ORIGINAL ARTICLE

Ultrasound characterization of joint conditions in the shoulder and knee

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Received: 05/10/2022 - Approved: 10/19/2022

ABSTRACT

Introduction: within musculoskeletal disorders there are, with high frequency, conditions that affect the shoulder and knee joints; in its diagnosis, ultrasound is of vital importance as an auxiliary means.
Objective: to characterize shoulder and knee affections by ultrasound.
Methods: a descriptive and cross-sectional study was carried out in the Imaging Service of the "Arnaldo Milián Castro" Hospital in the Province of Villa Clara. The population was made up of all the patients (434) referred to the Ultrasound Clinic of the osteomyoarticular system during the period from October 2018 to July 2021. The historical and inductive-deductive methods were used, as well as the documentary analysis of clinical histories and reports. ultrasonographic, observational and statistical.
Results: shoulder and knee conditions affected mainly those aged 50 to 59 years, the most frequent shoulder condition was omarthrosis and calcifications and tendinitis prevailed in supraspinatus lesions. Knee conditions were more frequent at 60 years of age and over, and gonarthrosis predominated, significantly related to the popliteal cyst, and lateral and medial ligament injury. The agreement between diagnostic impression and ultrasonographic diagnosis was good for the shoulder and moderate for the knee.
Conclusions: ultrasound was a useful means to characterize shoulder and knee conditions.
Key words: ultrasonography; joint diseases; knee; shoulder; gonarthrosis

RESUMEN

Introducción: dentro de los trastornos músculoesqueléticos se encuentran, con elevada frecuencia, las condiciones que afectan las articulaciones del hombro y la rodilla; en su diagnóstico la ecografía tiene vital importancia como medio auxiliar.
Objetivo: caracterizar ecográficamente las afecciones del hombro y de la rodilla.
Métodos: se realizó un estudio descriptivo y transversal en el Servicio de Imagenología del Hospital "Arnaldo Milián Castro" de la Provincia de Villa Clara. La población estuvo

conformada por todos los pacientes (434) remitidos a la Consulta de Ecografía del sistema osteomioarticular durante el período de octubre de 2018 a julio de 2021. Se utilizaron los métodos histórico e inductivo deductivo, el análisis documental de historias clínicas y los informes ultrasonográficos, de observación y el estadístico.
Resultados: las afecciones de hombro y de rodilla afectaron mayormente las edades de 50 a 59 años, la afección más frecuente del hombro fue la omartrosis y en las lesiones del supraespinoso primaron las calcificaciones y la tendinitis. Las afecciones de rodilla fueron más frecuentes a los 60 y más años y predominaron la gonartrosis, relacionada significativamente con el quiste poplíteo, y la lesión de los ligamentos lateral y medial. El acuerdo entre impresión diagnóstica y diagnóstico ultrasonográfico fue bueno para el hombro y moderado para la rodilla.
Conclusiones: la ecografía resultó un medio útil para caracterizar las afecciones del hombro y de la rodilla.
Palabras clave: ultrasonografía; artropatías; rodilla; hombro; gonartrosis

INTRODUCTION

In 2004, the World Health Organization[1] defined musculoskeletal disorders as health problems of the locomotor system that include muscles, tendons, skeletal bones, cartilage, ligaments and nerves. Individuals may present from mild and transient discomfort to irreversible and disabling injuries, many caused or intensified by work. Their diagnostic and therapeutic approach requires speed and efficiency. Within this group of disorders are, with high frequency, conditions affecting the shoulder and knee joints; in their diagnosis, ultrasound is of vital importance as an auxiliary tool.[2]
Ultrasound was introduced in medical diagnosis in the 70's of the last century; however, its full application to the study of the locomotor system did not begin until just over 20 years ago, when high-resolution transducers appeared that allowed obtaining images with sufficient definition of the anatomical details.[3]
Current high-resolution ultrasound scanners provide high-definition soft-tissue images, which, together with their safety, portability and dynamic and comparative examination capabilities, have made this imaging method a fundamental tool of choice for the study of the locomotor system.[4] Due to its usefulness for specialists in Orthopedics, Traumatology, Physiatry and Rheumatology and in order to reach a diagnosis with certainty and consequently indicate an adequate treatment to patients, in the 90's of the last century,[5] its use began in Cuba, at the Clinical Surgical Hospital "Hermanos Ameijeiras" in Havana City; later it was extended to the Institute of Sports Medicine and other hospitals in Havana.[6]
Professor Valls was a pioneer in the application of this technique in the country who, in 2003, working together with other professionals of great experience in the area of Imaging, put in the hands of Cuban specialists his book Ultrasound of the locomotor system,[6] which collects, in a theoretical and practical way, the use of high resolution ultrasound in the imaging diagnosis of the locomotor system or the osteomyoarticular system.
Dr. Elio Llerena Rodríguez, current professor and founder of the Ultrasound Clinic of the osteomioarticular system (ECOSOMA, Ecografía del sistema

osteomioarticular) in the Province of Villa Clara, assures that it started between 1996 and 1997 at the "Arnaldo Milián Castro" Hospital in the City of Santa Clara. The first activities were carried out by Dr. Mayra Alejandro Gaspar together with the third year Residents of the Imaging Specialty, who began to introduce themselves in the ultrasound diagnosis of knee affections, especially popliteal cysts, muscular lesions and stoning syndrome, among others.

Around 2003, Dr. Bastos, a physician from the Sports Medicine Center of Villa Clara, who had taken the SOMA Ultrasound Course with Doctors Ricardo Anillo Badía and Jorge Luis Hernández Castro, in Havana, approached the Radiology Department of the mentioned hospital to put into practice the knowledge he had acquired. During his stay at the "Arnaldo Milián" Hospital, Dr. Bastos trained Dr. Alejandro and the Residents who were in training at that time for the practice. Once Dr. Bastos stopped attending the practice, Dr. Alejandro and Dr. Llerena took it over; they mainly performed knee ultrasound and started to introduce themselves in the diagnosis of other joints. By means of self-study, by Dr. Bastos' clarifications and by applying the experiences acquired in events and in the practice in the office, they completed their training and began to train the Residents. From then on, the scope of the practice was expanded and the diagnosis of ankle, wrist and hip disorders was started and, around 2010, the training of specialists from the rest of the central provinces began, with the participation of Professors Dr. Alejandro, Dr. Llerena and Dr. Madyaret Águila Carbelo.

At present, the Specialists of the ECOSOMA Clinic are inserted in the International Arthroscopy Program of the Province of Ciego de Avila, with the participation of Specialists from different countries such as Germany, United States, Sweden, Australia and United Kingdom.

Several studies support the criterion that ultrasound offers an alternative as an initial examination in case of suspected shoulder injury. Internationally, diagnostic accuracy percentages of this method are reported to be above 90%.[7]

There have been multiple international researches referred to the diagnosis of different shoulder conditions in different patients and scenarios.[2] A bibliographic review carried out in 2018,[8] describes the role of ultrasound in the diagnosis and treatment of different causes of shoulder pain and addresses the diagnosis of the most important alterations of that joint.

A study performed in Ciego de Avila, Cuba, evaluates the diagnostic efficacy of high-resolution ultrasound in patients with rotator cuff ruptures.[9]

Regarding the use of ultrasonography in the diagnosis of knee conditions, it has been suggested that there is research indicating that this means can be useful in the diagnosis of meniscal disease and other structures. A meta-analysis conducted in 2015 to establish the role of ultrasonography in the diagnosis of meniscal injuries concluded that the accuracy of ultrasonographic diagnosis for the latter is acceptable, with high specificity and moderate sensitivity.[10]

At the national level, the oldest research was carried out in 2004: a pioneer study in Havana, which lasted from 2001 to 2003 and received 524 patients in which the shoulder and knee joints were the main tributaries of ultrasound indication.[5] These results allowed demonstrating the usefulness of ultrasound of the

locomotor system for the diagnosis of tendon injuries, ligament injuries and joint effusions of the shoulder and knee.

In a study developed in Camagüey, in 2019, on the behavior of patients with synovial plica of the knee, it is assured that high-definition ultrasound provides important elements that corroborate the clinical suspicion of the disease.[11]

A sonographic characterization of knee lesions concluded that ultrasound is an effective diagnostic modality for the diagnosis of knee alterations with little limitation in its evaluative function on ligament and meniscus lesions.[12]

In Villa Clara, there have been several studies referred to the use of ultrasonography in the diagnosis of knee affections, one of them had as objective to compare the imaging results obtained by ultrasound and magnetic resonance in meniscal disease and those obtained during knee arthroscopy in patients who come to the Orthopedics Service of the University Clinical-Surgical Provincial Hospital "Arnaldo Milián Castro".[13]

An investigation on the imaging-arthroscopic relationship in knee alterations found a high diagnostic concordance between ultrasound, MRI and arthroscopy, as well as a high sensitivity of the first test in the diagnosis of meniscopathies and knee synovitis.[14]

Aware of the benefits of knowing the sonographic characteristics of the articular alterations, both for the diagnosis and for the treatment of the patient, the researchers propose to characterize the articular alterations of the shoulder and knee identified in patients who are seen at the ECOSOMA Clinic and are referred to the Imaging Service of the "Arnaldo Milián Castro" Hospital in the period from October 2018 to July 2021.

METHODS

Design and population

A descriptive and transversal study was carried out in the ECOSOMA Clinic of the Radiology Service of the Clinical Surgical University Hospital "Arnaldo Milián Castro" of Santa Clara City, Villa Clara Province, in the period between October 2018 and July 2021.

The study population was constituted by the 434 patients referred to the mentioned service for clinical suspicion of articular diseases at shoulder or knee level who possessed an indication for performing ultrasound indicated by Orthopedic, Rheumatology and Physiatry Specialists, among others, and who consented to participate in the research.

Study variables

Epidemiological, imaging and clinical variables were operationalized: age, mechanism of the condition, shoulder diseases, supraspinatus tendon disorders, pathological alterations of the knee, ultrasound diagnosis and diagnostic impression.

Techniques and procedures for data collection

Theoretical (historical and inductive-deductive) and empirical (documentary analysis of medical records and ultrasonographic reports and observation) and statistical methods were used for data collection.

The entire sample underwent physical examination of the affected joint, as well as dynamic ultrasound. A Samsung ultrasound equipment, model IPC-1530, SN. MO 1757, 50/60Hz, with 7.5 and 10MHz transducers and both B-mode and color Doppler were used. Measurements of the variables were collected through interrogation and ultrasound examination. The scan was directed to the area of maximum pain, initially without applying force and then with gradually increasing isometric contraction, with longitudinal, transverse and sometimes oblique scanning. All observations were performed by the same specialist with experience in this type of study to avoid biases in the information. The data obtained were collected in a data collection guide created by the investigators.

Shoulder examination technique: technique and structures routinely examined (performed as described by Mendoza Ruíz et al.[15]

Knee examination technique: the knee examination was performed according to Ventura's indications.[16]

Analysis and processing of information

The data were stored in an Excel file and exported to the SPSS 20.0 program for Windows 10. The absolute and relative frequencies were used to describe the qualitative variables and the mean and standard deviation for the quantitative variables.

Ethical considerations

The principles of medical bioethics were taken into account: respect for the individual (autonomy), for which the consent of each patient was requested, and the principles of beneficence, non-maleficence and justice. Patients were informed in detail about the research they were taking part in, its objectives and the benefits it will bring to society, and they were guaranteed that the researchers assume responsibility for the use, care and handling of the information obtained, as well as that the publication of the results will only be done for scientific purposes. Finally, it was clarified that non-acceptance to participate in the study or the express desire to abandon it does not exempt the patient from the corresponding medical treatment.

RESULTS

The study included 434 patients, of which more than 50% corresponded to those over 50 years of age.

Table 1 shows the distribution of the population according to age and non-traumatic degenerative mechanism of production for each of the joints explored. A total of 230 (53%) and 60 (13.8%) were diagnosed with knee and 60 (13.8%) shoulder disorders. By age groups, a higher prevalence of knee disorders was observed in those over 60 years of age (21%) and in the shoulder between 50

and 59 years 31 (7.1%); in relation to the non-traumatic degenerative production mechanisms associated with the occupation, the highest percentage was attributed to the group of 50 to 59 years for the two anatomical positions.
There was a significant relationship between the age groups and the mechanism of production of knee injuries (px^2 less than 0.05).

Table 1. Distribution of patients according to age and mechanism of production

Age	MAO		No MAO		Total	
	N	%**	N	%**	N	%*
Knee	x^2=42.0167; px^2=0.0000					
19 - 29	3	3.0	11	8.5	14	3.2
30 - 39	11	10.9	9	7.0	20	4.6
40 - 49	25	24.8	14	10.9	39	9.0
50 - 59	43	42.6	23	17.8	66	15.2
≥ 60	19	18.8	72	55.8	91	21.0
Total*	**101**	**23.3**	**129**	**29.7**	**230**	**53.0**
Shoulder	x^2=7.7497; px^2=0.1012					
19 - 29	1	2.7	1	4.3	2	0.5
30 - 39	4	10.8	0	0	4	0.9
40 - 49	4	10.8	3	13	7	1.6
50 - 59	22	59.5	9	39.1	31	7.1
≥ 60	6	16.2	10	43.5	16	3.7
Total*	**37**	**8.5**	**23**	**5.3**	**60**	**13.8**

*Percentage of total population (434); **Percent per column
MAO: non-traumatic degenerative production mechanisms associated with occupation
x^2: Non-parametric Chi-square test statistic of independence
px^2: statistical significance (95%) % calculated per column

Among the shoulder disorders detected by ultrasound, the most frequent was omarthrosis (80, 44.4%) and, according to the classification, involvement of both shoulders predominated (62, 34.4%). It was followed in frequency by bursitis (73, 40.5%) and, of these, subacromiodeltoid (53, 49.1%). In third place, tendinitis was observed (73, 40.5%) and tenosynovitis of the long portion of the biceps (PLB) and supraspinatus tendinitis were diagnosed in 32 patients (43.8%). Chronic insertionitis was found in 45 patients (25%) and the most frequent was subscapularis insertionitis (38, 84.4%). Total supraspinatus rupture (7, 3.9%), partial supraspinatus rupture (28, 15.6%), hydroarthrosis (6, 3.3%) and fracture with incomplete traces of the humeral head (2, 1.1%) were diagnosed less frequently -Table 2.
Sonographic patterns in supraspinatus tendon injuries were diagnosed in 85 patients (78.7%); insertionalitis and calcifications were observed in 40 patients (37%) and chronic insertionalitis in 33 (32.4%) and dysmorphic calcification in 35 (32.4%). Ruptures in 35 (25.9%) and was more frequent on the bursal side 23 (21.3%). There were 20 (18.5%) investigated with tendinitis, chronic 14 (13%) -Table 3-.

Table 2. Diagnosed ultrasound alterations of the shoulder

Shoulder diseases (N=180)	N	%
Omarthrosis	**80**	**44.4***
Scapulo humeral	6	3.3[a]
Acromio clavicular	12	6.7[a]
Both	62	34.4[a]
Bursitis	**73**	**40.5***
Bursitis of the subacromiodeltoidea	53	49.1[b]
Bursitis of the long portion of the biceps	11	10.2[b]
Bursitis of the subscapularis	9	8.3[b]
Tendinitis	**73**	**40.5***
Tendosynovitis of the long portion of the biceps	32	43.8[c]
Supraspinatus tendinitis	32	43.8[c]
Subscapularis tendinitis	7	9.6[c]
Infraspinatus tendinitis	2	2.7[c]
Chronic insertionitis	**45**	**25.0***
Subscapularis tendon	5	11.1[d]
Infraspinatus tendon	2	4.4[d]
Supraspinatus tendon	38	84.4[d]
Supraspinatus partial tear	**28**	**15.6***
Supraspinatus total tear	**7**	**3.9***
Hydroarthrosis	**6**	**3.3***
Bone lesion: fracture with traces incomplete fracture of the humeral head	**2**	**1.1***

*Percent of total shoulder diseases; a: percent of total osteoarthritis; b: percent of total bursitis; c: percent of total tendonitis; d: percent of total chronic insertionitis

Table 3. Sonographic patterns in supraspinatus tendon injuries according to ultrasound

Supraspinatus tendon injuries	N	%
Insercionitis	**40**	**37**
Acute	2	3.7
Chronic	33	324
Chronic with signs of aggravation	5	46
Tendon calcifications	**40**	**37**
Tendon thickness	5	4.6
Dysmorphic	35	32.4
Ruptures	**35**	**25.9**
Partial	7	6.5
Bursal side	23	21.3
Articular side	2	1.9
Intrasubstantial	3	2.8
Tendinitis	**20**	**18.5**
Acute	2	1.9
Chronic	14	13.0
Chronic with signs of aggravation	4	3.7
Hydroarthrosis	**6**	**5.6**
Total	**85**	**78.7**

Of the 108 patients scanned by shoulder ultrasound, 78 presented alterations associated with supraspinatus tendon injuries, with no significant statistical association between them. The most frequent was omarthrosis (64, 82.1%),

followed by bursitis (49, 62.8%) and, within this, subacromiodeltoid (39, 50%) -Table 4-.

Table 4. Shoulder alterations associated with supraspinatus tendon injuries according to ultrasound

Shoulder conditions	Supraspinatus tendon	
	No.	%*
Omarthrosis	**64**	**82.1**
Bursitis	**49**	**62.8**
Subacromiodeltoid bursitis	39	50.0
Bursitis of the long portion of the biceps	11	14.1
Bursitis of the subscapularis	9	11.5
Tendinitis	**9**	**11.5**
Acute subscapularis subscapularis tendinitis	5	6.4
Tendinitis of the long portion of the biceps longus biceps	4	5.1
Tendinitis of the infraspinatus	1	1.3
Thickening of the coracoacromial ligament	**6**	**7.7**
Muscular atrophy	**4**	**5.1**
Supraspinatus trophism muscle atrophy	4	5.1
Atrophy of the infraspinatus muscle	3	3.8
Total	**78**	**100.0**

*Percentage calculated with respect to the total number of patients with shoulder disorders associated with supraspinatus tendon injuries

Table 5. Distribution of patients according to the knee alterations detected by ultrasound

Pathologic alterations of the knee (N=326)[a]	n	%
Gonarthrosis	220	67.5
Suprapatellar bursitis	139	42.6
Anserine bursitis	13	4.0
Infrapatellar bursitis	7	2.1
Bursitis between gastronemius and semimembranosus	7	2.1
Degenerative meniscopathy	93	28.5
Meniscal tears	49	15.0
Parameniscal cyst	9	2.8
Meniscal calcification	8	2.5
Calcified endosopathy of the quadriceps tendon	69	21.2
Tendinitis of the goose foot	29	8.9
Quadriceps tendinitis	8	2.5
Popliteal cyst	58	17.8
Medial collateral ligament injury	35	10.7
Lateral collateral ligament injury	12	3.7
Chondrocalcinosis	10	3.1
Synovial plics	5	1.5
Hematoma	1	0.3

[a] Total number of patients with knees studied

The alterations detected by ultrasound examination of the knee joint are shown in Table 5. The greater frequency of gonarthrosis is evident, present in 67.5% of those examined. Among the bursitis, the most frequent was suprapatellar bursitis (139, 42.6%). As for meniscal lesions, they were present in 142 patients (43.7%); significant statistical differences were obtained (p=0.023), but in favor

of those in whom these lesions were not detected. The most frequent lesion was degenerative meniscopathy (93, 28.5%), followed by meniscal tears (49, 15%). The most frequent tendinopathy detected by ultrasound was calcified enthesopathy of the quadriceps tendon (21.2%), while the highest frequency of ligament injuries corresponded to medial collateral ligament injury (10.7%).
Table 6 shows the distribution of other knee alterations detected by ultrasound in patients who also presented gonarthrosis.
The relationship between gonarthrosis detected by ultrasound and popliteal cyst is statistically significant with 46 patients (24.3%) and an OR=2.07; CI (1.05-4.1), as well as with the medial collateral ligament lesion found in 30 patients (15.9%) and an OR=3.19; CI (1.20-8.47).
Among the patients in whom gonarthrosis was detected ultrasonographically, the other most frequently found involvement was meniscal tear (96, 50.8%), followed by suprapatellar bursitis (91, 48.1%) and calcified quadriceps tendon enthesopathy (49, 25.9%).

Table 6. Distribution of knee alterations associated with gonarthrosis according to ultrasonography

Knee disorders	Gonarthrosis		IC (95%)		
	Yes	%	OR	LB	UB
Meniscal tear	96	50.8	1.01	0.63	1.61
Suprapatellar bursitis	91	48.1	0.85	0.53	1.36
Calcified quadriceps tendon enthesopathy	49	25.9	1.23	0.68	2.20
Popliteal cyst	46	24,3	2.07	1.05	4.1
Medial collateral ligament injury	30	15,9	3.19	1.20	8.47
Goose foot tendinitis	18	9.5	0.77	0.35	1.69
Bursitis anserina	9	4.8	1.09	0.33	3.62
Joint effusion plus synovitis	9	4.8	1.09	0.33	3.62
Lateral collateral ligament injury (LCL)	9	4.8	1.46	0.39	5.52
Chondrocalcinosis	7	3.7	1.13	0.29	4.45
Infrapatellar bursitis	5	2.6	1.21	0.23	6.34
Tendinitis of the quadriceps tendon	5	2.6	0.80	0.19	3.41
Bursitis between gastronemius and semimembranosus	4	2.1	0.64	0.14	2.89
Synovial plics	3	1.6	0.72	0.118	4.37
Total	**189**				

OR: odds ratio; CI: confidence interval of OR; LB: lower bound; UB: upper bound

The distribution of meniscal lesions and their relationship with other knee alterations detected by ultrasound is shown in Table 7. 10 patients in whom only the first alteration was detected were excluded.
Statistically significant are the relationships between the detection by ultrasound of meniscal lesions and suprapatellar bursitis, with 73 patients (55.3%) and an OR=1.89; CI (1.21-2.95); the lesion of the lateral collateral ligament present in 10 patients (7.6%) and an OR=6.89; CI (1.48-31.98) and chondrocalcinosis detected ultrasonographically in eight patients (6.1%) with OR=5.43 and CI (1.13-25.99).
According to the frequency of occurrence among patients in whom meniscal lesions were detected ultrasonographically, the most frequent was gonarthrosis

(96, 72.7%), followed by supratellar bursitis (73, 55.3%) and calcified quadriceps tendon enthesopathy (36, 27.3%).

Table 7. Knee alterations associated with meniscal lesions detected by ultrasonography

Knee alterations N=132	Meniscal lesions		IC (95%)		
	Yes	%	OR	LB	UB
Gonarthrosis	96	72.7	1.01	0.63	1.61
Suprapatellar bursitis	73	55.3	1.89	1.21	2.95
Calcified quadriceps tendon enthesopathy	36	27.3	1.55	0.91	2.65
Popliteal cyst	18	13.6	0.52	0.28	0.96
Goose foot tendinitis	11	8.3	0.77	0.35	1.69
Lateral collateral ligament LCL injury	10	7.6	6.89	1.48	31.98
Medial collateral ligament injury LCM	20	15.2	1.85	0.90	3.75
Chondrocalcinosis	8	6.1	5.43	1.13	25.99
Joint effusion plus synovitis	7	5.3	1.54	0.50	4.68
Anserine bursitis	5	3.8	0.80	0.26	2.51
Infrapatellar bursitis	4	3.0	1.75	0.38	7.94
Synovial plics	4	3.0	5.30	0.59	47.99
Tendinitis of the quadriceps tendon	4	3.0	1.30	0.32	5.31
Bursitis between gastronemius and semimembranosus	3	2.3	0.97	0.21	4.41

OR: odds ratio; CI: confidence interval of OR; LB: lower bound; UB: upper bound

Table 8 shows the relationship between the diagnostic impression and the diagnosis in ECOSOMA. Among patients who had their shoulder scanned there are 42 coincidences (63.6%) and the agreement is good (0.61<K<0.80). There are 84 coincidences (43.9%) between the diagnoses issued and the ultrasonographic findings in patients who had the knee explored; for these the agreement was moderate (0.41<K<0.60).

Table 8. Relationship between diagnostic impression and diagnosis on ECOSOMA of the knee and shoulder

	Knee	Shoulder
Matches	84 (43,9%)	42 (63,6%)
No matches	107	24
Number of diagnostic impressions	191	66
Kappa (K)	0.56	0.687
Type of agreement	Moderate	Good

DISCUSSION

Painful shoulder is one of the most frequent musculoskeletal conditions, after 65 years of age its prevalence is 25%,[7,17] a figure higher than that found by ultrasound in the present investigation. The prevalence of painful shoulder increases proportionally with age, it is common in patients older than 50 years and the average age is 60 years,[18] which coincides with the results of the present study. The Mexican Institute of Social Security[19] points out that this condition may be related to joint instability in people under 35 years of age, shoulder overload in people between 40 and 50 years of age or cuff degeneration

in people over 55 years of age, which should be taken into account when performing the exploration of the structures of this joint. The results obtained by Cisneros and collaborators[20] when ultrasonographically exploring the knee joint coincide with those of this research because they found a discrete predominance among patients corresponding to the group of 50 to 59 years old. However, others[13] reported a higher frequency between the ages of 40 and 49 years.

Regarding the mechanism of production of the lesion in this study, non-traumatic lesions were more frequent, which increased as age increased, a fact that coincides with that reported by other authors[10,13,20,21] who suggest that this result may be related to the aging process and the diseases that occur at an older age. The atraumatic lesions of the meniscus occur on a previous degenerative meniscopathy from the fourth decade of life onwards.[13,21]

The highest frequency of shoulder alterations detected by ultrasound found in this investigation corresponded to omarthrosis, which differs from the results of other authors who found a predominance of supraspinatus tendinitis[5] and that tendon disease is the most frequent cause of shoulder pain.[22] Of all the muscles and tendons that make up the rotator cuff, the most frequently affected is the supraspinatus because it is susceptible to repeated "pinching" and because the blood supply to the tendon decreases during arm abduction.[23] In developed countries, it is estimated that approximately 1% of the adult population will consult for upper extremity pain: the reported incidence is 19 per 1000 patients per year, of which 65-70% are caused by rotator cuff syndrome.[24]

The sonographic patterns found in supraspinatus tendon injuries coincide with those consulted by several authors.[1,5] Supraspinatus tendinitis may occur within a chronic process, especially in older populations (the most frequent in this research), and it presents insidiously, without a history of a single specific trauma event.[23] Ultrasound plays an important role in its study, which is strongly recommended -after the failure of conservative treatment- to confirm or rule out complete or partial rupture and, to a lesser extent, for tendinopathies, subacromial bursitis and calcifying tendinitis.[25]

Regarding the shoulder alterations associated to the supraspinatus tendon lesions according to ultrasound in the present investigation, the highest frequency was found in omarthrosis and in second place bursitis; other authors[23] pointed out that two of the sources they consulted indicated an association between bursitis and autoimmune diseases such as rheumatoid arthritis.

Other investigations[2,3] express that the ultrasound diagnosis of meniscal lesions is acceptable, with high specificity, but moderate sensitivity. Ultrasound was the best method applied in terms of sensitivity and specificity to ascertain meniscal lesions; however, it is not equally sensitive for the diagnosis of plica, synovial alterations, osteoarthritis and chondromalacia.[3]

The association of osteoarthritis with age has been clearly defined, some authors have considered it a normal process of old age.[7,20] The higher frequency of gonarthrosis found in this research, by means of sonographic exploration of the knee joint, confirms this approach and coincides with what has been expressed by other authors.[26] One investigation reported an incidence of synovitis in 149 of the cases studied, articular cartilage lesions in 96 and gonarthrosis in 53[5] and

another found synovial plica, meniscal lesions, articular cartilage lesions and synovial membrane affections as the most frequent disorders in this order.[3]
In coincidence with the results of the present investigation, other authors[27] have reported that gonarthrosis is the most frequent joint disease, with the highest incidence and prevalence, which is why it is considered a health problem with a high prevalence in men under fifty years of age and in women after fifty, especially after menopause and with a higher prevalence. Approximately 80% of people over 65 years of age present radiographic changes with evidence of knee osteoarthritis.
When relating the diagnostic impression and the ultrasound diagnosis of the shoulder, it differs from others[3] who reported a positive and direct linear correlation between the clinical and ultrasound diagnoses of cuff ruptures and tendinitis of the long portion of the biceps, while in the rest of the shoulder conditions there is no relationship between the clinical and ultrasound diagnoses.
No references were found to compare the relationship between the diagnostic impression and the results of the sonographic examination of the knee found in this research.

CONCLUSIONES

The majority of patients attending the ECOSOMA clinic were those 50 years old and older. Those aged 50 to 59 years were mainly affected by shoulder disorders and those aged 60 years and over were affected by knee disorders. The mechanism of production was independent of age for shoulder disorders and the most frequent alteration was omarthrosis. The most frequently found sonographic pattern in the supraspinatus tendon was tendon calcification, tendinitis was the least frequent condition and there was no significant association between shoulder conditions and lesions of that tendon. In the knee, the most frequent mechanism of production was non-traumatic, mainly the degenerative ones associated to the occupation, and gonarthrosis was predominant, significantly related to popliteal cyst and medial collateral ligament injury. The correlation between the diagnostic impression and the ultrasound diagnosis in the shoulder examination was good, while for the knee it was moderate.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

CONTRIBUTION OF THE AUTHORS

MÁC: conceptualization, formal analysis, research, resources, supervision, validation, writing the original draft, writing (review and editing).
ASM: conceptualization, data curation, formal analysis, research, methodology, visualization, writing the original draft, writing (reviewing and editing).
IME: data curation, formal analysis, research.
CRG: data curation, formal analysis, research, visualization, writing the original draft, writing (reviewing and editing).
ELR: resources, supervision, validation.
REG: resources, validation.