



Surgical Treatment of the Consequences in the Wrist of Rheumatoid Arthritis

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Abstract

Introduction: The consequences of lesions caused by Rheumatoid Arthritis on the wrist are responsible for important deformities and functional limitations, which make them taxed for surgical action, that sometimes can be complex.

Objectives: The objective of this work was to evaluate the results of the different surgical techniques used in this study.

Method: A prospective longitudinal intervention study was carried out. The sample was made up of 17 patients (24 wrists) with this diagnosis, attended by the Superior Member Service, External Minifibers and Microsurgery of the International Orthopaedic Scientific Complex "Frank País" in the period from January 2014 to March 2018. The evaluation of the results was carried out according to the Cooney Score, the Allien and Machle Score as well as the complications that presented the patients.

Results: In the preoperative period the evaluation of an 83.3% of the studied patients total was Bad, 16.7% of them was Regular and none of them was Good. Six months after the postoperative period the 41,7% of the patients was evaluated as Good, the 58,3% as Regular and none as Bad. Only three patients presented complications, one of them with superficial wound sepsis and the other two cases presented paresthesia on the back of the wrist.

Conclusion: The surgical techniques used in the current study as a treatment for the consequences of Rheumatoid Arthritis on the wrist showed encouraging results.

Keywords: Rheumatic Wrist; Rheumatoid Arthritis

Introduction

The wrist has anatomical and structural characteristics that make it prone to the consequences of rheumatoid arthritis, which is established in the carpal bones and between them and radius, all this is reinforced by a system of ligaments and tendons (flexors and extensors) which are covered also by waxy pods coated by a synovial membrane such as the joint capsule of the wrist, to which must be added a very mobile distal radiocubital articulation, barely supported by the triangular fibrocartilage and the interosseous membrane [1,2].

There is a high incidence of patients with deformities and functional limitations in the wrist as consequences of rheumatoid ar-

thritis, and some authors consider that 2/3 of the patients with the suffering have at least one symptom that increases to more than 90% in 10 years [3]. This consequences are of great complexity and candidate for a surgical treatment.

Surgical techniques have been determined by the specific pattern of the disease, the stages in which the lesions are and the deformities location, in addition to the characteristics of the patient; being the most frequently associated: dorsal tenosynovectomies and if necessary, flying; joint synovectomies; realignment of the carpi ulnaris extender (E.C.U); tendon repair; and sometimes wrist arthrodesis. It is important to mention that there is disagreement respect to the attitude taken towards the head of the ulna [3-6].

Objective of the Study

The main objective of this research has been to scientifically value the results of such techniques in our study universe, in addition to provide the knowledge and assessment of the application of them to the hand surgery services in our country to reduce injuries, their consequences and achieve a functional hand that improves the quality of life of these patients.

Methods

A longitudinal prospective study of serial case intervention was carried out. The universe consisted of 29 patients who attended the consultations of the Superior Member Service, Hand and Microsurgery of C.C.O.I.'s "Frank País", in the period from January 2014 to March 2018 with diagnosis of pain and wrist deformity caused by Rheumatoid Arthritis. The sample consisted of 17 patients and a total of 24 wrists. Those who fulfill the following criteria were surgically involved.

Inclusion criteria:

1. Patients over 18 years diagnosed with Rheumatoid Arthritis and with deformity or wrist injuries, as a result of this disorder.
2. Patients who have been tracked for such injuries in C.C.O.I 'Frank País.
3. Patients in which a minimum follow-up of 6 months from the date of operation is possible.

Exclusion criteria:

1. Patients with deformities or wrist injuries of non-rheumatic causes.
2. Patients who have been previously operated in other institutions.

Interrupt and output criteria:

1. Patients in whom data collection is incomplete.
2. Patients who leave the follow-up at external consultation.
3. Patients who do not carry out the established medical indications.

The average age was 56.6 years, with a minimum of 30 years and maximum of 76 years; 10 female and 7 male patients were treated for a 1.4/1 ratio; the dominant limb was the most affected with a 54.2% of the operated wrists. 76.4% of the patients performed manual work during their working lives, 83% of them reported a latency time before the surgery of 5 years a rate that ranged from 3 years to more than 20 years.

The severity of the lesions was determined on morphological criteria using the Larsen classification modified by Bichat. It was

obtained a wrist in Stage I, five in Stage II, 13 in Stage III, three at Stage IV A and two at Stage V A.

The ulnar displacement of the carpal was presented in 66.7% of the wrists, all in correspondence with radiological lesions equal to or greater than Stage 3 of Larsen modified by Bichat; the radial inclination of the carpal was appreciated in 10 wrists (41.6%), all lesions in stages equal to or greater than Stage 3. Carpal collapse was presented in five patients in stage IV A and V A.

Radiological measurements were based on carpal collapse and ulnar slippage rates in Young and Mac criteria. Murty. The radial deviation of the carpal was calculated by the Shapiro technique; in cases of destruction of the radial glenoid measurements were made as recommended by Four as tier (the radial deviation of the carpal was measured between the axis of the second metacarpal and the lower quarter of the radius, normal values were considered to be an angle equal to or less than 15 degrees).

Surgical technique

When the lesions were only located on the dorsal face of the wrist it was repaired in a single time, including the rupture of tendons. In cases where were associated injuries to the flying face, it was processed in two times.

The patient is placed in supine decubitus with upper limb affection on a side table for hand, prior regional anesthesia (brachial plexus blockage) or general; the emptying and placement of an ischemic band in the affection member is proceeded; antibiotic prophylaxis (Cefazoline 1g EV 1 hour before surgery) was performed. Preparation of the surgical field (antipsy of the operating area and placement of field cloths). The following surgical techniques were performed depending on the type of deformity and the stage in which it was presented.

Dorsal face

The skin incision spread from the distal end of the forearm and at the level of the distal radio-ulnar joint, it became slightly oblique towards the second interdigital space with a length that allowed a separation of vessels and dorsal sensory branches, then, the extender retinaculum was inserted over the ulnar edge and lifted, preserving its radial insertion; the entire hypertrophic synovial was removed from the extender tendons. When the first compartment was affected, the hypertrophic synovial that protruded at the level of the radio-distal ulnar joint and the-carpal radio was removed. When an extender tendon was injured, it was repaired. If the distal radio-ulnar joint was shown to have been dislocated, the Darrach technique was performed with a complete synovectomy of the lower radio-ulnar; occasionally, in young and active patients with such dislocation, the Sauve-Kapandji technique was performed. When

there was palmar dislocation of the posterior ulnar tendon, it was restored to the dorsal face of the wrist and stabilized with a flap of the retinal ligament extender previously divided into two: the proximal passed under the extenders and sutured in the form of pulley at the same height at the posterior ulnar and the distal is left behind the tendons and sutured on the ulnar slope, rebuilding the pulley. When active dorsal flexion with ulnar deviation was limited, the first radial was transferred over the posterior ulnar tendon. In cases where the pain dominated in the symptomatic picture, the sensory branch of the posterior interim nerve was resection. Wrist arthrodesis was performed in patients with pain and marked joint deterioration.

The skin was closed and immobilized with an anearchical splint with discreet extension of the wrist; when the suture or transposition of tendons to the finger extenders was necessary the immobilization of the tendons as well as the elbow in 90 degrees was included. If there was instability of the distal radio-ulnar joint, the elbow was also included in the immobilization.

Immobilization was maintained for 3 to 4 weeks, healing was performed every third day and sutures were withdrawn after 15 days (Figure 1).



Figure 1: A. Dorsal incision at the level of the metacarpophalangeal joint where the synopsis encompassing the extender tendon is seen. B. Dorsolateral incision where the large synovitis of the wrist is observed. C. Tendon erosion (Long Thumb Extender). D. Exercise of the synovial lining the tendon (synovectomy).

Volar side

In the cases that presented carpal tunnel syndrome it was proceeded in a second time by an volar curve incision on the ulnar side of the thenar groove and parallel to it, this incision was extended to the flexor groove of the wrist, incurring slightly towards the radial, the phase was opened when palmar and the transverse ligament of the carpal was injected and the hypertrophic synovial tissue was removed. The skin was closed, and the stitches removed after 15 days.

The following variables were taken into account for the evaluation of the results: pain, function, mobility (according to the Cooney Score), degree of patient satisfaction (according to the Alien and Machle score) and the presence of complications. The evaluation was applied individually before and after surgery by the same examiner between 20 and 24 weeks.

The information was collected from the medical records of patients admitted with the diagnosis of Rheumatoid Arthritis. This data was processed in a database created in a microcomputer with Word and Excel systems, where each row corresponded to a patient; and each column to a variable. The SPSS 17 statistical system was also used.

A good doctor-patient relationship, close communication and confidentiality of the data were maintained at all times. All proceedings were carried out under the consent and approval of patients and their families.

Results

Synovitis was the most find presented in the physical examination at the level of the distal radio-ulnar joints, radio-carpal and extender sheath in 100% of cases; distal radio-cubital dislocation was presented at 66%, followed by the rupture of extenders 50%, radial inclination of the carpal 41.6%, deformity in dorsal alforja of the wrist 37.5%, carpal tunnel syndrome 20.8% and the zigzag deformity of the hand 8.3%.

Synovectomy and tenosynovectomy was performed on 100% of the operated wrists in order of frequency on the dorsal face of the wrist; 50% extender tendon repair; Darrach and Sauve-Kapandji technique at 10.41.6% 6,25% wrists 100% of the distal radio-ulnar dislocations present in the sample; restitution of the dislocated posterior ulnar tendon to 37.5%; the tendon transfers of the first radial over the post-25% ulnar; resection of the sensory branch of the posterior inter-bone nerve at 16.6%; the arthrodesis of wrist

was the less performed, just in 3 occasions. On the volar face, the opening of the tunnel carpo with synovectomy that included the flexor tendons was performed in 5 wrists (Table 1).

Surgical technical	No.24	%
Wrist synovectomy	24	100
Tenosinovectomía	24	100
Tendon transfer of the first radial over the posterior ulnar	6	25
Repair of extender tendons	12	50
Resection of the sensory branch of the posterior interim nerve	4	16.6
Opening of the carpal tunnel plus Flexor Synovectomy	5	20,8
Sauve-Kapandji technique.	6	25
Darrach technique.	10	41.6
Dislocated posterior ulnar tendon restitution	9	37.5
Wrist arthrodesis	3	12.5

Table 1: Distribution of the different surgical techniques performed.

Pain was present in all 24 wrists (100% of patients) during preoperative, becoming permanent but tolerable in 58.3% of the patients; 33.3% were presented in light activities and in intense activities just an 8.3%. During the postoperative period (6 months and more), 25% had no pain, 58.3% occasionally had pain and 16.7% just presented pain during intense activities (Table 2).

Pain	Pre-operative		Post-operative	
	No.	%	No.	%
None. 25 pts.	0	0	6	25.0
Occasional. 20 pts.	0	0	14	58.3
During heavy or intense activities. 15 pts.	2	8.3	4	16.7
During light activities. 10 pts.	8	33.3	0	0
All the time, but tolerable. 5 pts.	14	58.3	0	0
Severe needs medicine. 0 pts.	0	0	0	0
Total	24	100	24	100

Table 2: Valloration of wrist pain according to Cooney Score.

The function of the wrist in the preoperative was classified as prevented from performing in any type of activity at 12.5%, allowing to perform those very light at 70.8% and moderated at 16.7%.

After operation (6 months and more) 16.7% reported normal activities, discrete limitations by 62.5% and moderated by 20.8% (Table 3).

Function	Pre-operative		Post-operative	
	No.	%	No.	%
Normal activities. 40 pts.	0	0	4	16.7
Discreet restriction. 30 pts.	0	0	15	62.5
Moderate limitation of its activities. 30 pts.	4	16.7	5	20.8
It is possible to only do light activities. 10 pts.	17	70.8	0	0
Limitation of all activities. 0 pts.	3	12.5	0	0
Total	24	100	24	100

Table 3: Valoration of wrist function according to Cooney score.

The range of flexo wrist extension during preoperative in 8 patients was below 30°; 14 wrists between 30 and 60 degrees; and one respectively between 61°-90° and 91°-120°, which corresponded in equal order with stages II and I of the classification of Larsen and Bichat, and kalthough it improved during the postoperative period in general, only 25% achieved a greater rank tan 90 degrees and 58.3% between 61-90 degrees. The 3 wrists with 0o corresponded to the arthrodesis performed (Table 4).

Mobility according to flexo-extension range	Pre-operative		Post-operative	
	No.	%	No.	%
More than 120 degrees. 25 pts.	0	0	1	4.2
From 91° to 120°. 15 pts.	1	4.2	5	20.8
From 61° to 90°. 10 pts.	1	4.2	14	58.3
From 30° to 60°. 5 pts.	14	58.3	1	4.2
Less than 30 degrees. 0 pts.	8	33.3	3	12.5
Total	24	100	24	100

Table 4: Valuation of wrist mobility according to Cooney score.

100% of patients reported a postoperative satisfaction rating of: Satisfied. The final assessment of the results shows that in the preoperative period 83.3% obtained an assessment of bad and 16.7% of regular. In the post-operative the results were improved when evaluated of good 41.7% and 58.3% of regular (Table 5).

Complications were reported in 3 patients: one case with superficial sepsis and partial dehiscence of the wound and two cases presented paresthesia on the back of the wrist.

Result	Pre-operative		Post-operative	
	No.	%	No.	%
Excellent (90 - 100 pts.)	0	0	0	0
Well (80 - 89 pts.)	0	0	10	41.7
Regular (65 - 79 pts.)	4	16.7	14	58.3
A Little (Less than 65 pts.)	20	83.3	0	0
Total	24	100	24	100

Table 5: Final alloration of the results according to Cooney's Score.

Discussion

The synovectomy that included in our study the radio-carpal and radio-cubital distal joints, in addition to the tenosynovectomy of the extensors was performed on all operated wrists. The revised authors agree on the need for an early synovectomy that can influence, on the one hand, the overall immune process by reducing self-aggression and preventing the progressive destruction of tendons, capsules, ligaments and joints, along with significant pain relief [4-11]. Gschwend [12] in 1988, noticed a significant analgesic effect and a significant decrease in synoviation in periods of crisis after its realization; however that radiological destruction continued to progress. The biggest discrepancies in synovectomies are related to the extent of the synovectomies; Four as tier [13] proposes non-reception at the level of the radio-carpal and mediocarpal joints, although in the case of the reception of the head of the ulna to the proximal row of the carpal gets dry in the largest part of the pathological synovial and as for the intercarpal that offers the risk of being incomplete if the ligaments stabilizers of the carpal are respected or on the contrary if the entire synovial is without the synovial is risked of aggravating instability unless the fixation is chosen. Some, such as Al not and Welby [14], also advocate inter capriana synovectomy, stating that it is not the cause of loss of wrist flexibility if its movement is performed early.

The most characteristic and known involvement of rheumatoid deformity begins with synovitis in distal cubital radioarthritis. Its stability depends mainly on the ligaments and the correct application of the structures around it; when synovial pannus invades and destroys these structures, joint distension is favored followed by the rupture of the triangular fibrocarty cartilage (FCT) and the dislocation of the Carpi Ulnaris Extender (ECU) [15]. All of this is what will give rise to the beginning of the deformities following a cascading sequence described by Allieu [16]. In order to prevent this progressive destruction of morphology and function of the hand, a synovitation would be indicated in patients with synovia of more

than six months of evolution that has not been controlled with adequate medical treatment. Arthroscopic synovectomy can be performed, obtaining good results, in the early stages of the disease and provided that there is no major joint destruction (up to a stage III in Larsen) [17,18]. However, where there are already risk factors for tendon rupture such as the existence of erosions or dislocation of distal radio-ulnar articulation, which occurs in 78% of the hands that have ruptures of extensor tendons [19] we must assess the deformities that have conditioned that rupture. In this situation, it is advisable to act on the Articulation Radio-Cubital Distal by surgery of Darrach or Sauvé-Kapandji. With the latter, we'll get a better stabilization of the distal ulnar stump that has its ligaments destroyed, while avoiding the ulnar translation of the carpal [20].

The restitution of the dislocated posterior ulnar tendon was associated in 75% of cases with the transfer of the first radial, both indications and surgical techniques corresponded to those recommended [21].

Tendon repair and ruptures were performed simultaneously taking into account the number of tendons and injury, consisting of tenorrhaphies, sutures to adjacent tendons and interleaved grafts, which is in line with the recommended by several authors [16,18-22].

Wrist osteoarthritis is performed in patients with marked joint deterioration (Larsen stages IV and V), pain and functional loss, which some consider with better results than total wrist replacement [12-20].

Once a carpal collapse has already originated, and as long as he is not very advanced (until Larsen III), and with a full midcarpal shear, we can prevent or delay the progressive deterioration of the rheumatoid wrist by performing a limited arthrodesis that prevents the subluxation to fly, the displacement to the ulnar side and the supination of the carpal. Radiolunar arthrodesis, with or without the incorporation of scaphoids to it, has been shown to be effective in avoiding such alterations, allowing to gain propensity strength and maintaining useful mobility [22].

The section of the sensory branch of the posterior interosseal nerve at wrist level was performed on 4 occasions where there was severe pain in correspondence with what was recommended by Campbell and other authors [20-22].

V-Olar face surgery consisted of releasing compression of the median nerve by opening the carpal tunnel. It was also accompa-

nied by a broad synovectomy that included flexor tendons in the carpal canal [22].

Conclusion

The realization of an early synovectomy of the wrist and rheumatic hand, as well as the tendon pods at that level is validated by the natural history of the disease itself, its physiopathology and the results obtained by multiple authors with its realization.

Surgical techniques used to treat the wrist consequences should be aimed at reducing pain, improving function, achieving the highest possible stability and improving patients' quality of life. These results were obtained in our work and have been in relation to existing injuries, achieving the best in wrists that were included in categories I and II of the Larsen radiological classification modified by Bichat.

The degree of satisfaction achieved was determined by the improvement of pain.

Conflict of Interest

There is no conflict of interest of the authors.

Contribution from Authors

Dr. Mailyn Naples Perez. Auxiliary surgeon. Case monitoring, drafting of the final report.

Dr. Nelson Juan Cabrera Viltres. Chief surgeon. Case tracking.

Dr. Mario de Jesús Bernal González. Chief surgeon. Case monitoring, drafting of the final report.

Dr. Leopold Alvarez Placeres. Case tracking.

Dr. Yaima Rizo Fiallo. Case tracking.

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