

Nonsurgical treatment of basal joint arthritis of the thumb at Eaton's stage 1-2. Physiotherapy versus steroid injection: a clinical trial

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Abstract

Purpose. Trapeziometacarpal (TMC) joint osteoarthritis (OA) causes significant functional disability secondary to painful pinch and grip. Many conservative treatments currently exist for the management of the early stages of the TMC OA, with the purpose of decreasing pain, restoring function and slowing down the evolution of OA. Among them application of heat, passive and active mobilization of the TMC joint, massage therapy and stretching of the first web span are often proposed to patients, though many physicians prefer to administer intra-articular corticosteroids as they do in other arthritic joints.

The purpose of this study was to compare these two different measures of treatment: 10 sessions of physical therapy versus a corticosteroid intra-articular injection, both associated with joint splinting.

Methods. Fifty patients were followed-up for one year. They received physiotherapy or a corticosteroid injection, according to their preference. Each

one was assessed for pain, function and strength at 2, 6 and 12 months and at the end of the study for overall satisfaction.

Results. Although the parameters improved more rapidly with infiltrative therapy, the period of pain relief was relatively longer in patients treated with physiotherapy with a longer overall persistence of complete remission from pain. The final functional evaluation demonstrated scores similar to those of pre-treatment.

Conclusions. Both corticosteroid articular injection and physiotherapy treatment can improve the painful symptoms in the early stages of TMC OA but treatment with corticosteroids is faster.

Hand function returns to baseline scores similar to those of the pre-treatment assessment in both cases, however physiotherapy is associated with a longer remission of pain.

Keywords: basal joint arthritis, trapeziometacarpal joint, thumb, physiotherapy, steroid injection.

Riassunto

Obiettivo. L'artrosi dell'articolazione trapeziometacarpale causa una importante riduzione della funzione della mano secondaria a una pinza e una presa dolorose. Esistono molti trattamenti conservativi da utilizzare nelle fasi iniziali della rizoartrosi con il fine di ridurre il dolore, ripristinare la funzione della mano e rallentare l'evoluzione artrosica. Tra questi le applicazioni di calore, la mobilizzazione attiva e passiva dell'articolazione trapeziometacarpale la massoterapia e lo stretching del primo raggio sono spesso proposti al paziente, sebbene molti medici preferiscono, come usano fare in altre articolazioni, somministrare farmaci corticosteroidi intrarticolari.

Lo scopo di questo studio è di comparare, in associazione a un breve periodo di tutela con ortesi dell'articolazione trapeziometacarpale, queste differenti metodiche di trattamento: dieci sessioni di terapia fisica con una infiltrazione articolare di corticosteroidi.

Materiali e Metodi. Cinquanta pazienti, seguiti per un periodo di un anno sono stati trattati con fisioterapia o infiltrazione in relazione alla loro pre-

ferenza. Sono state valutate la sintomatologia dolorosa, la funzione, la forza a 2, 6 e 12 mesi e la soddisfazione complessiva del paziente.

Risultati. I parametri migliorano più rapidamente con la terapia infiltrativa, il periodo di remissione del dolore è mediamente più lungo nei soggetti trattati con fisioterapia: questi però manifestano una persistenza della completa remissione del dolore mediamente più lunga. La valutazione funzionale finale mostra punteggi simili a quelli di pretrattamento.

Conclusioni. Sia il trattamento con infiltrazione di corticosteroidi che il trattamento fisioterapico possono migliorare la sintomatologia dolorosa nelle fasi iniziali della rizoartrosi, il trattamento con corticosteroidi con più rapidità.

Se la funzione della mano mediamente ritorna a punteggi simili a quelli di pretrattamento con entrambi i trattamenti, il trattamento fisioterapico è associato ad una remissione del dolore più prolungata.

Parole chiave: rizoartrosi, articolazione trapezio metacarpale, fisioterapia, infiltrazione di corticosteroidi.

Introduction

As reported by several authors^{1,2,3} trapeziometacarpal (TMC) joint osteoarthritis (OA), or basal joint arthritis of the thumb, is the second most common degenerative joint disease of the hand and affects mostly middle-aged and elderly postmenopausal women⁴. It is usually idiopathic (primary OA), but instability and occupations involving repetitive thumb use can be associated with TMC OA^{5,6,2,7} as well as rheumatoid arthritis or trauma⁷, although less frequently.

Pain and adduction contracture with narrowing of the first web space often make this pathology a disabling condition by compromising pinch and grasp. Because the TMC joint is instrumental for thumb opposition, not only is the kinematics of the first digital ray greatly impaired, but the overall hand function as well. The degree of OA and the intensity of pain should guide the physician in deciding whether to propose conservative or surgical treatment^{8,9,10}. The conservative therapy of TMC OA aims at relieving pain while restoring thumb strength. It has been advocated as the standard of care in patients affected by early stages of basal joint arthritis or prior to surgical reconstruction of the joint, which is indicated in more advanced arthritic stages^{8,1}. Several treatments, such as local application of heat, motion exercises and muscle strengthening, have been proposed for the management of TMC joint OA. Another management method for this pathology is intra-articular injection of drugs such as corticosteroids, currently performed by many physicians. Joint protection by splinting has been also advocated as an important element in the conservative management of TMC joint OA^{11,12,13,14}.

The purpose of this study was to compare two groups of patients affected by early stages of TMC joint OA treated with physiotherapy versus a corticosteroid intra-articular injection, both followed by a period of joint splinting. The authors report the clinical results, to support and verify nonsurgical treatments for the management of this common degenerative hand disease.

Materials and Methods

Inclusion criteria

A prospective study was initiated in January 2011. Patients presenting with primary TMC joint OA at radiographic Eaton-Littler stage 1 to 2 with pain were considered for this study. Eaton classification¹ is a radiographic rating used to define the severity of basal joint arthritis. According to this classification, TMC OA is divided into four stages which correspond to increasing severity: in the first stage there is initial osteoarthritis with subchondral sclerosis without cartilage degeneration; in the second stage the cartilage exhibits initial degeneration as the joint space is reduced. In

the third and fourth stages the joint space has disappeared, bone sclerosis is diffuse, geodes and osteophytes are present and larger than 2 mm and may be associated with pantrapezial arthritis. Patient selection was based on clinical evaluation including isolated pain at the base of the first metacarpal, tenderness over the TM joint, a positive grind test result and a radiographic assessment including anteroposterior and lateral views of the TMC joint. Patient suffering from Rheumatoid Arthritis or from the sequelae of trauma were excluded from the study.

The patients

Patients were examined from January 2011 to December 2011 in the out-patient Orthopaedics & Hand Surgery department of The Catholic University School of Medicine, Rome, Italy. All the potential candidates, affected by pain on the radial side of the carpus, suggestive of TMC joint AO, were referred to and examined by a hand surgeon. If the patient fulfilled the criteria previously stipulated, they were selected for the study. Sixty-nine patients were recruited consecutively in one year. All of them presented painful primary TMC OA with a radiographic Eaton-Littler stage 1 to 2. Two kinds of treatment were proposed to the patients: a physiotherapy program in ten sessions and four weeks of joint protection by splinting, or corticosteroid intra-articular injection, also followed by four weeks of splinting. Between them, 40 patients chose the physiotherapy program, and 29 the joint injection treatment. The first consecutive 25 patients who chose physiotherapy were selected for the study as group *P*, the first consecutive 25 patients who chose the corticoid injection were selected as group *C*. The remaining patients were also treated, but they were not included in the study. Three cases (2 from group *P* and 1 from group *C*) were lost to follow-up, and were therefore replaced by three more consecutive cases.

Between the 50 cases selected for the study, 19 presented with Eaton-Littler stage 1 and 31 at stage 2 on the first examination. In 21 cases TMC OA affected both hands, but pain was more intense on the dominant side. The onset of symptoms ranged from 5 to 26 months prior to treatment (with a mean period of 9 +/- 22 SD months). Women prevailed in sex distribution (41 women versus 9 men). The mean age was 62 years +/- 6 SD (range 44-76). All patients signed a written informed consent to participate in the study.

The treatment

Group *P*: The care plan included 10 physical therapy sessions with a hand therapist, performed from Monday to Friday for two weeks. This included the application of heat (paraffin wax and hot pack), followed by passive and active mobilization of the TMC joint, massage therapy and stretch-

ing of the first web span. A thermoplastic custom made thumb spica splint (with wrist in neutral, first metacarpal in slight abduction and free thumb inter-phalangeal joint), was applied during the initial visit.

Group C: Patients were treated in an out-patient surgery. Hand skin was disinfected with betadine (10% povidone-iodine) topical antiseptic solution. The TMC joint was palpated through manual manipulation of the patient's thumb. The injection was given with a 25-gauge needle, dorsal to the abductor pollicis longus - extensor pollicis brevis tendons. The needle was manipulated to slip down to the base of the first metacarpal and advanced to pierce the joint capsule. A solution containing methylprednisolone acetate (40mg/1 mL) and lidocaine (10mg) was injected until the joint was full. The hand was then splinted with a previously manufactured thermoplastic spica splint.

Post-treatment care

Patients were advised to maintain continuous splinting for four weeks, in order to avoid mechanical stress to the TMC joint and to promote the resolution of inflammation and pain. After this period, they were instructed on hand activities to avoid which may lead to a relapse in TMC joint pain, such as strong grasping, imbalance between joint movement and rest, exposure of the finger joints to vibration, using the joint in an unstable plane¹⁵.

The functional assessment

Each patient had a subjective assessment for: 1) TMC joint pain and restriction of activities to four degrees: 1- no pain or restriction, 2 - mild pain with use and some restriction, 3 - pain at rest with some restriction, 4 - pain at rest with severe restriction; 2) - function in activities of daily living, by a questionnaire for disabilities of the arm, shoulder and hand (DASH)¹⁶; 3) - overall satisfaction with treatment, on a scale of 1-10 (1=totally dissatisfied and 10=completely satisfied). (Tab. 1). An objective assessment was undertaken to evaluate key pinch strength, recorded in Kilograms by a Preston pinch meter (Tab. 2).

Assessments were performed in four stages: just prior to treatment, then at 2, 6 and 12 months.

Statistical analysis

All data were initially entered into an Excel database (Microsoft, Redmond, Washington – United States) and the analysis was performed using the Statistical Package for the Social Sciences Windows, version 13.0 (SPSS, Chicago, Illinois, USA). Descriptive statistics consisted of the mean \pm standard deviation (SD) for parameters with gaussian distributions (after confirmation with histograms and the Kolgomorov-Smirnov test). Comparison of variables in time

(pre-treatment, 2 months, 6 months, 12 months) was performed with the ANOVA for repeated measures or Kruskal-Wallis (groups>2) or Mann-Whitney (groups=2) for non-parametric variables and the Chi-Square test or Fisher's exact test (if cells<5) for categorical variables.

p value of < 0.05 was considered statistically significant.

Results

Pain. (Table 1 - Panel 1A.)

Group P: Prior to treatment we recorded 21 patients with mild pain with use and 4 patients with pain at rest and functional restriction. Between two and six months, 16 patients reported no pain or restriction. One year after treatment just one patient complained of pain at rest and 14 reported occasional mild pain which continued to cause limited restriction. In 10 cases pain was still absent at one year: this value is statistically significant compared to group C (*p* < 0.05).

Group C: Prior to treatment 18 patients reported mild pain with use and 7 reported pain at rest and functional restriction. At two months 20 patients reported no pain or restriction. Results diminished at six months and at one year 17 patients reported some restriction due to pain with use and 6 patients complained of pain at rest.

Function in activities of daily living. (Table 1 - Panel 1B.)

Group P: Subjective assessment of functional disability in activities of daily living gave a mean total DASH score of 8.2 pre-treatment. After therapy, mean DASH score progressively decreased to 4.1 six months post-treatment; increasing to 7.2 at one year post-therapy.

Group C: The group scored a mean DASH of 10.8 pre-treatment. After corticoid injection and splinting, mean DASH score significantly decreased (*p* < 0,05) to 3.8 two months post-treatment (Panel 1-B); it then rose to 5.3 at six months and to 8.6 at one year post-treatment.

Overall satisfaction at one year. (Table 1 - Panel 1B.)

Group P: The group totalled a mean score of 8.2 in overall satisfaction.

Group C: The group totalled a mean score of 6.8 in overall satisfaction.

Pinch strength. (Table 1 - Panel 1C.)

Group P: The group improved from a mean value of 4.6 kg to a maximum result of 5.8 kg at six months, to a final reading of 5.2 kg at one year.

Group C: The group improved from a mean value of 4.3 kg to a maximum result of 5.4 kg at two months, to 4.8 kg at one year.

Complications.

Group P: No complications were recorded.

Table 1. SUBJECTIVE OUTCOMES: groups P (n=25) vs C (n=25)

panel 1A.		pre-treatment	2 months	6 months	12 months
<i>no pain or restriction</i>	Group P	0	16	16	10 [†]
	Group C	0	20	14	2
<i>mild pain under use: some restriction</i>	Group P	21	9	8	14
	Group C	18	4	10	17
<i>pain score at rest: some restriction</i>	Group P	4	0	1	1
	Group C	7	1	1	6
<i>pain at rest: severe restriction</i>	Group P	0	0	0	0
	Group C	0	0	0	0
panel 1B.		pre-treatment	2 months	6 months	12 months
<i>mean DASH ±SD score</i>	Group P	8,2 ± 1,2	7,4(^) ± 1,6	4,1 ± 1,4	7,2 ± 2,8
	Group C	10,8 ± 2,0	3,8(*) ± 1,0	5,3 ± 0,6	8,6 ± 0,6
<i>Overall satisfaction</i>	Group P				8,2 ± 1,8
	Group C				6,8 ± 1,4
panel 1C.		pre-treatment	2 months	6 months	12 months
<i>Mean Key Pinch strength (kg.)</i>	Group P	4,6 ± 2,2	5,0 ± 3,4	5,8 ± 2,5	5,2 ± 2,2
	Group C	4,3 ± 1,6	5,4 ± 0,4	5,2 ± 1,6	4,8 ± 1,8

(†) $p < 0,05$; to 2 months Group P vs Group C; (*) $p < 0,05$ pre-treatment vs 2 months; (^) $p < 0,05$; to 2 months Group P vs Group C

Group C: in six cases an episode of temporary acute local pain and inflammation was recorded, starting between 1 and 6 hours after the injection and resolving spontaneously, after one-to-two days. Patients were cautioned about this possibility and they were instructed to apply a cold pack over the joint if necessary.

Discussion

This study prospectively compares the benefits of intra articular corticosteroid injection with physiotherapy treatment including application of heat and kinesiotherapy. The study group consisted of patients with early arthritis of the TMC joint (Eaton stages 1-2).

At the first follow-up visit (two months) both groups demonstrated an improvement of the considered parameters (pain, function, strength) with total remission of pain in the majority of subjects (group P: 16/25; Group C: 20/25).

In the group of subjects treated with corticosteroid injection a statistically significant improvement ($p < 0,05$) of the DASH score was observed compared to both pre-treatment clinical conditions and the group treated with physical therapy.

The benefits of treatment of osteoarthritis by intra-articular corticosteroids are already known. Day et al.¹¹ In addition,

in a study of 30 patients with a mean age similar to our study group (61 years old), suffering from TMC osteoarthritis treated with corticosteroid infiltration and temporary splinting, a remission of pain for more than 18 months in 6 out of 7 cases with Eaton stage 1 and in 40% of cases with Eaton Stage 2-3 was observed.

In the onset of degenerative disease of the TMC, and the painful symptoms that follow, work activity plays an important role. In fact, some occupations such as tailors, dressmakers, and milliners, sewers, embroiderers and activities that involve hand positions such as tip, lateral, palmar or forceful pinch causing high pressure patterns in the CMC joint are frequently associated with the development of OA TMC⁶.

This aspect has not been considered in the research nor in the above study, given the lack of a program of joint protection and prevention of relapse related to the performance of these particular occupational activities that may affect the extension of pain remission period.

Physiotherapy treatment, from the functional point of view, exhibits less evident results in the early stages; on final inspection, however, a significantly greater number of patients ($p < 0,05$) in the group P (10/25) experienced prolonged painful symptomatology remission compared to group C.

In a large systematic review of the literature Valdes et al.¹³ reported moderate evidence in the scientific literature supporting the effectiveness of the application of heat, hand exercises, adaptive equipment, and the use of carpometacarpal orthotics for pain reduction, restoration of joint articulation and hand function.

The stronger therapeutic relationship between the physiotherapist and the patient and the longer duration of time spent by the physiotherapist with the patient, compared to the orthopedic surgeon performing the joint infiltration, may have improved the knowledge of the conditions that determine the recurrence of pain^{17,18}.

In this regard Berggreen et al.¹⁹ recommend that patients with osteoarthritis of the carpometacarpal joint of the thumb are offered a occupational therapy program in addition to access to splints preoperatively.

However, at the end of the study, there is a notable equivalence between the average scores obtained with the DASH scale. To our knowledge, this is the first study examining two of the many possibilities of conservative treatments available for TMC OA.

Among the limitations that must be considered when interpreting the data of this study, in addition to the mentioned lack of knowledge on the work performed by patients, is the lack

of a control group to distinguish the effect of the application of the orthosis from the effects of other therapies. In fact the effectiveness of the continuous application of an orthosis in reducing the painful symptoms is well known.

Conclusion

The results obtained suggest that both measures are effective as temporary treatments for thumb basal joint arthritis. Both procedures obtained a good degree of patient satisfaction. The goals were to provide temporary mobility and a pain-free thumb and this was achieved in both groups.

This study has shown that patients treated with corticosteroid injection experienced on average a rapid improvement of pain and strength, which however appeared to be short-lived, with a notable attenuation of the effect of treatment between the second and sixth month, meaning that most patients in group C returned to baseline (pre-treatment) levels after one year. Patients treated with application of heat, passive and active mobilization of the arthritic joint, massage therapy and stretching experienced more gradual improvement of symptoms, however, although these patients reported a final DASH score similar to the patients treated with infiltration, their period of pain relief proved to be longer on average.

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