

IMPROVEMENTS IN HIP OSTEOARTHRITIS WITH LAVAGE, TRIAMCINOLONE AND HILAN G-F20

MELHORA NA OSTEOARTRITE DE QUADRIL POR LAVAGEM, TRIANCINOLONA E HILANO

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ABSTRACT

Objective: To verify whether the use of Hylan G-F20 improves saline lavage and triamcinolone injection results in the treatment of hip osteoarthritis (HOA). **Methods:** 82 patients with HOA categorized as grades II and III severity, according to Kellgren and Lawrence criteria, were randomized into the groups: lavage and triamcinolone (G0); lavage, triamcinolone, and 2 mL of hylan G-F20 (G1); lavage, triamcinolone, and 4 mL of hylan G-F20 (G2); lavage, triamcinolone, and 6 mL of hylan G-F20 (G3). The VAS, range of motion (ROM), WOMAC, and Lequesne questionnaires were administered at baseline, one, three, six, and twelve months post-injection. **Results:** All groups showed clinically relevant improvements (> 20%) between baseline and first month post-injection, maintaining subjective results throughout the study period ($p < 0.001$). We found no differences between groups in any subjective evaluations ($p > 0.05$, for all). G2 and G3 obtained improved flexion results up to a year ($p = 0.028$). Hylan groups presented an improved external rotation since the first postoperative month and maintained the results up to a year (G1, $p = 0.041$; G2, $p = 0.007$), whereas G0 showed no improvement ($p = 0.336$). **Conclusion:** Hip lavage and triamcinolone injection, with or without the use of hylan, improves pain, function, and quality of life up to a year in HOA. Hylan may improve ROM up to one year. **Level of Evidence IB, Randomized clinical trial.**

Keywords: Hyaluronic Acid. Viscosupplementation. Triamcinolone. Osteoarthritis, Hip. Randomized Controlled Trial. Minimal Clinically Important Difference.

RESUMO

Objetivo: Verificar se o Hylan G-F20 melhora os resultados da lavagem e injeção de triamcinolona na osteoartrite do quadril (OAQ). **Métodos:** 82 pacientes com HOA Kellgren e Lawrence graus II e III foram randomizados: lavagem e triamcinolona (G0); lavagem, triamcinolona e 2 mL de Hylan G-F20 (G1); lavagem, triamcinolona e 4 mL de Hylan G-F20 (G2); lavagem, triamcinolona e 6 mL de Hylan G-F20 (G3). A escala visual analógica (EVA), amplitude de movimento (ADM), questionários Womac e Lequesne foram obtidos no início, um, três, seis e doze meses após a injeção. **Resultados:** Todos os grupos apresentaram melhora clinicamente relevante (> 20%) entre o início e o primeiro mês, mantendo resultados subjetivos durante o estudo ($p < 0,001$). Não foram encontradas diferenças entre os grupos nas avaliações subjetivas ($p > 0,05$). A flexão aumentou no G2 e G3 até um ano ($p = 0,028$). A rotação externa melhorou nos grupos Hylan no primeiro mês, mantendo os resultados até um ano (G1, $p = 0,041$; G2, $p = 0,007$), enquanto G0 nunca melhorou ($p = 0,336$). **Conclusão:** Lavagem do quadril e injeção de triamcinolona, com ou sem Hylan, melhoram a dor, função e qualidade de vida até um ano na OAQ. Hylan pode melhorar a ADM até um ano. **Nível de evidência IB, Ensaio clínico randomizado.**

Descritores: Ácido Hialurônico. Viscosuplementação. Triamcinolona. Osteoartrite do Quadril. Ensaio Clínico Controlado Aleatório. Diferença Mínima Clinicamente Importante.

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INTRODUCTION

Osteoarthritis (OA) is the leading cause of musculoskeletal disability worldwide¹ and hip osteoarthritis (HOA) has one of the highest disease burdens.² Risk factors interaction (joint- and patient-level) determine

whether HOA will eventually manifest as a clinical disease. The synovial membrane participates actively in HOA progression.³ Joint lavage and capsular distension followed either by weekly hylan G-F 20 or corticosteroids (CS) improve pain and function in HOA patients.^{4,5}

All authors declare no potential conflict of interest related to this article.

The study was conducted at Universidade de São Paulo, Hospital das Clínicas, Medical School, Osteometabolic Diseases Group of the Institute of Orthopedics and Traumatology. Correspondence: Márcia Uchôa de Rezende. Rua Dr. Ovídio Pires de Campos, 333, São Paulo, SP, Brazil, 05403010. marcia.uchoa@hc.fm.usp.br



Intra-articular CS injections improve HOA symptoms in the short-⁶ and mid-term.⁷ The efficacy of hip viscosupplementation depends on the accuracy and number of intra-articular injection, proper patient selection, and product characteristics. Intra-articular injection of hyaluronic acid (HA) is analgesic⁸ and anti-inflammatory⁹ and promotes a better distribution of forces to reduce pressure and restore synovial fluid viscoelastic properties.¹⁰ Its prolonged effect is explained by the interaction with membrane receptors CD44 that reduce the expression level of cytokines, prostaglandin E2 (PGE2), metalloproteinases, and activated T cell. This study aimed to verify whether different Hylan G-F 20 doses could optimize hip joint lavage and hydraulic distention results in moderate HOA.

MATERIALS AND METHODS

Trial design and setting

This is a double-blind, prospective, randomized clinical trial. The protocol was approved by the Ethics Committee for the Analysis of Research Projects under the number 0255/10 and registered in clinicaltrials.gov under the number NCT 01810809. Participants were randomized into four groups (G0, G1, G2, and G3). G0 patients underwent hip lavage and received an injection of 1 mL (20 mg) triamcinolone hexacetonide and 2 mL lidocaine 2% at the affected joints. G1, G2, and G3 patients underwent the same procedure added to the injection of one (2 mL), two (4 mL), or three (6 mL) hylan G-F 20 ampoules (Synvisc[®]; Genzyme Biosurgery, New Jersey, USA; hylan G-F 20). Each participant reported pain intensity by the visual analogue scale (VAS) and completed the Western Ontario and McMaster Universities (WOMAC) and Lequesne questionnaires. The affected hips range of motion (ROM -flexion, extension, abduction, adduction, internal, and external rotations) was measured with a goniometer. Evaluations were repeated one, three, six, and twelve months after the procedure.

Participants

Men and women with painful HOA without joint space obliteration participated in the study. At inclusion, all patients used analgesics (paracetamol and codeine) and diacerhein, except those with contraindications. Patients did not use non-steroidal anti-inflammatory drugs (NSAIDs) routinely and were asked not to use them during study period, including seven days before the evaluation and procedure. Inclusion criteria were: patients had to meet the American College of Rheumatology diagnostic criteria for HOA; present no previous fracture or surgery on the target hip; have had no intra-articular injection on the target hip during the six months preceding the study; reach grades II and III at the Kellgren & Lawrance (K&L) criteria; understand and accept the informed consent form; present no inflammatory, auto-immune, and septic diseases; be in clinical treatment for HOA taking oral diacerhein (or another disease-modifying OA drug) over three months, without symptoms resolution; and have not used NSAIDs for over a week. Exclusion criteria were: pregnancy; allergy to hylan G-F 20; systemic CS or NSAIDs use during the study; absence in more than two evaluations.

Procedure description

All procedures were performed in an operating room. The patient was positioned supine on a radiolucent table and underwent general anesthesia. A 14- or 16- gauge needle was introduced under fluoroscopy, according to the described technique,¹¹ and iodinated contrast (Ultravist[®]; iopromide 300; Bayer Pharma AG, Berlin, Germany 300 mg iodine/mL) was injected (Figure 1A) to confirm intra-articular position. Then, a physiological saline injection was performed until hip capsule was distended (Figure 1B) and contrast

was withdrawn (250 to 500 mL of saline). After syringe withdrawal, contrast and saline were expelled from the catheter. Once joint was emptied (Figure 1C), medications were injected (Figure 1D) as above described and the hip was manipulated in flexion, flexion-external rotation and flexion-internal rotation, and flexion and abduction.

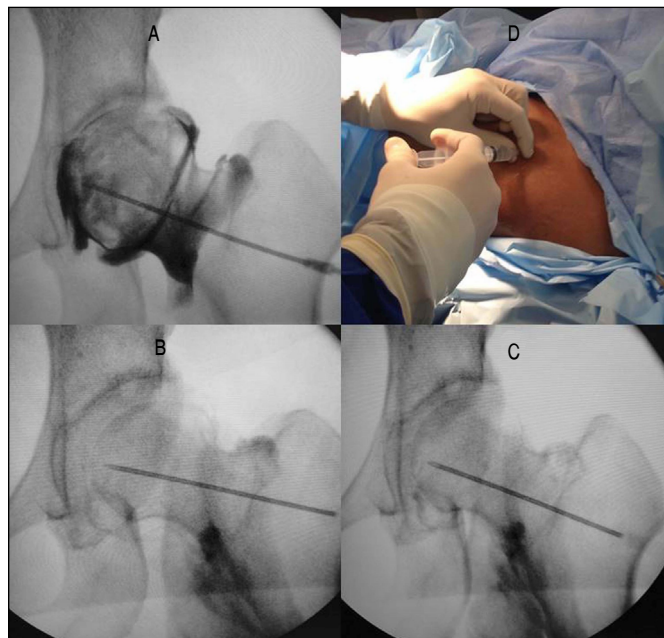


Figure 1. Procedure.

A: fluoroscopic image of the hip showing needle positioning and contrast injection that skirted femoral neck and head; B: contrast removal by saline lavage. The fluoroscopic image shows hydraulic distention by distancing the femoral head from the acetabulum; C: fluoroscopic image after emptying, in preparation for D: drug injection.

Aftercare

All patients were discharged with a naproxen 500 mg twice daily prescription, for three to five days, for pain control. Patients were also instructed to seek medical staff in case of pain, heat, redness, fever, or functional worsening at any time during the study period.

Sample Size

Sample size was calculated at the website www.lee.dante.br, applying the standard deviation found in a previous study for a one-point difference in WOMAC stiffness, enabling an 80% statistical power and a 5% significance level. We found the result of sixteen patients per group, which was increased by 20% due to possible dropouts and exclusions, resulting in twenty patients per group.

Statistical analysis

For descriptive data analysis, categorical data were described by their absolute value and respective proportion among groups, continuous data by average/median, and standard deviation and confidence interval/percentile was established at 25-75. Outcome data were continuous and underwent Kolmogorov-Smirnov normality test to verify distribution. The parametric one-way ANOVA with repeated measures was employed to test pain analysis (VAS and WOMAC pain) and functional outcomes (WOMAC stiffness, WOMAC function, WOMAC total, and Lequesne). The Kruskal-Wallis' and Friedman's nonparametric tests were used to compare groups and time for ROM measures. Subsequently, the Mann-Whitney's test was used for post-hoc pairwise comparisons with Bonferroni correction. Type I error less than or equal to 5% was accepted as statistically significant difference. The Last Observation Carried Forward (LOCF) method was used to impute missing temporal

follow-up data. The analysis was performed using the SPSS 23 software for Mac and tabulated in Excel® spreadsheet.

RESULTS

Groups were homogeneous for all data at baseline ($p > 0.05$) (Tables 1, 2, and 3). Figure 2 shows patients' flow during the study. Table 2 shows the results obtained by VAS, WOMAC, and Lequesne. All results indicate a pattern: a great improvement from baseline to one-month evaluation followed by a decline, but still maintaining clinically important improvements (more than 12%)¹² up to a year (last evaluation), showing that all groups improved over time ($p < 0.001$) for all pain and function questionnaires.

We found no differences among groups in any subjective evaluation and time (VAS, $p = 0.733$; WOMAC pain, $p = 0.986$; WOMAC stiffness, WOMAC function, WOMAC total, and Lequesne, $p = 0.274$). Each injected hip was considered one case when evaluating ROM, and at the end of the study we had 28 hips in G0, 31 in G1, 36 in G2, and 37 in G3. Extension, abduction, and internal rotation results showed no significant differences over time between groups (all $p > 0.05$). After the procedure, external rotation improved in viscosupplemented groups (G0 median results progressively worsened but not significantly, $p = 0.336$). External rotation remained improved in hyalan-injected groups throughout the study, and was not significant only in G3 (G1, $p = 0.041$, G2, $p = 0.007$ and G3, $p = 0.058$, Table 3).

Table 1. Baseline data for age, body mass index, gender, laterality, number of affected joints, and pain severity according to Kellgren & Lawrance grade by group.

	Group			
	G0 n = 19	G1 n = 19	G2 n = 22	G3 n = 22
Age	<i>Mean (SD)</i>			
	60.1 (12.8)	62.2 (13.8)	61.5 (11.6)	64.1 (11.7)
BMI	<i>Mean (SD)</i>			
	29.6 (4.6)	28.5 (4.6)	28.7 (7.2)	28.4 (5.4)
Female Gender	<i>Mean (SD)</i>			
	16 (84.2%)	18 (94.7%)	16 (72.7%)	16 (72.7%)
Laterality	<i>Mean (SD)</i>			
Right	5 (26.3%)	2 (10.5%)	5 (22.7%)	3 (13.6%)
Left	3 (15.8%)	4 (21.1%)	3 (13.6%)	4 (18.2%)
Bilateral	11 (57.9%)	13 (68.4%)	14 (63.6%)	15 (68.2%)
Affected joints	<i>Mean (SD)</i>			
Unilateral	4 (21.1%)	4 (21.1%)	5 (22.7%)	6 (27.3%)
Bilateral	5 (26.3%)	8 (42.1%)	8 (36.4%)	5 (22.7%)
Multiple arthritis	10 (52.6%)	7 (36.8%)	9 (40.9%)	11 (50.0%)
K&L	<i>Mean (SD)</i>			
2	18 (60.0%)	16 (50.0%)	24 (70.6%)	25 (67.6%)
3	12 (40.0%)	16 (50.0%)	10 (29.4%)	12 (32.4%)

BMI: body mass index; K&L: Kellgren & Lawrence; SD: standard deviation.

Table 2. Results (mean and standard deviation) for VAS, WOMAC pain, WOMAC stiffness, WOMAC function, WOMAC total, and Lequesne according to group and assessment.

	Group			
	G0 n = 19	G1 n = 19	G2 n = 22	G3 n = 22
VAS	<i>Mean (SD)</i>			
Baseline	63.8 (21.5)	68.2 (21.8)	55.8 (31.4)	69.2 (20.9)
One Month	35.5 (33.4)	31.9 (22.0)	28.4 (27.2)	44.0 (34.3)
Three Months	44.3 (31.7)	43.3 (21.9)	40.1 (29.3)	43.0 (29.7)
Six Months	46.2 (28.0)	49.9 (30.0)	37.6 (28.9)	43.0 (31.4)
Twelve Months	40.3 (34.4)	48.4 (27.0)	40.8 (27.8)	46.6 (27.7)
WOMAC Pain	<i>Mean (SD)</i>			
Baseline	11.1 (3.3)	10.4 (3.3)	10.5 (4.9)	10.5 (4.4)
One Month	6.6 (5.4)	6.0 (3.9)	6.9 (5.2)	6.8 (4.4)
Three Months	7.1 (4.2)	7.9 (3.3)	7.4 (4.4)	7.0 (5.0)
Six Months	6.9 (4.6)	8.0 (4.7)	6.4 (4.9)	7.9 (4.7)
Twelve Months	6.4 (4.1)	7.7 (4.8)	8.0 (5.2)	7.6 (4.7)
WOMAC Stiffness	<i>Mean (SD)</i>			
Baseline	4.4 (1.8)	4.1 (1.8)	4.0 (2.3)	4.9 (2.0)
One Month	2.7 (2.2)	2.4 (1.9)	2.8 (2.3)	3.2 (2.4)
Three Months	3.0 (2.1)	2.7 (1.4)	2.5 (2.2)	3.4 (2.4)
Six Months	2.8 (2.2)	3.2 (2.2)	2.1 (2.2)	3.6 (2.3)
Twelve Months	3.4 (2.0)	2.8 (2.1)	2.8 (2.0)	3.6 (2.3)

Table 2. Results (mean and standard deviation) for VAS, WOMAC pain, WOMAC stiffness, WOMAC function, WOMAC total, and Lequesne according to group and assessment.

	Group			
	G0 n = 19	G1 n = 19	G2 n = 22	G3 n = 22
WOMAC Function	<i>Mean (SD)</i>			
Baseline	42.1 (8.5)	36.2 (2.7)	35.2 (13.6)	40.6 (9.8)
One Month	22.6 (17.9)	24.7 (14.3)	24.5 (14.8)	27.6 (15.4)
Three Months	24.6 (12.7)	25.7 (13.9)	26.9 (13.9)	27.6 (16.5)
Six Months	28.4 (13.2)	29.4 (16.0)	24.9 (17.7)	29.6 (13.9)
Twelve Months	26.6 (13.2)	28.2 (15.7)	27.4 (16.7)	31.3 (16.3)
WOMAC Total	<i>Mean (SD)</i>			
Baseline	56.8 (12.2)	50.3 (16.2)	49.0 (19.5)	56.2 (16.6)
One Month	31.8 (24.9)	33.1 (19.1)	33.0 (22.7)	37.6 (21.1)
Three Months	34.6 (17.4)	36.3 (17.5)	36.8 (19.7)	38.4 (23.2)
Six Months	38.1 (18.6)	40.6 (22.3)	33.3 (24.2)	41.0 (19.7)
Twelve Months	36.4 (18.0)	38.7 (21.5)	38.3 (23.1)	42.5 (22.5)
Lequesne	<i>Mean (SD)</i>			
Baseline	13.4 (3.6)	12.3 (4.1)	11.5 (3.3)	12.9 (3.2)
One Month	8.5 (4.8)	7.9 (4.2)	8.8 (4.9)	10.5 (4.6)
Three Months	9.4 (4.5)	10.2 (4.2)	9.0 (3.9)	10.2 (4.9)
Six Months	10.6 (5.1)	10.5 (4.1)	8.5 (4.8)	11.3 (4.6)
Twelve Months	9.4 (4.6)	11.2 (4.7)	9.6 (5.5)	11.0 (5.3)

VAS: Visual Analog Scale; SD: Standard Deviation; WOMAC: Western Ontario and McMaster Universities questionnaire.

Table 3. Results (median and percentile 25-75) for range of motion according to group and evaluation.

	Group			
	G0 n = 28	G1 n = 31	G2 n = 36	G3 n = 37
Flexion	<i>Median (Percentile 25-75)</i>			
Baseline	105.0 (95.0 ; 115.0)	105.0 (95.0 ; 113.0)	109.0 (100.0 ; 115.2)	110.0 (93.0 ; 114.0)
One Month	110.0 (100.0 ; 115.0)	106.0 (94.0 ; 110.0)	113.0 (110.0 ; 120.0)	112.0 (105.0 ; 120.0)
Three Months	100.0 (95.0 ; 110.0)	104.0 (100.0 ; 110.0)	110.0 (100.0 ; 121.0)	107.0 (100.0 ; 111.0)
Six Months	106.0 (100.0 ; 120.0)	100.0 (96.0 ; 112.0)	110.0 (100.0 ; 120.0)	108.0 (100.0 ; 110.0)
Twelve Months	100.0 (90.0 ; 115.0)	100.0 (90.0 ; 110.0)	112.0 (101.5 ; 118.2)	110.0 (100.0 ; 117.0)
Extension	<i>Median (Percentile 25-75)</i>			
Baseline	15.0 (10.0 ; 18.0)	14.0 (8.0 ; 16.0)	12.5 (10.0 ; 20.0)	15.0 (10.0 ; 20.0)
One Month	15.0 (10.0 ; 20.0)	15.0 (10.0 ; 20.0)	15.0 (10.0 ; 20.0)	15.0 (10.0 ; 18.5)
Three Months	14.0 (10.0 ; 20.0)	15.0 (10.0 ; 20.0)	15.0 (12.0 ; 20.0)	14.0 (10.0 ; 18.0)
Six Months	14.0 (11.0 ; 20.0)	12.0 (10.0 ; 20.0)	15.0 (10.0 ; 20.0)	15.0 (10.0 ; 19.0)
Twelve Months	14.0 (10.0 ; 15.0)	10.0 (9.0 ; 15.0)	14.0 (10.0 ; 15.2)	12.0 (10.0 ; 15.5)
External Rotation	<i>Median (Percentile 25-75)</i>			
Baseline	40.0 (30.0 ; 45.0)	28.0 (21.0 ; 38.0)	32.0 (30.0 ; 45.0)	30.0 (21.0 ; 44.5)
One Month	38.5 (30.0 ; 45.7)	35.0 (30.0 ; 44.5)	39.0 (31.5 ; 46.2)	40.0 (15.0 ; 40.0)
Three Months	38.0 (23.5 ; 44.0)	34.0 (30.0 ; 42.0)	40.0 (32.2 ; 46.2)	40.0 (30.0 ; 45.0)
Six Months	34.5 (26.5 ; 43.7)	38.0 (31.0 ; 45.0)	35.5 (30.0 ; 44.2)	40.0 (31.0 ; 45.0)
Twelve Months	34.0 (26.5 ; 42.7)	32.0 (30.0 ; 40.0)	37.0 (30.0 ; 42.2)	36.0 (30.0 ; 44.0)
Internal Rotation	<i>Median (Percentile 25-75)</i>			
Baseline	25.5 (20.0 ; 30.7)	25.0 (15.0 ; 35.0)	23.5 (20.0 ; 30.0)	25.0 (15.0 ; 35.0)
One Month	20.0 (15.0 ; 29.0)	22.0 (10.0 ; 30.0)	26.0 (19.0 ; 34.5)	26.0 (20.0 ; 33.0)
Three Months	28.0 (11.7 ; 31.5)	29.0 (20.0 ; 34.0)	25.5 (20.0 ; 34.2)	30.0 (21.0 ; 30.0)
Six Months	26.0 (18.5 ; 30.0)	22.0 (15.0 ; 30.0)	27.0 (20.0 ; 31.0)	30.0 (21.0 ; 34.0)
Twelve Months	22.0 (20.0 ; 28.7)	26.0 (15.0 ; 33.0)	27.0 (22.7 ; 32.5)	25.0 (17.5 ; 32.0)
Adduction	<i>Median (Percentile 25-75)</i>			
Baseline	28.0 (21.0 ; 30.0)	27.0 (20.0 ; 30.0)	25.0 (20.0 ; 30.0)	28.0 (20.0 ; 30.0)
One Month	30.0 (25.0 ; 30.0)	30.0 (20.0 ; 30.0)	30.0 (25.7 ; 30.0)	29.0 (20.0 ; 30.0)
Three Months	30.0 (24.2 ; 30.0)	30.0 (25.0 ; 30.0)	30.0 (27.5 ; 30.0)	30.0 (20.0 ; 30.0)
Six Months	30.0 (28.5 ; 30.0)	30.0 (25.0 ; 30.0)	30.0 (25.0 ; 30.0)	30.0 (20.0 ; 30.0)
Twelve Months	30.0 (22.2 ; 30.0)	30.0 (25.0 ; 30.0)	30.0 (25.0 ; 30.0)	28.0 (24.0 ; 30.0)

Table 3. Results (median and percentile 25-75) for range of motion according to group and evaluation.

	Group			
	G0 n = 28	G1 n = 31	G2 n = 36	G3 n = 37
Abduction	<i>Median (Percentile 25-75)</i>			
Baseline	30.5 (26.5 ; 45.0)	30.0 (23.0 ; 40.0)	31.0 (25.7 ; 38.5)	30.0 (26.0 ; 40.0)
One Month	31.5 (30.0 ; 40.0)	34.0 (29.0 ; 40.0)	32.0 (30.0 ; 38.5)	33.0 (30.0 ; 40.0)
Three Months	32.5 (26.5 ; 40.0)	32.0 (28.0 ; 45.0)	32.5 (30.0 ; 40.0)	30.0 (29.0 ; 36.0)
Six Months	32.0 (28.5 ; 39.5)	31.0 (27.0 ; 40.0)	31.0 (28.0 ; 42.2)	32.0 (30.0 ; 36.5)
Twelve Months	35.0 (25.0 ; 41.5)	30.0 (28.0 ; 40.0)	33.5 (29.5 ; 39.2)	35.0 (30.0 ; 40.0)

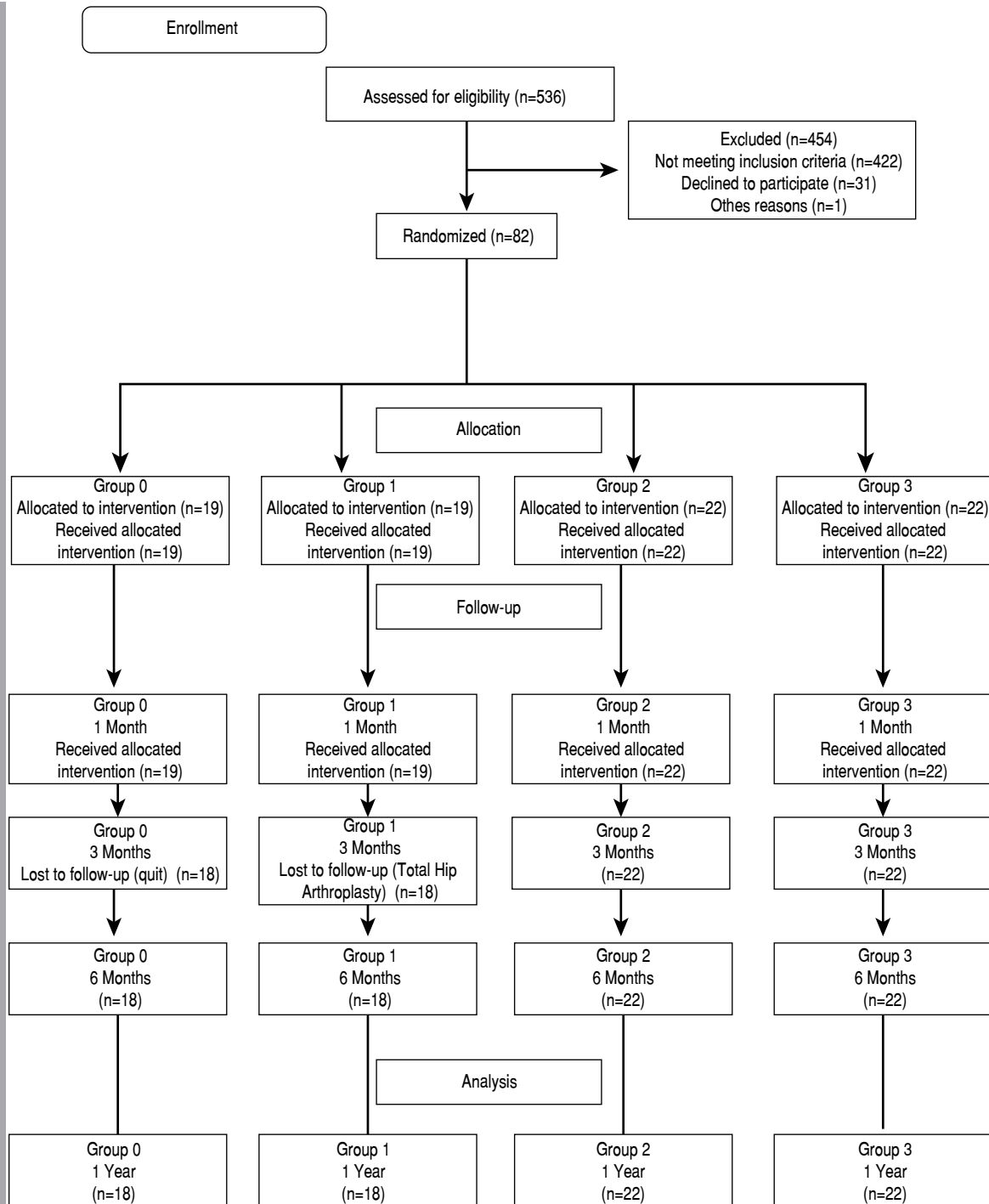


Figure 2. Patients flow in the study.

Flexion improved in all groups at the first month post-procedure evaluation, but was more significant in G2 and G3 than in G1 ($p = 0.002$ and $p = 0.006$, respectively). One year after the procedure, G2 maintained an improved ROM compared with G0 and G1 ($p = 0.048$ and $p = 0.011$, respectively), and G3 maintained improved flexion compared with G1, but not G0 ($p = 0.038$ and $p = 0.112$, respectively), (Table 3). All groups showed an improved adduction immediately after the procedure, which remained after one year and were significant for G0 ($p = 0.035$), G2 ($p < 0.001$) and G3 ($p = 0.031$, Table 3).

All patients left the hospital without pain and reported no infection, fever, or synovitis. During the study, five patients (one in G0, three in G1, and one in G3) rapidly progressed to OA grade IV and were considered complications of the procedure. In one of the patients, we observed these worsening results after six-weeks, in another after three months, and in the remaining at the sixth month of evaluation.

DISCUSSION

Our study pose some limitations: first, it does not have a control group (sham injection or lavage alone), hindering our ability to reach meaningful conclusions regarding different groups. Secondly, we observed differences in certain planes of motion, considerably small, and with questionable clinical significance. These differences may result from measurement error, indicating the need for further studies to use Cybex in the evaluation of muscle power and range of motion. Third, although statistically insignificant, G2 and G3 have a higher proportion of grade II K&L when compared with other groups, which could affect long lasting results.

Does lavage associated with triamcinolone injection improve pain and function in moderate hip osteoarthritis at one, three, six, or twelve months?

According to our results, yes. Studies have reported short-⁶ and mid-term pain improvement for intra-articular corticosteroids (CS) hip injection,⁷ but not for twelve months.¹³ Another study compared tidal lavage to CS injection in knee osteoarthritis (KOA) and found improved short and mid-term results.¹⁴ As for hip osteoarthritis (HOA), saline solution injection had no effect in improving patients' pain or function, whereas CS improved both.¹³ Sterile water (6 mL) and CS injection has shown to improve pain, stiffness, and function in HOA patients, compared with isolated CS injection, up to three months.⁵ However, in our study, pain, function, stiffness, and quality of life showed clinically important improvements (more than 12%¹² for all variables, in all evaluations, and in all groups) for up to a year, with the best results at the one month reassessment ($p < 0.001$).

Does Hylan G-F20 addition improves lavage and triamcinolone?

Considering previous experiences with triamcinolone addition to hylan G-F 20 in KOA,¹⁵ as well as the synergism of hip and knee lavage and hylan G-F 20,^{16,17} we expected a significant difference between G0 and hylan-injected groups. All groups presented clinically important improvements¹² in pain (VAS and WOMAC pain), stiffness (WOMAC stiffness), and function (WOMAC function, WOMAC total, and Lequesne) ($p < 0.001$ for all over time), and we found no differences among groups in any re-evaluation during the study period (all $p > 0.05$). However, hylan-injected groups

showed better range of motion (ROM) results. For ROM analysis, each hip was considered one case and the ROM obtained at each evaluation was compared to baseline results; we found a tendency to lose ROM among patients injected with CS alone. Flexion amplitudes improved in the first month, but then decreased below baseline angles ($p = 0.017$).

Is there a best hylan G-F20 dosage?

This study provides no support to answer this question. Although all hylan-injected groups presented an improvement in external rotation, it was only significant in G1 and G2 ($p = 0.041$, $p = 0.007$, respectively). In the last evaluation, groups showed no difference in internal rotation over time ($p > 0.05$, for all). Adduction also improved within all groups, perhaps with a more clinical relevance in G2 (five-degree increase, $p < 0.001$, Table 3) – the group with a higher percentage of grade II K&L participants. A study found that K&L grade III patients responded more to hylan than to CS, without a difference in K&L grade II.¹⁸ Our results could not endorse this finding because the groups showed no difference for this variable at any time of the study ($p > 0.05$).

Does this procedure entail any complication?

By the end of each procedure, we administered an intra-articular lidocaine (20 mg/mL) injection while retrieving the needle from the skin. Intra-articular injection of anesthetics and corticosteroids are chondrotoxic.¹⁹ Lidocaine is more chondrotoxic than bupivacaine and ropivacaine.²⁰ The co-injection of hyaluronic acid (HA) suppresses chondrocytes apoptosis caused by local anesthetics.²¹ However, we had five cases of rapidly progressive HOA, which we attributed to chondrolysis by lidocaine or/and by triamcinolone. We used 20 mg triamcinolone in each hip – half the dose described by Young et al.,⁵ who reported no adverse effects at three months. Most complications in our study were confirmed at the one-year re-evaluation. Interestingly, the group with more cases of rapid progression was not G0 but rather G1. HA protective effect depends on administered dose for both anesthetics and HA.²¹ Yet, group 3, which had the highest hylan dose, also had one case of rapid progression.

CONCLUSION

Hip lavage followed by triamcinolone injection improves short and long-term pain and function in patients with moderate HOA. ROM may be improved for a longer time period (one year) by adding hylan G-F20. Triamcinolone and local anesthetics dosage should be reduced to avoid adverse effects, and the ideal hylan G-F20 single-dose seems to be higher than 2mL.

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