

Association of pinch strength with hand dysfunction, finger deformities and contact points in patients with rheumatoid arthritis

Sirs,

Among disabilities in rheumatoid hands, weakness of pinch strength severely deteriorates hand function (1, 2). This study aimed to investigate the association of pinch strength with hand dysfunction in patients with rheumatoid arthritis (RA), as well as with several factors concerning thumb and index finger, such as deformities and contact points during pinch.

Eighty-one hands of 42 outpatients with RA who met the American College of Rheumatology criteria (3) were examined. All patients were female, with the average age of 63.9 years (range, 38–82) and with the average duration of RA with 18 years (1–59). Hand dysfunction was evaluated by Hand Disability Index (HDI), which was calculated as the sum of the scores of seven items from the Japanese version of the Stanford Health Assessment Questionnaire (4), focusing on hand and finger function.

Deformities in thumb and index finger were evaluated with their appearance and manual examination, and contact points during tip pinch were classified as apex or phalanx in longitudinal plane, and as pulp, oblique, or lateral in transverse plane. Then three types of pinch strength, tip pinch, key pinch and three-digit pinch, were measured by pinch gauge (Sammons Preston, IL), and was analysed in relation to HDI as well as deformities and contact points. The correlations between HDI and pinch strength were examined by Spearman's rank correlation coefficient. Comparison between two groups sorted by the presence or absence of studied matters was examined by Mann-Whitney U-test. A p -value of <0.05 was considered statistically significant.

Average HDI was 10.1 ± 6.1 , and average pinch strength was 1.05 ± 0.81 kg in tip pinch, 1.55 ± 1.10 kg in key pinch, and 1.48 ± 1.01 kg in three-digit pinch, which all demonstrated significant negative correlations with HDI (Fig. 1). That is to say, hands were more disabled with less pinch strength.

Out of the 81 hands studied, 30 had boutonniere, 7 had swan neck, and 4 had mutilated



Fig. 1. Correlation of hand disability index (HDI) and pinch strength. All types of pinch demonstrated significant negative correlations with HDI (tip pinch, $r = -0.60$, $p < 0.001$; key pinch, $r = -0.64$, $p < 0.001$; and three-digit pinch, $r = -0.65$, $p < 0.001$). Data analysed by Spearman rank correlation coefficient.

deformity in thumb. Tip pinch strength in hands with mutilated deformity was significantly weaker than that in hands without deformity (0.31 ± 0.59 kg vs. 1.21 ± 0.85 kg). As for the deformities in index finger, 13 had ulnar deviation, 37 volar dislocation of metacarpophalangeal (MP) joint, 5 swan neck and 3 boutonniere deformity. Tip pinch strength in hands with volar dislocation of MP joint was significantly weaker than in those without (0.72 ± 0.62 kg vs. 1.33 ± 0.86 kg).

Contact point of thumb during tip pinch significantly affected the pinch strength, when it was studied in transverse plane. Number of hands with contact point of thumb at Pulp, Oblique and Lateral were 27, 29 and 25, with tip pinch strength of 1.36 ± 0.95 kg, 1.17 ± 0.72 kg and 0.59 ± 0.5 kg, respectively. Tip pinch strength in lateral was significantly weaker than that in pulp and oblique. In contrast, contact point of index finger significantly affected the pinch strength, when studied in longitudinal plane. Number of hands with contact point of index finger at apex and phalanx were 54 and 27, with tip pinch strength of 1.21 ± 0.86 kg and 0.74 ± 0.62 kg, respectively, the difference of which was statistically significant. Contact point of thumb studied in longitudinal plane as well as that of index finger in transverse plane did not affect pinch strength.

In this study, pinch strength was significantly associated with hand dysfunction in RA patients, and was deteriorated by mutilated deformity of thumb and MP volar dislocation in index finger. Moreover, tip pinch strength was the maximum with thumb contact on its pulp surface and with index finger on its apex, whereas abnormal contact points demonstrated significant weakness.

We believe these results would be helpful not only in planning reconstructive surgeries but also in conservative management of rheumatoid hands.

A. NAMPEI¹, MD, PhD

K. SHI², MD, PhD

M. HIRAO², MD, PhD

T. MURASE², MD, PhD

H. YOSHIKAWA², MD, PhD

J. HASHIMOTO², MD, PhD

¹Department of Orthopaedic Surgery, Osaka Rosai Hospital, Sakai, Japan; ²Department of Orthopaedic Surgery, Osaka University Graduate School of Medicine, Osaka, Japan.

This work is attributed to: Department of Orthopaedic Surgery, Osaka University Graduate School of Medicine, Osaka, Japan.

Address correspondence and reprint requests to: Kenrin Shi, MD, PhD, Assistant Professor, Department of Orthopaedic Surgery, Osaka University Graduate School of Medicine, 2-2 Yamada-oka, Suita, Osaka 565-0871, Japan. E-mail: shi@ort.med.osaka-u.ac.jp

Competing interests: none declared.

References

- BODUR H, YILMAZ O, KESKIN D: Hand disability and related variables in patients with rheumatoid arthritis. *Rheumatol Int* 2006; 26: 541–4.
- VLIET VLIJLAND TP, VAN DER WIJK TP, JOLIE IM, ZWINDERMAN AH, HAZES JM: Determinants of hand function in patients with rheumatoid arthritis. *J Rheumatol* 1996; 23: 835–40.
- ARNETT FC, EDWORTHY SM, BLOCH DA *et al.*: The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. *Arthritis Rheum* 1988; 31: 315–24.
- MATSUDA Y, SINGH G, YAMANAKA H *et al.*: Validation of a Japanese version of the Stanford Health Assessment Questionnaire in 3,763 patients with rheumatoid arthritis. *Arthritis Rheum* 2003; 49: 784–8.