

Clinical case

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DIAGONAL EARLOBE CREASE: FRANK'S SIGN IN ISCHEMIC HEART DISEASE

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The article emphasizes the necessity of meticulous physical examination of the patient in the modern clinical practice. Two clinical examples of diagonal earlobe crease, also known as Frank's sign, are given. Both cases describe patients with ischemic heart disease, but age of patients and severity of Frank's sign differ. The literature data about its frequency in different groups of population as well as the clinical significance and possible underlying pathophysiological mechanisms of Frank's are shown.

KEY WORDS: diagonal earlobe crease, Frank's sign, atherosclerosis

ДІАГОНАЛЬНА СКЛАДКА МОЧКИ ВУХА: ОЗНАКА ФРАНКА ПРИ ІШЕМІЧНІЙ ХВОРОБІ СЕРЦЯ

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У статті підкреслюється необхідність ретельного фізичного обстеження хворого в сучасній клінічній практиці. Дано два клінічні приклади діагональної складки мочки вуха, також відомої як ознака Франка. Обидва випадки описують хворих із доведеною ішемічною хворобою серця, але різного віку із різною виразністю ознаки Франка. Наведено літературні дані про її частоту в різних популяційних групах, а також клінічне значення та можливі основні патофізіологічні механізми виникнення ознаки Франка.

КЛЮЧОВІ СЛОВА: діагональна складка мочки вуха, ознака Франка, атеросклероз

ДИАГОНАЛЬНАЯ СКЛАДКА МОЧКИ УХА: ПРИЗНАК ФРАНКА ПРИ ИШЕМИЧЕСКОЙ БОЛЕЗНИ СЕРДЦА

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В статье подчеркивается необходимость тщательного физического обследования больного в современной клинической практике. Даны два клинических примера диагональной складки мочки уха, также известной как признак Франка. Оба случая описывают больных с доказанной ишемической болезнью сердца, но различного возраста и с различной выраженностью признака Франка. Приведены данные литературы о его частоте, а также о клиническом значении и возможных патофизиологических механизмах развития признака Франка.

КЛЮЧЕВЫЕ СЛОВА: диагональная складка мочки уха, признак Франка, атеросклероз

INTRODUCTION

Despite the widespread introduction of modern laboratory and instrumental methods for diagnosing cardiovascular diseases (CVD), especially of atherosclerotic origin, careful interviewing and physical examination of the patient continue to play an important role in the diagnosis of ischemic heart disease (IHD).

The physical examination of a patient with suspected atherosclerotic CVD should include an assessment of whether a patient looks younger or older than his or her actual age [1–3]. This approach assumes that the perceived age of a patient correlates with age-related disease and mortality, and thus that patients appearing older than their chronological age are more likely to have poor health status, compared with those appearing their actual age [4]. Previous studies have found that male pattern baldness, grey hair, and facial wrinkles as well as presence of arcus cornea are all markers of looking old for one's age [1, 5–7].

Earlobe crease, xanthelasmata, and arcus cornea are appearance factors, which similarly to the common age-related signs occur more frequently with increasing age. Cardiovascular disease is one of the most common age-related diseases, and also the leading cause of death worldwide [1].

According to the literature data earlobe crease (ELC) has been shown to be associated with CVD or risk factors for CVD and could be a marker of predisposition to CVD.

CLINICAL CASE

Case 1 presentation. A 61-year-old man presented to the emergency department with 5-hour burning chest pain non-responsive to sublingual nitroglycerin, irradiating to the left shoulder, associated with dyspnea. His has a history if long-standing hypertension, positive family history for hypertension and cerebrovascular disease. Physical examination noted diagonal (Frank's sign) and pre-auricular creases in both earlobes (Fig. 1).



Fig. 1. Photograph shows the diagonal earlobe and preauricular creases

An electrocardiogram revealed horizontal ST-segment depression with negative T wave in I, AVL and V5–V6 leads. Cardiac enzymes

(troponin T, MB fraction of creatine kinase) were markedly elevated. Coronary angiography revealed occlusion of marginal branch of

circumflex artery, and one stent was placed. The following diagnosis was made: IHD. Acute (13.10.2017) myocardial infarction without Q wave of the basal and lateral left ventricle wall. Occlusive atherosclerosis of circumflex artery (Corona-roangiography with stenting 13.10.2017). Essential hypertension III stage 3 grade, very high total cardiovascular risk. HF I stage with preserved systolic function II FC.

This clinical case demonstrates Frank's sign in patient slightly older than 60 years with proven CVD. Although it has limited sensitivity, the sign is more useful diagnostically in persons younger than 60 years of age than in older persons [8].

The next clinical case demonstrates this sign in older patient with proven CVD but without arterial hypertension.

Case 2 presentation. A 73-year-old man who complains of general fatigue with a past medical history of non-Q-wave myocardial infarction, confirmed by cardiac enzymes, dyslipidemia, paroxysmal form of atrial fibrillation according to results of electrocardiographic Holter monitoring is under our following-up with the diagnosis IHD. Postinfarction (non-Q-wave anterior infarction 10.09.2014) cardiosclerosis. Atrial fibrillation, paroxysmal form. EHRA I, CHA2DS2-VASc - 3, HAS-BLEED-2. HF I stage with preserved systolic function II FC. Condition after mild amiodarone-induced thyroid dysfunction with spontaneous restoration of euthyroidism. The case of amiodarone-induced thyroid dysfunction was described previously [9]. This patient was noted to have bilateral Frank's sign with 2 diagonal earlobe creases (Fig. 2).



Fig. 2. Photograph shows two diagonal earlobe creases

Both cases demonstrate an association between ELC and proven atherosclerosis of the coronary arteries regardless of patients' age. According to some literature data, the frequency of ELC has been shown to be high in patients with IHD, which was shown in our clinical cases.

DISCUSSION

In Raman study, the prevalence of ELC, a sign of coronary heart disease was observed in nearly 60 % of patients with diabetes more than 40 years old [10]. In Australia, Davis et al. [11] reported that the sensitivity and specificity of

ELC for detecting IHD were 60 % and 48 % but this sign was of little value as a sign of the presence of diabetic vascular complications. According to another study [12] of 520 forensic autopsy cases, the existence of an ELC was noted in 55 % of cases. ELC was found to be the strongest independent risk factor for coronary artery disease and sudden cardiac death apart from age and body mass index for both genders.

ELC runs from the lower pole of the external meatus, diagonally backward to the edge of the lobe at approximately 45 degrees. In 1973, Frank first reported the association of the presence of ELC with IHD [13]. It was deemed as the Frank sign. However, a consensus for the routine use of ELC in IHD patients is yet to be formed [14].

Preliminary observations by ancient Chinese traditional doctors suggesting that a ‘positive

ear-lobe sign’ is associated with the development of premature coronary artery atherosclerosis have been heralded [15–16]. Prior to Frank’s description, aficionados of Roman sculpture might have seen but not grasped the significance of busts portraying the emperor Hadrian prominently displayed bilateral ear lobe creases [17–18]. Classical writings suggest that the Roman emperor Hadrian, born in Italia, 10 km from present day Sevilla, died from congestive heart failure resulting from hypertension and coronary atherosclerosis. This diagnosis is supported by the identification of bilateral diagonal ear creases on sculptures of several busts of Hadrian as well as literary evidence of behavior pattern A. Roman portrait sculpture is considered to be highly accurate and detailed (Fig. 3) [15, 18–19].

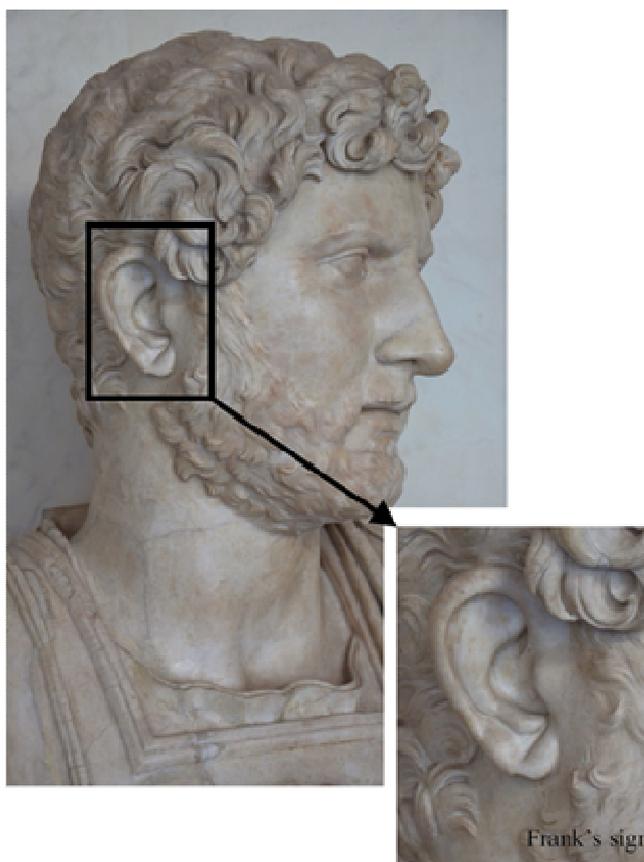


Fig.3. Colossal head of Hadrian. Rome, Vatican Museums, Pius-Clementine Museum, Round Room, 7 (Musei Vaticani, Museo Pio-Clementino) [19]

The etiologic basis of ELC is not clear and the underlying pathophysiological mechanisms are still under discussion. The suggested

explanation might include degeneration of elastin as well as unbalanced ratio of collagen to elastin, as these traits reflecting

microvascular disease were similarly seen in biopsy specimens taken from the earlobes and the coronary bed. Similarly to the heart, earlobes have an end-artery-type of microcirculation without collaterals and become quickly anoxic if end-arteries are occluded [20]. Thus, the postulated theory suggests that any pathological condition influencing the microvasculature such as IHD, diabetes mellitus, metabolic syndrome and arterial hypertension may contribute to the formation of Frank's sign [14]. Moreover, diffuse loss of elastin and elastic fibers were observed in biopsy specimens taken from earlobe creases depicting the vasculature morphology present in the coronary bed, pathognomonic of IHD. A conclusion that elastin degeneration in the skin may be a marker of abnormalities in vessel walls with similar elastic properties was made [21]. Therefore, risk factors for CVD associated with abnormal microcirculation might cause ELC due to a local microvascular alteration associated with atherosclerosis [22].

Moreover, a possible association between Frank's sign and carotid arteries atherosclerosis has been demonstrated recently by clinical, autopsy, and angiography studies though not finally confirmed. Some authors supposed that Frank's sign might be the earliest manifestation of a generalized vascular disease and subclinical atherosclerosis [23–25]. The ELC was also associated with such IHD surrogates as brachial-ankle pulse wave velocity and aortic intima-media thickness in subjects without clinically overt CVD. A common patho-physiologic relation between ELC and IHD has been shown in the molecular biology research, which may be explained by structural similarity: earlobe collagen consists of peptide chains resembling those present on scavenger macrophages receptor used for the ingestion of atheromatous cholesterol [24, 26].

The relation between Frank's sign and ageing is still controversial. The primary role of

ageing was discussed due to the rarity of ELC among infants and because Japanese male patients having ELC had shortened telomeres in peripheral white blood cells, again implicating aging [23–24]. Embryologic and vascular supply disorders are also suggested by the same genetically originated end-arterioles and similar leukocyte antigen subtypes for both ELC and coronary artery atherosclerosis [24–25, 27].

Thus the majority of clinical, angiographic and postmortem reports support the idea that ELC can be a valuable extravascular physical sign able to highlight those patients who are predisposed to atherosclerotic CVD. Along with the patient's medical history and meticulous physical examination Frank's sign may be helpful in evaluation of atherosclerotic risk.

CONCLUSIONS

The goal of any medical procedure is to achieve the best clinical result with the maximal possible improvement in the quality of life and life expectancy of the patient while minimizing the cost of evaluation. The basis of the approach is the meticulous physical examination of the patient [28].

Most cardiovascular risk factors require specific laboratory investigations (i.e. lipid profile, glucose) and might not be highly available in low or middle-income countries, where access to health resources is sometimes limited. That is why the identification of simple clinical signs associated with an increased risk of cardiovascular disease cannot be overestimated. Thus appropriate integration of patient symptoms, demographics, clinical characteristics, and examination findings remains essential for the clinician to accurately determine the likelihood of atherosclerotic cardiovascular diseases to distinguish those patients who need further meticulous investigation.

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