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Research Article

Physiotherapy for better pain management

Effect of Myofascial Release as an Adjunct with Conventional Therapy on Range Of Motion and Pain in Post Traumatic Knee Stiffness

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Abstract: Post traumatic stiffness and pain are the two main complications which occur after any severe trauma to the knee. Fascia and muscular structures are the major causes for developing stiffness but they are ignored by many physiotherapists as they only focus on intra-articular causes of stiffness. Therefore less research work is available on the effect of myofascial release (MFR) on post-traumatic knee stiffness. Myofascial release can provide immediate effects on stiffness which can be more beneficial if given with conventional protocol of physiotherapy. So it is necessary to study the effect of myofascial release with conventional therapy. To study the effect of myofascial release as an adjunct with conventional therapy on range of motion and pain in post traumatic knee stiffness, 24 subjects of post traumatic knee stiffness both males and females were selected. Their consent was taken and they were given conventional physiotherapy treatment with myofascial release technique. Results were obtained by pre test and post test assessment of visual analogue scale (VAS) and range of motion analysis. According to the statistical analysis of pre test and post test assessment it was found that myofascial release technique significantly improves the range of motion and reduces the pain of affected knee joints. MFR is effective in improving the range of motion and decreasing the pain of affected knee joints in case of posttraumatic knee stiffness when given with conventional physiotherapy protocol.

Keywords: Myofascial release, post-traumatic knee stiffness, conventional physiotherapy, visual analogue scale.

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1. INTRODUCTION

Knee is a large and complex joint of the body. Complexity of the joint results from ligamentous attachments along with numerous muscles crossing the joint. Knee joint supports the body along with hip and ankle when standing and it is a primary functional unit in walking, climbing, running and sitting activities. The joint capsule encloses two articulations i.e. the tibiofemoral and the patellofemoral.[1,2] The knee joint has less congruence thus the muscles must provide greater control of all fine movements of the joint in absence of one or more ligaments. Multiple forces applied through the knee joint can contribute for various injuries and degenerative damage. Bones and cartilaginous structures of tibiofemoral joint get injured by large direct forces of falls or twists or by abnormal ligamentous and muscular forces.[3] Condylar fractures of femur, fractures of tibial plateau, and patellar fractures are some common fractures which occur around knee joint. In condylar fractures of femur restoring the congruity of articular surface is important and when the fracture is displaced open reduction and internal fixation with multiple cancellous screws, condylar blade-plate or locking compression plate is performed. Patellar fracture cases are treated with reduction of fragments and fixing them with tension band wiring.[4] Post-operative stiffness of knee is a major problem after trauma. It is the main complication resisting the patient from gaining back his normal lifestyle. Immobility of knee joint after operation can result in contractures and instability of knee joint. Post-traumatic stiffness can be caused by dense intra-articular adhesions and/or fibrotic transformation of peri-articular structures.[5,6,14] Flexion contracture, extension contracture or combine contractures can develop in knee joint after several months of immobility.[7] Physiotherapists use various techniques in conventional physiotherapy such as continuous passive motion(CPM), repeated prolonged loading exercises, isometric quadriceps femoris exercises, active range of motion exercises, stretching exercises and mobilization of the joint to reduce stiffness and improve range of motion.[6,9] According to various studies myofascial release is also a useful method to treat stiffness and it can be defined as the graded stretch of soft tissue while the patient remains passive during its application.[5,8] Fascia surrounds every structure of the body all the way down to the cellular level. It is a tough connective tissue spreading throughout the body in three dimensional web from head to toe.[10] This connective tissue in immobilized muscle changes and the ratio of collagen increases. Myofascial release (MFR) is a technique that stretches restricted fascia, so it appears useful in reducing pain and muscle stiffness and improving range of motion.[11] generally, the fascial system provides support, stability and cushioning effect; tightening of this system is a histologic, physiologic and biomechanic protective mechanism that is a response to trauma. Myofascial release is done by applying a sustained pressure into the restricted tissue barrier. After a few releases the tissue will become softer and more pliable. It relieves the pressure on pain sensitive structures such as nerves and blood vessels and restores the length and health of the myofascial tissue. Thus it also restores the alignment and mobility of the joint[10] and patient feel easy to move.[11] Myofascial release is a very effective treatment which can provide immediate effect on stiffness if given with conventional physiotherapy protocol but still many physiotherapists only focus on intra-articular factors overlooking the effects on fascia in the case of stiffness. Therefore it is important to study the effect of myofascial release along with conventional physiotherapy as it can reduce the time of recovery.

2. METHOD

The study was conducted in the outpatient department of Krishna College of physiotherapy. 24 subjects were selected according to the inclusion and exclusion criteria. As this study includes both male and female patients within the age group of 20 to 40 years, patients with any femoral, patellar and tibial fracture or any soft tissue injury, after 3 to 6 months of surgery. Study excludes the patients with acute infection or deep vein thrombosis, complex pain regional syndrome, implant failure or pre prosthetic fracture, Rheumatoid arthritis, motor neuron disease and cognitive impairments. The study was ethically approved by the Institutional Ethical Committee, KIMS Deemed To Be University, Karad with the Ref. No. KIMSDU/IFC/05/2019 . Written consent of the patient was taken. The treatment protocol was explained to the subjects and then they underwent pre test using Visual analogue scale and range of motion analysis. After that the subjects were given a 4 week protocol of various exercises, stretching techniques and myofascial release technique.[5,6] The results of the pretest were compared with post test assessments conducted after the end of treatment protocol.

2.1 Ethical Clearance

Ethical clearance was taken from the institutional committee of Krishna Institute of Medical Sciences, Deemed to be University, Karad. Ethics committee registration no. ECR/307/Inst/MH/2013/RR-16 with the Ref. No. KIMSDU/IFC/05/2019.

3. STATISTICAL ANALYSIS

Two outcome measures were selected i.e. Visual analogue scale and range of motion analysis to obtain the results. Paired t test, unpaired t test, mean and standard deviation was calculated by using the software SPSS version 20. Following tables (Table 1,2 and 3) shows the values obtained by analysing the data.

Table 1 Visual analogue scale

	Pre		post		Paired t test		Inference
	mean	SD	Mean	SD	p value	t value	
at rest	0.3083	0.5469	0	0	0.0111	2.762	Very significant
on activity	4.954167	1.044	0.6416	0.4671	<0.0001	22.778	Extremely significant
Unpaired t test							

t value	19.314
p value	<0.0001
Inference	Extremely significant

Table 2 Range of motion analysis For Flexion

	Flexion				Unpaired t test		Inference
Left leg affected	**Pre**		**Post**		**t value**	**p value**	
	Mean	**SD**	**Mean**	**SD**			
	111	29.231	132.416	8.944	3.432	0.0013	Very significant
Paired t test - p value	<0.0001		0.0194				
t value	11.809		2.736				
Inference	Extremely significant		Very significant				
Right leg affected	107.125	31.547	131.75	8.699	3.686	0.0006	Very significant
paired t test- p value	<0.0001		0.00079				
t value	11.943		3.24				
	Extremely significant		Very significant				

Table 3 Range of motion analysis For Extension

	Extension				Unpaired t test		Inference
Left leg affected	Pre		Post		t value	p value	
	mean	SD	Mean	SD			
	-2.375	3.398	-0.333	1.167	2.784	0.0078	Very significant
Paired t test - p value	0.0006		0.1803				
t value	4.782		1.431				
Inference	Extremely significant		Not significant				
Right leg affected	-2.833	3.644	-0.20833	0.7211	3.462	0.0012	Very significant
paired t test- p value	0.0003		0.3388				
t value	5.119		1				
Inference	Extremely significant		Not significant				

4. RESULT

The study was conducted among 24 subjects in Krishna institute of Medical Sciences, Deemed to be University, Karad. 15 male and 9 female subjects participated. In which 6 subjects were of the age group of 20 to 30 years and 18 belonged to the age group of 31 to 40 years. The results of visual analogue scale and range of motion analysis are given below (Table 4,5 and 6).

Table 4 Visual analogue scale

	Pre		post		Paired t test		Inference
	mean	**SD**	**Mean**	**SD**	**p value**	**t value**	
at rest	0.3083	0.5469	0	0	0.0111	2.762	Very significant
on activity	4.954167	1.044	0.6416	0.4671	<0.0001	22.778	Extremely significant
Unpaired t test							
t value	19.314						
p value	<0.0001						
Inference	Extremely significant						

The above table shows the results of VAS in pre test and post test. The pre test (of rest) has a mean & SD 0.3083±0.5469 and the post test (of rest) has a mean and SD of 0. The p and t value are 0.0111 and 2.762 respectively which is very significant. In the pre test (on activity) has a mean & SD of 4.954167±1.044 and post test (On activity) has a mean & SD of 0.6416±0.4671.The p and t value are <0.0001 and 22.778 respectively which is extremely significant.

Table 5 Range of motion analysis For Flexion

	Flexion				Unpaired t test		Inference
Left leg affected	**Pre**		**Post**		**t value**	**p value**	
	Mean	**SD**	**Mean**	**SD**			
	111	29.231	132.416	8.944	3.432	0.0013	Very significant
Paired t test - p value	<0.0001		0.0194				
t value	11.809		2.736				
Inference	Extremely significant		Very significant				
Right leg affected	107.125	31.547	131.75	8.699	3.686	0.0006	Very significant
paired t test- p value	<0.0001		0.00079				
t value	11.943		3.24				
	Extremely significant		Very significant				

The above table shows the results of Range of motion analysis of flexion in pre test and post test. The pre test (of left leg affected) has a mean & SD 111± 29.231and post test (of left leg affected) has a mean and SD of 132.416± 8.944 . The p and t value are 0.0013 and 3.432 respectively which is very significant. In the pre test (of right leg affected) has a mean & SD of 107.125±31.547 and post test (Of right leg affected) has a mean & SD of 131.75±8.699.The p and t value are 0.0006 and 3.686 respectively which is very significant.

Table 6 Range of motion analysis For Extension

	Extension				Unpaired t test		Inference
Left leg affected	**Pre**		**Post**		**t value**	**p value**	
	mean	**SD**	**Mean**	**SD**			
	-2.375	3.398	-0.333	1.167	2.784	0.0078	Very significant
Paired t test - p value	0.0006		0.1803				
t value	4.782		1.431				
Inference	Extremely significant		Not significant				
Right leg affected	-2.833	3.644	-0.20833	0.7211	3.462	0.0012	Very significant
paired t test- p value	0.0003		0.3388				
t value	5.119		1				
Inference	Extremely significant		Not significant				

The above table shows the results of Range of motion analysis of extension in pre test and post test. The pre test (of left leg affected) has a mean & SD -2.375± 3.398and post test (of left leg affected) has a mean and SD of -0.333± 1.167. The p and t value are 0.0078 and 2.784 respectively which is very significant. In the pre test (of right leg affected) has a mean & SD of -2.833±3.644 and post test (Of right leg affected) has a mean & SD of -0.20833±0.7211.The p and t value are 0.0012 and 3.462 respectively which is very significant.

5. DISCUSSION

The aim of this study was to find out the effect of myofascial release as an adjunct with conventional therapy on range of motion and pain in post traumatic knee stiffness. Both male and female subjects suffering from post traumatic knee stiffness caused by any femoral, patellar and tibial fracture or any soft tissue injury were included. Subjects who underwent surgery at least 3-6 months back were selected, then only the injury will have sufficient time to heal. 24 subjects with age groups of 20 to 40 were selected for the study. The mean of the age group was found as 34. It is shown in previous studies that age can be the risk factor for males with age group of 25 to 35 had increased risk for injury of any type. Accidents are also considered as the major risk for trauma and it is common in the working population. Exhaustion is one of the reasons causing this because it is shown that accidents are clustered towards latter parts of week and late afternoons to evenings on the other days. According to the sample males (15) involved were more as compared to the females (9). Female athletes have greater risk for knee injuries than males.[12,13] The previous study of immediate effect of myofascial release on range of motion, pain and biceps and rectus femoris muscle activity after total knee replacement by Danielle Cristine Carvalho Muniz e Silva concluded that MFR reduced knee pain and knee range of motion was increased. Positive results of this study shows that treatment based upon anatomical trains concept contributes to the improvement of knee stiffness in total knee replacement patients. So it is important to find out if it is useful in post-traumatic knee stiffness and pain which is one of the major complications after any trauma around the knee joint. Two outcome majors were selected to cover these two components.[5] Subjects were given superficial heating and after that MFR, Maitland mobilization, range of motion exercises and stretches. Maitland Mobilization technique was given by applying two glides on the tibiofemoral joint i.e. posterior glide and anterior glide.[2] The exercise program consists of isometric exercises for three muscles and stretching techniques. Three isometric exercises using a towel roll for hamstrings, quadriceps and hip adductors were taught to the patients. The stretching exercises were also given for

quadriceps, hamstrings and calf muscles. Subjects were instructed to perform the stretches twice daily for 4 weeks. Home exercise programs also include these stretches performed once after hot fomentation.[6] MFR is given according to the anatomy trains concept on the superficial back line of lower limb. It is given on the gluteal region, posterior fascia lata and crural fascia. The technique was performed in three strokes directly over the patient's skin by sliding the hand throughout the extension with constant pressure in the craniocaudal direction.[5] Visual analogue scale (VAS) was taken to determine the pain in subjects[15]. In pre test the mean of the first component of VAS i.e. at rest was 0.3 and mean of the second component i.e. on activity was 4.9. According to inclusion criteria patients who have undergone a surgery before 3 to 6 months are selected and because of this reason the subjects have stiffness in the knee more than the pain. Paired t test was performed to compare the results of pre and post test. It shows very significant results when pre and post components of at rest were compared with p and t values of 0.0111 and 2.762 respectively. It is extremely significant in activity with p and t values of <0.0001 and 22.778 respectively.(Table1,Table4) Goniometry was used to measure the range of motion of knee joints. The mean of range of motion for affected knees is found as 81.29 for flexion and as -4.79 for extension which is very low compared to normal ranges which are for knee flexion 130-140° and for extension 0°. Negative values of knee extension indicates flexion deformity of the knee i.e. when knee cannot go into full extension. Range of motion analysis was performed by comparing the ranges of affected knee with the normal knee joint of the subject. Paired t test was performed to compare the values for flexion of affected knee with the normal knee in both pre and post test. In the post test data analysis it was found very significant with p and t values as 0.0194 and 2.736 respectively for left leg affected subjects and 0.00079 and 3.24 for right leg affected subjects. Unpaired t test was performed to compare the pre and post test values for flexion of affected knee which is also found very significant with the p and t values of 0.0013 and 3.432 respectively for left leg affected subjects and 0.0006 and 3.686 for right leg affected subjects.(Table2,Table5) Same tests were performed for the extension. Unpaired t test shows very significant results. But paired t test for post test data analysis of normal and affected knee shows result as not significant as it is the comparison between post test values of normal and affected leg. It shows that the majority of the subjects recover from the extension lag but some of them still have 2-3° of extension lag. It may be due to the MFR technique performed only on the posterior muscle chain and not anteriorly i.e. on the extensor muscle group.(Table3,Table6) The MFR was given along with conventional physiotherapy program i.e. superficial heating, Maitland mobilization, isometric exercises and stretching regime and it was found effective for relieving the pain and improving the range of motion of knee joint in post-traumatic knee stiffness cases.

6. CONCLUSION

According to the results of data analysis, this study concluded that myofascial release is significantly effective when given with conventional physiotherapy programs for reducing pain as well as improving the range of motion of the knee joint in the cases of post-traumatic knee stiffness.

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8. AUTHORS CONTRIBUTION STATEMENT

Both authors contributed to analyzing the data and preparation of the manuscript. First author contributed mostly to the concept and design of the study.

9. CONFLICT OF INTEREST

Conflict of interest declared none.

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