LONGITUDINAL EVALUATION OF CLASSIC AND NOVEL ECHOCARDIOGRAPHIC INDICES OF LEFT VENTRICULAR FUNCTION AFTER KIDNEY TRANSPLANTATION

L. Lakkas[1], E. Ntounousi[2], A. Bechlioulis[1], A. Duni[2], I. Gkirdis[1], C. Pappas[2], K.K. Naka[1], L.K. Michalis[1]

[1]2nd Department of Cardiology and Michaelideion Cardiac Center, and [2]Nephrology Department and Renal Transplant Unit, University of Ioannina, Ioannina, Greece

Introduction

➢ **Cardiovascular disease** is the leading cause of death in kidney transplant recipients (KTRs) with functioning graft.

➢ **Abnormal cardiac morphology** is a risk factor for cardiovascular complications in KTRs.

➢ Echocardiographic study, including conventional indices and **novel deformation related indices**, is considered a suitable diagnostic utility for the evaluation of **subclinical left ventricular (LV) dysfunction** and may discriminate patients at high cardiovascular risk.

Aim – To evaluate possible longitudinal changes of classic and novel echocardiographic parameters and their association with renal graft function markers.

METHODS

Study Population

➢**37 prevalent KTRs** (mean eGFR-CKD-EPI 55±13 ml/min/1.73m², mean age 50 years old, 65% men, median time from KT 51 months), in steady state from the out-patient clinic

➢**Exclusion criterion** was known cardiovascular disease

➢Patients were followed up (FU) for a median 39 months (min 32, max 43)

➢**Renal function markers** (eGFR and 24h urine protein-UPR, mg/24h)

➢**LV systolic and diastolic function indices** (by con-ventional tissue Doppler and 2D strain echocardiogra-phy) were assessed at baseline and at the end of FU period.

### Echocardiography (Vivid-7 ultrasound, General Electric)
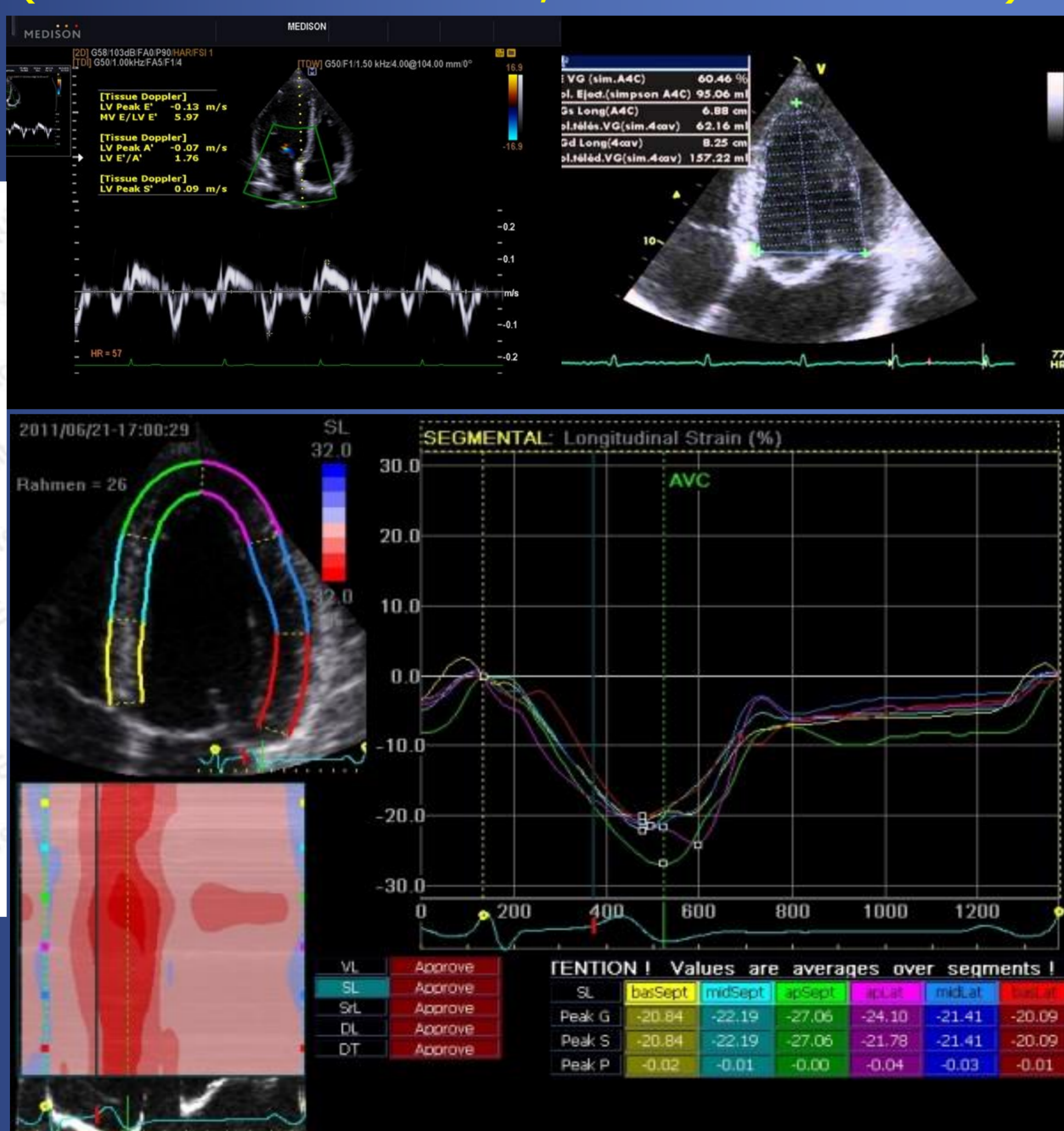
RESULTS

Changes in metabolic parameters at follow-up

	Baseline	Follow-up	P value
BMI, kg/m²	26.0±4.4	26.2±4.2	0.665
Urea, mg/dl	40 (36, 57)	47 (38, 71)	0.078
eGFR-CKD EPI ml/min/1.73 m²	55±13	57±17	0.218
Urine protein	130 (63, 326)	175 (110, 441)	0.038
Hb, g/dl	13.5 (12.1, 14.9)	13.5 (11.9, 15.1)	0.962
Na, mmol/l	139±3.3	138±3.1	0.006
K, mmol/l	4.5±0.4	4.2±0.4	0.006
Ca, mg/dl	9.9±0.5	9.7±0.6	0.006
PO4, mg/dl	3.2 (2.8, 3.6)	3.0 (2.6, 3.5)	0.320
PTH	98 (72, 132)	98 (80, 128)	0.975
Total cholesterol, mg/dl	212±32	201±25	0.077
HDL-c, mg/dl	55±13	52±11	0.054
LDL-c, mg/dl	126±29	118±22	0.198
Triglycerides, mg/dl	148±50	154±53	0.569

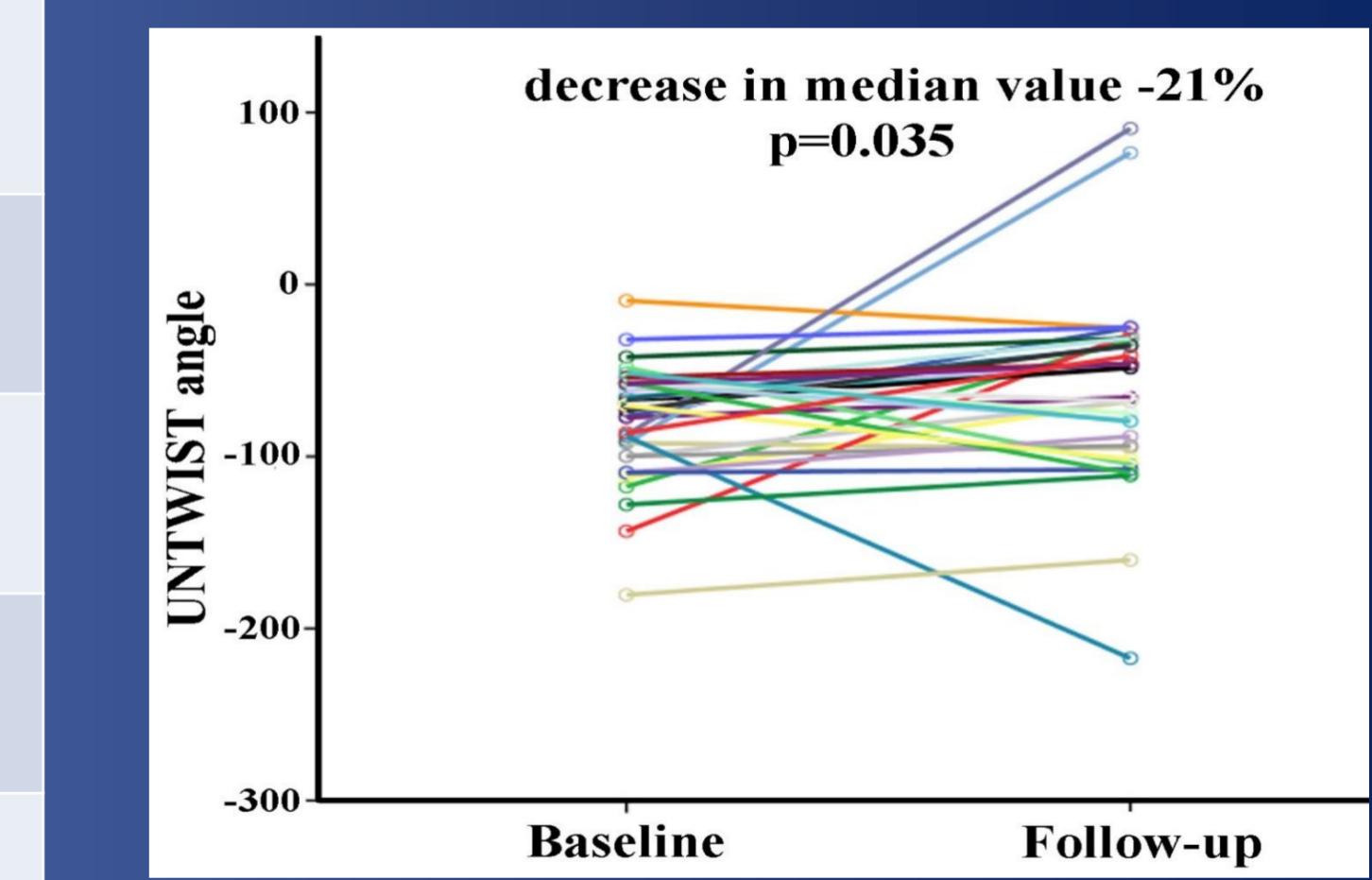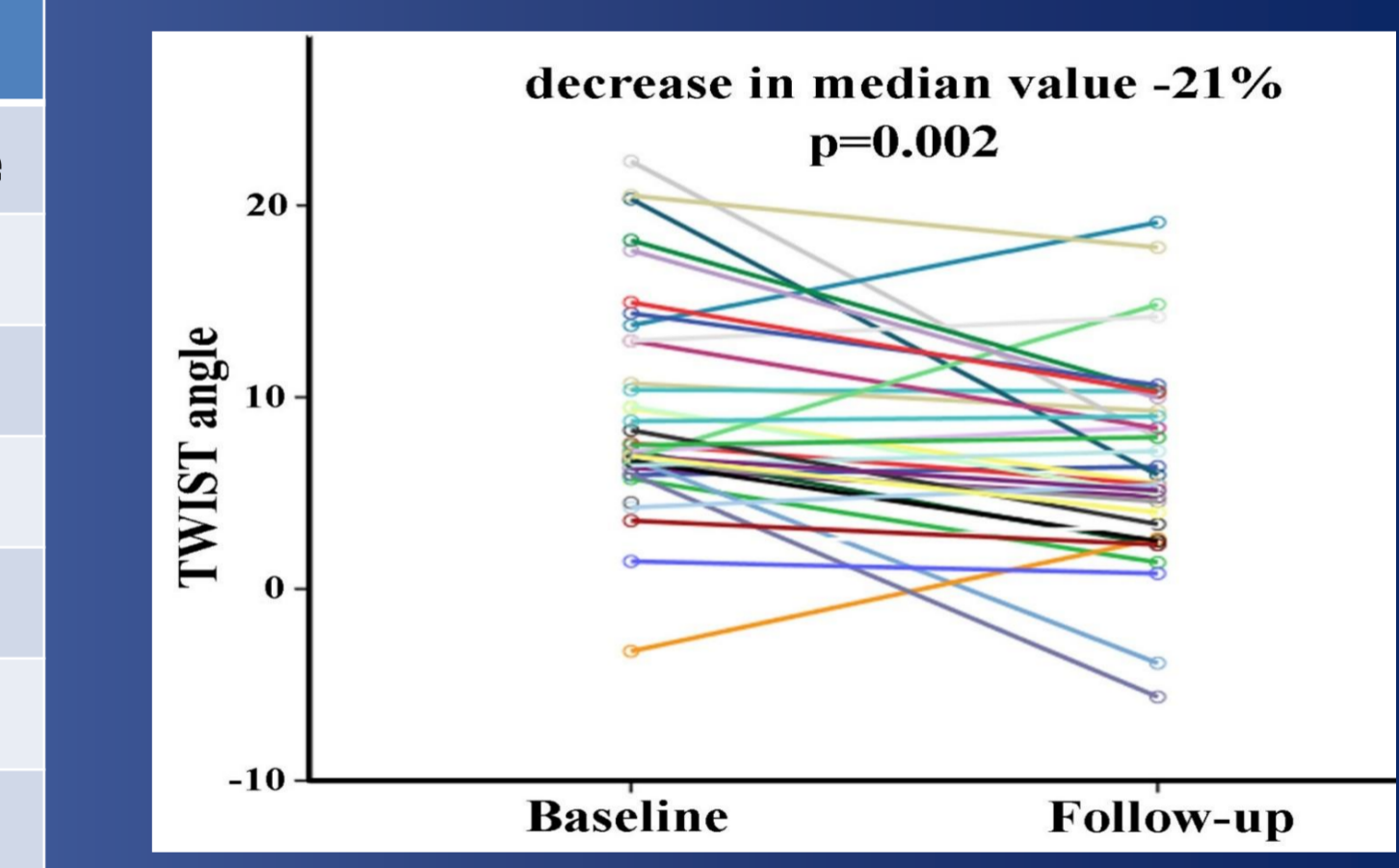*Data are presented as mean±SD or median (IQ range)*
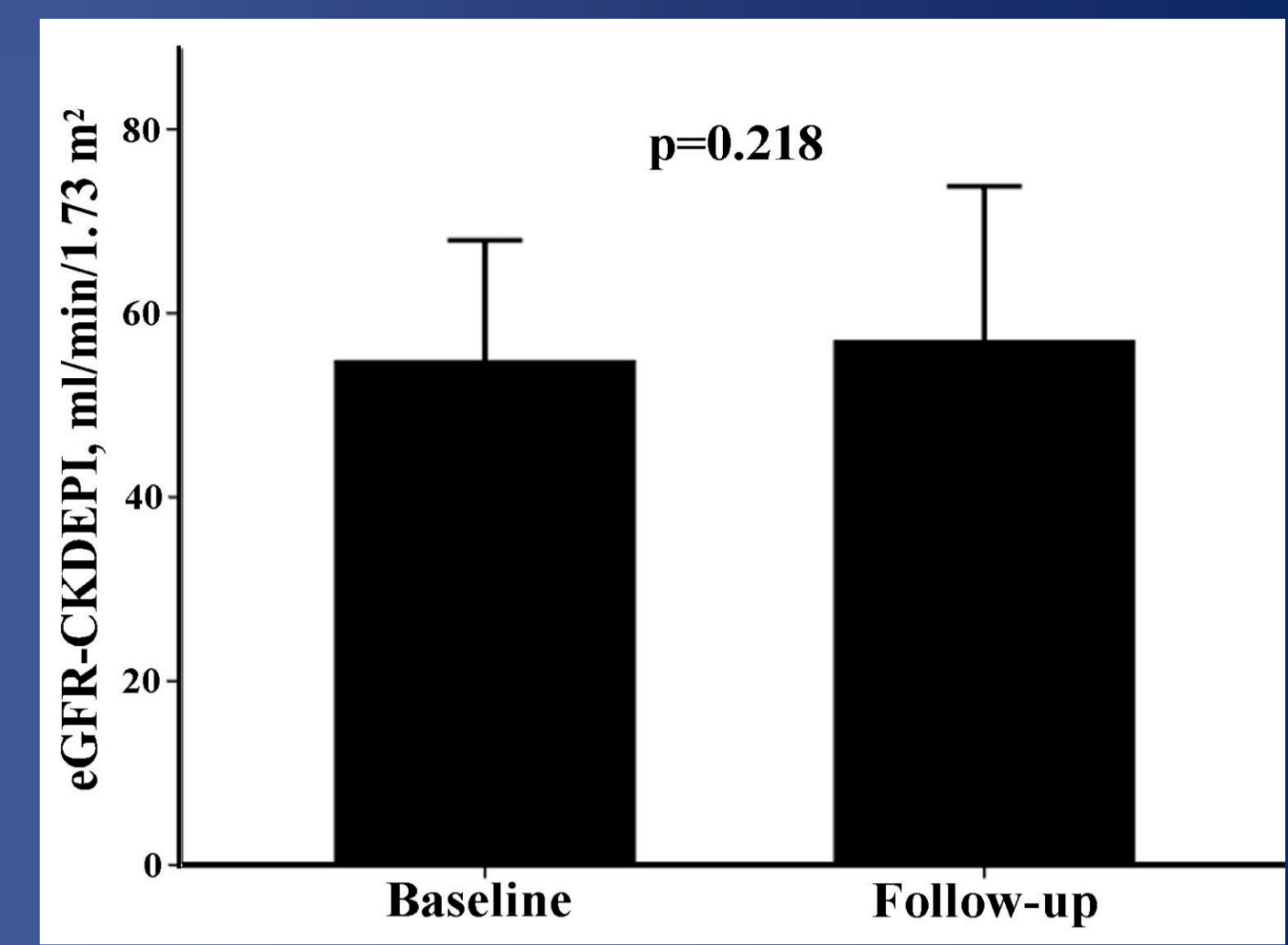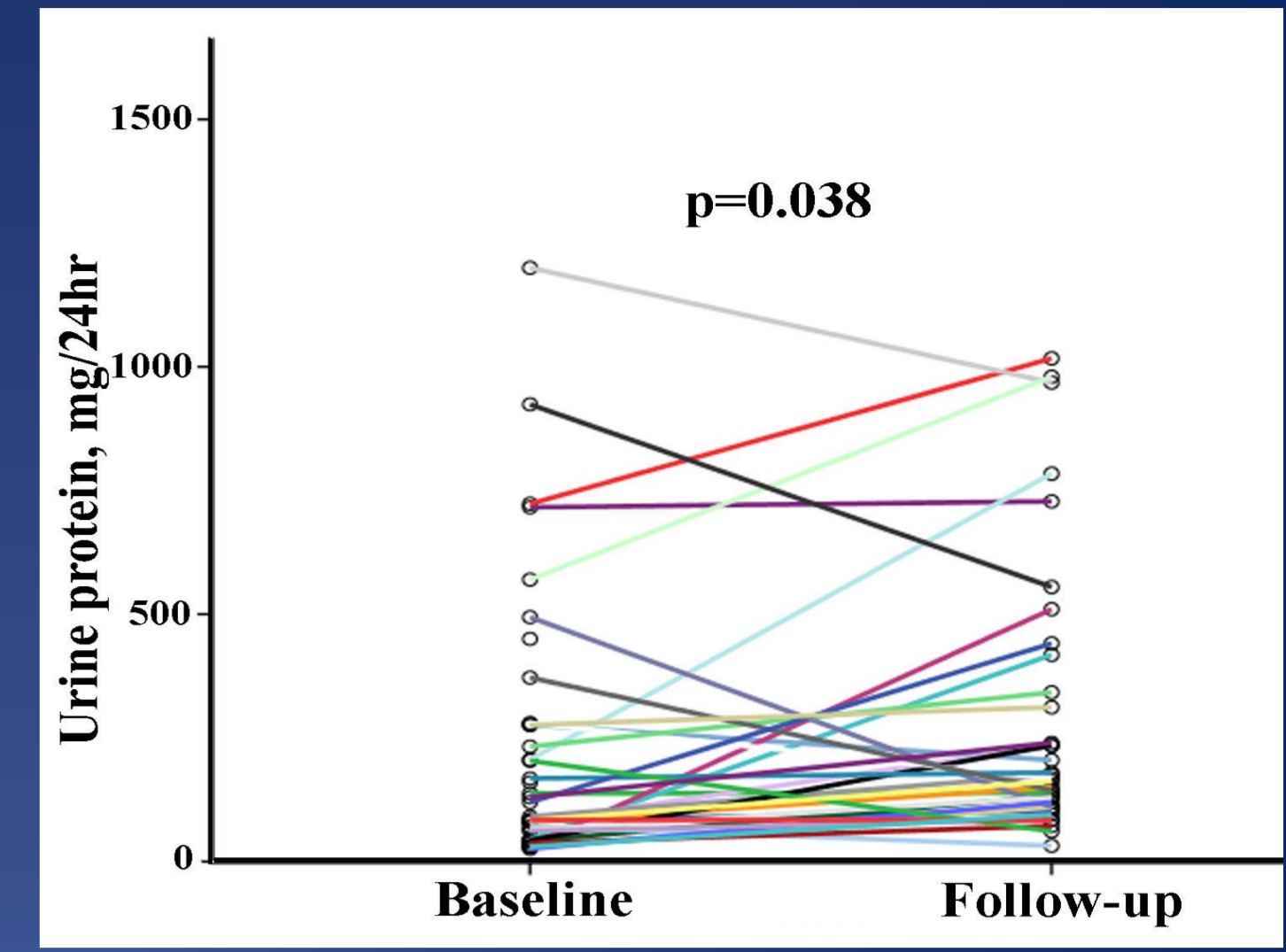
Changes in classic echo parameters at follow-up

	Baseline	Follow-up	P value
LVEF, %	71 (65, 76)	65 (60, 70)	0.001
LVMI, gr/m²	96 (73, 118)	99 (86, 141)	0.009
Stroke Volume, ml	84±18	78±18	0.114
LAVI, ml/m²	31±10	32±10	0.605
E/A	1.00 (0.84, 1.15)	0.90 (0.73, 1.07)	0.015
IVRT, msec	87±21	92±25	0.321
Systolic PAP, mmHg	26±15	27±8	0.711
Smedial, cm/sec	8 (7, 10)	7 (7, 9)	0.104
Slateral, cm/sec	10 (8, 11)	9 (8, 10)	0.568
E', cm/sec	11±3	9±2	<0.001
E/E'	7.3 (6.5, 9.5)	8.8 (7.9, 9.9)	0.002
TAPSE, mm	24 (21, 27)	22 (21, 24)	0.374
TvSV, cm/sec	15 (14, 16)	14 (12, 16)	0.008

Data are presented as mean±SD or median (IQ range)
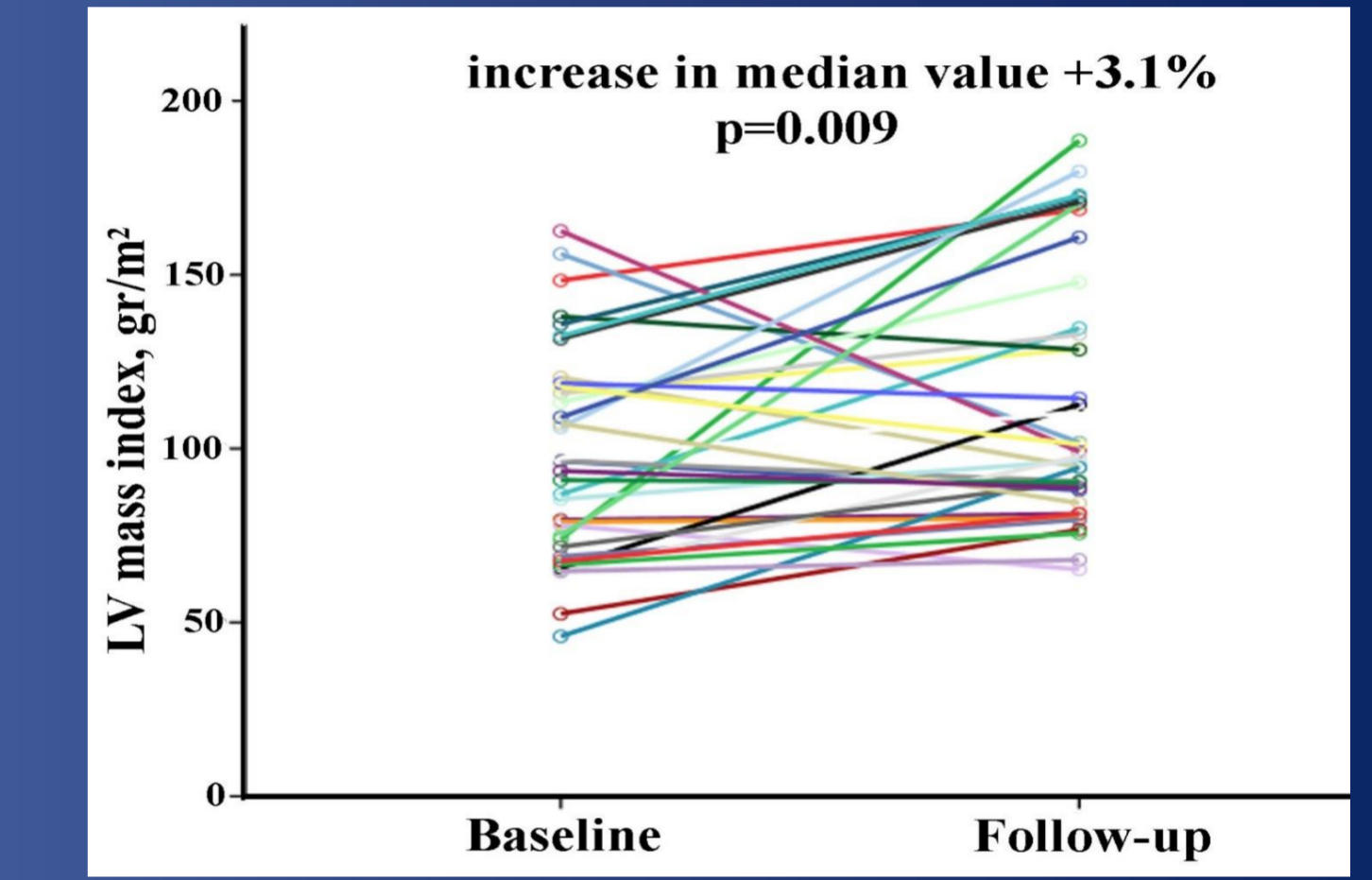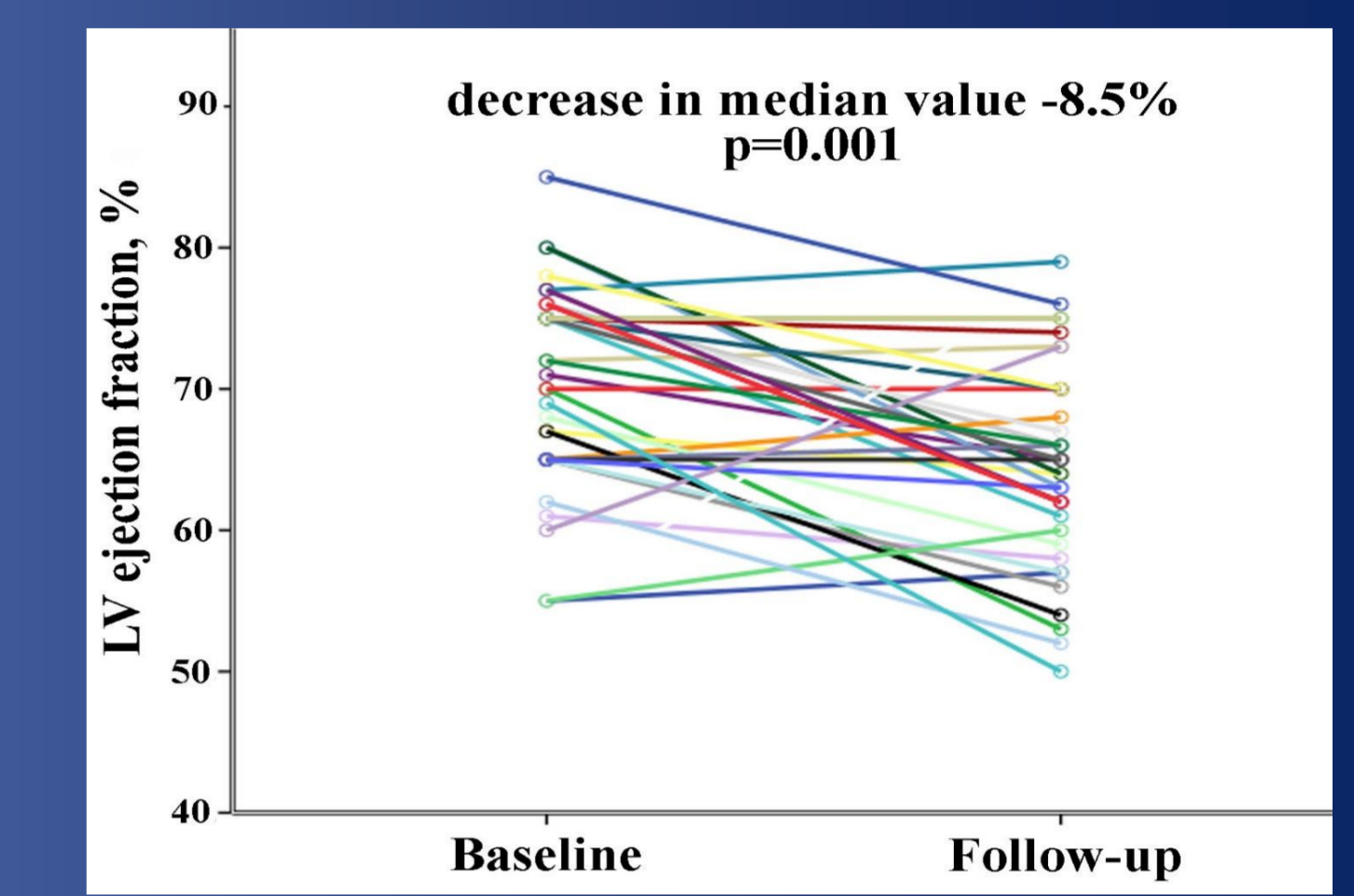
Changes in novel echo parameters at follow-up

	Baseline	Follow-up	P value
GLS,%	-21±4	-20±3	0.157
GCS,%	-28±7	-29±7	0.471
GRS,%	19 (13, 33)	22 (15, 36)	0.753
SRS, s-1	-1.31±0.24	-1.09±0.20	<0.001
SRE, s-1	1.56±0.49	1.26±0.36	<0.001
SR_IVR, msec	0.36±0.14	0.36±0.19	0.813
TWIST angle, degress	7.2 (6.2, 12.9)	5.7 (3.3, 9.8)	0.002
Time to peak systole, msec	387±77	385±115	0.927
UNTWIST angle, degress	-70 (-96, -57)	-55 (-92, -33)	0.035
Time to diastole, msec	499 (458, 537)	494 (463, 538)	0.987
C_PEAK,degress	-1.00 (-1.94, -0.38)	-0.25 (-0.88, 0.00)	<0.001
C_TIME,msec	73 (40, 100)	45 (0, 77)	0.002

Data are presented as mean±SD or median (IQ range)

p=0.038 — Urine protein, mg/24hr (Baseline / Follow-up)

p=0.218 — eGFR-CKDEPI, ml/min/1.73 m² (Baseline / Follow-up)

decrease in median value -8.5% p=0.001 — LV ejection fraction, % (Baseline / Follow-up)

increase in median value +3.1% p=0.009 — LV mass index, gr/m² (Baseline / Follow-up)

decrease in median value -21% p=0.002 — TWIST angle (Baseline / Follow-up)

decrease in median value -21% p=0.035 — UNTWIST angle (Baseline / Follow-up)

Correlation of changes in renal and echocardiographic markers

	Δ (eGFR-CKDEPI)	Δ (Urine Protein)
Δ (LVEF)	R -0.244, p=0.146	R -0.175, p=0.315
Δ (LVMI)	R -0.151, p=0.372	R 0.073, p=0.675
Δ (E/A)	R -0.156, p=0.358	R 0.041, p=0.816
Δ (E')	R -0.002, p=0.982	R 0.082, p=0.645
Δ (E/E')	R -0.042, p=0.810	R -0.079, p=0.655
Δ (TWIST)	R 0.183, p=0.286	R 0.195, p=0.268
Δ (UNTWIST)	R -0.091, p=0.598	R -0.208, p=0.239
Δ (SRS)	R -0.181, p=0.292	R -0.141, p=0.426
Δ (SRE)	R -0.085, p=0.621	R -0.029, p=0.869
Δ (C_PEAK)	R 0.054, p=0.754	R 0.175, p=0.331
Δ (C_TIME)	R 0.044, p=0.803	R -0.065, p=0.720
Δ (GLS)	R -0.287, p=0.095	R -0.039, p=0.826

	Δ (LVEF)	Δ (LVMI)
Δ (TWIST)	R 0.327, p=0.052	R 0.141, p=0.411
Δ (UNTWIST)	R -0.114, p=0.509	R -0.116, p=0.500
Δ (SRS)	R -0.321, p=0.056	R -0.135, p=0.434
Δ (SRE)	R 0.025, p=0.887	R 0.193, p=0.259
Δ (C_PEAK)	R -0.013, p=0.942	R -0.058, p=0.741
Δ (C_TIME)	R -0.241, p=0.163	R -0.056, p=0.749
Δ (GLS)	R -0.189, p=0.270	R -0.244, p=0.152

In a population of chronic stable KTRs with not known cardiovascular disease, a worsening in several classic and novel echocardiographic indices of LV function was observed in a **short term FU** indicating probably a **subclinical deterioration of cardiac function and an increased cardiovascular risk.**

Interestingly this deterioration was evident *independently of changes in renal function.*

Further studies are needed to establish the diagnostic and prognostic role of these novel echocardiographic parameters in clinical practice.

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