Proportion of Diagonal Ear Lobe Crease and its Association With Sudden Death Due to Coronary Artery Disease- An Autopsy Study

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Abstract

Coronary artery disease has been a number one killer worldwide and in India it has increased phenomenally as the most important cause of sudden natural death of cardiac aetiology in the last few decades. Changing lifestyles, stress, habits, presence of other predisposing pathologies etc have played direct as well as indirect roles in its causation. Conventionally the predictors for coronary artery disease have been predominantly risk factors. Notwithstanding this, of recently a number of extra cardio vascular physical parameters like ear lobe crease have shown a reasonably promising trend in predicting the presence of coronary artery disease thereby enabling prompt intervention which in turn can reduce cardiac mortality in the long run. The present study focuses on this aspect of detecting an association between diagonal ear lobe crease and sudden death due to coronary artery disease. A total of 188 cases brought for medicolegal autopsy was studied. It has been revealed that diagonal ear lobe crease detected at autopsy has a statistically significant association with both the presence of coronary artery disease as well as the severity of atheromatous occlusion in sudden deaths. Hence diagonal ear lobe crease can have a reasonable predictive value in detecting coronary artery disease that could be used for the early detection of individuals with coronary artery disease and thus pave the way for early interventional strategies.

***Key words**: diagonal ear lobe crease, coronary artery disease, sudden death, extra cardiovascular physical predictors.*

Introudction

Atherosclerosis is a major source of disability and leading cause of mortality in India. Coronary artery atherosclerosis has resulted in millions of citizens suffering either a fatal myocardial infarction or stroke associated death [1]. Premature mortality because of cardiovascular disease in India has showed a phenomenal rise especially during the last few decades[2]. Many of these catastrophic events were in individuals free of prodromal symptoms and often without classical risk factors such as hypertension, hyperlipidemia, diabetes, tobacco use, obesity, or sedentary lifestyle. This "detection gap" has spurred clinicians to attempt to find extravascular physical signs which might identify individuals at high risk of atherosclerosis and consequent cardiac fatalities. "Frank's sign or diagonal ear-lobe crease" is found to be associated with the development of premature atherosclerosis of the coronary arteries.

It has been postulated that diagonal ear-lobe crease and coronary artery atherosclerosis originate simultaneously because the ear lobe and heart are supplied by "end arteries" without the possibility for collateral circulation.[3] Still controversies exist regarding the association between them[4]. If there is such an association, an intervention at the right time could bring down the mortality rate due to cardiovascular disease. Several studies conducted abroad have demonstrated an association between ear lobe crease and sudden death[5,6,7,8, 9]. So, this study is scientifically challenging and socially relevant to these changing times as far as cardiovascular disease and sudden death is concerned.

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Materials and Method

This was a cross sectional study conducted in the Department of Forensic Medicine, Government Medical College, Kottayam during the period from 1st March 2017 to 28th February 2018. All sudden death cases in the age group 15-60 years brought to the department for medico-legal autopsy were selected. A total of 188 such cases were studied. Relevant details of the deceased regarding the previous history of illness, details of the present illness, treatment history etc were obtained from the police and the available close relatives. All cases were studied for diagonal ear lobe crease and categorized as:

1. absent
2. unilateral
3. bilateral

Coronary arteries were examined for atheromatous thickening of the intima, calcification, any haemorrhage into the atheromatous plaque and thrombosis. Circumference of coronary artery, 5 cm distal to its origin was taken using twine and measured using Vernier callipers. Thickness of coronary artery wall was also measured using Vernier callipers. From these measurements, area of original lumen and residual lumen of coronary artery and the percentage of occlusion were calculated mathematically.

Results

Among the 188 cases studied, the greatest number of victims were in the age group of 40 to 60 years (48.94%). The youngest age to participate in the study was 18 years, whereas the eldest was 82 years. The mean age of the study sample was 50 years with a standard deviation of 14.

Of the 188 cases, 163 (86.7 %) were males and 25 (13.3 %) were females. The lowest age among the females was 32 years and the highest was 82 years. On the other hand, the lowest age among males was 18 and the highest was 82 years.

In the present study, the most common cause of death was cardiovascular disease (64.9%) and among this, coronary artery disease due to atherosclerosis accounted for 62.2%. Second commonest cause was respiratory system disorders (21.3%). Third commonest cause was central nervous system diseases (7.4%) followed by gastrointestinal system disorders (2.7%) and those related to the genito-urinary system (3.7%), which were by far the least common. Among coronary artery disease, males are mostly affected (92.3% and 96.4%) compared to female (7.7% and 3.6%) in younger and middle age groups respectively. But during old age, it was seen that the proportion of females with coronary artery disease rose to 25%. In male population incidence was more during middle age (51%) but in female population incidence was more during old age (69.2%). %).

The subjects were classified into three categories based on presence of ear lobe crease as: a. Absent. b. Unilateral ear lobe crease and c. Bilateral ear lobe crease.

Among the study group consisting of 188 cases, 53.2 % had bilateral earlobe crease, 5.3% had unilateral earlobe crease and absent ear lobe crease in 41.5 %.

Table 1: Table showing association of cause of death and diagonal earlobe crease

Earlobe crease	Coronary artery disease		Others	
	Frequency	Percentage	Frequency	Percentage
Absent	36	46.2	42	53.8
Present	81	69.2	29	26.4
Total	117	62.2	71	37.8

Diagonal Earlobe crease was present in 69.2 % cases of sudden death due to coronary artery disease and 26.4% cases of sudden death due to other causes. Statistically significant association (Chi-square – 14.666, *p value = 0.000)* was observed between the coronary artery disease and diagonal earlobe crease.

The subjects were further classified into four categories based on percentage of stenosis as follows:

1. <25% - minimal stenosis
2. 25-50% - mild stenosis
3. 50-75% - moderate stenosis
4. >75% - severe stenosis.

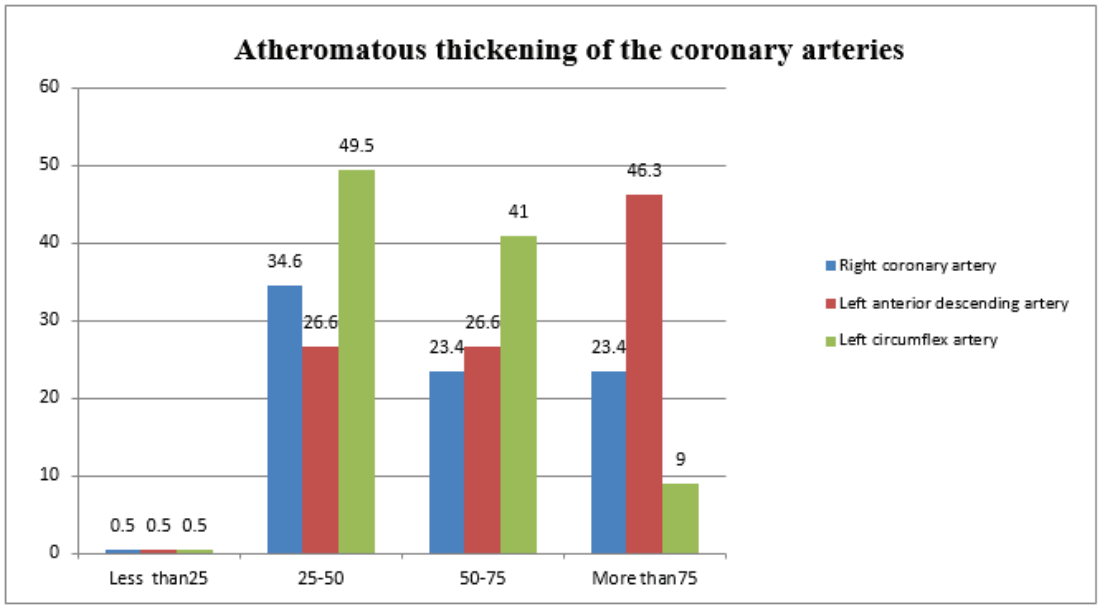

Figure 1: Showing atheromatous thickening of the coronary arteries

Table .2: Showing association of ear lobe crease and severity of occlusion

Severity of occlusion	**Diagonal ear lobe crease**			
	Absent		**present**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
<75 (Noncritical)	49	62.8	28	25.5
>75 (Critical)	29	37.2	82	74.5
Total	78	100	110	100

74.5% cases with ear lobe crease showed critical narrowing. Whereas only 25.5% of cases with ear lobe crease showed noncritical narrowing. Statistically significant association (Chi-square for trend – 26.350, *p value = 0.000)* was observed between the severity of occlusion and diagonal earlobe crease.

Discussion

Among the 188 cases studied, the greatest number of victims were in the age group 40 to 60 years (48.94%). Regarding coronary artery diseases, nearly half (47%) of cases, were present in the middle age category (40 to 60 years).

In an autopsy study conducted by Salini.R et al[10] at Government Medical College Thiruvananthapuram, maximum incidence of sudden cardiac death was found to be in the age group of 40-50 years (28.3%) followed by 27.7 % in the age group 50-60 years. Therefore, an estimated 55.3% were in the age group 40-60 years which is very close to our study. In another autopsy study by Deepu.T et al[11] at Government Medical College, Kottayam, maximum number of Sudden natural deaths due to coronary artery disease were in the 36-50-year age group (42.2%) and 33.3% in the 51-65-year age group which is again in agreement with our findings. Among coronary artery diseases, nearly half (47%) of cases were occurring in the middle-aged group. On increasing age, risk of coronary artery disease was also seen rising exponentially.

In a study by Mittal.G et al[12] conducted at Kasturba Medical College Mangalore; a male to female predisposition ratio of 7:1 was observed, which is proximate to our findings. In the autopsy study by Salini.R et al[10], among coronary artery diseases, incidence was more in males (90%), which is again consistent with findings of the present study. Incidence of coronary atherosclerosis is very high in males which may be due to high workload, stress, change in dietary habits and addictions like alcohol, drugs and smoking.

In the study group, irrespective of the cause of death 53.2 % had bilateral earlobe crease, 5.3% had unilateral earlobe crease and it was found absent in 41.5 %. As regards coronary artery disease in particular, 69.2% of them had diagonal earlobe crease. Statistically significant association (Chi-square – 14.666, *p value = 0.000)* was observed between the coronary artery disease and diagonal earlobe crease.

In an autopsy study by Kaukola et al[13], ear lobe crease was present in 66.3% of cases of occlusive coronary artery disease which is in compliance with our findings. As revealed in a British forensic necropsy study[8], proportion of diagonal earlobe crease in males and females was (72%) and (67%) which is also in agreement with our findings. In the study by Salini.R et al[10], ear lobe crease was present in 66.3% of cases of occlusive coronary artery disease and hence is not inconsistent with the present study.

Statistically significant association was also observed between the severity of occlusion and diagonal earlobe crease with 74.5% cases showing critical narrowing of the coronary arteries especially the anterior descending branch of the left coronary artery. In an autopsy study by Patel. V et al[14], sensitivity of well-defined bilateral diagonal earlobe crease for detecting severe coronary artery disease was 62.1% for men and 69.2% for women, which is in accordance with our findings. In an angiogram study by Evrengül H et al[7], there was a highly significant statistically greater prevalence of diagonal earlobe crease (51.4%) in those patients with more than 70% stenosis than in those whose angiogram was normal (15.1%), which is evidently lesser than the findings of this study.

As per the present study, horizontal ear lobe crease can be considered as a predictor for the presence of coronary artery disease.

Conclusions

The present study "Proportion of Diagonal Ear Lobe Crease and its Association with Death due to Coronary Artery Disease – An Autopsy Study" was to assess the proportion of new risk factors in coronary artery disease and whether it can predict chances of coronary artery disease so that fatalities due to cardiovascular diseases may be reduced in the future. 1. Majority of victims were in the age group of 40 to 60 years (48.94%). Among sudden deaths due to coronary artery disease, greater number of victims were present in the middle age group.

2. Males are predominantly affected in sudden death due to coronary artery disease (88.88%).

3. The most common cause of death was cardiovascular diseases (64.9%) and among this, coronary artery disease due to atherosclerosis accounted for 62.2%. Second commonest cause was respiratory system disorders (21.3%). Third commonest cause is central nervous system disorders (7.4%) followed by gastrointestinal system diseases (2.7%) and least commonly those of the genito-urinary system (3.7%).

4 Among coronary artery disease, 69.2 % of them had diagonal earlobe crease. Statistically significant association (*p value = 0.000)* was observed between coronary artery disease and diagonal earlobe crease. Diagonal ear lobe crease can be reasonably considered as a predictor for the presence of coronary artery disease.

5 74.5% cases with ear lobe crease showed critical narrowing (more than 75%). Statistically significant association (*p value = 0.000)* was observed between

the severity of occlusion and the presence of diagonal earlobe crease.

6. Among the three coronary arteries, critical narrowing (more than 75%) was mostly seen in left anterior descending artery (46.3%), followed by right coronary artery (23.4%) and least commonly in the left circumflex artery (9%).

Conflict of Interest statement: This study is an original research work and does not include issues of conflict of interests

Source of Funding: Self

Ethical Clearance: Ethical Clearance was obtained from the Institutional Review Board, Government Medical College, Kottayam.

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