

# The diagonal ear-lobe crease

## As sign of some diseases

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### ABSTRACT

**Objective:** The present study dealt with the question of possible association between the diagonal ear lobe crease (ELC) and diabetes mellitus, hypertension, myocardial infarction, coronary artery diseases.

**Methods:** The present study was carried out as a field study with the contributions of 6 Primary Health Care Centers in Golbasi, Education and Research Area, Ankara, Turkey in May 2003 June 2003 and includes 3722 individuals (1250 males and 2472 females) of different age groups. From each individual, ELC was

graded and a thorough medical history was taken.

**Results:** Ear lobe creases were found more in males and there was a statistically significant positive association between ELC and these diseases in both sexes.

**Conclusion:** It was thus thought that ELC could well be included as a valuable sign in diagnosing and screening such diseases.

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The diagonal ear lobe crease (ELC) is a deep mark clearly visible by naked eye, extending from the tragus to posterior pinna at approximately 45 degrees. Frank<sup>1</sup> first suggested the association between ELC and coronary artery disease (CAD). Nineteen out of 20 patients with an ELC had at least one or more documented risk factors for CAD.<sup>1</sup> Several reports supported an association between ELC and CAD.<sup>2-9</sup> However, some investigators denied this association and pointed out that age might influence the appearance of ELC which is more commonly found in elderly persons.<sup>10-13</sup> Other authors related the increase in the prevalence of both ELC and CAD to ageing.<sup>14-17</sup> In this work, we attempted to evaluate the association, if there are any, between ELC and diabetes mellitus (DM), hypertension (HT), myocardial infarcts (MI) and CAD as a part of population screening study on a Central Anatolian Population from the vicinity of

Ankara, and tried to find out the possible significances/roles of such association in early diagnosis of some systemic diseases.

**Methods.** This work was designed as a part of field studies and carried out as joint project by the Departments of Anatomy, Forensic Medicine and Public Health, Gazi University, Faculty of Medicine in May 2003 to June 2003, with the contributions of 6 Primary Health Care Centers in Gölbaşı, Education and Research Area, Ankara, Turkey, on individuals >18, with a total of 3722 (1250 males, 2472 females).

The age, gender, occupation, education and medical history records (on proven files) such as DM, HT, MI and CAD, with family backgrounds were all noted by face to face questionnaire technique. All individuals were also examined for the presence

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or absence of a diagonal ELC on one or both ears by 13 doctors who were previously trained for proper detection of the crease, and then recorded with other details.

Ear lobe crease considered present if there were a visible wrinkles; thus, it was noted and graded first for each ear separately according to the following system: grade 0 = no crease at all, grade 1 = any crease <50% across the lobe, grade 2 = less than 100% across the lobe and grade 3 = deep and prominent crease across the whole lobe. Following this, bilateral grading (BG) of right and left ears established together as follows: Right 0/Left 0 = BG 0, Right 1 1 0/Left 1 0 1 = BG 1, Right 2 2 2 1 0/Left 2 1 0 2 2 = BG 2, Right 3 3 3 3 2 1 0/Left 3 2 1 0 3 3 3 = BG 3.

Statistical analyses were carried out using chi-square tests.

Results. The study population consisted of 3722 individuals (1250 males and 2472 females), of mixed social backgrounds and different age groups (Table 1). Of the 3689 individuals, 76.7% showed BG 0, 16.5% BG 1, 5.1% BG 2 and 1.7% BG 3. However, there was a greater prevalence of ELC in those individual with CAD, and this was found to be statistically significant (Pearson chi-square = 174.909  $p < 0.05$ ) (Table 2). However, the prevalence of ELC was found to be higher in males ( $p < 0.05$ ) and this was thought to be caused by the fact that BG 0 was noted in 69% of females compared to 31% of males (Pearson chi-square = 44.011  $p < 0.05$ ) (Table 1).

Of the 3722 individuals, 8.6% were previously diagnosed diabetics and 24.5% had a positive family history of DM. Bilateral grading of 0 was noted in

Table 1 - Distribution of the ear-lobe crease grading by age groups and gender.

Characteristics	Ear-lobe crease grading				Total n (%)
	Bilateral grade 0 n (%)	Bilateral grade 1 n (%)	Bilateral grade 2 n (%)	Bilateral grade 3 n (%)	
<b>Gender</b>					
Male	888 (31)	242 (39.9)	88 (46.6)	32 (51.6)	1250 (33.6)
Female	1976 (69)	365 (60.1)	101 (53.4)	30 (48.4)	2472 (66.4)
<b>Age (years)</b>					
18-27	895 (31.2)	58 (9.6)	6 (3.2)	-	959 (25.8)
28-37	753 (26.3)	63 (10.4)	14 (7.4)	-	830 (22.3)
38-47	510 (17.8)	103 (17)	28 (14.8)	7 (11.3)	648 (17.4)
48-57	393 (13.7)	158 (26)	47 (24.9)	11 (17.7)	609 (16.4)
58-67	210 (7.3)	144 (23.7)	50 (26.5)	22 (35.5)	426 (11.4)
68	103 (3.6)	81 (13.3)	44 (23.3)	22 (35.5)	250 (6.7)
<b>Total</b>	<b>2864 (100)</b>	<b>607 (100)</b>	<b>189 (100)</b>	<b>62 (100)</b>	<b>3722 (100)</b>
Pearson chi-square = 44.011 ( $p < 0.05$ ), Adults mean age were 41.02 SD = 15.95.					

Table 2 - Relationship between ear-lobe crease grading and coronary artery disease.

Ear lobe crease reading	Coronary artery disease (+)		Coronary artery disease (-)		Total	
	n (%)	Line %	n (%)	Line %	n (%)	Line %
Bilateral grade 0	82 (46.3)	2.9	2751 (78.3)	97.1	2833 (76.7)	100
Bilateral grade 1	49 (27.7)	8.0	538 (15.9)	92.0	607 (16.5)	100
Bilateral grade 2	26 (14.7)	13.8	162 (4.6)	86.2	188 (5.1)	100
Bilateral grade 3	20 (11.3)	32.7	41 (1.2)	67.3	61 (1.7)	100
<b>Total</b>	<b>177 (100)</b>	<b>4.8</b>	<b>3512 (100)</b>	<b>95.2</b>	<b>3689 (100)</b>	<b>100</b>
Pearson chi-square = 174.909 ( $p < 0.05$ ). Thirty-three persons did not participate						

Table 3 - Relationship between ear-lobe crease grading and diabetes mellitus (DM) and family history of DM.

Ear-lobe crease grading	DM (+)			DM (-)			Total			Family DM(+)			Family DM (-)			Total		
	n	(%)	Line %	n	(%)	Line %	n	(%)	Line %	n	(%)	Line %	n	(%)	Line %	n	(%)	Line %
Bilateral grade 0	177	(55)	6.2	2687	(79)	93.8	2864	(76.9)	100	703	(77.3)	24.6	2158	(76.9)	75.4	2861	(77)	100
Bilateral grade 1	96	(29.8)	15.8	511	(15)	84.2	607	(16.3)	100	138	(15.1)	22.8	467	(16.6)	77.2	605	(16.3)	100
Bilateral grade 2	34	(10.6)	17.9	155	(4.6)	82.1	189	(5.1)	100	53	(5.8)	28.0	136	(4.8)	72.0	189	(5.1)	100
Bilateral grade 3	15	(4.6)	24.2	47	(1.4)	75.8	62	(1.7)	100	16	(1.8)	26.2	45	(1.7)	73.8	61	(1.6)	100
<b>Total</b>	<b>322</b>	<b>(100)</b>	<b>8.6</b>	<b>3400</b>	<b>(100)</b>	<b>91.4</b>	<b>3722</b>	<b>(100)</b>	<b>100</b>	<b>910</b>	<b>(100)</b>	<b>24.5</b>	<b>2806</b>	<b>(100)</b>	<b>75.5</b>	<b>3716</b>	<b>(100)</b>	<b>100</b>
<b>Chi-square</b>	Pearson chi-square = 101.358 ( $p < 0.05$ )						Pearson chi-square = 2.323 ( $p > 0.05$ )											
<b>PS</b>	All responded						6 persons did not response											

Table 4 - Relationship between ear-lobe crease grading and hypertension (HT) and family history of HT.

Ear-lobe crease grading	HT (+)			HT (-)			Total			Family HT(+)			Family HT (-)			Total		
	n	(%)	Line %	n	(%)	Line %	n	(%)	Line %	n	(%)	Line %	n	(%)	Line %	n	(%)	Line %
Bilateral grade 0	436	(55.2)	15.3	2411	(82.8)	84.7	2847	(77)	100	948	(77.1)	33.7	1870	(76.9)	66.3	2818	(77)	100
Bilateral grade 1	235	(29.7)	38.7	371	(12.7)	61.3	606	(16.3)	100	207	(16.9)	34.7	388	(16)	65.3	595	(16.3)	100
Bilateral grade 2	85	(10.7)	45.2	103	(3.5)	54.8	188	(5.1)	100	54	(4.4)	28.7	134	(5.5)	71.3	188	(5.1)	100
Bilateral grade 3	34	(4.4)	54.8	28	(1)	45.2	62	(1.6)	100	20	(1.6)	33.8	39	(1.6)	66.2	59	(1.6)	100
<b>Total</b>	<b>790</b>	<b>(100)</b>	<b>21.2</b>	<b>2913</b>	<b>(100)</b>	<b>78.8</b>	<b>3703</b>	<b>(100)</b>	<b>100</b>	<b>1229</b>	<b>(100)</b>	<b>33.5</b>	<b>2431</b>	<b>(100)</b>	<b>66.5</b>	<b>3660</b>	<b>(100)</b>	<b>100</b>
<b>Chi-square</b>	Pearson chi-square = 276.703 ( $p < 0.05$ )						Pearson chi-square = 2.386 ( $p > 0.05$ )											
<b>PS</b>	19 persons did not answer						62 persons did not answer											

Table 5 - Relationship between ear-lobe crease grading and myocardial infarct (MI) and family history of MI.

Ear-lobe crease grading	MI (+)			MI (-)			Total			Family MI (+)			Family MI (-)			Total		
	n	(%)	Line %	n	(%)	Line %	n	(%)	Line %	n	(%)	Line %	n	(%)	Line %	n	(%)	Line %
Bilateral grade 0	51	(46.8)	1.8	2743	(77.8)	98.2	2794	(76.8)	100	545	(72.6)	19.3	2278	(78)	80.7	2823	(76.9)	100
Bilateral grade 1	28	(25.7)	4.7	565	(16)	95.3	593	(16.3)	100	132	(17.6)	22	467	(16)	78	599	(16.3)	100
Bilateral grade 2	13	(11.9)	6.9	175	(5)	93.1	188	(5.2)	100	60	(8)	32	127	(4.4)	68	187	(5.1)	100
Bilateral grade 3	17	(15.6)	27.8	44	(1.2)	72.2	61	(1.7)	100	14	(1.8)	22.5	48	(1.6)	77.5	62	(1.7)	100
<b>Total</b>	<b>109</b>	<b>(100)</b>	<b>3</b>	<b>3527</b>	<b>(100)</b>	<b>97</b>	<b>3636</b>	<b>(100)</b>	<b>100</b>	<b>751</b>	<b>(100)</b>	<b>20.5</b>	<b>2920</b>	<b>(100)</b>	<b>79.5</b>	<b>3671</b>	<b>(100)</b>	<b>100</b>
<b>Chi-square</b>	Pearson chi-square = 158.946 ( $p < 0.05$ )						Pearson chi-square = 18.93 ( $p < 0.05$ )											
<b>PS</b>	86 person did not answer						51 persons did not answer											

6.2% of diabetic patients. There were statistically significant ELC prevalence in those with DM (Pearson chi-square=101.358  $p<0.05$ ) whereas no statistically significant difference was found between ELC and individuals with a positive family history of DM (Pearson chi-square=2.323  $p>0.05$ ) (Table 3).

The percentage of individuals with previously diagnosed CAD was 4.8% and the prevalence of ELC in this population was significant (Pearson chi-square=174.909  $p<0.05$ ) compared to those who had no CAD (Table 2). The ratio of individuals with HT was 21.2% and those with HT history in family were 33.5%. The former group showed higher prevalence of ELC, which is statistically significant (Pearson chi-square=276.703  $p<0.05$ ). However, there was no statistically significant difference between ELC and a positive family history of HT (Pearson chi-square=2.386  $p>0.05$ ) (Table 4).

The ratio of those individuals who suffered from MI previously was 3% whereas those who had a positive family history of MI were 20.5% and the prevalence of ELC was higher with a significant difference (Pearson chi-square=158.946  $p<0.05$ ) in those who suffered from MI previously compared to individuals who had no MI history at all. The prevalence of ELC was fairly high in people with a positive family history of MI, and showed statistically significant difference (Pearson chi-square=18.930  $p<0.05$ ) (Table 5).

**Discussion.** The association between ELC and CAD was first suggested by Frank<sup>1</sup> in 1971 who concluded that ELC was a useful marker for CAD particularly in those patients aged <60. Subsequently, several studies based on various data showed positive and some negative correlation between ELC and CAD.<sup>18-20</sup> In a study performed on a large number of patients, Davies et al<sup>21</sup> concluded that ELC has a little value as a useful clinical sign in CAD and in retinopathy in type II diabetes. However, Anderson et al<sup>22</sup> suggested that the ELC was positively related to diabetic retinopathy in a letter to Editor. Motamed and Pelekoudas<sup>23</sup> suggested that ELC was clinically valuable as a sign of the pre-CAD. Similarly Elliot and Powell<sup>24</sup> in a study of more than 200 patients from a university-based coronary care unit, concluded that ELC might help to identify the higher risk patients. A quick review of previous studies on ELC revealed that most of them are clinically based and dealt mainly with the association between ELC and cardiovascular diseases.<sup>25</sup> There are some on its association with sleep apnea syndrome,<sup>11</sup> as being an indicator of operative and coronary risk factor.<sup>9,10,12</sup> In a postmortem study, Patel et al<sup>3</sup> claimed that it may

well be important to include the ELC grading in the routine clinical examinations as sign of increased risk of atherosclerotic disease. In a similar study, Kirkham et al.<sup>26</sup> concluded again that ELCs were associated with cardiovascular causes of death.

Our work was an extensive population screening study on a heterogeneous group of people with or without DM, HT, MI and coronary heart disease in themselves and with or without a positive family history. The diagonal ELC was found statistically more in males with a BG 0 being 31% compared to 69% in females. We found a significant correlation between ELC and CAD, and the creases became more common with age. Similarly, the prevalence of ELC was higher in those with previously diagnosed as diabetic with a BG 0 being 6.2% in diabetic compared to 93.8% in non-diabetic patients. The prevalence of ELC was higher in individuals with HT as it was in those with history of MI.

Our statistical results on a large number of people with different ages and backgrounds suggest that individuals with diagonal ELC are more likely to have high blood pressure, and ELCs are closely associated with DM, MI and CAD. Consequently, the ELC would be a valuable sign for clinicians and health workers doing population screening for systemic vascular diseases. It may be important to include the ELC grade in the postmortem examination of forensic sudden death cases as a predictive sign of natural causes of death.

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