A Study of Arterial Stiffness in Turner Syndrome Patients Using Cardio-Ankle Vascular Index

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OBJECTIVES

Increased mortality in Turner syndrome(TS) is largely related to cardiovascular(CV) complications. While PWV is the gold standard for assessing aortic stiffness and is able to predict adverse CV outcomes[1], it is influenced by changes in blood pressure (BP). Another parameter, the cardio-ankle vascular index (CAVI) has been developed for evaluation of arterial stiffness independently of BP. The aim of this study was to compare arterial stiffness using CAVI between TS patients and healthy controls and to evaluate for possible factors affecting arterial stiffness within the patient group.

METHODS

27 TS patients and 22 normal controls
- Inclusion criteria: confirmed TS karyotype, aged 15-40 years
- Exclusion criteria: T2DM, hypertension on medication
- Healthy control group matched for age and BMI

Data collection
Age, karyotype, family history, congenital heart disease, renal anomalies, thyroiditis, growth hormone (GH) treatment, estrogen replacement

Venous sampling after 12 hr fast: Glucose, insulin, lipid profile

Measurements: weight, height, waist circumference (WC), body composition (by bioelectric impedance)

Assessment of CAVI, PWV using the VaSera (VS-1000, Fukuda Denshi)

RESULTS

Table I. General comparisons and observations of clinical and metabolic factors

Clinical characteristics	TS (n=27)	Control (n=22)	p-value
Age (yr)	24.1 ± 5.2	25.7 ± 5.0	0.291
Height (cm)	150.4 ± 5.6	160.5 ± 5.1	<0.001
BMI (kg/m^2)	23.1 ± 3.4	21.8 ± 3.3	0.172
BSA (m^2)	1.44 ± 0.51	1.68 ± 0.48	0.100
Umbilical WC (cm)	91.0 ± 6.0	75.41 ± 8.0	<0.001
Body fat (%)	32.0 ± 6.2	28.5 ± 6.3	0.058
Systolic BP (mmHg)	122 ± 13	112 ± 8	0.002
Diastolic BP (mmHg)	75 ± 13	71 ± 7	0.580
Total cholesterol (mg/dl)	178 ± 23	185 ± 22	0.316
Triglycerides (mg/dl)	95 ± 47	84 ± 27	0.368
LDL cholesterol (mg/dl)	106 ± 21	102 ± 16	0.462
HDL cholesterol (mg/dl)	64 ± 14	63 ± 12	0.686
PWV (m/sec)	5.55 ± 1.64	6.32 ± 1.70	0.122
CAVI	6.63 ± 0.68	6.05 ± 0.90	0.012

Karyotypes
- 45,X monosomy: n=11 (41%)
- Other karyotypes: n=16 (59%)

Congenital heart disease: n=7 (26%)
- Partial anomalous pulmonary venous return,
- Aortic coarctation (n=2), Bicuspid aortic valve (n=2),
- Hypertrophic left ventricle, Tricuspid regurgitation

Renal anomalies: n=8 (30%)
- Horseshoe kidney (n=3), elongated kidney, renal duplication, reflux nephropathy, cyst, rotation anomaly

GH treatment: n=25 (93%)
- Start age of GH: 11.35 ± 2.72 years
- Duration of treatment: 4.82 ± 3.19 years

Estrogen replacement therapy: n=27 (100%)
- Start age of estrogen replacement: 16.35 ± 1.43 years

There were no significant factors related to CAVI using multivariate regression analysis including age, systolic BP, waist circumference, HOMA-IR and presence of cardiac anomalies.

Mean CAVI measurements are significantly higher in the TS patients compared to controls.

P = 0.012
CAVI
6.63 ± 0.68   6.05 ± 0.90
TS (n=27)   Control (n=22)
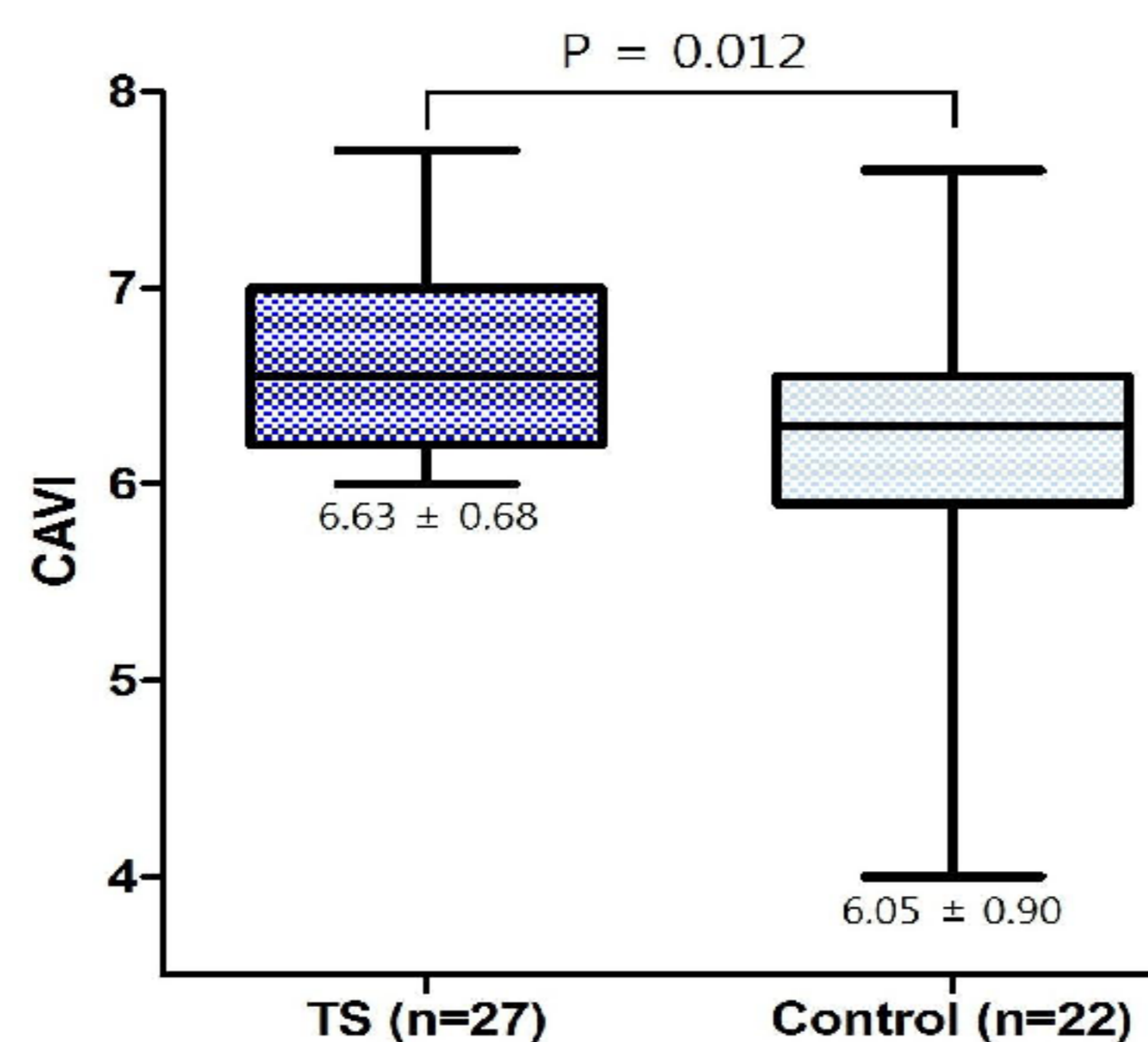
CONCLUSIONS

TS patients showed a significantly increased arterial stiffness as measured by CAVI compared to an age and BMI matched normal control group.

Further prospective studies in larger TS patient group are mandatory in order to find significant factors related to increased arterial stiffness.

REFERENCES

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