

CLINICAL SCIENCE

Association between ear creases and peripheral arterial disease

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INTRODUCTION: Peripheral arterial disease is a severe manifestation of atherosclerosis that can lead to critical ischemia of the lower limbs and is also associated with high cardiovascular risk. Diagonal lobular and anterior tragal ear creases have been associated with coronary artery disease, but they have not yet been investigated in patients with peripheral arterial disease.

OBJECTIVES: To evaluate the prevalence of ear creases among patients with peripheral arterial disease of the lower limbs, compared with patients without documented atherosclerotic disease.

METHODS: Cross-sectional study including 60 male patients with peripheral arterial disease of the lower limbs and 60 dermatologic outpatients matched for age and gender. The associations were adjusted for other risk factors by conditional logistic regression.

RESULTS: The prevalence of diagonal and anterior tragal ear creases was higher among cases (73% vs. 25% and 80% vs. 43%, respectively) than controls; these associations remained significant even when adjusting for other known risk factors of atherosclerosis (odds ratio = 8.1 and 4.1, respectively).

CONCLUSIONS: Ear creases are independently associated with peripheral arterial disease and may be an external marker for risk identification.

KEYWORDS: Ear; Atherosclerosis; Peripheral; Arterial; Disease.

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INTRODUCTION

Peripheral arterial disease (PAD) is a severe manifestation of atherosclerosis that may be asymptomatic or lead to critical ischemia of the lower limbs, and is also associated with increased risk of death from cardiovascular disease.¹

Some known risk factors for PAD include smoking, diabetes mellitus, familial history of atherosclerotic event, hypertension, and hypercholesterolemia.² The diagonal lobular crease (DLC), described by Frank,³ and anterior tragal crease (ATC), by Miot et al.⁴ (Figure 1), were identified as factors independently associated with coronary artery disease,⁵⁻⁷ but they have not yet been studied in patients with PAD. Detection of external signs associated with PAD can assist in risk stratification and identification of patients who would benefit from early intervention or modification of risk factors related to disease progression.

We studied the prevalence of ear creases in patients with PAD of the lower limbs, in comparison with patients without documented atherosclerotic disease.

METHODS

A cross-sectional study consisted of interviews with adult male patients treated at the University Hospital.

Cases were selected from claudication outpatients, with PAD of the lower limbs confirmed by arteriography. The

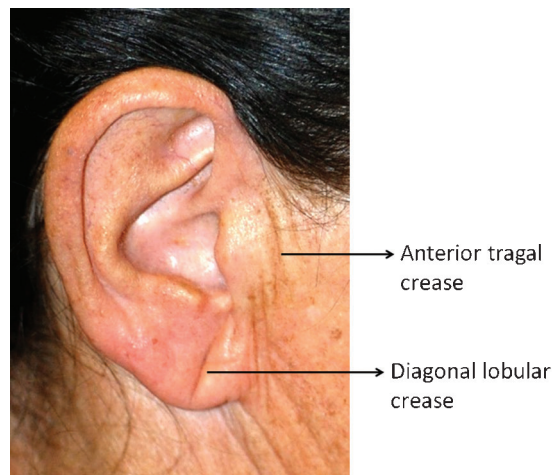


Figure 1 – Ear creases.

control group was matched for gender and age and was recruited among dermatologic outpatients, who had not been revascularized (legs or ankle) or who had an ankle-brachial index not <0.9 or >1.3 (arterial noncompliance).

Patients who presented any of the following conditions were excluded from the study: immunosuppression, ear deformity, earring use or arterial obstruction due to other etiologies that could not be attributed to PAD.

The main dependent variable was the presence of PAD in the lower limbs, and the main independent variable was the presence of bilateral auricular creases. Other covariates were diabetes mellitus, previous smoking, age, familial and personal past history of atherosclerotic vascular disease (cerebral or myocardial atherosclerotic event), dyslipidemia, body mass index, and hypertension. Patients who did not know their family history were considered to have a negative history.

Categorical variables are given as frequencies and bivariately compared by the χ^2 test or Fisher's exact test. Continuous variables are represented by mean and standard deviation and compared by the Student t-test. The association between variables is expressed as an odds ratio from the bivariate analysis subsequently adjusted by conditional logistic regression, comprising covariates with $p < 0.2$.

Data were analyzed by the software SPSS 17.0. Two-tailed p values <0.05 were considered significant.

Sample size was defined according to the final multiple logistic model with $\alpha = 0.05$ and power = 85%.⁸

This study was approved by the institutional ethics committee.

RESULTS

Sixty patients with PAD and 60 controls were enrolled in the study. The main clinical and demographic characteristics of patients and controls are listed in Table 1. The bivariate analysis disclosed the higher frequencies of known PAD risk factors among patients and also identified their positive association with ear creases. DLC and ATC were

Table 1 - Main clinical and epidemiological data.

Variables	Cases	Controls	Odds ratio [†]	p Values
Age, mean (SD) [*]	66.0 (11.9)	64.2 (13.4)	-	-
BMI, mean (SD) [†]	25.1 (4.0)	24.3 (4.0)		0.23
Familial history [‡]	21 (35)	15 (25)	1.6	0.23
Myocardial infarction	12 (20)	3 (5)	4.8	0.02
Cerebral vascular accident	10 (17)	6 (10)	1.8	0.28
Diabetes mellitus	27 (45)	7 (12)	6.2	0.00
Hypertension	49 (82)	22 (37)	7.7	0.00
Dyslipidemia	19 (32)	10 (17)	2.3	0.06
Ever a smoker	53 (88)	40 (67)	3.8	0.00
DLC	44 (73)	15 (25)	8.3	0.00
ATC	48 (80)	26 (43)	5.2	0.00
DLC+ATC	38 (63)	8 (13)	11.2	0.00

Results are shown as number (%) unless stated otherwise.

Significant results are shown in bold.

^{*}Matched variable;

[†]body mass index;

[‡]familial report of cerebral or myocardial atherosclerotic event;

^{††}unadjusted odds ratio.

ATC, anterior tragal crease; BMI, body mass index; DLC, diagonal lobular crease.

Table 2 - Multivariate analysis of auricular creases adjusted for potential confounders.

Variable	Odds ratio [*]	95% CI	p Value
DLC	8.1	2.8 to 23.3	0.00 [†]
ATC	4.1	1.4 to 12.1	0.01 [†]
DLC+ATC	10.6	3.2 to 35.2	0.00 [†]

^{*}Odds ratio adjusted for age, myocardial infarction, diabetes mellitus, hypertension, dyslipidemia, and tobacco.

[†] p (whole model) <0.01.

ATC, anterior tragal crease; DLC, diagonal lobular crease.

also more prevalent among cases than controls in all age groups (data not shown).

Multivariate analysis of the frequency of ear creases adjusted for age, diabetes mellitus, hypertension, myocardial infarction, dyslipidemia, and tobacco reinforced the association between PAD and ear creases (Table 2).

DISCUSSION

Earlobe creases were more common in male patients with PAD than in age-matched controls. These creases may represent an external sign of microangiopathic lesions in terminal circulation of the ear that occur at the same time as PAD since atherosclerosis is a systemic disease. In other series of patients, overall mortality and sudden death were significantly higher in the group with DLC.^{9,10} Male patients were selected to minimize the effect that earrings might have had on the ears, and because men are more affected by PAD and atherosclerosis than women. As the prevalence of both PAD and bilateral ear lobe creases increases over time, age matching was performed to normalize these risks between the groups.

Controls did not undergo arteriography for ethical and logistic reasons. The ankle-brachial index was chosen as the method to select controls owing to its high specificity (99%) and sensitivity (89%) for identification of PAD.¹¹ Moreover, the accidental inclusion of cases among controls would have diluted the association of ear creases and atherosclerosis, rather than strengthened it.

The noninvasive identification of external findings, including DLC and ATC, digital clubbing, cyanosis, and hair loss on extremities provides information additional to epidemiological aspects such as smoking, hypertension, diabetes and dyslipidemia in raising a suspicion of atherosclerosis and risk of cardiovascular events.¹²

Further investigations should be performed with larger samples, heterogeneously distributed according to age, gender, ethnicity, and PAD severity, to provide a stratified risk analysis and a long-term follow up evaluation of prognostic factors in PAD.

Bilateral DLC and ATC are semiological findings which are quick and easy to evaluate and were independently associated with PAD in this population.

REFERENCES

- Criqui MH, Langer RD, Fronek A, Feigelson HS, Klauber MR, McCann TJ, et al. Mortality over a period of 10 years in patients with peripheral arterial disease. *N Engl J Med.* 1992;326:381-6, doi: 10.1056/NEJM199202063260605.
- Selvin E, Erlinger TP. Prevalence of and risk factors for peripheral arterial disease in the United States: results from the National Health and Nutrition Examination Survey, 1999-2000. *Circulation.* 2004;110:738-43, doi: 10.1161/01.CIR.0000137913.26087.F0.

3. Frank ST. Aural sign of coronary artery disease. *N Engl J Med.* 1973;289:327-8.
4. Miot HA, Medeiros LM, Siqueira CRS, Cardoso LC, Gumieiro JH, Pandini Filho MA, et al. Associação entre doença arterial coronariana e as pregas lobular diagonal e anterotragal em homens. *An Bras Dermatol.* 2006;81:29-33.
5. Evrengül H, Dursunoğlu D, Kaftan A, Zoghi M, Tanriverdi H, Zungur M, et al. Bilateral diagonal earlobe crease and coronary artery disease: a significant association. *Dermatology.* 2004;209:271-5, doi: 10.1159/000080847.
6. Edston E. The earlobe crease, coronary artery disease, and sudden cardiac death: an autopsy study of 520 individuals. *Am J Forensic Med Pathol.* 2006;27:129-33, doi: 10.1097/01.paf.0000221067.73173.d7.
7. Tranchesi Junior B, Barbosa V, de Albuquerque CP, Caramelli B, Gebara O, dos Santos Filho RD, et al. Diagonal earlobe crease as a marker of the presence and extent of coronary atherosclerosis. *Am J Cardiol.* 1992;70:1417-20, doi: 10.1016/0002-9149(92)90292-7.
8. Hsieh FY, Bloch DA, Larsen MD. A simple method of sample size calculation for linear and logistic regression *Statist Med.* 1998;17:1623-34, doi: 10.1002/(SICI)1097-0258(19980730)17:14<1623::AID-SIM871>3.0.CO;2-S.
9. Elliott WJ, Karrison T. Increased all-cause and cardiac morbidity and mortality associated with the diagonal earlobe crease: a prospective cohort study. *Am J Med.* 1991;91:247-54, doi: 10.1016/0002-9343(91)90123-F.
10. Elliott WJ, Powell LH. Diagonal earlobe creases and prognosis in patients with suspected coronary artery disease. *Am J Med.* 1996;100:205-11, doi: 10.1016/S0002-9343(97)89460-0.
11. Feigelson HS, Criqui MH, Fronck A, Langer RD, Molgaard CA. Screening for peripheral arterial disease: the sensitivity, specificity, and predictive value of noninvasive tests in a defined population. *Am J Epidemiol.* 1994;140:526-34.
12. Miric D, Fabijanic D, Giunio L, Eterovic D, Culic V, Bozic I, et al. Dermatological indicators of coronary risk: a case-control study. *Int J Cardiol.* 1998;67:251-5, doi: 10.1016/S0167-5273(98)00313-1.