MedCrave
Step into the World of Research
International Physical Medicine & Rehabilitation Journal

Research Article
Open Access
CrossMark

Occupational therapy approach in a specific case of extensor tenorrhaphy in zone VII

Abstract

Introduction: Hand is an important structure for the performance of all Activities of Daily Living and for its perfect functioning it is necessary all its anatomical structures in complete harmony. Tendon injuries caused by agents such as glass and knives are very frequent in hand injuries and their sequelae generate incapacity for work performance and Activities of Daily Living. These are associated with lesions of the skin, nerves, and arteries. Anatomical knowledge of the hand is essential because lesions can progress to complex sequelae if not treated properly.

Objective of the study: The objective of the present case study is to reflect on the intervention of Occupational Therapy in a hospital context with a patient submitted to tenorrhaphy of zone VII extensors, during a period of 13 consecutive weeks.

Methods: It is intended to carry out a prospective case study of mixed analysis, in which a patient who performed OT at the Physical Medicine and Rehabilitation Service of the Centro Hospitalar Universitário do Algarve (CHUA) – Portimão Unit.

Results: The treatment performed at the level of edema, scar, pain, muscle strength, range of motion and performance and satisfaction of the activities identified as significant by the patient, provided an improvement in the sensorimotor recovery of the extensors in zone VII of the hand with optimization of functional gains.

Conclusion: The Occupational Therapy approach contributed to the patient's recovery, avoiding major complications and a faster and more favorable return to their usual activities. Although extensor tendon injuries are frequent, there is a lack of scientific evidence on the subject. Therefore, further studies in hand therapy, to validate the therapeutic techniques comparing the data with the existing ones, must be conducted.

Keywords: hand, tendon injury, extensor tendons, occupational therapy, case study

Volume 8 Issue 2 - 2023

Carlota Vieira,[1] Lília Brito,[2] Tiziana Vieira,[3] António Arsénio Duarte,[3,4] Ana Paula Martins,[4,5] José Luís Coelho[4,6]

[1]Department of Occupational Therapy, Centro de Saúde da Madalena, Portugal
[2]Department of Occupational Therapy, Santa Casa da Misericórdia das Alcáçovas, Portugal
[3]Department of Occupational Therapy, Centro Hospitalar Universitário do Algarve (CHUA), Portugal
[4]Professors at IPBeja – Polytechnic Institute of Beja, School of Health of Beja, Portugal
[5]Department of Occupational Therapy, Hospital Garcia de Orta (HGO), Portugal
[6]Department of Physical Therapy, Centro Hospitalar Universitário do Algarve (CHUA), Portugal

Correspondence: António Arsénio Duarte, Professors at IPBeja – Polytechnic Institute of Beja, School of Health of Beja, Portugal, Tel +351962932972, Email ajaduart@gmail.com

Received: May 24, 2023 | **Published:** June 06, 2023

Abbreviations: ADLs, activities of daily living; OT, occupational therapy; CHUA, centro hospitalar universitário do algarve; MCF, metacarpophalangeal; IF, interphalangeal; EVA, visual analogue scale; COPM, Canadian occupational performance measure; PIP, proximal interphalangeal; DIF, distal interphalangeals; CMMS, casting motion to mobilize stiffness; RUL, right upper limb; LUL, left upper limb.

Introduction

Hand has a fundamental role in human activity and from the physiological point of view, it consists of various bone, muscle, nerve, and tendon structures that are essential for its own action. When injury occurs in these structures, the hand may become compromised and lose some functions, which consequently will lead to abnormal patterns of grip detrimental to the functionality of the individual.[1] Therefore, anatomical knowledge of the hand is essential to prevent lesions from progressing to complex sequelae if they are not adequately treated.[2] The tendons that act in the flexion and extension movements of the fingers of the hand are anatomical structures originated in the forearm and with insertion in the wrist and fingers to establish the function of handgrip and finger extension.[2]

The extensor tendons of the hand are located superficially on the dorsal surface of the hand and are very susceptible to injury. Among the most common hand injuries, tendon injuries are considered the most frequent hand injuries, caused by agents such as glass and knives.[2] Such injuries involve tendon loss or gaps in the extensor tendons that require specialized attention and can be considered some of the most difficult injuries to repair, since the extensor tendons have less excursion than the flexor tendons.[3] Tenorrhaphy (tendon suture) requires anatomo-physiological knowledge of the joints, pulley system and osteofibrous tunnel. Postoperative rehabilitation is necessary in tenorrhaphy of the hand. The tendons have a vascularization originating in the muscles of the palmar arch and metacarpal arteries. The healing process occurs through two types of mechanisms, the intrinsic (ability of the tendons to be nourished by the synovial fluid) and the extrinsic (occurs by fibroblasts, connective tissue and vascular). Early mobilization of the tendon favors healing and prevents tendon adhesion.[4]

The extensor tendons of the fingers are thinner than the flexor tendons. The anatomical particularities that lead to closed ruptures are due to the fact that they are more superficial, being in close contact with the skin and joints. The extensor muscles of the hand are made up of two sets of muscles: the intrinsic extensors (those that have their origin and insertion in the hand itself) and the extrinsic (whose origin is in the elbow and forearm). The intrinsic extensor muscles are responsible for the extension of the metacarpophalangeal (MCF) and interphalangeal joints, including the extensor fingers, the extensor of the index finger and the extensor of the 5th finger. The intrinsic extensor muscles, on the other hand, are the lumbricals and interosseous muscles, which, in addition to extending the interphalangeal joints, also contribute to the flexion of the metacarpophalangeal muscles.[5]

To facilitate the diagnosis and approach of the lesions, the extensor apparatus of the hand is divided into eight zones from distal to proximal, designated as *Verdan's* zones: zone I – distal interphalangeal joint (IF), zone II – middle phalange, zone III – proximal IF joint, zone

IV – proximal phalange, zone V – MCF joint, zone VI – dorsum of the hand, zone VII – extensor compartment of the wrist (retinaculum of the extensors) and zone VIII – extrinsic extensor muscles. Injury in zones III to VIII usually requires surgical treatment and the duration of immobilization is 3 weeks. Lesions in zone VII occur under the retinaculum of the extensors and are often complicated by adhesion, loss of movement, retraction of the proximal extremity and anomalies of an osteofibrous nature that favor secondary adhesions. Although the healing of the extensor tendons is easily achieved, the main concern is the sequelae of stiffness, usually in extension.[2]

The mobilization of extensor tendon injury is more difficult than that of flexor tendons. There is a severe tendency of the extensor tendons to form adhesions due to their superficial position and close contact with the underlying bone.[6] Scarring adhesion is the most complex problem after an injury to the extensor tendons due to the tendency of its dorsal lining to adhere to the underlying structures, limiting normal excursion during flexion and extension. The extensor tendons in zones V, VI and VII (proximal to the MCF joints) are adherent because they are involved in paratendinous and synovial membranes that respond to the injury in a similar way to the flexor tendons, causing incomplete extension or flexion, caused by the loss of sliding of the extensor tendon.[4] Recovery from extensor tendon rupture in zones V-VII is often associated with delayed extension of the MCF joint, extrinsic stiffness and formation of adhesions that hinder finger flexion and decreased grip strength.[7]

Evans (1995)[4] studied the normal excursion of the extensor of the fingers in zones V, VI and VII to suggest guidelines for the passive movement, as early as possible of the extensor tendons. Evans (1995)[4] concluded that 5mm of tendon sliding after a repair is effective and safe to limit tendon adhesions and applied a postoperative splint that allows active flexion movements to be performed, while providing passive extension. The splint is applied for 3 weeks, starting with active movement between the third and fourth weeks. A removable volar splint is used between exercise periods to protect the tendon for an additional two weeks. The use of a dynamic splint for flexion can be started 6 weeks after surgery to recover flexion if necessary. The objective of the research is to "prove the effectiveness of the OT approach in occupational performance and satisfaction with this same performance in a patient with extensor tenorrhaphy in zone VII, in a hospital context".

Presentation of the case

The patient is a male, right-handed, Caucasian, of Portuguese nationality and is 39 years old. Previously autonomous in Activities of Daily Living (ADLs). He lives with his wife, son, and stepson in Algarve. His educational qualifications are the 9th grade and he is a distributor of ice cream. He was on sick leave. He was diagnosed with laceration of common and proper extensor tendons (D2 to D5) of the left hand, following a domestic accident with knife, occurred on 12/31/2021. He was transported to the Hospital de Santa Maria (Lisbon), undergoing surgery on 01/01/2022, having been performed tenorrhaphy of extensors zone VII with immobilization with plastered splint. The patient was discharged and returned to his home. He removed the plastered splint at the general surgery consultation of the hospital of residence (CHUA – Portimão Unit) after 6 weeks and was referred for physiatry consultation. While waiting to be called to this specialty, he sought answers in rehabilitation in his area of residence.

On 02/24/2022 he had a physiatry consultation and was referred through the physiatrist for OT treatments for presenting motor changes such as significant pain at the mobilization of the left wrist and hand, local edema and joint stiffness of the left hand and marked functional impotence. The OT sessions began on 03/02/2022 and took place in a therapeutic setting, lasting about one hour, with daily periodicity.

Materials and methods

A descriptive, mixed analysis (combines qualitative and quantitative methods) and prospective studies was carried out from March 2 to May 27, 2022, during 13 consecutive weeks, with a periodicity of 5 days per week, where it is intended to evidence the OT approach in a specific case of a tenorrhaphy of the extensor tendons of zone VII. This is a case study and as such the sample was selected for convenience in OT in the Physical Medicine and Rehabilitation Service of CHUA – Portimão Unit. Ethical procedures were considered throughout the investigation, with approval by the CHUA Health Ethics Committee on 30-05-2022, and Board of Directors authorization on 03-06-2022 to carry out the study. The Signing of the Informed Consent form, under the patient authorization for disclosure of data for scientific and academic purposes, was also done.

To conduct the clinical reasoning inherent to the patient, the Canadian Model of Occupational Performance and Occupational Involvement was chosen.[8] Initially, indirect observation was used [9] through the consultation of the clinical process of the patient, being considered the first methodology to be used before the first contact with him, to obtain information about his diagnosis, clinical history and other relevant basic information that may be useful for the intervention. To complement the information obtained through indirect observation and obtain knowledge of the profile and occupational narrative of the patient, semi-structured interviews were applied as evaluation methodologies.[4] To identify and evaluate the personal, environmental, and occupational factors that contribute to occupational performance problems, specific methods based on standardized and non-standardized assessment instruments were used. Regarding non-standardized assessment instruments, direct observation under provocation[4] of ADLs in a simulated context was used to observe deficits in the performance components during the execution of the requested activities.

Regarding selected standardized assessment instruments, the Vancouver Healing Scale,[10] Perimetry,[11] Goniometry,[12] Muscle Strength Test,[13] Visual Analogue Scale (VAS) for Pain[14] and the Canadian Occupational Performance Measure (COPM) were used.[15] After applying the instruments, in general the patient referred pain to the active mobilization of the wrist and fingers that he classified as 9 in the VAS. He had edema on the back of the hand and fingers, muscle strength grade 2 in the fingers and wrist and grade 3 in the forearm with limitation in the wrist and in all fingers, both MCF, proximal interphalangeal (PIP) and distal interphalangeal (DIF) not performing finger pinch or grip. He had a scar on the wrist with minimal resistance and on palpation the patient reported pericicatricial hypoesthesia. All these factors were a conditioning factor that negatively interfered and compromised the occupational performance of the patient in their significant activities. He identified several significant activities through the COPM that he considered to have difficulty performing and that were considered problematic in relation to occupational performance, namely Feeding, Dressing, Bathing and Driving the car.

Therefore, after verifying the factors that positively and negatively influenced the occupational performance of the patient, considering the information collected throughout the evaluation, the following therapeutic objectives were outlined:

Citation: Vieira C, Brito L, Vieira T, et al. Occupational therapy approach in a specific case of extensor tenorrhaphy in zone VII. *Int Phys Med Rehab J.* 2023;8(2):118–124. DOI: 10.15406/ipmrj.2023.08.00346

At the end of the 13 weeks of the therapeutic program it is expected:

I. That the edema has reversed.

II. That the pain has decreased by at least 70%.

III. That the scar obtains a total score of 3/13 in the parameter's height, vascularization, pigmentation, and flexibility.

IV. That muscle strength in the forearm, wrist and fingers increase to grade 4 in the muscle test.

V. That the joint amplitudes increase by at least 20º.

VI. That the activities identified as significant (feeding, dressing, bathing, and driving the car) present a score of 7 in performance and satisfaction.

Intervention

OT plays an important role in the rehabilitation of the hand after a traumatic injury, aiming at the functional recovery of the patient and his reintegration in his family and in his professional and social context. Technical knowledge was applied according to the injury and the musculoskeletal structures involved, as well as its pathophysiology in the healing of injured tissues, emphasizing the re-education of lost physical functions such as muscle strength and range of motion as well as dealing with complications associated with 6 weeks of immobilization in the limb such as pain at mobilization, joint stiffness, edema, and scar treatment.

Therefore, the OT approach was based on the application of therapeutic techniques directed to the forearm, wrist and hand, intervening in the control of pain and edema, in the treatment of the scar, in the motor and functional deficits of the patient in order to favor the execution of grip movements, aiming at muscle strengthening and joint amplitudes in order to improve the functionality of the left hand, seeking to maximize the functional performance of the patient in the execution of their ADLs. These techniques and procedures contribute to prevent and reduce edema, assist in tissue healing, relieve pain, allow muscle relaxation, prevent incorrect use or even the disuse of the limb itself, prevent the joints from becoming rigid and develop motor and functional functions again.[16] This approach allowed to help the patient to reach a new standard of occupation and improve the satisfaction of their occupational performance, giving them more autonomy, well-being, and quality of life. Thus, to achieve the therapeutic objectives outlined, an intervention plan was delineated for the patient where the therapeutic intervention performed by the researchers is described.

The intervention was divided into two phases. The first phase included controlling the edema, modeling, desensitizing the scar and advising the patient to perform exercises at home. In a second phase, when the edema was controlled, the researchers continued to treat the scar and began to control the pain, as well as improve muscle strength and joint amplitudes, and finally intervene in performance and satisfaction with significant activities identified as problematic for the patient. The authors started the intervention plan by preparing an activity to control edema of the wrist and left hand and management of the scar. Edema was one of the complications caused by the postoperative period, and rehabilitation is important for prevention and treatment. This is a sign of an inflammatory reaction, which results from a disturbance in the balance of the normal capillary filtration pressure and may be characterized by excessive accumulation and fluid in the interstitium.[16] When prolonged, it has an impact on joint range of motion, soft tissue mobility, quality of scar tissue formation, function, strength and aesthetics of the hand.[17] When it becomes chronic, it can cause fibrosis of the joints, muscles, vessels, and nerves and consequently stiffness, limitation of movement and even infection.[16]

To control edema, which is one of our priorities to achieve gains in mobility, the techniques used were based on active movement, simple lymphatic drainage massage and compressive bandaging with *Coban*. The edema that the patient presented was in a maturation phase since he was operated on 01/01/2022 and only started the OT sessions on 02/03/2022. The maturation phase of edema[18] is considered the final phase of healing that begins twenty-one days after the injury and can last up to one year. At this stage, the development of adhesions and range of motion constraints occur due to the deposition of collagen in a more organized manner. Thus, the treatment of edema in this phase began by the active movement that helped in venous and lymphatic drainage through the active contraction of proximal muscles that consequently facilitate the more efficient drainage of distal edema. By performing active exercises with the patient, muscle pumping and movement in the soft tissues was created, as well as compression of the veins and lymphatic vessels useful in the control of edema.[18]

Another technique used was the simple lymphatic drainage massage to stimulate the lymphatic system to move the proteins present in the interstitial spaces. If the proteins remain in these spaces, they pull the fluid back into them and perpetuate the edema. Finally, the 24-hour *Coban* compression bandage technique was applied twice at the end of each therapeutic session with the objective of external compression providing back pressure to the active muscles and compensating for the elastic insufficiency of the edematous tissue, improving circulation efficiency, reducing edema, and facilitating lymphatic function while providing gentle compression and not limiting range of motion.[18] This technique was applied to the fingers, hand, and wrist up to the elbow.

The patient's injury led to the formation of an open wound that later led to a scar in the postoperative period. Thus, it was necessary in all sessions to perform the treatment of the scar through scar massage,[16] helping to realign the connective tissue, contributing to a satisfactory healing, preventing retractions and adhesions that could cause limitation in movement. The desensitization technique was also used during 6 weeks of intervention since the beginning of the sessions since the patient presented pericicatricial hypoesthesia. This consists of a gently applied scar massage performed in the opposite direction to the tension forces of the tendon at the level of the scar present in the wrist, alternating with smooth and rough objects on the sensitive region to shape the scar and normalize sensitivity.[16] Another technique used was the vacuum therapy used during 5 weeks of intervention since the beginning of the sessions, since the scar presented a minimum resistance. This technique consists of restoring the shape and function of tissues to improve circulation and oxygenation of the interstitial medium, an important factor in tissue structure. It is a non-invasive technique that uses a device that causes a strong suction on the skin that generates an acute inflammatory process. From this inflammation, the process of physiological repair of the skin takes place and there is the restoration of tissue integrity through the stimulation of cells known as fibroblasts.[19]

The physiological effects of vacuum therapy[20] include the improvement of lymphatic blood circulation, eliminating zones of skin tension, improving the malleability of connective tissue, and contributing to the reduction of adhesions and fibrosis. The patient was advised to use the limb in their ADL and to perform exercises at home, provided by the researchers, with the objective of actively mobilizing the segments that in turn facilitated the reduction of edema, pain and joint stiffness and the gain of joint amplitudes, in

order to complement the rehabilitation program carried out in the hospital. In a second phase of the intervention, after the edema was controlled, the treatment of the scar was continued for another week and the moist heat was started to control pain and joint stiffness, as well as to improve joint amplitudes.

Pain is a common problem in rehabilitation,[16] which can cause protective and excessive attitude of the injured limb and incoordination of the motor pattern. For pain control, moist heat was used for 15 minutes before starting the mobilization of the forearm, wrist and hand. The moist heat[21] is called thermotherapy and was used to promote the reduction of joint stiffness and relaxation of the muscle and joint structures of the patient and consequently control the pain at mobilization. The postoperative period in hand trauma and subsequent immobilization[16] causes loss of range of motion and muscle weakness. Due to these motor impairments, it was important to intervene in OT in the choice of exercises and therapeutic activities to be performed during the sessions that prepare the patient for occupational performance. Initially, the *Casting Motion to Mobilize Stiffness* (CMMS) technique was used, since the patient presented joint stiffness and limitation in joint amplitudes, which hindered our intervention. Thus, after discussing the case with the physiatrist, we opted for the application of the CMMS technique only for 48 hours. This technique consists of performing a plaster splint in order to immobilize the proximal joints in an ideal position, while restricting the distal joints so that they mobilize in the desired amplitudes and directions. The CMMS technique is a way to apply the desired stress and recover normal movement patterns. In this case, this technique was performed with the wrist in maximum extension allowing the flexion of the fingers. During the sessions, the patient was asked to perform an active movement directed by flexion and extension of the fingers, in the desired pattern and within the plaster, with the objective of learning a new movement pattern in the motor cortex.[22,23] After 48 hours, the cast was removed, and it was agreed with the physiatrist to reevaluate the case together before proceeding to the application of the technique as reported in the literature. Although in the reevaluation, there was a slight gain in joint amplitudes and a decrease in pain at mobilization, in the opinion of the physiatrist this technique would bring gains in flexion, but there would be losses in extension, for this reason it was decided not to perform this technique again.

Other techniques used were the passive joint mobilization performed in the joints of the forearm, wrist and left hand due to joint stiffness, edema and pain combined with strengthening exercises through therapeutic resources carefully chosen for joint movement gain and muscle strengthening that were performed actively, passively, active-assisted and resisted, with the objective of promoting the increase of range of motion and muscle strength, as well as promoting motor skills appropriate to functional motor patterns. After the exercises and therapeutic activities, activities based on occupation (feeding, dressing, bathing, and driving a car) identified as problematic by the patient were performed through the training of ADLs in a simulated context with the therapeutic purpose of promoting training and teaching strategies that facilitate their performance.

Results

The reassessment was carried out monthly until the end of May (about 3 months) and the same instruments used in the evaluation were used, to understand the evolution of the user Table 1. Regarding the evaluation of the scar, the Vancouver Healing Scale was used, where it is possible to observe, through table 1, that initially the scar presented a minimum resistance, a reddish vascularization, and the scar tissue, was hyperpigmented with a thickness >2mm and <5mm. On palpation, the patient reported pericicatricial hypoesthesia, without pain and pruritus. He had a total s-core of 8/13 (height: 2; vascularization: 2; pigmentation: 2; flexibility: 1). At the end of the 13 weeks of intervention, the scar presented only a pinkish vascularization with a thickness <2 mm with normal pigmentation and with a normal flexibility with a total s-core of 2/13 (height: 1; vascularization: 1; pigmentation: 0; flexibility: 0) Graph 1, Graph 2.

Regarding the evaluation of edema, perimetry of the dorsum of the hand (Graph 1) was used according to the figure of 8 method, and perimetry of the fingers (Graph 2), using a tape measure to measure finger to finger. It was verified that the patient initially presented an increase in the perimetry of the dorsum of the hand by 3 cm and of the fingers by 0.5 cm, compared to the uninjured upper limb. At the end of the 13 weeks of intervention, it was found that there was a decrease in edema of the back of the hand by 2.5 cm and of the fingers by 0.3 cm compared to the initial evaluation Graph 3.

Regarding the evaluation of muscle strength, the Muscle Strength Test (Graph 3) was applied on the muscles responsible for the movements of the forearm, wrist, and hand. It was observed that initially in the forearm the patient performed the movement with gravity action without resistance (degree 3/5) and in the wrist and hand partially complete the ranges of motion without gravity (degree 2/5). At the end of the 13 weeks of intervention, there was an increase in muscle strength, that is, the patient performed the movement against gravity and endures a minimum resistance (degree 4/5) in all segments except for the flexion of the wrist, which only performed the movement with the action of gravity without resistance (degree 3/5) Graph 4.

Range of motion was evaluated through goniometry (Graph 4). Initially it was verified that the patient had joint limitations at the level of the joints of the forearm, wrist, and fingers. Since these ranges of motion are well below the maximum amplitude of each joint for each movement. At the end of the 13 weeks of intervention, there was an overall improvement in range of motion between 10º and 20º Graph 5.

Regarding pain assessment, VAS for pain was used, since the patient initially reported pain to the mobilization of the wrist and finger segments, which he classifies as 9 in the VAS (Graph 5). At the end of the 13 weeks of intervention, the patient was pain-free when mobilizing the segments. However, in the first two weeks (02-03-2022 to 16-03-2022) the patient maintained the initial pain, classifying it as 9 in the VAS. Between the week of 2022-03-16 to 2022-03-23, there was a decrease in pain on mobilization by one score (8 in the VAS). From 06-04-2022 until the end of treatment there was a decrease in pain at mobilization until the end of the intervention sessions Table 2.

Through the COPM, initially, the patient identified several significant activities that he considered to have difficulty in performing. After identifying the significant activities, the patient was asked to prioritize these same activities, classifying them according to performance and satisfaction, as can be seen in Table 2. It was verified that the patient reported having a poor occupational performance in all the identified activities. Regarding satisfaction, it was concluded that he was dissatisfied with his performance in terms of Food, Dress, Bath and Driving the car. After the analysis of the COPM, it can be pointed out that he did not get involved as he would like in his ADLs since his performance was compromised. At the end of the 13 weeks of intervention we can conclude that both the occupational performance score and the satisfaction score are higher than the score obtained in the first evaluation. The patient recognized a positive evolution both in terms of his performance in the activities and in the satisfaction, he had with his performance.

Citation: Vieira C, Brito L, Vieira T, et al. Occupational therapy approach in a specific case of extensor tenorrhaphy in zone VII. *Int Phys Med Rehab J.* 2023;8(2):118–124. DOI: 10.15406/ipmrj.2023.08.00346

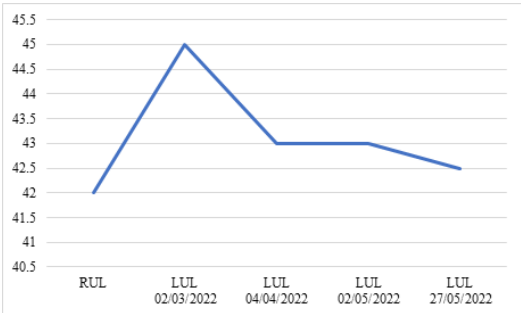
Table 1 Scar assessment: vancouver healing scale

		Initial assessment 2/3/2022	4/4/2022	2/5/2022	Revaluation 27/05/22
Height (Thickness)					
0	Normal/Flat				
1	<2.0mm		1	1	1
2	>2.0mm and <5.0mm	2			
3	>5.0mm				
Vascularization (erythema)					
0	Normal skin color				
1	Pink		1	1	1
2	Reddish	2			
3	Purple				
Pigmentation (Color)					
0	Normal			0	0
1	Hypopigmented				
2	Hyperpigmented	2	2		
Flexibility (Malleability)					
0	Normal		0	0	0
1	Flexible	1			
2	Little resistant				
3	Steadfast				
4	Adherent				
5	Contracture				
Total		8	4	2	2

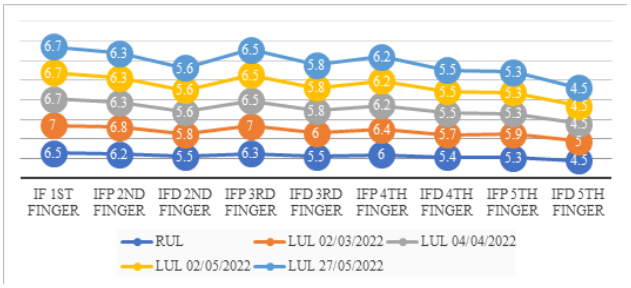
Note: The reference values agree with the authors Santos MC, et al.,[10]

Table 2 COPM

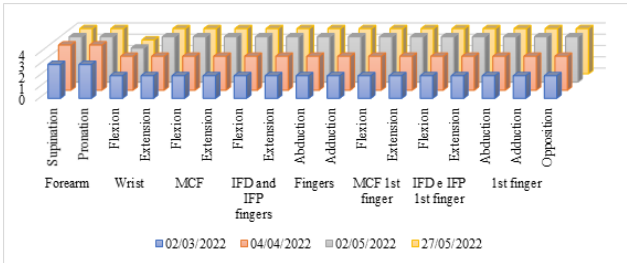
	Initial assessment 2/3/2022		Revaluation 27/05/2022	
Occupational performance problems	**Performance**	**Satisfaction**	**Performance**	**Satisfaction**
1. Feeding: cutting food	3	1	10	10
2. Dress: button the buttons and put on the blouse and pants	4	2	10	10
3. Bath: wash the body and grab the shower	4	4	9	9
4. Car driving: grabbing the steering wheel	5	5	10	10
Total score	4	3	9,75	9,75



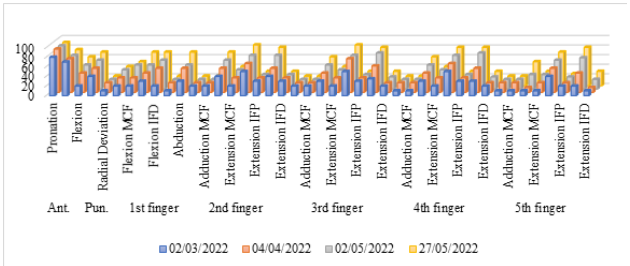
Graph 1 Evaluation of edema of the dorsum of the hand.



Graph 2 Evaluation of edema of the fingers.

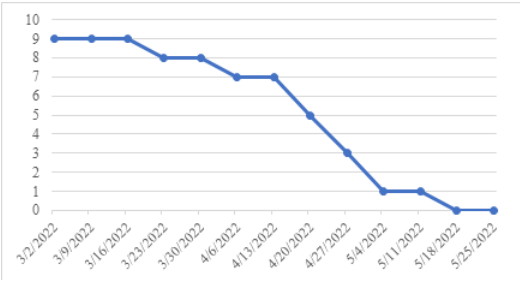


Graph 3 Muscle strength assessment.



Graph 4 Evaluation of joint amplitudes.

Citation: Vieira C, Brito L, Vieira T, et al. Occupational therapy approach in a specific case of extensor tenorrhaphy in zone VII. *Int Phys Med Rehab J.* 2023;8(2):118–124. DOI: 10.15406/ipmrj.2023.08.00346



Graph 5 Pain assessment.

Discussion

Throughout the 13 consecutive weeks of intervention, the evolution of the case under study was analyzed. In this time interval, emphasis was given to the re-education of lost physical functions such as muscle strength and range of motion, as well as complications associated with 6 weeks of limb immobilization, such as pain at mobilization, joint stiffness, edema, and scar. The intervention protocols in extensor tendon injuries in VII[24] assume that treatment should be initiated in the inflammatory phase of wound healing, within 3 to 5 days after tenorrhaphy.

After tenorrhaphy it is advisable to perform a volar splint[4,24] that allows to perform active flexion movements, while providing passive extension. The splint is applied for 3 weeks, starting with active movement between the third and fourth weeks. In the case under study, the patient after tenorrhaphy was immobilized with plaster cast for 6 weeks, developing complications such as pain on mobilization, joint stiffness, edema and decreased muscle strength and range of motion, as well as functional limitations. Thus, an anamnesis, as well as a functional evaluation of the hand are fundamental to provide data that help the best therapeutic strategy to be performed. The diagnosis, early treatment and intervention of OT in the postoperative period are essential to improve the functionality of the injured hand as much as possible. Early controlled active mobilization in the postoperative period of extensor tendon injuries in VI to VIII is an appropriate treatment methodology since there are many clinical complications associated with extensor tendons treated with immobilization, such as wrist tenodesis effect, delay of extensors, loss of DIF flexion, occurrence of adhesions, functional limitations, and prolonged treatment time.[24]

When the patient started the OT sessions he presented edema in a maturation phase, being considered a chronic edema so the treatment is more time-consuming being difficult to mobilize the limb and for this reason it was necessary to soften it before. Thus, the treatment of edema began with active movements to improve drainage. The lymphatic drainage massage was used to stimulate the lymphatic system and applied twice at the end of each session on the fingers, hand, and wrist to the elbow, for 24 hours. The compressive bandaging technique with *Coban* was also applied and was considered the technique that led to the reduction of edema since when it was applied it increased the tissue hydrostatic pressure.[18] After the reassessments of the edema, there was a small decrease in the back of the hand and in the fingers in general.

After tenorrhaphy, the scar[16] presented minimal resistance, reddish vascularization and the scar tissue was hyperpigmented with a thickness >2 mm and <5 mm and the patient reported pericicatricial hypoesthesia. Thus, techniques such as scar massage, vacuum therapy and desensitization techniques were performed. It was verified that in the reassessment the patient presented a lower result in the total score of the evaluation of the scar, and we can conclude that it exhibits a better state.

Injuries at the wrist level led to loss of mobility due to pain resulting from immobilization.[16] In the case under study, there was a 100% decrease in pain compared to the initial evaluation. Although in the first two weeks (02-03-2022 to 16-03-2022) the patient maintained the initial pain (9 in the VAS), from the day 06-04-2022 there was a decrease in pain at mobilization until the end of the intervention. It is thought that it may have been from the moment the CMMS technique was applied for 48 hours. Thus, we suggest that in future studies when researchers choose to perform this technique that it be applied right at the beginning of the intervention, if the patient meets the criteria as our case study, and apply it in a longer period.[22,23] Prolonged immobilization caused loss of range of motion and muscle weakness. The OT approach was based on the application of therapeutic techniques combined with exercises and therapeutic activities directed to the wrist and hand, intervening in the motor and functional deficits of the patient to favor the execution of grip movements, aiming at muscle strengthening and joint amplitudes to improve the functionality of the left hand; seeking to maximize the functional performance of the patient in the execution of their ADLs. There was an increase in muscle strength in general, as expected, as well as in joint amplitudes.

In the reassessment of the COPM, the patient recognized its evolution in terms of the performance of the activities identified as significant and this was reflected in the satisfaction score in relation to the initial evaluation. In the case under study, it was possible to verify a significant improvement in the functional use of the left hand, consequently bringing an improvement in performance and satisfaction with this same performance to the patient and a return to his personal and professional life. As reported in the literature, cases with extensor tendon injuries have a better recovery compared to flexor tendon injuries,[24, 25] as seen in our case study.

Conclusion

Hand injuries are frequent, and it is important that rehabilitation begins as early as possible to reduce the unfavorable consequences and functional sequelae of this type of injuries. The theoretical foundation and the practical action with the patient, allowed the realization of this case study and consequently a deepening of the knowledge of the OT performance in hand injuries. The therapeutic resources intervened directly in the recovery of the movements lost due to the injury and in the prevention of adhesions, causing the patient to establish normal movement and return to their daily activities. However, there is a need to conduct new studies in hand therapy to validate the therapeutic techniques comparing the data with those currently existing.

Acknowledgments

The authors would like to express all their gratitude and appreciation to all those who, directly or indirectly, contributed to the development and realization of this case study. The contribution of all was essential for the realization of this research study, whose process went through different stages, from the request for authorization to carry out the study, the data collection, the intervention performed and the systematization and reflection of the case under study. Without wanting to leave defined hierarchies, we want to thank the Health School of Beja, for having provided us with the opportunity to join the Postgraduate in Hand Therapy / Reeducation of the Upper Limb. We also want to thank the supervisors António Arsénio Duarte, Ana

Paula Martins and José Luís Coelho for all the time made available to give the most correct indications and for all the teachings they have transmitted to us at the level of research. We are grateful for all the time provided, support, guidance, collaboration, dedication, interest, criticism, suggestions, commitment, rigor, wisdom, understanding, enthusiasm and sharing.

We also thank the CHUA for the authorization and favorable opinion to carry out the case study, as well as to thank the patient of the study who participated and authorized the dissemination of their data, thus allowing the realization of this study. And finally, the last words of thanks could not fail to be addressed to our relatives, especially our parents, colleagues, and friends. A huge thank you for believing in our abilities and our work, for your availability, advice and moral support. Your support was crucial to the completion of this research study. To all of you, we wish to express our sincere thanks.

Conflicts of interest

The authors have no conflicts of interest with this work.

References

1. Beladelli LM, Mente PX, Gasparini GC. A contribuição da terapia ocupacional na reabilitação de mão após lesão traumática. *Multitemas*. 2002;25:43–154.
2. Silva JB, Gazzalle A, Alvarez G, et al. Lesões tendinosas da mão. *Revista da AMRIGS*. 2011;55(2):197–201.
3. Türker T, Hassan K, Capdarest-Arest N. Extensor tendon gap reconstruction: a review. *Journal of Plastic Surgery and Hand Surgery*. 2016;50 (1):1–6.
4. Pedretti L, Early M. *Terapia Ocupacional Capacidades Práticas para as Disfunções Físicas.* 5ª edição. São Paulo: Roca Lda; 2006.
5. Francisco MC, Yang JH, Neves FT, et al. Mecanismo extensor da mão: desvendando a anatomia e avaliação por métodos de imagem. *Revista Brasileira de Reumatologia*. 2007;47(4):290–294.
6. Rabbani MJ, Amin M, Khalid K, et al. Early active mobilization vs. immobilization following modified Kessler repair of extrinsic extensor tendons in zone V to VII. *Journal of Ayub Medical College Abbottabad (Pakistan)*, 2019;31(3):320–325.
7. Mouzopoulos G, Vlachos C, Ampadiotaki M, et al. The "Sparti" splint for rehabilitation of extensor tendon injuries in zones V-VII. *Handchir Mikrochir Plast Chir (Sparti).* 2018;50(3):216–218.
8. Townsend E, Polatajko H. *Enabling occupation II: Advancing an occupational therapy vision for health, well-being, e justice through occupation.* Ottawa: CAOT; 2007.
9. Crepeau E, Cohn S, Schell B. *Willard & Spackman Terapia Ocupacional.* 11ª edn. Rio de Janeiro: Guanabara Koogan Lda; 2011.
10. Santos MC, Tibola J, Marques CMG. Tradução, revalidação e confiabilidade da Escala de Cicatrização de Vancouver para a língua portuguesa. *Revista Brasileira de Queimaduras (Florianópolis)*. 2014;13(1):26–30.
11. Miller LK, Jerosch-Herold C, Shepstone L. Clinical assessment of hand oedema: A systematic review. *Hand Therapy*. 2017;22(4):153–164.
12. Marques, AP. *Manual de Goniometria*. 3ª edn. São Paulo: Manole; 2014.
13. Hislop HJ, Avers D, Brown M. *Daniels and Worthingham's Muscle Testing: Techniques of Manual Examination and Performance Testing*. 9ª edição. St. Louis: Elsevier; 2007.
14. Silva FC, Deliberato PCP. Análise Das Escalas De Dor: Revisão De Literatura Analysis Of The Pain Scales: Literature Review. *Revista Brasileira de Ciências da Saúde*. 2009;7(19):86–89.
15. Radomski MV, Latham CAT. *Terapia Ocupacional para Disfunções Físicas*. 6ª edn. São Paulo: Santos; 2013.
16. Torrezan CB, Idemori TC, Leite PS. *Intervenção ambulatorial da terapia ocupacional nas lesões traumáticas de punho e mão através de um manual de orientações com instruções de exercícios domiciliares*. 2009. p. 1–14.
17. Miller LK, Jerosch-Herold C, Shepstone L. Clinical assessment of hand oedema: A systematic review. *Hand Therapy*. 2017;22(4):153–164.
18. Villeco JP. Edema: A Silent but Important Factor. *Journal of Hand Therapy.* 2012;*25*(2):153–162.
19. Bentes ANM, Dayana PM. Recursos fisioterapêuticos utilizados no tratamento das cicatrizes hipertróficas em pacientes queimados. *Pós-graduação em Fisioterapia Dermato-Funcional. Faculdade Ávila* (Brasil). 2012;1–16.
20. Bacelar VC, Vieira ME. Importância da vacuoterapia no fibro edema glenóide. *Fisioterapia Brasil*. 2006; 7(6):440–443.
21. Branco PS. *Temas de Reabilitação – Agentes Físicos*. Porto: Medesing: Edições e Design de Comunicação, Lda; 2005. p. 1–64.
22. Midgley R. Case Report: The casting motion to mobilize stiffness technique for rehabilitation after a crush and degloving injury of the hand. *Journal of Hand Therapy*. 2016;29(3):323–333.
23. Midgley R. Case Report: The use of Casting Motion to Mobilize Stiffness to regain digital flexion following dupuytren's fasciectomy. *Hand Therapy*. 2010;15(2):45–51.
24. Eissens MH, Schut SM, Sluis CK. Early Active Wrist Mobilization in Extensor Tendon Injuries in Zones 5, 6, or 7. *Journal of Hand Therapy*. 2007;20(1):89–91.
25. Ahmad I, Agrawal L, Khurram MF, et al. An unusual mode of extensor ttendon injury – A case report. *Journal of Medical Sciences and Health*. 2020;6(2):50–53.