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AURICULAR CONDUCTIVITY MEASUREMENTS FOR CHRONIC PAIN

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INTRODUCTION

The overall purpose of this study is to evaluate Auriculotherapy as a tool for clinical diagnosis in the setting of a chronic orofacial pain referral center. Since auricular diagnosis and treatment are not yet mainstream clinical tools, we evaluate our initial level of interobserver reliability using this skin conductivity measuring device (Stimflex 400A).

STUDY OBJECTIVE

Part I: To determine how consistently two observers using written guidelines obtain equivalent measurements from the same subjects, at the same time using one measuring device. Traditional full body acupuncture uses 14 different energy channels located from the top of the head to the tip of the toes in order to access the entire body and all of its varied systems. Auriculoacupuncture, considered to be a microsystem or subset within the overall realm of acupuncture, includes the disciplines of auricular diagnostics and therapeutics. Within this subsystem, the entire somatotopic map of the body is represented by the image of an inverted fetus on each ear, in an "auricular homunculus" of sorts. Each pinna is felt to contain all of the somatotopic contact points from the ipsilateral half of the body. Thus, the right hand would be accessible through the right pinna, the left leg through the left pinna, etc. The location of these somatotopic points upon the ear are reportedly consistent from one individual to the next.

Several prior studies have concluded that when there is painful pathology in a specific part of the body, the corresponding somatotopic ear point will exhibit lowered resistance (increased conductivity) and is said to be "reactive" compared to the surrounding skin. (1) For example, a patient with traumatic left wrist pain would have increased skin conductivity at the corresponding wrist point in the left pinna. This would manifest as a low skin resistance measurement (< 4 meg ohm) and be considered a "reactive" auricular point. This point may also exhibit localized tenderness in the same patient. It is reported that by using this methodology in a double blinded fashion, an examiner can localize existing pathology by detecting low skin resistance in corresponding somatotopic points in the ear. (2)

Within the setting of the Chronic Orofacial Pain Clinic at the University of the Pacific (UOP) Dental School, we intend to evaluate this methodology in a controlled manner. Our approach to patient care requires that more than one examiner be capable of carrying out an auricular diagnostic protocol. Therefore, we intend to perform the study with two examiners carrying out all measurements on each study subject (see Materials & Methods section). Since this adds an additional variable to the data collection, we intend to perform the study in two parts. Part I will compare the findings of two different observers who will take conductivity measurements from the same subjects at the same time. Once a satisfactory level of inter-rater reliability can be established, Part II will examine diagnostic accuracy and consistency of this method. Based on our findings, we may include auricular diagnostic techniques to our existing patient evaluation approach. Any additional tool would be most welcome in the clinical approach to chronic pain.

MATERIALS & METHODS

Thirty-nine volunteer subjects were selected from the Chronic Orofacial Pain Clinic, from the dental student population and from staff and faculty at UOP School of Dentistry. Subjects were entered into the study as a convenience sample. Subject ages ranged from 23 to 57 and averaged 33 years. There were 13 females and 26 males. All volunteers provided signed statements of informed consent.

A standardized self-report questionnaire was completed by all subjects. The report indicated the

INSIDE THIS ISSUE:

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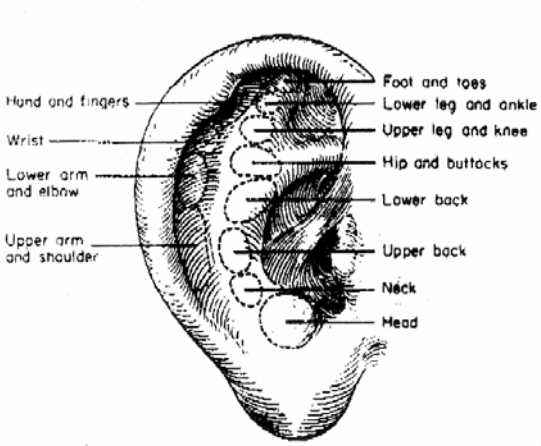
AURICULAR CONDUCTIVITY (CONT.)

subject's age, gender and the presence or absence of pain in specific parts of the body. For the purposes of this study, six areas of the body were considered: Thumb, Hand, Wrist, Forearm, Elbow and Shoulder. These six (6) areas correspond to the 6 somatotopic points in each ear that would subsequently have electrical conductivity measurements taken by study examiners. In this study, no medical history was taken other than the questionnaire and no physical exam performed besides auricular conductivity measurements.

To record data, a separate, two page form was used for each subject, one for each examiner. Each page required entry of 12 data points by each examiner, six points on each ear. With two examiners collecting data on each subject, there were 24 data points taken for each of 39 subjects in the project.



The emphasis in this Part (one) of the study is placed on inter-observer reliability. We deliberately chose two observers (PS & KMS) with different levels of experience in auricular acupuncture. One examiner (PS) is a licensed acupuncturist with 10+ years of experience. The 2nd (KMS) is a clinical psychologist and biofeedback therapist with minimal background in acupuncture techniques.

The exact location of each auricular testing point was based on somatotopic mapping illustrated in a study by Oleson, 1980. (1) (**Figure 1**). Auricular conductivity measurements were taken using the StimFlex 400A device by Electro Medical Inc. The device is similar to a galvanic skin resistance (GSR) biofeedback instrument. The StimFlex consists of a metal-tipped probe with a spring-loaded stylus, a source of constant 9V DC current and an analog current meter. The metal stylus quantified the amount of current flowing through ear point; it was spring-loaded to avoid pressure-induced changes in conductivity. All subjects had each of 12 data points (6 per ear) measured by both observers during a single clinic visit. The subjects were examined in a sitting position and had their auricular skin cleaned with alcohol prior to any measurements. Each observer was blinded to the other's measurements during the clinic visit. Each attempted to perform the measurements in the same locations (based on map) and with same technique as the other. The subject's ear skin was pulled slightly taut and the probe held perpendicular to the skin. A wooden tongue blade was placed behind the pinna for added stability. With the spring-loaded probe compressed from 10 – 40% of spring travel distance, the probe was glided slowly over each designated site to find blinded to the other's measurements during the clinic visit. Each attempted to perform the measurements in the same locations (based on map) and with same technique as the other. The subject's ear skin was pulled slightly taut and the point of greatest increase in skin conductivity, demonstrated by the greatest deflection in analog resistance meter. That point was numerically entered in subject record as a value between 0 – 9 meg ohm. A value between 0 – 4 meg ohm was considered "*reactive*" (lowered resistance, increased conductivity) and a reading 5 – 9 considered "*non-reactive*". No electrical stimulation was performed. The examiners were blinded to clinical questionnaire information until after conductivity measurements were taken. A complete set of data points was collected on 39 subjects, resulting in 468 total data points (12 x 39). To enable more meaningful comparison, each observer's numerical reading was converted as follows: O – 4 = "reactive" or "treatable"; 5 – 9 = "non-reactive" or "non-treatable". For each data point measured, the two observers either: agreed (both reactive or both non-reactive), or disagreed (one reactive & one non-reactive).

RESULTS: The two observers were in agreement for 304 of 468 data points. That is, in 64.9% or in approximately 2 out of every 3 data points measured, the two observers *agreed* that the measurement was either reactive or non-reactive (or, treatable vs. non-treatable). In 1 out of every 3 data points measured, the two observers *disagreed* Re: reactive vs. non-reactive. In any given subject (with 12 data points), the level of agreement between the two observers ranged from a low of 25% (1 subject) to a high of 100% (2 subjects).

CONCLUSIONS: Using a particular set of guidelines, the observers in this study fell short of an acceptable level of agreement that would be expected of a measurement that is used for clinical decision making. Based on our experience in this study, we have noted several aspects of the research protocol that could be modified in order to raise the interobserver reliability to a clinically acceptable level. The possible changes to protocol could include the following: 1) develop a more regimented technique for measuring auricular conductivity; 2) teach the modified technique to all clinical participants prior to initiating a repeat study; 3) standardize all the data collection and recording methods; 4) study a patient population with more pathology.

BIBLIOGRAPHY

1) Oleson, TD, et al. An experimental evaluation of auricular diagnosis: the somatotopic mapping of musculoskeletal pain at ear acupuncture points. Pain. 1980; 8:217-229.
2) Bergsmann, O, et al. Differences in electrical skin conductivity between acupuncture points and adjacent skin areas. American Journal of Acupuncture. 1973; 1: 27-32.

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CONSULTANT PROFILE

Eric Van Ostrand, M.D. *Neurologist*

Dr. Van Ostrand graduated with honors, Magna cum Laude from Haverford College in Pennsylvania with a Bachelor of Science degree in Chemistry and French in 1989, and his doctorate in 1993 from the University of Rochester School of Medicine in Rochester, New York. Dr. Van Ostrand continued his post-graduate training at the University of Pennsylvania from 1993 through 1998. Following graduation he worked as an Assistant Instructor in Neurology, an Instructor in Neurology, followed by a Neurology Conference Coordinator at the University of Pennsylvania. Dr. Van Ostrand earned his board certification in Neurology in 1997 and is a certified member of the Acute Stroke Intervention team with participation in investigational drug trials. He is a current member of the American Academy of Neurology and the Sacramento Medical Society. Currently, Dr. Van Ostrand is in general practice with a specialization in the Peripheral Nervous System and Neurodiagnostic Evaluations. Dr. Van Ostrand is licensed to practice medicine in the state of California. He has been performing medical-legal evaluations since July 2000.

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Local chiropractor and consultant to Benchmark Medical Consultants, Susan Bromley D.C., was selected by the F.I.C.S. as one of only four doctors of chiropractic medicine from the United States to treat and support participants during the 2004 Olympic Games in Athens, Greece.

Twelve to eighteen international chiropractic medicine doctors worked at the VISA World Olympian Reunion Center, located at the Athens Lawn Tennis Center. The clinic provided services to all past and present athletes, as well as the entire Olympic community, if needed. The selection of doctors for this clinic is made by the International Federation of Sports Chiropractic/ Fédération Internationale de Chiropratique du Sport (FICS). The FICS is comprised of national chiropractic sports councils worldwide, individual members, and has affiliations with international organizations within the chiropractic profession and the world of sports. "To be chosen to work at this level is a great honor and opportunity," Bromley noted.

Olympic athletes face a lot of overuse injuries since they push themselves harder than the average person who works out regularly. "Sports chiropractors are trained to treat specific injuries of the muscle and tissue that cause pressure on connecting joints and nerves that don't allow a body an optimum performance," said Bromley. By using chiropractic care as an alternative pain relief treatment, an athlete can reduce the risks associated with narcotic pain control and or surgery.

Dr. Bromley has an extensive background in sports medicine and athletics. She currently practices in Union City, California, and consults through Benchmark Medical Consultants as an independent consultant. Since 1997, she has been a ProSport Chiropractic participating doctor for the Professional Rodeo Cowboys Association, as well as the International Women's Football League (IWFL). Bromley's experience also includes working with high profile athletic and sports teams, including: US American Fin Swimming Team, American Basketball League, Women's Professional Basketball, Barnum and Bailey Circus, Winston Cup, Las Vegas Motor Speedway, Sears Point Raceway, and California Speedway. She attended University of California, Los Angeles and Los Angeles College of Chiropractic in Whittier, California where she graduated Cum Laude in 1994.

The Acropolis at Athens
Photo: Dr. Susan Bromley, D.C.

The Summer Olympic Games were held from August 13th through 29th, 2004 in Athens, Greece.

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