Original Investigation / Özgün Araştırma

The Decreased Sensory Thresholds in Rheumatoid Hand: Comparisons with Osteoarthritic and Normal Hands

Romatoid Eldeki Azalmış Duysal Eşikler: Osteoartritli ve Normal Ellerle Karşılaştırma

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ABSTRACT

Objective: We aimed to assess the quantitative median sensory and motor function of the patients with rheumatoid hands and compared with healthy normal hands and osteoarthritic hands and to investigate the some differences and possible relationships.

Methods: Hand pain-VAS, disease activity score of 28 joints (DAS28), health assessment questionnaire (HAQ), radiographic Larsen score and laboratory test results were recorded in patients with rheumatoid arthritis. Quantitative sensory testing of the median nerve including Semmes- Weinstein (S-W) touch pressure thresholds, and 2- point discrimination (2-PD) test, and pinch strength measurement were performed in all subjects.

Results: Seventy-two female patients with rheumatoid arthritis (mean age: 55.9 ±9.5 years), 43 female patients with osteoarthritis (mean age: 58.9 ±4.8 years), and 39 female controls (mean age: 56.6 ±5.8 years) were recruited to the study. The subjects with RA demonstrated greater sensitivity with light touch (S-W touch-pressure thresholds) relative to the other population (p=0.028). Constant predictors of S-W touch pressure threshold of median nerve were duration of disease, DAS28, HAQ, rheumatoid hand deformities and laboratory parameters including CCP, RF, CRP, and platelet count in multiple linear regression analysis of patients with rheumatoid arthritis (p<0.05).

Conclusion: Sensory touch pressure thresholds are lower in rheumatoid hands than osteoarthritic hands, and healthy hands. Sensory threshold measurement can be useful to assess painful fingers of rheumatoid hands confirming hypersensitive states and differentiating active arthritis.

Keywords: Hand, rehabilitation, rheumatoid arthritis, osteoarthritis, sensory threshold

ÖZET

Amaç: Romatoid ellerde kantitatif median sinir duysal ve motor fonksiyonunu incelemeyi ve sağlıklı normal eller ve osteoartritli ellerle karşılaştırarak bazı farklar ve olası ilişkileri araştırmayı amaçladık.

Yöntemler: Romatoid artritli (RA) hastalarda el ağrısı-VAS, 28 eklemdeki hastalık aktivite skorunu (DAS28), sağlık değerlendirme anketi (SDÖ), Larsen skoru ve laboratuvar test sonuçları kaydedildi. Tüm bireylere median sinir kantitatif duysal testi olan Semmes-Weinstein (S-W) dokunma basınç eşikleri, ve 2-nokta diskriminasyon (2-ND) testi ile çimdik-gücü ölçümü yapıldı.

Bulgular: Yetmiş-iki romatoid artritli kadın hasta (ort.yaş: 55.9 ±9.5 yıl), 43 osteoartritli kadın hasta (ort. yaş: 58.9 ±4.8 yıl), ve 39 kadın kontrol (ort.yaş: 56.6 ±5.8 yıl) çalışmaya alındı. RA hastaları hafif dokunmaya (S-W dokunma-basınç eşikleri) diğer populasyona gore daha fazla duyarlılık gösterdi (p=0.028). Multipl doğrusal regresyon analizinde RA hastalarının median sinir S-W dokunma-basınç eşiğinin sabit belirleyicileri hastalık süresi, DAS28, SDÖ, romatoid el deformiteleri ve CCP, RF, CRP, ve trombosit sayısı gibi laboratuvar sonuçlarıydı (p<0.05).

Sonuçlar: Romatoid eldeki duysal dokunma basınç eşikleri osteoartritik el ve sağlıklı ellerden daha düşüktü. Romatoid elde ağrılı parmakları değerlendirmede duysal eşik ölçümü aktif artriti ayırt etmede ve hipersensitif durumu doğrulamada faydalı olabilir.

Anahtar sözcükler: El, rehabilitasyon, romatoid artrit, osteoartrit, duysal eşikler

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Introduction

The hand is the main target in many rheumatic diseases such as rheumatoid arthritis (RA) and osteoarthritis (OA), and is main tactile sensory organ that is uniquely designed for fine motor activities (1,2).

Evaluation and treatment of hand problems in both RA and OA can be challenging (3-5). The possible neurologic contribution in the pathogenesis of the rheumatoid hand is not well understood (6-14). Interestingly, none of these studies were assessed sensory thresholds in rheumatoid hands compared to osteoarthritic and healthy hands. Sometimes, patients with arthritis had tender joints without any joint swelling and any laboratory activity. We hypothesized that decreased sensory thresholds may be responsible for this complex condition.

Basically, the sensory experience starts in the skin as free nerve endings or in a number of specialized receptors. One of them, tactile sensitivity is mediated by mechanoreceptors that conduct action potentials via A-beta fibers and can be detected with Semmes-Weinstein (S-W) monofilaments and 2-point discrimination (2-PD), which are easy to use and reliable for quantifying tactile sensitivity (15-18).

The primary aim of this study was to confirm the decreased sensory thresholds in rheumatoid hands and to compare with osteoarthritic and healthy hands. A secondary aim was to investigate the relationship between sensory function of the hand, and clinical, laboratory, and radiographic disease characteristics of rheumatoid arthritis.

Materials and Methods

Subjects

All subjects were randomized selected from outpatient clinic of physical and rehabilitation medicine department of tertiary care hospital. One hundred-fifty four females with right-hand dominance were included to the study. Seventy-two female patients with RA met the 1987 American College of Rheumatology criteria for RA (19) were investigated. Forty-three female patients with hand OA (20) and 39 volunteer female healthy normal controls (HNCs) were also examined for comparisons. HNCs were free of hand problems and any other orthopedic impairment or systemic disease that could have affected their hand function. Patients and controls were excluded if they were male, had a history of hand injury or surgery that lead to functional loss in the hands, entrapment neuropathies of upper extremity such as carpal tunnel syndrome, radiological atlanto-dental space of >0.5mm, known concomitant systemic connective tissue disease, neurological disease and psychiatric disorders, or had co-morbid disease such as diabetes, hypo- or hyperthyroidism, or asthma.

The present study has been approved by the local ethic committee and has therefore been performed in accordance with the ethical standards laid down in the 2008 revision of 1964 Declaration of Helsinki. All persons gave their informed consent prior to their inclusion in the study. All patients continued their medications but were off medications that might have altered their mental state. Detailed neurologic examination of the upper extremity was performed in all subjects. Patients with involvement of upper and lower motor neuron findings were not included to the study. Sensory motor examination of the hand including quantitative touch-pressure thresholds of S-W monofilaments for tactile sensitivity, static 2-PD for cortical discrimination, and pinch measurement for pinch strength were also performed to all subjects.

Instrumentation and Procedure

Five filaments S-W test was used for detection of touch-pressure threshold. The 2.83 S-W filament (marking number), detected over most of the body, serves as a cut-off reference for normal versus abnormal peripheral nerve function, and the heavier filaments quantify levels of abnormality and loss. Volar sides of index (D2) and middle (D3) fingertips were used for sensorial assessment in this study. Thumb fingertips were not selected because of some knife-cut scar tissues in this housewife population. Semmes-Weinstein pressure aesthesiometer (North Coast Medical, Campbell, California) is a kit of 20 probes, each probe consisting of a nylon monofilament attached to a Lucite rod. We selected 5 of them (2.4 and 2.83 for normal or green, 3.61 for diminished light touch or blue, 4.31 for diminished protective or purple, and 5 for loss of protective or red monofilament) to obtain quick and easy touch-pressure threshold results. The classification of Semmes-Weinstein monofilaments were:

1.65-2.83 mg: normal

3.22-3.61 mg: diminished light touch

3.84-4.31 mg: diminished protective

4.58-6.65 mg: loss of protective

>6.65 mg: untestable

Each probe is a marked with a number ranging from 1.65 to 6.65 that represents the logarithm of ten times the force in tenths of milligrams (log10 force 0.2mg) required to bow the monofilament when it is applied perpendicular to the skin (15,16). The hand was fully supported in the experienced examiner's hand (SG). Vision occluded by the patient simply closing her eyes.

Testing with the monofilaments began with filaments in the normal threshold level and progresses to the filament of increasing pressure until touch identified by the patient in the hand rehabilitation setting. The filaments were applied three times to the same spot, with one response out of three considered an affirmative response. All the filaments were applied in a perpendicular fashion in 1 to 1.5 seconds, continued in pressure in 1 to 1.5 seconds, and lifted in 1 to 1.5 seconds.

2-PD is the classic test of functional sensibility because it is generally acknowledged to relate to the ability to use the hand for fine tasks (17). The test instrument have blunt testing ends such as Disc-Criminator (Disc-Criminator, PO Box 16392, Baltimore, Maryland) as we used in the present study. During the test, the patient's hand was fully supported. Vision was occluded. With the patient's eyes closed and her hand cradled in the examiner's (SU), the examiner gently places the caliper on the skin in a longitudinal direction, that is, on either the ulnar or the radial side of the digit. The tips of the index and the middle fingers were tested in this study. Because the fingertips are the most important in active exploration and tactile scanning of an object, testing was begun with 5mm of distance between the two points. One or two points were applied lightly to the fingertip in a random sequence in a longitudinal orientation to avoid crossover from overlapping digital nerves. Because it is light-touch discrimination that is being tested and because the patient is to be compared to the normal population, the pressure applied should be very light and stop just at the point of blanching. Seven of ten responses must be accurate for scoring. Static 2-PD classes were listed below:

2-6mm: normal

7-10mm: fair

11-15mm: poor

>16mm: non-functional

Pinch strength was measured with JAMAR Hydraulic Pinch Gauge (18). Three types of pinch were assessed by experienced examiner (SG): (1) prehension of the thumb pulp to the lateral aspect of the index middle phalanx (key, lateral, or pulp-to-side), (2) pulp of the thumb to pulps of the index and long fingers (three-jaw chuck, three-point chuck), and (3) thumb tip to tip of the index finger (tip-to-tip). The mean of three trials was recorded, and comparisons were made with the two hands.

Rheumatoid Arthritis-Specific Disease Parameters

Disease activity score of 28 joints (DAS28<2.6: remission, 2.6-3.2: mild, 3.2-5.1: moderate, >5.1 severe disease activity) (21), C-reactive protein (CRP), anti-cyclic citrullinated peptide (CCP), and rheumatoid factor (RF) were recorded in patients with RA. DAS28 parameters consist of swollen joint count, tender joint count, patient assessment of disease activity, and erythrocyte sedimentation rate (ESR). Functional disability was assessed and classified (mild: 0-1, moderate: 1.1-2, severe: 2.1-3) by Health Assessment Questionnaire (HAQ) (22). Pain was evaluated by 10cm visual analogue scale (VAS) in the last week. Laboratory parameters were included as ESR, C-reactive protein (CRP), RF (latex agglutination), and CCP. Hand x-rays were evaluated according to the Larsen scoring system (23).

Data Analysis

All statistical analyses of data were made using SPSS for Windows 11.5 package program. Mean and standard deviation or median [minimum-maximum] for continuous variables with 95% confidence interval for mean and the number of the case and percentage for categorical variables were calculated for descriptive statistics.

Results were presented as the mean ± S.D and number and percentages. One-way analysis of variance test with Bonferroni's correction adjusting for multiple comparisons was used for the importance of difference on comparison of means between groups. The Kruskal-Wallis test for non-parametric data was used to reveal the significance of differences between subject groups. Correlation analysis was performed with Pearson correlation coefficient. And partial correlation was applied after controlled by age, disease duration, DAS28, disease activity, HAQ, and disability. Multiple linear regression analyses were performed to estimate the partial impact of disease duration and disease activity parameters as independent variables on the dependent variable of touch pressure threshold by S-W monofilament. The significance levels were set at $p<0.05$.

Results

Seventy-two female RA patients with a mean age of 55.9 ±9.5 (37-74), forty-three female OA patients with a mean age of 58.9 ±4.8 (50-69), and thirty-nine female healthy normal controls (HNCs) with a mean age of 56.6 ±5.8 (50-69) years were recruited to the study ($p<0.05$). The duration of disease was 9.8 ±8.5 (3-40) years in patients with RA and 2.8 ±0.9 (1-5) years in patients with OA ($p<0.001$).

The demographic, clinical, laboratory findings, and medications of patients with RA were shown in Table 1. According to DAS28 15.3% of patients were in remission, 7% had mild, 77.7% had moderate disease activity for RA. HAQ scores of RA patients showed that 50% of patients

Table 1. The demographic, clinical, laboratory findings, and drug characteristics of female patients with rheumatoid arthritis.

	RA (n=72)
Age (years), mean ±SD (min-max)	55.9 ±9.5 (37-74)
Hand pain-duration (years), mean ±SD (min-max)	9.8 ±8.5 (3-40)
Hand pain-score of VAS (cm)	4.3 ±1.2 (3-10)
DAS28 score, mean ±SD (min-max)	4.8±1.4 (1.7-7.5)
remission, n (%)	11 (15.3%)
mild disease activity, n (%)	5 (7%)
moderate disease activity, n (%)	56 (77.7%)
HAQ score, mean ±SD (min-max)	1.2±0.7 (0.1-2.2)
mild disability, n (%)	30 (50%)
moderate disability, n (%)	18 (25%)
severe disability, n (%)	18 (25%)
Larsen score, mean ±SD (min-max)	36.6±19.0 (0-108)
ESR (mm/hr), mean ±SD (min-max)	36.5±18.2 (5-77)
CRP (mg/dl), mean ±SD (min-max)	1.5±2.0 (0.1-11.1)
DMARDs user, n (%)	72 (100%)
Mono-DMARD user, n (%)	38 (52.7%)
Combined two-DMARDs user, n (%)	31 (43.1%)
Combined three-DMARDs user, n (%)	3 (4.2%)
Corticosteroid user, n (%)	39 (54.2%)
NSAIDs user, n (%)	23 (31.9%)

had mild, 25% of patients had moderate and 25% of patients had severe disability for RA. The distribution of rheumatoid hand deformities was symmetric. The most frequent rheumatoid hand deformity was the ulnar deviation of MP joints (19.4%). Caput ulna and thumb-Z deformities were as common as 16.7% and 15.3%, respectively. Buttonhole and Swan neck deformities of fingers were less commonly seen only in 9 patients (12.5%). Hand and finger deformities of patients with osteoarthritis consisted of angular deformities of first carpometacarpal and IP joints.

Tactile Sensitivity

The classification of tactile sensitivity measurement examined by S-W and 2-PD tests were summarized in Table 2.

The comparisons of quantitative sensory and motor median nerve examination findings of both hands including 2-point discrimination, S-W-monofilaments, pinch strength (key, three-point; tip-to-tip) in all groups were summarized in Table 3. 2-PD values were similar in patients with RA and HNCs (p=0.35). But these values were better in healthy hands than osteoarthritic hands (p=0.042). The subjects with RA demonstrated greater sensitivity with sensory threshold of S-W monofilament test relative to the other populations with OA (p=0.006) and HNCs (p=0.028). All of the pinch strength values were similar in all groups (p=0.213).

Correlation and Regression Analysis of Median Nerve Sensory Motor Findings

Pearson correlation table with 2-tailed significance in patients with rheumatoid arthritis were summarized in Table 4. The number of rheumatoid hand deformities associated with reduced tip pinch strength (r= - 0.444, p=0.018). The deformity of ulnar deviation was correlated with S-W touch pressure threshold (r= - 0.540, p=0.003), and CRP (r= 0.293, p=0.013). S-W touch pressure threshold was positively correlated with 2-PD (r=0.445, p=0.018).

Partial correlations were performed after controlling for age, duration of disease, disease activity, disability, and radiographic damage. S-W test of right D2 were correlated with right buttonhole (r=0.494, p=0.032) and left buttonhole (r=0.494, p=0.032) deformities after the adjustments.

Constant predictors and coefficients of S-W touch pressure threshold of median nerve were duration of disease (Beta: 0.916), DAS28 (Beta: 0.891), HAQ (Beta: -3.326), rheumatoid hand deformities (Beta: 1.116), and laboratory parameters including CCP (Beta: 2.213), RF (Beta: 0.562), and CRP (Beta: 0.720) in multiple linear regression analysis (p<0.05).

Discussion

This study suggests that impaired median nerve function is present in afferent myelinated A-beta fibers in patients with RA and OA. Light touch sensitivity was greater or touch-pressure threshold was lower in rheumatoid hands compared to osteoarthritic and healthy hands. And osteoarthritic hands had greater deep sensation using 2-point discrimination values compared to healthy and rheumatoid hands. These two different joint diseases have different pathologic and clinical presentations.

As a matter of fact light touch and deep pressure sensibility are considered to represent two ends of a continuum of cutaneous sensibility, with light touch being perceived by receptors in the superficial skin layers and pressure being perceived by receptors in the subcutaneous and deeper tissue (1). Light touch sensibility is a necessary component of fine discrimination. Pressure sensibility is a form of protective

Table 2. The comparison of tactile sensitivity classifications between groups.

	RA (n=72)	OA (n=43)	HNCs (n=39)	p
2-PD right digit II (class)				0.243
Normal	93.1% (67)	93% (40)	100% (39)	1.000
Fair	6.9% (5)	4.7% (2)	0% (0)	1.000
Poor	0% (0)	2.3% (1)	0% (0)	0.279
2-PD right digit III (class)				0.123
Normal	88.9% (64)	90.7% (39)	100% (39)	0.314
Fair	11.1% (8)	7% (3)	0% (0)	1.000
Poor	0% (0)	2.3% (1)	0% (0)	0.705
2-PD left digit II (class)				0.680
Normal	93.1% (67)	95.3% (41)	97.4% (38)	1.000
Fair	6.9% (5)	2.3% (1)	2.6% (1)	1.000
Poor	0% (0)	2.3% (1)	0% (0)	1.000
2-PD left digit III (class)				0.199
Normal	86.1% (62)	90.7% (39)	97.4% (38)	0.375
Fair	13.9% (10)	7% (3)	2.6% (1)	1.000
Poor	0% (0)	2.3% (1)	0% (0)	0.966
S-W right digit II (class)				
Normal	13.9% (10)	4.7% (2)	0% (0)	0.163
Diminished light touch	43.1% (31)	34.9% (15)	33.3% (13)	0.144
Diminished protective	36.1% (26)	60.5% (26)	66.7% (26)	0.563
Loss of protective	6.9% (5)	0% (0)	0% (0)	1.000
S-W right digit III (class)				
Normal	18.1% (13)	7% (3)	0% (0)	0.038§
Diminished light touch	43.1% (31)	27.9% (12)	33.3% (13)	0.026§
Diminished protective	36.9% (26)	65.1% (28)	66.7% (26)	0.097
Loss of protective	2.9% (2)	0% (0)	0% (0)	1.000
S-W left digit II (class)				
Normal	20.8% (15)	2.3% (1)	2.6% (1)	
Diminished light touch	45.8% (33)	39.5% (17)	33.3% (13)	
Diminished protective	33.3% (24)	55.8% (24)	56.4% (22)	
Loss of protective	0% (0)	2.3% (1)	7.7% (3)	
S-W left digit III (class)				
Normal	20.8% (15)	2.3% (1)	2.6% (1)	0.002§
Diminished light touch	50% (36)	41.9% (18)	33.3% (13)	0.001§
Diminished protective	29.2% (21)	55.8% (24)	59% (23)	0.008¶
Loss of protective	0% (0)	0% (0)	5.1% (2)	1.000

§ *statistically significant difference between RA and HNCs,* **¶***statistically significant difference between RA and OA*

sensation because it warns of deep pressure or of low grade repetitive pressure, which might result in injury to the skin. S-W monofilament testing was accepted as one of the quantitative sensory test for touch pressure thresholds showing slowly adapting fibers (24). Strikingly, we detected that S-W test results were greater sensitive in disabled patients with longstanding RA. Peripheral sensitization and A-beta fiber re-organization in the level of spinal cord may be responsible for this greater sensitive state.

While S-W touch pressure threshold detection is primarily used to detect early sensory changes, 2-PD are used for advanced sensory changes. The major problem in assessing sensibility by 2-PD is cortical modification of thresholds. Two-point discrimination is the classic test of functional sensibility, because it is generally acknowledged to relate the ability to use the hand for fine tasks (1-3). Moberg observed that 6mm of 2-PD is required for winding a watch, 6-8mm for sewing, 12mm for handling precision tools, and above 15mm gross tool handling with decreased speed and skill (25). We also found that 2-PD values were worse in patients with hand OA compared to HNCs.

Nerve damage associated with RA has been showed mostly as a subclinical entity expressing a mild sensory or sensorimotor axonal polyneuropathy in RA (8). Higher vibration thresholds were also defined in RA patients, suggesting involvement of A-β fibers (8,9). Decreased pain pressure thresholds were also defined in affected and non-affected body parts of patients with RA, suggesting the function of A-δ fibers might also be

Table 3. The multiple comparisons of quantitative sensory and motor test results between groups.

	RA (n=72)	OA (n=43)	HNCs (n=39)	p
2-PD right digit II (mm)	3.7±1.3	4.1±1.6*	3.4±0.7*	0.481
(min-max)	(1-7)	(3-13)	(2-5)	0.041*
2-PD right digit III (mm)	3.8±1.3	4.3±1.6*	3.6±0.7*	0.357
(min-max)	(2-7)	(3-13)	(2-5)	0.042*
2-PD left digit II (mm)	3.8±1.3	4.1±1.6	3.5±0.7	0.834
(min-max)	(1-7)	(3-13)	(2-6)	0.059
2-PD left digit III (mm)	3.9±1.3	4.3±1.5*	3.5±0.8*	0.53
(min-max)	(2-7)	(3-13)	(2-6)	0.014*
S-W right digit II	3.7±0.6§	4.0±0.5	4.1±0.3§	0.028§
(min-max)	(2.4-4.6)	(2.4-4.3)	(3.6-4.3)	0.193
S-W right digit III	3.7±0.6§¶	4.0±0.5¶	4.1±0.3§	0.006§
(min-max)	(2.4-4.3)	(2.4-4.3)	(3.6-4.3)	0.032¶
S-W left digit II	3.6±0.7§¶	4.0±0.4¶	4.0±0.4§	0.001§
(min-max)	(2.4-4.3)	(2.4-5)	(3.6-4.3)	0.003¶
S-W left digit III	3.5±0.7§¶	4.0±0.4¶	4.0±0.4§	0.0001§
(min-max)	(2.4-4.3)	(2.4-4.3)	(2.4-4.3)	0.001¶
Pinch strength-right key	11.1±5.1	12.3±2.8	12.3±2.8	0.396
(min-max)	(2-25)	(7-17)	(4-16)	0.477
Pinch strength-left key	10.8±5.3	11.4±2.7	11.5±3.0	1
(min-max)	(2-25)	(4-17)	(5-17)	1
Pinch strength-right tip	7.3±4.4	6.2±1.8	6.3±1.8	0.213
(min-max)	(1-22)	(3-11)	(1-10)	0.404
Pinch strength-left tip	7.1±4.3	6.0±1.9	5.9±1.8	0.242
(min-max)	(1-20)	(2-11)	(3-9)	0.209
Pinch strength-right 3-point	8.2±4.6	8.4±2.4	8.6±2.4	1
(min-max)	(1-21)	(4-12)	(1-12)	1
Pinch strength-left 3-point	8±4.5	7.8±2.3	8.1±2.2	1
(min-max)	(1-19)	(4-14)	(4-12)	1

*****statistically significant difference between OA and HNCs*, **§***statistically significant difference between RA and HNCs,¶*statistically significant difference between RA and OA*

negatively affected by RA (26,27). The contradictory results of tactile sensitivity measured via Semmes-Weinstein monofilaments were published in a couple of small studies for rheumatoid foot (28,29). A loss of protective sensation was reported in high percentage of (7, 28%) patients and none of the controls in this study. In contrary, we had only five (6.9%) patients with RA, one (2.3%) patient with OA, and three (7.7%) HNCs showed loss of protective sensation. Small sample size and different area of interest of previous studies may be responsible for these differences. And we investigated painful hands with RA and OA and compared to pain-free hands of HNCs of 154 persons totally.

Chronic pain stimuli from inflamed rheumatoid synovium in these patients may lead to synthesis of neurotrophic growth factors in synovium leading to peripheral sensitization (30). This may also lead to synapses between A-delta and A-beta fibers known as A-beta fiber re-organization in spinal cord level. Any tactile stimulus came to spinal cord via A-beta fibers perform synapses with A-delta fibers and this may lead to pain perception instead of touch pressure (31). A different point of view is immune contribution to neuropathic pain: innate and adaptive immune cells in the periphery and spinal cord can sensitize primary nociceptors and secondary nociceptive neurons respectively to produce pain hypersensitivity (32). Tactile stimulation in daily living activities may lead to pain in greater sensitive fingers. Sensory re-education programs might be useful in these sensitive fingers in hand rehabilitation setting.

Another findings of our study were the reflections of rheumatoid disease on the touch pressure threshold. Duration of disease, disability-HAQ, rheumatoid hand deformity, RF and CRP were predictors of touch pressure

Table 4. Pearson correlation table with 2-tailed significance of patients with RA.

	Duration of RA	Disease activity-DAS28	Disability-HAQ	Radiographic score Larsen
Age (years)	r=0.271*, p=0.024	r=0.268, p=0.169	r=0.485**, p=0.009	r=0.350**, p=0.003
Duration of RA (years)	r=1	r=0.043, p=0.826	r=0.352, p=0.066	r=0.271*, p=0.024
DMARDs (number)	r=0.190, p=0.112	r=0.208, p=0.288	r=0.258, p=0.185	r=-0.397**, p=0.001
Disability and HAQ	r=0.317, p=0.101 r=0.352, p=0.066	r=0.776**, p=0.0001 r=0.714**, p=0.0001	r=0.930**, p=0.0001 r=1	r=0.055, p=0.788 r=0.055, p=0.788
Disease activity and DAS28	r=0.168, p=0.393 r=0.043, p=0.826	r=0.913** p=0.0001 r=1	r=0.776**, p=0.0001 r=0.714**, p=0.0001	r=-0.017, p=0.936 r=-0.076, p=0.713
ESR (mm/hr)	r=-0.30, p=0.802	r=0.383*, p=0.044	r=0.170, p=0.386	r=0.082, p=0.501
CRP (mg/dL)	r=-0.124, p=0.305	r=0.388*, p=0.046	r=0.266, p=0.180	r=0.118, p=0.333
Platelet count	r=-0.190, p=0.116	r=0.119, p=0.545	r=-0.075, p=0.704	r=0.538**, p=0.0001
Right and left ulnar deviation	r=0.465**, p=0.0001 r=0.413**, p=0.0001	r=0.173, p=0.379 r=0.130, p=0.509	r=0.363, p=0.058 r=0.249, p=0.201	r=0.383**, p=0.001 r=0.422**, p=0.0001
Right and left caput ulna	r=0.248*, p=0.037 r=0.276*, p=0.020	r=0.067, p=0.734 r=0.067, p=0.734	r=0.111, p=0.574 r=0.141, p=0.472	r=0.370**, p=0.002 r=0.303*, p=0.011
Right and left thumb-Z	r=0.453**, p=0.0001 r=0.454**, p=0.0001	r=-0.180, p=0.360 r=-0.007, p=0.972	r=-0.081, p=0.682 r=0.060, p=0.764	r=0.280**, p=0.019 r=0.279**, p=0.020
S-W-rightD2 S-W-right D2 class	r=-0.371, p=0.052 r=-0.386*, p=0.042	r=-0.139, p=0.480 r=--0.302, p=0.119	r=-0.286, p=0.140 r=-0.340, p=0.077	r=0.226, p=0.266 r=0.189, p=0.356
S-W-rightD3 S-W-right D3 class	r=-0.411*, p=0.030 r=-0.451*, p=0.016	r=-0.220, p=0.262 r=-0.324, p=0.093	r=-0.373, p=0.050 r=-0.413*, p=0.029	r=0.108, p=0.600 r=0.020, p=0.923
Tip pinch-R	r=-0.320**, p=0.007	r=-0.429*, p=0.023	r=-0.623**, p=0.0001	r=0.116, p=0.340
Tip pinch-L	r=-0.296*, p=0.012	r=-0.339, p=0.077	r=-0.501**, p=0.007	r=0.157, p=0.194
Keypinch-R	r=-0.313*, p=0.020	r=-0.075, p=0.817	r=-0.172, p=0.594	r=-0.107, p=0.433
Keypinch-L	r=-0.347**, p=0.010	r=0.008, p=0.980	r=-0.089, p=0.783	r=-0.150, p=0.271
Tri-pinch-R	r=-0.399**, p=0.003	r=-0.018, p=0.956	r=-0.181, p=0.574	r=-0.180, p=0.185
Tri-pinch-L	r=-0.296*, p=0.028	r=0.090, p=0,781	r=-0.012, p=0.972	r=-0.076, p=0.577

** statistically significant correlation at the p<0.05 level, **statistically significant correlation at the p<0.01 level*

threshold in this study. It may be interpreted as active, chronic, and disabled cases with rheumatoid arthritis had lower sensory thresholds. No direct comparisons could be performed because of scanty data about this issue.

The main limitation of this study might be the cross-sectional design. A longitudinal design might explain the changes of sensory nerve function, more precisely.

Conclusion

Sensory touch pressure thresholds are lower in rheumatoid hands than osteoarthritic hands, and healthy hands. Sensory threshold measurement can be useful to assess painful fingers of rheumatoid hands confirming hypersensitive states and differentiating active arthritis.

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