Research Square

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Use of Hyaluronic Acid Injection after Arthroscopic Release in Lateral Patellar Compression Syndrome with Degenerative Cartilage Changes: Randomized Control Trial

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Research article

Keywords: Hyaluronic acid injection, Lateral patellar compression syndrome, Arthroscopic release, Kujala score, Visual analogue scale, Knee pain, Functional outcome

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Abstract

Background

Degenerative cartilage changes can be seen, in cases of lateral patellar compression syndrome, involving the patellofemoral joint. Hyaluronic acid is a natural component of the synovial fluid and responsible for its elastic features and function of articular surfaces. The aim of this study is to show the effect of intra-articular injection of Hyaluronic acid, after arthroscopic lateral release in lateral patellar compression syndrome, on the functional outcome and knee pain in those patients with degenerative cartilage changes.

Method

Ninety patients age (30-50) years with lateral patellar compression syndrome and degenerative cartilage changes were divided randomly into 2 groups. Group A was treated by arthroscopic lateral release and received intrarticular injection of Hyaluronic acid 2 weeks after surgery. Group B was treated by arthroscopic lateral release only. Both groups were assessed by Kujala score and visual analogue scale for knee pain preoperatively and re-assessed postoperatively at 3 months, 6 months, 12 months and 24 months.

Results

There was significant improvement in Kujala score and Visual analogue scale post-operatively in both groups (P-value<0.001) with better improvement in Kujala score in group A after intra-articular injection of Hyaluronic acid up to 2 year of follow up (P-value=0.006) as well as better improvement in visual analogue score at 6 months post-operatively (P-value=0.035)

Conclusion

Intra-articular injection of Hyaluronic acid after arthroscopic release, in patients with lateral patellar compression syndrome and degenerative cartilage changes, can result in better improvement of knee pain and functional outcome up to 2 years of follow up.

Trial registration: NCT, NCT04134611. Registered 18 October 2019 -Retrospectively registered, *https://www.clinicaltrials.gov/NCT04134611*

Background:

Lateral patellar compression syndrome is characterized by localized dull anterior knee pain, exacerbated by activities that stress the patellofemoral joint, such as stair climbing, squatting and prolonged sitting with flexion of the knee. In such syndrome, there is increased patellofemoral joint pressure and venous engorgement of the patella and this can lead to degenerative cartilage changes. [1–3]

After failure of conservative treatment for lateral patellar compression syndrome, lateral patellar retinacular release is a surgical option, which can be done arthroscopically in selected patients. [4–8]

Hyaluronic acid is a natural component of the synovial fluid and responsible for its elastic features and function of articular surfaces [9, 10]. Intra-articular injection of Hyaluronic acid is one of the recommendations for treatment of degenerative joint diseases [11–17].

On review of literatures regarding lateral patellar compression syndrome associated with degenerative cartilage changes, there is only one study; which showed the effect of arthroscopic lateral release followed by viscosupplementation for treatment of patellofemoral osteoarthritis [18]. There was no previous randomized controlled trial to show the effect of arthroscopic lateral release followed by hyaluronic acid injection for treatment of lateral patellar compression syndrome with degenerative cartilage changes so we planned our study to show the effectiveness of such method of treatment on pain relief and functional outcome with follow up for 2 years.

Methods

Study design

This study is a single center, double blinded, prospective, randomized, comparative, controlled trial. For all patients, the arthroscopic procedure and intra-articular injection of Hyaluronic acid were done by same orthopedic surgeon, to avoid bias related to difference in the skill of different surgeons, in a tertiary orthopedic hospital from June 2017 to March 2018 with follow up for 2 years until March 2020

Patients

Ninety patients age (30-50 years) were involved in this study. All these patients were diagnosed as lateral patellar compression syndrome by clinical background, MRI and proved by arthroscopic examination. Conservative treatment of quadriceps strengthening exercise and non-steroidal anti-inflammatory analgesics was failed for 6 months in these patients. All these patients were treated by arthroscopic lateral patellar release for lateral patellar compression syndrome and patellofemoral cartilage degenerative changes were found. These patients were divided randomly into two groups. Group A (45 patients) were treated by local injection of Hyaluronic acid (MW 750 KD, Mylan company, United States) intraarticularly, 2 weeks after arthroscopy, while group B (45 patients) did not receive intraarticular injection. Both groups were assessed preoperatively and postoperatively at periods of 3 months, 6 months, 12 months and 24 months by using Visual analogue scale for knee pain and Kujala score for functional outcome

Method of randomization and blindness of the study

These 90 patients were randomly divided into two groups by entering the names of patients in excel file and by computer system the list was randomized then the patients with odd number sequences were regarded as group A and those patients with even number sequences were regarded as group B. This

study is double blinded so the patients are blinded to which method would be used for them and the doctor who assessed the patients, preoperatively and post-operatively, is blinded for which group the patients were belonged.

Inclusion criteria

This study involved patients were diagnosed as lateral patellar compression syndrome according to the following criteria and all these patients had failure to conservative treatment of quadriceps strengthening physiotherapy and non-steroidal anti-inflammatory drugs for 6 months [19,20].

1. Clinical features:

1/ The most painful and tender area is located over the lateral margin of the patella [21,22].

2/ Abnormal patellar tilt test: when the patella can't be lifted from the lateral femoral condyle with extended knee by the examiner [21,22].

3/ Abnormal medial patellar glide test: when the examiner can't shift the patella by one or more quadrants medially with knee in flexion of 10 degrees) [21,22].

1. MRI features:

1/Patellar translation relative to the femur, this usually occurs more laterally than medially. Subluxation/translation is measured as the distance between perpendicular lines drawn on an axial image; one from the medial edge of the patella and another one through the most anterior part of the medial femoral condyle. A 2 mm distance is the upper accepted limit of normal.[23]

2/Abnormal patellar tilt, which may be present with or without patellar translation, it is the most closely related radiologically to lateral patellar compression syndrome. The patellofemoral angle is measured at the level of the patellar midpoint on sagittal imaging. It should measure more than 8° and opens laterally, if less than 8° or opens medially; it is considered abnormal.[23]

3/ Early stages I and II degenerative cartilage changes in lateral part of patellofemoral joint. Stage I is defined as slight elevation of the surface signal from the hyaline cartilage. Stage II is defined as chondral fissure affecting less than 50% of the total thickness of articular cartilage. [24]

1. Arthroscopy:

All patients were assessed by arthroscopy to see how the patella touching the lateral femoral condyle more than medial femoral condyle with knee movement in flexion and extension as well as to see the degenerative cartilage lesion in lateral part of the patellofemoral joint. Those patients with Outerbridge grade I and II are involved in this study.

Outerbridge grade I chondral lesion is defined as softening and swelling, which often require tactile feedback with a probe or other instrument to assess. Outerbridge Grade II lesion is defined as partial-thickness defect with fissures that do not exceed 0.5 inches in diameter or reach subchondral bone. [25]

Exclusion criteria

Exclusion criteria included:

1.Smoking

2.Patellar instability: patient has medial or lateral glide test of 3 or more quadrants or history of patellar dislocation.[21]

3.Diabetes Mellitus

4.Ligament hyperlaxity based on Beighton's criteria [26]

5.Pathological femoral anteversion or tibial torsion by Steheli'test [21,27]

6.Q-angle more than 20 degrees [21,28]

7.Knee osteoarthritis [21]

8.Previous knee surgery or knee joint infection

9. Grade 3 and 4 chodropathy.

MRI stages III is defined as chondral fissure affecting more than 50% of total thickness of articular cartiage. MRI stage IV is defined as deep chondral fissure reaching the subchondral bone and presenting oedema in the adjacent bone marrow. [24]

Arthroscopic grade III is defined as fissuring of the cartilage with a diameter > 0.5 inches with an area reaching subchondral bone. Arthroscopic grade IV is defined as erosion of the articular cartilage that exposes subchondral bone. [25]

10.Patellat alta [21]

11. Trochlear dysplasia type II, III, and IV according to Dejour's classification [21, 29]

Follow up and outcome measures

All these patients were assessed for primary outcome measure of Kujala score and secondary outcome measures which involved Visual analogue scale for knee pain and postoperative complications of bleeding, infection, medial patellar instability and recurrence of knee pain for a period of 2 years follow up.

All patients were assessed by Kujala score for functional outcome and VAS for knee pain preoperatively and postoperatively at 3 months, 6 months, 12 months and 24 months.

There is no loss of patients during the period of follow up for 2 years.

Intervention

Under general or spinal anaesthesia, patient was on supine position with pneumatic thigh tourniquet on the side of operation and attatched to a leg holder. Knee arthroscopy was done through standard anterolateral and anteromedial portals. Examination of all compartments of the knee were assessed and observing the patellar movement on the trochlear groove during flexion and extension of the knee to assess the contact between the patella and lateral part of trochlear groove. Assessment of the patellofemoral joint for the chondral lesion. Lateral patellar retinacular release was done by back-knife and electrocoutary with continous monitoring of the patellar movement in the trochlear groove and the patellar contact with the lateral femoral condyle during knee movement in flexion and extension. Hemostasis was secured and drain was not used.

Post-operative care

All patients were encouraged to do quadriceps exercise with gradual weight bearing as early as possible. After 2 weeks, single intraarticular injection of hyaluronic acid (60mg) was done in group A. All patients were assessed by Visual analogue score for knee pain and Kujala score at 3 months, 6 months 12 months and 24 months postoperatively

Post-operative complications

1/ Hemarthrosis occurred in 5 patients; 3 of them in group A and 2 patients in group B. All of them were treated by aspiration and firm bandage.

2/ One case got DVT in group B and was treated by anticoagulant medication

3/ No case of infection

4/ No case of recurrence for 2 year of follow up

Recurrence is defined as painful Passive Patellar Tilt test with Medial Patellar Glide test of less than 1 quadrant of patellar width according to Kolowich et al. [21,30]

5/ No case of medial patellar instability

Medial patellar instability is defined as medial patellar translation of three or more quadrants of patellar width on Medial Patellar Glide test with positive Gravity Subluxation test according to Nonweiler and DeLee. [21,31]

Data Analysis

Statistical analysis was carried out using SPSS version 23. Categorical variables were presented as frequencies and percentages. Continuous variables were presented as (Means ± SD). Student t-test was used to compare means between two groups. Paired t-test was used to compare two paired readings. Chi-square test was used to find the association between categorical variables. A *p*-value of ≤ 0.05 was considered as significant.

Results

Demographic data

In current study, 90 patients were involved. The mean age of patients was (41.13 ± 6.10). The younger age was 30 years and the older one was 50 years. There were 23 males who represent (25.6%) and 67 females who represent (74.4%).

Primary outcome measure: (Kujala score)

In group A, the mean differences of Kujala score between pre-operative and post-operative assessments in four time periods (3 months, 6 months, 12 months and 24 months) was shown in table (1).

Table 1: The mean differences of Kujala score between pre-operative and post-operative assessments in four time periods for group A

Study variables	Periods of assessment	N	Mean	SD	Paired t-test	P-value
Kujala score	Kujala score preoperatively	45	40.60	6.03	**-36.57**	**<0.001**
	Kujala score 3 months postoperatively	45	83.28	4.61		
	Kujala score preoperatively	45	40.60	6.03	**-42.57**	**<0.001**
	Kujala score 6 months postoperatively	45	84.62	3.09		
	Kujala score preoperatively	45	40.60	6.03	**-46.96**	**<0.001**
	Kujala score 1 year postoperatively	45	86.08	1.59		
	Kujala score preoperatively	45	40.60	6.03	**-48.18**	**<0.001**
	Kujala score 2 year postoperatively	45	87.11	1.97		

In group B, the mean differences of Kujala score between pre-operative and post-operative assessments in four time periods (3 months, 6 months, 12 months and 24 months) was shown in table (2).

Table 2: The mean differences of Kujala score between pre-operative and post-operative assessments in four time periods for group B

Study variables	Periods of assessment	N	Mean	SD	Paired t-test	P-value
Kujala score	Kujala score preoperatively	45	40.64	5.83	**-34.63**	**<0.001**
	Kujala score 3 months postoperatively	45	76.35	3.48		
	Kujala score preoperatively	45	40.64	5.83	**-37.46**	**<0.001**
	Kujala score 6 months postoperatively	45	77.93	3.10		
	Kujala score preoperatively	45	40.64	5.83	**-44.39**	**<0.001**
	Kujala score 1 year postoperatively	45	84.82	3.00		
	Kujala score preoperatively	45	40.64	5.83	**-44.99**	**<0.001**
	Kujala score 2 year postoperatively	45	85.822	2.33		

Figure (1) showed the mean differences of post-operative Kujala score between study groups including (group A and group B) in four periods of assessments. There were significant differences between means of Kujala score for knee pain between these two groups after 3 months postoperatively (t= 8.048, P= <0.001), and after 6 months (t=10.225, P=<0.001), and after one year (t=2.50, P=0.015) and 2 years(t=2.822, P=0.006) of operation.

Figure 1: The mean differences of post-operative Kujala score between study groups

Secondary outcome measures

1/ Visual analogue scale for knee pain

In group A, the mean differences of VAS score for knee pain between pre-operative and post-operative assessments in four time periods (3 months, 6 months, 12 months and 24 months) was shown in table 3

Table 3: The mean differences of VAS score for knee joint between pre-operative and post-operative assessments in four time periods for group A

Study variables	Periods of assessment	N	Mean	SD	Paired t-test	P-value
VAS score	VAS score preoperatively	45	8.44	0.50	**25.02**	**<0.001**
	VAS score 3 months postoperatively	45	2.06	1.49		
	VAS score preoperatively	45	8.44	0.50	**29.83**	**<0.001**
	VAS score 6 months postoperatively	45	1.31	1.39		
	VAS score preoperatively	45	8.44	0.50	**43.09**	**<0.001**
	VAS score 1 year postoperatively	45	0.80	0.99		
	VAS score preoperatively	45	8.44	0.50	**50.99**	**<0.001**
	VAS score 2 year postoperatively	45	0.53	0.89		

In group B, the mean differences of VAS score for knee pain between pre-operative and post-operative assessments in four time periods (3 months, 6 months, 12 months and 24 months) was shown in table 4.

Table 4: The mean differences of VAS score for knee pain between pre-operative and post-operative assessments in four time periods for group B

Study variables	Periods of assessment	N	Mean	SD	Paired t-test	P-value
VAS score	VAS score preoperatively	45	8.31	0.46	**23.21**	**<0.001**
	VAS score 3 months postoperatively	45	2.48	1.51		
	VAS score preoperatively	45	8.31	0.46	**23.93**	**<0.001**
	VAS score 6 months postoperatively	45	2.00	1.65		
	VAS score preoperatively	45	8.31	0.46	**32.86**	**<0.001**
	VAS score 1 year postoperatively	45	0.88	1.30		
	VAS score preoperatively	45	8.31	0.46	**45.89**	**<0.001**
	VAS score 2 year postoperatively	45	0.51	0.92		

Figure (2) showed the mean differences of post-operative VAS score for knee joint between study groups including (group A and Group B) in four periods of assessments. There were significant differences between means of VAS score for knee joint between these two groups after 6 months postoperatively (t=

-2.138, P=0.035), while non-significant differences between two groups after 3 months(t=-1.328, P=0.187), one year (t=-0.365, P=0.716) and 2 years(t=0.116, P=0.908) of operation.

Figure 2: The mean differences of post-operative VAS score for knee pain between study groups

2/ Post-operative complications

There were 3 patients in group A who got postoperative hemarthrosis while 2 patients in group B got hemoarthrosis. One patient in group B got deep venous thrombosis of the leg veins of the side of surgery.

Discussion

Regarding demographic data

There were no significant differences between means of age between these two groups (P=0.121), as well as there was no significant association between gender and study group, (P=0.809). This means that age and gender would not affect the differences in the results between two groups.

Regarding the primary outcome measure (Kujala score)

When I compared the results of Kujala score between preoperative and four postoperative periods of assessment in both groups A and B, there were significant differences (P-value<0.001). This means that arthroscopic lateral release can improve the functional outcome in those patients with lateral patellar compression syndrome.

There were significant differences between means of Kujala score for knee pain between these two groups after 3 months postoperatively (t= 8.048, P=<0.001), and after 6 months (t=10.225, P=<0.001), and after one year (t=2.50, P=0.015) and 2 years(t=2.822, P=0.006) of operation. This means that visco-supplementation by intra-articular injection of Hyaluronic acid can improve significantly the functional outcome of these patients with degenerative cartilage changes after lateral release for lateral patellar compression syndrome.

Regarding the secondary outcome measure (Visual analogue scale)

There was significant improvement in visual analogue scale postoperatively in both groups A and B (P-value<0.001). This means that arthroscopic lateral patellar release for lateral patellar compression syndrome can improve knee pain.

There were significant differences between means of VAS score for knee joint between these two groups after 6 months postoperatively (t= -2.138, P=0.035), while non-significant differences between two groups after 3 months(t=-1.328, P=0.187), one year (t=-0.365, P=0.716) and 2 years(t=0.116, P=0.908) of operation. This means that intra-articular injection of Hyaluronic acid can accelerate the improvement in knee pain after arthroscopic lateral release in lateral patellar compression syndrome with degenerative cartilage changes.

Regarding the secondary outcome measures (postoperative complications)

There were 3 patients in group A and 2 patients in group B suffered from post-operative hemarthrosis and were treated by aspiration and firm bandaging without need for another arthroscopy.

There was one patient in group B suffered from DVT of leg on side of operation and was treated with anticoagulant after consultation with hematologist.

Fortunately, I had no infection, recurrence or patellar instability with 2 years of follow up.

Regarding comparison with other related studies

On review of previous literatures, only one study can be found dealt with using of intra-articular injection of Hyaluronic acid after arthroscopic lateral release in lateral patellar compression syndrome [18].

Fosco et al study	Current study
Retrospective study	Randomized controlled trial
25 patients were involved	90 patients were involved
Mean of Kujala score improved from 45.8 before surgery to 82.7 after treatment	There was significant improvement in Kujala score in post-perative assessment in both groups with significant improvement after intra-articular injection of Hyaluronic acid in group A in comparison with group B
Visual analogue scale improved of 68.6 % from preoperative	There was significant improvement in visual analogue scale of knee pain after intra-articular injection of Hyaluronic acid in group A in comparison of group B

Conclusion

Intra-articular injection of Hyaluronic acid after arthroscopic release, in patients with lateral patellar compression syndrome and degenerative cartilage changes, can result in better improvement of knee pain and functional outcome up to 2 years of follow up.

Abbreviations

VAS: Visual analogue scale

MRI: Magnetic resonance imaging

DVT: Deep venous thrombosis

Declarations

Ethics approval and consent to participate

The protocol of this clinical study was reviewed and approved by the research ethics committee in Hawler Medical University. Both verbal and written informed consents to participate were obtained from all patients before study conduction. The guarantee was given for confidentiality of their personal information.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The author declare that he has no competing interests.

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No funding was received.

Authors' contributions

Sherwan A. Hamawandi was responsible for experiment design, conceptualization, supervision, data collection, manuscript writing and statistical data analysis.

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Figures

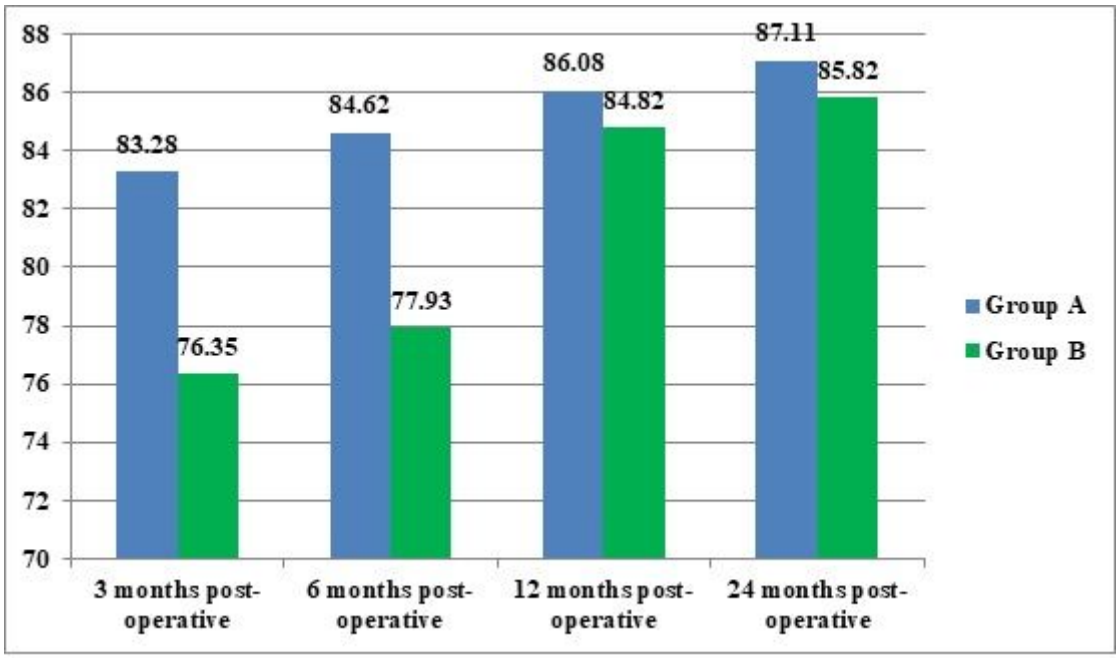

Figure 1

The mean differences of post-operative Kujala score between study groups

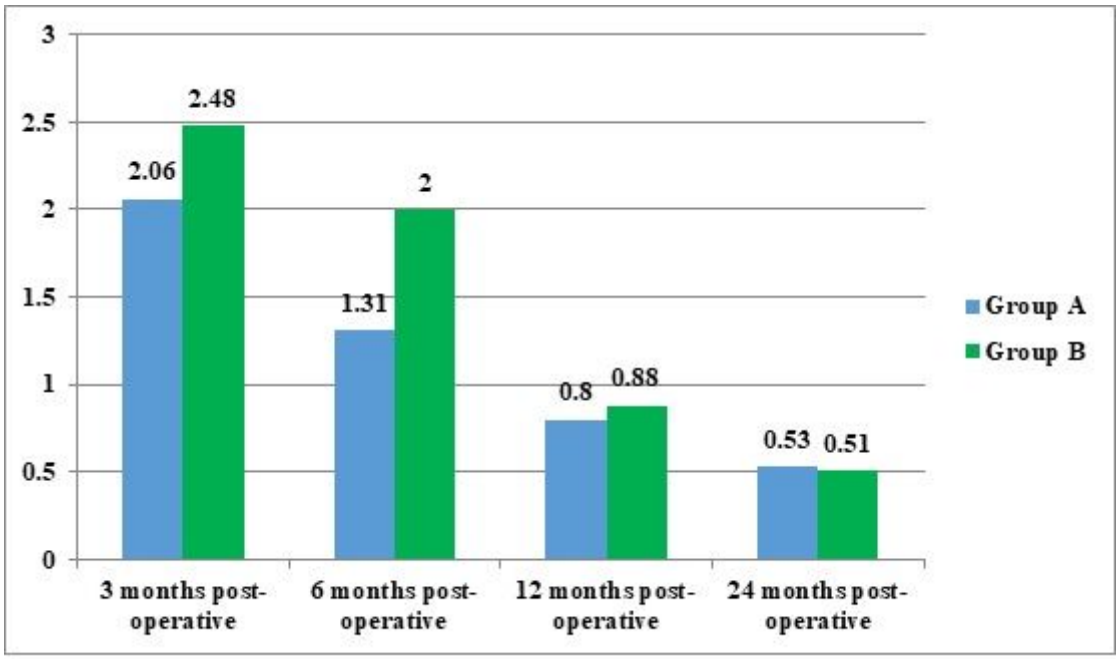

Figure 2

The mean differences of post-operative VAS score for knee pain between study groups

Supplementary Files

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