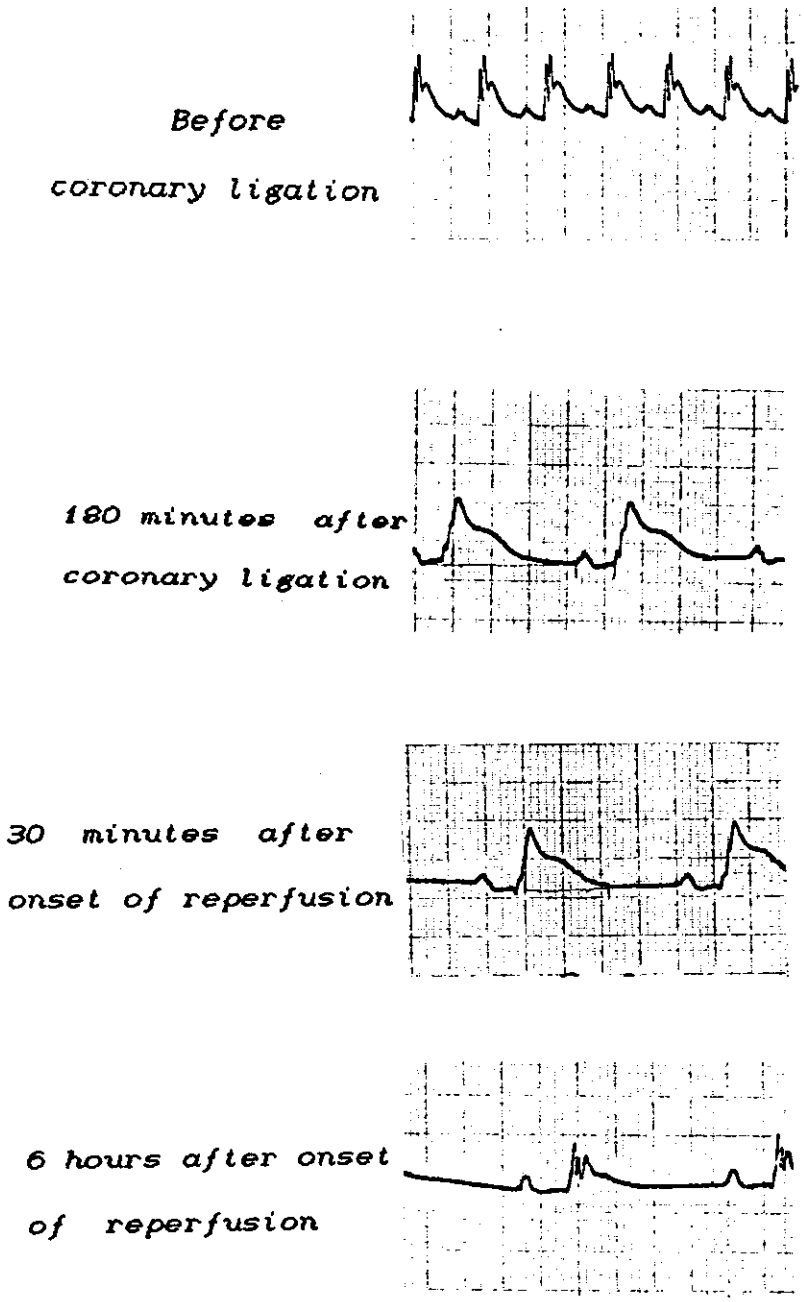
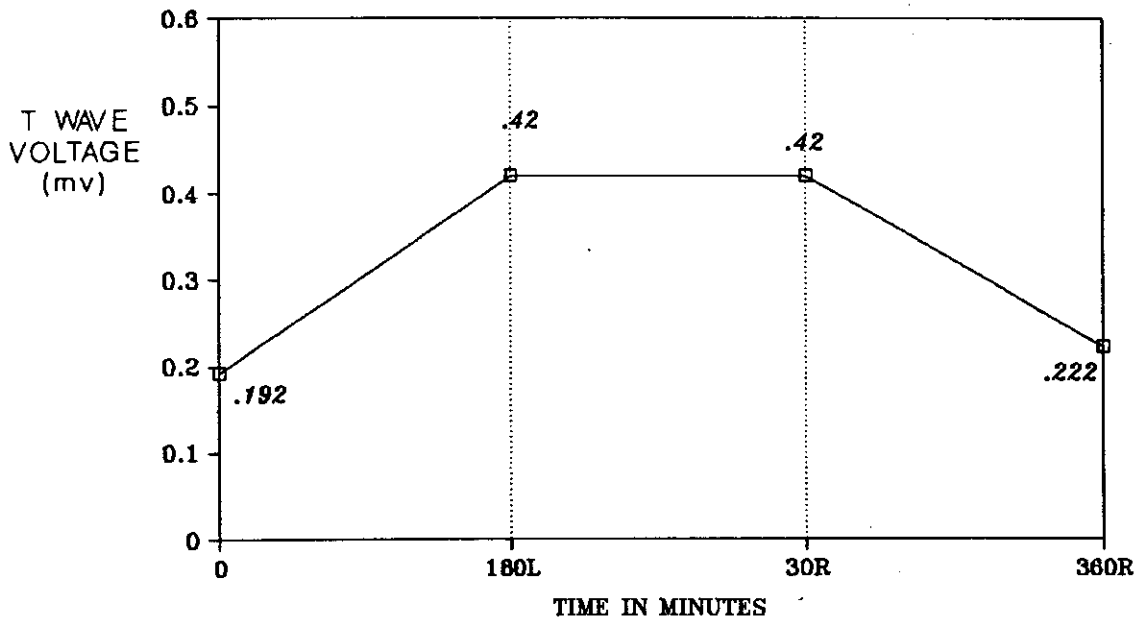


Figure (31a): *The effects of reperfusion of the cardiac muscle 3 hours after coronary artery occlusion on the ischemia-induced changes in T wave voltage and T wave area.*

THE EFFECTS OF REPERFUSION AFTER 180 MIN OF CORONARY OCCLUSION ON T WAVE VOLTAGE AND T WAVE AREA



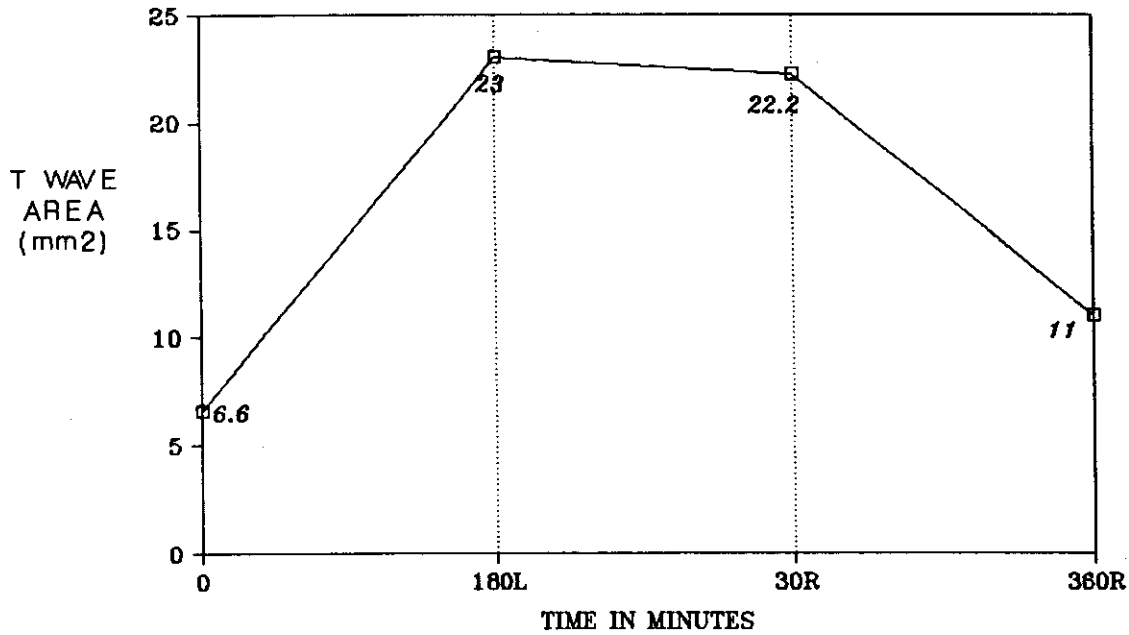


FIGURE 31b

of the T wave. 6 hours after the onset of reperfusion, the mean value of the T wave voltage was 0.222 ± 0.04 mv which was significantly higher than that before coronary ligation ($P < 0.05$). (the range being 0.18 - 0.28 mv).

As noticed from Table (31), before coronary ligation the area under the T wave ranged between 6 and 7 mm^2, with a mean value of 6.6 ± 0.548 mm^2. After 3 hours of coronary ligation the T wave area ranged between 16 and 33 mm^2 with a mean value of 23 ± 6.96 mm^2 showing a significant increase compared with the value before coronary ligation ($P < 0.01$). After 30 minutes of reperfusion the T wave area ranged from 16 to 30 mm^2 with a mean value of 22.2 ± 6.14 mm^2 showing no change from the value immediately before reperfusion ($P > 0.05$). After 6 hours of reperfusion, the T wave area ranged from 8 to 15 mm^2 with a mean value of 11 ± 2.65 mm^2. This value is significantly less than the value immediately before reperfusion ($P < 0.005$). However, it is still higher than the corresponding value before coronary ligation ($P < 0.03$).

As also noticed from Table (31) the S CPK 6 hours after onset of reperfusion in this subgroup of rats was 15487.6 ± 337.27 u/L (range was 15123 - 16021 u/L). The

corresonding infarction size was 60.92 ± 3.75% LV (the range as seen from Table 31 was 55 - 64% LV).

E2) The effects of pretreatment of rats with the calcium channel blocker (verapamil) in rats subjected to coronary occlusion for 3 hours before the onset of reperfusion:

The results are shown in Table (32) and Figures (32a 32b). It can be seen that the T wave voltage, before coronary ligation, ranged between 0.10 and 0.15 mv, the mean value was 0.132 ± 0.020 mv. After 3 hours of coronary ligation, the range was from 0.45 to 0.55 mv, the mean value was 0.496 ± 0.036 mv,showing a significant increase compared with the value before coronary ligation ($P < 0.0001$). 30 minutes after the onset of reperfusion the T wave voltage ranged from 0.38 to 0.48 mv, the mean value was 0.418 ± 0.039 mv,showing a significant decrease when compared with the value immediately before reperfusion ($P < 0.001$). after 6 hours of reperfusion the range of T wave voltage was between 0.15 and 0.20 mv, the mean value was 0.166 ± 0.023 mv, which was significantly higher than that before coronary ligation ($P<0.05$).

Table (32): The effects of pretreatment with the calcium channel blocker, verapamil, (at a dose of 0.01 mg/100 gm rat body weight given i.v. 15 minutes before onset of reperfusion). on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary occlusion for 180 minutes before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	180 L	30 R	360 R	0	180 L	30 R	360 R	6 hr	6 hr.
1	0.15	0.50	0.40	0.18	5	30	27	10	16032	60.0
2	0.10	0.45	0.38	0.15	4	30	25	8	15393	58.0
3	0.13	0.48	0.40	0.20	5	30	26	11	14010	61.3
4	0.13	0.50	0.43	0.15	4.5	32	28	8	16183	55.0
5	0.15	0.55	0.48	0.15	5	34	30	9	15121	58.4
Mean	0.132	0.496"	0.418""	0.166"	4.7	31.2"	27.2""	9.2"	15347.8	58.54
S.D.	0.020	0.036	0.039	0.023	0.45	1.79	1.92	1.3	867.3	2.377
P <		0.0001	0.001	0.05		0.0001	0.001	0.001		

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 180 minutes after coronary ligation (Time 180 L).

L = After coronary ligation.

R = After coronary reperfusion.

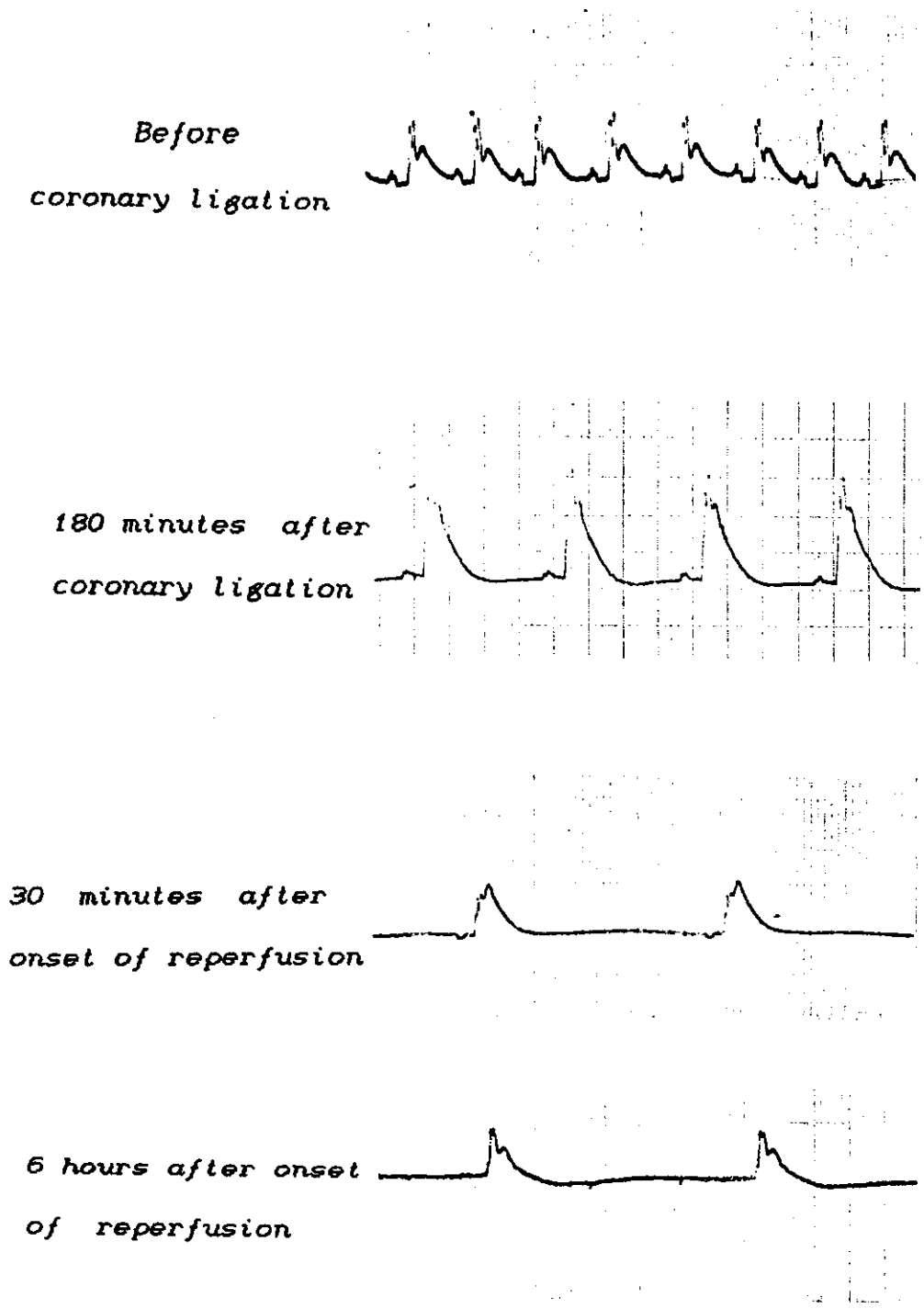
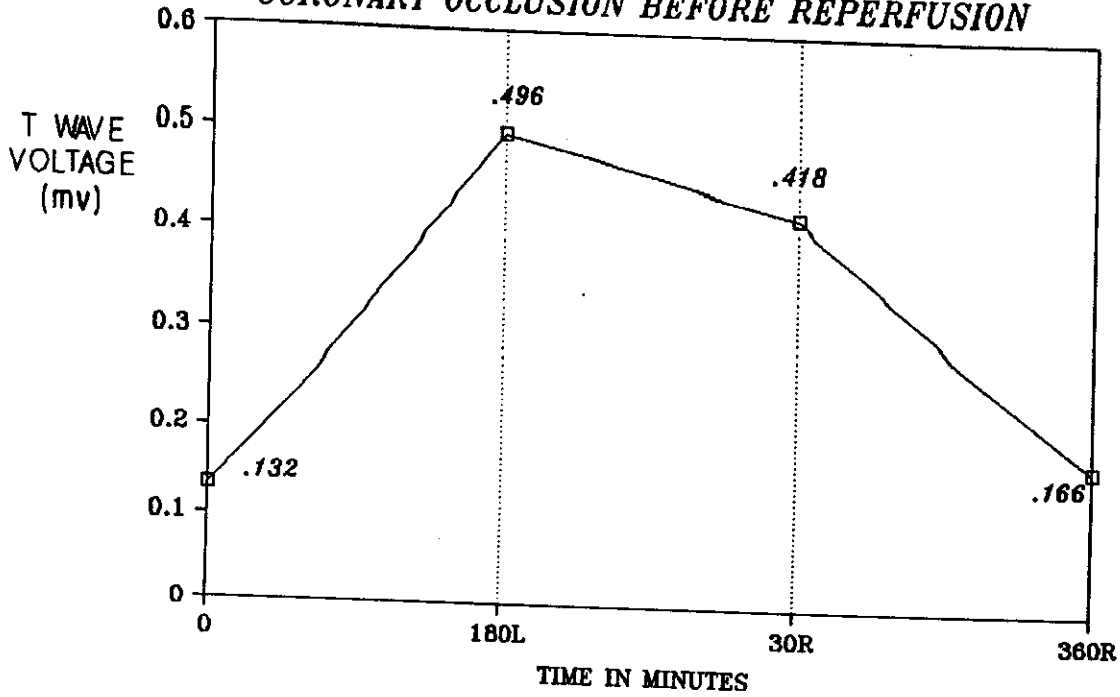


Figure (32a): *The effects of pretreatment with calcium channel blocker, verapamil, on the T wave voltage and T wave area in rats subjected to coronary artery occlusion for 3 hours before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH VERAPAMIL ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO 3 HOURS OF CORONARY OCCLUSION BEFORE REPERFUSION



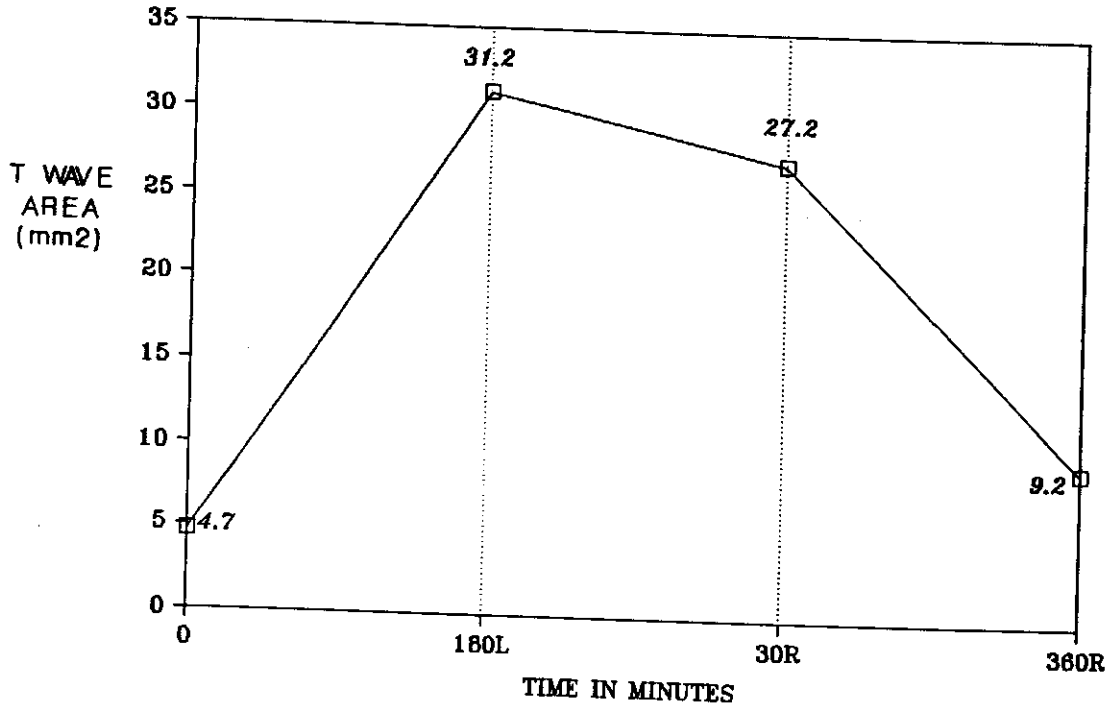


FIGURE 32 b

The T wave area, before coronary ligation ranged between 4 and 5 mm^2 with mean value of 4.7 ± 0.45 mv. After 3 hours of coronary ligation, the T wave area ranged from 30 to 34 mm^2 with mean value of 31.2 ± 1.79 mm^2, showing a significant increase compared with the value before coronary ligation ($P < 0.0001$). 30 minutes after reperfusion, the range was between 25 and 30 mm^2 with a mean value of 27.2 ± 1.92 mm^2 i.e. the T wave area was significantly decreased on reperfusion when compared with the value immediately before reperfusion ($P < 0.001$). 6 hours after onset of reperfusion, the area ranged between 8 and 11 mm^2, the mean value was 9.2 ± 1.30 mm^2 which was significantly higher that the value before coronary ligation ($P < 0.001$).

It is also noticed from Table (32) that 6 hours after the onset of reperfusion, the S CPK ranged between 14010 and 16183 u/L, with a mean value 15347.8 ± 867.3 u/L. The infarction size was 58.54 ± 2.377% LV (the range was 55 - 61.3% LV).

E3) The effects of pretreatment with calcium gluconate (0.12 mg/100 gm rat body weight given I.P., 30 minutes before onset of reperfusion) in rats subjected to coronary occlusion for 3 hours before onset of reperfusion:

The results are shown in Table (33) and Figures (33a & 33b). It can be noticed from Table 33 that the T wave voltage, before coronary ligation, ranged between 0.10 to 0.20 mv, the mean value was 0.158 ± 0.041 mv. 3 hours after coronary ligation the T wave voltage ranged between 0.43 and 0.60 mv, the mean value was 0.492 ± 0.066 mv, showing a significant increase compared with the value before coronary ligation. ($P < 0.0001$). 30 minutes after onset of reperfusion, the T wave voltage ranged between 0.45 and 0.60mv, the mean value was 0.512 ± 0.061 mv. This value was not different from that immediately before reperfusion (3 hours after coronary ligation) ($P > 0.05$). 6 hours after reperfusion, the T wave voltage ranged between 0.30 and 0.40 mv, the mean value was 0.372 ± 0.041 mv which was significantly higher than the value before coronary ligation ($P < 0.002$).

Table (33): The effects of pretreatment with calcium gluconate (0.12 mg/100 gm rate body weight given I.P., 30 minutes before onset of reperfusion) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to 180 minutes coronary occulsion before onset of reperfusion.

	T wave voltage (mv)				T wave area(mm^2)				S CPK level	Infarct area
	Time in minutes				Time in minutes				after	after
No.	0	180 L	30 R	360 R	0	180 L	30 R	360 R	6 hr.	6 hr.
1	0.13	0.43	0.45	0.40	4	12	13	11	15020	60.0
2	0.10	0.45	0.48	0.38	4	13	13	11	16100	62.0
3	0.18	0.48	0.48	0.40	7	15	14	12	16121	61.2
4	0.20	0.60	0.60	0.38	8	18	18	14	14321	58.0
5	0.18	0.50	0.55	0.30	8	16	17	13	15122	54.0
Mean	0.158	0.492"	0.512""	0.372"	6.2	14.8"	15""	12.2"	15336.8	59.04
S.D.	0.041	0.066	0.061	0.041	2.05	2.39	2.35	1.30	770.68	3.19
P <		0.0001		0.002		0.0001		0.001		

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 180 minutes after coronary ligation (Time 180 L).

L = After coronary ligation.

R = After coronary reperfusion.

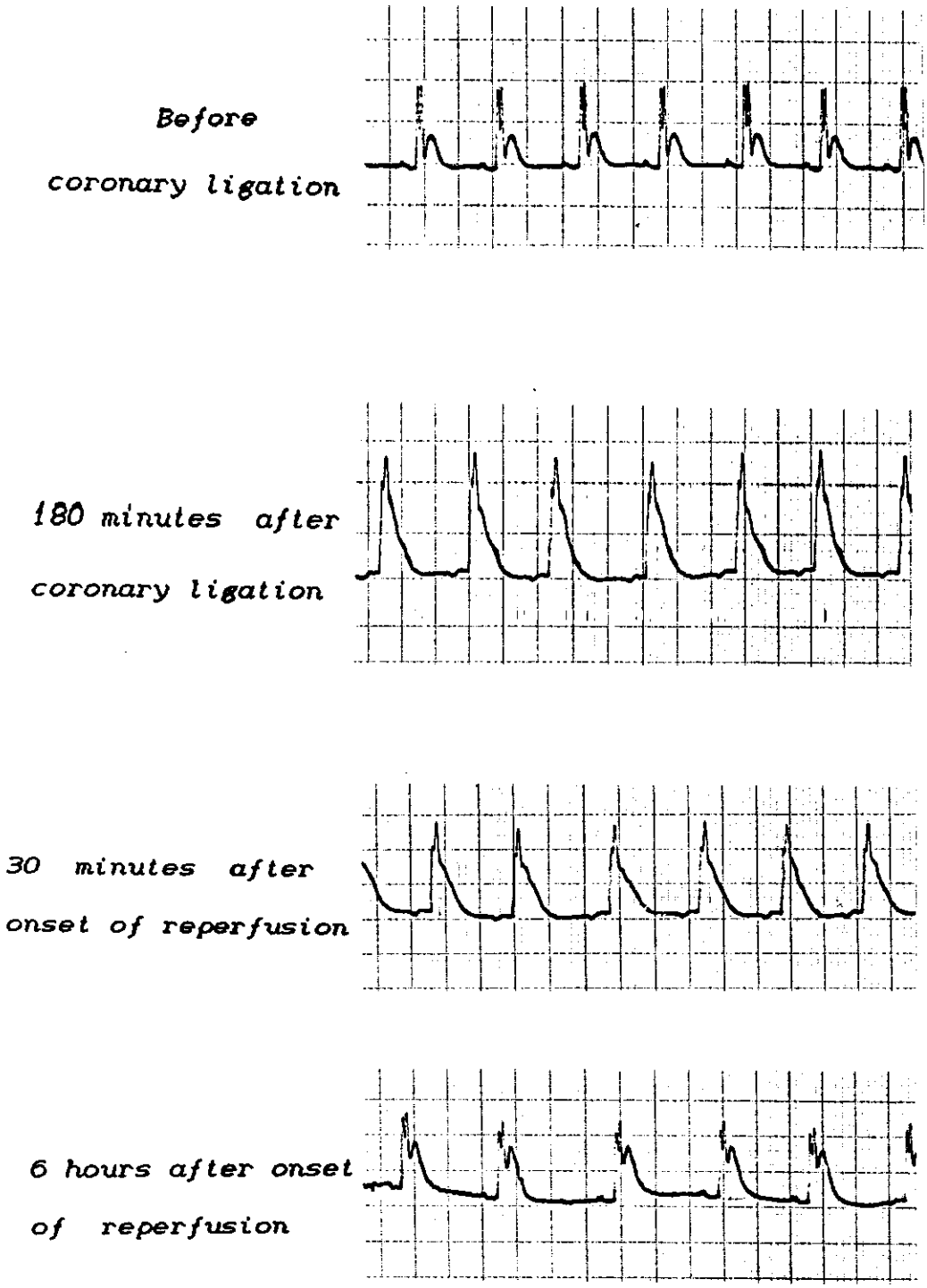
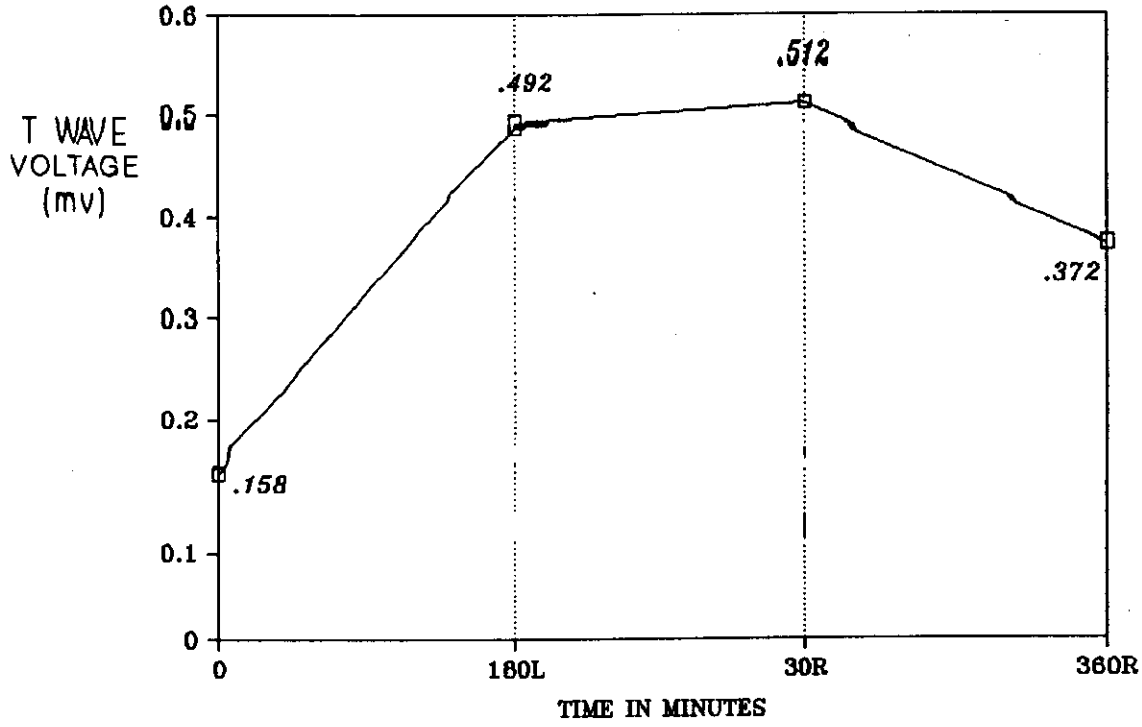


Figure (33a): *The effects of pretreatment with calcium gluconate, on the T wave voltage and T wave area in rats subjected to coronary artery occlusion for 3 hours before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH CALCIUM GLUCONATE ON T WAVE VOLTAGE AND AREA IN RATS SUBJECTED TO 3 HOURS OF CORONARY OCCLUSION BEFORE REPERFUSION



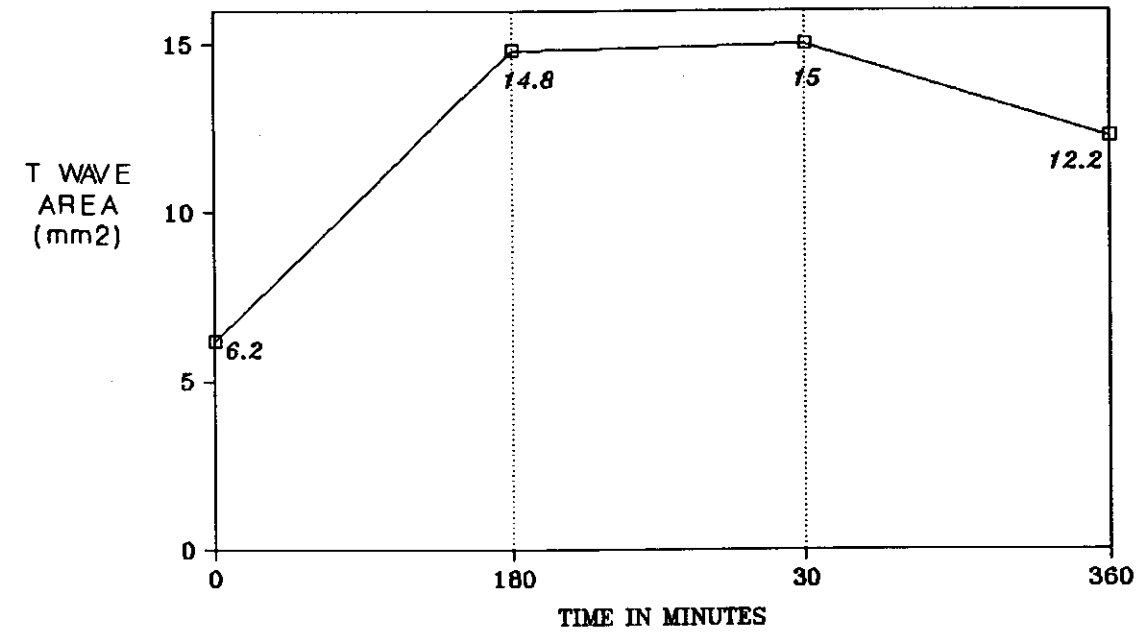


FIGURE 33 B

The T wave area, before coronary ligation, ranged from 4 to 8 mm^2 with a mean value of 6.2 ± 2.05 mm^2. 3 hours after coronary ligation, the range was between 12 and 18 mm^2, the mean value was 14.8 ± 2.39 mm^2, showing a significant increase compared with the value before coronary ligation ($P < 0.0001$). After 30 minutes of reperfusion the range of the T wave area was between 13 and 18 mm^2, the mean value was 15 ± 2.35 mm^2. This value was not different from that immediately before reperfusion ($P > 0.05$). 6 hours after reperfusion, the range was from 11 to 14 mm^2, the mean value was 12.2 ± 1.30 mm^2 which was significantly higher than the value before coronary ligation ($P < 0.001$).

It is also noticed from Table (33) that the S CPK in this subgroup of rats 6 hours after the onset of reperfusion ranged from 14321 to 16121 u/L with a mean value 15336.8 ± 770.68 u/L. The infarction size in this subgroup of rats 6 hours after onset of reperfusion ranged between 54 - 62% LV. The mean value as seen from Table (33) was 59.04 ± 3.19% LV.

E4) The effects of pretreatment with $PGF_{2\alpha}$ (0.015 mg/100 gm rat body weight injected intraperitoneally, 30 minutes before the onset of reperfusion) in rats subjected to coronary artery occlusion for 3 hours before coronary occlusion:

The results are shown in Table (34) and Figures (34a & 34b) in this subgroup, the T wave voltage before coronary ligation, ranged between 0.10 and 0.18 mv, the mean value was 0.142 ± 0.029 mv. Three hours after coronary ligation, the range of the T wave voltage was between 0.33 and 0.45 mv, the mean value was 0.392 ± 0.043 mv showing a significant increase when compared with the value before coronary ligation ($P < 0.0001$). 30 minutes after the onset of reperfusion, the voltage of the T wave ranged between 0.33 and 0.40 mv, the mean value 0.372 ± 0.031 mv. This value was not different from that immediately before reperfusion ($P > 0.05$). 6 hours after the onset of reperfusion, the range was between 0.10 and 0.20 mv, the mean value was 0.152 ± 0.040 mv. This value was not different from that before coronary ligation ($P > 0.05$).

Table (34): The effects of pretreatment with PGF$_{2\alpha}$ (0.015 mg/100 gm rat body weight given I.P. 30 minutes before onset of reperfusion) on the T wave voltage (mv), T wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to coronary occlusion for 180 minutes before onset of reperfusion.

No.	T wave voltage (mv) Time in minutes				T wave area (mm^2) Time in minutes				S CPK level after 6 hr.	Infarct area after 6 hr.
	0	180 L	30 R	360 R	0	180 L	30 R	360 R		
1	0.13	0.38	0.35	0.13	4	12	10	4	15201	60
2	0.15	0.45	0.40	0.20	5	15	14	5	14890	65
3	0.15	0.40	0.40	0.18	5	13	12	5	16900	63
4	0.10	0.33	0.33	0.10	3.5	11	10	3	15000	59
5	0.18	0.40	0.38	0.15	5.5	12	10	4	15201	54
Mean	0.142	0.392	0.372	0.152	4.6	12.6	11.2	4.2	15438.4	60.2
S.D.	0.029	0.043	0.031	0.040	0.82	1.52	1.79	0.84	827.94	4.21
P <	0.0001				0.001		0.005			

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 180 minutes after coronary ligation (Time 180 L).

L = After coronary ligation.

R = After coronary reperfusion.

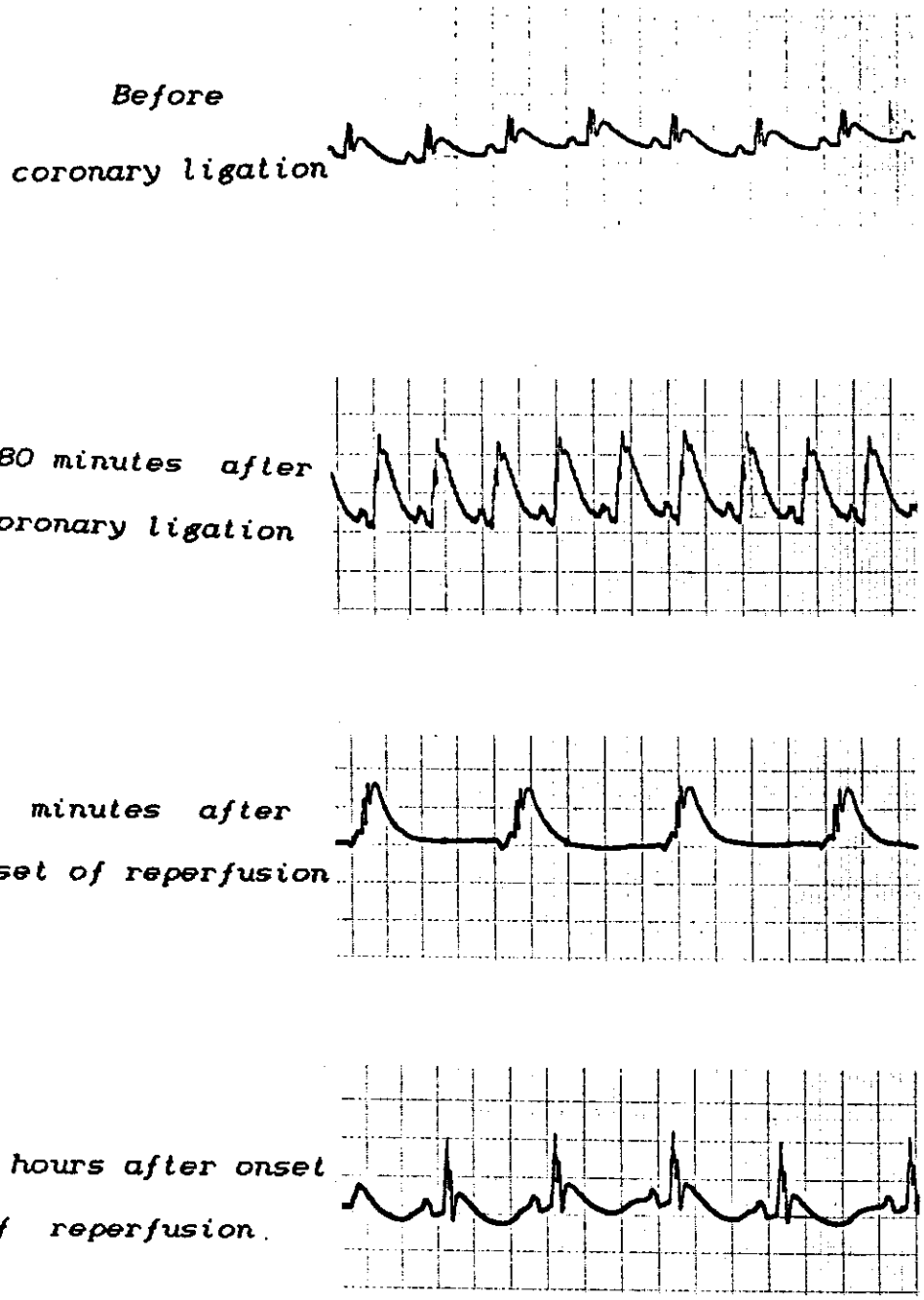
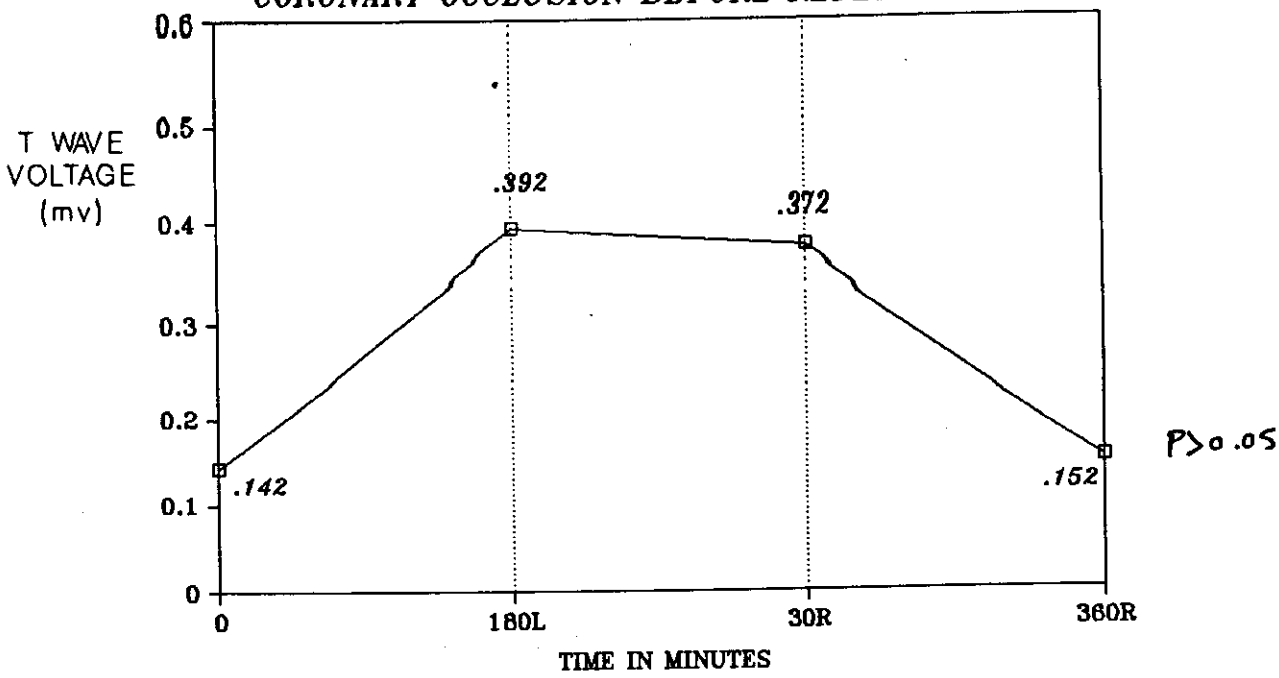


Figure (34a): *The effects of pretreatment with PGF2α, on the T wave voltage and T wave area in rats subjected to coronary artery occlusion for 3 hours before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH PGF2α ON T WAVE VOLTAGE AND T WAVE AREA IN RATS SUBJECTED TO 3 HOURS OF CORONARY OCCLUSION BEFORE REPERFUSION



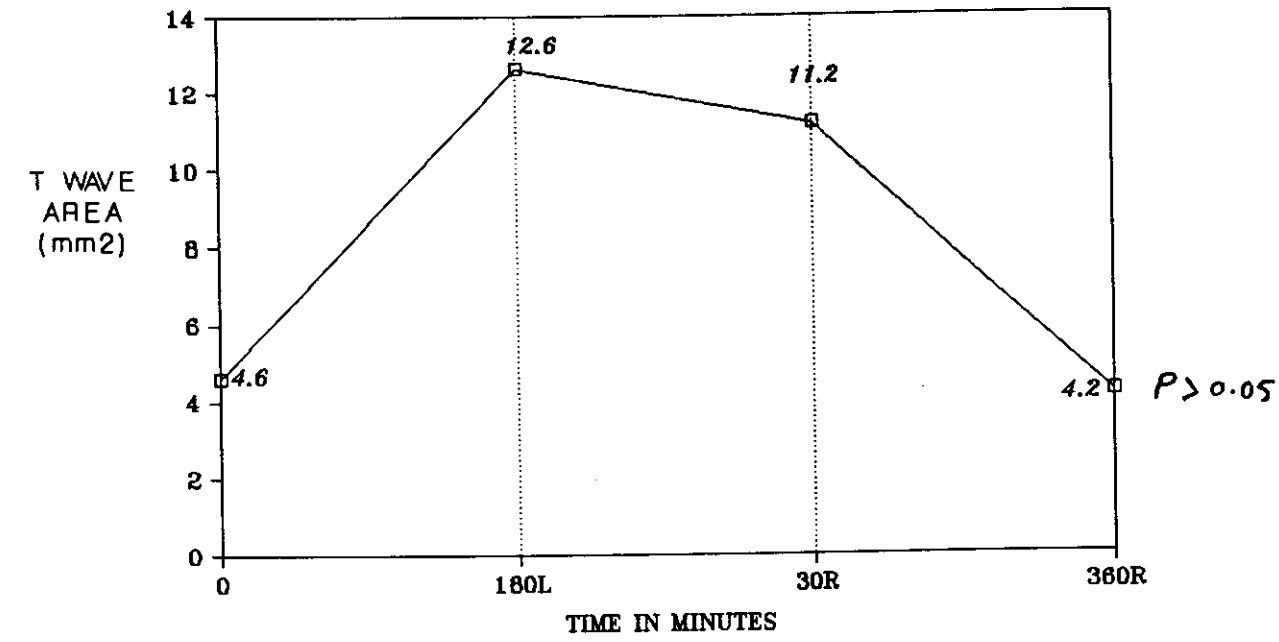


FIGURE 34b

The T wave area, before coronary ligation, ranged between 3.5 and 5.5 mm^2, the mean value was 4.6 mm^2 ± 0.82 mm^2. After 3 hours of coronary ligation, the range was between 11 and 15 mm^2, the mean value was 12.6 ± 1.52 mm^2, showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). 30 minutes after reperfusion, the range was between 10 and 14 mm^2, the mean value was 11.2 ± 1.79 mm^2, showing a significant decrease when compared with the value immediately before reperfusion ($P < 0.005$). After six hours of reperfusion, the area ranged between 3 and 5 mm^2, the mean value was 4.2 ± 0.84 mm^2. This value was not different from that before coronary ligation ($P > 0.05$)

The S CPK 6 hours after onset of reperfusion of the cardiac muscle in rats pretreated with PGF2α, in rats subjected to ligation of the main left coronary artery for 3 hours (Table 24), ranged between 14890 & 16900 u/L with a mean value 15438.4 ± 827.94 u/L. The corresponding infarction size was of a mean value 60.2 ± 4.21% LV. (the range being 54 to 65% LV).

E3) The effects of pretreatment with indomethacin (0.06 mg/100 gm rat body weight given i.v., 15 minutes before onset of reperfusion) in rats subjected to coronary artery ligation for 3 hours before onset of reperfusion:

The results are shown in Table (35) and Figures (35a & 35b). It can be seen that in this subgroup, the T wave voltage, before coronary ligation, ranged between 0.10 and 0.18, the mean value was 0.138 ± 0.029 mv. After 3 hours of coronary ligation, the range was between 0.40 and 0.48 mv, the mean value was 0.438 ± 0.040 mv showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). 30 minutes after onset of reperfusion, the range was between 0.42 and 0.50 mv, the mean value was 0.464 ± 0.035 mv, showing a significant increase when compared with the value immediately before reperfusion ($P < 0.02$). 6 hours after the onset of reperfusion, the range of the T wave voltage was between 0.40 and 0.50 mv, the mean value was 0.448 ± 0.041 mv . This value was significantly higher than the initial value before coronary ligation ($P < 0.001$)

Table (35): The effects of pretreatment with indomethacin (0.06 mg/100 gm rat body weight given intravenously 15 minutes before onset of reperfusion) on T wave voltage (mv), t wave area (mm^2), S CPK (u/L) and infarction size (% LV) in rats subjected to 180 minutes coronary occlusion before onset of reperfusion.

No.	T wave voltage (mv) Time in minutes				T wave area(mm^2) Time in minutes				S CPK level after 6 hr.	Infarct area after 6 hr.
	0	180 L	30 R	360 R	0	180 L	30 R	360 R		
1	0.13	0.43	0.45	0.43	4	20	24	26	21100	70.0
2	0.18	0.40	0.45	0.43	6	19	26	27	20800	65.5
3	0.15	0.40	0.42	0.40	5	17	21	26	20800	73.0
4	0.13	0.48	0.50	0.48	5	24	28	28	21200	71.2
5	0.10	0.48	0.50	0.50	4	25	28	30	19998	68.0
Mean	0.138	0.438"	0.464""	0.448"	4.8	21"	25.4""	27.4"	20779.6	69.54
S.D.	0.029	0.040	0.035	0.041	0.8	3.39	2.97	1.67	472	2.90
P <		0.001	0.02	0.001		0.001	0.005	0.0001		

" Compared with the values before coronary ligation (Time 0).

"" Compared with the values at 180 minutes after coronary ligation (Time 180 L).

L = After coronary ligation.

R = After coronary reperfusion.

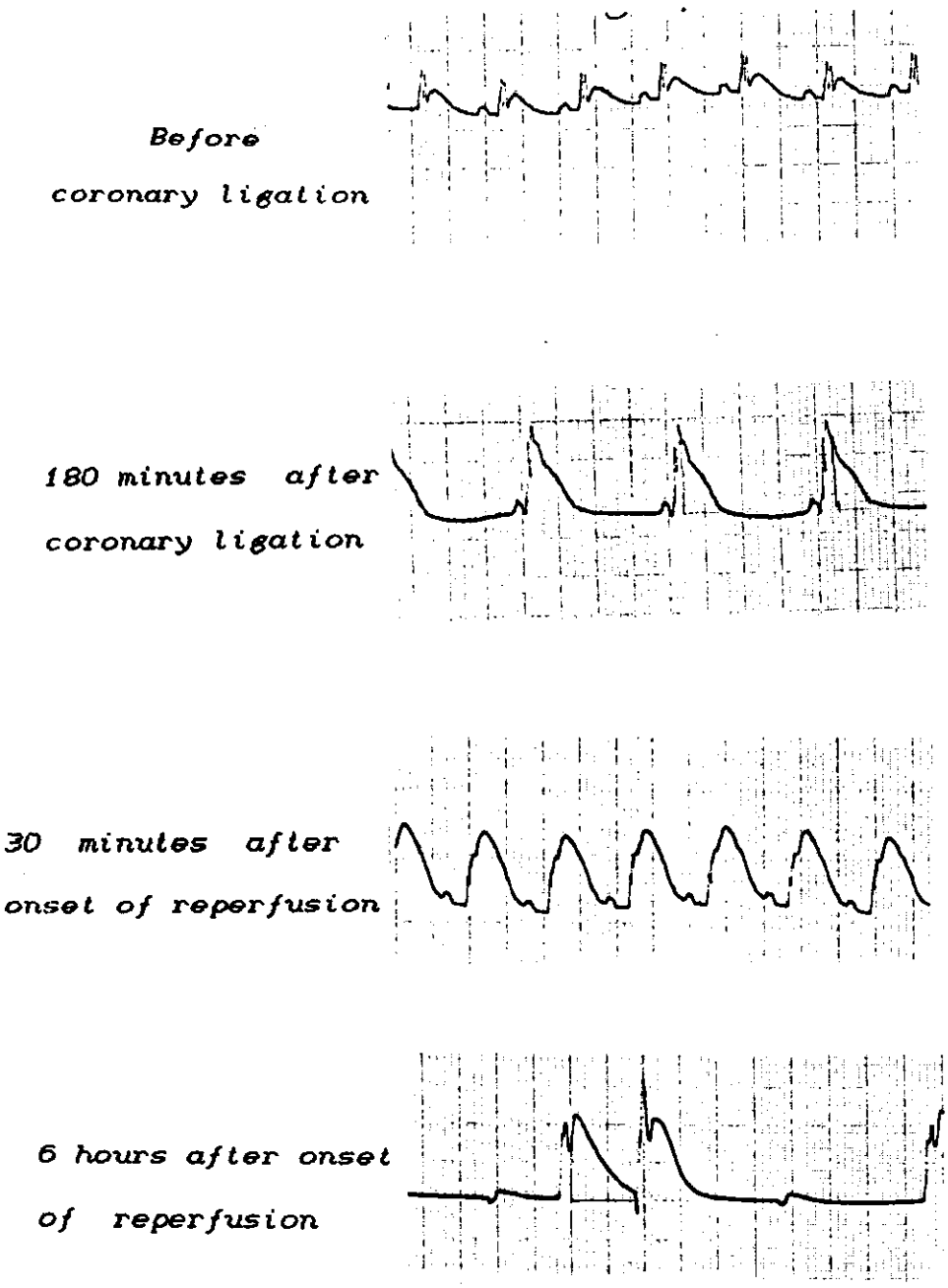
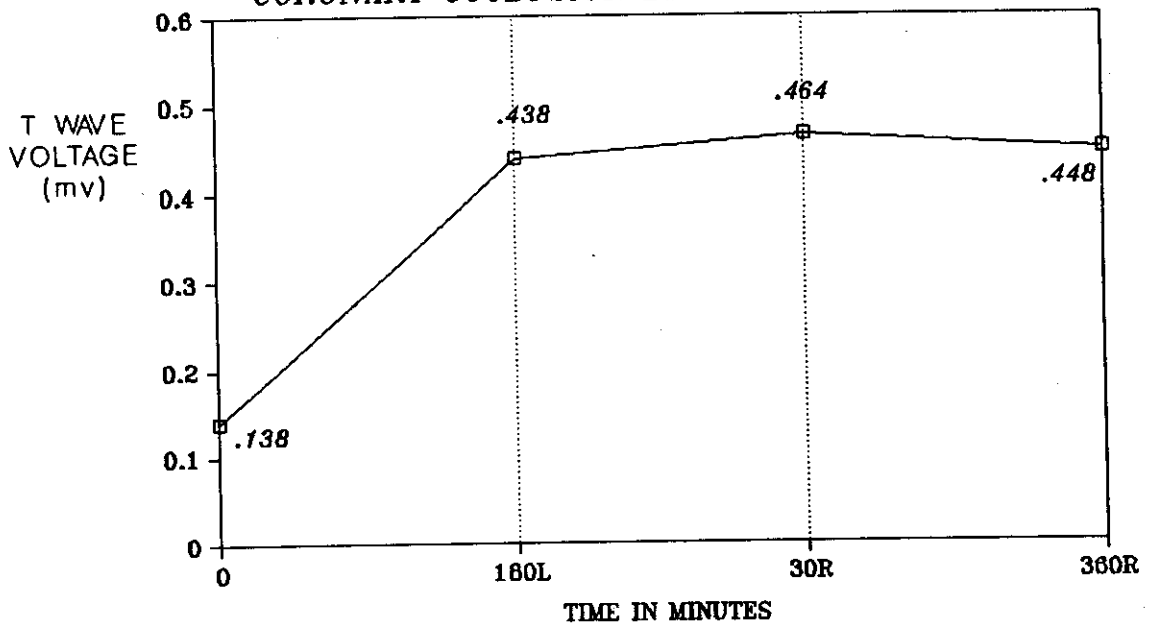


Figure (35a): *The effects of pretreatment with indomethacin, on the T wave voltage and T wave area in rats subjected to coronary artery occlusion for 3 hours before onset of reperfusion.*

THE EFFECTS OF PRETREATMENT WITH INDONETHACIN ON T WAVE VOLTAGE AREA IN RATS SUBJECTED TO 3 HOURS OF CORONARY OCCLUSION BEFORE REPERFUSION



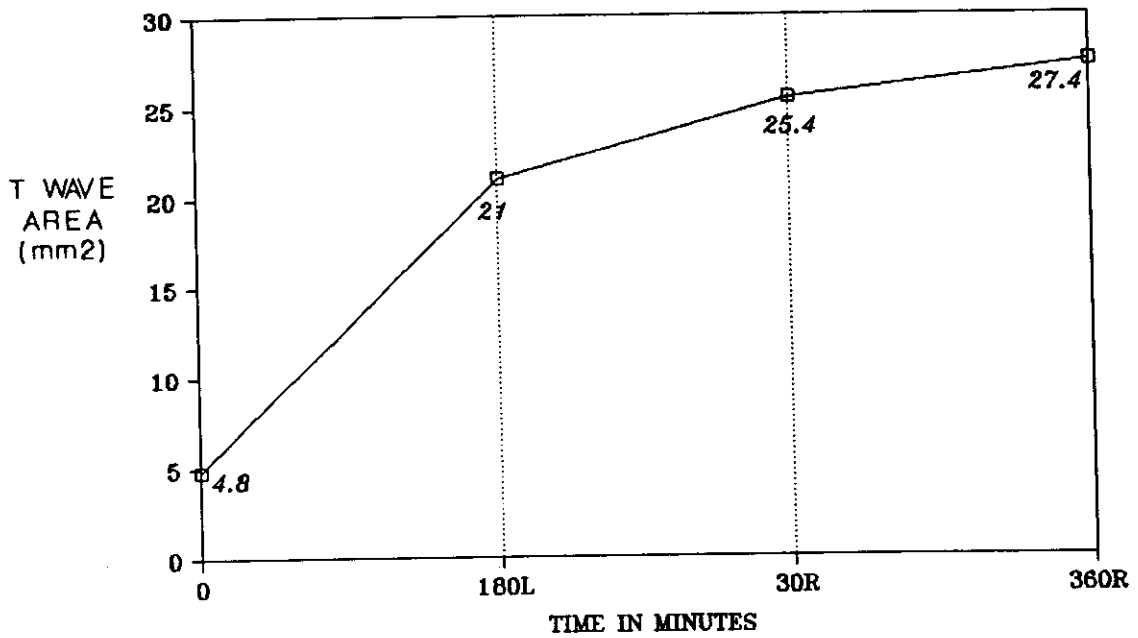


FIGURE 36b

The T wave area, before coronary ligation, ranged between 4 and 6 mm^2, the mean value was 4.8 ± 0.84 mm^2. Three hours after coronary ligation, the range was between 17 and 25 mm^2, the mean value was 21 ± 3.39 mm^2 showing a significant increase when compared with the value before coronary ligation ($P < 0.001$). 30 minutes after reperfusion, the range of the area was between 21 and 28 mm^2, the mean value was 25.4 ± 2.97 mm^2 showing a significant increase when compared with the value immediately before reperfusion ($P < 0.005$). Six hours after reperfusion, the range was between 26 and 30 mm^2, the mean value was 27.4 ± 1.67 mm^2 . This value was significantly higher than the initial value before coronary ligation ($P < 0.0001$).

The S CPK in this subgroup of rats after 6 hours of reperfusion ranged from 19998 to 21200 u/L with a mean value 20779.6 ± 472 u/L. The infarction size ranged from 65.5 to 73% LV with a mean value 69.54 ±+ 2.90% LV.

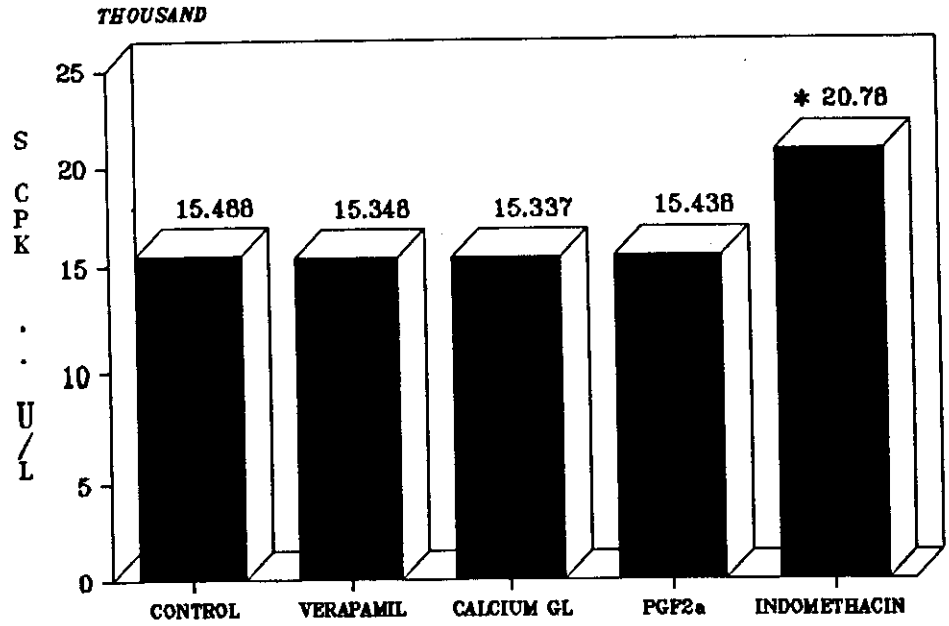
Table (36) shows the mean values and standard deviations of all the results included in this subgroup of rats which were subjected to left coronary artery occlusion for 3 hours followed by reperfusion for 6 hours. From that Table it can be seen that in the

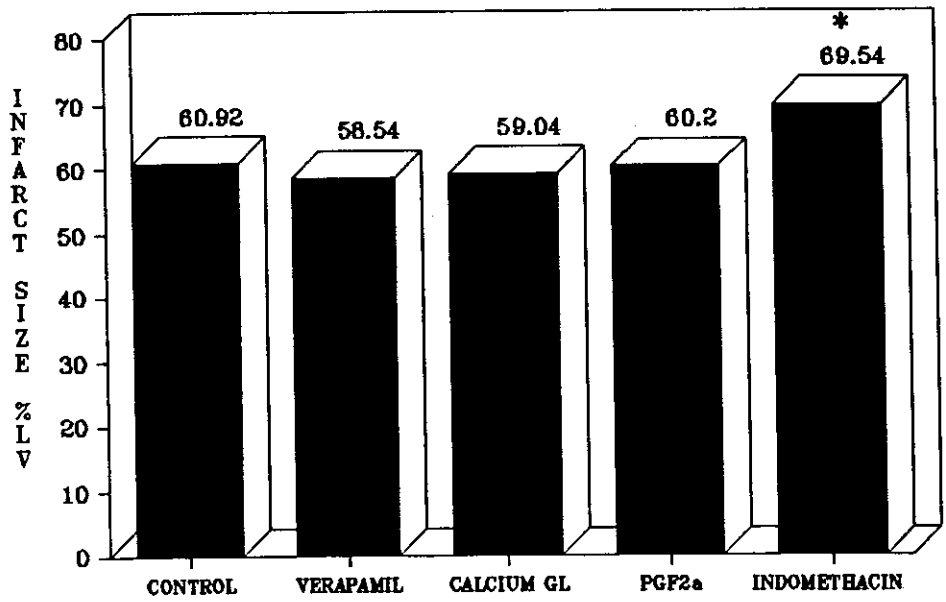
Table (36) Means & standard deviations of the T wave voltage (mv), T wave area (mm^2) S CPK (u/L) & infarction size (%LV) in all subgroups of rats subjected to 3 hours of coronary occlusion before onset of reprefusion

SUBGROUP	T WAVE VOLTAGE (mv)				T WAVE AREA (mm^2)				scpk (u/L)	inf. size (%lv)
	TIME				TIME				6 hours after	6hours after
	Before co. lig.	3 hrs. after co lig.	30 min after reperf.	6 hours after reperf.	before co. lig.	3 hrs. after co lig.	30 min after reperf.	6 hours after reperf.	reperf.	reperf
Non treated rats	0.192 ± 0.037	0.420 ± 0.057	0.420 ± 0.057	0.222 ± 0.040	6.60 ± 0.548	23.00 ± 6.96	22.20 ± 6.14	11.00 ± 2.65	15487.60 ± 337.27	60.920 ± 3.750
C.C.B. pretreated rats	0.132 ± 0.020	0.496* ± 0.036	0.418 ± 0.039	0.166* ± 0.023	4.70 ± 0.45	31.20* ± 1.79	27.20 ± 1.92	9.20 ± 1.30	15347.80 ± 867.31	58.540 ± 2.377
Calcium Gl pretreated rats	0.158 ± 0.041	0.492 ± 0.066	0.512* ± 0.061	0.372* ± 0.041	6.20 ± 2.05	14.80* ± 2.39	15.00* ± 2.35	12.20 ± 1.30	15336.80 ± 770.68	59.040 ± 3.190
PGF2α pretreated rats	0.142 ± 0.029	0.392 ± 0.043	0.372 ± 0.031	0.152* ± 0.040	4.60 ± 0.82	12.60* ± 1.52	11.20* ± 1.79	4.20* ± 0.84	15438.40 ± 827.92	60.200 ± 4.210
Indometh. pretreated rats	0.138 ± 0.029	0.438 ± 0.040	0.464 ± 0.035	0.448* ± 0.041	4.80 ± 0.84	21.00 ± 3.39	25.40 ± 2.97	27.40* ± 1.67	20779.60* ± 472.00	69.54* ± 2.900

* = $P < 0.05$

S CPK AND INFARCTION SIZE AFTER 6 HOURS IN RATS SUBJECTED TO CORONARY OCCLUSION FOR 3 HOURS BEFORE REPERFUSION





* = *P<0.05*

FIGURE 36

calcium channel blocker treated subgroup, the T wave voltage & area, were significantly high at 3 hours after coronary ligation. The T wave voltage was significantly lower at 6 hours after reperfusion ($P < 0.05$). In the calcium gluconate treated subgroup, the T wave voltage was significantly higher at 30 minutes and 6 hours after reperfusion ($P < 0.05$). The T wave area was significantly higher at 3 hours after coronary ligation and 30 minutes after coronary reperfusion ($P < 0.05$). In PGF$_{2\alpha}$ treated subgroup, the T wave voltage was significantly lower at 6 hours after reperfusion, the T wave area was significantly lower at 3 hours after coronary ligation, 30 minutes and 6 hours after coronary reperfusion ($P < 0.05$). In indomethacin treated subgroup, there was a significant increase in the T wave voltage, T wave area, S CPK and infarction size after 6 hours of reperfusion ($P < 0.05$). (See Fig. 36).