THE USE OF EXAMINATION ON AURICULAR ACUPUNCTURE ZONES AS HEALTH SCREENING TEST

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The Use of Examination on Auricular Acupuncture Zones as Health Screening Test

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CERTIFICATE OF ORIGINALITY

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Abstract

Theory on auricular acupuncture (AA) suggests that different body areas can be reflected on the external ear as a homunculus. Researches on auricular acupuncture were mostly conducted to examine its treatment effect, but its role of being a complementary diagnostic tool has been overlooked. This study aimed to investigate the accuracy of using auricular examination for screening hepatic, renal and lumbar spine disorders.

Subjects, aged from 18-60 years old, were recruited from hospitals and the general population. They were classified into the patients and healthy subjects of three groups, namely liver, kidney and lumbar groups. Each subject received three auricular examination (AE) methods including visual inspection, electrical skin resistance measurement and tenderness testing on the respective AA zones of both ears. The results of auricular examinations were compared to the clinical tests adopted by Western medicine including the blood test on liver function and renal function, plus the Aberdeen Back Pain Scale, which served as the diagnostic evaluations for the liver, kidney and lumbar groups respectively.

A total of 169 subjects were recruited. Forty-five subjects were recruited in the liver group; 52 subjects in the kidney group; and 72 subjects in the lumbar group. Visual inspection on the AA zones demonstrated that significant difference were found between the patients and the healthy subjects in all the three groups (all $p<0.05$). The sensitivity ranged from 0.64 to 0.80 and specificity ranged between 0.60 to 0.76 in the liver and the kidney groups. The sensitivity and specificity in the lumbar group ranged 0.35 to 0.56 and 0.79 to 0.89 respectively. Visual inspection demonstrated acceptable sensitivity and specificity in screening hepatic and renal disorders primarily. It suggests that mal-function of liver and kidneys is reflected by

the presence of morphological changes on its corresponding AA zones. However, its low sensitivity indicates that it is not a satisfactory clinical test in detecting lumbar problem.

For electrical skin resistance on the AA zones, significant difference was found between the patient and healthy subjects in the liver group, the in-patients versus out-patients and the in-patients versus healthy subjects in the lumbar group (all $p<0.05$). The electrical skin resistance of the patients was lower than the healthy subjects. That means, subjects with more severe low back pain and subjects suffer from hepatic disorders can be differentiated from those who are free from these disorders by showing lower electrical skin resistance on the corresponding AA zone. On the other hand, no significant difference in electrical skin resistance was found between the patients and healthy subjects in the renal group and the out-patients versus healthy subjects in the lumbar group ($p>0.05$). It seems that measurement of electrical skin resistance is not sensitive enough to pick up people with comparatively mild low back pain and people suffer from renal diseases.

In the tenderness testing, no significant difference was shown in any of the three groups (all $p>0.05$). Its sensitivity ranged from 0.23 to 0.50 and the specificity lied between 0.63 and 0.80. The sensitivity of tenderness testing on AA zones showed that this is a weak clinical examination in screening hepatic, renal or lumbar disorders. Pain perception is a very subjective measurement, and it may be a limitation of the tenderness testing.

Moderate correlation (r=0.4 - 0.56) between the (L) and the (R) ear was found among the results of most of the AE. Nevertheless, the correlation among various auricular examinations was weak (r=0.04 – 0.29). The three AE adopted in this study showed different findings in various groups. It may suggest that individual AE has its own importance in examining specific disorders.

Acknowledgements

I give thanks to the Lord with my grateful heart. HE turned weak into strong, made what seemed impossible possible. It was in God's love and guidance that I finished this tough work.

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List of Abbreviation

AA – Auricular acupuncture

AE – Auricular examination

ABPS – Aberdeen Back Pain Scale

ISAP - International Standardization of Auricular Points

TCM – Traditional Chinese Medicine

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Chapter 1

Introduction & Literature Review

Acupuncture – wisdom from experience of Chinese ancestors. It has the history of over 2000 years and yet, there is much to be explored nowadays. Its therapeutic effects are gaining more and more recognition all around the world. Not only Chinese clinicians practice acupuncture, but also numerous Western practitioners do. As acupuncture is becoming more well known, more research are being conducted to explore its scientific evidence. Does acupuncture really work? How does it work?

1.1. History of auricular acupuncture

Apart from the body acupuncture, there are several micro-systems of acupuncture. Micro-systems imply that circumscribed body area reflects different parts of the whole body. The arrangement of the reflections may not be in scale to the body but usually they are in a systematic order. It is mainly for diagnostic and therapeutic purposes. Auricular acupuncture (AA) is one of those micro-systems.

AA was first notated in “The Yellow Emperor’s Classic of Internal Medicine”. It stated the relationship between the auricle, meridians and the internal organs. The use of AA for making diagnosis and treatment could also be found in this classic literature which was written thousand years ago. Besides, literature on ear stimulation for health problems could be found in ancient Egypt, Greece and Rome (Oleson, 2003). However, it was not until 1950s AA was developed in a more

systemic and scientific way. It was proposed by a French physician, Paul Nogier in 1957 that certain points on our auricle could reflect different regions of the body in a specific order (Nogier, 1972). The order is presented in the form of an inverted foetus with the head towards the ear lobe, the trunk in the middle and the legs towards the upper rim of the auricle. (Fig 1.1)

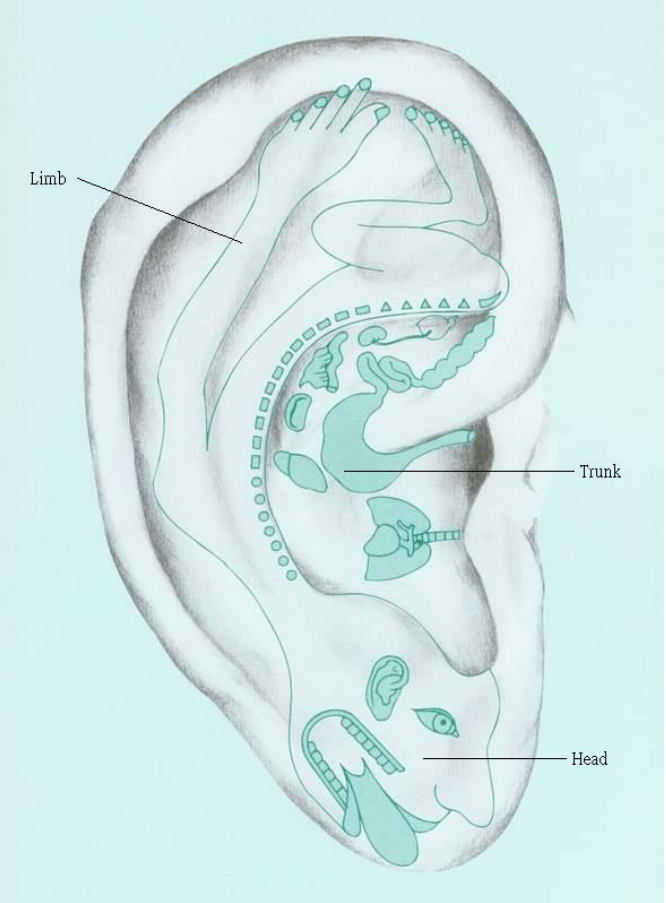


Fig 1.1 Inverted foetus model by Paul Nogier (adapted from Rubach, 2001)

Both Western and Chinese clinicians or scientists tried to develop AA in a more contemporary and scientific way since Nogier's discovery. Oleson et al (1980) had a study on somatotopic mapping of musculoskeletal areas at AA zones. It tested the reactivity of the AA zones by the electrical conductivity and tenderness on the subjects who were suffering from any of the 12 areas of the body including back, upper and lower limbs. It resulted in 75.2% concordance between the area of musculoskeletal pain and auricular diagnosis. The mapping agreed well with

Nogier's postulation. When Chinese practitioners learned about the modern AA from Europe, the concept and application of AA was reviewed and massive studies were carried out in China.

Due to the rapid development of AA, more and more AA zones were identified and named by various people all around the world. However, there was a lack of standardization. There were mainly two streams in ear charts, Oriental and Western. In 1982, World Health Organization regional office for the Western Pacific entrusted China to draft the "International Standardization of Auricular Points" (ISAP). Conferences on auricular nomenclature were held in China, Korea and the Philippines from 1985 to 1989. The WHO working group finally came to a consensus in the AA zones identification at the 1990 meeting in France (WHO, 1990). Thirty-nine AA zones were discussed and adopted in the meeting. The adoption of the AA zones was based on three main criteria:

i. Had international and common names in use

ii. Had well proven therapeutic values

iii. Its location on the auricle appeared to be well accepted

There were 36 AA zones which did not meet the above three criteria and were therefore not adopted. In light of the incomplete acceptance of the whole ear chart, the China government standardized its own national auricular zones nomenclature

with 91 AA zones in 1992 which is commonly used in China currently. The national standardized ear chart was based on the recommendation forwarded by the 1990 WHO working group. Meanwhile, scientists led by Oleson in the States developed another system of auricular divisions which is well known in the Western practice. Up to date, neither the Western nor Oriental ear chart is recognized world wide.

1.2. Clinical application of auricular acupuncture

"The Yellow Emperor's Classic of Internal Medicine" stated that function of the kidney could be evaluated by the appearance of the external ear. It was the first available record that noted the use of AA for making clinical diagnosis. It also discussed about applying stimulation on the external ear as a treatment. For example, blood-pricking on the auricle was quoted as a treatment. History of AA as a treatment tool was also found in some other literature in ancient China (黃, 2000). When it comes to modern scientific research, most of the researches focused on its therapeutic effect. Only a few researchers investigated the diagnostic accuracy of AA.

1.2.1. Treatment

There are a number of advantages of AA over body acupuncture. Unlike body acupuncture, AA does not require the patient to undress or expose any of the body

parts for treatment. This brings convenience and avoids embarrassment between patients and clinicians. AA is another excellent choice of treatment for people who are scared of piercing needles into the body. It could be carried out non-invasively by the use of auricular seeds. The risk of getting infection is thus much reduced. For patients who have difficulties in bed mobility, AA is much more convenient to apply than body acupuncture. The patients can just simply lie on either their back or sides to receive AA treatment.

AA is used for a wide scope of clinical conditions such as substance abuse withdrawal, analgesia, weight reduction or sleep promotion. In a study investigating the analgesic effect of AA, 90 patients suffering from cancer pain had undergone auricular treatment regime (Alimi et al, 2003). Patients were divided into 3 groups of receiving genuine AA, receiving AA on placebo points and having auricular seeds on placebo points. All patients received their respective treatment for 2 months. Each patient had either needles inserted or seeds fixed on the AA zones on a monthly basis and the implant stayed there until the next evaluation. Visual analog score (VAS) was used to evaluate the pain level. It was found that patients receiving genuine AA attained a 36% decrease in VAS score at 2 months whereas the 2 placebo groups only showed a 2% change. Statistical significant difference was found between the genuine AA group and the 2 placebo groups ($p<0.0001$).

A study on sleep promotion also achieved encouraging results (易, 2004). Among the 33 patients complaining of insomnia, they all received AA with seeds fixed on the AA zones for 10 days. Over 90% of the patients either fully recovered from insomnia or had obvious improvement in sleeping. Nevertheless, the definition of “obvious improvement” was not clearly stated in the paper. This makes it difficult to justify the conclusion of the study.

Another research studied the effectiveness of AA treatment on cocaine addiction (Avants, 2000). 82 cocaine-dependent subjects were recruited and were randomly assigned to either of the 3 groups: AA group, needle-insertion control group and no-needle relaxation group. Treatment sessions were provided 5 times weekly to the subjects recruited. After receiving the treatment for 8 weeks, 52 subjects completed the study. Their urine test showed that the subjects in AA group were significantly more likely to have cocaine-negative results ($p \leqslant 0.05$) as compared to the other 2 control groups.

It seems that most of the researches on AA treatment efficacy yielded promising results. It has given AA a sound foundation for future development.

1.2.2. Diagnosis

Body acupuncture works on the meridians basis. It helps to restore the balance between Yin and Yang in order to promote health. Individual acupuncture points do

not necessarily have any role in reflecting health status. However, AA works on a microsystem. Changes in the AA zones may reflect the status of the corresponding body areas. This characteristic added on the value of AA as a diagnostic tool. AA pioneers claimed that they were able to identify the physical condition through simple auricular examination in ancient time. Nowadays, more detailed auricular assessments have been developed over the years. Its use for diagnostic purpose is gaining popularity rapidly in recent years, and is predicted to be developed further in the future (管, 1995). Auricular assessments usually include visual inspection, detection of electricity property, testing of tenderness spots, staining, etc (王&崇, 1988).

1.2.2.1. Visual inspection

Auricular observation for shape, color change, abundance of capillaries, appearance of papules, desquamation is included in the assessment. Various morphological changes may suggest different pathological changes. For instance, groove may suggest heart problem; erythema suggest heat, inflammatory or acute disease; dark spots suggest stagnant blood; whiteness suggest chronic disease; scaly skin or desquamation suggest dermal disease (Abbate, 2004; 黃, 2000).

Quite a number of clinical reports in China recognized its diagnostic

efficacy. For example, a study tested the diagnostic accuracy of silicosis by auricular visual inspection on lung AA zone (向&唐, 1984). Among the 223 subjects, 73.5% subjects in the patient group were found to have positive findings on auricular visual inspection compared with 14% in the control group. The between-group difference reached significance (p<0.01).

Auricular inspection as an accessory diagnosis of patients with stomach cancer also reported an extremely high sensitivity (Chen, 1993). The inspection observed the presence of white or brown plum blossom-like pits on the stomach AA zone as an indicator of stomach cancer. A diagnostic accuracy of 98% was reported among 147 subjects with 22 patients in the group.

Though these clinical reports claimed high diagnostic accuracy by visual inspection, the methodologies adopted were not well documented. Owing to this weakness, the statements of these studies were less convincing.

1.2.2.2. Electrical property

Measuring the electricity property of AA zone is a more objective assessment tool. From the auriculotherapy point of view, pathological change of a body area could be reflected by increased skin conductivity on its corresponding AA zone. Research on cardiac patients showed that 19 out of 20 patients had a positive 10μA or more deflection of current at the “heart” AA

zone while none of the 30 healthy subjects showed any positive findings (Ong, 1980). This finding agreed with the belief that an increase in electricity conductivity and a decrease in electrical resistance can be found on a specific AA zone that reflects corresponding somatotopic pathological changes.

1.2.2.3. Testing of tender spots

Testing on tenderness level of AA zones is a common practice to localize the origin of the disease and the area to be selected as treatment zones. AA practitioners believe that pain threshold of AA zone would decrease with pathology in the corresponding body region. 黃 (2000) suggested that the lower pain threshold at the corresponding AA zone, the more severe the pathological change is.

Though testing of tenderness is commonly used in clinical setting, research on it was rare. Among the few studies available, one of the study investigating AA diagnostic accuracy on thyroid disease showed a positive result (魏 & 繆, 1994). The study carried out assessment of electrical resistance and tenderness level on AA zones on the 2 groups of subjects, patient group and control group. The results showed that 80% of the subjects suffering from thyroid disease reported tenderness on palpation at the thyroid AA zone whereas only 6% of the subjects in the control group reported tenderness at the same AA zone

(p<0.001). The tenderness level measured in the study was judged by subjective complain and reactions like frowning, screaming, withdrawal of the subjects. As every individual would have different pain thresholds and one subject would react differently towards the same intensity of pain from another one, the design of this study was not objective enough.

1.2.2.4. Staining

Auricular staining is an auricular diagnostic tool invented by Chinese practitioners, Guan Zunxin and his group in 1980s. It observes the absorption of staining on AA zones after dyeing with a chemical mixture of crystal violet and Eriochrome black T as the main components. They proposed that AA zone corresponding to the body area with dysfunction would be more heavily stained than the rest of the auricle. Guan carried out a series of clinical studies to investigate the diagnostic accuracy of this staining technique and showed outstanding results (管, 1986). He reported that 95% accuracy in diagnosing silicosis was achieved in his study and statistical difference (p<0.01) was found in staining between patients with gastrointestinal diseases and the control group. Most of the research on staining was conducted by the same working group.

1.3. Theoretical perspectives of auricular acupuncture

There are a number of understandings of AA from different schools of thoughts. This dissertation will focus on several theories which are more well known**.**

1.3.1. Homuncular Reflex Theory

Ying-Qing Zhang from China discovered that the second metacarpal and even any of the peripheral long bones can be a homunculus in 1973 (黃, 2000). Later on, Ralph Alan Dale from the States also claimed that every part of the gross anatomy including the ear could be a reflective microsystem of the entire body in 1976 (Oleson, 2003). The micro-acupuncture systems postulated were identified in the ear, eye, tongue, hand, foot, face, abdominals and even every long bone of the body. Basically, it was suggested that every microsystem replicates the arrangement of the body and is connected to the somatotopic, neurological reflex in the brain via spinal cord. Information and stimulus from the body part can be sent to the homunculus via the path and vice versa. As the connection is bi-directional, the microsystems are able to serve both diagnostic and therapeutic purposes.

1.3.2. Embryological Theory

This theory was proposed by Dr. Nogier. The development of the external ear starts as early as the sixth week of embryogenesis (Rubach, 2001). Dr. Nogier noted that all the three embryonal germ layers (ectoderm, mesoderm and endoderm), from

which all the body tissues are derived, could be found on the auricle with the distribution shown on Fig 1.2. He suggested that each of the embryonal germ layers on the ear represents different somatotopic areas in the way similar to the inverted foetus pattern that he postulated.

Ectodermal tissue (superficial tissue) is found mainly on the lower part of the ear. Ectoderm-derived body components include brain, nervous system, skin, teeth, etc. Mesodermal tissue (middle tissue) is found mainly on the upper half of the ear and it develops into skeleton, muscles, urogenital organs, etc. Endodermal tissue (deep tissue) occupied the valley in the middle of ear. Most of the internal organs such as gastrointestinal system, respiratory system, thyroid glands and thymus gland are derived from it.

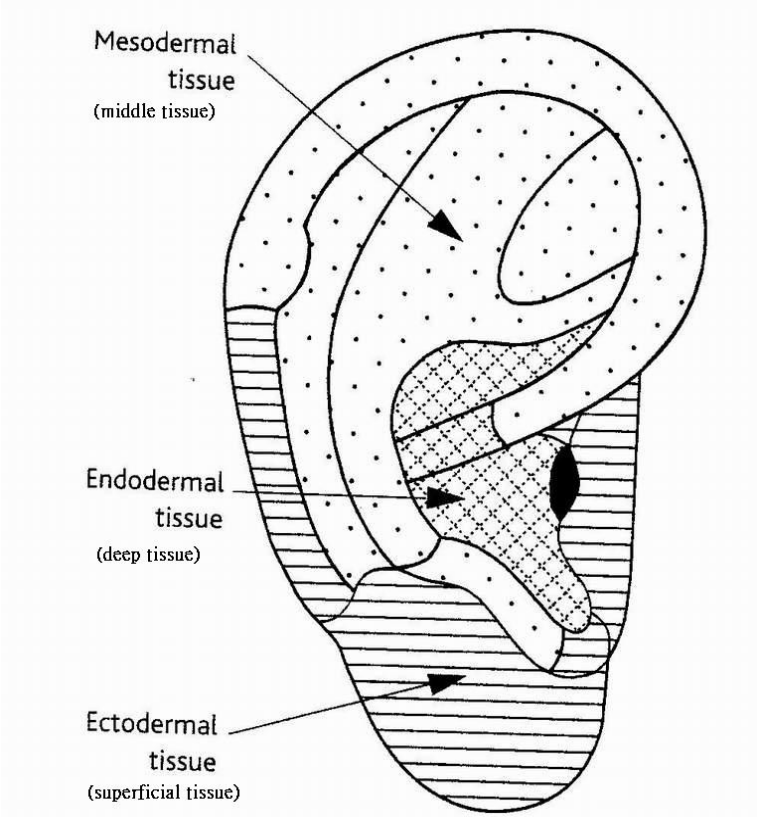


Fig 1.2 Embryonal germ layers on ear (adapted from Oleson, 2003)

1.3.3. Meridian Theory

One of the most important concepts in Traditional Chinese Medicine is Qi, the flow of energy. Qi can be presented in different forms. For instance, qi runs through our body along meridians. Sufficiency and balance of Yin and Yang qi determine one's health condition. According to the distribution of the six Yang meridians and description in the Yellow Emperor's Internal Medicine, all the six Yang meridians pass through the ear. Meanwhile, the other six Yin meridians connect to the Yang meridians through lateral channels or vessels. It is believed that functioning of different body parts could be reflected on the ear by any change of qi due to the close relationship between the ear and the meridians. It was quoted in some of the publications that stimulation on AA zones would give somatic sensation along its corresponding meridians (Liu & Zhao, 1995; 黃, 2000).

1.4. Rationale and objectives of the study

A timely, accurate and precise diagnosis is a crucial factor for prescribing the right treatment so as to achieve the best therapeutic efficacy. Nevertheless, conditions related to internal medicine may not be detected in their early stage. Some may even require complicated, expensive or invasive investigation techniques such as Magnetic Resonance Imaging (MRI), endoscopy, biopsy, blood test for

making an accurate diagnosis. A simple, non-invasive, convenient, and economical clinical examination is potentially very useful for health screening and prophylactic purposes. This may reduce the cost of primary care and even prevent patient from any delay of receiving treatment owing to late detection of the corresponding disease.

Among different kinds of alternative medicine, examination of AA zones is a simple, convenient and inexpensive diagnostic tool. Considering this, AA has a high potential to be an ideal diagnostic tool for health screening and prophylactic purposes. A number of clinical reports on AA diagnostic accuracy are available in China and most of them reported high accuracy. However, the methodology and justification of the study were not clearly defined on most of the papers as discussed in previous sections. The lack of validity of the study and thus, weakened the strength of the statements. This study was to explore auriculotherapy in a more scientific way and tried to give a better documented study. It aimed to examine the accuracy of using AA zones as a complementary clinical diagnostic tool. Specific objectives were to investigate:

i. the accuracy and precision in using AA zone examination as a screening test for the liver, kidney, lungs and lumbar spine.

ii. the correlation between the results of AA zone examination on the left and the right ear.

iii. the correlation among the examination procedures of AA zone assessment.

Chapter 2

Instrumentation & Reliability

A pilot study was carried out before implementing the main study. The pilot study mainly served 2 purposes:

i. To investigate the inter- and intra-rater reliability of the auricular examinations (AE).

ii. To conduct a trial run of the procedures for the main study and to determine whether modification would be needed in the main study.

Approval was obtained from the Research Ethical Committee of the Hong Kong Polytechnic University for the whole study.

2.1. Methodology

The pilot study was carried out in a private integrated out-patient clinic. Subjects from the general population were recruited through advertisements posted on the flyers of the clinic. After written consent was obtained, medical history and current health status of the subjects were obtained. Then, a series of AE, which is to be elaborated in later section, was done on both ears of the subjects by one examiner and then repeated by another examiner. One of the examiners was the main investigator of the main study while the other one was a licensed Traditional Chinese Medicine (TCM) practitioner in the clinic. Both examiners were blinded from knowing the health status of the subjects. Upon finishing the AE, subjects were randomly assigned to receive a specific laboratory test for testing the presence

of one of the four disorders, namely hepatic, renal, pulmonary and lumbar disorders, being investigated randomly.

2.1.1. Auricular acupuncture zones

Based on the anatomical structure of the external ear, its antero-lateral surface was divided into several regions. Main regions include helix, scapha, antihelix, triangular fossa, concha, tragus, antitragus and lobule (Fig 2.1).

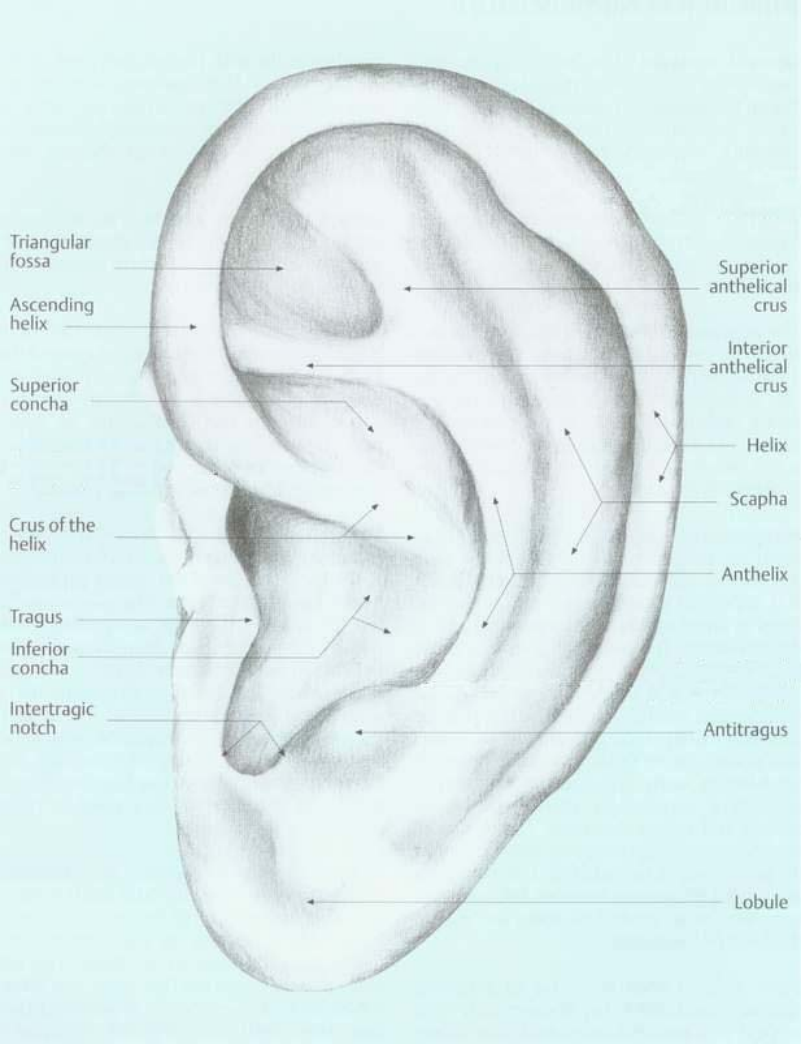


Fig 2.1 Anatomical structure of ear (adapted from Rubach 2001)

Four specific zones on the antero-lateral surface of the external ear that represent liver (CO12), kidney (CO10), lungs (CO14), and lumbar spine (AH9) were identified based on the Chinese national standardization of auricular acupuncture zones (管, 1995) for AE (Fig 2.2):

1. *Liver (CO12)*

   On the posterior and inferior portion of the superior half of concha, toward the antihelix

2. *Kidney (CO10)*

   On the superior concha, inferior to the intersection of superior and inferior crus of antihelix

3. *Lungs (CO14)*

   Covers most of the area on the inferior concha except the central cave and area between the central cave and the auditory canal

4. *Lumbar (AH9)*

   On the posterior and superior 2/5 portion of the antihelix

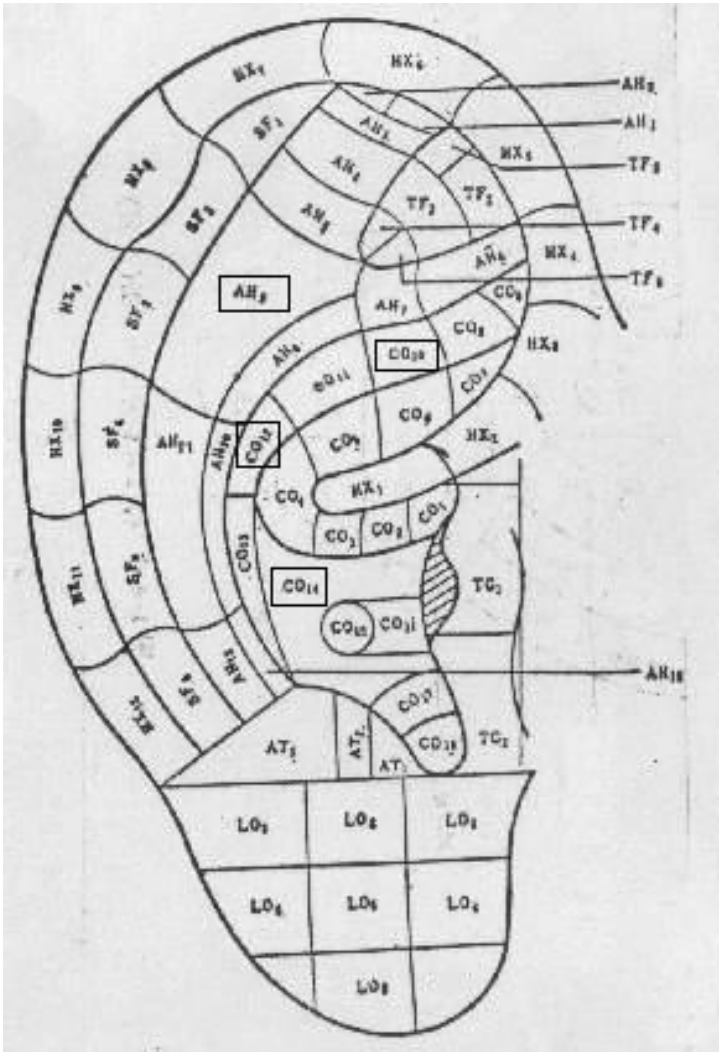
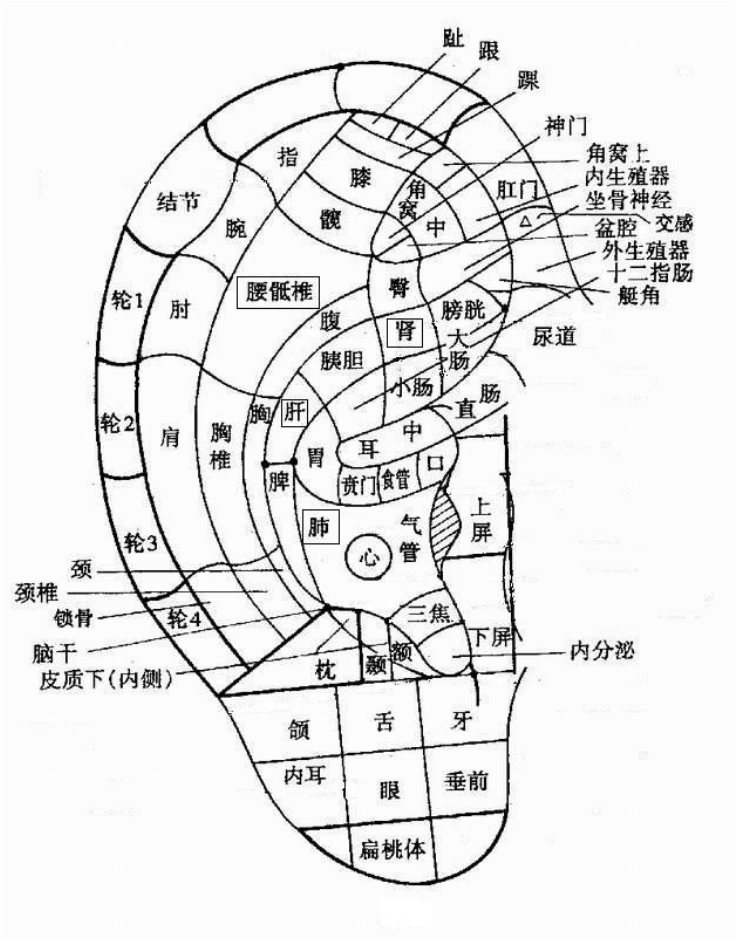


Fig 2.2 Distribution of AA zones according to the Chinese national standardization (adapted from 管,1995)



2.1.2. Auricular examinations

2.1.2.1. Visual inspection

The inspection involved an eye-balling observation of the external ear to see whether there was any special feature in four aspects: skin color, shape (e.g. tiny nodule, dumping, etc), abundance of capillary and desquamation on each of the four AA zones. Both of the ears would be assessed under room light. Three levels of measurement were used for the changes in each aspect with score "0" represented no change, "1" represented mild change and "2" represents severe change. Total score added up from the four aspects of special features on each zone of each ear ranged from 0 – 8.

2.1.2.2. Electrical skin resistance measurement

For testing electrical property on AA zones, the electrical resistance on the skin of the external ear was detected by an ohmmeter (Fig 2.3) with 2 pointer-electrodes. The AA zone Sanjiao (CO17), which is located inferior and posterior to the auditory canal, just inferior to AA zone of the

Fig 2.3 Ohmmeter

lung (Fig. 2.2), was chosen for the placement of the inactive pole. Sanjiao zone was chosen because it reflects the general condition of the trunk according to the traditional Chinese medicine. The inactive electrode was lightly touched on the AA zone Sanjiao and the active electrode was lightly touched on the AA zone being measured. The pressure applied onto the AA zones was sustained as a light touch which was just enough to detect the reading. The electrical resistance was recorded in terms of MΩ after it was detected and the light touch of electrodes was sustained for 10s to produce a steady reading in the ohmmeter. Measurement at each AA zone was repeated for 3 times and the average electrical skin resistance of the 3 trials was calculated.

2.1.2.3. Tenderness testing

The AA zone Sanjiao (CO17) was selected as the reference AA zone. Pain threshold at Sanjiao zone was measured by the use of a pressure algometer (Fig 2.4) with a pointer of 0.25mm radius. The force required to trigger pain threshold at Sanjiao zone would be below 5N and it was used as a reference value and the same force was applied onto other AA zones being tested. The subject was then asked to grade the relative intensity of pain as compared to the reference point. Score "0" referred to less pain / more or less the same pain

as the reference zone. Score "1" was a bit more painful than the reference zone and Score "2" was significantly more painful than the reference zone. Each AA zone was tested 2 times for determining intra-rater reliability.

Fig. 2.4 Algometer

2.1.2.4. Staining

This part of AE was done according to the technique introduced by Guan Zunxin (管, 1995). The specific AA zones were first cleansed by 5% sodium bicarbonate, 0.25% potassium permanganate, 5% oxalic acid and distilled water. A mixture dye with the composition of 0.2g Eriochrome black T, 1g crystal violet, 2ml aniline and 98ml 95% alcohol was smeared onto the AA zones twice. The dye was allowed to stay for 30 seconds. It was then washed out by 5ml of 95% alcohol and dried by cotton wool. The amount of staining remained on the AA zones was inspected. Score "0" was graded for no observable staining remained at all, "1" for mild staining and "2" for obvious staining.

Visual inspection, electrical skin resistance and tenderness testing was done by one investigator and then repeated by another investigator before proceeding to the next part of the AE. Both of the investigators were blinded from knowing the results done by the other investigator.

Concerning the part of staining, it was not feasible to repeat the same test twice on the same day. Once the stain was applied on the AA zones, it could not be completely washed out immediately. Thus, instead of repeating the technique on the same subject by two investigators, the staining technique was carried out on the subject only by either investigator at one time. Both of the investigators would then grade the scores individually without any discussion.

2.1.3. Laboratory tests

Four clinical tests that are commonly used in the western medicine were selected as the main diagnostic tests for the four organs or body area (liver, kidneys, lungs and lumbar spine) being studied. They are correspondingly named as:

2.1.3.1. Liver function test

Liver function test is a routine blood test for screening general liver function. It consists of several items. Among those, the most important items reflecting general liver function are alkaline phosphate (ALP), aspartate

aminotransferase (AST) and alanine aminotransferase (ALT). These 3 items would be the markers used in this study to illustrate if the liver function is normal.

2.1.3.2. Renal function test

Renal function test is a commonly used blood test in clinical setting to check general renal function. Creatinine level is the key factor to determine the renal function status in this blood test. Therefore, the creatinine level was used to evaluate the renal function in this study.

2.1.3.3. Chest X-Ray

Chest X-Ray is probably the most popular front line screening test for chest disorders. Arterial blood gas, bronchoscopy and lung biopsy can tell a more precise diagnosis to some of the pulmonary pathologies. However, these are invasive investigations and thus, not preferred to be used in this study. Another pulmonary diagnostic test, high resolution computer tomography is more advanced to pick up morphological changes in the lungs. Nevertheless, its expensive cost makes it less commonly used. Owing to the limiting factors of these pulmonary tests, chest X-Ray, that is non-invasive and with low cost, is the comparatively more favourable diagnostic test to be used in this study.

2.1.3.4. Lumbar X-Ray

X-Ray, Computer tomography (CT scan) and Magnetic Resonance Imaging (MRI) are the popular diagnostic tests used for lumbar disorders. CT scan and MRI are sophisticated techniques for investigating lumbar disorders. However, the cost is expensive, its availability is poor and it is time consuming to carry out the procedure. Concerning these constrains, lumbar X-Ray was preferred to be used as the diagnostic test for lumbar group in this study.

2.2. Results

10 subjects, 4 male and 6 female, were recruited. The mean age was 39 years old with standard deviation of 7.0 years old.

2.2.1. Visual inspection

2.2.1.1. Inter-rater reliability

The score of visual inspection on each of the AA zone ranged from 0 to 8. Visual inspection was carried out once by each of the two investigators. Thus, only inter-rater reliability agreement was analyzed and intra-rater reliability was not applicable. Since the measurement was a scale data, Intraclass Correlation Coefficients (ICC) with Two-way random effects model (absolute agreement definition) was adopted to analyse the inter-rater reliability

agreement. There were eight individual evaluations on every subject by each investigator. Table 2.1 shows the results. All of the individual evaluation showed poor reliability (0.03 to 0.32).

Table 2.1 Inter-rater reliability agreement of visual inspection

	ICC	95% Confidence interval	
		Lower bound	Upper bound
Liver zone on (L) ear	0.15	0	0.61
Liver zone on (R) ear	0.03	0	0.39
Kidney zone on (L) ear	0.12	0	0.55
Kidney zone on (R) ear	0.32	0	0.74
Lung zone on (L) ear	0.17	0	0.44
Lung zone on (R) ear	0.30	0	0.43
Lumbar zone on (L) ear	0.03	0	0.63
Lumbar zone on (R) ear	0.16	0	0.70

2.2.2. Electrical skin resistance measurement

2.2.2.1. Intra-rater reliability

The electrical skin resistance on each of the AA zones was measured 3 times. Each of the subjects underwent the same procedure twice by two investigators. The analysis was done by ICC with One-way random effects model (people effect random). The results from the main investigator of the present study and the TCM practitioner are shown in Table 2.2 and Table 2.3.

The intra-rater reliability agreements of both investigators were satisfactory. The ICC of the main investigator ranged from 0.87 to 0.92 which indicated high reliability. On the other hand, ICC of the TCM practitioner ranged from 0.61 to 0.90 and implied moderate to high reliability.

Table 2.2 Intra-rater reliability agreement of the main investigator in electrical skin resistance measurement

	ICC	95% Confidence interval	
		Lower bound	Upper bound
Liver zone on (L) ear	0.87	0.68	0.96
Liver zone on (R) ear	0.87	0.68	0.96
Kidney zone on (L) ear	0.88	0.71	0.97
Kidney zone on (R) ear	0.94	0.84	0.98
Lung zone on (L) ear	0.88	0.70	0.96
Lung zone on (R) ear	0.92	0.78	0.98
Lumbar zone on (L) ear	0.92	0.78	0.98
Lumbar zone on (R) ear	0.91	0.78	0.98

Table 2.3 Intra-rater reliability agreement of the TCM practitioner in electrical skin resistance measurement

	ICC	95% Confidence interval	
		Lower bound	Upper bound
Liver zone on (L) ear	0.80	0.47	0.96
Liver zone on (R) ear	0.83	0.53	0.96
Kidney zone on (L) ear	0.84	0.53	0.96
Kidney zone on (R) ear	0.61	0.17	0.91
Lung zone on (L) ear	0.64	0.21	0.91
Lung zone on (R) ear	0.87	0.62	0.97
Lumbar zone on (L) ear	0.90	0.70	0.98
Lumbar zone on (R) ear	0.72	0.29	0.95

2.2.2.2. Inter-rater reliability

Mean of the 3 trials from individual investigator was taken for inter-rater reliability analysis. ICC with Two-way random effects model (absolute agreement definition) was employed. Most of the ICC yielded high inter-rater reliability from 0.71 to 0.88 except the one of kidney zone on the (R) ear. Its inter-rater reliability was moderate with ICC of 0.51. Table 2.4 below lists the result:

Table 2.4 Inter-rater reliability agreement in electrical skin resistance measurement

	ICC	95% Confidence interval	
		Lower bound	Upper bound
Liver zone on (L) ear	0.72	0	0.95
Liver zone on (R) ear	0.76	0	0.96
Kidney zone on (L) ear	0.71	0	0.95
Kidney zone on (R) ear	0.51	0	0.88
Lung zone on (L) ear	0.83	0.35	0.97
Lung zone on (R) ear	0.76	0.10	0.96
Lumbar zone on (L) ear	0.88	0.44	0.98
Lumbar zone on (R) ear	0.87	0.22	0.98

2.2.3. Tenderness testing

2.2.3.1. Intra-rater reliability

There were 3 levels of grading, which were “0”, “1” and “2”, in the testing. Kappa was used to analyze this ordinal data. For the main investigator, testing in seven out of eight AA zones achieved moderate intra-rater reliability from 0.57 to 0.70. Lumbar zone on (L) ear was the only one found to have low intra-rater reliability (0.31) as shown in Table 2.5.

For the TCM practitioner, similar results were found. Six out of eight evaluations were found to have moderate reliability ranged from 0.56 to 0.77. Two of the AA zones, kidney zone on (R) ear and lung zone on (L) ear were

shown to have low reliability of 0.34 and 0.36 respectively. Individual Kappa results are listed in Table 2.6 below.

Table 2.5 Intra-rater reliability agreement of the main investigator in tenderness testing

	Kappa	95% Confidence interval	
		Lower bound	Upper bound
Liver zone on (L) ear	0.57	0.02	1
Liver zone on (R) ear	0.62	0.19	1
Kidney zone on (L) ear	0.70	0.32	1
Kidney zone on (R) ear	0.68	0.31	1
Lung zone on (L) ear	0.67	0.28	1
Lung zone on (R) ear	0.70	0.32	1
Lumbar zone on (L) ear	0.31	0	0.76
Lumbar zone on (R) ear	0.60	0.10	1

Table 2.6 Intra-rater reliability agreement of the TCM practitioner in tenderness testing

	Kappa	95% Confidence interval	
		Lower bound	Upper bound
Liver zone on (L) ear	0.58	0.12	1
Liver zone on (R) ear	0.76	0.37	1
Kidney zone on (L) ear	0.56	0.01	1
Kidney zone on (R) ear	0.34	0	0.77
Lung zone on (L) ear	0.36	0	0.89
Lung zone on (R) ear	0.77	0.35	1
Lumbar zone on (L) ear	0.70	0.17	1
Lumbar zone on (R) ear	0.73	0.25	1

2.2.3.2. Inter-rater reliability

The inter-rater reliability of tenderness testing was analyzed by Kappa. All the evaluations of the AA zones showed moderate agreement from 0.48 to 0.74 (Table 2.7).

Table 2.7 Inter-rater reliability agreement in tenderness testing

	Kappa	95% Confidence interval	
		Lower bound	Upper bound
Liver zone on (L) ear	0.72	0.23	1
Liver zone on (R) ear	0.48	0.04	0.92
Kidney zone on (L) ear	0.59	0.15	1
Kidney zone on (R) ear	0.52	0.20	0.84
Lung zone on (L) ear	0.58	0.10	1
Lung zone on (R) ear	0.53	0.03	1
Lumbar zone on (L) ear	0.72	0.23	1
Lumbar zone on (R) ear	0.74	0.15	1

2.2.4. Staining

2.2.4.1. Inter-rater reliability

Staining was done on each subject only once and evaluated by the two individual investigators separately. Thus, intra-rater reliability analysis was not applicable. Kappa was used to analyze the inter-rater reliability. All the eight

evaluations on the AA zone showed poor inter-rater reliability from -0.25 to 0.25 as listed in Table 2.8.

Table 2.8 Inter-rater reliability agreement in staining

	Kappa	95% Confidence interval	
		Lower bound	Upper bound
Liver zone on (L) ear	0	0	0.05
Liver zone on (R) ear	0	0	0.40
Kidney zone on (L) ear	0	0	0.13
Kidney zone on (R) ear	0	N/A	N/A
Lung zone on (L) ear	0	0	0.35
Lung zone on (R) ear	0	0	0.24
Lumbar zone on (L) ear	0.25	0	0.72
Lumbar zone on (R) ear	0.16	0	0.63

2.3. Discussions

2.3.1. Visual inspection

The results in the inter-rater reliability of visual inspection were poor. The best ICC inter-rater reliability found in the eight evaluations was 0.32 only. There are two reasons which could probably explain the finding. Firstly, visual observation for the changes on the ear was rather subjective. Different people may have different interpretation of what they see. This is a limitation of visual inspection. In addition, the background of the two investigators in terms of medical training and

clinical experience were quite different. This might have resulted in an even bigger discrepancy in interpreting what they saw. In order to minimize the discrepancy, the two investigators did some evaluations after the first pilot test. They ran a dummy visual inspection on a couple of subjects and discussed about what they observed on the AA zones. This helped the two investigators to have a better understanding of what another investigator perceived in the inspection and came to a compromise on the grading.

The grading of visual inspection was reviewed after the pilot test. Various morphological changes on the AA zones might suggest different pathologies. More changes observed on the AA zone do not necessarily imply a more severe pathological change. For instance, an inspection of having a papule and abundance of capillaries on liver AA zone does not necessarily imply a more severe disease than another inspection of having a papule solely on liver AA zone. Taking this factor into account, the grading of visual inspection was changed to a dichotomous level. It was either graded as “0” which meant no abnormality observed or “1” which meant the presence of any of the morphological changes that presented as the change in skin color, shape, abundance of capillary and desquamation on the AA zones.

Another pilot study was undertaken after the above review. In the second pilot

study on visual inspection, 12 subjects with 4 male and 8 female were recruited. The mean age was 29 years old with a standard deviation of 8.0 years. The inter-reliability agreement was evaluated by Kappa as listed in Table 2.9.

Table 2.9 Inter-rater reliability agreement in visual inspection in the 2nd pilot

	Kappa	95% Confidence interval	
		Lower bound	Upper bound
Liver zone on (L) ear	0.80	0.43	1
Liver zone on (R) ear	0.25	0	0.87
Kidney zone on (L) ear	0.03	0	0.56
Kidney zone on (R) ear	1.0	1	1
Lung zone on (L) ear	0.75	0.30	1
Lung zone on (R) ear	0.63	0	1
Lumbar zone on (L) ear	0.33	0	0.84
Lumbar zone on (R) ear	0.47	0	0.98

High inter-rater reliability was demonstrated on the liver and lung zones of (L) ear and kidney zone of (R) ear (Kappa = 0.75 to 1.0). Moderate agreement of 0.63 was found on lung and lumbar zones of (R) ear whereas the testing on kidney and lumbar zones of the (L) ear and liver zone of the (L) ear yielded low inter-rater reliability (Kappa = 0.03 to 0.33).

The inter-rater reliability was much improved after the procedure was revised. This gave a clue that detailed guideline of visual inspection is required to reduce the inter-rater variability in future study. Visual inspection plays an important role in

traditional Chinese medicine. It could give essential information and help to differentiate the pathology. Therefore, this part of AE would be retained in the main study even though a few of the evaluations could not achieve moderate or high agreement,.

2.3.2. Electrical skin resistance measurement

All the intra- and inter-rater reliability agreement on this assessment was found to be moderate and high. This assessment was the most objective one among the four AE procedures. It would not be affected by the prejudice of the investigator nor subjective perception of the subject. As far as a constant light touch from the electrode is maintained onto the ear, there should not be much variation among measurements.

AA zone of Sanjiao was used for the inactive pole in measurement. In traditional Chinese medicine, Sanjiao serves as the connection between different parts of the trunk where most of the internal organs sit in. It is closely related to the production of Qi and blood (Abbate, 2004). It is also associated with digestive function and immunity. In that case, any diseases from internal organs may affect the findings on Sanjiao zone. The status of Sanjiao would contaminate the findings of the AA zones being examined. Owing to this factor, Sanjiao was abolished as the inactive pole in the main study. Instead, the upper ear root where no AA zone was

located would be used as the inactive pole.

2.3.3. Tenderness testing

The findings of intra-rater reliability of the main investigator were similar to those performed by the TCM practitioner. Both investigators yielded moderate intra-rater reliability in most of the AA zones. The grading of this test relied on the subjective report from the subject. It is well known that there are individual variations for human subjective feelings. Moderate intra-rater reliability was acceptable to proceed to the main study. Meanwhile, it was considered that pain threshold might be reduced when the pressure was applied onto the same small AA zone repeatedly. The tenderness level might be affected upon repeated testing due to sensitization. To avoid sensitization, each AA zone would be tested once only in the main study.

Concerning the inter-rater reliability in this part of AE, all of the evaluations were found to have moderate agreement. It was satisfactory to proceed onto the main study.

Similar to the part of electrical skin resistance measurement, Sanjiao zone was used as the reference zone. Based on the rationale discussed in the previous section (2.3.2), it would be better to select another AA zone which does not have a close relationship with the diseases being studied as the reference point. AA zone of

Tooth (LO1) was thus selected to be the reference point for tenderness testing in the main study. AA zone of Tooth is located at the upper medial portion of the ear lobule when the surface of the lobule is evenly divided into 9 squares. Subject inclusion criteria of being free from toothache would be included in the main study.

2.3.4. Staining

The inter-rater reliability was low for staining. According to the inventor (管, 1995), the most important issue to determine the success of staining is the time control of the dye staying on the ear and the rinsing off of the dye. The assessment procedure was carried out according to the technique described by the inventor in his publication. However, neither of the two investigators in the present study have prior experience on performing this staining technique. This may explain the low reliability agreement found in the pilot study. In addition, the available literatures that support the practice of this staining technique were mostly from the inventor's research team. Some clinical reports actually criticized that there was approximately 20% missed diagnosis rate or high pseudopositive rate of this staining technique (Chen, 1993). Detailed methodologies of these clinical reports were not recorded in the paper. The lack of formal training on performing the staining technique and the controversial critics in the literature reduce its practical value as one of the AE procedures. Thus, this AE procedure would be dropped in the main study.

2.3.5. Lung group

Chest X-Ray was used as the diagnostic test for the lung group for comparison with AE. Apart from chest X-Ray, there are several diagnostic tests available to evaluate lung function or pathology, for example, spirometry, lung function test, arterial blood gas, high resolution computer tomography, bronchoscopy or lung biopsy. Unfortunately, there is no single test that can serve as the gold standard to identify all the lung dysfunctions. Even though chest X-Ray was rather commonly taken for patients with pulmonary diseases, it cannot be used to diagnose all the pathologies of pulmonary diseases. There are a variety of lung dysfunctions or diseases and the pathologies are quite different from one another. Furthermore, it is very difficult to quantify the pathological changes seen on the X-Ray.

Among patients hospitalized for lung disease, most of them need to put on breathing aids. It is unethical to ask the subject to remove the breathing aids during the AE. In such a situation, the investigator could not be blinded. In view of the above two factors, the lung group was withdrawn from the list of investigation in the main study.

2.3.6. Lumbar group

Similar to the lung group, X-Ray was used to evaluate the lumbar dysfunction in the pilot study. Lumbar X-Ray is able to show alignment of bone, degeneration,

fracture, joint space and abnormal bone mass or appearance. But it cannot pick up some pathologies of the spine such as intervertebral disc protrusion, ligament injury or nerve impingement. Even for an advanced investigation as Magnetic Resonance Imaging (MRI), it does not necessarily match well with clinical presentations of patients. A study on lumbar MRI was conducted in 1994 (Jensen, et al). The MRIs of 98 subjects without any active complain of low back pain were examined. It was found that only 36% of the subjects were found to have normal discs at all lumbar levels whereas the rest of the subjects presented with different types of disc bulging. Again, there is no single clinical assessment available that can be used as a gold standard examination for all lumbar dysfunctions either.

Other than these clinical investigations, specific instruments can be an option to evaluate the health outcome of people with specific disorders. Aberdeen Back Pain Scale (ABPS) is one of the specific instruments to evaluate the health outcome of people suffering from low back pain (Appendix III). ABPS is a self-administered questionnaire consists of 19 items cover the areas including duration and area of pain, analgesia and weakness; loss of bending, sleep, work, leisure, sex life and self-care; confinement to bed. It registers the subjective report of different dimensions in low back pain. The questionnaire evaluates the presence of symptoms and the severity of it. It also takes the loss of function and limitation in daily life

consequential to low back pain into account. Therefore, the whole picture of the condition can be demonstrated more clearly. The total score of ABPS ranges from 0 to 100 with 0 implies the least disabled and 100 implies the most severely disabled. The validity, reliability and responsiveness of the ABPS were well established (Ruta et al, 1994; Garratt et al, 2001). ABPS was also converted into Chinese and its validity, reliability and responsiveness was proven (Leung et al, 1999). Based on all these favourable factors of ABPS, it would be used as the evaluation tool of lumbar dysfunctions in the main study instead of the X-Ray.

Chapter 3

Methodology

3.1. Subjects

The present study was undertaken in Queen Mary Hospital, Duchess of Kent Children's Hospital (Adult wards) and a private integrated out-patient clinic. Subjects were recruited from the two hospitals and the general population. Patients who currently suffered from either hepatic diseases, renal diseases or lumbar disorders were recruited and were classified into liver, kidney or lumbar group accordingly. Healthy subjects were recruited for comparison purpose. Subjects were classified as either patients or healthy subjects according to the criteria below:

3.1.1. Patients

- Age 18-60 years old of either gender.
- Currently suffering from dysfunction in only one of the three organs or area which were liver, kidney and lumbar spine. "Dysfunction" of the liver and kidney was defined as derangement of its respective laboratory diagnostic test, details would be explained in later section, whereas subjective report of low back pain for more than a week was considered as lumbar disorder.
- No past history of diseases in the other two organs or area apart from the current dysfunction mentioned above. "Past history" was defined as any documented medical history or diagnosis made by medical professions. On

top of it, low back pain lasted for more than a week was defined as “past history” for lumbar dysfunction.

3.1.2. Healthy subjects

- Age 18-60 years old of either gender.
- No clinical presentation of dysfunction in either one of the three organs or area named above. For the healthy subjects of hepatic and renal groups in this group, their respective laboratory diagnostic test result had to lie within the normal range. For healthy subjects in the lumbar group, they were not experiencing any pain, numbness or parathesia in their low back and lower limbs two weeks prior to the auricular examination (AE).
- No past history of any disease of the three organs or area as mentioned above.

Eligible subjects should be able to communicate with the investigators. Those who were suffering from fever were excluded since fever would decrease the electrical resistance on the whole body including the ear thus affecting the accuracy of the results of AE. As the auricular acupuncture (AA) zone of Tooth was selected as the reference zone in the tenderness measurement of AE, any subject suffering from toothache was excluded as well. The group allocation of the subjects is illustrated in Fig 3.1.

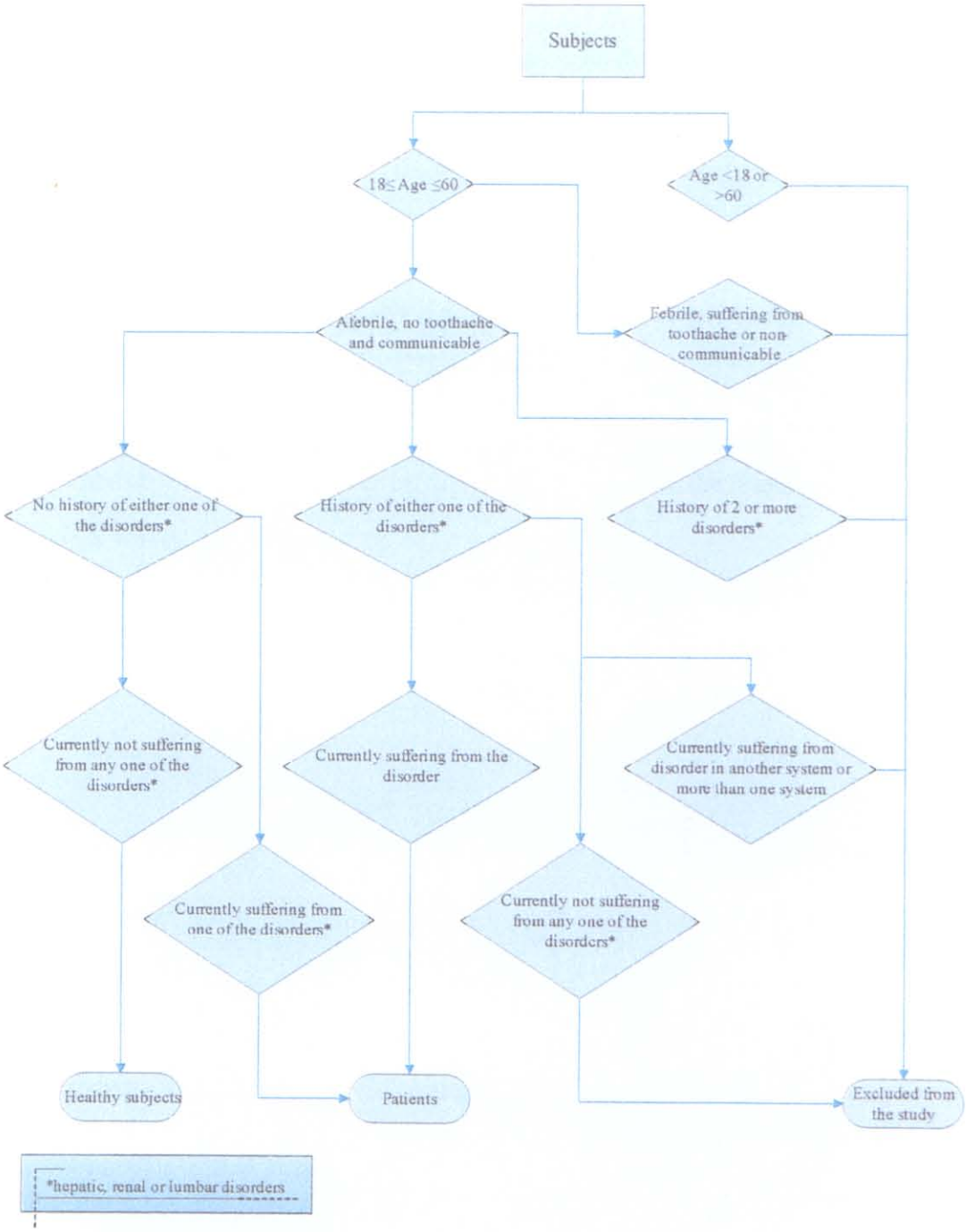


Fig. 3.1 Flow chart of group allocation of the subjects

Statistical software, PASS, was used to calculate the sample size. Effect size was calculated based on the data of a previous study (葉 & 李, 1998). It was estimated that a total of approximately 180 subjects should be recruited with 90 subjects each in the patients and the healthy subjects respectively. Parameters used for the sample size calculations included: (1) 5% alpha and 80% power; (2) 2-sided alternative. All these parameters are commonly used in the literature.

3.2. Procedure

Subjects recruited from the general population were invited to receive the examination procedures in the private integrated out-patient clinic. Subjects recruited in Queen Mary Hospital, Duchess of Kent Children's Hospital (in-patient setting) would have the AE and other investigations done in their respective hospital. Procedures were done as the following:

3.2.1. Study conducted in a private integrated out-patient clinic

Volunteer subjects were recruited from the general population. An advertisement was posted in the clinic's flyer to recruit volunteer subjects. Subject recruitment was also done by convenience sampling. The study was explained to the recruited subjects by investigator A and written consent (see Appendix I) was obtained. Subjects were first asked to fill in a brief questionnaire about their current

health status and past medical history so as to ensure their fulfilment of the inclusion criteria.

Body temperature was taken by the auricular digital thermometer to confirm that they were not suffering from fever at the moment. Then, AE was carried out by investigator B, who was the main investigator of the study, on the subjects' bilateral ears in supine lying. Subjects were not allowed to provide any information about their health to investigator B so that investigator B was blinded to the grouping of the subjects. Upon finishing the AE, subjects who were suffering from low back pain were asked to fill out the Aberdeen Back Pain Scale (ABPS). For subjects who reported that they were suffering from or had past history of either hepatic disease or renal disease, blood sample was taken for liver function test or renal function test respectively. Subjects who did not have any clinical presentation or history of both hepatic disease and renal disease would receive either liver function test or renal function test randomly. Results of the AE did not contribute to the decision on which blood test was to be done.

3.2.2. Study conducted in Queen Mary Hospital and Duchess of Kent Children's Hospital

The study was approved by the Research Ethical Committee of The University of Hong Kong to be conducted in the above named hospitals. In-patients from general wards, orthopedic wards and medical wards in these two hospitals were

screened by investigator A. Candidates who fulfilled the inclusion criteria were invited to participate in the present study. Written consent (see Appendix II) was obtained from the subjects prior to any assessment.

The subjects' body temperature was measured by the auricular digital thermometer to make sure that they were afebrile. AE was carried out on the subjects' ears bilaterally in supine position by investigator B who was blinded from any medical information about the subjects. Meanwhile, the diagnosis of the current admission, results of relevant laboratory diagnostic test and past medical history were traced by investigator A from the bednotes in the hospital. Subjects who were suffering from low back pain were asked to fill out the ABPS after finishing the AE.

3.2.3. Auricular acupuncture zones

Auricular examination was carried out on four AA zones on both ears of each subject. One AA zone was selected to be examined for each of the three organs or area being studied. Liver zone, kidney zone and lumbar spine zone were the AA zones corresponding to liver, kidney and lumbar spine respectively. Two most popular ear charts, Western and Oriental, are being used in clinical practice. However, neither of them is recognized world wide. The Oriental one was standardized by the China government that was based on the recommendation of the WHO working group (管, 1995). The location of the AA zones used in this study

adopted the China national standardization of AA zones.

1. *Liver (CO12)*

   On the posterior and inferior portion of the superior half of concha, toward the antihelix

2. *Kidney (CO10)*

   On the superior concha, inferior to the intersection of superior and inferior crus of antihelix

3. *Lumbar (AH9)*

   On the posterior and superior 2/5 portion of the antihelix

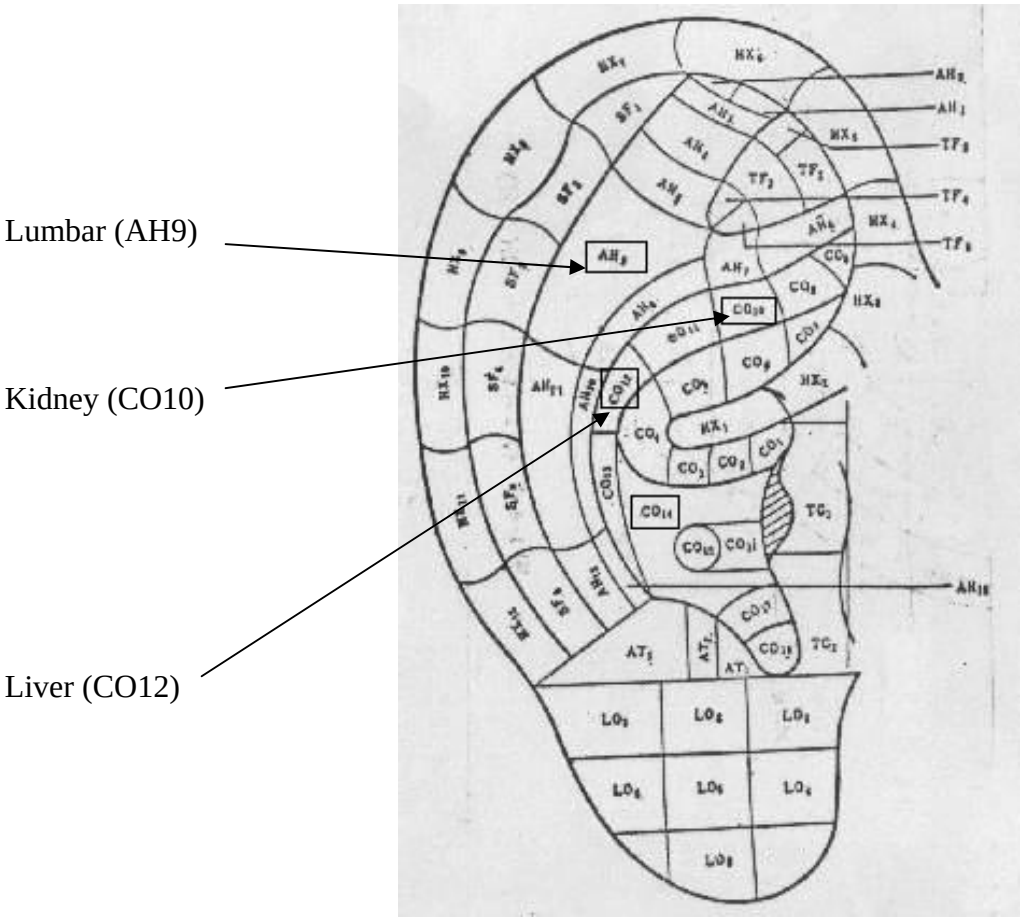


Fig 3.2 Distribution of AA zones according to the Chinese national standardization (adapted from 管, 1995)

3.2.4. Auricular Examinations

3.2.4.1. Visual inspection

Both of the ears were assessed under room light. The inspection involved visual observation of the external ear to see whether there was any special feature in four aspects: skin color (e.g. pale, red, dark), shape (e.g. papules, groove), abundance of capillary and desquamation on each of the three AA zones. Each feature might imply different pathologies. Two levels of measurement, positive or negative, were used in this part of AE. It was graded

as “positive” if any of the special features was noticed on the AA zone(s). “Negative” result indicated that none of the above special features was observed on the AA zone(s).

3.2.4.2. Electrical skin resistance measurement

For electrical property of the AA zones, the electrical skin resistance was detected by an ohmmeter with two pointer-electrodes. The inactive electrode was placed on the upper ear root, where no AA zone was located there, with light pressure. Meanwhile, the active electrode was placed on the AA zone being measured. The pressure applied onto the AA zones was sustained as a light touch which was just strong enough to detect the reading. The electrical resistance was recorded in terms of Mega Ohms (MΩ) after it was detected and the electrodes were sustained there for 10s. Each AA zone was tested 3 times and the average resistance of the 3 trials was calculated.

3.2.4.3. Tenderness testing

The AA zone of Tooth (LO10) was used as the reference AA zone. AA zone of Tooth was located at the upper medial portion of the ear lobule when the lobule was evenly divided into 9 square regions. Pain threshold of the tooth zone was measured by applying force up to 5N on it by a pressure algometer with a pointer of 0.25mm radius. The force measured would be a

reference value and the same force was applied onto each of the AA zones being tested. The subject was then asked to grade the severity of pain as compared to the reference zone. Score "0" referred to less painful or having similar pain level as the reference zone. Score "1" referred to mildly more painful than the reference zone while score "2" referred to significant greater pain than the reference zone. Each AA zone was tested once.

3.2.5. Laboratory diagnostic tests and questionnaire

One laboratory diagnostic test or questionnaire was adopted for each of the organs or area being studied to evaluate its function. The result of these tests/questionnaires was used to test the concordance with the auricular diagnosis.

3.2.5.1. Liver function test

This blood test is a commonly used clinical test for screening liver dysfunction. There are a number of items included in the test. Among the items, three enzymes, alkaline phosphate (ALP), aspartate aminotransferase (AST) and alanine aminotransferase (ALT) are recognised as important markers of hepatic function. In this study, these three enzymes were selected as the markers to evaluate the hepatic function. If the levels of two or three out of the three enzymes were deranged, the subject was considered to have liver dysfunction and was allocated in the patient group. If all the three enzymes

were within the normal range, the subject was allocated in the healthy group. If only one of the enzymes was out of the normal range, the subject would be dropped out from the study.

3.2.5.2. Renal function test

Renal function is most commonly evaluated by this blood test. Creatinine is the main item in the test to justify the functional status of the kidney. Any recruited subjects who had their creatinine level higher than the normal range were classified as patients. Subjects who had their creatinine level bound within the normal range, were considered as healthy subjects. Subjects with creatinine level lower than the normal range were excluded.

3.2.5.3. Aberdeen Back Pain Scale (ABPS)

Neither of any single clinical assessment or investigation available was proved to detect all kinds of lumbar spine dysfunction. In view of this, a questionnaire, Aberdeen Back Pain Scale (Appendix III), consisting of 19 items was used in this study to evaluate the severity of back pain, its related symptoms and loss of functional abilities. ABPS was validated and reported to be a reliable package for assessing the health of people with low back pain (Ruta et al, 1994). The Chinese version was also validated (Leung et al, 1999).

3.2.6. Statistical analysis

Statistical software, SPSS of version 11.5 was used as the main analysis tool. For binary or ordinal data from the findings of visual inspection and tenderness testing, crosstab and Pearson Chi-square was used to compare the difference between groups. The sensitivity and specificity of the two auricular examinations were calculated according to the following formulae:

$$\text{Sensitivity} = \frac{\text{Total number of subjects with the disorder correctly diagnosed by the auricular examination}}{\text{Total number of subjects suffering from the disorder tested}}$$

$$\text{Specificity} = \frac{\text{Total number of subjects free from the disorder correctly diagnosed by the auricular examination}}{\text{Total number of subjects free from the disorder tested}}$$

Continuous data of the electrical skin resistance was treated with independent t-test/ One-way ANOVA to investigate the groups' difference. The relationship of the auricular examinations' findings between the (L) and the (R) ear was studied by Pearson and Spearman rho correlation. Finally, the relationship between various auricular examinations was examined by mixed models and Spearman rho correlation.

Chapter 4

Results

4.1. Demographic data

Forty-five subjects were recruited for the liver group, with 20 subjects classified as the patients and 25 as the healthy subjects. Among the patients, there were 15 male and 5 female subjects. The mean age of the patient group was 39.4 ± 2.8 years old. For the healthy subjects, there were 10 male and 15 female subjects. The mean age was 32.5 ± 2.1 years old. Among the 20 patients, 45% of them had their alkaline phosphate (ALP) out of the normal range and 95% of them had their aspartate aminotransferase (AST) and alanine aminotransferase (ALT) deviated from the normal range.

Fifty-two subjects were recruited in the kidney group. Among the subjects, 22 subjects were classified as the patients with 8 male and 14 female. The average age in the patients was 45.9 ±10.9 years old. For the healthy subjects, 30 (11 male subjects and 19 female subjects) were recruited with the mean age of 30.2 ± 5.7 years old. The creatinine level of the patients ranged from 156 - 2157μmol/L for male and 114 - 1216μmol/L for female. Its mean was 787 ± 698μmol/L for male and 751 ± 379μmol/L for female respectively.

The subjects in the lumbar group were classified into healthy subjects, out-patients and in-patients. Subjects who did not have any history of low back pain lasted more than a week and currently not suffering from low back pain were

recruited as the healthy subjects. There were a total of 28 subjects (14 male and 14 female subjects) with a mean age of 31.3 ± 9.3 years old in this group. They all scored 0 out of 100 in the Aberdeen Back Pain Scale (ABPS). Subjects who were currently suffering from low back pain but not hospitalized were recruited as the out-patients. Among the 26 out-patients, 6 were male and 20 were female. Their mean age was 32.3 ± 6.4 years old and the mean ABPS score was 9.5 ± 4.9. Subjects who were being hospitalized because of their low back pain problem were classified as the in-patients. There were a total of 18 in-patients (9 male and female each). The mean age was 37.3 ± 10.5 years old and the mean ABPS score was 38.9 ± 11.2.

4.2. Auricular examination

4.2.1. Visual inspection

Pearson Chi square was adopted to analyze the difference in visual inspection between the patients and healthy subjects.

4.2.1.1. Liver group

Data from visual inspection on liver zone of both ears were analyzed to investigate the difference between groups. Significant difference was found between the patients and healthy subjects on both left and right ears [(L)

p=0.008, (R) *p*=0.04]. The visual inspection on the (L) ear showed that only 30% of the patients had negative findings while 60% of the healthy subjects was found to be negative. On the other hand, 70% of the patients and 40% of the healthy subjects showed positive findings (Table 4.1). The sensitivity of this examination was thus 0.7 whereas the specificity is 0.6.

For the (R) ear, similar findings were shown. It was found that 30% of the patients and 76% of the healthy subjects had negative findings whereas 70% of the patients and 24% of the healthy subjects had positive findings. The sensitivity and specificity on the (R) ear were 0.7 and 0.76 respectively.

Table 4.1 Visual inspection on liver zone of (L) ear

			Group		Total
			Healthy	Patient	
Liver zone on (L) ear	negative	Count	15	6	21
		(% within Group)	(60.0%)	(30.0%)	(46.7%)
	positive	Count	10	14	24
		(% within Group)	(40.0%)	(70.0%)	(53.3%)
Total		Count	25	20	45
		(% within Group)	(100.0%)	(100.0%)	(100.0%)

Table 4.2 Visual inspection on liver zone of (R) ear

			Group		Total
			Healthy	Patient	
Liver zone on (R) ear	negative	Count	19	6	25
		(% within Group)	(76.0%)	(30.0%)	(55.6%)
	positive	Count	6	14	20
		(% within Group)	(24.0%)	(70.0%)	(44.4%)
Total		Count	25	20	45
		(% within Group)	(100.0%)	(100.0%)	(100.0%)

4.2.1.2. Kidney group

Visual inspection showed significant difference between the patient group and the healthy subjects on kidney zone of the (L) ear (p=0.008). Over half of thepatients (63.9%) showed morphological change on the kidney zone of the (L) ear whereas 36.1% of the patients did not show any. Only a minority of the healthy subjects (26.7%) showed morphological change on their kidney zone of the (L) ear and majority healthy subjects (73.3%) did not show any visual change on it (Table 4.3). Therefore, the sensitivity on the (L) ear was 0.64 and its specificity was 0.73.

Regarding the kidney zone on the (R) ear, significant difference was also found between the groups (p=0.04). Among the patients, 68.2% were observed to have morphological change and the rest of the group (31.8%) did not show

any change on the kidney zone of the (R) ear. In contrast, no abnormality was observed on the kidney zone of the (R) ear in 60% of the healthy subjects and the other 40% had positive findings on it (Table 4.4). It demonstrated 0.68 in sensitivity and 0.60 in specificity on the (R) ear.

Table 4.3 Visual inspection on kidney zone of (L) ear

			Group		Total
			Healthy	Patient	
Kidney zone on (L) ear	negative	Count	22	8	30
		(% within Group)	(73.3%)	(36.4%)	(57.7%)
	positive	Count	8	14	22
		(% within Group)	(26.7%)	(63.6%)	(42.3%)
Total		Count	30	22	52
		(% within Group)	(100.0%)	(100.0%)	(100.0%)

Table 4.4 Visual inspection on kidney zone of (R) ear

			Group		Total
			Healthy	Patient	
Kidney zone on (R) ear	negative	Count	18	7	25
		(% within Group)	(60.0%)	(31.8%)	(48.1%)
	positive	Count	12	15	27
		(% within Group)	(40.0%)	(68.2%)	(51.9%)
Total		Count	30	22	52
		(% within Group)	(100.0%)	(100.0%)	(100.0%)

4.2.1.3. Lumbar group

When the out-patients were compared with the in-patients, no significant difference was found in visual inspection on lumbar zones of both (L) and (R) ears [(L) p=0.51, (R) p=0.72]. As no significant difference was shown between the in- and out-patients, these 2 groups were merged into a single "patients" group and the results of the patient group was compared with that of the healthy subjects. Significant difference in visual inspection on the lumbar zones was found between the healthy subjects and the combined patient group [both (L) & (R) p=0.01].

For the findings on the (L) ear, no morphological change (negative finding) was found in 89.3% of the healthy subjects. That means only 10.7% of the healthy subjects was found to have morphological change (positive finding). The specificity is as high as 0.89 on the (L) ear. In the out-patient group, 65.4% of the subjects had negative findings while 34.6% had positive findings. Among the 3 groups, the in-patient group had the least proportion of subjects who have negative findings (55.6%) and the greatest proportion having positive finding (44.4%). The results are shown in Table 4.5. Although there was significant difference between groups, the sensitivity of visual inspection on the (L) ear was only 0.35 in the out-patients and 0.44 in the in-patients.

Table 4.5 Visual inspection on lumbar zone of (L) ear

			Group			Total
			Healthy	Out-patient	In-patient	
Lumbar zone on (L) ear	negative	Count	25	17	10	52
		(% within Group)	(89.3%)	(65.4%)	(55.6%)	(72.2%)
	positive	Count	3	9	8	20
		(% within Group)	(10.7%)	(34.6%)	(44.4%)	(27.8%)
Total		Count	28	26	18	72
		(% within Group)	(100.0%)	(100.0%)	(100.0%)	(100.0%)

For the visual inspection on the lumbar zone of (R) ear, the findings demonstrated a similar trend as that of the (L) ear. There were 78.6%, 50% and 44.4% of the subjects showed negative findings among the healthy subjects, out-patients and in-patients respectively. On the other hand, 21.4%, 50% and 55.6% of the subjects had positive findings among the healthy subjects, out-patients and in-patients respectively (Table 4.6). The sensitivity on the (R) ear was 0.50 and 0.56 in the out-patients and in-patients respectively and the specificity was 0.79.

Table 4.6 Visual inspection on lumbar zone of (R) ear

			Group			Total
			Healthy	Out-patient	In-patient	
Lumbar zone on (R) ear	negative	Count	22	13	8	43
		(% within Group)	(78.6%)	(50.0%)	(44.4%)	(59.7%)
	positive	Count	6	13	10	29
		(% within Group)	(21.4%)	(50.0%)	(55.6%)	(40.3%)
Total		Count	28	26	18	72
		(% within Group)	(100.0%)	(100.0%)	(100.0%)	(100.0%)

4.2.2. Electrical skin resistance measurement

Independent t-test and one-way ANOVA were used for data analysis in the part of electrical skin resistance.

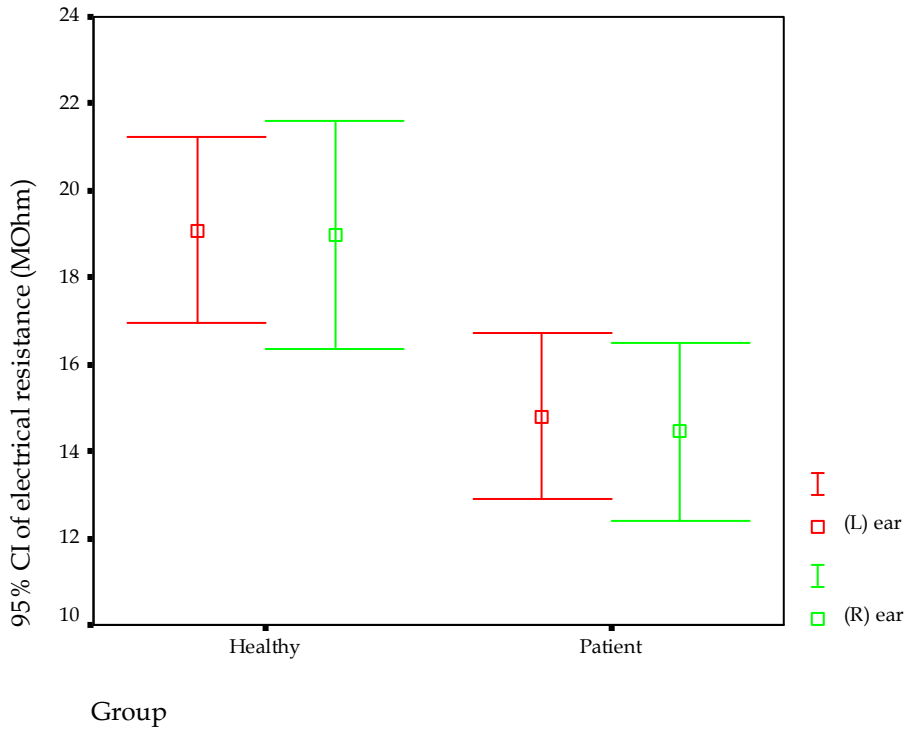
4.2.2.1. Liver group

Significant differences were found between the patients and healthy subjects on the liver zone of both ears (p<0.01, see Table 4.7). The mean electrical skin resistance among the patients was lower than that among the healthy subjects for both (L) and (R) ears. The patients had an average electrical skin resistance of 14.81±4.05MΩ for the (L) ear and 14.46±4.05MΩ for the (R) ear respectively. The corresponding electrical skin resistances of the healthy subjects were 19.10 ± 4.94MΩ for the (L) ear and 18.98 ± 6.06MΩ for the (R) ear respectively.

Table 4.7 Electrical skin resistance on liver zone of both ears

	Healthy subjects	**Patients**	***p*-value**
Electrical skin resistance (MΩ) on (L) ear	19.10 ± 4.94	14.81 ± 4.05	0.004
Electrical skin resistance (MΩ) on (R) ear	18.98 ± 6.06	14.46 ± 4.37	0.009

Fig 4.1 Electrical skin resistance on liver zone



4.2.2.2. Kidney group

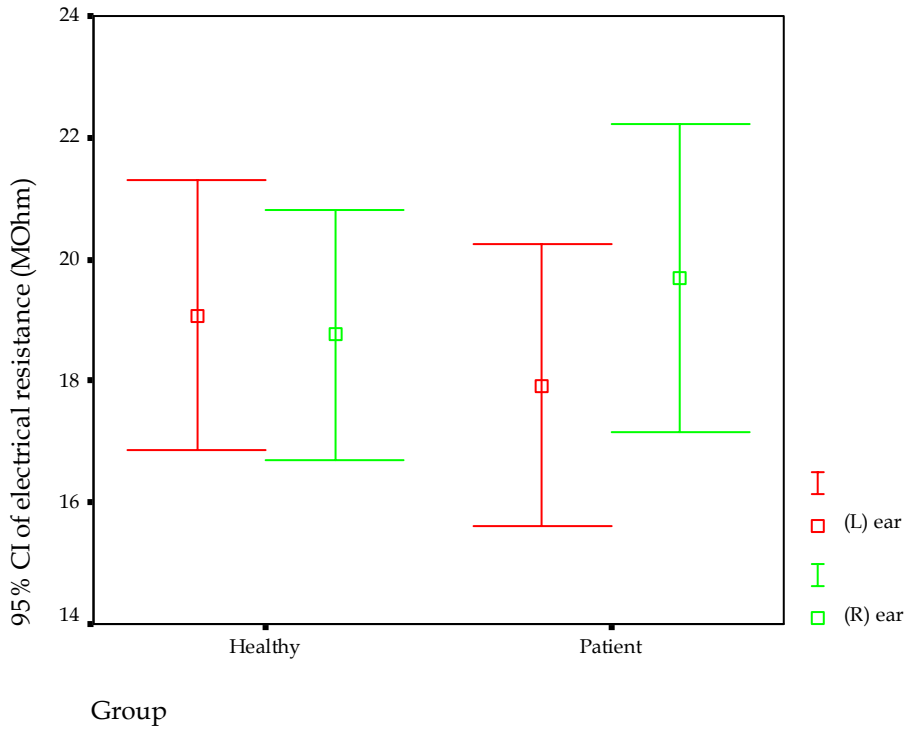
The findings showed that the average electrical skin resistance on the (L) kidney zone of the patients was lower than that of the healthy subjeccts. The corresponding mean of the patients was 17.93 ± 5.24MΩ and that of the healthy subjects was 19.27 ± 6.04MΩ. The mean difference between groups was 1.36MΩ (Table 4.8) but the difference between groups was not significant (*p*=0.40).

For the findings on the kidney zone of the (R) ear, no significant between-group difference was found (p=0.67). The mean in the patients (19.69 ± 5.70MΩ) was slightly higher than that in the healthy subjects (19.02 ± 5.51MΩ).

Table 4.8 Electrical skin resistance on kidney zone of both ears

	Healthy subjects	**Patients**	***p*-value**
Electrical skin resistance (MΩ) on (L) ear	19.27 ± 6.04	17.93 ± 5.24	0.40
Electrical skin resistance (MΩ) on (R) ear	19.02 ± 5.51	19.69 ± 5.70	0.67

Fig 4.2 Electrical skin resistance on kidney zone



4.2.2.3. Lumbar group

When comparing the average electrical skin resistance on the lumbar zone among the three groups, similar findings were shown on both ears. The out-patients had the highest mean [(L) 22.37 ± 5.54 MΩ, (R) 23.76 ± 5.69MΩ], the healthy subjects was in the middle [(L) 20.95 ± 5.27MΩ, (R) 21.25 ± 5.11MΩ] and the in-patients had the lowest mean [(L) 16.26 ± 4.15MΩ, (R) 14.30 ± 5.13MΩ].

ANOVA was carried out and showed significant difference between the 3 groups on both ears (p<0.01, see Table 4.9). When the findings were further analyzed by Post-Hoc (Bonferroni), significant differences were found in healthy subjects versus in-patients and out-patients versus in-patient group on both ears (p<0.05, see Table 4.10). However, statistically significant difference was not achieved between healthy subjects and out-patients (Table 4.10).

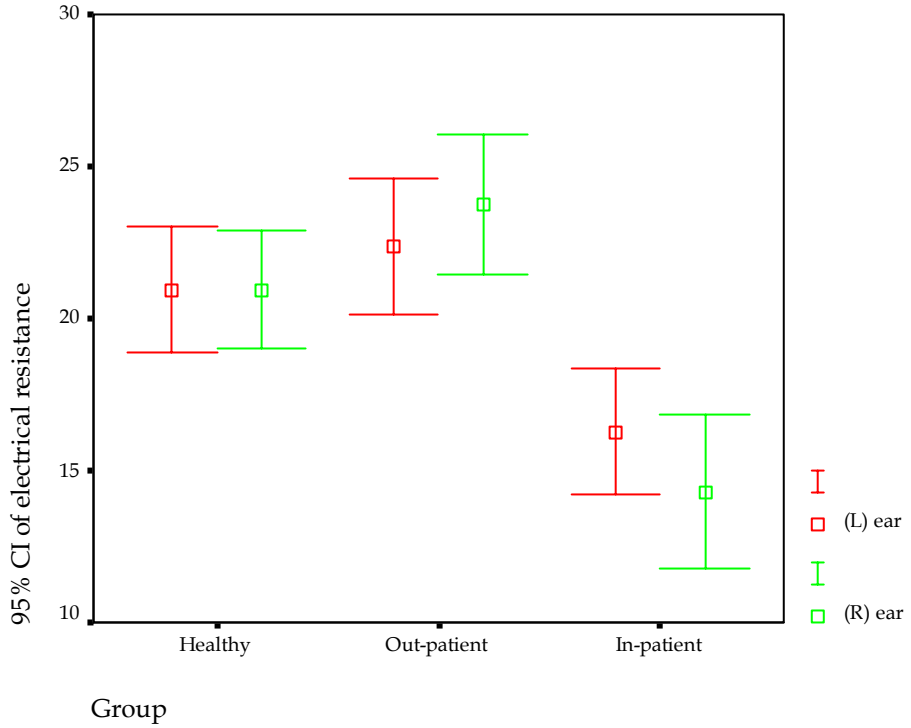
Table 4.9 Electrical skin resistance on lumbar zone of both ears

	Healthy subjects	**Out-patients**	**In-patients**	**ANOVA *p-value***
Electrical skin resistance (MΩ) on (L)	20.95 ± 5.27	22.37 ± 5.54	16.26 ± 4.15	0.001
Electrical skin resistance (MΩ) on (R)	21.25 ± 5.11	23.76 ± 5.69	14.30 ± 5.13	0.000

Table 4.10 Post-Hoc test (Bonferroni) of electrical skin resistance on lumbar zone

	Groups (A vs B)	**Mean difference (MΩ) (A – B)**	***p*-value**
Lumbar zone on (L) ear	Healthy vs Out-patient	-1.42	0.949
	Healthy vs In-patient	4.69	0.01
	Out-patient vs In-patient	6.11	0.001
Lumbar zone on (R) ear	Healthy vs Out-patient	-2.52	0.263
	Healthy vs In-patient	6.94	0.000
	Out-patient vs In-patient	9.46	0.000

Fig 4.3 Electrical skin resistance on lumbar zone



4.2.3. Tenderness testing

Pearson's Chi square was used for analyzing the findings on tenderness.

4.2.3.1. Liver group

No significant difference was found between the patients and the healthy subjects for the liver zone of both ears [(L) p=0.822, (R) p=0.746].

Among the healthy subjects, similar findings were shown on both ears that 68% of the subjects reported that the tenderness experienced at the liver zone was not greater than the reference zone (which scored "0"). The rest of the subjects, 32%, reported that the liver zone was more tender than the reference zone (which scored "1" or "2") (Table 4.11, 4.12).

Among the patients, 75% of the subjects scored "0" on the liver zone of the (L) ear and 65% for the (R) ear. Only 25% and 35% of the subjects scored "1" or "2" for liver zone on the (L) and (R) ear respectively.

It showed that the sensitivity of detecting hepatic dysfunction by this part of AE was poor. Its sensitivity was only 0.25 for the (L) and 0.35 for the (R) ear. Though the specificity was 0.68 on both ears, the pseudo-negative rate among the patients was high [(L) 75%, (R) 65%] meanwhile.

Table 4.11 Tenderness testing on liver zone of (L) ear

			Group		Total
			Healthy	Patient	
Liver zone on (L) ear	0*	Count	17	15	32
		(% within Group)	(68.0%)	(75.0%)	(71.1%)
	1*	Count	7	4	11
		(% within Group)	(28.0%)	(20.0%)	(24.4%)
	2*	Count	1	1	2
		(% within Group)	(4.0%)	(5.0%)	(4.4%)
Total		Count	25	20	45
		(% within Group)	(100.0%)	(100.0%)	(100.0%)

* 0 = pain not greater than the reference zone

1 = pain mildly greater than the reference zone

2 = pain significantly greater than the reference zone

Table 4.12 Tenderness testing on liver zone of (R) ear

			Group		Total
			Healthy	Patient	
Liver zone on (R) ear	0	Count	17	13	30
		(% within Group)	(68.0%)	(65.0%)	(66.7%)
	1	Count	6	4	10
		(% within Group)	(24.0%)	(20.0%)	(22.2%)
	2	Count	2	3	5
		(% within Group)	(8.0%)	(15.0%)	(11.1%)
Total		Count	25	20	45
		(% within Group)	(100.0%)	(100.0%)	(100.0%)

4.2.3.2. Kidney group

For the kidney zone of the (L) ear, no significant difference was found between the patients and the healthy subjects in the tenderness testing (p=0.382). More than half of the subjects (54.5% in the patients and 63.3% in the healthy subjects) reported “0” score for the tenderness level on kidney zone (Table 4.13). The rest, 45.4% of the patients and 36.6% of the healthy subjects scored “1” or “2” for the tenderness level on the kidney zone of the (L) ear. From the above findings, the sensitivity was 0.45 and the specificity was 0.63 on the (L) ear.

Table 4.13 Tenderness testing on kidney zone of (L) ear

			Group		Total
			Healthy	Patient	
Kidney zone on (L) ear	0	Count	19	12	31
		(% within Group)	(63.3%)	(54.5%)	(59.6%)
	1	Count	10	7	17
		(% within Group)	(33.3%)	(31.8%)	(32.7%)
	2	Count	1	3	4
		(% within Group)	(3.3%)	(13.6%)	(7.7%)
Total		Count	30	22	52
		(% within Group)	(100.0%)	(100.0%)	(100.0%)

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For the corresponding zone of the (R) ear, marginally significant difference (p=0.05) was found between groups. Majority of the healthy subjects (80%) rated “0” on the kidney zone of (R) ear comparing with half of the patients (50%) had “0” score. The remaining 20% of the healthy subjects and the other 50% of the patients scored “1” or “2” for the tenderness level on the kidney zone of (R) ear (Table 4.14). Thus, sensitivity of 0.50 and specificity of 0.8 was yielded on the (R) ear.

Table 4.14 Tenderness testing on kidney zone of (R) ear

			Group		Total
			Healthy	Patient	
Kidney zone on (R) ear	0	Count	24	11	35
		(% within Group)	(80.0%)	(50.0%)	(67.3%)
	1	Count	4	5	9
		(% within Group)	(13.3%)	(22.7%)	(17.3%)
	2	Count	2	6	8
		(% within Group)	(6.7%)	(27.3%)	(15.4%)
Total		Count	30	22	52
		(% within Group)	(100.0%)	(100.0%)	(100.0%)

4.2.3.3. Lumbar group

No significant difference was found among the healthy subjects, out-patients and in-patients when the tenderness level was tested on the lumbar

zone of both ears [(L) p=0.34, (R) p=0.39].

The distribution of the findings among the 3 groups was quite similar on both ears. In the healthy subjects, there were 71.4% of the subjects rated “0” on tenderness on both ears and the rest (28.6%) scored “1” or “2”. For the out-patients, 69.2% and 76.9% subjects rated “0” on the (L) and (R) ear accordingly. The remaining 20.8% and 23.1% out-patients scored “1” or “2” on (L) and (R) ear respectively. There was 55.6% of the in-patient group reported “0” score for tenderness on both ears, the rest (44.4%) scored “1” or “2” (Table 4.15, 4.16).

According to the results, the sensitivity of tenderness testing in this group was 0.31 for the (L) ear and 0.23 for the (R) ear among the out-patients whereas it was 0.44 for the (L) and 0.45 for the (R) among the in-patients. On the other hand, the specificity was 0.71 on both ears. It should be noticed that the pseudo-negative rate was fairly high among both the out-patients [(L) 69.2%, (R) 76.9%] and the in-patients (55.6% for both ears).

Table 4.15 Tenderness testing on lumbar zone of (L) ear

			Group			Total
			Healthy	Out-patient	In-patient	
Lumbar zone on (L) ear	0	Count	20	18	10	48
		(% within Group)	(71.4%)	(69.2%)	(55.6%)	(66.7%)
	1	Count	8	5	6	19
		(% within Group)	(28.6%)	(19.2%)	(33.3%)	(26.4%)
	2	Count	0	3	2	5
		(% within Group)	(.0%)	(11.5%)	(11.1%)	(6.9%)
Total		Count	28	26	18	72
		(% within Group)	(100.0%)	(100.0%)	(100.0%)	(100.0%)

Table 4.16 Tenderness testing on lumbar zone of (R) ear

			Group			Total
			Healthy	Out-patient	In-patient	
Lumbar zone on (R) ear	0	Count	20	20	10	50
		(% within Group)	(71.4%)	(76.9%)	(55.6%)	(69.4%)
	1	Count	5	5	7	17
		(% within Group)	(17.9%)	(19.2%)	(38.9%)	(23.6%)
	2	Count	3	1	1	5
		(% within Group)	(10.7%)	(3.8%)	(5.6%)	(6.9%)
Total		Count	28	26	18	72
		(% within Group)	(100.0%)	(100.0%)	(100.0%)	(100.0%)

4.3. Correlation of auricular examinations between (L) and (R) ears

Correlations between the (L) and (R) ear in each AE, i.e. visual inspection on (L) ear vs visual inspection on (R) ear, electrical skin resistance on (L) ear vs electrical skin resistance on (R) ear and tenderness testing on (L) ear vs tenderness testing on (R) ear were investigated by Pearson and Spearman rho correlation analysis. Moderate correlations (0.40 - 0.56) were found in most of the AE between the (L) and (R) ears in all the liver, kidney and lumbar groups (Table 4.17). All these moderate correlations were shown to be significant (p<0.05). The only two AE that showed weak correlations (0.24 - 0.25) between the (L) and (R) ears were visual inspection and tenderness testing in the lumbar group (p≤0.05).

Table 4.17 Correlations between (L) and (R) ears in each AE

		Liver group	Kidney group	Lumbar group
Visual inspection	Correlation Coefficient	0.40	0.45	0.25
	(Sig.)	(0.01)	(0.001)	(0.04)
Electrical skin resistance	Correlation Coefficient	0.56	0.50	0.46
	(Sig.)	(0.000)	(0.000)	(0.000)
Tenderness testing	Correlation Coefficient	0.49	0.40	0.24
	(Sig.)	(0.001)	(0.003)	(0.05)

4.4. Correlations among the three auricular examinations

Correlations among the three auricular examinations, namely visual inspection, electrical skin resistance and tenderness testing were examined by mixed models and Spearman rho analysis. These AE showed weak correlations (0.04 – 0.29) among themselves in the liver, kidney and lumbar groups (Table 4.18). The relationships were not significant (all $p>0.05$).

Table 4.18 Correlations among the investigations on visual inspection, electrical skin resistance and tenderness testing

		Liver group	Kidney group	Lumbar group
Visual inspection vs Electrical skin resistance	Correlation Coefficient	-0.29	-0.04	-0.22
	(Sig.)	(0.08)	(0.80)	(0.08)
Electrical skin resistance vs Tenderness testing	Correlation Coefficient	-0.14	-0.21	-0.22
	(Sig.)	(0.68)	(0.36)	(0.21)
Tenderness testing vs Visual inspection	Correlation Coefficient	0.15	0.25	0.18
	(Sig.)	(0.41)	(0.07)	(0.18)

Chapter 5

Discussion

5.1. Visual inspection

In all the groups, i.e. liver, kidney and lumbar groups, visual inspection showed significant difference between the patients and healthy subjects on both ears (all $p<0.05$).

In the liver group and kidney group, 60-76% subjects in the healthy subjects had negative findings, which implied that visual inspection found no morphological change on the corresponding auricular acupuncture (AA) zones. Meanwhile, 64-70% subjects among the patients of these 2 groups showed positive results, which implied there was morphological change observed on their corresponding AA zones.

It was suggested that dysfunction of a particular body area would be reflected by the morphological change appeared on its corresponding AA zone (Abbate, 2004). The findings of the present study support the above belief. When an organ or a body area is not functioning well, change of color or shape, papules, desquamation or abundance of capillaries would be present on the corresponding AA zone. Chen (1993) reported a study examining the presence of white or brown plum blossom-like pits in stomach AA zone yielded 98% accuracy in diagnosing stomach cancer. However, the detailed methodology, for instance, whether the study was double-blinded, remained unknown. Thus, it is difficult to justify the validity of

their findings.

The study mentioned above investigated a specific pathology by observing a specific morphological change on the AA zone. In contrast, the present study investigated the accuracy of using auricular examination (AE) as a primary health screening test. Any morphological change observed was taken into account. Patients in the liver and renal groups suffered from quite a wide variety of diseases. Some were acute whereas others were chronic. The severity of their diseases varied as well. Morphological change(s) observed on the AA zones may suggest different pathologies. One morphological change may not imply a more severe pathology than the other one. In view of this, the visual inspection was just graded as positive (with morphological change present) or negative findings (no morphological change observed) without further detailed subdivisions. As a health screening test, differentiation between positive and negative is good enough to serve as a primary investigation. It is simple and quick to carry out a general visual inspection on the AA zones in clinical settings.

In the first pilot study, low inter-rater reliability was yielded. The inter-rater reliability was much improved after the investigators' discussion in a couple of dummy trials. A drawback from the pilot studies is that subjective perception of visual inspection existed. Nevertheless, it was resolved after discussion and

agreement was made between the investigators. Therefore, better documentation or training is required in order to make an accurate visual inspection, which is agreed by all clinicians.

In the lumbar group, significant difference was found between the patients and healthy subjects in visual inspection of the lumbar zone (p=0.01). Both ears showed satisfactory specificity of 0.79 – 0.89. That means 79% - 89% of subjects without low back pain were correctly picked up by this AE. In spite of this, the sensitivity were low (0.35 – 0.56) and the pseudo-negative rate was comparatively high (44-65%). The chance of making wrong diagnosis of a person with low back pain is relatively high.

It is well known that there are numerous causes of low back pain and it can be quite complicated. Low back pain is only a symptom, not a specific diagnosis. The cause of low back pain can be bone fracture, tumour, joint dysfunction, muscle weakness/ strain, ligament strain, disc prolpase, nerve impingement, spinal instability. Psychosomatic component can contribute to the symptom as well. The lumbar zone in AA does not define very clearly what structures are included. The nomenclature is not self-explanatory whether it is for the lumbar spine solely or it also includes other structures around, e.g. muscles, ligaments, intervertebral disc, nerves. In addition, it is unclear if any psychosomatic factor contributing to the low

back pain may also be reflected as a morphological change on the lumbar AA zone. All these factors might have affected the sensitivity of visual inspection on lumbar disorders.

As a health screening test, a complicated examination is not favourable. Thus, only one AA zone was used for health screening for a single body area or organ in this study. The AA zone of its anatomical structure was selected to be examined as the primary AA zone of that particular body system. It only provides a crude idea whether that body area or organ is functioning normally. For a disorder that arises from numerous and complicated causes such as low back pain, the examination of a single AA zone may not be good enough to reflect the whole clinical condition. It may be worthy to carry out visual inspection on more than one AA zone which is thought to be relevant to the condition and see if the diagnostic sensitivity can be improved. Further study is needed for it.

5.2. Electrical skin resistance measurement

In the liver group, there was significant difference found between the patients and the healthy subjects on both ears (both $p<0.05$). The average electrical skin resistance on liver zone was lower among the patients than in the healthy subjects of this group with a mean difference of 4.29 – 4.52 MΩ. It demonstrates that when the

liver is not functioning well, it can be reflected by a drop in the electrical skin resistance on the liver AA zone. It coheres to the thinking of the scholars working in AA.

From a physiological point of view, people believe that a change in the electrical resistance on AA zones is a result of alterations of the electrical resistance on the underlying cell membranes (黃, 2000). There are plenty of blood capillaries, nerve and sweat glands on the external ear. Some scientists explained the low electrical resistance by the sympathetic control of blood vessels (Oleson, 1999). Some believe that it is the activation of sudomotor sympathetic nerves that causes the change in skin moisture and results in the decrease of electrical resistance (Usichenko et al, 2003).

Most of the researchers just explained the localized physiological change but did not comment on the topographic distribution of areas with lowered electrical resistance with respect to the ear chart. 黃 (2000) is one of the few who tried to explain the topographic distribution. She postulated that when a particular body part or system is not functioning well, the electrical resistance on its cell membranes would be lowered. The signal is then picked up and sent to the central nervous system through the meridians. The nerve cells stimulated in the central nervous system would send signals to the corresponding AA zone afterwards and change its

electrical property consequently. Nevertheless, the existence of meridians is not supported by any scientific evidence. Thus the above postulation is not generally accepted.

There is abundant nerve supply to the external ear,. Facial nerve supplies for motor and sympathetic nerve is available on the external ear. Sensory nerve supply includes auricular branch of vagus nerve, great auricle nerve, lesser occipital nerve and auriculotemporal nerve. Among the sensory supply, vagus nerve also supplies most of the pulmonary system and the alimentary tract including associated secretion glands such as gall bladder and liver (Snell, 1995). It is interesting to observe that liver zone was the only one among the three zones being studied, which showed significant difference between the patients and the healthy subjects in both visual inspection and electrical resistance measurement. It gives hint on possible linkage between liver and the liver AA zone via vagus nerve. Is vagus nerve the pathway transmitting signals between the liver organ and the liver AA zone? Further exploration is required.

In the lumbar group, significant difference existed when the in-patients was compared to the healthy subjects and the in-patients were compared to the out-patients. The in-patients had a lower average electrical skin resistance in both groupings. The mean difference ranged 4.69 – 9.46MΩ. It gave rise not only to

statistical significance, but also implied clinical significance.

Comparing the Aberdeen Back Pain Scale (ABPS) score of the in-patients and the out-patients, the in-patients had a much higher mean of 39.8 (out of 100) than the out-patients (9.5 out of 100). It is interpreted that the in-patients had a more severe low back pain which resulted in more functional limitations. The findings suggest that electrical skin resistance on the lumbar AA zone is sensitive to differentiate people with rather severe low back pain from people with mild/ without low back pain.

It was interesting to find no significant difference between the out-patients and the healthy subjects of the group. The choice of evaluation tool for lumbar group should be taken into consideration. The limitation of using ABPS as the evaluation tool of low back pain was that it is a self-administered questionnaire. It does not include much information about the pathology of lumbar spine. As discussed in section 2.3.6, clinical objective assessment (e.g. MRI) may not match with the presence of low back pain symptoms. There is not a single clinical test that can serve as a gold standard of low back disorder assessment. This is the limitation of the present study. The ABPS was used because it covers most the dimensions of low back pain. It evaluates the symptoms of low back pain as well as the functional disability and handicap caused by it.

In the kidney group, no significant difference was shown between the patients and the healthy subjects on both ears (p>0.05). It seems that electrical skin resistance is not valid to reflect the renal function.

In clinical practice, most of the practitioners would use an AA zone detector to identify the AA zone with low electrical resistance. It either gives audio prompt or visual output without showing the actual figures when it detects low electrical resistance. For scientific research, device which shows the actual value of electrical property was usually adopted. However, different researchers chose different placements of the inactive pole. Some might ask the subject to hold the inactive pole with his/her hand while some others might fasten the inactive pole onto the subject's arm or hand. The disadvantage of these placements of the inactive pole is that the electrical resistance would be affected by how strong the hand grip is or how tight the electrode is fastened. When the pressure on the electrode increases, the electrical resistance drops and vice versa. Hence, a confounding variable is introduced. The skin temperature or sweat in the arm or hand would also influence the measurement.

In the current study, the inactive pole was placed at a standard zone on the ear in order to shorten the path of the electrical circuit and minimize the effect from another body area. A consistent, minimal light touch which was just able to detect

the electrical skin resistance on the AA zone was maintained by the assessor. This avoided any influence by the performance of the subject. In addition, the inactive pole was placed at the ear root where no AA zone is found. This is a neutral reference point and the electrical resistance on the AA zone being measured would not be affected by the status of any body area.

Some scholars tried to define the normal range of electrical skin resistance on AA zones. For instance, 黃 (2000) quoted a normal range as 100 -5000KΩ. The scientific evidence for calculating this figure was not mentioned. So, the significance of this figure remains in doubt. On the other hand, the normal range of electrical skin resistance may change as per method of measurement. Up till now, there is no standardized method in measuring electrical resistance on AA zones. As a result, it is difficult to define the normal range of electrical resistance on AA zones. If the measurement method is standardized and the normal range can be determined, it would give greater clinical significance. It is a subject for further investigation.

5.3. Tenderness testing

No significant difference between the patients and the healthy subjects was found in the tenderness testing in any of the three groups (all $p>0.05$). The tenderness testing showed sensitivity of 0.23 – 0.50 and specificity of 0.63 – 0.80.

By looking at the findings of specificity, i.e. true-negative rate, it sounded

acceptable. However, its value in making diagnosis remained very doubtful when its pseudo-negative rate was put into consideration. The pseudo-negative rate ranged from 50% to 77%. That implied 50% - 77% of the patients were wrongly diagnosed as healthy. As a medical diagnostic test, a much higher diagnostic accuracy is expected.

The tenderness testing was the only AE determined by the subjective feeling of the subject. The pain perception of the AA zone was tested by introducing a mechanical stimulus (force) onto it in this study. The tenderness sensation is subject to individual's nociceptive perception. Some people have higher general pain threshold and some have relatively lower general pain threshold regardless the existence of any diseases. Unlike comparing the pre- and post-treatment pain level to examine treatment efficacy, this study examined the diagnostic accuracy of a single evaluation. Giving an absolute pain level by VAS or other pain evaluation system is not applicable. In Chinese medicine, clinicians commonly evaluate the tenderness level on the AA zones by observing the response of the subjects when a certain force is applied onto it. For example, they observe if the subject frowns, blinks, shows comprehensive expression or tries to withdraw from the force. The weakness of this evaluation method is that no baseline of pain level was established when the reaction of the subject towards pain varied a lot. Again, it is not an ideal

method to investigate tenderness.

Owing to the lack of suitable measuring tools, a specific tenderness testing method was developed in the present study to suit the needs of AE. The present study measured the relative tenderness level compared to the reference AA zone. The inter- and intra-rater reliability of the tenderness testing was established in the pilot study. The grading of the tenderness level was classified as score “0” – similar or less tender than the reference AA zone, “1” – mildly more tender than the reference AA zone and “2” – significantly more tender than the reference AA zone. This is a gross classification. A more precise and well defined evaluation method may be developed in further investigations.

Although no significant difference was shown between the patients and the healthy subjects on tenderness testing in this study, a lot of clinical practitioners observed that patients with a particular disease feel more tender at its corresponding AA zone. Oleson (1999) tried to explain this clinically observed phenomenon from a neurophysiological perspective by using the result of an experiment done by Chan et al. Chan et al (1998) found that the skin acupuncture points on the dogs’ bodies had a significantly higher concentration of substance P than the other control skin points. Oleson (1999) explained that substance P was a spinal neurotransmitter found in nociceptive, afferent C-fibers. It helped in pain transmission and stimulated

the subcutaneous release of histamine. This finally led to hypersensitivity of sensory neurons. As a result, increased concentration of substance P would decrease the pain threshold and made the AA zone more tender to touch.

5.4. Correlation of auricular examination between (L) and (R) ear

Moderate correlation (r = 0.4-0.56) was found between the (L) and (R) ear of the three AE. They were all significant (p<0.05). Only two evaluations, visual inspection and tenderness testing in the lumbar group, yielded weak correlation (r = 0.24-0.25).

As far as the laterality of AA is concerned, scientists tend to agree that both ears give information of the disease but it is more prominent on the ipsilateral auricle (Rubach, 2001). Oleson (2003) proposed that the signals of stimulus from one side of the body ascended to the brain on the contralateral side. The signals from the brain then descended and crossed back contralaterally to the ear. This double contralateral projection resulted in the reflection on the auricle ipsilateral to the body area. Oleson's thought was supported by his own study (1980). His study examined 59 individuals with musculoskeletal pain just on one side of their bodies. He found that the conductivity on the ipsilateral auricle (with respect to the side of the bodily problem) was significantly higher than the contralateral auricle.

In this study, three AA zones were examined. Two of them, kidney and liver were internal organs, it is not easy to distinguish whether the (L) side and/or the (R) side of the organ function normally. The internal organs sit in the body trunk and they function as a whole to serve the body. Taking this factor into account, it can be understood that both individual liver stream and kidney groups showed similar findings on (L) and (R) ears in most of the AE. It was reasonable to find moderate correlation between (L) and (R) ear in these two groups.

For the lumbar group, some patients might suffer from low back pain on one side only while some might suffer from low back pain right in the middle or bilaterally. The information on the AA zone may be more prominent on one side than the other if the subject only had unilateral pain. This might have explained the weak correlations of the AE in the lumbar group. The ABPS provided the information about the referred symptoms on one side if any. However, the information of the location of the localized back pain was not available in the questionnaire. The lack of information limited further analysis on the laterality effect of AA. Future studies with more background information of the low back pain would help to give a more detailed analysis.

5.5. Correlation among auricular examinations

The relationship between the three AE was investigated. Fairly weak correlation ($r = 0.04 – 0.29$) was found among visual inspection, electrical skin resistance measurement and tenderness testing, and all of them were not significant.

Regarding the previous studies in AA, it was noted that evaluations of an individual AE was more commonly employed. It was not a common practice to investigate the diagnostic accuracy of various AE as a whole. From the findings in individual AE, it can be observed that some of them showed significant difference between the patients and the healthy subjects while some did not in the same group. Because of the discrepancy of the findings in various streams, it was not surprising to find weak correlation among the three AE. The weak correlation between different AE implies that the result from one of the AE does not give many hints on the result of another AE. A specific disorder may be detected by a specific AE but not by another AE. Each of the AE has its own importance in examining different disorders.

5.6. Significance of the study

In the previous literature, researches on auriculotherapy focused more on its treatment efficacy. There is a lack of well controlled scientific researches that

reported the diagnostic accuracy of AE. The present study demonstrated that these simple and inexpensive AE could serve as a successful health screening test for liver, kidney and lumbar disorders, it established a concrete corner stone for its further development as a more precise diagnostic tool.

The results of the current study showed that the condition of certain body parts could be reflected by the appearance and the electrical skin resistance on its corresponding AA zone. It provides not only the ground for further investigations on making precise diagnosis, it also gives strong evidence that the AA zones have close relationship with its corresponding body parts. This could also provide the ground to use auriculotherapy as treatment. This close link between the AA zones and different body parts is the basis to adopt AA as a clinical treatment modality.

5.7. Limitation of the study

Though auricular acupuncture has the history of over two thousand years, it was mostly developed based on clinical experience rather than scientific research. There are still quite a lot of areas in auriculotherapy that remained uncertain or not accepted world-wide yet. For example, the method of carrying out AE is not standardized, postulations of mechanisms and laterality of auriculotherapy are not well accepted. Thus, a number of variables are interacting which may affect the

current results.

Among the three AA zones examined in this study, liver zone, kidney zone and lumbar zone, liver zone is the only one recognized by the WHO working group (1990). Discrepancy exists between Western approach and Chinese approach in locating the kidney zone and lumbar zone. This discrepancy is partially because of the difference in defining terms. For example, “kidney” in Western medicine means the organ itself whereas “kidney” in TCM is for the storage of “essence” and “qi”. As the mapping of AA zones is inconsistent, it is constraining the validity of research on auriculotherapy.

There are nearly a hundred AA zones found on the external ear. Each AA zone only covers a tiny area on the ear. Adjacent AA zones are very close to each other. The possibility of wrongly locating the AA zone could be a possible error during data collection even though the guideline of locating the AA zone is followed.

Chapter 6

Conclusion

Auricular examination (AE) of visual inspection, electrical skin resistance measurement and tenderness testing were evaluated in the present study. We found that visual inspection of morphological change on the corresponding auricular acupuncture (AA) zones is sensitive to screen hepatic and renal disorders but not for lumbar disorders. Our findings also showed that hepatic disorder and severe low back pain is reflected by a reduction in electrical skin resistance on corresponding AA zones. The cut-off point to be considered as “normal” is pending for further investigation. However, measurement on electrical skin resistance does not provide information on the status of the kidney function. Another AE, tenderness testing was not found to be sensitive to screen any of the three kinds of disorders. The method of evaluating tenderness on the AA zones is subject to review in future studies.

The results from the (L) and the (R) ear showed moderate correlation. However, the correlation among the three AE was weak. It seems that different AE is indicated in screening specific disorders. Each of them has its own importance in screening various disorders. More well designed research is needed for developing auriculotherapy both as diagnostic tool and therapeutic modality.

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Appendices

Appendix Ia

The Hong Kong Polytechnic University
Department of Rehabilitation Sciences

Research Project Informed Consent Form

Title: The use of examination on auricular acupuncture zones as health screening test.

Investigator: Dr. Gladys Cheing (Ph.D., Assistant Professor)
Miss Sharon Wan (M.Phil candidate of the HKPU)

This study aims to examine the accuracy of using auricular acupuncture zones as a health screening test for liver, kidney and lumbar spine disorders. The results of this study will provide useful information for the potential use of auricular acupuncture zones as a complementary diagnostic technique.

In the auricular examination, the inspection involves an eye-balling observation, testing of tenderness and the detection of electrical property of auricular acupuncture zones on both external ears of each subject. The examination will last for about 30 minutes.

During the examination, the subject may experience pain on the external ear upon the testing of tenderness. Nevertheless, the examination is non-invasive and will not do any harm on the subject.

After the auricular examination, each subject may need to fill out a questionnaire about low back pain or to receive one of the following diagnostic tests if indicated: taking blood sample for (1) liver function test, for (2) renal function test.

Consent:

I, _____, have been explained the details of this study. I voluntarily consent to participate in this study. I understand that I can withdraw from this study at any time without giving reasons, and my withdrawal will not lead to any punishment or prejudice against me. I also understand that my personal information will not be disclosed to people who are not related to this study.

I can contact Dr Gladys Cheing / Miss Sharon Wan at telephone 2766 / 9687 for any questions about this study. If I have complaints related to the investigator(s), I can contact Mrs Michelle Leung, secretary of Departmental Research Committee, at 2766 . I know I will be given a signed copy of this consent form.

Signature (subject): _____ Date: _____

Signature (investigator): _____ Date: _____

Signature (witness): _____ Date: _____

Appendix Ib

香港理工大學康復治療科學系

「耳穴作臨床診斷的應用」研究計劃同意書

研究負責人：　鄭荔英博士　(香港理工大學助理教授)
溫芸小姐　(香港理工大學康復治療科學系碩士學生)

研究進行地點：　承中醫療綜合診所

是項研究主要透過耳穴測試用以診斷肝、腎及腰椎病的準確度。研究結果將對耳穴診斷的發展提供寶貴資料。每位參與者將接受雙耳之耳穴檢查，包括：視診、測試電傳導量及尋找壓痛點，測試過程約三十分鐘。其間尋找壓痛點時參與者或會感到耳朵有輕微疼痛。整個測試過程都不會對參與者造成任何傷害。

隨後，參與者將需填寫一份腰背疼痛問卷或接受肝功能、腎功能血液測試之其中一項。

本人 _____ 得釋上述研究之內容，所提出的疑問亦得到圓滿的答覆並願意參與。本人明白我有權隨時退出上述研究而無需提供任何理由，亦無需負上任何責任及後果。本人知道所提供的個人資料不會被外洩于任何與本研究計劃無關的人仕，亦不會於研究著作中被披露。

若我對上述研究有任何疑問，可致電 2766　/ 9687　向鄭荔英博士/ 溫芸小姐查詢。如我對研究負責人有任何不滿，可致電 2766　向研究委員會秘書梁小姐投訴。本人將獲給予此同意書副本乙份。

參與者簽署：_____ 日期：_____

研究人員簽署：_____ 日期：_____

見證人簽署：_____ 日期：_____

Appendix IIa

The Hong Kong Polytechnic University
Department of Rehabilitation Sciences

Research Project Informed Consent Form

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Investigator: Dr. Gladys Cheing (Ph.D., Assistant Professor)
Miss Sharon Wan (M.Phil candidate of the HKPU)

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In the auricular examination, the inspection involves an eye-balling observation, testing of tenderness and the detection of electrical property of auricular acupuncture zones on both external ears of each subject. The examination will last for about 30 minutes.

During the examination, the subject may experience pain on the external ear upon the testing of tenderness. Nevertheless, the examination is non-invasive and will not do any harm on the subject.

The reports of the diagnostic tests namely like liver function test, renal function test, etc performed in the hospital will be traced from the patients' medical record. Subjects who are suffering from low back pain will be asked to fill out a questionnaire about their low back pain.

Consent:

I, _____, have been explained the details of this study. I voluntarily consent to participate in this study. I understand that I can withdraw from this study at any time without giving reasons, and my withdrawal will not lead to any punishment or prejudice against me. I also understand that my personal information will not be disclosed to people who are not related to this study.

I can contact Dr Gladys Cheing / Miss Sharon Wan at telephone 2766 / 9687 for any questions about this study. If I have complaints related to the investigator(s), I can contact Ms Michelle Leung, secretary of Departmental Research Committee, at 2766 . I know I will be given a signed copy of this consent form.

Signature (subject): _____ Date: _____

Signature (investigator): _____ Date: _____

Signature (witness): _____ Date: _____

Appendix IIb

香港理工大學康復治療科學系

「耳穴作臨床診斷的應用」研究計劃同意書

研究負責人：鄭荔英博士　(香港理工大學康復治療科學系助理教授)

溫芸小姐　　(註冊物理治療師,香港理工大學碩士學生)

是項研究主要透過耳穴測試用以診斷肝、腎及腰椎病的準確度。研究結果將對耳穴診斷的發展提供寶貴資料。每位參與者將接受雙耳之耳穴檢查，包括：視診、測試電傳導量及尋找壓痛點，測試過程約三十分鐘。其間尋找壓痛點時參與者或會感到耳朵有輕微疼痛。整個測試過程都不會對參與者造成任何傷害。

隨後，參與者曾於院內進行之相關檢驗報告例如：肝功能測試、腎功能測試等會被記錄下來以作參考。如參與者患有腰背痛，將需填寫一份腰背疼痛問卷。

本人 _____ 得釋上述研究之內容，所提出的疑問亦得到圓滿的答覆並願意參與。本人明白我有權隨時退出上述研究而無需提供任何理由，亦無需負上任何責任及後果。本人知道所提供的個人資料不會被外洩于任何與本研究計劃無關的人仕，亦不會於研究著作中被披露。

若我對上述研究有任何疑問，可致電 2766　/ 9687　向鄭荔英博士/ 溫芸小姐查詢。如我對研究負責人有任何不滿，可致電 2766　向研究委員會秘書梁小姐投訴。本人將獲給予此同意書副本乙份。

參與者簽署：_____ 日期：_____

研究人員簽署：_____ 日期：_____

見證人簽署：_____ 日期：_____

Appendix III Aberdeen Back Pain Scale

背痛問卷
(Initial / Monthly / Discharge)

姓名 _____ 日期 _____

1. 在過去兩星期內，有多少天背部或下肢會感到痛楚？(只√一格)

沒有一次	
有，持續一至五天	
有，持續六至十天	
有，持續十天以上	

2. 在過去兩星期內，你在患處最痛當日，要服用過多少片止痛藥？(只√一格)

完全沒有	
少於四片	
四至八片	
九至十二片	
超過十二片	

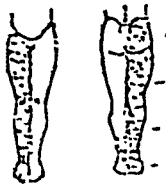
3. 下列哪一項或幾項動作會令痛楚惡化？(可√多格)

咳嗽	
噴嚏	
坐著	
站立	
彎腰	
走路	
以上動作都沒有令痛楚惡化	

4. 躺臥會否減輕痛楚？(只√一格)

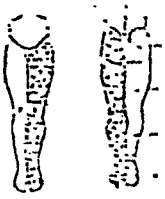
會	
否	

5. 你右下肢之下列各部位 (見圖位置) 有否感到痛楚？(可√多格)



臀部 ☐
大腿 ☐
小腿 ☐
足部/足踝 ☐
沒有痛楚 ☐

6. 你左下肢之下列各部位 (見圖位置) 有否感到痛楚？(可√多格)



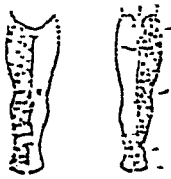
臀部 ☐
大腿 ☐
小腿 ☐
足部/足踝 ☐
沒有痛楚 ☐

Appendix III

7. 你左與右下肢各部有否失去知覺？(只√一格)

沒有	
有，只有一下肢	
有，左右下肢都有	

8. 你右下肢哪個或哪幾個部位 (見圖位置) 出現軟弱乏力或無力現象？(可√多格)



□ 無此現象

9. 你左下肢哪個或哪幾個部位 (見圖位置) 出現軟弱乏力或無力現象？(可√多格)

□ 無此現象

10. 假如你有痛患而嘗試直膝彎腰 (見下圖)，你可彎腰多遠才被痛楚抑止？(只√一格)

完全不能彎腰	
指尖可觸及大腿中段	
指尖可觸及膝部	
指尖可觸及足踝	
可觸及地板	

11. 在過去兩星期內，於患處痛楚最嚴重當晚，會影響你的睡眠有多大？(只√一格)

完全不受影響	
沒有失眠，但要服藥才能入睡	
雖因痛難眠，但仍能入睡超過四小時	
只能入睡二至四小時	
睡眠不足兩小時	

12. 在過去兩星期內，於患處痛楚最嚴重當日，會影響坐下時有多大？(只√一格)

可隨意長久坐下	
只可在自己喜歡的椅子上隨意長久坐下	
痛楚令我不能坐下超過一小時	
痛楚令我不能坐下超過三十分鐘	
痛楚令我不能坐下超過十五分鐘	
痛楚令我完全不能坐下	

Appendix III

13. 在過去兩星期內，於患處痛楚最嚴重當日，有否妨礙你站立？(只√一格)

可以站立而痛楚亦沒有增加	
可以站立但痛楚會增加	
痛楚令我不能站立超過一小時	
痛楚令我不能站立超過三十分鐘	
痛楚令我不能站立超過十五分鐘	
痛楚令我完全不能站立	

14. 在過去兩星期內，於患處痛楚最嚴重當日，有否妨礙你步行？(只√一格)

我能步行超過二十分鐘	
痛楚令我不能步行超過二十分鐘	
痛楚令我不能步行超過十分鐘	
痛楚令我不能步行超過五分鐘	
可以步行，但不多過五分鐘	
完全無法步行	

15. 在過去兩星期內，患處痛楚有否妨礙工作，家務或其他日常生活？(只√一格)

全無妨礙	
可繼續工作，但受到影響	
有妨礙達一天之久	
有妨礙達二至六天之久	
有妨礙超過七天之久	

16. 在過去兩星期內，你因痛楚而須臥床休息有多少天？(只√一格)

完全沒有	
有一至五天	
有六至十天	
有十天以上	

17. 在過去兩星期內，痛楚有否影響你的性生活？(只√一格)

沒有影響	
輕微影響	
稍有影響	
完全妨礙性生活	
不適用	

18. 在過去兩星期內，你的工餘活動 (包括運動，嗜好及社交) 有否因痛受影響？(只√一格)

不受痛楚影響	
輕微受痛楚影響	
頗受痛楚影響	
受痛楚嚴重影響	
因痛楚而要完全停頓	

19. 在過去兩星期內，你本人的起居生活 (如梳洗，穿衣等) 受到痛楚影響有多大？(只√一格)

完全無影響	
痛楚令我的起居生活需要他人協助	
痛楚令我極需要他人協助	
痛楚令我完全不能照顧自己	

Appendix IV

ACUPUNCTURE AND CHINESE MEDICINE IN THE MODERN AGE

Clinical Practice • Policy • Regulation • Research • Education • Standards • Safety

World Federation of Acupuncture-Moxibustion Societies

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第六届世界针灸学术大会

2004 年 10 月 29 日 - 10 月31 日　澳大利亚　黄金海岸

Appendix IV

The Use of Auricular Examination for Health Screening

Wan Sharon W, Dr. Cheing Gladys LY, Prof. Lo Sing Kai

Objectives: This study aimed to investigate the accuracy of using auricular examination for screening liver or lumbar spine disorders.

Design: 18 patients and 30 normal subjects were recruited for the lumbar group whereas 18 patients and 25 normal subjects were recruited for the liver group. Auricular examinations included visual inspection, electrical resistance measurement and tenderness recording on the AH9 (lumbar spine) and CO12 (liver) zone were carried out. The results of the auricular examination in the lumbar group were compared to the results of the Aberdeen Back Pain Scale (ABPS). Similarly, auricular findings in the liver group were compared to the blood test of liver function.

Results: Significant differences (all $p<0.05$) in inspection and electrical resistance of auricular examination were found between the patient group (both the liver and lumbar groups) and the normal group. However, no significant difference (all $p>0.05$) was found in the testing of tenderness level between the two groups. Weak to moderate correlations were found between inspection and electrical resistance detection of AH9 and ABPS ($p<0.05$).

Conclusion: Our findings suggest that visual inspection and electrical resistance measurement in auricular examination can be a complementary diagnostic tool for screening lumbar or liver disorders. However, the testing of tenderness on the acu-zone seems not a valid tool in diagnosing lumbar or liver disorders.