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Title: Auricular diagnosis in chronic illnesses

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Abstract (250 words)

Background

Given that ears are valuable tools in controlling constitutional predispositions, auricular diagnosis can be used as a complementary approach that is simple, effective, and inexpensive for identifying chronic illnesses. This diagnostic method has a pre-diagnostic value and is important in the secondary level of prevention, so that earlier treatment could be provided.

Objective

This article describes how this diagnostic method was applied in cases with coronary heart disease (CHD) or lower urinary tract symptoms (LUTS), which are common chronic illnesses among the adult population.

Design

Case-control study approach was adopted via visual inspection, electrical skin resistance measurement, and tenderness testing to investigate the auricular signals and their relationship with specific chronic illnesses.

Setting and Subjects

Subjects from the CHD positive (+ve) group (n=50) were recruited from the cardiac unit of a regional hospital in Hong Kong; whereas the subjects in the CHD negative (–ve) group (n=50) and LUTS study (n=113) were recruited from the community.

Results

In the CHD study, the presence of ear lobe crease was significantly associated with CHD. The “heart” zone of the CHD +ve cases had significantly higher conductivity and experienced significant tenderness in both ears compared with the control group. Similarly, nearly all of the specific acupoints in the participants in the LUTS +’group indicated significantly higher conductivity and tenderness sensation than those in the LUTS −ve group.

Conclusion

The predictive value of auricular signals on CHD/LUTS, which were detected by visual inspection, electrical skin resistance measurement, and tenderness testing, was observed in a Chinese population.

A systematic and scientific approach is presented using visual inspection, electrical skin resistance measurement, and tenderness testing to investigate the auricular signals and their relationship with specific chronic illnesses.

Keywords: auricular diagnosis, coronary heart disease, lower urinary tract symptoms, chronic illness.

Introduction

The ear has a reflexive property; therefore, various physical attributes may appear on the auricle when body disorders exist. These attributes include variations in shape, color, size, and sensation, appearance of papules, creases, and edema, and increased tenderness or decreased electrical conductivity.[1,2]

Frank[3] first reported the association between the presence of an ear lobe crease (ELC) and coronary heart disease (CHD). He identified diagonal creases on the ear lobes that run either unilaterally or bilaterally from the lower probe of the external auditory meatus diagonally backwards to the edge of the lobe.[4] Given

that CHD is a common medical problem worldwide, early diagnosis of CHD through a non-invasive and effective approach is necessary.

The prevalence of lower urinary tract symptoms (LUTS) is common among elderly men. It is a recent term for what was historically known as prostatism – a symptom resulting from the compression or obstruction of the urethra and irritating voiding disturbances, of which the principal underlying cause is benign prostatic hyperplasia (BPH) of the prostate gland.[5] Uroflowmetry, urine analysis, prostate-specific antigen, urinary cytology, ultrasound, imaging, cystoscopy, urodynamic pressure flow study, and measurement of the post-void residual volume are existing Western diagnostic methods.[6] However, some of these diagnostic methods for LUTS are time consuming, inefficient, inconvenient, and expensive.[7] LUTS can progress to chronic illnesses and significantly lower the quality of life of aging men.[7, 8] Therefore, simple, effective, and inexpensive methods for identifying the LUTS status of the public are necessary for early diagnosis and treatment.

Objectives

The objectives of this study are as follows:

1. To determine an ear diagnosis method for specific chronic illnesses via visual inspection, electrical skin resistance measurement, and tenderness testing.
2. To gain a better understanding of the predictive value of auricular signals among the Chinese population suffering from CHD or LUTS.

Subjects and settings

(A) CHD study

This is a case–control study in which the subjects from the CHD positive (+ve) group were recruited from the cardiac unit of a regional hospital in Hong Kong. Half of the 50 subjects suffered from acute episodes ($n = 25$), that is, newly diagnosed CHD patients (within 3 months), whereas the rest were chronic CHD cases ($n = 25$). All CHD +ve cases were compared with the community subjects without CHD, i.e. CHD negative (−ve) group. These control subjects did not have any previous medical history of CHD or any experience of having cardiac-related symptoms including palpitation, chest pain, and/or dyspnoea. The participants in the case and control groups were matched by age and gender.

(B) LUTS study

A total of 113 male participants were recruited through convenience sampling from five local elderly centers located in different districts of Hong Kong. Cases were defined as those verified as having LUTS with an International Prostate Symptom Score (IPSS) with a total score of 8 or above (moderately symptomatic) or maximum urinary flow rate (Qmax) < 15 ml/s, as measured by an uroflowmeter after screening and/or previous medical history of BPH.[9,10] Controls were defined as those who did not have LUTS using the criteria

previously mentioned. Only subjects aged 40 years or above were included in the study.

Methods of ear diagnosis

Ear diagnosis was conducted using three approaches, namely, inspection, palpation, and electrical detection. The observer was blinded to the grouping of the participants. Special auricular signals that were associated with coronary risks or LUTS were observed and recorded on both ears. The following procedures were used to assess the auricles:

a) Visual inspection

In the CHD study, discoloration, appearance of edema ripples in the “heart” region after pressing, presence of ear hair, and ELC were observed in both auricles. ELC was graded according to the system modified from Patel et al.[11]: grade 0 = no crease at all; grade 1 = any crease >0 but <=50%; grade 2=>50% but less than 100% across the lobe; grade 3 = a complete crease across the lobe that is superficial but not deep; and grade 4 = deep and prominent crease across the entire lobe. In the LUTS study, auricular signals, such as discoloration and presence of nodular scleroma, were observed in both auricles on seven specific auricular points, including the “angle of superior concha,” “middle superior concha,” “internal genitals,” “urinary bladder,” “ureter,” “kidney,” and “urethra.”

b) Electrical skin resistance measurement

An individual threshold was set for each subject before ear acupoint assessment. The threshold was obtained by placing an acupoint detector on the “Shenmen” point and increasing the detection sensitivity until the sound, lights, or visual meter on the equipment indicated high electrical conductance. The sensitivity was then slightly reduced until the “Shenmen” point was only barely detected.[2, 12] An electrical acupoint detector (Pointer Plus™) was used to measure the auricular electrical resistance in the specific acupoints under study.

c) Tenderness testing

A pressure algometer (force gauge) with a unit range of 0 g to 500 g was used to apply force in the testing regions using the “Shenmen” point as a reference. The observed value (g) was recorded each time the subject began to feel pain when the pointer of the instrument was applied on the acupoints during testing.

Ethical considerations

Ethical approval from the hospital and the universities involved were sought. Written informed consent was obtained from every eligible person who agreed to participate. The purpose and procedures of the study were explained verbally and in writing to the participants. Participation in these studies was on a voluntary basis, and all participants were assured that they have the right to refuse or withdraw from the study at any time. Personal information and data remained confidential and anonymous.

Selected findings

(A) CHD study

Among the 100 recruited participants, 50 were from a regional hospital in Hong Kong (25 acute cases and 25 chronic cases) and 50 were from the community (CHD−ve as controls). The mean age of the participants was 65.32 years (S.D. = 14.12), with 54 males and 46 females.

Auricular signals

(i) Visual inspection

The presence of ELC, which is the primary auricular signal for CHD prediction in this study, was significantly associated with CHD. More participants in the CHD +ve group showed the presence of ELC compared with those in the CHD −ve group ($p < 0.05$). More participants in the CHD +ve group also exhibited ear hair growth than those in the CHD −ve group, especially in the right ear ($p < 0.01$). Stratified analyses indicated that chronic cases had significant hair growth on the right ear.

Among these CHD +ve cases, the most commonly involved artery with blockage was the left anterior descending (75%), followed by the right coronary artery (RCA; 55.3%), left circumflex (44.7%), posterior descending artery (16.2%), and posterior lateral branch (2.6%). The degree of RCA stenosis was significantly associated with the presence of ELC on either the right ($p < 0.001$) or left ear

($p < 0.05$). The number of major epicardial arteries involved was also associated with the presence of ELC ($p < 0.01$) and edema around the “heart” zone ($p < 0.05$) in the right ear.

(ii) Electrical skin resistance measurement

The “heart” zone of the CHD +ve cases had significantly higher conductivity in both ears (i.e., less electrical skin resistance) compared with the control group ($p < 0.01$). Stratified analyses indicated a significant change in the conductivity of the “heart” zone in chronic CHD +ve cases ($p < 0.01$) but not in acute cases.

(iii) Tenderness testing

The participants in the CHD +ve group experienced significant tenderness in the “heart” region in both ears ($p < 0.001$) compared with those in the CHD −ve group. A significant relationship was noted between the average tenderness (%) in both ears ($r = 0.707$, $p < 0.001$) in cases with either acute ($p < 0.01$) or chronic condition ($p < 0.01$).

(B) LUTS study

The mean age of the participants ($n = 113$) was 74.36 years (S.D. = 7.59). All participants were men. The mean IPSS scores of participants for the LUTS +ve and LUTS −ve groups were 14.64 (S.D. = 5.93) and 3.09 (S.D. = 2.84), respectively. Statistically significant differences were observed in each domain of

the IPSS scale between groups in terms of the symptoms related to LUTS, including incomplete emptying ($p < 0.001$), frequency ($p < 0.001$), intermittency ($p < 0.001$), urgency ($p < 0.001$), weak stream ($p < 0.001$), straining ($p < 0.001$), and nocturia ($p < 0.001$). The mean Qmax of participants for the LUTS +ve and LUTS −ve groups were 8.40 ml/s (S.D. =3.45) and 17.94 ml/s (S.D. = 14.77), respectively.

Auricular signals

(i) Visual inspection

In general, no significant differences in the discoloration and the presence of nodular scleroma in specific acupoints were found between the LUTS +'ve and the LUTS −'ve groups.

(ii) Electrical skin resistance measurement

Nearly all of the specific acupoints in the participants in the LUTS +'group (except the "urethra" in both ears and the "ureter" in the left ear) indicated significantly higher conductivity than those in the LUTS −ve group. In the right ear of the participants, the electrical conductivity of the "angle of superior concha" exhibited the maximum sensitivity of 0.74 and an NPP value of 0.58. The "kidney" had a maximum specificity of 0.68 and a PPV value of 0.76 among the selected acupoints under testing. The "angle of superior concha" in the left ear indicated maximum sensitivity (0.70), PPV (0.73), and NPV (0.55) compared with the other

acupoints.

(iii) Tenderness testing

The participants in the LUTS +ve group experienced significant tenderness in almost all of the specific acupoints (except the “angle of superior concha” and the “urinary bladder” in the right ears) than those in the LUTS −ve group. The “angle of superior concha” exhibited considerable sensitivity (0.49 vs 0.58), specificity (0.73 vs 0.62), PPV (0.74 vs 0.70), and NPC (0.48 vs 0.48) in either right or left ears during tenderness testing.

Discussion

This study adopted a systematic and scientific approach using visual inspection, electrical skin resistance measurement, and tenderness testing to investigate auricular signals and their relationships with two chronic problems, namely, CHD and LUTS.

The results of the CHD study suggested that the presence of ELC, high electrical conductivity, and tenderness of the ‘heart’ region is associated with the presence of CHD. These findings could advance our knowledge on the integrated approach in combining Chinese and Western models of care for diagnosing patients with underlying CHD.

Several researchers have speculated that creasing is associated with earlobe shape, variation in age of creasing onset according to race, and variation in the

frequencies of occurrence of different earlobe shapes by race.[13] The subjects included in this study were Asian Chinese, which limits the generalizability of the findings to other populations. Given possible cultural differences in ELC presentation, further studies on earlobe creases should consider the effects of age, race, and earlobe shape on ELC prevalence.

Although retrospectively examining the auricles from the time of birth of these subjects is impossible, we speculate that the crease is not present at birth and develops later in life. However, whether or not the crease is a genetic predisposition that takes years to appear or a result of localized vascular disease and skin atrophy remains to be determined.[14] More participants in the CHD +ve group had hair growth in their ears than those in the CHD −ve group. This finding agrees well with the observations reported by Verma et al., who showed that excessive hair growth in the meatus externa has a correlation with CHD.[15]

The electrical resistance in the corresponding auricular points decreases when a disease or disorder is present in the body, and areas with lower electrical resistance than that of the standard are considered either positively or highly conductive electrical resistance points.[12] In the CHD study, a significant change was observed in the conductivity of the “heart” zone in chronic CHD +ve cases but not in acute cases. The change in electrical conductivity of acupoints may need some time to develop and is present when the disease progresses.

The degree of acupoint tenderness is usually associated with the severity of the condition; the more sensitive the point, the more severe the disorder.[2,16] Among the three examination methods adopted in the CHD study, tenderness testing of the "heart" zone had the highest sensitivity (92.0%) and the highest positive predictive value (78.6%) for the prediction of CHD status.

In the LUTS study, visual inspection of the acupoints under testing may not be a reliable measure in detecting LUTS status. However, nearly all of the specific acupoints on the participants in the LUTS +ve group indicated significantly higher conductivity than those in the LUTS −ve group. In addition, the participants in the LUTS +ve group experienced significant tenderness in almost all of the specific acupoints compared with those in the LUTS −ve group in both ears. While LUTS do not pose threats of serious illnesses or degradation of the physical integrity of elderly men, the effect of LUTS on increased risk of falls and fall-related injuries, increased risk of emotional and psychological problems, and diminished quality of life of those affected should not be undermined.

Implications of findings

The results of this study can improve our knowledge on the association between specific auricular reflective signs and certain chronic illnesses. Auricular diagnosis has a pre-diagnostic value and is important in the secondary level of prevention. Prognosis may be improved by early preventive measures if chronic conditions can be identified at an earlier stage.

Auricles examination may be integrated into routine clinical examination of a patient to increase the predictive accuracy of the underlying problems for earlier introduction of preventive measures before the disease advances. Given that the ear is a valuable tool in indicating constitutional predispositions, the use of auricular diagnosis, if found effective, can be used as a complementary approach. This diagnosis is simple, effective, and inexpensive for identifying patients with medical problems.

Limitations of the study

This study suggests the association between ELC and CHD, but the mechanisms leading to the concurrent development of ELC and CHD and the time of onset remain unknown. A future prospective cohort study could be conducted to follow up newly diagnosed medical illnesses and identify changes in the auricular signals that may have appeared during disease progression. These studies were conducted on a relatively small sample. Therefore, further investigations must be performed with a larger sample to validate the use of auricular signs as predictors that assist in CHD/LUTS diagnosis. The auricular signals may be governed by ethnical differences; more investigations are required before these results can be extrapolated to other ethnic groups.

Conclusion

The predictive value of auricular signals on CHD/LUTS, which were detected by visual inspection, electrical skin resistance measurement, and tenderness testing, was observed in a Chinese population. The findings obtained can improve our knowledge on an integrated approach that combines Chinese and Western models of care to diagnose patients with these underlying conditions. Further studies should be conducted to ascertain the diagnostic value of AT on more chronic conditions and with a larger sample.

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Author Disclosure Statement

No competing financial interests exist.

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