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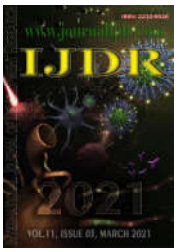

RESEARCH ARTICLE OPEN ACCESS

CORRELATION BETWEEN MEDICATION AND EXERCISES WITH PARTIAL VASCULAR OCCLUSION ASSOCIATED OR NOT WITH SHOCK WAVE THERAPY IN THE TREATMENT OF KNEE OSTEOARTHRITIS

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ABSTRACT

Knee osteoarthritis (OAJ) is a degenerative, chronic and irreversible condition of the articular cartilage, which is associated to injuries and inflammations in the other periarticular structures to the knee, being capable of causing pain, physical, psychosocial, functional impairments and impaired quality of life of affected people. The cause is multifactorial, involving old age, trauma, biomechanical changes, genetic, immunological, endocrine, biomechanical and osteometabolic factors. Its identification is made by clinical and imaging investigation and the treatment is multiprofessional. The aim of this study was to correlate the therapeutic results of the use of medication, medication associated with exercises with partial vascular occlusion and medication associated with exercises with partial vascular occlusion and Extracorporeal Shock Wave Therapy (TOCE) in the treatment of individuals with OAJ. Through the study, it can be concluded that the isolated use of medication, in the treatment of OAJ, promotes only analgesia, and that its association with low resistance exercises with partial vascular occlusion and use of TOCE, promote analgesia, weight gain quadriceps strength, improved functionality and quality of life for individuals with OAJ, without, however, changing muscle trophism. The best results were seen in individuals with OAJ who received TOCE.

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INTRODUCTION

Osteoarthritis of the knee (OAJ) is one of the most common diseases of the musculoskeletal system, affecting about 40% of individuals over the age of 60, with women being more affected than men, in an approximate proportion of 9.6% to 18% (LI WEI *et al*, 2018). Among several treatments for OAJ, "resistance" exercises performed with 65% or more of 1 Maximum Resistance (1RM), for strengthening and hypertrophy of the quadriceps muscle, are considered first-rate in the treatment of this condition (BENNEL *et al*, 2008).

It is important to consider that in the face of muscle deficiency, degeneration and the presence of pain, as occurs in OAJ, it becomes almost impossible to carry out training with high resistance of the affected patients (BENNEL *et al*, 2012). However, several studies have shown that when performing resistance exercises with low resistance (20 - 40% of 1RM) associated with partial vascular occlusion, performed with a specific sphygmomanometer, adjusted and positioned on the thighs of the individuals, one can have the same result of strength gain and trophism as that obtained in high resistance training, with the advantage that they are more comfortable and offer

Another treatment option for OAJ is Extracorporeal Shock Wave Therapy (TOCE). TOCE emits low frequency and high intensity cavitational mechanical waves in the body tissues, with the purpose of promoting analgesia, reducing inflammation and accelerating local cicatrization, through neurosensory, vascular and biochemical action (KERTZMAN *et al*, 2015). There is controversy regarding the benefits of using TOCE in the treatment of OAJ, with effective and non-effective results, often correlated to the modulation of the equipment, types of waves (radial and focal), standardization of the number of sessions and isolated use of this therapy (LI WEI *et al*, 2018). The use of TOCE has been advocated in a multimodal way, that is, in conjunction with other treatments, in various types of musculoskeletal injuries, with relevant scientific evidence (KERTZMAN *et al*, 2015). In the case of OAJ, there are still no studies combining the application of TOCE with the performance of quadriceps strengthening exercises with low resistance and partial vascular occlusion. (KERTZMAN *et al*, 2015). The objective of this study was to correlate the therapeutic results of the use of medication, medication associated with exercises with partial vascular occlusion and medication associated with exercises with partial vascular occlusion and TOCE in the treatment of individuals with OAJ.

Theoretical Reference: OAJ is inflammatory and chronic, with degeneration of articular cartilage and impairment of associated structures, such as subchondral bones, ligaments, meniscus, joint capsules and muscles, being associated with pain, functional limitation, sleep impairment, psycho-emotional disorders and loss of quality of life in general for affected individuals (ABBOTT *et al*, 2013). Its etiology is multifactorial, and may be related to age, muscle weakness, traumas, fractures, biomechanical imbalances, osteometabolic, endocrine, immunological and genetic factors, with the consequent presence of an imbalance between the formation and destruction of the elements of the articular cartilage (COIMBRA *et al*, 2004). Its treatment is multiprofessional, and may involve doctors, physiotherapists, nutritionists, psychologists and physical educators, to provide the best clinical, mechanical, nutritional, emotional and functional results for the affected people (COIMBRA *et al*, 2004). The diagnosis of OAJ is based on anamnesis, inspection, palpation, physical and functional tests and analysis of image exams (HART *et al*, 1995).

Among the various self-reported scales of quantitative pain assessment, which is a subjective symptom present in the clinical condition of patients with OAJ, the Visual Analog Scale (EVA) is the most widely used worldwide, due to its ease of application and understanding. It has an ordinal score scale from zero to 10, where zero means no pain, 1 and 2 indicate “mild pain", 3 to 7 “moderate pain" and 8 to 10 “severe pain" (MASCARENHAS; SANTOS, 2011).
It is of utmost importance to assess the strength of the quadriceps in patients with OAJ and to identify their level of muscle weakness. A simple, low cost and easy application to quantify the strength of the quadriceps is the assessment of its peak strength during maximum voluntary isometric contraction, which can be performed by dynamometry, using a portable dynamometer (ROBLES *et al*, 2011).
In order to assess the stiffness, functionality and quality of life of patients with OAJ, it is possible to use the functional test called TUG, which is simple and easy to perform. In performing it, the appraised person will move from a seated position on the chair to a standing position and will walk as fast as possible, covering a distance of 3 meters, until reaching a previously stipulated demarcation, having to go around it and return to the seated position on the chair. The time of this journey must be marked and compared with the time taken in the period after the therapeutic interventions (PODSIADLO *et al*, 1991).
The Womac questionnaire (Western Ontario and McMaster Universities Osteoarthritis Index) has been used to assess pain intensity, joint stiffness and functional difficulties resulting from Osteoarthritis in the hip and knee (FERNANDES, 2003). The SF-36 questionnaire is an instrument for evaluating multidimensional quality of life. It has been widely used in individuals with musculoskeletal disorders in general and psychosocial disorders, including those with OAJ.

It is a simple, self-reported questionnaire, easy to apply and understand, which has 2 domains: “Physical Health" and “Mental Health" (KAWANO *et al*, 2015). The pharmacological approach and the use of some nutraceuticals is present in most cases of OAJ treated conservatively, being represented by analgesics, non-hormonal anti-inflammatory drugs (AINH), topical agents, viscosupplementers, injectable corticosteroids, neuromodulators, chondroitin, glucosamine, diacerein, devil's claw and non-hydrolyzed type II collagen (OSIRI *et al*, 2000). Since it has been proven that quadriceps strength training, with partial vascular occlusion and low resistance (20 - 40% of 1RM) presents results equivalent in strength gains to those where high resistance is used (> 65% of 1RM), many authors have used this option, in the treatment of patients with OAJ, to minimize joint overload, maximize comfort and increase patient compliance in exercise programs (FERRAZ *et al*, 2018). Regarding the use of TOCE in OAJ, Li Wei *et al* (2018), reported that TOCE is a safe therapy and that its results in the treatment of OAJ are relatively promising, since this technique was applied in isolation in some cases and without a standardization of mechanical wave modulation (frequency and dose), number of applications and rest interval between applications.

METHODOLOGY

Study Characterization: A controlled, randomized, double-blind study was carried out from August to December 2020 in the city of Rio Verde-GO, Brazil. The study was approved by the ethics committee of the University of Rio Verde (UniRV) and the participants signed an Informed Consent Form (TCLE). The procedures performed in this study are in accordance with the Helsinki Declaration and the CONSORT guidelines (SCHULZ *et al*, 2010).

Target Population and Sample: 45 individuals of both sexes, aged between 50 and 75 years, living in the city of Rio Verde-GO participated in this study.

Inclusion criteria: Individuals of both sexes, aged between 50 and 75 years, non-smokers, with body mass index (BMI) up to 35 kg / m2, referred by a single orthopedist, surgeon and OAJ knee specialist, with grade II or III OAJ, according to the Kellgren & Lawrence index (KELLGREN; LAWRENCE, 1957) and Visual Analog Pain Scale (EVA) between 2 and 8, using at least 2 classes of drugs used in the treatment of OAJ, for a minimum of 01 week.

Exclusion Criteria: The exclusion criteria were the presence of osteosynthesis, prostheses, morbidities, syndromes, diseases and musculoskeletal and cardiovascular injuries that could prevent individuals from performing the exercises proposed in this study and their inclusion in regular physical exercise programs in the last 6 months.

Experimental and Ethical Procedures: The G-Power software version 3.1.2 was used for sample calculation. An analysis of the sample number was carried out beforehand, adopting a power (1 - β error) of 0.95 and α error of 0.05. The calculation was based on the assumption of an F test with analysis of variance by repeated measures and intra- and inter-group interactions. The effect size (ES) used in the calculation was based on a previously published meta-analysis, which found values of 0.4 for the improvement of physical function from the exercise intervention. All volunteers included by the eligibility criteria, signed an informed consent form, approved by UniRV’s Ethics and Research Committee. They were divided into 03 groups (n = 15 in each group), randomly using a computer generated code, with the following denominations and actions: group that used only medication (M), group that used medication and low intensity exercises with partial vascular occlusion (MEO) and the group that used the medication, low intensity exercises with partial vascular occlusion and shock wave therapy (MEOTOC).

All participants were evaluated, initially and after 12 weeks (3 months), by one of the researchers, called evaluator 1, using questionnaires from WOMAC, SF-36, TUG, digital dynamometer and measuring tape. The WOMAC and SF-36 questionnaires, containing self-reported questions, were delivered to the participants to answer and return them within 48 hours. In the TUG, the participants left and returned from a seated position in a chair, covering the distance of 3 meters, measured with a measuring tape, and the time of this route was marked by evaluator 1. Before the test was carried out, the individuals performed this route for the effect of learning. Quadriceps isometric strength was assessed by a new digital dynamometer (®Fit Pulley), with the individual sitting on a chair, with his back to the wall, with the knees flexed at 90 degrees and arms crossed and supported on the contralateral shoulders, dynamometer located behind the individual, fixed at two points, on an iron support attached to the wall and ona rigid band, fixed with Velcro, on the individual's ankle, on the same side of the quadriceps that was assessed (BRYK *et al*, 2016). The therapist requested maximum isometric contraction and collected the demarcated result, in Kgf, on the dynamometer. 03 force measurements were taken and their average calculated.

Quadriceps trophism was assessed by thigh cirtometry, measured with a tape measure positioned 21cm above the upper pole of the patella (MILAGRES *et al*, 2006). Individuals in group M served as control, using only appropriate medication, according to medical advice. The load that was used for training individuals in the MEO and MEOTOC groups was 20% of 1RM (Maximum Resistance) in the first 4 sessions and 30% of 1RM from the 5th session to the 12th session, following the guidelines of Ferraz *et al*, (2018). The 1RM of each individual was verified by evaluator 1, in the extending chair, in a flexion angle of 90 degrees from the knees to the maximum extension of zero degrees, and also in the leg press, in an angle of maximum extension of the knees of zero degrees up to 90-100 degree bending. The weight was added until the maximum load was reached in no more than five attempts, with intervals of three minutes between them and verbal encouragement to the individuals. The highest load achieved during the attempts was considered to be 1RM. A specific previous warm-up was carried out (FERRAZ *et al*, 2018).The individuals in the MEO groups used medication and underwent 12 exercise sessions, supervised by evaluator 2, twice a week, for a total time of 6 weeks. The exercises were performed in the extensor chair and in the leg press, respectively, at angles of 60 to 90 degrees of knee flexion and from zero to 30-40 degrees of knee flexion, to minimize cartilage overload (POWERS *et al*, 2014). In the extensor chair and leg press, 4 sets of 15 repetitions were performed, with 20% of 1RM, in the first 4 sessions and 30% of 1RM from the 5th session to the 12th session. The rest time interval between the sets was 1 minute and between one equipment and the other it was 3 minutes.

During the exercises and 1-minute rest intervals between them, partial vascular obstruction was performed, using new sphygmomanometers (®Clinic Leg / 10 x 80cm) positioned in the middle thirds of both thighs, inflated 1.5 times the individuals' systolic blood pressure, measured with a new ®Missouri sphygmomanometer and ®Littmann Class II SE stethoscope. The sphygmomanometers were deflated in the descending period, of 3 minutes, between the change of equipment (FERRAZ *et al*, 2018). Participants in the MEOTOC group also used appropriate medication, carrying out the same exercise program as the MEO group, also supervised by evaluator 2, with the addition of TOCE, issued by the ®Thork Shock Wave (Ibramed) device, at the end of the exercises in 6 first sessions, twice a week, with 3000 shots being applied with an energy dose of 110mj, frequency of 15Hz and a 15mm stainless steel tip, bordering the regions around the patella and periarticular to the symptomatic knees, with individuals in prone position with bent knees (LI W *et al*, 2018).
Data were collected from 45 individuals related to age, weight, height, BMI, PA, number of knee with OA, side of knee with OA, EVA, value of 1RM in the extensor chair and in the horizontal leg press, degree of OAJ, time of onset and medications used in the treatment of OAJ.

Data on EVA, SF-36, Womac, TUG, Quadriceps Strength and Cirtometry were also collected from individuals in groups M, MEO and MEOTOC, initially and after 03 months. This investigation followed the criteria established by Resolution 466/12 of the National Health Council of Brazil.

Statistical Procedures: Statistical analyzes were performed using the Bioestat 5.0 software. The characteristics of the patients under study were presented by descriptive statistics (mean ± standard deviation or sample size (n) and percentage (%)). After checking the normality of the data, mixed models were used in 2 stages (initial and final) and monitoring, on 3 levels, of groups M, MEO and MEOTOC, as fixed factors and subjects as random factors to compare the effect of different medication protocols, medication associated with low resistance exercises and partial vascular occlusion and medication associated with low resistance exercises with partial vascular occlusion and use of TOCE. To verify the homogeneity of the groups, when comparing the values of the dependent and independent variables pre-intervention, after the division of the groups, one-way ANOVA was used for independent samples. In the case of significant F values, the post-hoc test with tukey adjustment was used for the purpose of multiple comparison. The paired t-test was used to compare the results of the groups at the beginning and at the end of the experiment. The level of significance (α) was $p < 0.05$.

This investigation followed the criteria established by Resolution 466/12 of the National Health Council of Brazil.

RESULTS AND DISCUSSIONS

Table 01 compared the initial characteristics of the participants, OAJ and the medications used in the three groups studied. Therefore, the Analysis of Variance was performed, with no statistically significant differences. It is worth considering that, initially, there were 60 participants with OAJ, andthat 15 of them were disconnected due to lack of attendance and assiduity to the sessions and due to unjustified withdrawals. Thus, the remaining 45 participants, with a total of 61 knees affected by OA, were subdivided into 3 groups. Group M consisted of 15 participants, 23 knees (76.7%), nine of which were right knees (39.1%), four of which had grade II(44.4%) and five that had grade III(55.6%) and fourteen left knees (60.9%), of which eight with grade II (57.1%) and six with grade III osteoarthritis(42.9%), who used only medication (table 01). The MEO group consisted of 15 participants, 21 knees (70.0%), eight of which were right knees (38.1%), four with grade II (50.0%) and four with grade III osteoarthritis (50.0%), and thirteen left knees (61.9%), of which eight with grade II(61.5%) and five with grade III(38.5%), who used medication and performed low resistance exercise with partial vascular occlusion (table 01). And the MEOTOC group, that also included 15 participants, 17 knees (56.7%), seven of which were right knees (41.2%), five with grade II (71.4%) and two with grade III (28.6%) and ten left knees (58.8%), of which eight with grade II (80.0%) and two with grade III osteoarthritis(20.0%), who used medication, performed low resistance exercises with partial vascular occlusion and TOCE (table 01). Ferraz *et al* (2018) mentions that the effectiveness of the results found in a study involving exercises of low resistance with partial vascular occlusion is directly proportional to the evaluation and execution of a double-blind training of the participants, choice of validated instruments for the quantification of the results, performance of at least 12 sessions, follow up of 16 weeks, determination of 1RM and specific vascular occlusion for each participant, as adopted in this study. As verified in table 01, the individuals affected by OAJ had an advanced age, whose average was over 60 years old, corroborating the reality of this condition and the description of Knob *et al* (2018). Women were the most affected, most likely by the hormonal issue, since according to Richmond *et al* (2000) after menopause, there is a significant loss of estrogen, which tends to influence the metabolism of the articular cartilage cells, with a consequent increase in their fragility and loss of integrity.

Table . Characteristics of participants, from OAJ, and medication used in groups M, MEO and MEOTOC

VARIABLES	GROUPS			P
	M (n = 15)	MEO (n = 15)	MEOTOC (n = 15)	
Age (years)	62,07 ± 8,95	62,20 ± 8,40	63,07 ± 7,76	0,939
Weight (kg)	83,13 ± 9,83	82,40 ± 11,43	84,47 ± 9,94	0,860
Height (cm)	173,67 ± 6,91	172,73 ± 6,33	173,67 ± 9,41	0,929
BMI (kg/m^2)	27,60 ± 2,26	27,55 ± 2,87	27,96 ± 1,29	0,859
Time OAJ (months)	74,67 ± 75,78	58,40 ± 57,29	61,27 ± 61,78	0,769
Male (n(%))	6 (40)	3 (20)	6 (40)	0,549
Female (n(%))	9 (30)	12 (40)	9 (30)	0,741
1 knee OA (n(%))	7 (24,1)	9 (31,1)	13 (44,8)	0,381
2 knees com OA (n(%))	8 (50,0)	6 (37,5)	2 (12,5)	0,174
OA right knee (n(%))	9 (37,5)	8 (33,3)	7 (29,2)	0,765
OA left knee (n(%))	14 (37,8)	13 (35,2)	10 (27,0)	0,139
OA right knee g2 (n(%))	4 (30,8)	4 (30,8)	5 (38,5)	0,897
OA right knee g3 (n(%))	5 (45,5)	4 (36,3)	2 (18,2)	0,431
OA left knee g2 (n(%))	8 (33,3)	8 (33,3)	8 (33,3)	-
OA left knee g3 (n(%))	6 (46,2)	5 (38,5)	2 (15,4)	0,245
Viscosupplementation (n(%))	8 (53,3)	9 (60,0)	11 (73,3)	0,524
Chondroprotection (n(%))	11 (73,3)	6 (40,0)	8 (53,3)	0,188
Corticoid Infiltration (n(%))	5 (33,3)	6 (40,0)	8 (53,3)	0,536
Analgesic (n(%))	9 (60,0)	13 (86,7)	12 (80,0)	0,217
AINH (n(%))	13 (86,7)	7 (46,7)	4 (26,7)	0,004
Neuromodulator (n(%))	2 (13,3)	3 (20,0)	4 (26,7)	0,665
Corticoid Injection (n(%))	0 (0,0)	2 (13,3)	4 (26,7)	0,342
Muscle Relaxer (n(%))	0 (0,0)	1 (6,7)	4 (26,7)	0,351

Data expressed as mean ± standard deviation and significance level (P). Significant differences were observed between groups at the beginning of the experiment for AINH only. BMI - Body Mass Index Time OAJ - Time committed by Knee Osteoarthritis Knee with OA - Knee with Osteoarthritis OA right or left knee - Osteoarthritis in right or left knee OA right or left knee g2 and g3 - Osteoarthritis right or left grade 2 and grade 3.

Individuals with unilateral and bilateral OAJ were found, with an average time of onset ranging from 58 to 74 months, compatible with the evolutionary, chronic and degenerative characteristic of OAJ (FIDELIX *et al*, 2006). We opted to maintain the use of medication for the participants of this study, unlike many other studies, because it is a clinical reality and the fact that practically all individuals affected by OAJ, who present pain, make use of appropriate medication, as already described by Coimbra *et al* (2004) and Hochberg (2012). And according to these aforementioned authors, it is prudent to combine more than one class of drugs for the treatment of OAJ. More than two medications were prescribed in all cases, with the purpose of relieving peripheral and central pain, reducing inflammation, promoting muscle relaxation, protecting and improving the cartilage nutrition of the affected individuals. The classes of drugs prescribed to the participants in this study were AINH (24; 53.3%), analgesics (34; 75.6%), viscosupplementers (28; 62.2%), chondroprotectors (25; 55.6%), muscle relaxants (3; 6.7%), corticoid infiltrations (19; 42.2%), corticoid injections (4; 8.9%) and neuromodulators (9; 20.0%).

In the comparison of the initial and final EVA, in knee R and L, in the participants of the 3 groups, the Analysis of Variance was used and, finding a statistically significant difference, the Tukey test was applied. There was a statistically significant reduction in pain, assessed by EVA (P = 0.000), in participants of the 3 groups, on both knees, with the MEOTOC group presenting an average significantly lower than the averages of the M and MEO groups. It is believed that the regression of pain is linked to the use of medication, to the strengthening of the quadriceps muscle, with low resistance and partial vascular occlusion, which improves joint stability and helps in the absorption of joint overload and, also, to the use of TOCE, which provides analgesia and anti-inflammatory effect. The results showed that multimodal therapy, involving the sum of these resources, especially TOCE, was more effective in relieving pain, as evidenced in the participants of the MEOTOC group. According to Coimbra *et al* (2004) and Hochberg (2012), the use of medication for pain and inflammation control of OAJ is already well-founded in literature and in clinical practice, and should be used in conjunction with other therapies to obtain the best results. Regarding the SF-36 variable, related to the quality of life questionnaire, both in the physical health (PH) and mental health (MH) domains, statistically significant differences were found between the three groups (P = 0.000), with the MEOTOC group presenting an average significantly higher than the averages of the M and MEO groups. We assume that the results of improving the quality of life, in physical and mental aspects, are directly related to the improvement in pain and functionality found in the participants of the 03 groups, with emphasis on those in the MEOTOC group. For theWomac variable, referring to the questionnaire evaluating pain, stiffness and functionality, statistically significant differences were found between the three groups (P = 0.000), with the MEOTOC group presenting an average significantly higher than the averages of the M and MEO groups. As for the TUG, which is a functional test, capable of assessing the dynamic capacity of individuals to perform a specific task, statistically significant differences were found between the three groups (P = 0.000), with the MEOTOC group presenting an average significantly lower than the averages of the groups. M and MEO groups. It is known that OAJ's stiffness and loss of functionality are closely linked to pain, inflammation, muscle weakness and physical inactivity. And as the participants in group M only used medication, without associated muscle training, there was no statistically significant improvement in the reduction of the overall score of the Womac, indicative of improvement, or even in the reduction of the execution time of the TUG test. Participants in the MEO and MEOTOC groups, on the other hand, had lower scores on the Womac questionnaire, indicating improvement, and reduction in the execution time of the TUG functional and agility test, with the best results being evident in the MEOTOC group, most likely because the therapies used in this group offered the best analgesic, anti-inflammatory and, mainly, muscle strength gains. For the variableright and left quadriceps strength there were also statistically significant differences between the three groups (P = 0.001), with the MEOTOC group showing an average significantly higher than the averages of the M and MEO groups. In group M, there was no evidence of strength gain in the quadriceps, probably due to the lack of muscle training. In the MEO and MEOTOC groups, there was a significant improvement in muscle strength, which we attribute to the execution of low resistance exercises with partial vascular occlusion, performed in a minimum amount of 12 sessions and in safety angles. This result of muscle strength gain is in agreement with the findings of Takarada *et al* (2000) and Ferraz *et al* (2018). In the case of participants in the MEOTOC group, who showed the best results in gaining quadriceps strength, and who performed the same strength training and number of sessions as participants in the MEO group, we believe that this is due to the greater regression of pain, observed in the MEOTOC

group, from the application of TOCE, which ended up favoring a better performance in strength gain of the quadriceps muscle, which was trained with the reduced effect of arthrogenic inhibition, corroborating the description of Mani-Babu *et al* (2014). Takarada *et al* (2000), Cook *et al* (2017) and Ferraz *et al* (2018) also found in their studies, involving the training of the quadriceps muscle, with low resistance and partial vascular occlusion, in individuals with OAJ, strength gain, improvement in functionality and quality of life, without, however, associating medication and TOCE in their therapies, as was done in this study and evidenced the best results in the MEOTOC group. For the variable Cirtometry, related to the measurement of the quadriceps muscle mass, no statistically significant differences were found between the three groups, both on the right (P = 0.654) and on the left (P = 0.529). In group M, a reduction in cirtometry was observed. Muscle trophism gain, evaluated in this study by means of cirtometry, is a variable that is controversial in the literature. In this study, participants in the MEO and MEOTOC groups showed strength gains, without however showing changes in muscle trophism, as also observed by Sumide *et al* (2009). In contradiction, the authors Cook et *et al* (2017) and Ferraz *et al* (2018) found an increase in muscle trophism, ascertained by tomography, associated with the gain of strength after muscle training with occlusion. The hypotrophy observed in the participants of group M may be related to their sedentary lifestyle and the lower level of pain reduction, capable of causing arthrogenic inhibition and loss of muscle mass, as described by Cook *et al* (2017).

Final Considerations

In view of the present study, we can conclude that the isolated use of medication, conventionally used for the treatment of OAJ, promotes only analgesia, and that its association with the performance of low resistance exercises with partial vascular occlusion and use of TOCE, promotes analgesia, gain of quadriceps strength, improvement of the functionality and quality of life of individuals with OAJ, without however modifying muscular trophism. In cases where the combination of these therapies was used, including TOCE, the best results were found, showing that TOCE should be incorporated into the treatment of OAJ, since this resource proved to be quite effective and promising in the treatment of this condition.

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