

# **Endothelial function as a marker for the assessment of CV risk factor control among hypertensive diabetic patients**

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This project was supported by a grant for residents from the Goldman Faculty Fund for Medical Research of the Faculty of Health Sciences

# Endothelial dysfunction and Cardiovascular risk

Endothelial dysfunction is a key player in the pathogenesis of hypertension, diabetes and atherosclerosis

Endothelial dysfunction is associated with an increased cardiovascular risk in hypertensive diabetic patients

The evaluation of endothelial function provides important prognostic information for cardiovascular outcome



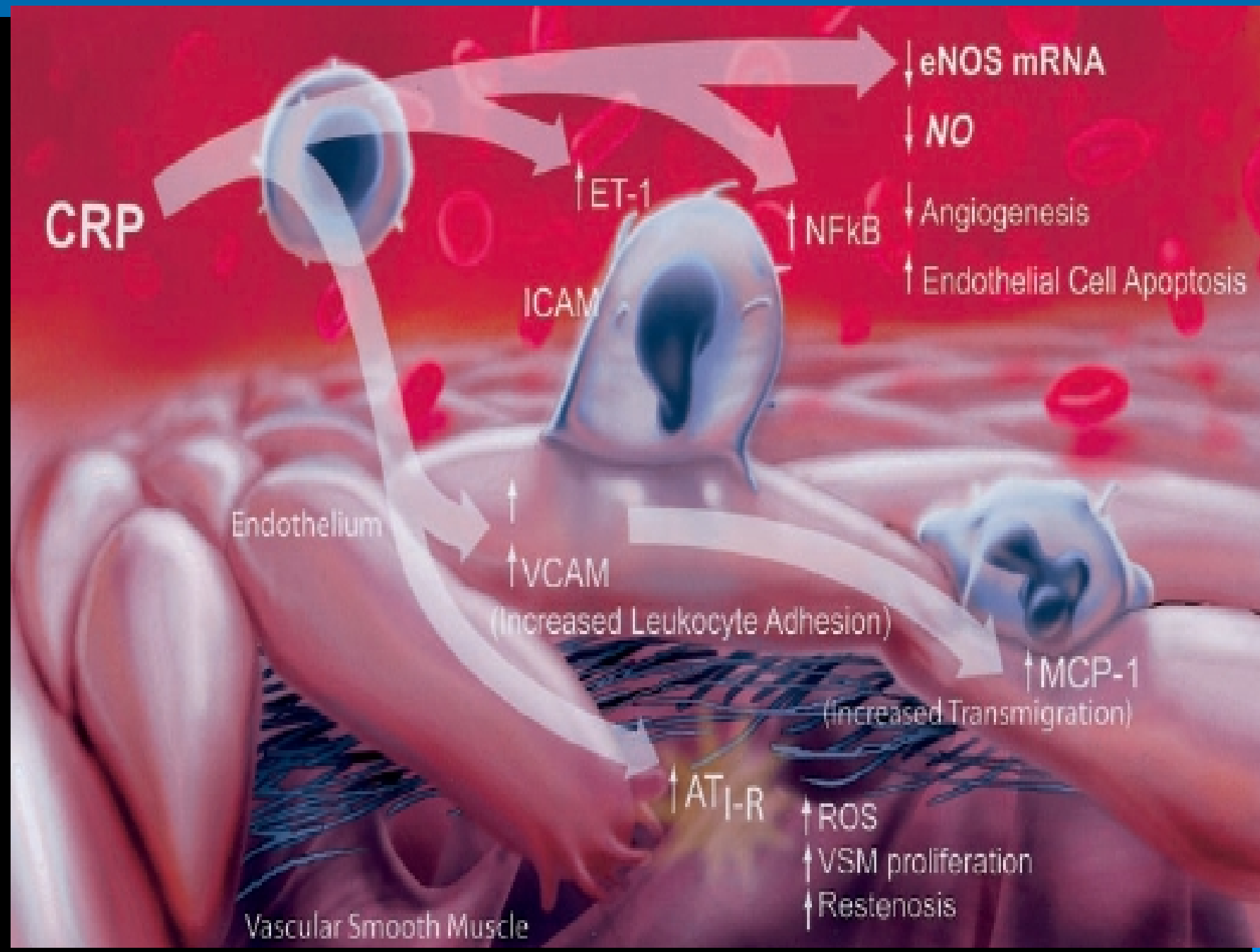
# Endothelial dysfunction as a therapeutic target

Endothelial dysfunction is a systemic disorder which is expressed by imbalance in endothelial production of vasoactive mediators, which regulate vessel tone, vascular inflammation, platelet aggregation and coagulation

Endothelial dysfunction is a reversible disorder and antihypertensive drugs can improve endothelial function

RAS blockers and CCB are preferred therapy for the improvement of endothelial dysfunction

Endothelium was recognized as an additional target organ( besides the heart, brain and kidney ) of the hypertensive disease, it's damage should be prevented and monitored by **markers of endothelial dysfunction**



# Markers of Endothelial function

Endothelin-1: is a marker for of endothelium induced vasoconstriction

Nitrite and nitrate levels in the serum( stable end-products of NO ): is a marker of endothelium-dependent vasodilatation

CRP( High sensitivity C- reactive protein): is a marker of low-grade vascular inflammation

Microalbuminuria: is a marker of total endothelial damage and a powerful marker for CV risk

# The Aims of Study

## To evaluate:

1. The effect of blood pressure and traditional risk factors control on endothelial function and on the expression of different markers
2. The time-profile of the effect of the treatment on endothelial function: by evaluation at 3, 6 and 12 months of follow-up
3. The correlations between markers of endothelial function and changes in BP

# Patients and methods

Study population: 100 diabetic patients with uncontrolled hypertension

Time frame of study - 12 months

Observation and treatment: patients will be in close follow - up in the Hypertension Clinic

Data collection: demographic and laboratory data , diabetes mellitus characteristics , target organ involvement , antihypertensive treatment

Laboratory evaluation: ET-1, NO, CRP, Microalbumin

All patients will undergo laboratory evaluation at recruitment and after 3, 6 and 12 months

# Progress report: 30 patients

## Baseline characteristics : clinical data

Age	63.9 ± 12.8
Sex (% men)	50
Time of HTN	12.6 ± 8.9
Time of DM	8.0 ± 5.7
Office SBP	152.8 ± 12.2
Office DBP	83.4 ± 8.5
BMI	31.8 ± 4.5
HbA1C	7.23 ± 1.6
SMOKER	3
LDL	89.9 ± 28.3
HDL	52.3 ± 19.4
TG	139.4 ± 62.1

# Baseline characteristics

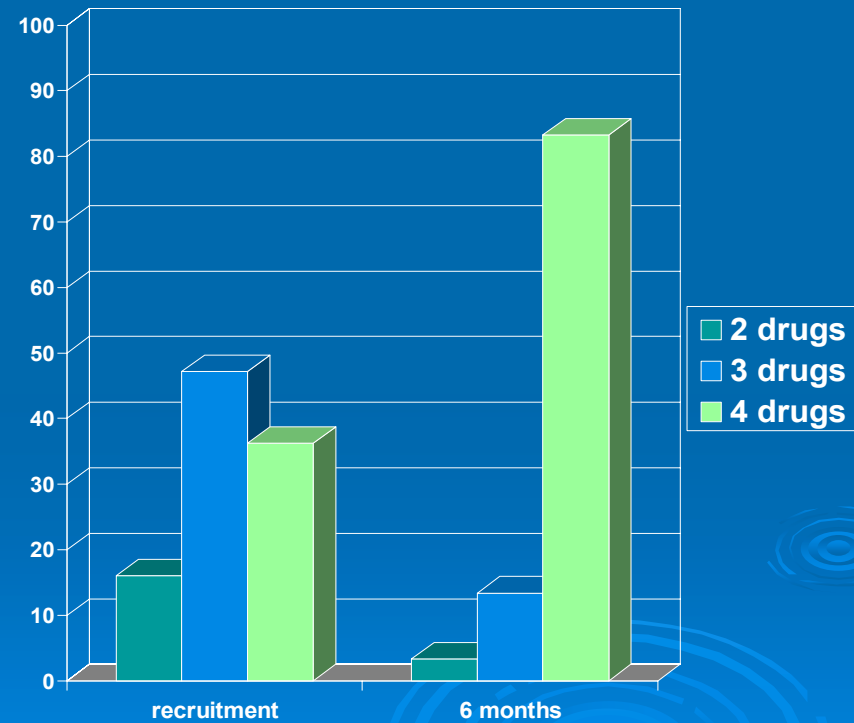
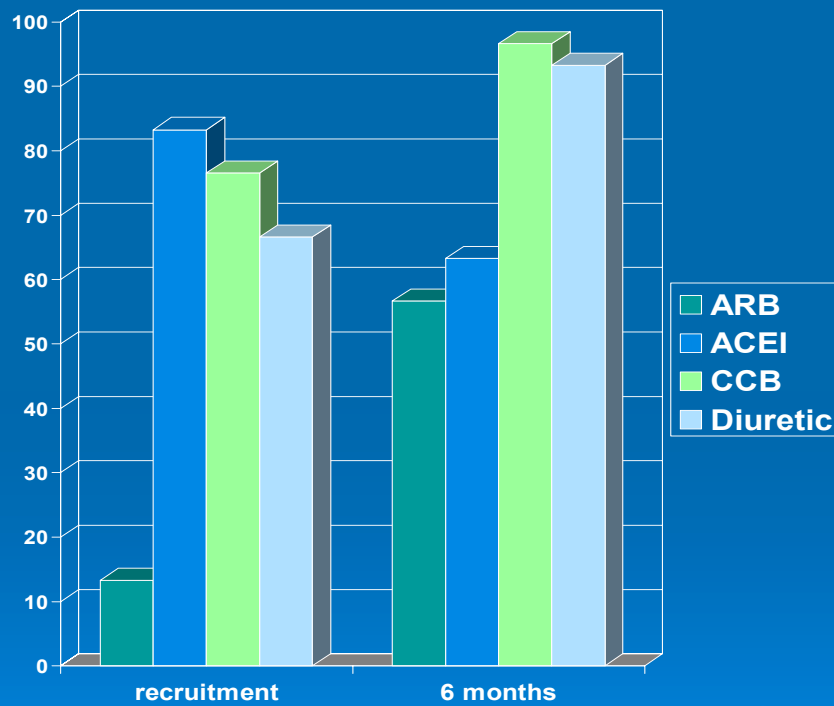
## Target organ damage

<b>TOD</b>	<b>Patients</b>
CIHD	7
CVA	5
CRF Cr >1.3 or Microalbumin	19
Retinopathy	10
PVD	3
LVH	20

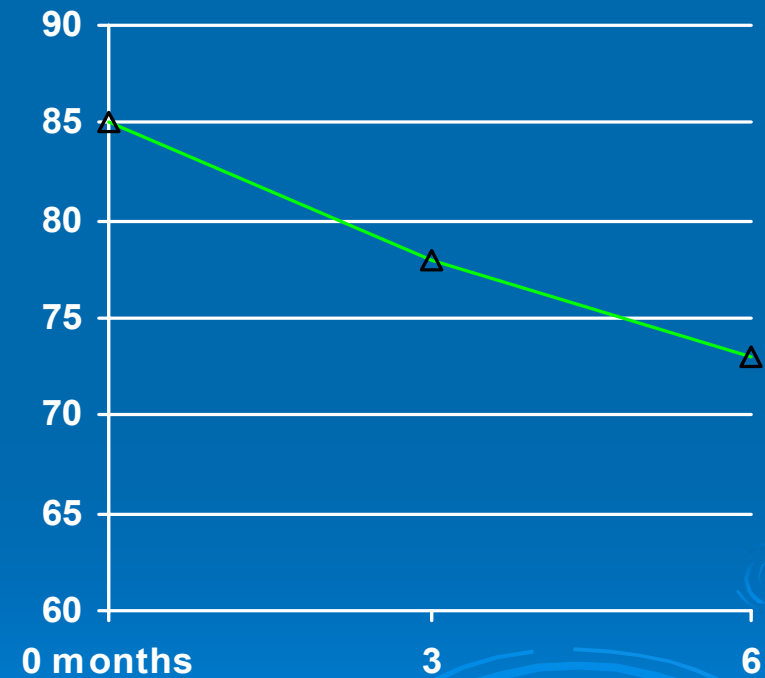
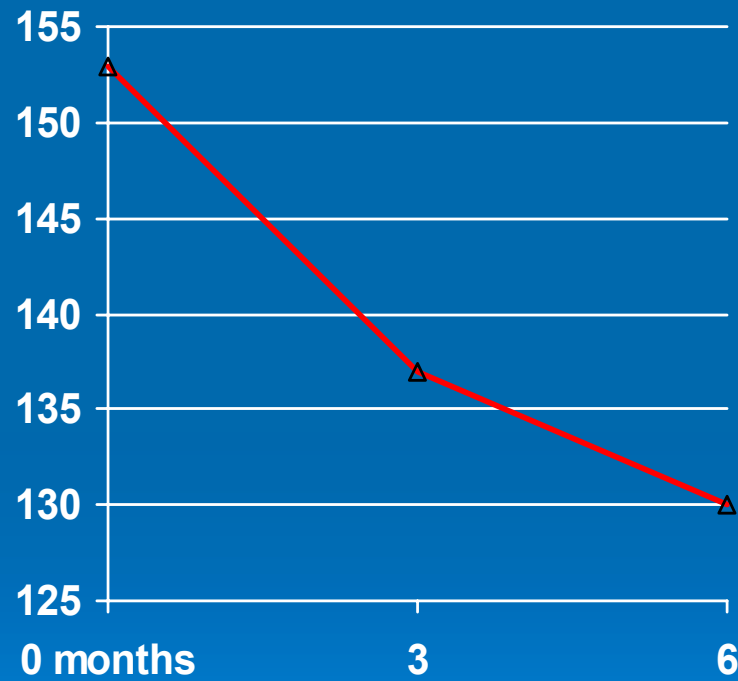
# Changes in antihypertensive medications

<b>Medications</b>	<b>Recruitment (%)</b>	<b>6 months (%)</b>
<b>ARB</b>	13.3	56.7
<b>ACEI</b>	83.3	63.3
<b>CCB</b>	76.6	96.6
<b>B-blockers</b>	53.3	53.3
<b>Diuretics</b>	66.6	93.3
<b>L-blockers</b>	30	33.3
<b>2 medications</b>	16.5	3.3
<b>3 medications</b>	47.2	13.4
<b>4 medications</b>	36.3	83.3

# Changes in antihypertensive medications



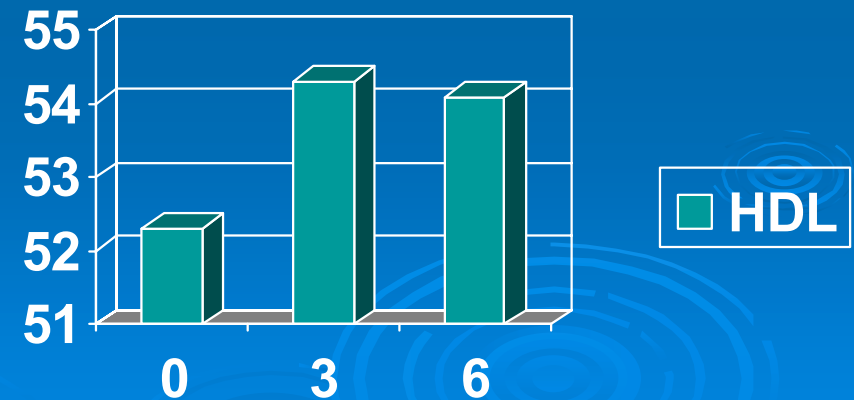
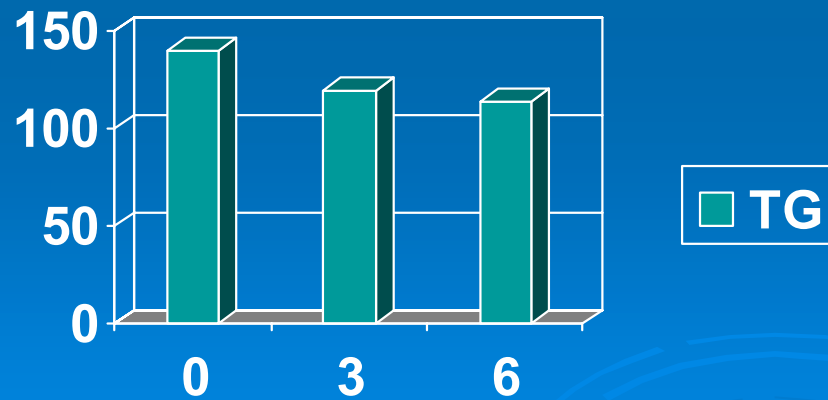
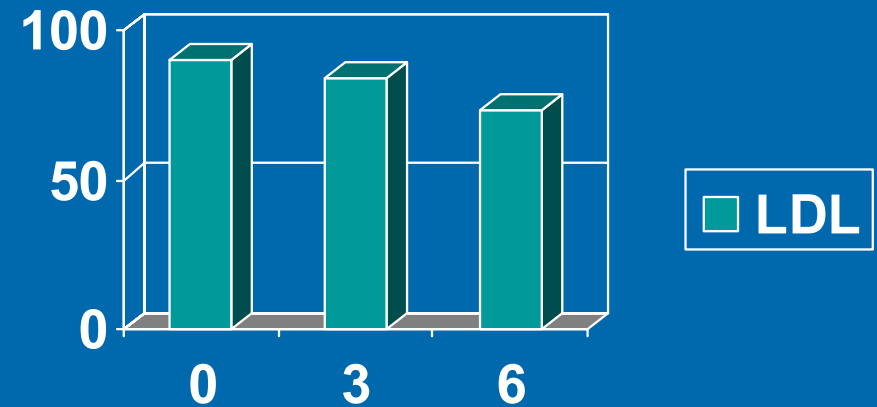
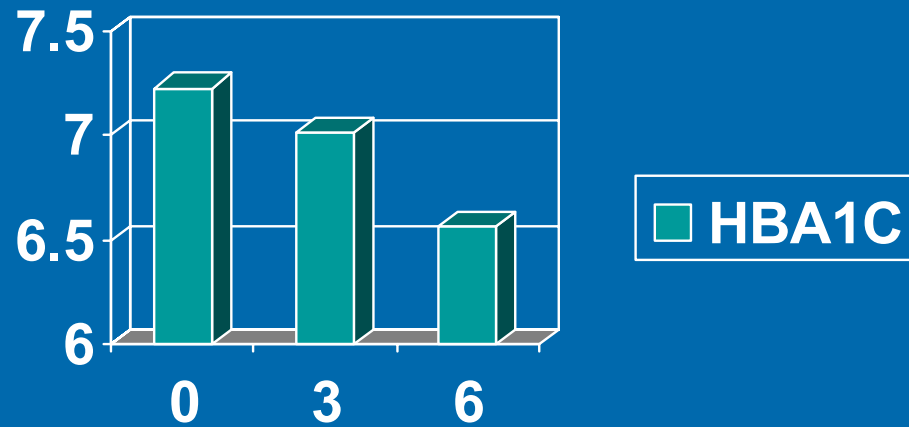
# The changes in office blood pressure



# Changes in traditional risk factors

<b>Metabolic parameters</b>	<b>Recruitment</b>	<b>3 months</b>	<b>6 months</b>	<b>P value</b>
<b>HbA1C</b>	7.23 ± 1.6	7.02 ± 1.3	6.57 ± 0.5	<u><b>0.054</b></u>
<b>BMI</b>	31.8 ± 4.5	31.8 ± 4.3	30.8 ± 2.8	1.000
<b>LDL</b>	89.9 ± 28.3	83.5 ± 20.6	72.8 ± 18.5	<u><b>0.056</b></u>
<b>HDL</b>	52.3 ± 19.4	54.3 ± 20.7	54.1 ± 18	0.178
<b>TG</b>	139.4 ± 62.1	119.3 ± 45.7	113.8 ± 31.2	<u><b>0.034</b></u>

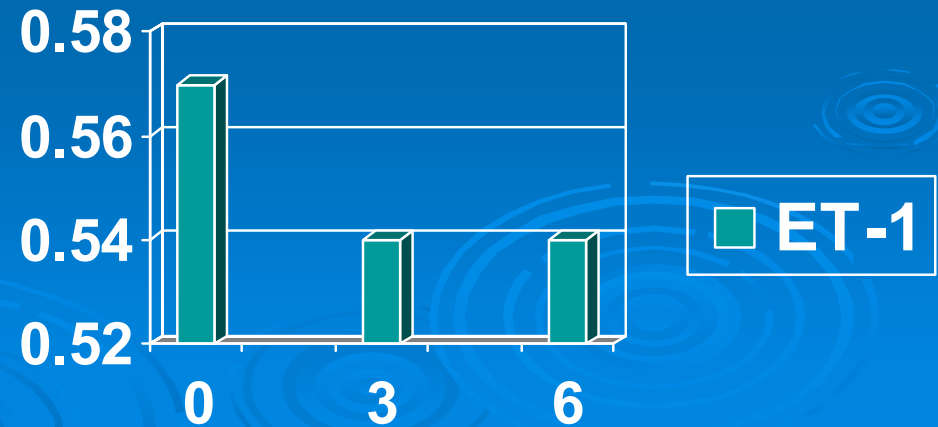
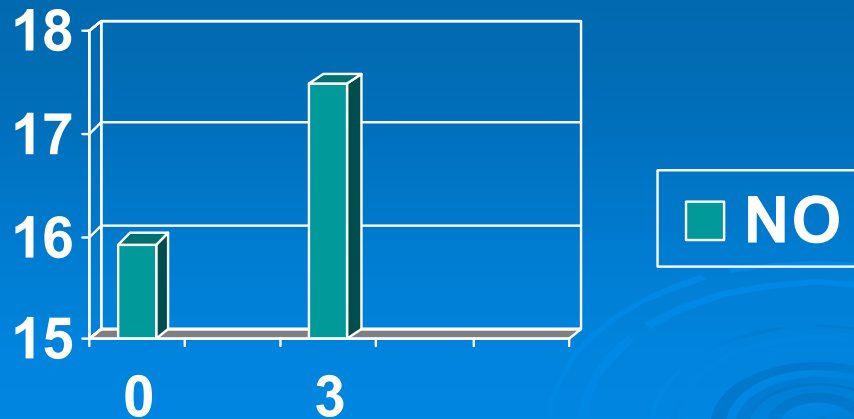
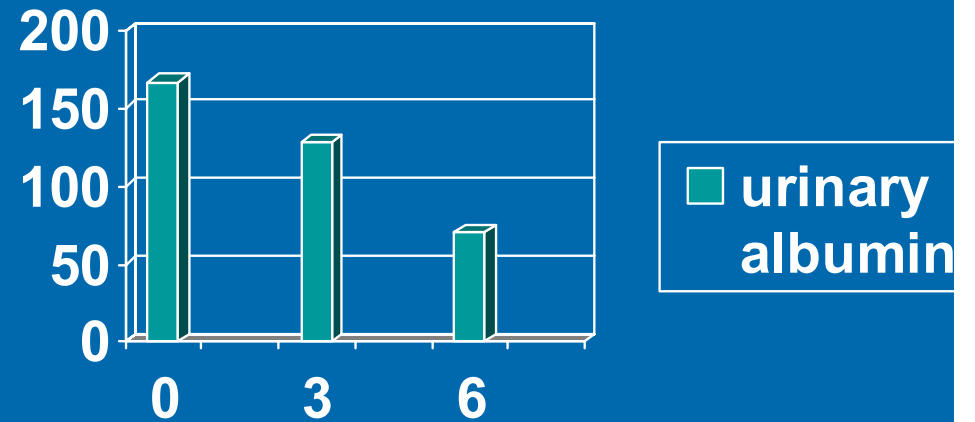
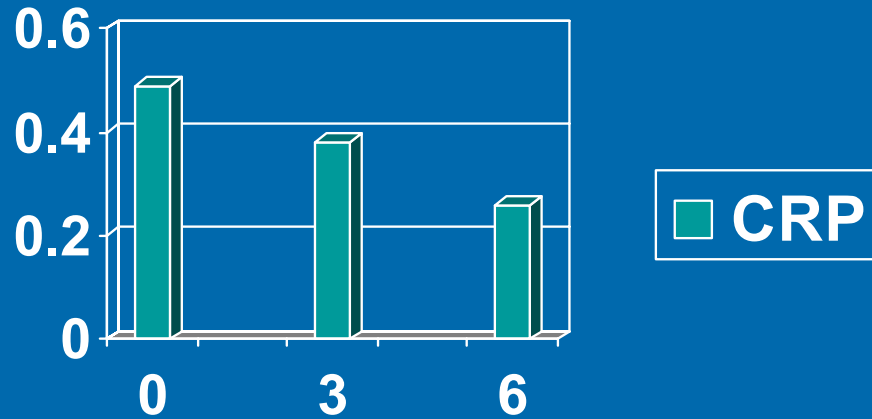
# Changes in traditional risk factors



# Changes in markers of Endothelial function

<b>Markers</b>	<b>Recruitment</b>	<b>3 months</b>	<b>6 months</b>	<b>P value</b>
<b>Cardiac CRP</b>	0.49 ± 0.55	0.38 ± 0.40	0.26 ± 0.24	<b>0.023</b>
<b>ET-1</b>	0.57 ± 0.19	0.54 ± 0.22	0.55 ± 0.29	0.567
<b>NO level</b>	15.93 ± 5.8	17.48 ± 11		0.494
<b>Microalbuminuria</b>	167.7 ± 307.8	128.0 ± 269.7	79 ± 150	<b>&lt;0.01</b>

# Changes in markers



# Changes in ET-1

Time \ ET-1	ET-1 ↓ 55 %	ET -1 ↑ 45 %
<b>Recruitment Mean</b>	0.67	0.40
<b>3 months Mean</b>	0.61	0.50
<b>6 months Mean</b>	0.50	0.52
<b>Delta Δ</b>	- 0.17	+ 0.12
<b>%</b>	26 %	30 %

# Correlation between markers and blood pressure

Blood pressure	ET-1	NO	microalbumin	CRP
SBP	r- 0.184 p- 0.329	r- -0.153 p- -0.418	<u>r- 0.328</u> <u>p- 0.049</u>	<u>r- 0.342</u> <u>p - 0.065</u>
DBP	r- 0.188 p- 0.356	r- -0.275 p- -0.222	<u>r- 0.321</u> <u>p- 0.054</u>	<u>r - 0.332</u> <u>p - 0.074</u>

# Summary of results

1. Blood pressure decreased significantly.

2. Significant changes in metabolic parameters :  
HBA1C, LDL, TG.

3. Significant changes in microalbuminuria , CRP levels and significant correlation with blood pressure .

4. Positive non-significant changes in NO, ET-1 and non-significant correlation with blood pressure.

# Conclusion

The reduction of blood pressure and positive change in metabolic parameters improved the biochemical markers for endothelial function.

Only long time follow-up can tell if this positive change will improve the prognosis of the patients.