



Diagonal Ear Lobe Crease as a Marker of Coronary Artery Disease

KEYWORDS

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ABSTRACT **Introduction:** Extravascular markers of coronary artery disease (CAD) are important in clinical evaluation of patients. Diagonal ear lobe crease (DELC) or Frank's sign is one such indicator. This study has attempted to evaluate the association of ear lobe crease and ear canal hair with coronary artery disease in Maharashtrian subjects.

Methodology: A total of 273 subjects of Maharashtrian origin of both sexes from age 11 to 70 years were considered. The subjects were examined for presence of diagonal ear lobe crease. The crease was defined as complete or incomplete, single or double, unilateral or bilateral, horizontal vertical or diagonal crease in ear lobe. Both auricles were examined for presence of DELC under good illumination and were photographed. The external ear canal was examined for ear canal hair (ECH).

Results: Approximately 90% of patients of coronary artery disease showed the diagonal ear lobe crease. 87 % of Patients of coronary artery disease in younger age group of 30-49 years showed a prominent ear lobe crease. While 90% of patients in the age group 50 years and above displayed the ear lobe crease, almost 36% of apparently healthy population in this age group also displayed the ear lobe crease. Unlike other studies, the present study could not establish a definite relation between Diagonal ear lobe crease in conjunction with Ear canal hair as more sensitive indicators of underlying coronary artery Disease.

Conclusion: DELC is identified as a definite extravascular marker of CAD in Maharashtrian subjects, especially in the age group of 30-49 years. The presence of DELC in other conditions like Hypertension and Diabetes mellitus seems to indicate that the underlying pathology could be one involving blood vessels in general and not coronary blood vessels alone.

Introduction:

Coronary artery disease is one of the major causes of morbidity and mortality. Identifying the risk factors for coronary artery disease (CAD) has been the focus of medical researchers for a long time. The first association of Diagonal Ear Lobe Crease (DELC) and CAD dates back to ancient Rome, where Emperor Hadrian, who was supposedly known to have died of CAD also had a bilateral ear lobe crease as documented in studies¹. Frank in 1973 reported the first extra cardiac physical sign, the DELC in CAD². Since then, many reports of association between DELC and CAD for specific population groups have been documented³⁻⁷. Verma et al reported a strong correlation between the DELC and CAD in Sindhis⁸. They believe that DELC, when considered along with ear canal hair is of better value in predicting CAD. Lichstein et al studied the association of DELC and CAD and opined that DELC be considered as coronary risk factor¹⁰. A large study in Brazil also considered DELC as indicator of CAD¹¹.

Methodology:

A total of 273 subjects of Maharashtrian origin of both sexes from age 11 to 70 years attending OPD or subsequently admitted to a large tertiary care general hospital in Pune were examined for presence of DELC in one or both auricles. The subjects were examined for presence of diagonal ear lobe crease. The external ear canal was examined for hair. Ear Canal Hair (ECH) positive were those patients with deeply pigmented stiff hair present in at least one of the following places - tragus, antitragus or external acoustic meatus. The patients with hair only on the pinnae were not considered as ECH positive.

The crease was defined as complete or incomplete, single or double, unilateral or bilateral, horizontal vertical or diagonal crease in ear lobe (Figure 1). Both auricles were examined for presence of DELC under good illumination and were photographed. The DELC extending for more than 1/3rd of width or length of lobule were considered. Doubtful and ambiguous cases were omitted. The depth of DELC was also noted.



Figure 1: Varieties of ear lobe creases considered in the study

Results:

Out of 273 subjects, 225 males and 48 females from age of 10 to 70 years were considered in the study. Only one patient with rheumatic heart disease showed DELC. 77% of hypertensive patients, 85 % of diabetics and 90 % of CAD patients had DELC. Interestingly, 10.6% of healthy controls also showed DELC. (table 1)

Table 1: Tabulation of presence and absence of DELC in different disease conditions considered in the study; CHD – congenital heart disease, RHD – Rheumatic heart disease, HT – hypertension, DM – Diabetes mellitus, CAD – Coronary artery disease.

Disease	Total	DELC +	Percentage	DELC -	percentage
CHD	3	0	0	3	100
RHD	13	1	7.7	12	92.3
HT	22	17	77.3	5	22.7
DM	7	6	85.7	1	14.3
CAD	30	27	90	3	10
Control	198	21	10.6	177	89.4

As seen from Table 1, significant percentages of patients with Hypertension (77.3%), Diabetes mellitus (85.7%) and coronary artery disease (90%) showed the DELC. In comparison, patients with congenital heart disease and Rheumatic heart disease showed very low incidence of DELC. The DELC was seen in 10.6% of the healthy population.

Table 2: age group 30-49 years

	CAD+	CAD-	Total
DELC+	7	4	11
DELC-	1	70	71
Total	8	74	82

Table 3: age group > 50 years

	CAD+	CAD-	Total
DELC+	20	17	37
DELC-	2	32	34
Total	22	49	71

Table 2 shows that in the age group of 30-49 years, 87.5% of patients with coronary artery disease displayed the DELC while only 5.7% of patients without coronary artery disease showed the DELC. In the age group of 50 years and beyond, 90.9% of patients with coronary artery disease showed the diagonal ear lobe crease while 34.69% of patients without coronary artery disease showed the DELC.

The results of associations between DELC and CAD alone and DELC together with ECH with CAD are given in tables below (table 4). Occurrence of DELC in patients with CAD was compared with patients without coronary artery disease.

Table 4: Association between DELC alone with CAD and DELC+ECH with CAD

	CAD+ (n=30)	CAD- (n=123)		CAD+ (n=30)	CAD- (n=123)
DELC+	7	4		7	4
DELC-	1	70		1	70
Total	8	74		8	74

DELC+	27	21	DELC+ ECH+	22	3
DELC-	3	102	DELC+ ECH-	8	120

Table 4 does not give any conclusive evidence that DELC along with ECH are more indicative of underlying coronary artery disease than DELC alone.

Discussion:

Since the first study by Frank in 1973, many studies have considered the association of DELC with CAD. The data considered in most of these studies was primarily obtained from subjects admitted for coronary angiography or subjects with myocardial infarction and patients from various outpatient departments of hospitals. In most of these instances, there is selection bias as only those attending the hospital for some ailment were studied. The present study has alleviated such bias by considering the subjects from schools, colleges and the general population. In most of previous studies, only the patients with CAD were considered. The present study has considered all forms of heart diseases including congenital and rheumatic heart diseases. In most of the individuals, cardiac pathology is usually associated with hypertension and diabetes. The present study concludes that DELC is also seen in patients of Hypertension and diabetes. Therefore, DELC is not exclusive indicator of CAD but a problem with blood vessels in general.

Most previous studies from different ethnic groups report occurrence of DELC in CAD with variable frequencies, ranging from 45- 92%. Different ethnic groups, including Brazilians, Chinese, Hawaiians, Japanese, Sindhis and north Indians show DELC in patients with CAD. As per previous studies, orientals, native American Indians and children with Beckwith’s syndrome do not show any association between DELC and CAD.

The present study in Maharashtrians found DELC in 90% of patients with coronary artery disease. In the age group of 30-49 years, 87.5% of patients with coronary artery disease showed the ear lobe crease. In the age group of 50 years and above, while the DELC was present in 90.9% of patients of coronary artery disease, a significant 34.69% of apparently healthy population showed the DELC. Unlike the findings of Verma et al, this study could not derive any conclusive evidence of DELC and ECH together being more sensitive markers of underlying coronary artery disease than DELC alone. A study with a larger sample size may be attempted to find an association, if any, of the sensitivity of DELC and ECH as markers for underlying coronary artery disease.

Conclusions:

The Diagonal ear lobe crease is identified as a definite extravascular marker of CAD, especially in the age group 30-49 years. The fact that the same DELC is also seen in high percentages of patients with Hypertension and Diabetes mellitus indicates that the underlying pathology could be related to the blood vessels in general.

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