

## Ear-lobe Crease: A Sign of Cerebrovascular Risk

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Received, December 10, 2008

Accepted, December 25, 2008

Cerebrovascular accident (CVA) or stroke, atherosclerotic diseases (ASD) and cardiovascular diseases (CVD) are the leading causes of morbidity and mortality in the modern world. Many epidemiological studies have been carried out so far to find out the risk factors and reliable predictors of these conditions. Many of us may not be aware of yet another possible predictor of these types of diseases, identified as an extra-cardiac physical sign “ear-lobe crease (ELC)”. The typical ELC is a deep diagonal crease extending obliquely from the lower end of tragus towards the outer inferior border of the ear-lobe covering at least two thirds of its length (**Figure 1**). ELC has been extensively studied and reported as a predictor of CVD and ASD, however, less information is available on the relationship between the ELC and stroke. As stroke and CVD share the same sets of risk factors such as hypertension, diabetes mellitus, dyslipidemia, and the systemic atherosclerosis, ELC can also be a common predictive marker of these conditions and their devastating outcomes. The importance of this very simple sign has been highlighted here along with a short review of literatures.

Atherosclerotic diseases (ASD) such as cerebrovascular accident (CVA) and cardiovascular disease (CVD) are the leading causes of morbidity and mortality in the modern world. Diagonal ear-lobe crease (ELC), a physical sign first reported more than three decades back, has been found and established as a predictor of cerebro and cardiovascular risk. However it has not received the attention and promotion it deserves.

Various studies have been reported in the world literature regarding the association of ELC with CVD and ASD. ELC is a very important, simple and a useful sign to screen the population at risk in a country like Nepal where other thorough screening tests are not always possible. Importance of this simple sign has been highlighted in this article along with a short review of literatures.

**Key words:** atherosclerosis, cardiovascular disease, cerebrovascular disease, diagonal ear-lobe crease, stroke

### Short Review of the Studies about ELC

ELC is the fold or crease in the skin of the ear lobe, which was first described by Frank ST in 1973 as a positive ear-lobe sign in the New England Journal of Medicine.<sup>12</sup> He reported it as a prominent crease in the lobule portion of the auricle and found that 19 of the 20 patients with an ELC had at least one of the known risk factors of coronary artery disease (CAD) and thus suggested it to be associated with premature cardiovascular disease. Since then there have been many other reports about ELC as a risk factor for coronary artery disease. Much recently ELC has been studied in many other aspects of atherosclerosis and cerebrovascular diseases too.

Many studies in the past have investigated the relation of ELC with CAD.<sup>1, 3, 4, 6, 8-14, 16-19, 21-25, 29, 30, 32-37</sup> Lichstein et al. studied 531 patients with CAD and reported that ELC was associated with majority of cases.<sup>25</sup> Similarly, Christiansen JS also reported that the presence of ELC is positively related to CAD, supporting the findings of Lichstein et al.<sup>4</sup> Many other studies showed the same

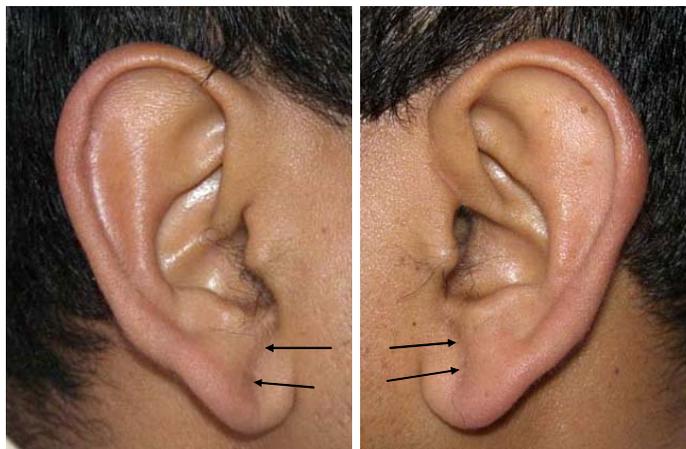


Figure 1. A typical ear-lobe crease in an asymptomatic young man with risk factors for CVD (young onset hypertension and a strong family history of coronary artery disease). Ear-canal hairs are also present.

tendency.<sup>6, 34, 16</sup> Moncada et al. studied 300 apparently healthy individuals and recorded the presence or absence of ELC.<sup>29</sup> Their results suggested that people with ELC were more commonly associated with the risk factors such as high BP, abnormal fundoscopic findings or signs of ischemia on electrocardiography (ECG) than the people without ELC.

The prevalence of ELC has been found to increase with increasing severity of CAD (as measured by the number of affected coronary vessels) and also with increasing age of the patient. Most studies in the past agreed that although the prevalence of the ELC increases with advancing age, the correlation of the ELC with coronary artery disease is independent of this phenomenon. However, some reports have tried to attribute the relation between ELC and CAD to age as solely dependent factor. Tranchesi et al. have reported significant association between ELC and CAD in quite a large sample of 1,424 patients irrespective of patient's chronological age and sex, though they also found the growing prevalence of ELC with advancing age.<sup>35</sup> Similar findings have been reported by many other investigators.<sup>4, 8, 29, 32, 28, 33</sup> Interestingly, another study has found not only the ELC to be associated with CAD but also the ear-canal hair.<sup>37</sup> In a prospective study where the patients were followed blindly for 10 years, the ELC was an independent predictor of future cardiac events and was associated in graded fashion with the number of creased ears and future risk.<sup>10</sup>

Despite many reports that correlated ELC with CAD positively, there are few studies which could not establish the same correlation between them. Mehta et al. reported no correlation between the ELC and CAD demonstrated angiographically, though a statistically significant relation between patient age and ELC was found.<sup>26, 27</sup> Similarly, Kuon et al. reported that ELC is only associated with age and overweight.<sup>21</sup> A large study in Hawaiian Japanese-Americans found a positive relation between the ELC and

obesity but not with the CAD.<sup>32</sup> Similarly, a much recent study in healthy Malay population also reported that this relation is not significant in Malay population.<sup>5</sup> Presence and significance of ELC has been sometimes reported as nonspecific in some population samples. In regards to the south Asian population, however, Verma et al. have reported ELC and ear-canal hair as significant predictors of coronary artery disease in Indian population.<sup>36</sup> These findings should be further studied and verified in our region.

Besides these epidemiological studies, many pathological and autopsy studies have also been reported about ELC.<sup>7, 9, 31, 33, 38</sup> In one study, where the ear lobe biopsy specimen from 12 patients were examined histologically, elastic fiber tear was seen in eight patients with ELC but not in the four patients without ELC.<sup>33</sup> Another study of 27 patients with ELC, showed elastin degeneration in all the cases with ELCs examined microscopically.<sup>38</sup> These histological findings of elastic fiber tear and degeneration of elastin are thought to be the result of premature aging of the skin, and it is postulated that similar premature aging of the arterial wall also occurs in the blood vessels. That is why the patients with ELC also had arterial or coronary diseases. Although intriguing, this theory needs further evidence for its verification. A necropsy study has found a strong association between ELC and cardiovascular cause of death in men and women.<sup>18</sup> Elliott et al in a prospective observational study reported that, overall cardiac morbidity as well as mortality was associated with the diagonal ELC.<sup>9</sup> In one recent forensic autopsy study of 520 cases, earlobes were studied and noted for the presence of ELC followed by examination for the cause of death and the degree of atherosclerosis in coronary arteries, cerebral arteries and aorta.<sup>7</sup> Results showed that ELC was strongly correlated with CAD in both men and women. The sensitivity of the ELC sign was 75% and positive predictive value was 68 %.

Almost all of these past studies have been carried out in respect to cardiovascular diseases. As the risk factors and predictors of CVD are equally responsible for the cerebrovascular diseases and stroke, ELC also seems to be equally important for the prediction of cerebrovascular diseases. Apart from these studies, few others have investigated the relation of ELC with other aspects of stroke and systemic atherosclerosis.<sup>2, 15, 20, 35</sup> Kobayashi et al. has reported an association of ELC with the established risk factors of atherosclerosis.<sup>20</sup> In a cross-sectional study, association of ELC with common carotid artery atherosclerosis, a surrogate marker of atherosclerotic disease, has been reported in healthy subjects.<sup>2</sup> Higuchi et al. on the other hand, investigated whether individuals with ELC have a shortened telomere, which correlates with an accelerated cell turn over and premature aging, leading to atherosclerosis. Their results suggested that ELC is a useful dermatological indicator of an accelerated aging process, as suggested by excessive telomere loss and might be a useful indirect marker of high-risk patients.<sup>15</sup>

In this regard the author of this article also investigated the correlation of ELC with carotid artery atherosclerosis in Oriental population (Japanese) and the results showed that ELC is significantly associated with carotid artery intima-media thickening as well as the atherosclerotic plaques in the carotid arteries (Unpublished data). Thus, by simply examining the ear lobe of a patient with other risk factors, CVA or CVD can be detected and prevented in advance. On the basis of most of the previous studies and also our study, it is wise to suggest that ELC should be promoted as a marker of possible atherosclerotic changes, and might serve as a reminder to those patients who might otherwise not be screened for modifiable risk factors for atherosclerosis and thus cerebrovascular disease and stroke. Therefore, it is strongly suggested that ELC is a useful predictor of cerebrovascular disease or stroke. The presence of ELC should thus be taken as a call for the thorough screening for other modifiable risk factors of cerebrovascular diseases and stroke.

### Conclusions

As ELC is a very easily detectable sign it can be promoted as a simplest index of arterial atherosclerosis hence the simplest predictor of the possible devastating consequences like stroke. It can be easily applied in any settings and even by primary level health care professionals for the screening of the patients in terms of future risk of stroke. It would be very useful for a country like Nepal where the medical facilities and manpower are limited and are clustered around the urban areas. In this regards, it should be studied in our own context and investigated and established as a simple tool especially for screening purposes.

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