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Conservative treatment of CMC-1 osteoarthritis

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Abstract Initially, osteoarthritis of the carpometacarpal joint of the thumb (CMC-1) should be conservatively treated. However, literature concerning this topic is absent. Therefore, 39 patients (71 hands) with conservatively treated osteoarthritis of the carpometacarpal joint of the thumb were reviewed. The minimum follow-up period was 1 year; the average follow-up period was 8.8 years. Thirty-two women had bilateral CMC-1 osteoarthritis; the remaining seven patients had unilateral CMC-1 osteoarthritis. Although suggested by others, long-term pain relief was not observed in this study. Moreover, patient satisfaction, thumb strength, and mobility were not influenced by the duration of the CMC-1 osteoarthritis. In conservatively treated patients, worse results are achieved than in operated patients, especially concerning their subjective experiences. The authors therefore advise surgery, especially in the case of pain which hampers the activities of daily life.

Keywords CMC-1 · Osteoarthritis · Conservative treatment

Introduction

Initially, osteoarthritis of the carpometacarpal joint of the thumb (CMC-1) should be conservatively treated, as was

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stated first by Lasserre in 1949 [13]. When conservative treatment has been unsuccessful and pain interferes with the activities of daily living, surgical treatment is indicated [1, 3, 4, 6, 10, 11, 13, 14, 15, 17, 18, 19,20]. In general, surgical treatment of osteoarthritis of the CMC-1 joint yields good results and reduces morbidity [1, 3, 4, 5, 6, 10, 11, 14, 15, 17, 18, 19,20]. Literature concerning the results of conservative treatment of osteoarthritis of the CMC-1 joint is not available. In 3 studies, only the percentages of the conservatively treated patients that had to be operated were mentioned [3, 6,10]. However, neither pain nor functional status of these patients were described.

Since every patient is first conservatively treated, it is necessary to objectively measure the effects of this type of treatment. Although this paper concerns a retrospective study, the aim was to gain insight into the results of conservative treatment of CMC-1 osteoarthritis in 39 patients.

Patients and methods

In the period between 1970 and 1996, 105 patients with osteoarthritis of only the peritrapezial joints were treated conservatively. In all, 54 patients were willing to participate in this study. Of those, 15 patients had to be excluded because of new, coexistent pathology, such as carpal tunnel syndrome, de Quervain's disease, or trigger fingers. The remaining 39 patients (35 women and four men; 71 hands) were included in this study; 32 women with bilateral CMC-1 osteoarthritis. The average age of the patients was 62.5 years (range 42–75), the average follow-up period was 8.8 years (range 1–26 years). Patients were treated with nonsteroidal anti-inflammatory drugs (NSAIDs) (73%), physiotherapy (62%), analgesics (56%), splints (45%) and/or intra-articular corticosteroid injections (28%). Several combinations of treatments were applied, as is shown in Fig. 1.

Evaluation of the results included patient opinion concerning cosmetic appearance, function, pain, mobility, and strength. The range of motion of the CMC-I, MCP-I and IP joint was measured with a goniometer. Opposition was determined to the little finger. Tip and key pinch were measured with a Preston pinch meter and grip strength with a Jamar dynamometer, according to the protocol described by Mathiowetz [16]. The hand function was measured

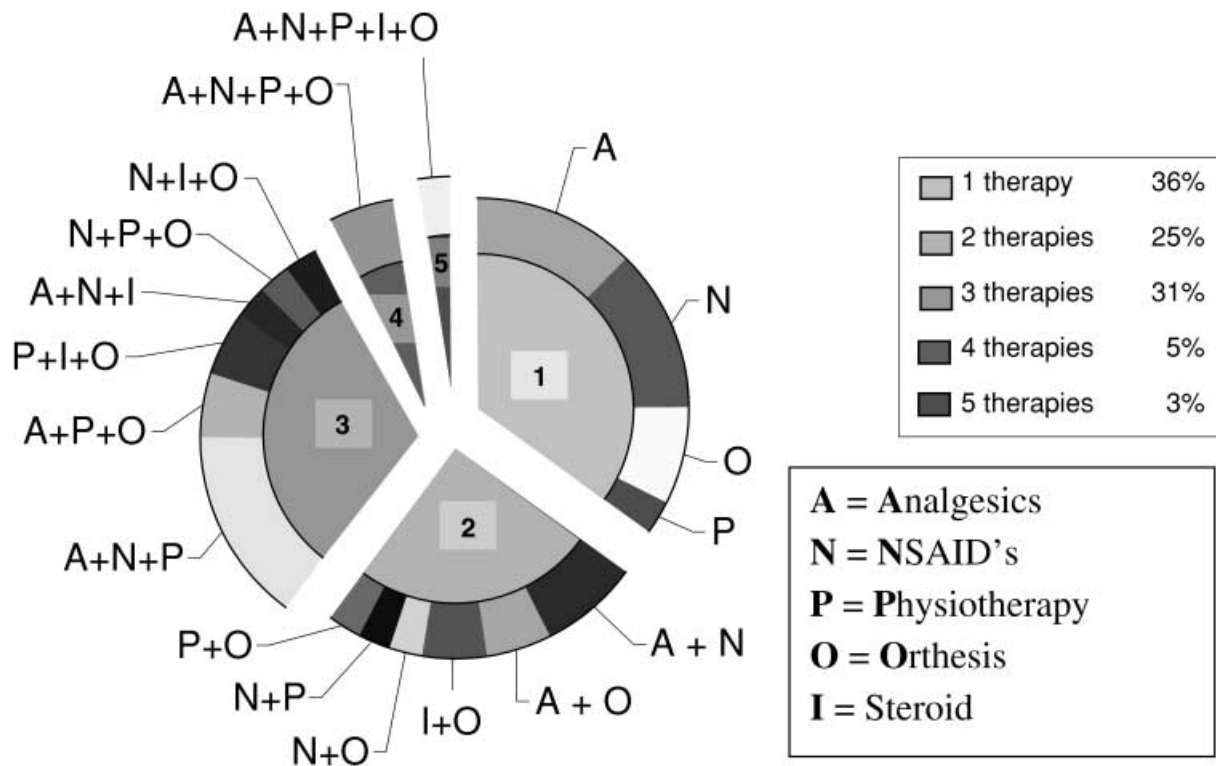


Fig. 1 The percentages of hands for each type of conservative treatment modality (mono-therapy) as well as for the combination therapies

with the sequential occupational dexterity assessment (SODA) test [12], which analyses 12 activities of daily living (ADL). With each activity, the ability and the difficulty in performance are scored. The maximum score that can be reached is 108, indicating a normal hand function.

X-rays were made to determine the stage of osteoarthritis of the CMC-1 joint, which was scored according to Eaton & Littler [7], and they were compared with the X-rays from the first consultation.

Statistical analysis was performed with the statistical package for social sciences (SPSS). Two-tailed Student's *t*-tests were used to analyse different sub-groups. Both subjective and objective data were plotted against the duration and the stage of CMC-1 osteoarthritis.

Results

Subjective findings

The scores resulting from our studies of patient opinion are listed in the first five tables. The opinions concern cosmetic appearance (Table 1), function (Table 2), pain (Table 3), mobility (Table 4), and strength (Table 5). Besides the scores of the complete group ($n=71$ hands), scores per type of conservative therapy are listed: analgesics ($n=40$ hands), NSAID's ($n=35$ hands), injection ($n=15$ hands), orthesis ($n=27$ hands) and physiotherapy ($n=28$ hands). These subgroups consist of patients with monotherapy as well as combination therapy and are statistically comparable with regard to age, gender, and du-

Table 1 Patient satisfaction with cosmetic appearance (in percentage)

Appearance	Very dissatisfied	Dissatisfied	Satisfied	Very Satisfied
Analgesics	0	23	72	5
NSAID's	0	14	80	6
Injection	0	13	87	0
Splint	0	26	67	7
Physiotherapy	0	29	71	0
Total group	0	22	70	8

Table 2 Patient satisfaction with hand function (in percentage)

Function	Very dissatisfied	Dissatisfied	Satisfied	Very Satisfied
Analgesics	5	48	47	0
NSAID's	6	49	45	0
Injection	0	47	53	0
Splint	0	37	63	0
Physiotherapy	7	57	36	0
Total group	3	42	55	0

Table 3 Occurrence of pain (in percentage)

Pain	Always	Light labour	Heavy labour	Never
Analgesics	58	10	27	5
NSAID's	57	11	26	6
Injection	53	0	47	0
Splint	33	7	60	0
Physiotherapy	50	14	36	0
Total group	53	7	37	3

Table 4 Patient opinion of mobility of the thumb (in percentage)

Mobility	Worse	Even	Better
Analgesics	83	17	0
NSAID's	80	20	0
Injection	93	7	0
Splint	56	44	0
Physiotherapy	89	11	0
Total group	73	27	0

Table 5 Patient opinion of strength (in percentage)

Strength	Worse	Even	Better
Analgesics	80	20	0
NSAID's	89	11	0
Injection	100	0	0
Splint	81	19	0
Physiotherapy	100	0	0
Total group	85	15	0

ration of the complaints. In general, patients treated with a splint score better than the other subgroups, whereas physiotherapy scores worse. When comparing the group of patients treated with a splint with the group of patients without a splint, the former scores significantly better with regard to pain and mobility: $P=0.016$ and $P=0.023$ respectively. The group treated with physiotherapy scores significantly worse for appearance, function, mobility and strength when compared with the group of patients treated with other forms of conservative therapy: $P=0.049$, $P=0.006$, $P=0.005$, and $P=0.0005$ respectively.

The intensity of the pain was not influenced by the duration of the CMC-1 osteoarthritis (alpha between 0.129 and 0.765 with $P<0.05$). In other words, pain was not relieved in the long term. No correlation could be observed between the stage of osteoarthritis and pain (r between 0.02 and 0.58). The values were not significant (P between 0.11 and 0.96).

Mobility

Palmar and radial abduction were 43.8° (SD 7.4) resp. 45.5° (SD 8.9). Of the 71 thumbs, 46 (65%) could be opposed to the base of the little finger. All other thumbs could be opposed to the proximal or middle phalanx of the little finger. Although 37 thumbs (52%) could adduct against the second metacarpal, 15 thumbs (21%) showed an adduction contracture with hyperextension of the MCP-1 joint during pinch. Mobility of the CMC-1 joint was not influenced by the duration of osteoarthritis (alpha between 0.008 and 0.495 with $P<0.05$). There was a negative linear correlation between the stage of osteoarthritis and the palmar abduction ($r=-0.5$; $P=0.022$).

The differences in the mobility between the groups with different conservative treatments were not statistically significant. However, taking all the measurements together, the group treated with physiotherapy scored best.

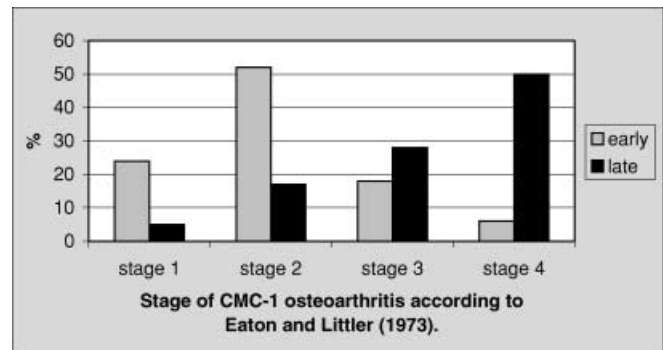


Fig. 2 The stages of CMC-1 osteoarthritis at first consultation (i.e., early) and at the time of evaluation for this study (i.e., late). Note that after a longer period more patients have the more severe stages 3 and 4 of osteoarthritis

Strength

Tip pinch was 3.5 kgf (SD: 1.4), key pinch was 6.4 kgf (SD: 2.1). Grip strength measured 21.8 kgf (SD: 9.0). Strength was neither influenced by the duration (alpha between 0.221 and 0.465; $P<0.05$) nor by the stage of osteoarthritis (r between -0.02 and -0.29 ; P between 0.120 and 0.468).

With regard to strength, differences between the groups receiving different conservative treatments were not statistically significant. Taking tip pinch, lateral pinch, and grip strength together, the group of patients wearing a splint scored best.

Ability to perform activities of daily living

The mean score of the SODA test was 96 (89% of normal). The ability to perform activities of daily living was neither influenced by the duration nor by the stage of osteoarthritis ($r=-0.07$; $P=0.671$). Because of pain, some patients appeared to have adapted their way of performing these activities. Strangely, the patients treated with physiotherapy scored the worst on this test (92.0). The difference in the score on the SODA test between the group of patients treated with physiotherapy and the group of patients treated with other conservative therapies was significant ($P=0.017$).

X-Rays

The X-rays taken at first consultation showed stage 1 in 31% of the hands, stage 2 in 44%, stage 3 in 15%, and stage 4 in 8%. With time, the X-rays showed an increase of the stage of osteoarthritis of the CMC-1 joint (Fig. 2). The stage of osteoarthritis was not influenced by the duration of osteoarthritis ($r=0.11$; $P=0.668$).

Discussion

This study shows that conservative treatment of CMC-1 osteoarthritis neither improves pain, mobility, and strength nor the ability to perform ADL activities after a follow-up period of at least 1 year. When comparing these results with those of operative treatment listed in Table 6, the conservatively treated patients are less satisfied, have more pain and a greater percentage of adduction contractures with MCP-hyperextension. Strength and mobility, however, are comparable (patients after arthrodesis excluded).

Only 3% of the patients in this study became painfree. Moreover, pain relief in the long-term was not achieved. When treated surgically, 31% [5] to 89% [19] of the patients are totally pain free and pain relief is universal (Table 6). Kessler [10] found that patients with polyarticular pathology of the trapezium respond better to conservative treatment than patients with isolated osteoarthritis of the trapeziometacarpal joint, because the former had passed the acute stage. This study, however, does not support Kessler's idea since spontaneous pain relief was never observed. The surgically accomplished pain relief strongly supports the idea that operating on patients with CMC-1 arthritis should be considered at an earlier stage.

The differences in pain relief between conservative and surgical treatment are in accordance with patient satisfaction: 42% in this study versus 78%–96% (Table 6) [4,19]. This is another important argument in favour of operative therapy at an earlier stage.

The mobility of the CMC-1 joint after conservative and operative treatment is comparable except for arthrodesis (Table 6) [4,9]. However, in 21% of the hands in this study, an adduction contracture was diagnosed with hyperextension of the MCP-joint, especially during pinch grip. A trapezium excision corrects an adduction contracture and a possible zigzag collapse of the first ray often corrects itself afterwards [8]. Key pinch as well as grip strength after conservative treatment are also comparable to the results after operative treatment.

The average score of the SODA test was 96, which is 89% of normal. This means that patients can perform their daily activities, sometimes in an adapted manner. None of the other authors used this recent test. Because other authors evaluated only some of the SODA test activities [1, 5, 15,20], it is not easy to compare our results with the literature. Atroshi found that 11 ADL activities could be performed with little or no difficulty [1]. Lins found that the majority of the patients had either no difficulty or only mild difficulty with ADL activities [15]. Varley found no functional disability in 56% of the operated thumbs [20]. After trapezium excision followed by flexor carpi radialis tendon interposition, we found that all patients went back to their former activities [5]. In general, hand function of the patients in this study seems to be comparable with those of operative treatment.

As expected, the X-rays showed a tendency of progression of the stage of osteoarthritis and there is no form of treatment (conservative treatment included)

Table 6 Literature review of results of operative treatment of CMC-1 osteoarthritis compared with the results of conservative treatment in this study (ECRL Extensor carpi radialis longus, FCR flexor carpi radialis, APL abductor pollicis longus, ip interposition, lrti ligament reconstruction and tendon interposition, sra stabilized resection arthroplasty, tss tendon suspension sling)

Author (Reference)	Method	No pat.	Female patients (%)	No. hands	Age (years)	Follow-up (months)	Pain relief (%)	Totally painfree (%)	Radial abduction (B)	Palmar abduction (B)	Oppos. to MCP-5 (%)	Key pinch	Grip strength	Satisfied (%)
Varley 20	Trap. excision	30	93	34	58	60	–	47	45	40	68	3.7 kgf ^a	18.3 kgf ^a	–
Atroshi11	ECRL-ip	17	100	17	57	39	100	53	54	49	88	32 kPa ^b	65 kPa ^b	94
Damen5	FCR-ip	34	82	45	57	103	93	31	40	40	82	4.7 kgf ^c	22.7 kgf ^a	93
Robinson18	APL-ip	23	83	39	54	53	100	–	Mobility is 92% of unaffected, unoperated side		–	5.6 kgf ^d	22.5 kgf ^a	83
Le Viet14	FCR-lrti	54	93	69	60	44	97	87	–	50	–	R:0, 4 L.; 34 N/cm ^{2e}	R:0, 6 L.0, 5 N/cm ^{2e}	94
Lins15	FCR-lrti	27	93	30	64	42	89	40	Tip of thumb pulp to radial aspect pip dig.2: 7.5 cm		–	4.5 kgf ^e	17.7 kgf ^a	85
Uriburu19	FCR-sra	159	89	180	57	94	99	89	–	51	97	5.6 kgf ^e	26 kgf ^e	96
Kleinman11	FCR-tss	38	82	40	59	21	85	58	51	50	–	5.1 kgf ^e	18.8 kgf ^a	89
Boeckstyns2	Caffinière prosthesis	28	89	31	62	48	93	72	–	41	87	27 kPa ^b	49 kPa ^b	–
Nicolas17	Caffinière prosthesis	17	76	20	57	64	95	80	39	39	–	Good ^a	–	–
Karlsson9	Arthrodesis	43	81	43	60	35	–	65	41	37	49	5.5 kgf ^f	57 kPa ^b	91
Chamay4	Arthrodesis	29	62	32	56	79	91	50	29	33	–	4.9 kgf ^e	26.5 kgf ^e	78
Damen	Conservative	39	90	71	63	106	0	3	44	46	65	6.4 kgf ^e	21.8 kgf ^a	42

^a Jamar pinch or grip meter

^c Preston pinch meter

^d B&L pinch meter

^e Type of instrument not mentioned

^f Mannerfeldt intrinsic meter

available that will prevent advancement of osteoarthritic changes. The stage of osteoarthritis did not have an effect on pain, strength, mobility, or ADL function.

Besides the far better pain relief and patient satisfaction with functional outcome after surgical therapy, the other subjective findings are also in favour of operative treatment at an earlier stage. In this study, 78% of the thumbs had a satisfying cosmetic appearance versus 91% after flexor carpi radialis tendon interposition (FCR) arthroplasty [5]. In 85% of the thumbs in this study, a subjective power reduction was felt. Although difficult to compare, this feeling is reduced after operative treatment [9, 15, 18,20]. In this study, a decreased mobility was experienced in 73% versus 26% in an arthrodesis population, of which it is generally accepted to reduce the mobility [9].

In this study, several types of conservative treatments were evaluated, mostly combination therapy. Because of this overlap, it was not possible to conclude which type of conservative therapy is most effective. However, when splitting the complete group of patients in a group receiving one type of therapy and a group that does not receive that type of therapy, it was possible to find some differences in effectiveness. With regard to the subjective findings, patients with a splint scored the best, whereas patients treated with physiotherapy scored the worst. With regard to mobility and strength, there was a tendency for better function in the groups of patients treated with physiotherapy and a splint, respectively. On the other hand, patients treated with physiotherapy scored significantly worse on the SODA test.

In conclusion, with regard to strength, mobility, and ADL-function, only small differences can be observed between operated and conservatively treated patients. However, with regard to patient satisfaction and pain reduction, operative treatment is favourable. Since the above mentioned characteristics do not improve in the long-term and the degenerative changes increase with time, one should suggest the patient to operate, especially in the case of pain hampering ADL. With regard to different types of conservative treatment, a splint seems to be preferred. However, the subgroups were too small in number for adequate statistical analysis. Therefore, suggestions concerning the best combination therapy cannot be made.

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