

A Study to compare the effect of Open versus Closed kinetic chain exercises in Patello-femoral arthritis.

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Abstract: Background And Purpose Of The Study: *Patello-femoral arthritis is the most common type of arthritis especially older people sometimes it is called as degenerative joint disease. Patello-femoral arthritis is one of the common causes of physical disability in adults. It is the second most common cause of chronic conditions. 50% of older persons after 55 years are affected. Some of the young people get arthritis from the joint injuries. Arthritis is the leading cause of disability in our nation more than other systemic diseases like heart diseases, cancer and diabetes. There are many therapeutic interventions for the treatment of patello-femoral arthritis. The study is to determine whether closed kinetic chain exercise offer any advantages over open kinetic chain exercises.*

Method: *The patients are randomly selected based on inclusion and exclusion criteria and divided into two groups. Group A and Group B. Group A is trained with closed kinetic chain exercise and Group B is trained with open kinetic chain exercises for a period of 12 weeks. the pre and post treatment readings of VAS and KUJALA scale are taken in both groups for statistical analysis.*

Results: *The results showed reduction in pain and improvement in functional activity in both Group A and Group B, significant improvement has been noted in Group A after 12 weeks of training.*

Conclusion: *This study shows that there was significant improvement in functional ability and reduction of pain as a result of both open and closed kinetic chain exercises program. There are only few significant differences between closed kinetic chain exercises (GROUP-A) and open kinetic chain exercises (GROUP-B). It reveals that closed kinetic chain exercises are more effective in the treatment of patello-femoral arthritis than the (GROUP-B) open kinetic chain exercises*

I. Introduction

“Osteoarthritis arthritis is a degenerative joint disease thought to be wear and tear of joints it mainly effecting the articular cartilage”

Patello-femoral arthritis is the most common type of arthritis especially older people sometimes it is called as degenerative joint disease⁷. Patello - femoral arthritis is one of the common cause of physical disability in adults. It is the second most common cause of chronic conditions. 50% of older persons after 55 years are affected⁶. Some of the young people get arthritis from the joint injuries⁶. Arthritis is the leading cause of disability in our nation more than other systemic diseases like heart diseases, cancer and diabetes. Patello-femoral joint arthritis is a complex multi factorial process. It can be a major causes of pain and disability and it has a substantial impact on function and activities of daily functional living².

The estimated population prevalence varies from 4 to 30% depend on age, gender and disease condition. After 50 years of age the incidence and prevalence of patello-femoral joint osteoarthritis incredible more rapidly in women than in men⁹. There are numerous evaluation and treatment options for patello-femoral arthritis however, there is no perfect treatment for everyone at any age so treatment must be individualized based on severity of symptoms. Patello-femoral osteoarthritis is the most prevalent disorder involving the knee¹². It is generally agreed that patello-femoral osteoarthritis should be managed initially by non-operative than by operative means today, little consensus exist regarding the most appropriate non-operative treatment¹³. Open kinetic chain leg extension exercises have been the traditional means of strengthening the quadriceps muscle, however several authors report that these exercises exacerbate the symptoms in many patients with patello -femoral arthritis¹⁸. The clinical use of closed kinetic chain exercises has significantly increased during the past several years²⁰. One of the reasons these exercises have received increased attention within the rehabilitation community is that they simulated and replicate many functional movements¹⁷.

Since studies have shown that the major changes as a result of strength training are task specific, it may be better to incorporate the rehabilitation into task related practice. In addition, it has been suggested that closed kinetic exercises are safer than open kinetic chain exercises because the former plays minimal stress on the patello-femoral joint in the functional range of motion¹⁶. Therefore patients with patello-femoral arthritis may tolerate closed kinetic chain exercises better and consequently may exhibit better functional results after such as exercise programs.

The purpose of this study was to investigate, the efficacy of open versus closed kinetic chain exercises. This study is to specifically determine whether closed kinetic chain exercises offer any advantages over conventional open kinetic chain exercises.

AIM:

The main aim of the study is to compare the effect of closed kinetic chain exercises versus open kinetic chain exercises in the treatment of patello-femoral arthritis.

OBJECTIVE:

Objectives of this study are to compare the effectiveness of closed kinetic chain exercises with open kinetic chain exercises in relieving pain and improving joint functions in patello-femoral arthritis.

NEED OF THE STUDY:

There are many therapeutic interventions in physiotherapy for the treatment of patello-femoral arthritis. Among them closed kinetic chain exercises and open kinetic chain exercises have proven to be beneficial in reducing pain and improving function. But very few studies are available in literature comparing both these groups of exercises. Hence this study is to determine whether closed kinetic chain exercises offer any advantages over open kinetic chain exercises.

HYPOTHESIS

NULL HYPOTHESIS: There is no significant difference between open kinetic chain and closed kinetic chain exercises in patello-femoral arthritis.

ALTERNATIVE HYPOTHESIS:- There is significant difference between open kinetic chain and closed kinetic chain exercise in patellofemoral arthritis.

II. Materials And Methodology

- **STUDY DESIGN-**
A Comparative Study.
- **STUDY DURATION-**
12 Weeks.
- **STUDY SETTING-**
SIMS college of physiotherapy,
Mangaldas Nagar,
GUNTUR.
- **SAMPLE SIZE-**
30 patients were selected randomly for the study.
- **SAMPLING TECHNIQUE-**
Samples are selected by simple randomized technique which is based on inclusion and exclusion criteria.

Inclusion Criteria-

Clinical signs and symptoms of patellofemoral arthritis radiological and on physical examination.

- Age 35-55 years.
- The patients who experience pain more than 6 weeks.
- Tenderness on palpation of patella.
- Pain in resisted knee extension, climbing up and climbing down stairs
- Both males & females

Parameters

- Pain.
- Patello femoral joint dysfunction.

TOOLS:

- For pain visual analog scale.
- For patello-femoral joint dysfunction evaluation by kujala scale.

EXCLUSION CRITERIA;-

- Any knee operations.
- Any infectious conditions of knee.
- Traumatic conditions.

-Congenital abnormalities.

MATERIALS:-

- Treatment couch.
- Pillows
- Stationary bicycle.
- Rowing machine
- Stair case.
- Hot packs.

III. Methodology

In this study after taking an informed consent, 30 patients are selected. They are divided into 2 groups, Group A and Group B. Each group is allotted 15 patients.

GROUP-A patients are treated with closed kinetic chain exercises and hot packs.

GROUP-B patients are treated with open kinetic chain exercises and hot packs.

- ▶ Pain parameter is measured with visual analogues scale in both groups before and after the treatment. Functional evaluation of both the groups is done with kujala scale before and after the treatment. Both the parameters are measured first day and after 12 weeks of treatment procedure.
- ▶ All the patients received their treatment in the physiotherapy department of S.I.M.S college.
- ▶ Every patient followed the exercise programme for required period of 12weeks.

In both training groups, each exercise was repeated 3 sets of 10 repetitions. The patient rested 1 minute after the conclusion of each set.

In GROUP-A:-

Closed kinetic chain exercise program consists of

- 1) Seated leg presses
- 2) One third knee bends on one leg and both legs
- 3) Stationary bicycling
- 4) Rowing- machine exercise
- 5) Step up-step down exercises.

In this exercise 3 seconds rest between repetitions is given.

In GROUP-B:-

Open kinetic chain exercise program consists of

- 1) Static quadriceps muscle contraction with knee in full extension
- 2) Straight leg raising with patient in supine lying
- 3) Short-arc movements from 10 degree of knee flexion to terminal extension
- 4) Leg abduction, adduction exercise in side lying

In this each exercise held isometrically for a count of 6 seconds with a 3 seconds rest between 10 repetitions.

- ▶ After the end of 12weeks post VAS and post KUJALA is taken and results are analysed.

IV. Data Analysis For Group A

S.N	VAS SCALE		KUJALA SCALE	
	PRE TREATMENT	POST TREATMENT	PRE TREATMENT	POST TREATMENT
1	9	6	55	90
2	8	5	60	85
3	7	4	50	75
4	9	6	55	78
5	7	5	65	80
6	8	6	50	70
7	8	4	69	86
8	9	6	58	75
9	7	4	60	85
10	8	6	50	73

11	9	7	60	80
12	9	5	68	85
13	8	4	70	85
14	7	5	75	90
15	9	6	45	90

Data Analysis For Group B

S.N	VAS SCALE		KUJALA SCALE	
	PRE TREATMENT	POST TREATMENT	PRE TREATMENT	POST TREATMENT
1	9	7	50	55
2	8	6	60	65
3	9	5	50	60
4	7	5	59	67
5	8	6	55	65
6	9	7	56	60
7	7	5	60	68
8	9	6	58	68
9	9	7	55	60
10	8	6	48	58
11	7	5	55	67
12	6	4	60	68
13	7	6	62	70
14	8	5	60	69
15	9	7	50	60

Comparison Of Pre And Post Vas For Group A

	PRE TREATMENT	POST TREATMENT
MEAN	8.13	5.266
STANDARD DEVEATION	0.833	0.96

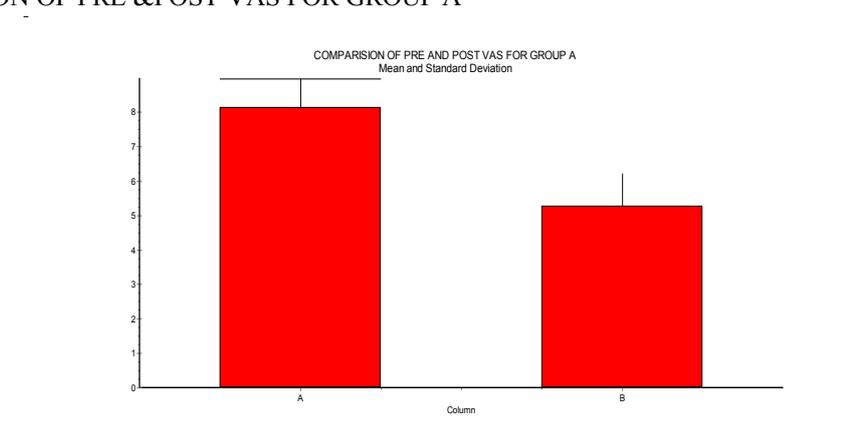
Sample size (N) : 15

P value is < 0.0001,

considered extremely significant.

t = 8.726 with 28 degrees of freedom.

COMPARISION OF PRE &POST VAS FOR GROUP A



COMPARISION OF PRE & POST V.A.S FOR GROUP-B

	PRE TREATMENT	POST TREATMENT
MEAN	8	5.8
STANDARD DEVIATION	1.000	0.941

Sample size (N) 15

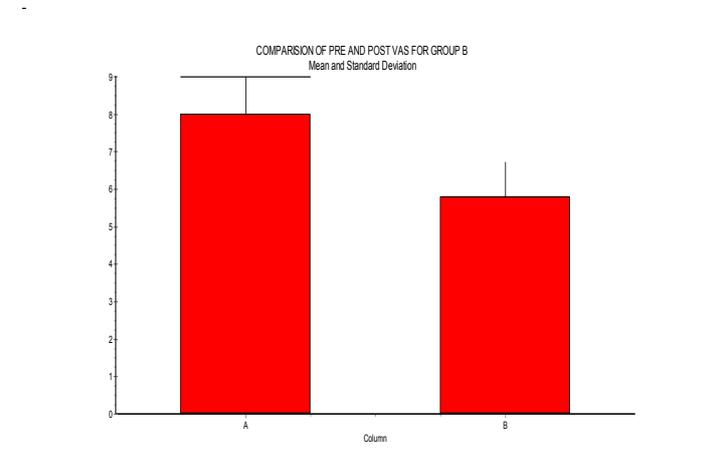
Unpaired t test.

P value is < 0.0001,

considered extremely significant.

t = 6.205 with 28 degrees of freedom.

COMPARISON OF PRE & POST VAS FOR GROUP B



Comparison Of Post Vas For Group-A & Group-B

VAS	Group A	Group B
MEAN	5.26	5.8
SD	0.96	0.94

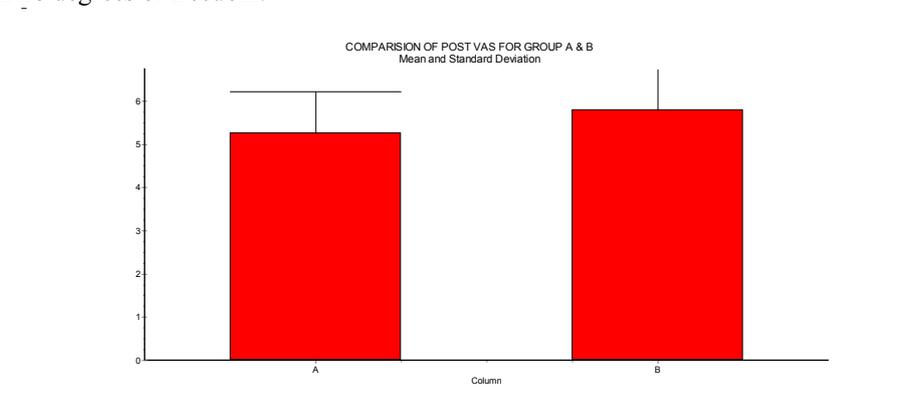
Sample size (N) 15 for each group.

Unpaired t test,

P value is 0.1359,

considered not significant.

t = 1.536 with 28 degrees of freedom.



Comparison Of Pre & Post Kujala Scale For Group A

	PRE TREATMENT	POST TREATMENT
MEAN	59.33	80.466
SD	8.731	6.739

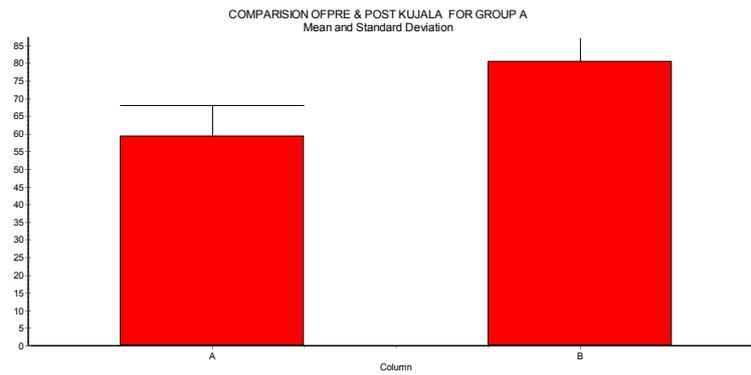
Sample size (N) 15

Unpaired t test,

P value is < 0.0001,

considered extremely significant.

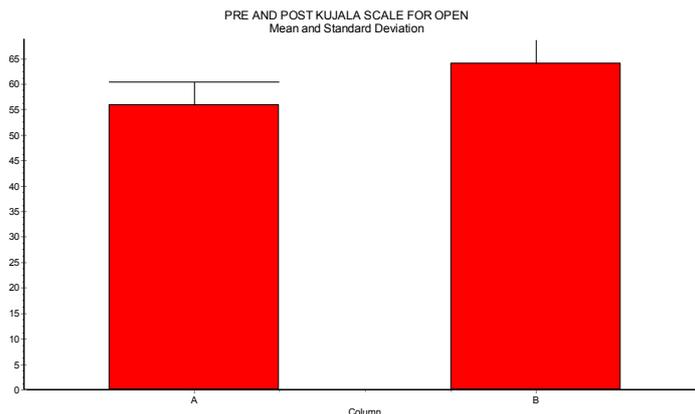
t = 7.421 with 28 degrees of freedom.



Comparison Of Pre & Post Kujala Scale For Group-B

	Pre treatment	Post treatment
Mean	55.866	64
SD	4.533	4.706

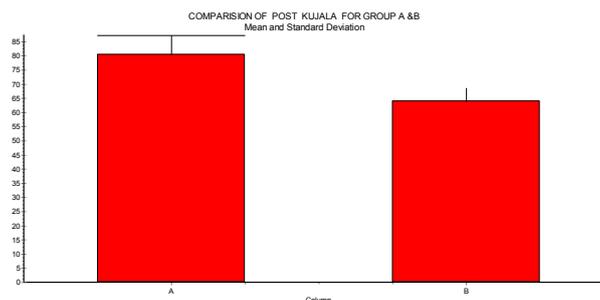
Sample size (N) 15
 Unpaired t test,
 P value is < 0.0001,
 considered extremely significant.



Comparison Of Post Kujala Scale For Group-A & Group -B

	Group A	Group B
Mean	466	64
SD	6.739	4.706

Sample size (N) 15 for each group.
 Unpaired t test.
 P value is < 0.0001,
 considered extremely significant.



V. Discussion

Open and closed kinetic exercises have been used by investigators as a rehabilitation protocol for patients with patello-femoral arthritis.

The results of the present study revealed that both Group A and Group B demonstrated a significant increase in overall functionality, as measured by kujala scale and reduction in pain measured by visual analogue scale.

The functional improvement of patients in both Group A and Group B is in agreement with previous findings reported in literature of good to excellent functional results and reduction in pain after closed /and open chain protocol. Although both Groups revealed a significant reduction in the reported pain during various activities, the issues of specificity of training and reports in the literature lead one to expect that the closed kinetic chain would demonstrate more functional benefits from the training program than with the open kinetic chain Group exercises.

Also since the closed chain exercises contain more eccentric muscle work, and because it is known that eccentric exercise develops more tension in the muscle and thereby obtains a greater training effect, this may be the primary factor in improving function and reducing pain more significant than the open kinetic chain group.

This study shows that both open and closed kinetic exercise programs lead to an improved subjective and clinical outcome in patients with patello - femoral arthritis but the closed kinetic chain group suggest that this type of treatment is a little more effective than the open kinetic chain program in the treatment of these patients.

VI. Conclusion

This study shows that there was significant improvement in functional ability and reduction of pain in both open and closed kinetic chain exercises program. However closed kinetic chain exercises(Group A) showed more significant improvement than open kinetic chain exercises(Group B) in reducing pain and improving function and hence more emphasis should be put on closed kinetic chain exercises (Group A) when treating patients with patellofemoral arthritis.

Limitations:

- ✓ Sample size is small.
- ✓ Study duration is short.
- ✓ No long term follow-up.
- ✓ Sub optimal treatment periods.

Recommendations:

- ✓ Sample size should be large.
- ✓ Study duration should be more.
- ✓ Treatment duration should be increased.
- ✓ Long term outcomes.

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Conflict of interest: Nil

Source of support: self

Ethical clearance:

While doing this project I have maintained the privacy of my subject's. I did not mention their names, initials, addresses and photographs or hospital numbers, and written descriptions because the information about the subject is not essential in my project.

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