

Clinical Relevance for the Veteran

SUMMARY OF SCIENTIFIC/TECHNICAL PAPERS IN THIS ISSUE

Distal Thigh/Arm Index as a Predictor of Success for Lumbar Sympathectomy

Bok Y. Lee, MD;
Lee E. Ostrander, PhD; German Aquino-Chu, MD;
Robert E. Madden, MD (p.383)

Purpose of the Work. Much of the confusion concerning the effectiveness of lumbar sympathectomy appears to be due to the differences in the criteria for choosing patients who may benefit from the procedure. Successful outcomes appear to depend upon methods of selecting patients for sympathectomy. Alternative criteria need to be evaluated objectively and quantitatively. In this study, two measures indicative of total limb blood flow were evaluated as predictors, mean calf blood flow (MCBF) by electromagnetic flowmetry and distal thigh-arm systolic pressure index (DTAI), and the relationship of outcome to criteria based on thresholds for MCBF and DTAI via Doppler ultrasonic was examined. **Subjects/Procedures.** Records of 90 patients undergoing sympathectomy were reviewed to determine the usefulness of the DTAI in predicting the outcome in a selected population based on several criteria including not being amenable to reconstructive surgery, impending gangrene or frank gangrene, pain at rest, ulceration, and/or disabling claudication. Clinical testing included DTAI and MCBF chosen as possible predictors of blood flow changes following sympathectomy, since each is indicative of overall limb flow. To examine the use of these tests as predictors, results were pooled into groups as a function of outcome and the *t*-tests were applied to test and to reject where appropriate to the null hypothesis that there were no significant differences. **Results.** Results have shown that DTAI >0.6 is a suitable criterion for selecting patients who will have a beneficial outcome after sympathectomy. **Relevance to Veteran Population.** Alleviates the confusion which exists regarding sympathectomy regarding who is and who is not a candidate.

Bok Y. Lee, MD

Gait Analysis in Peripheral Vascular Insufficiency Through-knee Amputation

Michael S. Pinzur, MD
(p. 388)

Purpose of the Work. Recent improvements in prosthetic limb componentry and surgical technique allow the through-knee (knee disarticulation) amputee to achieve direct load transfer (end weight bearing) to their prosthetic socket, and gain the intrinsic walking stability afforded by the four-bar linkage prosthetic knee joint. The metabolic cost of walking for the peripheral vascular insufficiency patient with a through-knee amputation is midway between that of the trans-tibial and trans-femoral amputation levels. **Subjects/Procedures.** Twelve peripheral vascular insufficiency trans-tibial amputees and five peripheral vascular insufficiency subjects at each of the unilateral trans-femoral, through-knee, ankle disarticulation, and midfoot amputation levels were tested. **Results** Walking electromyography revealed that the elderly, limited capacity, trans-tibial amputee does not adequately utilize the propulsive capacity of his knee extensors. When walking propulsion of elderly trans-tibial and through-knee amputees determined by force-plate determination was compared, there was no difference. **Relevance to the Veteran Population.** The data summarized in this paper should provide the rehabilitation-minded amputation surgeon objective data to determine the relative role of through-knee versus trans-tibial amputation in elderly veteran, and other peripheral vascular insufficiency, patients requiring lower extremity amputation.

Michael S. Pinzur, MD

A Closed Loop Automated Seating System

Richard J. Kwiatkowski, MS and
Raphael M. Iñigo, PhD (p. 393)

Purpose of the Work. Wheelchair users are highly susceptible to pressure sores. Products such as custom contoured cushions can produce "safe, desirable" pressure distributions. However, it is not well-known what constitutes a "desired" pressure distribution nor what contour produces that distribution for a particular person. A computer-aided seating system intended to determine seating con-

tours that produce predetermined, "desired" pressure distributions is described. **Procedures.** A prototype system was built to test the design of the system components. A test load was lowered onto an adjustable, forcesensing surface which was automatically adjusted until a predetermined force distribution was obtained. **Results.** The prototype created surface contours which produced uniform force distributions for a buttocks model. The prototype proved the concept design and it was decided that the full seating system should be built. **Relevance to Veteran Population.** The final system should be useful for determining "good" seating contours for veterans with the purpose of reducing the risk of pressure sores developing by prolonged sitting in a wheelchair by a person with loss of sensation.

Richard J. Kwiatkowski

Comparison of Functional and Medical Assessment in the Classification of Persons with Spinal Cord

Injury Janet H. Bednarczyk, BSc, RPT and David J. Sanderson, PhD (*p. 405*)

Purpose of the Work. The purpose of this study was to compare several medical and functional assessment classification systems within the same group of spinal cord injured subjects. **Subjects/Procedures.** Thirty subjects with traumatic spinal cord injury were classified by the same examiner and grouped according to three classifications systems: American Spinal Cord Association scale (ASIA), Bracken scale (BR), and the wheelchair basketball sports test (BB). Use of any of these scales could result in different classifications of the subjects. **Results.** There was a moderate correlation between the ASIA and BB ($r = 0.81$), a lower correlation between ASIA and BR (-0.66) and a low correlation between BR and BB (-0.48). It was clear that these systems could result in different patterns of subject grouping which could affect the results of clinical investigations. This implies that for the purposes of clinical research, care must be taken in the selection of a system and caution exercised when interpreting data from such studies. **Relevance to the Veteran Population.** Clinicians should be aware that the use of different classification systems can affect the results of clinical investigations, thereby affecting the treatment strategy to the veteran and ultimately the soundness of his rehabilitation treatment.

David J. Sanderson, PhD

Biomechanical Analysis of Body Mass Transfer During Stair Ascent and Descent of Healthy

Subjects James E. Zachezewski, MS, PT, SCS, ATC; Patrick O. Riley, PhD; David E. Krebs, PhD, PT (*p. 412*)

Purpose of the Work. The purposes of the study were to 1) assess whole body motion from the frontal (front), sagittal (parallel to the median plane), and transverse (across the body) planes; 2) compare center of mass (CM) displacement with center of pressure (CP); and, 3) further define the stance and swing phases of the legs in stair ascent (SA) and stair descent (SD). **Subjects.** Three males and eight females ranging in age from 26–70 (mean 34 years) served as subjects. All subjects were healthy without any type of musculoskeletal dysfunction which would hinder performance. **Procedures.** Subjects performed four trials of SA and SD at their own natural pace. Data were collected using the SELSPOT II/TRACK data acquisition system and two Kistler force plates. **Results.** Specific phases and duration of SA and SD are presented and described. Subtle differences of single- and double-limb support are demonstrated and discussed. Based on these results it is apparent that SD is a more dynamic process with greater inherent instability. **Relevance to Veteran Population.** Knowledge of normal SA and SD will allow comparison to individuals exhibiting various pathologies such as balance disorders, total joint replacement at the hip or knee, and degenerative joint disease, such as arthritis. Such comparisons should facilitate the development of appropriate treatment strategies by clinicians.

James E. Zachazewski, MS

Effect of Handedness in Tactile Speech Perception

Julia Z. Sarant, BSc, DipAud; Robert S.C. Cowan, PhD, DipAud; Peter J. Blamey, PhD; Karyn L. Galvin, BSc, DipAud; Graeme M. Clark, PhD, FRACS (*p. 423*)

Purpose of the Work. A multiple-channel electrotactile speech processor, the "Tickle Talker," has been developed at the University of Melbourne as a means of improving speech perception for profoundly hearing-impaired people who are unable to have a cochlear implant. Previously, the device has been worn on the non-dominant hand to avoid interference with daily activities. However, it was

appropriate to evaluate whether there would be a preferential pathway to the left cerebral hemisphere for information presented tactually to the right hand, similar to that known for auditory stimuli presented to the right ear. This study evaluated whether tactual sensitivity was greater for the dominant hand as compared with the non-dominant hand. It also evaluated whether users of the device achieved greater speech perception benefits using the device on the dominant hand as compared to the non-dominant hand. **Subjects.** The subjects were six normally hearing adults, three males and three females. **Procedures.** Evaluations of threshold pulse width, dynamic ranges, paired electrode identification, and a closed-set tactual pattern discrimination test battery showed no difference in tactual sensitivity measures between the two hands. Speech perception was assessed with closed sets of vowels and consonants and with open-set Harvey Gardner (HG) words and Arthur Boothroyd (AB) words. **Results.** Group mean scores were higher in each of the tactually aided conditions as compared to the

unaided conditions for speech tests, with the exception of AB words in the TTLA/LA condition on the right hand. Overall mean scores on the closed-set vowel test and on open-set HG and AB words were significantly higher for the tactually aided condition as compared to the unaided condition. Comparison of performance between the dominant and non-dominant hand showed a significant advantage for the dominant hand on the closed-set vowel test only. No significant differences between hands in either tactually aided or unaided conditions were evident for any of the other speech perception tests. Factors influencing this result could have been variations in degree of difficulty of the tests, the amount of training subjects received, or the training strategy employed. Although an advantage to presenting speech through the dominant hand may exist, it is unlikely to be great enough to outweigh possible restrictions on everyday use. **Relevance to Veteran Population.** It is useful to know that either hand may be used to operate this device.

Julia Z. Sarant