



Thyroid Hormone Levels and Echocardiographic Changes in Subclinical Hypothyroidism: A Correlation Study



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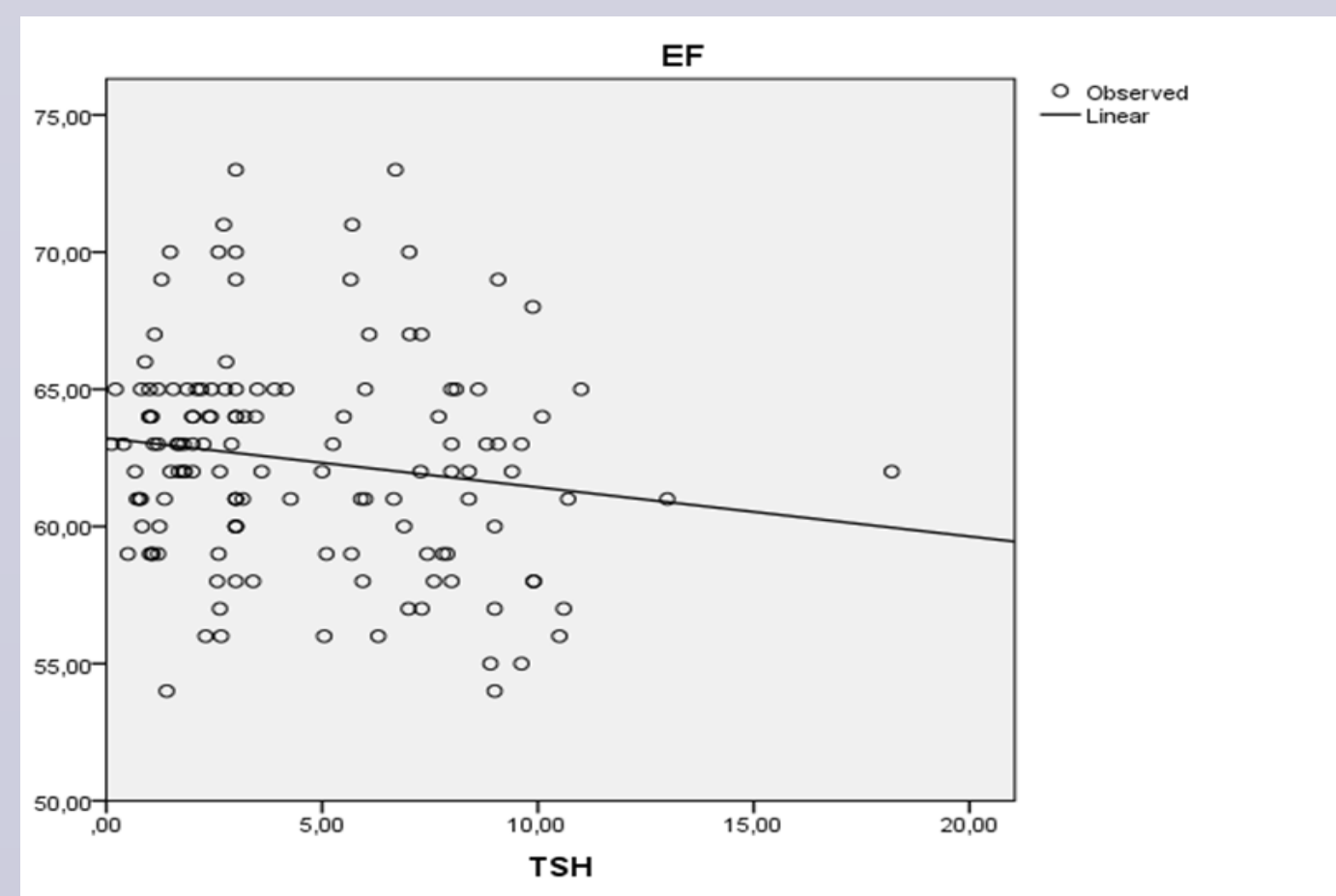
This study investigates the correlation between thyroid hormone values and echocardiographic parameters in patients diagnosed with subclinical hypothyroidism (SCH).

MATERIAL AND METHODS

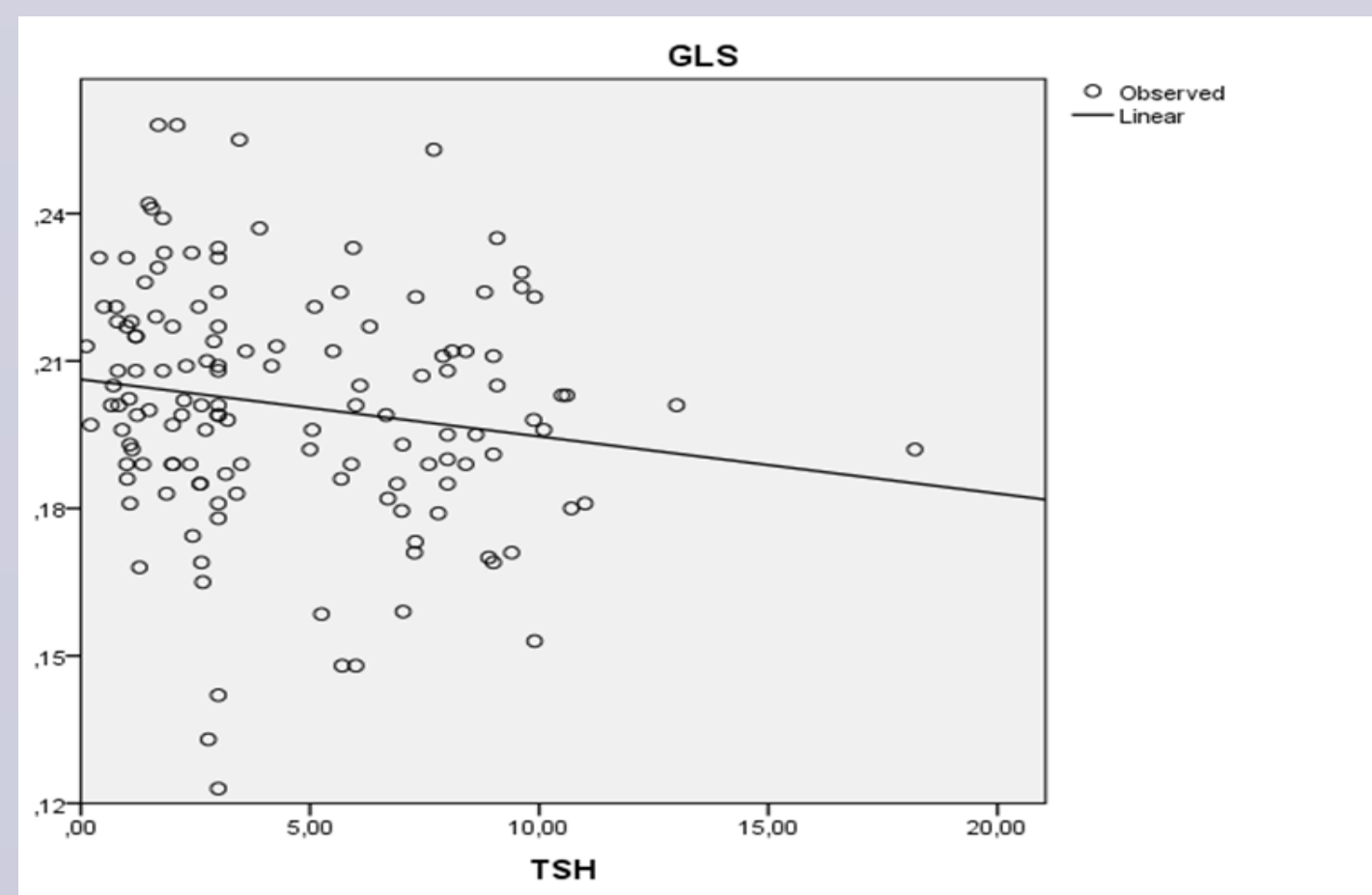
In fifty-four patients with newly diagnosed SCH who met the criteria for levothyroxine treatment, blood tests and echocardiographic studies were conducted at enrollment and again after five months of maintaining a euthyroid state. The results are presented as mean±SD and percentages. NS: non-significant, * chi-square test, Yates correction.

RESULTS AND DISCUSSION

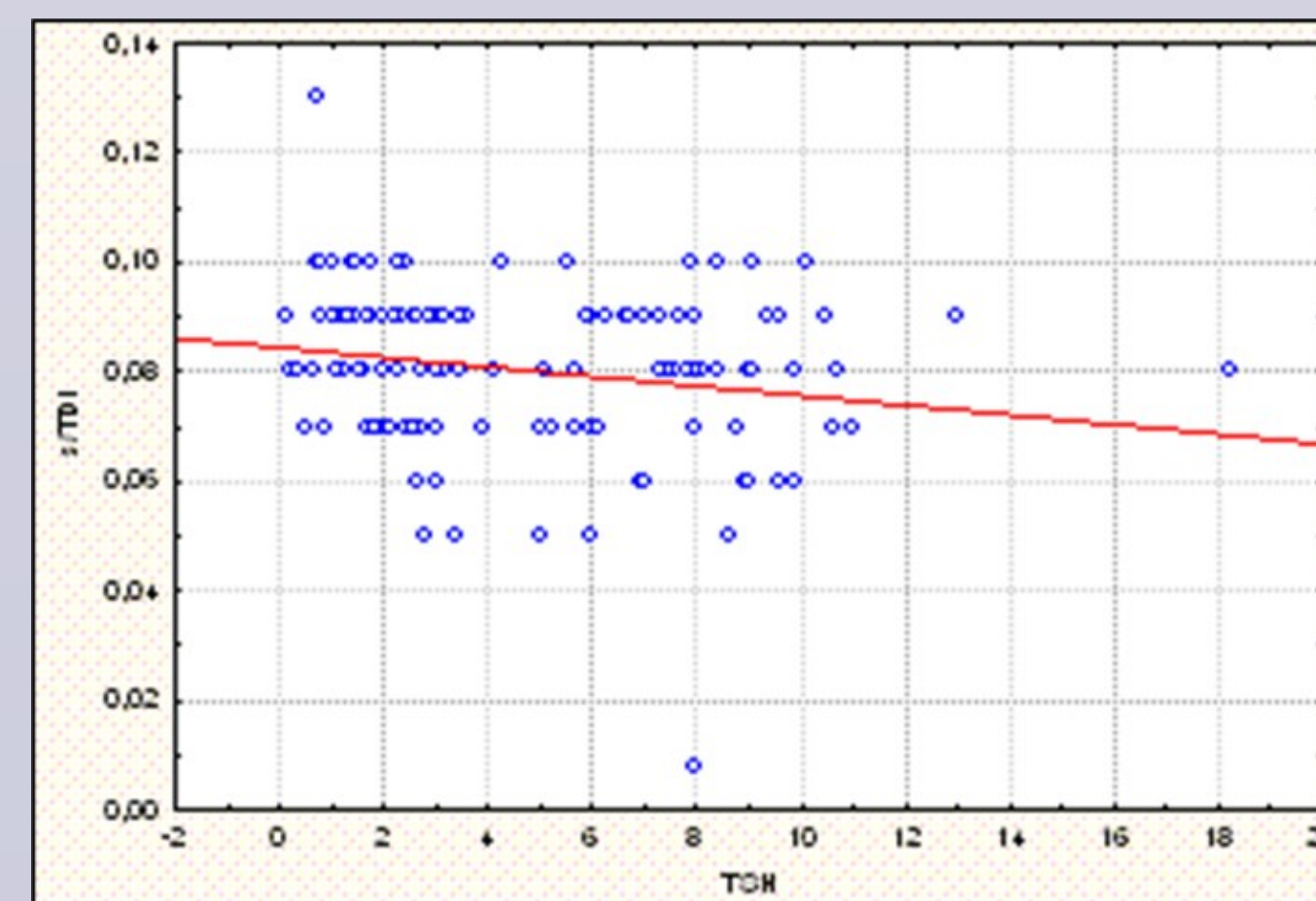
1. TSH negatively correlated with EF (graph 1), E/A, GLS (graph 2), S/TDI (graph 3) ($r=-0.15$, $r=-0.14$, $r=-0.26$, $r=-0.22$, $p<0.05$, respectively), and positively correlated with E/e' sep. (graph 4), ($r=0.14$, $p<0.05$).



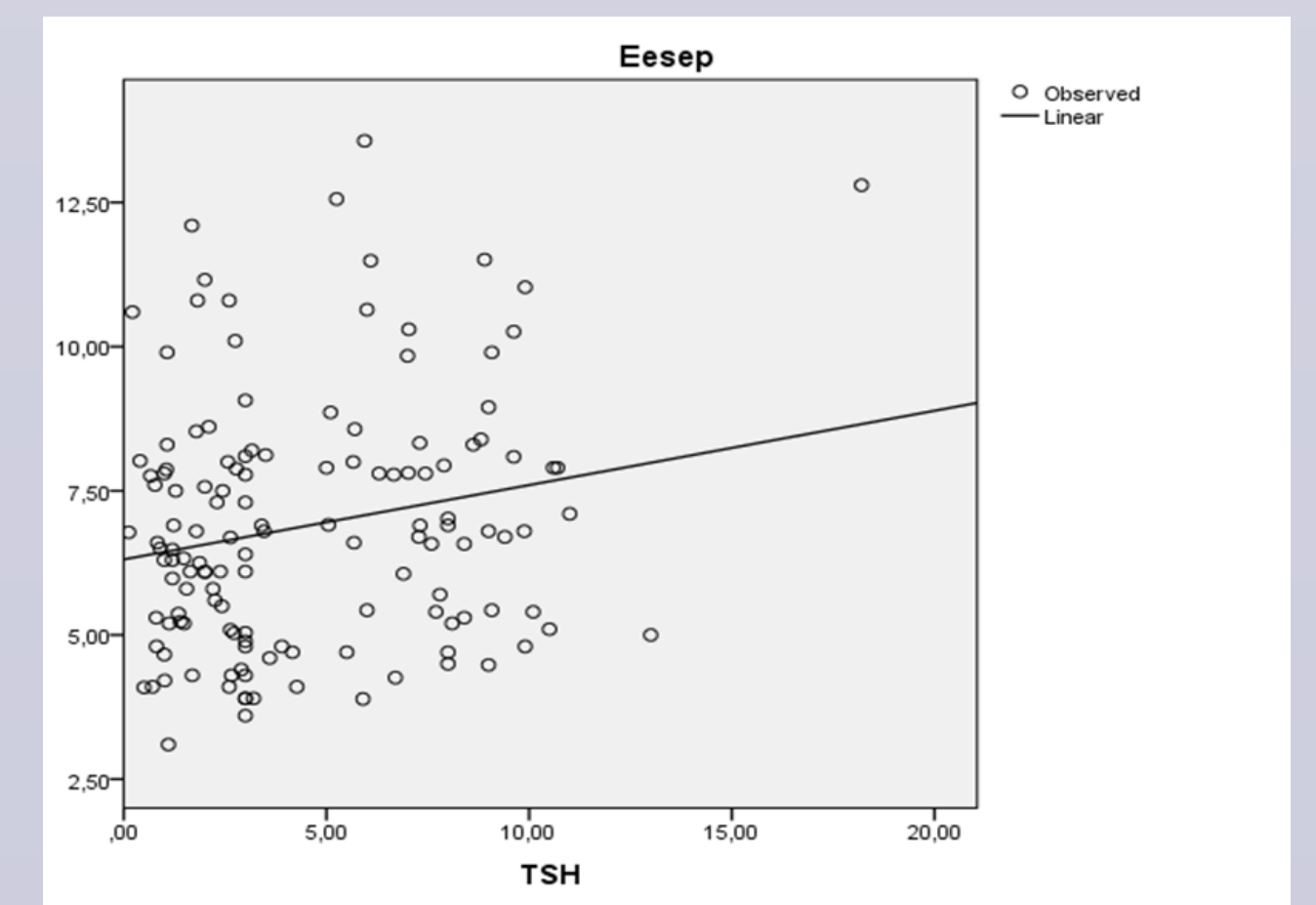
Graph 1. Negative correlation between TSH and EF



Graph 2. Negative correlation between TSH and GLS

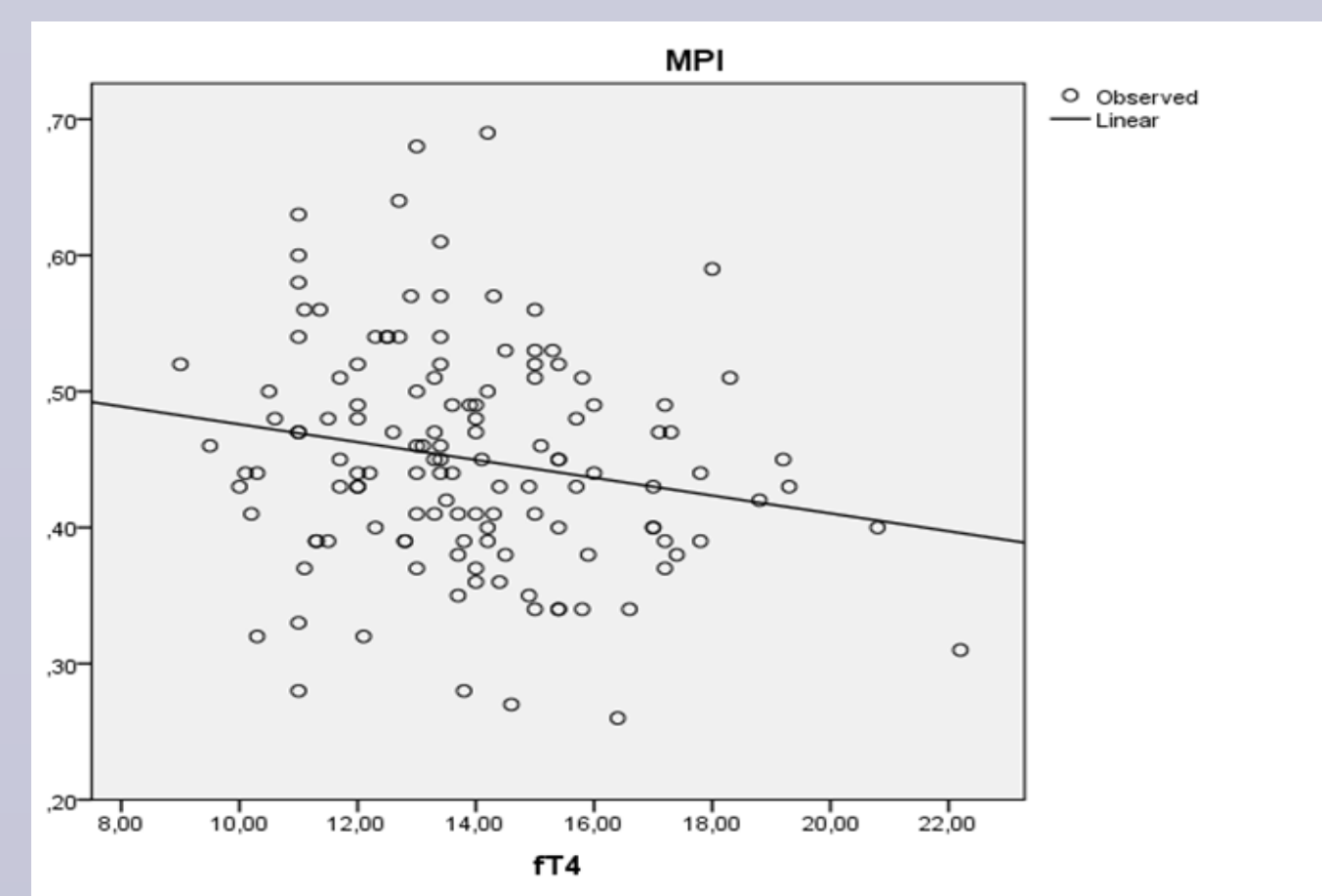


Graph 3. Negative correlation between TSH and s/TDI

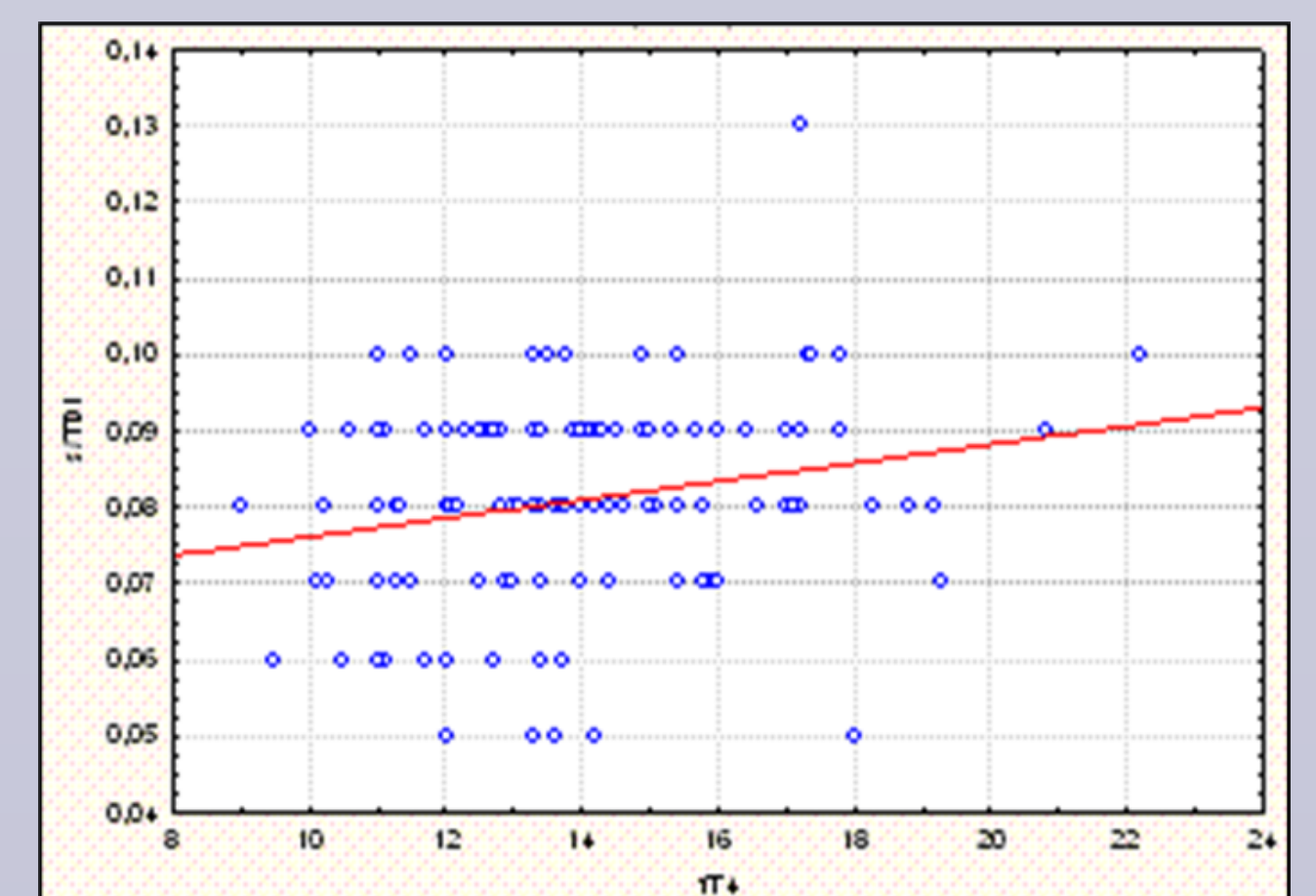


Graph 4. Positive correlation between TSH and E/e' sep.

2. FT4 negatively correlated with E/e' sep. (graph 5), IVRT, MPI ($r=-0.17$, $r=-0.21$, $r=-0.19$, $p<0.05$, respectively), and positively correlated with E/A, GLS, S/TDI (graph 6), ($r=0.18$, $r=-0.18$, $r=0.19$, $p<0.05$, respectively).
3. FT3 negatively correlated with A dur ($r=-0.39$, $p<0.01$), and positively correlated with EF and s/d ($r=0.18$, $r=0.22$, $p<0.05$).



Graph 5. Negative correlation between FT4 and MPI



Graph 6. Positive correlation between FT4 and s/TDI

Table 1. The difference in echocardiographic parameters after L-T4 therapy

	Investigated patients (n=54)		Statistical significance
	Before L-T4 treatment	After L-T4 treatment	
BMI (kg/m ²)	26,7 ±4,2	25,7 ±4,2	NS
BSA (m ²)	1,79±0,17	1,78±0,16	NS
TSH mU/L	8,1 ± 2,3	2,8 ± 2,6	p<0.001
FT4 pmol/L	12,3 ± 2,0	15,2 ± 2,6	p<0.01
FT3 pmol/L	4,5±1,1	6,4±3,3	p<0.01
LA area (cm ²)	13,1±2,7	13,2±2,0	NS
LA (mm)	31,3±3,9	31,7±3,9	NS
LAVI (ml/m ²)	21,95±5,77	20,7±5,43	NS
LVEDd (mm)	46,4±4,3	45,6±4,1	p=0.04
LVED vol (ml ³)	81,7±18,4	79,0±18,6	NS
LVES vol (ml ³)	31,6±7,8	30,6±6,5	NS
EF (%)	61,6±4,4	62,9±3,9	p=0.027
FS (%)	33,6±3,2	33,4±2,3	NS
IVS (mm)	10,8±0,9	10,8±1,0	NS
PW (mm)	8,7±1,2	8,7±1,1	NS
E/A (m/sec)	1,03±0,29	1,09±0,34	NS
DT(msec)	167,94±38,6	158,53±32,2	p=0.06
E/e' sep.	7,62±2,29	6,60±2,06	p<0.01
E/e' lat.	6,35±1,62	6,03±1,74	NS
E/e' average	6,98±1,9	6,74±1,7	NS
A dur (msec)	112,18±17,2	107,25±14,4	p<0.01
Ar dur (msec)	86,94±15,9	83,88±13,0	NS
IVCT (msec)	64,14±13,4	60,29±12,7	NS
IVRT (msec)	67,27±13,7	65,0±12,8	NS
MPI	0,47±0,08	0,43±0,07	p<0.01
d/s	1,26±0,16	1,25±0,22	NS
MR	7/54 (12,9%)	7/54 (12,9%)	NS*
Ao	0	1/54 (1,8%)	NS*
pericarditis	15/54 (27,8%)	13/54 (24,1%)	NS*
GLS (%)	-19,55±2,3	-20,07±2,7	p<0.05
S/TDI (msec)	0,077±0,01	0,078±0,01	NS
Ar-A	25,2±16,1	23,4±9,1	NS

After substitution therapy, there was a statistically significant improvement in parameters indicating diastolic dysfunction (A dur: 112.18±17.2 vs. 107.25±14.4 msec and E/e' sep.: 7.62±2.29 vs. 6.60±2.06, $p < 0.01$), as well as in global and longitudinal left ventricular function (MPI: 0.47±0.08 vs. 0.43±0.07 and GLS: -19.55±2.3 vs. -20.07±2.7, $p < 0.05$), (table 1).

CONCLUSION

Thyroid hormones directly influence specific parameters used to assess global and longitudinal systolic and diastolic left ventricular function in patients with SCH, and the most of them are reversible with levothyroxine treatment.



Using a general linear model with univariate analysis, we found that TSH had a statistically significant independent influence on EF (table 2), LVEDd (table 3), IVRT (table 4), MPI (table 5), GLS (table 6), and S/TDI (table 7). FT4 significantly influenced EF, LVEDd, LVEDvol, E/A, A dur, Ar dur, MPI, GLS, s/d, and S/TDI, while FT3 had a significant impact on EF, LVEDd, IVCT, MPI, and GLS ($p < 0.05$).

Table 2. Independent influence of thyroid hormones on EF

	sum of squares	deg. of freedom	F	significance
model	315887,078	5	1352,075	0,000
TSH	321,227	1	6,875	0,011
FT4	2288,585	1	48,979	0,000
FT3	291,260	1	6,233	0,015
age	105,650	1	2,261	0,137
BMI	352,897	1	7,552	0,007
	3597,92	77		

Dependent variable: EF, R2=0,988

Table 3. Independent influence of thyroid hormones on LVEDd

	sum of squares	deg. of freedom	F	significance
model	173357,96	5	1199,853	0,000
TSH	165,950	1	5,743	0,019
FT4	475,901	1	16,469	0,000
FT3	203,613	1	7,046	0,010
age	114,385	1	3,958	0,050
BMI	574,092	1	19,867	0,000
	2225,03	77		

Dependent variable: LVEDd, R2=0,987

Table 4. Independent influence of thyroid hormones on IVRT

	sum of squares	deg. of freedom	F	significance
model	342973,81	5	279,553	0,000
TSH	1263,085	1	5,148	0,026
FT4	850,761	1	3,467	0,066
FT3	805,306	1	3,282	0,074
age	844,969	1	3,444	0,067
BMI	305,907	1	1,247	0,268
	18893,71	77		

Dependent variable: IVRT, R2=0,944

Table 5. Independent influence of thyroid hormones on MPI

	sum of squares	deg. of freedom	F	significance
model	16,693	5	372,720	0,000
TSH	0,040	1	4,456	0,038
FT4	0,049	1	5,514	0,021
FT3	0,045	1	4,972	0,029
age	0,004	1	0,478	0,491
BMI	0,073	1	8,178	0,005
	0,690	77		

Dependent variable: MPI, R2=0,958

Table 6. Independent influence of thyroid hormones on GLS

	sum of squares	deg. of freedom	F	significance
model	3,162	5	565,746	0,000
TSH	0,007	1	6,362	0,014
FT4	0,037	1	33,277	0,000
FT3	0,006	1	5,616	0,020
age	0,000	1	0,211	0,647
BMI	0,197	1	0,073	0,787
	0,086	77		

Dependent variable: GLS, R2=0,972

Table 7. Independent influence of thyroid hormones on s/TDI

	sum of squares	deg. of freedom	F	Significance
model	0,489	5	482,113	0,000
TSH	0,001	1	4,270	0,042
FT4	0,007	1	32,484	0,000
FT3	0,000	1	1,070	0,304
age	0,000	1	2,200	0,142
BMI	0,001	1	3,200	0,078
	0,016	77		

Dependent variable: S/TDI, R2=0,967