Diagonal earlobe creases and fatal cardiovascular disease: a necropsy study

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SUMMARY   The association between diagonal earlobe creases and fatal cardiovascular disease was investigated in a consecutive series of 303 coroner's necropsies. Those studied all died outside hospital in the Brighton Health District. Data were analysed on the cause of death and on the type of earlobe, the presence or absence of diagonal creases, age, sex, height, and any previous history of cardiovascular disease or diabetes mellitus. The age of nine men and six women was not known. Cardiovascular causes of death included ischaemic and hypertensive disease, calcific valvar stenosis, ruptured dissecting aneurysm of the thoracic aorta, and ruptured atheromatous aneurysm of the abdominal aorta. The mean (SD) age at death was 72 (15) and the male to female ratio was 1·3:1. Diagonal creases were present in 123 (72%) of 171 men and 88 (67%) of 132 women. A previous history of cardiovascular disease was present in 90 (30%) of the total of 303 and 74 (35%) of the 211 with diagonal creases. A cardiovascular cause of death was present in 154 (73%) of 211 with and 41 (45%) of 92 without diagonal creases and was associated with an increased risk of a cardiovascular cause of death of 1·55 in men and 1·74 in non-diabetic women.

The Emperor Hadrian probably died of cardiovascular disease. Several busts, now in European museums, show quite distinct diagonal creases on both of his earlobes.[1] Diagonal earlobe creases run from the lower pole of the external meatus, diagonally backwards to the edge of the lobe at approximately 45° (figure), and have been associated with cardiovascular disease in several clinical studies.[2-13] We studied a series of coroner's necropsy cases to see whether diagonal earlobe creases are associated with fatal cardiovascular disease.

Patients and methods

Data were collected from unselected consecutive necropsies conducted on behalf of HM Coroner on adults at the Brighton Borough Mortuary by three consultant pathologists. These people had died within the Brighton Health District in circumstances in which it was not possible to issue a death certificate. Before the pathologist arrived in the mortuary to perform the necropsy, at least two of the

three members of the mortuary staff examined the ears. They classified the earlobe as soldered, attached, or free by comparing them with figure 1 in the paper by Overfield and Call.[14] They used the definition of Brues: "The free lobe is attached only to the ear, not to the side of the face in front of and below the ear. The attached lobe blends into the back of the cheek; and soldered lobe is an extreme version of the attached form".[15] The presence or absence of a diagonal crease on one or both ears was then recorded, together with details of age, sex, and height. The presence of a crease was only recorded if an unequivocal single crease was present, running diagonally backwards and downwards across the lobe from the external meatus. A photocopy of the figure in Frank's letter was used as a standard.[2]

After performing the necropsy the pathologist recorded the principal cause of death and classified it as cardiovascular or non-cardiovascular. This was done without taking the earlobe appearances into account. The presence or absence of a history of heart disease or diabetes mellitus was recorded from information supplied by the coroner's officers from their interviews with witnesses to the deaths and with the next of kin, which included details of all prescribed or proprietary medicines found in association with the subjects.

Table 1 *Earlobe type and diagonal creases*

Lobe type	Crease	No crease	All
Soldered	7	2	9
Attached	131	65	196
Free	73	25	98
Total	211	92	303

that included the best predictors was chosen. We did not use odds ratios because approximations of relative risk when the proportion of subjects with cardiovascular disease is high tend to invalidate this approach.

Results

Data from 303 necropsies were collected. The age of 15 people was not known. The mean (SD) age of the group was 72·2 (14·7). Details of age were available for 288 people: 162 men (mean (SD) age 70·3 (12·8) and 126 women (74·6 (16·6)).

Most of the earlobes were of medium size and classified as attached; creases were slightly more common on the larger free type than on the attached type (table 1). The diagonal creases were easily recognised: the mortuary staff always agreed on whether they were present or absent. Creases were less common in those aged $\leqslant$ 55. The frequency of creases remains fairly constant with increasing age in subjects from 55 years of age upwards (table 2). The proportion of creases at necropsies in those aged $\geqslant$ 55 (191/260) was significantly higher than in the younger subjects (11/28) (74% v 39%, p < 0·001, 95% confidence interval for the difference in proportions 17% to 52%). The proportion of creases in males and females was similar (123/171 (72%) v 88/132 (67%), 95% confidence interval for the difference in proportions −5% to 16%). A history of cardiovascular disease was present in 35% (47/211)

Fig *Diagonal earlobe crease.*

We investigated the relation between earlobe crease, age at death, height at death, diabetes, earlobe type, and the ratio of risks (RR) of cardiovascular cause of death, using the method proposed by Wacholder[16] for the regression estimation of ratios of risk as defined by Armitage.[17] These risk factors were fitted simultaneously into a regression model to identify those that were significantly related to the risk of cardiovascular cause of death while keeping the effects of all other risk factors constant. A model

Table 2 *Number of people with a cardiovascular cause of death (total deaths in brackets) by age, sex, and presence or absence of a crease*

| Crease | Age | | | | | |
	<55	55–64	65–74	75–84	85+	All*
Men:						
Present	5 (7)	13 (16)	35 (45)	34 (39)	7 (10)	99 (123)
Absent	1 (8)	6 (8)	11 (14)	4 (12)	3 (3)	26 (48)
RR	5·71	1·08	0·99	2·62	0·70	1·49
(95% CI)	(0·86 to 37·9)	(0·68 to 1·72)	(0·72 to 1·36)	(1·16 to 5·87)	(0·47 to 1·05)	(1·13 to 1·96)
Women:						
Present	0 (4)	5 (9)	10 (13)	23 (36)	15 (23)	55 (88)
Absent	1 (9)	0 (1)	2 (6)	7 (15)	4 (10)	15 (44)
RR	3·85		2·31	1·37	1·63	1·83
(95% CI)	(0·53 to 27·9)		(0·72 to 7·44)	(0·76 to 2·48)	(0·72 to 3·69)	(1·18 to 2·85)

*There was no record of the age of 15 people.
CI, confidence interval; RR, ratio of risks.

Table 3 *Cardiovascular causes of death*

Principal cause of death	No
Ischaemic/hypertensive	152
Abdominal aneurysm	15
Thoracic aneurysm	10
Calcific aortic valve stenosis	10
Cor pulmonale	6
Cardiomyopathy	2
Total	195

of those with creases compared with 17% (16/92) of those without.

CAUSES OF DEATH

Cardiovascular causes of death were classified into six groups (table 3). Most deaths were the result of ischaemic and/or hypertensive disease. In addition, there were smaller groups with other principal cardiovascular causes of death; this may extend the number of possible cardiovascular conditions associated with diagonal earlobe creases.

In men, earlobe crease, diabetes, and height in those without a crease were predictive of cardiovascular death (table 4). For men of an average height at death of 175 cm the risk of a cardiovascular cause of death was 1·55 (95% confidence interval 1·15 to 2·10) times higher in those men with a crease than in those without a crease. Height was analysed as a continuous variable and did not appear to increase the risk of a cardiovascular cause of death in those men with a crease, but increasing height increased the risk in those without a crease. For women, age at death, diabetes, and creases in non-diabetics were predictive of a cardiovascular cause of death. Creases in diabetic women were not predictive. In non-diabetic women with an average age at death of 75 years the risk of cardiovascular cause of death was 1·74 (95%

Table 4 *Log relative risk estimates from the "best" models for men and women*

	Beta (log relative risk)	Standard error	p
Men:			
Crease	0·441	0·154	0·0042
*Height	0·238	0·054	0·0001
Diabetes	0·212	0·068	0·0018
Crease and height interaction	−0·249	0·066	0·0002
Women:			
Crease	0·551	0·243	0·023
*Age (linear)	0·224	0·100	0·025
*Age (quadratic)	−0·294	0·129	0·022
Diabetes	0·936	0·230	0·0001
Crease and diabetes interaction	−0·579	0·243	0·017

*Height and age were standardised to have mean zero and SD of one, separately for men and women.

confidence interval 1·08 to 2·79) times higher when a crease was present.

Discussion

In 1973 Frank drew attention to the association between diagonal earlobe creases and coronary heart disease.[2] The creases on his patients' ears were usually bilateral and were associated with an increased number of other risk factors for coronary heart disease and with premature onset of the disease. He concluded that the presence of creases was a particularly useful marker of cardiovascular disease in those aged < 60, a finding subsequently confirmed by Gral and Thornburg.[3]

Other workers have shown that up to 90% of patients with creases undergoing coronary angiography have significant disease.[4] The creases are not usually present in childhood but develop during life, are not associated with diabetes, and should be regarded as a coronary risk factor.[5] They become more common with age, with the greatest increase in the fifth decade,[6 7] and are associated with increased degrees of coronary artery sclerosis.[5]

Creases tend to develop with coronary heart disease.[3 8 9] This close relation seems to be independent of age but may be associated with a previous history of myocardial infarction. The exceptions to this are "Oriental patients, native American Indian patients, and children with Beckwith's syndrome."[10]

The possibility of an underlying genetic factor has been considered. A threefold increase in HLA-B27 has been shown and an association with the C3-F atherosclerosis gene[11] and chromosome 11[18 19] has been suggested.

In a study of Japanese and American men aged 54–70 creases were found in 30% of subjects and were associated with obesity and systemic hypertension. A relation between creases and obesity rather than between creases and coronary heart disease was inferred.[12] Others have not found an association with obesity or with smoking, raised serum cholesterol, decreased high density lipoproteins, or systemic hypertension.[13]

We found a strong association between earlobe creases and a cardiovascular cause of death in men and women after age, height, and diabetes had been controlled for. Earlobe creases did not seem to increase the risk of a cardiovascular cause of death in diabetic women. We were not able to study the effect of obesity, but we saw as many creases on thin as fat people. The excess of elderly subjects reflects the fact that this was a group of people who had died suddenly and unexpectedly while living in the community. Although some may have been receiving treatment as hospital inpatients, none was in hospital

at the time of death. In addition to coronary heart disease, we found that those with other fatal cardiovascular diseases such as ruptured aortic aneurysms also tended to have earlobe creases.

The presence of the combination of a previous history of cardiovascular disease and earlobe creases was not as strongly associated with cardiovascular causes of death as the presence of an earlobe crease alone. This suggests that cardiovascular disease was being underdiagnosed in this population. We conclude that diagonal earlobe creases are associated with cardiovascular causes of death.

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