Atherosclerosis progression in chronic kidney disease

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Introduction

Cardiovascular event (CVE) rate is high in patients with chronic renal failure (CRF), but the underlying mechanisms are incompletely understood. Classical cardiovascular risk factors (RF) do not explain the increased risk, and studies observed paradoxical or absent associations between classical RF and mortality in CRF patients. Controlled trials did not shown systematically that statin therapy in CRF reduce CVE. This may be the result of accelerated atherosclerosis (ATC). Quantification of subclinical ATC can be evaluated very accurately and non- invasively by carotid total plaque area (TPA).

Objective: We investigated the relation of TPA and renal function in controls (GI), Stage 2 (GII), Stage 3 (G3) and Stage 4 (G4) CRF. Additionally, we also evaluated the association of classical RF and the progression of the TPA.

Methods: A cohort study in 331 patients was performed. Participants consented to a protocol approved by ethics committee. Clinical, laboratory tests and TPA were determined at time 0 and after 1 year. TPA was measured using carotid ultrasonography. Renal function was determined by MDRD equation. ANOVA and a multivariate generalized linear model with gamma distribution and log link function analysis were used when appropriate.

Results

Figure. TPA progression increases when renal function decreases

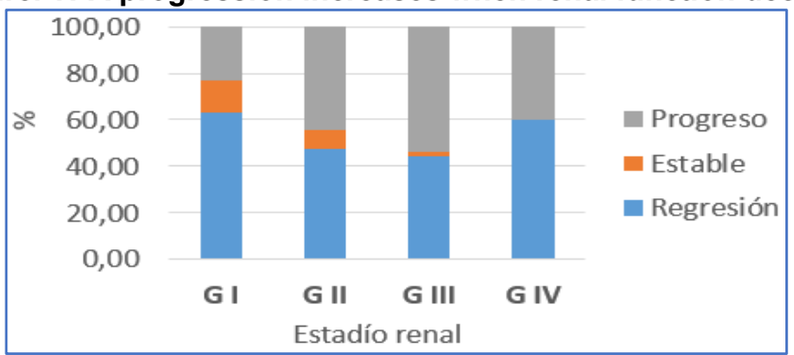

Table. Epidemiological characteristics of patients

	G_I	G_{II}	G_{III}	G_{IV}
Age	66±1.2	58±0.9	65±1	71.6±3.6
DM (%)	53	31	42	60
HTA (%)	90	55	75	93
BMI (Me±EE; Kg/m²)	32.5±1.1	31.3±0.4	30.1±0.4	31.5±2.1
Δ (%)	-3.43	1.05	0.7	0.7
eGRF (Me±EE; ml/min)	104±3.2	72±0.6	50.6±0.7	23±1.5
Δ (%)	-7.95	0.08	4.49	0.1
SBP (Me±EE; mmHg)	130±2	134±1.1	136±1.8	137±1
Δ (%)	-3.2	-1.91	-3.17	-6.18
DBP (Me±EE; mmHg)	75±1.4	79±0.7	77.4±1.2	70.2±3
Δ (%)	-3.74	-0.56	-0.82	-8.54
LDL Chol (Me±EE; mg/dl)	83±9	114±3	111±5	88±9
Δ (%)	-11.15	-6.12	-8.53	-10.89
HDL Chol (Me±EE; mg/dl)	51±2.6	50±1.2	50±1.4	51±5.6
Δ (%)	-4.08	-2.22	-1.91	-2.92
Tg (Me±EE; mg/dl)	146±17.7	150±5.8	150±5.8	179±38
Δ (%)	-7.2	9.3	-7.29	-3.12
HbA1c % (Me±EE; %)	6.7±0.3	6±0.1	6.4±0.7	6±0.3
Δ (%)	-0.44	2.41	4.37	10.06
TPA (Me±EE; mm²)	76±12	67±6	98±10	80±5
Δ (%)	-2.79	3.56	10.31	5.01

Δ: % of change between 1°&2° study

The generalized linear model indicated that TPA increased with lower eGFR in this population (p=0.01). While baseline TPA and progression of TPA was greater with CRF, it was not related to LDL, triglycerides, phosphate, PTH.

Summary

Carotid total plaque area increases along the renal function deterioration.
It is not related with the LDL cholesterol, triglycerides levels, blood pressure, body mass index.
Incidence of TPA progression is higher in patients with lower renal function.

Conclusion

Our data indicates that TPA increases along the renal function deterioration, and it is not related with the LDL cholesterol, blood pressure, triglycerides, or other classical risk factor.

We suggest that other mechanisms than the classics are responsible for the observed excess of cardiovascular disease in CKD patients and finally, determination of TPA should be use to confirm effectiveness of anti-atherosclerotic therapies on these patients.