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HAND MEASUREMENTS IN THE FOLLOW-UP OF ACROMEGALY

F. Tarhan[1], G. Koç[2], N.K. Erdoğan[2], G. Örük[3]

Acromegaly is a chronic progressive disease that originates from the increased secretion of the insulin-like growth-hormone (IGF-1) secondary to the hypersecretion of the growth hormone (GH). The enlargement of the minor hand and foot bones represents an early finding in this disease. Kleinberg et al. used the sesamoid index (SI) values for diagnosing the disease. The present trial was designed to investigate whether there was a difference between the control patients and the treated acromegalic patients in the SI, the terminal tuft width, the joint space and the metacarpal thickness. 34 patients were diagnosed and treated for acromegaly at the Rheumatology and Endocrinology Outpatient Clinics and 26 control patients presenting to the Rheumatology Outpatient Clinic, who were not detected to have an inflammatory rheumatologic pathology were enrolled. The hand radiographs of the patients that followed up for acromegaly and the control group were retrospectively evaluated. The SI, the tuft width, the joint space and the metacarpal thickness were measured. There was a statistically significant difference in the other parameters between the acromegalic patients and the control patients except the mean metacarpal thickness.

Key-word: Acromegaly.

Acromegaly is a chronic progressive disease resulting from the increased secretion of the insulin-like growth-hormone (IGF-1) secondary to the hypersecretion of the growth hormone (GH) (1, 2). In > 95% of the patients, GH hypersecretion is secondary to the benign pituitary adenoma. While the recent publications reported the prevalence to be more than 130 in a million cases, the biochemical acromegaly defined by the increased IGF-1 levels was reported to have a prevalence of 1000 in one million (3, 4). The irregular secretion of the GH has systemic effects in acromegaly. It may impact the bones, the cartilage, the skin, the skin appendices, the cardiac muscle, the blood vessels and all of the connective tissues. The enlargement of the minor hand and foot bones represents an early finding in this disease (1). While the large sesamoid bones were described for the first time by Steinbach et al. on the radiographs of the acromegalic patients, Kleinberg et al. used the sesamoid index values for diagnosing the disease (2). The present trial was designed to investigate whether there was a difference between the control patients and the treated acromegalic patients in the sesamoid index (SI), the terminal tuft width, the joint space and the metacarpal thickness.

Material and method

This retrospective study was approved by the institutional review board and informed constent waived. 34 patients diagnosed with and treated for acromegaly at the Rheumatology and Endocrinology Outpatient Clinics and 26 control patients presenting to the Rheumatology Outpatient Clinic, who were not detected to have an inflammatory rheumatologic pathology were enrolled in the trial. The hand radiographs of the patients followed up for acromegaly and the control group were retrospectively evaluated. The sesamoid index, the tuft width, the joint space and the metacarpal thickness were measured in both the acromegalic patients and the control group.

The sesamoid index is the greatest diameter of the medial sesamoid bone at the metacarpophalangeal joint of the first digit, measured in millimeters with a caliper, was multiplied by greatest diameter of the same sesamoid bone perpendicular to the first diameter. If the sesamoids of a pair of hands were of unequal size, the larger was used. The tuft width considered is the tuft width of the third finger evaluated in mm. The joint space measured is the joint space thickness of the second metacarpophalangeal joint measured in mm, and the metacarp width analyzed is the third metacarp width measured in mm.

Statistical analysis

A statistical assessment was conducted to determine whether there was a difference between the acromegalic patients and the control group in the sesamoid index, the tuft width, the joint space and the metacarpal width. Data were analyzed on a personal computer using the Statistical Package for Social Sciences software (SPSS, Chicago, Illinois).

Results

The study included 34 patients diagnosed with acromegaly and 26 control patients. The age and the gender distribution of the patients and the control group are presented in Table I. Among the acromegalic patients, 26 received (76.5%) surgical treatment and 8 received (23.5%) medical treatment. All of the patients had GH and IGF-1 levels that were within the normal limits. The mean follow-up was 34 months.

The mean parameters are presented for the acromegalic patients and the control group in Table II. There was a statistically significant difference in all the parameters between the acromegalic and the control patients except the mean metacarpal width value.

The distribution and the comparison of the mean parameters by gender in acromegalic patients and the control group is presented in Table III. SI values were significantly higher in males than females of control group. The number of the male patients was low in the acromegalic group with respect to SI, the mean values did not differ by gender. There were no statistically significant difference in all the other mean parameters between the acromegaly patients and the control patients by gender.

There was a significant difference between the patients below and above 40 years of age in SI. The

From: Department of 1. Rheumatology, 2. Radiology, 3. Endocrinology and Metabolism, Atatürk Education and Training Hospital, Izmir, Turkey.
Address for correspondence: Dr F. Tarhan, M.D., 126/7 sok. No: 9 K:3 Evka-3 Bornova-Izmir, 35040, Turkey. E-mail: eminefigentarhan@hotmail.com

Table I. — Distribution of the patients and control group by age and gender.

	Acromegaly	Control Group
Number of patients	34	15
Age range (mean)	22-75 (48,75)	28-62 (42,14)
Number of females (%)	24 (68,5%)	13 (50%)
Number of males (%)	10 (31,5%)	13 (50%)

Table II. – Distribution and comparison of mean parameters between acromegaly patients and control group.

	Acromegaly	Control Group	P
SI	25,09 ± 12,4	14,20 ± 3.08	P < 0,010
Tuft Width	11,97 ± 1,17	10,48 ± 0,44	P = 0,000
Joint Space	2,47 ± 0,51	1,84 ± 0,38	P = 0,000
Mtc Width	8,5 ± 1,03	8,5 ± 0,64	P = 0,914

Table III. – Distribution and comparison of mean parameters between acromegaly patients and control group by gender.

	Acromegaly			Control Group		
	Female	Male	p	Female	Male	p
SI	25,27 ± 11,4	24,6 ± 13,1	0,823	11,9 ± 2,34	16,14 ± 2,08	P < 0.01
Tuft Width	11,5 ± 1,05	12,03 ± 0,65	0,400	10,36 ± 1,13	12,02 ± 1,14	0.650
Joint Space	2,3 ± 0,51	2,67 ± 0,45	0,326	1,75 ± 0,22	1,92 ± 1,38	0.09
Mtc Width	8,25 ± 0,76	9,1 ± 1,36	0,615	8,5 ± 0,66	8,42 ± 0,53	0.25

Fig. 1. — AP plain radiograph of right hand. White lines show how to measure terminal tuft, metacarpal width, metacarpophalangeal joint space and sesamoid index.

mean SI level was above the mean level in 6 patients above 40 years of age while we failed to obtain the same result in the male patients. There was no statistical significance for male patients (chi-square, $p > 0.05$).

Discussion

Acromegaly is a chronic disease characterized by the hypersecretion of GH and the excessive growth of the extremities (5). The diagnosis is clinically established based on the typical facial findings. In suspected cases with unclear facial appearance, the diagnosis may have to be confirmed by sellar abnormalities on the head radiographs, following hypophysis MRI and the high GH level (2). The early diagnosis can be established by the demonstration of the enlargement of the minor hand and foot bones (1). The SI, described by Kleinberg et al. based on the hand graphics is considered an adjunctive diagnostic tool. The sesamoid bones may be in various numbers on the palmar side of the hand and metacarpophalangeal joint of the first finger. The sesamoid bones extend towards the medial part, have a round-mass shape and are embedded in the fibrous tissue of the tendons. They originate as cartilage nodules and are not visible on the direct radiographs until the puberty. Enlargement of the sesamoid bone occurs by the generalized hypertrophic bone changes. In addition, a marked increase in the connective tissue is observed. The enlargement of the bones represents a periosteal growth as opposed to the epiphyseal growth (6). Kleinberg et al. reported the median SI to be 20 in 100 control patients (50 males and 50 females), 40 and 33 among males and females, respectively in 20 acromegalic patients. All the acromegalic patients were detected to have a SI above 29. In the trial by Anton C, SI was 40 and 32 in males and females, respectively. The mean SI index was detected to be 34.8 in all the acromegalic patients. The present trial showed a mean SI index of 25.09 in acromegalic patients and of 14.20 in the control patients. SI was below the value described by Kleinberg et al. for the acromegalic patients and the control group. There's a high significance between the SI values of the

acromegalic patients and the control group ($p < 0.01$). Patients who were diagnosed and started to receive treatment at an early stage had a lower SI compared to the ones who were diagnosed later (6). The GH secretion should be suppressed for at least 6-24 months so that a regression in the joint manifestations and response to treatment can be achieved (7). Our patients received medical and surgical treatment or radiotherapy and were under follow-up for a minimum of 24 months. All the patients had GH and IGF-1 levels that were within the normal limits. Therefore, the SI levels were lower than those previously described. However, they were significantly higher relative to those of the control groups in the previous trials and those of our control group.

Many previous reports detected a higher SI in males among acromegalic patients (2, 6). Our trial revealed no significant difference of SI between the males and the females in the patient group. This was mostly attributed to the small number of males in acromegalic group. Anton et al. reported a significant difference between the males and the females with respect to SI even in the control group. Current study also indicated a significant difference of SI values in control group by gender in favor of males. Anton C suggests that gender differences are significantly involved in the SI values and would not be adequate in establishing the diagnosis. SI value should be assessed together with the other radiologic results (2).

Kleinberg et al. demonstrated a significant correlation between the age and the SI in male acromegalic patients. This was not observed for the female patients and attributed to the small number of patients. SI was significantly higher in patients above 37 years of age relative to those below 42 years of age. However, SI was again higher in the patients above 37 years of age compared to the control group (6). Our current study demonstrated a significant difference between the patients above and below 40 years of age in the SI values. The mean SI level was above the mean level in 6 patients above 40 years of age while we failed to obtain the same result in the male patients.

Anton C reported a statistically significant difference between the control group and the patients with respect to the tuft width. It was considered that the tuft width was more valuable than the SI because a larger portion of the acromegalic patients had positivity (2). There was a significant difference between the acromegalic patients and the control group with respect to the tuft width in our trial. However, no correlation was detected between the gender and the tuft width.

Kellgren et al. described thickening of the para-articular tissue and the joint cartilage in acromegaly. 16 of the 25 patients presented with the complaint of articular pain in his trial and the term, acromegalic joint disease, was used for the first time (2). Articular abnormalities in acromegaly consist of cartilage hypertrophy and cartilaginous-bony degeneration. Radiologic features of acromegalic degenerative changes (joint space narrowing, cyst and osteophyte formation) can be confused with primary degenerative joint disease (osteoarthritis). Differential diagnosis rests on the distribution of arthropathy. Acromegaly involves shoulders, elbows and MCP joints, which are unusual sites for primary osteoarthritis (8, 9).

Anton C. reported the joint space of MCP joint to be 1-2 mm in females and 1-3 mm in males among 100 control patients while the joint space was 1.5-2.75 mm and 1.75-2.75 mm in acromegaly patient group in females and males, respectively. In our trial, we detected a significant difference between the acromegalic patients and the control group with respect to the joint space of MCP joint. However, there was no difference by gender. As for the metacarpal width, there was no significant difference between the two groups in the mean values.

Conclusion

The diagnosis of acromegaly is usually established based on the typical facial findings. Radiologic findings represent a significant tool in establishing diagnosis in patients presenting to the Rheumatology or Endocrinology-Metabolism Outpatient Clinic, particularly in cases without marked clinical findings.

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