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Ultrasound Exploratory Study of Injuries in Baseball Athletes: Physiotherapy Intervention

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***Abstract*---**Soft tissue injuries are a recurrent cause that affects the vast majority of the baseball population in the province. The objective of the research is the diagnostic and prophylactic ultrasound exploratory study of soft tissue injuries and physiotherapeutic intervention in the population studied. In the analysis of results, it was obtained that the shoulders with tendinitis and tenosynovitis were the most affected injuries, who achieved the best response to the third cycle of the physiotherapy treatment scheme and around 30 days of sessions were needed, with 97% clinical alterations of the lesions and 84% echographic alterations of diagnostic and prophylactic examinations. Ultrasounds as a diagnostic indication allowed confirming lesions and affected regions, guiding better treatment selections and responses to effectiveness; as a prophylactic indication, it allowed to identify hidden injuries fundamentally in pitchers.

***Keywords*---**baseball, exploratory study, physiotherapy, sports injury, ultrasound examination.

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Introduction

Throwing a baseball is one of the fastest and most violent maneuvers a limb joint can be subjected to. Violent and rapid movement puts shoulder and elbow structures at risk; as well as sports that involve the use of the upper limb can cause frequent injuries to the elbows and shoulders, specifically pitchers. Repetitive throws of the shoulder joint at 90 degrees, or above, produce mechanical overloads on the shoulders (Sánchez, 2017; Aldana, 2018). The injuries that baseball players may suffer due to the constant pitching, the swinging of the bat or even the possibility of receiving a hit with the ball, can cause a series of physical problems (Arce, 2020; Bailón, 2020). Injuries in this discipline are defined as cumulative, due to excessive use (overuse), and acute (traumatic). The first ones occur over time, this is related to the stress of the muscles, joints and soft tissues without the adequate period for recovery. While acute ones occur due to a sudden force or impact, which can be very dramatic (Arce, 2020; Bailón, 2020).

In pitchers, it is described that the most common shoulder injuries are tendinitis and bursitis, due to excessive or repeated use above the head, excessive stretching of the shoulder capsule and ligaments due to acute traumas, leading to dislocations and dislocations; in the elbow, chronic overuse injuries due to the throwing action such as medial epicondylitis or golfer's elbow, lateral epicondylitis or tennis elbow, traumatic injuries such as ulnar ligament damage and bursitis frequently after falling on the elbow; in knees ligament tears, the anterior cruciate (ACL), medial collateral (MCL), posterior cruciate (PCL) and lateral collateral (LCL), cartilage injury due to tearing, decrease or loss of it due to overuse as in gonoarthrosis, traumatic of torn meniscus, chondromalacia, tendinitis or ruptured tendons such as quadriceps tendon, synovitis. In addition to those already mentioned, a baseball player may suffer from other physical problems such as muscle pain (DOMS), sprains, strains, fractures, others, as well as involvement of other regions such as the wrist, hand and back (Cordero & Jorge, 2008).

Ultrasound or ultrasound in sports medicine can diagnose multiple sports pathologies, it has shown sensitivity and specificity for partial and complete muscle tears in the shoulder, pathology related to sports that involve throwing balls; in elbow epicondylitis linked to throwing in cases refractory to treatment or when the diagnosis is doubtful, in complete ruptures that present retraction of the tendon, ultrasound has a sensitivity of 98% (Spicer et al., 2019; Cedrún, 2020). In the case of pitching a greater number of injuries in young pitchers, physical therapy and rehabilitation before considering surgery, we can start phase I and II of the rehabilitation process: the goal is to allow the injured tissue to heal, modify the activity, reduce pain and inflammation, and restore mobility. Phase II: Strengthening and neuromuscular exercises are started. Phases III and IV work in conjunction with the trainer, intensive strengthening and resistance exercises, continued neuromuscular training, introduction of plyometric training and a progressive interval throwing program, as long as the patient remains asymptomatic (Oyama, 2012; Deveau et al., 2014).

Shoulder injuries are complex, they must have a comprehensive treatment to recover from the injury and prevent relapses (Jimenez, 2017; Garrick, 2019). Injuries in these regions are the main cause of medical consultation in our environment, which cause significant limitations in the baseball population in the order of their sports, professional, work and daily career. The fundamental objective of the research is to implement the diagnostic and prophylactic exploratory ultrasound study in soft tissue injuries in baseball athletes and their physiotherapy intervention (Chenhall, 2005; Ennew & Binks, 1999).

Materials and Method

An exploratory diagnostic and prophylactic ultrasound study was performed. of soft tissue injuries and physiotherapeutic intervention to the population of baseball athletes from the Santiago de Cuba team, which participated in the 57th national baseball series 2017-2018. The sample under study consisted of 60 athletes of them, 34 Those who manifested clinical symptoms underwent diagnostic echoes to confirm the lesions, and 26 underwent prophylactic echoes to identify the presence of hidden lesions. Physiotherapy treatment schemes were applied to all of them according to the lesions found (Hammond, 2000; Bithell, 2000).

Procedures used for the investigation

In the Physical Medicine and Rehabilitation consultation, together with Orthopedics and Sports Medicine of the Provincial Center of Sports Medicine, rigorous laboratory tests were indicated and evaluated for the patients, they were interrogated and physical examination of the osteomyoarticular system of those of the specific affected regions, and diagnostic ultrasounds were indicated to 34 athletes who manifested clinical alterations in the affected regions, and prophylactic ultrasound in the areas of greatest overuse to 26 asymptomatic athletes. The sociodemographic variables of interest in the research and the main response variables were described. For this, we started from the data collected from the medical records made up by the authors in the investigation. The patients were distributed according to variables:

- Sociodemographic variables that were evaluated:
  - Player position: it was distributed according to the area in which the player takes possession of the field of play and the injuries found in the following categories: Receiver, Infielder, Outfielder, Pitcher.
  - Location of the affected anatomical region: it was distributed according to the region of the affected joint and the lesions found in the following categories: Shoulder, Elbow, Knee, Thigh, Ankle.
  - Fundamental factors found in athletes with clinical manifestation of injuries: It was recorded for intrinsic or predisposing factors given by the (athlete), it was distributed according to prevalence of appearance for the injury in the following categories: Inadequate body composition: % fat, high due to poor eating habits, inadequate physical conditioning: physical and mental fatigue, poor coordination, stretching, rest work regimen, Toxic habits: smoking, alcohol, improper execution technique,

incorrect use of sports implements, previous pathological states or history of injuries or old injuries.
    - Extrinsic factors or triggers given by the (medium or sport), were distributed according to the prevalence of appearance for the injury in the following categories: Poor ground conditions, insufficient and inadequate sports facilities, poor lighting of baseball fields, unfavorable weather (moisture, extreme temperature (heat), rain, unplanned extra-training activities
    - Physiotherapy intervention or treatment: it was recorded according to cycles of treatment schemes with therapeutic physical agents applied to the area of injury or anatomical location treated, depending on the injury found (Cryotherapy, Magnetotherapy, Di adynamic current (DD), Laser therapy, Paraffin, Contrast bath)
- Main response variables:
  Evaluation was made at the beginning in the first physiotherapy consultation or pre-treatment, and then after the application of the cycles of physiotherapy treatment schemes, it was distributed in:
    - Clinical alterations of the lesions: through the physical examination of the specific regions affected, and it was recorded in the following categories: presence of joint pain, inflammation, difficulty in joint mobility and limitation in carrying out sports activities.
    - Ultrasound alterations: were detected were detected diagnostic echoes in the regions affected by manifestations of the clinical alterations of the lesions, and prophylactic echoes in the joint regions of overuse in this sport; the alterations found were recorded in the following categories: presence of joint space narrowing, marginal osteophytes, bone sclerosis, calcification, band, increased synovial fluid or effusion, area of low echogenicity, area of high echogenicity, increased thickness of the capsule, joint surface irregularity, elbow cartilage thickening.
    - The results were measured according to the responses to the recovery of physiotherapy treatments, and were distributed in: Responses of the clinical alterations of the lesions after cycles of the treatment scheme, it was registered in the following categories:
        - Good: disappearance of the clinical alterations.
        - Fair: improvement of all or most of the clinical alterations.
        - Bad: no experimentation of changes, presents exacerbation of symptoms or appearance of new ones.
    - Responses of ultrasound alterations post cycles of treatment scheme, recorded the following categories:
        - Good: disappearance of the findings of the ultrasound alterations.
        - Regular: decrease or improvement of the findings of the ultrasound alterations.
    - No ultrasound changes: no variation or increase in the findings of ultrasound abnormalities.

The results of these response variables were collected in the registry prepared for this purpose by the authors, summarized in figures according to absolute and relative percentage distributions of Microsoft Excel, using mathematical statistical

studies for the analysis and interpretation of their results (Finch, 2006; Ahern & Lohr, 1997).

Analysis and discussion of the results

The results obtained in the analyzes can be shown in Table 1, where the distribution of the patients is found according to the appearance of the injuries, the position of the players on the field of play and the location of the affected anatomical regions. No. 60. Of all the anatomical regions affected the largest number was on the shoulders of pitchers with tendinitis injuries for 13.3% and tenosynovitis with 8.3%, the elbow regions with epicondylitis and spirochaetes also predominated both in pitchers with 6.6%.

Table 1
Distribution of patients according to appearance of injuries, position of players and location of anatomical regions. No. 60.

Injury	Position	Regions affected											
		Shoulders		Elbows		Knees		Thighs		Ankles		Total	
		no	%	no	%	no	%	no	%	no	%	no	%
Tendinitis	R	0	0	0	0	1	1.6	0	0	0	0	1	1.6
	JC	0	0	0	0	1	1.6	0	0	0	0	1	1.6
	J	1	1.6	0	0	0	0	0	0	0	0	1	1.6
	L	8	13.3	0	0	0	0	0	0	0	0	8	13.3
Tenosynovitis	R	0	0	0	0	0	0	0	0	0	0	0	0
	JC	0	0	0	0	0	0	0	0	0	0	0	0
	J	4	6.6	0	0	0	0	0	0	0	0	4	6.6
	L	5	8.3	0	0	0	0	0	0	0	0	5	8.3
Myofibril Rupture	R	0	0	0	0	0	0	0	0	0	0	0	0
	JC	0	0	0	0	0	0	2	3.3	0	0	2	3.3
	J	4	6.6	0	0	0	0	0	0	0	0	4	6.6
	L	2	3.3	0	0	0	0	0	0	0	0	2	3.3
Tendon Rupture	R	0	0	0	0	0	0	0	0	0	0	0	0
	JC	0	0	0	0	0	0	0	0	0	0	0	0
	J	1	1.6	0	0	0	0	0	0	0	0	1	1.6
	L	1	1.6	0	0	0	0	0	0	0	0	1	1.6
Osteoarthritis	R	0	0	0	0	0	0	0	0	0	0	0	0
	JC	0	0	0	0	1	1.6	0	0	1	1.6	2	3.3
	J	0	0	0	0	0	0	0	0	0	0	0	0
	L	4	6.6	1	1.6	0	0	0	0	0	0	5	8.3
Contusion	R	1	1.6	0	0	0	0	0	0	0	0	1	1.6
	JC	0	0	1	1.6	0	0	1	1.6	0	0	2	3.3
	J	0	0	0	0	0	0	0	0	0	0	0	0
	L	0	0	0	0	0	0	0	0	0	2	0	0
Synovitis	R	0	0	0	0	1	1.6	0	0	0	0	1	1.6
	JC	0	0	0	0	1	1.6	0	0	0	0	1	1.6
	J	0	0	0	0	0	0	0	0	0	0	0	0
	L	0	0	0	0	0	0	0	0	0	0	0	0
Bursitis	R	0	0	0	0	0	0	0	0	0	0	0	0
	JC	0	0	0	0	0	0	0	0	0	0	0	0
	J	1	1.6	0	0	0	0	0	0	0	0	1	1.6
	L	2	3.3	0	0	0	0	0	0	0	0	2	3.3
Epicondylitis	R	0	0	0	0	0	0	0	0	0	0	0	0
	JC	0	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0	0
	L	0	0	4	6.6	0	0	0	0	0	0	4	6.6
Epitrocleitis	R	0	0	0	0	0	0	0	0	0	0	0	0
	JC	0	0	0	0	0	0	0	0	0	0	0	0

	J	0	0	0	0	0	0	0	0	0	0	0	0
	L	0	0	4	6.6	0	0	0	0	0	0	4	6.6
	R	0	0	0	0	0	0	0	0	0	0	0	0
Capsulitis	JC	0	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0	0
	L	3	5	0	0	0	0	0	0	0	0	3	5
	R	0	0	0	0	0	0	0	0	0	0	0	0
Hematoma	JC	0	0	1	1.6	0	0	0	0	1	1.6	2	3.3
	J	0	0	0	0	0	0	0	0	0	0	0	0
	L	0	0	0	0	0	0	0	0	0	0	0	0
	R	0	0	0	0	0	0	0	0	0	0	0	0
sprain	JC	0	0	0	0	0	0	0	0	2	3.3	2	3.3
	J	0	0	0	0	0	0	0	0	0	0	0	0
	L	0	0	0	0	0	0	0	0	0	0	0	0
Total		37	61.6	11	18.3	5	8.3	3	5	4	6.6	60	100

Source: collection form of data.
Legend: R: receivers. JC: infielders. J: gardeners. L: launchers.

In reviewed bibliographies, some authors state that pitchers present injuries more frequently, of these, ligament injuries and epicondylitis are frequent in elbows; cartilage tears, rotator cuff injuries such as tendinitis or tendinopathies, muscle and tendon tears or ruptures, mainly of the supraspinatus and the long head of the biceps, are recurrent in the shoulders and are problems for pitchers, due to the greater number of pitches they make with respect to to players from other positions (Reyes, 2019; Mastrangelo et al., 2014; Peña Marrero et al., 2014; Cárcamo et al., 2016).

The previous authors also refer that throwing is the technical gesture that exposes the most to injury since it is an unnatural movement that compromises the different structures of the joint to twisting, stretching at high speed and at acute angles, in addition to being repetitive above of the head producing important mechanical overloads on the joints, they classify injuries according to the position in which they play (pitcher: shoulder and elbow injuries), (catchers, infielders and outfielders: suffer more injuries to the legs and knees). On the other hand, the author Frederick (2015), describes that when throwing with the arms at 90° or above 90°, the natural movement of the arm is altered, causing greater recruitment and demands on the muscles in correspondence with the different types of throws, which induce significant stress on the shoulder, often causing sports injuries in this joint. According to the authors, our results coincide with them (Li et al., 2013; Ma & Mateer, 1997).

Table 2 presents the distribution of the intrinsic or predisposing factors given by the athlete and the extrinsic or triggering factors given by the environment or fundamental sport found in athletes with manifestation of the clinical alterations of the injuries. No.34. Of the factors, the extrinsic or triggers (medium or sport) were the predominant with the environmental factors, the poor lighting of the baseball fields, in the categories of insufficient artificial light or sunlight or glare, very bothersome to vision on the field. in training and competitions, and the factor of unfavorable weather, in the category of extreme or high temperatures due to the intense heat of our tropical country, the same for both in all of the 34 affected with clinical alterations. Of the intrinsic or predisposing factors (athletes), the following factors predominated: health status, history of injuries or old

injuries, with the category of micro trauma or chronic degenerative injury of joint overuse, and the mental state factor, with the category of stress, both with 35.2%.

Table 2
Distribution of extrinsic or triggering factors (athlete) and intrinsic or predisposing factors (environment or sport) in manifestation of the clinical alterations of the injuries. No.34.

Intrinsic OR factors Predisposing (Athlete)	Categories	Total	
		No	%
Body composition	% Inadequate fat, high by bad eating habits.	1	2.9
Inadequate physical conditioning	Physical and mental fatigue (prolonged training, high intensity heat)	3	8.8
	Poor coordination (training and competitions):	10	24.4
	Inadequate rest work regimen:	3	8.8
Toxic Habits	Smoker	6	17.6
	Frequent drinker	6	17.6
	Incorrect use of (essentially poor or inadequate footwear)	6	17.6
Inadequate execution technique		5	14.7
	Acute sports trauma or accidents	4	11.7
Health states (history of injuries or old injuries)	Microtrauma or chronic degenerative injury (overuse) of joints	12	35.2
	External sports trauma or injury	3	8.8
	Other or non-sports diseases	5	14.7
Mental state	Dysfunctional personality	4	11.7
	Stress	12	35.2
	Anxiety	10	29.4
	Depression	2	5.8
	Inadequate concentration	6	17.6
Extrinsic OR factors Trigging (Middle Or Sports)	Categories	Total	
		No	%
Poor ground conditions	Inadequate player position or area (Ground hard and irregular)	12	35.2
Implements for sports practice and protection	Insufficient and inadequate sports equipment (essentially poor or inadequate footwear)	6	17.6
Environmental factors (poor lighting of baseball fields)	(Insufficient artificial light and sunlight or glare very intense at times of (training and competitions)	34	100
Unfavorable weather	Extreme temperature (heat)	34	100
Unplanned extra training activities (Uncontrolled athletic systems, free play)	Free games of baseball, soccer, others outside the sports and cycling area of training	4	sessions11.7

Source: data collection form

In a monographic study of the 52 national baseball series, authors such as, classify internal risk factors as predisposing, acting from the inside, but not sufficient to produce the injury, and external risk factors act on a predisposed athlete, classifying themselves as facilitating factors for e the injury is manifested, both factors it has a summation effect and its interaction "prepares" the athlete to be injured in a given situation, referring to these factors and those found in our study (Bahr & Reeser, 2003; Villanueva & Montesino, 2013). The health status factor with previous injuries explains that these predispose to new injuries, most of the time secondary to sequelae derived from the injury. In the study, this category was predominant with 35.2%, represented by the chronic degenerative injury of (overuse) repetitive microtrauma of the joints in the patients, which agrees with the authors (Petrova et al., 2021; Peniro & Cyntas, 2019).

At Adequate physical conditioning declares that where there is inadequate conditioning, both due to defects or excesses, predispose to injury, poor coordination in training and competitions, were the most incident in this factor with 24.4 %. In athletes with dysfunctional personality traits not susceptible to modification or control, they condition that there is not an adequate concentration in the development of the activity, the history of stressful events of daily life such as arguments, previous sports injuries and other situations that produce anxiety, depression or stress to the athlete prevent him from adequate concentration in the development of the activity. In the study, stressful events were more predominant with 35.2% and the anxiety with 29.4%, mainly due to the existence of previous sports injuries. Environmental factors: the authors state that factors such as rain and inadequate lighting alter the playing surface. It was observed in the exploration of our study, that in the total 100% of the 34 patients who manifested the clinical alterations of the lesions, insufficient artificial light and/or sunlight or glare bothersome to vision in the field, had a negative impact frequently in training and competitions (Baxtiyorovna, 2021; Lema et al., 2018).

From unfavorable weather: the authors allude to the fact that in humid and very hot climates, with temperatures that reach 36 or 38 degrees, planning the training schedule is essential, as they explain that you should always take advantage of the first hours of the morning, a hour after waking up and finish an hour before noon, as prolonged exposure to ultraviolet rays from sunlight is not recommended. These are strongest between 12 noon and 3 in the afternoon and can cause injuries due to muscle fatigue and extreme exposure to heat, among others. In the study the climate also in 100% of the 34 patients who manifested clinical alterations, negatively affected due to extreme exposure to heat from the high temperature at times of extended training and competitions, sometimes being a little more than the non-recommended times, being able to be one of the conditioning factors in the appearance of muscular fatigue, exhaustion, and with it, condition the appearance of injuries. Also results that agree with the authors (Wong, 2021; Rinartha et al., 2018).

On the other hand, in bibliographical reviews of an ultrasound diagnostic study, some authors describe that repetitive throws over the head cause chronic microtrauma or are conditions of the mechanical theory of overuse of the joint for the appearance of injuries such as calcific tendinitis , complete ruptures of the supraspinatus tendon in the shoulders; lateral epicondylitis (tennis elbow), medial

epicondylitis (golfer's elbow or epitrochleitis) in more frequent elbow injuries (Botella et al., 2009; Mantilla et al., 2014; Anillo et al., 2016; Pedre et al., 2016; Sansone et al., 2016; Cedrun, 2020; Martínez et al., 2020). This agrees with those of the intrinsic or predisposing factor (athlete) of the state of health, history of injuries or old injuries, in the category of microtrauma or chronic degenerative injury of joint overuse, as one of the most significant 35.2% found in ours. study, so it agrees with the authors.

Figure 1 shows the distribution of patients according to the relationship of the lesions with the exploratory echoes and physiotherapy treatment schemes applied. A) No.34 and B) No.26. The physiotherapy treatment scheme with physical agents was distributed as follows: those that were accompanied by A) clinical alterations in the acute phase and confirmed for diagnostic echoes, cryotherapy was first used for the first 72 hours, then the condition improved following cryotherapy and throughout the week for tendinitis, tenosynovitis, epicondylitis, spirochetes, synovitis and bursitis, combinations of treatment modalities were continued. DD currents and magnetic therapy, and on weekends with contrast baths; for ruptures of myofibrils, tendons, contusion, hematoma and sprain, the acute condition improved, after cryotherapy, the combination of laser therapy and magnetic therapy with contrast bath on weekends; in capsulitis and osteoarthrosis, the acute condition improved, after cryotherapy, paraffin and magnetotherapy continued during the week, plus contrast on weekends. The lesions B) that did not accompany manifest clinical alterations, and that were detected by radiological findings of the prophylactic echoes, were applied the previous combinations according to the lesion detected, except for cryotherapy.

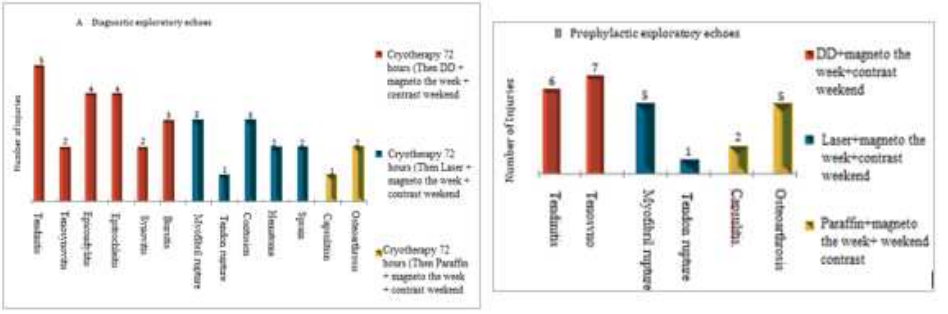

Figure 1. Distribution of patients according to the relationship of the lesions with A) Diagnostic exploratory echo No.34, B) Prophylactic exploratory echo No.26 and physiotherapy treatment schemes.
Source: data collection form

Figure 2 shows the distribution according to A) Evaluation of the clinical alterations of the lesions. B) Responses of the clinical alterations of the lesions after cycles of the physiotherapy treatment scheme. No. 34. In graph A) it is shown that in the 34 athletes who manifested clinical alterations of the injuries, the most significant at the beginning or before the physiotherapy treatment scheme, they were with 100% the pain, the difficulty for joint mobility of the affected regions, and the limitation for carrying out sports activities; followed by 88% inflammation. In graph B) it is observed that the good response to the clinical alterations of the lesions was achieved at the 3rd cycle of application of

the treatment schemes, showing with 97% the best response due to the disappearance of all the alterations; 3% reported regular response; and 0% bad response. The average of the treatment of the 3rd cycle was around 30 days of treatment sessions, this coincides with authors such, where they describe the results of researchers carried out in musculoskeletal injuries such as those addressed in ours, showed an overall efficacy between 70% and 98% in an average range of 33.9 treatment sessions with the use of combinations of physical agents exposed above, and showed a general efficacy of 98% for pain control in the first 10 treatment sessions 1st cycle, results that coincide with ours.

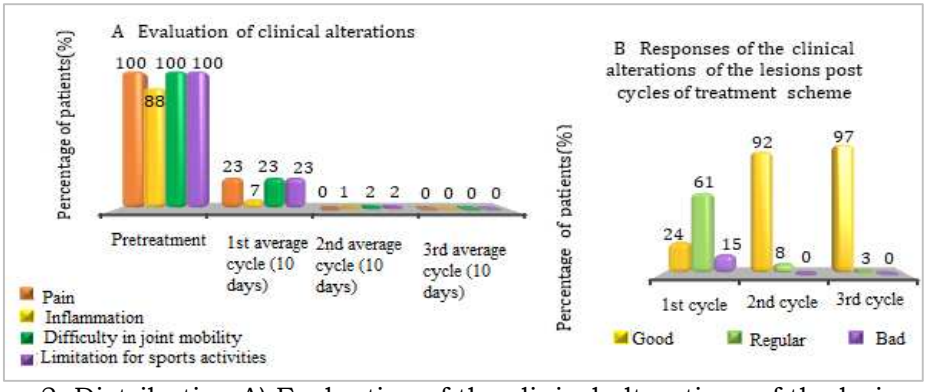

Figure 2. Distribution A) Evaluation of the clinical alterations of the lesions. B) Responses of the clinical alterations of the lesions after cycles of the physiotherapy treatment scheme.
Source: data collection form

The therapy applying cold (cryotherapy) that was used in all the confirmed lesions that expressed their initial stages or acute phases of the condition, was carried out several times a day during the week according to the treatment cycle in the affected area with the aim of mitigating the pain and reduce inflammation, the action of vasoconstriction that occurs prior to vasodilation eliminates pain by activating the circulatory and lymphatic system, because due to the pressure that inflammation exerts on the joint and with its movements, the pain worsens causing in turn stiffness and functional limitation of the joint, directly it has an effect on the sensory endings and pain fibers or by relieving muscle spasm, indirectly it relieves pain and also spasm by reducing swelling, bruising , hence the theory of its anti-inflammatory and analgesic effects, all of the above supported the use for its application in l The initial stages or acute phases of the lesions in our study.

The laser therapy applied to the lesions during the week in the treatment cycle was carried out with the objective of anti-inflammatory action: due to the opening of the circulation at the site of the lesion, favoring the exchange, arrival of oxygen, nutrients and other elements, stimulation of drainage and exits of waste material from cellular metabolism produced, reabsorption of edema and elimination of waste catabolites and release of mediators of inflammatory response by chemotactic factors and others; analgesic action: due to the release of endorphins, it also produces vasodilation that increases lymphatic drainage to remove waste material from the tissue, recovery of osmotic pressure and decrease

interstitial edema; and as a trophic action and tissue regeneration: with the aim of healing, scarring or regeneration of injured tissues by conditioning increased peripheral circulation and number of polymorphonuclear cells, neovascularization and granulation and regulation of cell proliferation.

Diadynamic current modalities were used in lesions treated during the week in the treatment cycle with the following objectives: diphasic diadynamics (DF) at the beginning of treatment and to prepare the area, short period (CP) with circulatory effect to relieve the pain of inflamed joints, and the long-term modality (LP) due to the predominant analgesic and spasmolytic effect, being more powerful and lasting than the previous ones. These results coincide with authors who revealed in their studies that the combination of modalities in applications of acute pain for shoulders and elbows of the pitcher, both for minor and major leagues, due to conditions such as tendinitis or supraspinatus tears in the rotator cuff , the long portion of the biceps (PLB), bursitis, epicondylitis, epitrocleitis, among others, is one of the most used schemes, although many of these pictures are subacute and chronic installation (Anillo et al., 2016; Cecilia, 2017).

The use of paraffin in the treatment schemes for injuries was carried out with the objective of fundamentally reducing the tensions of the ligaments and joint capsules that produce contractures and joint stiffness, resulting in difficulty in joint mobility and limitation for sports activities. cause of degenerative joint injuries. In these cases, the paraffin achieves a selective heating of the contractured joints, producing an increase in the extensibility of the connective tissue; other effects such as heat therapy was used in the preparation of the treatment area that opens circulation, also as a vasodilator action increased capillary blood flow, metabolic and enzymatic activity, stimulation of cell exchange, analgesic, muscle relaxant, antispasmodic and anti-inflammatory effects.

Electromagnetic fields were used in treatment schemes for injuries, with the aim of having a biostimulant, relaxation, anti-inflammatory, pain-relieving effect, rebalancing tissue circulation, increasing the level of oxygen and nutrients, stimulating the cell metabolism towards multiplication, rearrangement and restructuring of the matrix of injured tissues. The combination with the previous physical agents potentiates the effects of each one of them. Contrast baths were carried out in the treatment schemes for the lesions with the aim of obtaining an effect of cyclical opening and closing of the circulation, which is very useful in the immediate state of immobility due to rest, often with circulatory stasis. Contrasts help stimulate blood and lymphatic circulation such as vasodilation and vasoconstriction responses (cyclical opening and closing of circulation), this increases the number of blood cells and helps eliminate waste that accumulates within the inflamed areas, leading to nutrients and oxygen, improves immune function, increases the functional activity of the tissues being treated, reduces congestion, relieves inflammation, hence its value in reducing edema, produces a consensual effect on the contralateral limb, water provides security in motion and notably facilitates functional recovery, in addition to being easy to apply at home, without interruption of treatment days or sections, hence the methodology in the cycles of applied treatment schemes.

In general, the favorable clinical response of these physical agents in baseball injuries has been justified taking into account their therapeutic effects, the objectives of the treatment to be worked on, the phase or stage of the treating injury (acute, sub-acute or chronic), selection criteria of the physical agent, origin or type of pain, location of the injury, age of the patient, history, evolution of the condition or other accompanying diseases, among other characteristics, which were demonstrated by bibliographic results consulted and addressed coinciding with the ours.

Figure 3 shows the distribution according to A) Evaluation of the exploratory ultrasound alterations. B) Responses of the exploratory ultrasound alterations after cycles of the physiotherapy treatment scheme. No. 60. The findings obtained in the evaluation of the exploratory ultrasound alterations, it was found that more than one categories of the alterations were repeated in the patients, in A) the most predominant ones are shown at the beginning or pre-treatment of the cycles of the scheme of physiotherapy applied, with 45% the presence of liquids and 12% the existence of areas of low echogenicity, high echogenicity or heteroechogenicity, and irregularity of the articular surface with equal percentages in the three categories. The existence of these ultrasound alterations speaks in favor of the presence of tendinopathies and degenerative arthropathies fundamentally. B) Shows that a good response to the ultrasound alterations was achieved at the 3rd cycle of the treatment schemes applied, being around 30 days of treatment secession, showing the best response with 81% due to the disappearance of all the alterations found; 19% reported regular response, and 0% with no changes in response to ultrasound alterations. Then, the patients underwent an evolutionary echo after having received the third cycle of treatment schemes, that is, 3 months around 90 days, which corroborated maintaining the good and regular response achieved, and even though in some they persisted some degenerative signs such as osteophytes, calcifications, sclerosis, decrease in joint space, in general, all of them experienced a change of improvement when the remaining ultrasound alterations disappeared.

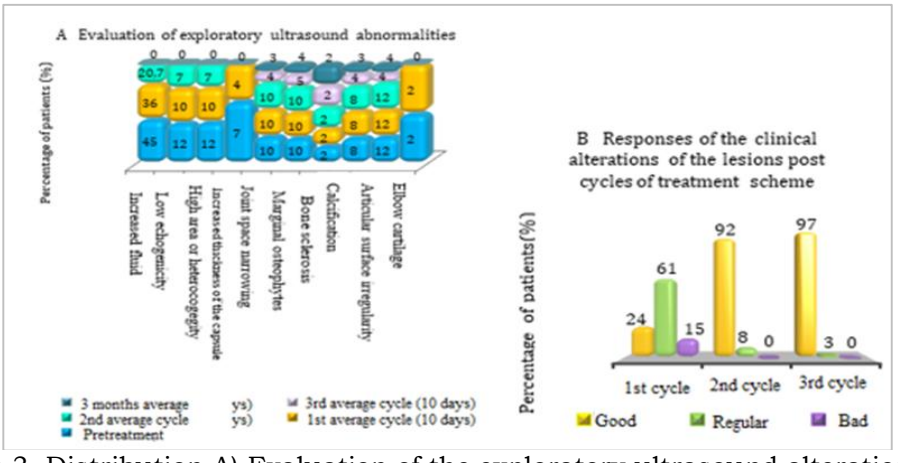

Figure 3. Distribution A) Evaluation of the exploratory ultrasound alterations. B) Responses of the exploratory ultrasound alterations after cycles of the physiotherapy treatment scheme.
Source: data collection form

In bibliographic reviews of ultrasound diagnostic studies and rehabilitation and physiotherapy treatment, they describe similar results found to those of this research, since they refer that in shoulder injuries due to tendinopathies, the most significant ultrasound findings are the presence of hypoechogenicity, hyper or heteroechogenicity, in bursitis what is found is inflammation and increased fluid in the bursa or leaks from it; in tendon ruptures it would depend on whether it is partial or complete, in which signs of hypoechoic or anechoic interruption of the tendon, absence of the tendon, discontinuity of the fibers, hematoma can be observed; In elbow injuries: epicondylitis and epitrochleitis, heterogeneous thickening of the tendon is frequently found, with associated fluid and tissue hyperemia or edema, partial tears, osteochondral lesions, intra-articular loose bodies, osteoarthrosis, thickening of the synovial membrane, thickening and hypo echogenicity of the elbow. tendon in case of tendinosis or areas of rupture; and regarding the most frequent ankle injuries: in ultrasound diagnosis they describe that it is possible to visualize said ligament, classifying the degrees of injury in grade I, II and III (Botella et al., 2009; Mantilla et al., 2014; Pedre et al., 2016; Sansone et al., 2016).

Conclusion

The ultrasound exploratory study, as a diagnostic indication in the studied sample, confirmed the lesions presented and the affected regions; As a prophylactic study, it identified hidden lesions in affected regions, mainly in pitchers. The findings of the initial and evolutionary ultrasound radiological signs, both diagnostic and prophylactic, made it possible to evaluate better selections of physical agents for combinations and cycle of treatment schemes for responses to effectiveness.

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