Prisms Intervention For Knee Osteoarthritic Patients To Reduce Pain And Increase Joint Range Of Motion- "Case Series"

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Abstract- *This case series investigates the effectiveness of the acronym intervention PRISM (Paraffin Wax, Rest, Isometric/Isotonic, Stretching/Strengthening, Mobilisation/) in addressing knee osteoarthritis (OA). Knee OA is a prevalent musculoskeletal condition, imposing substantial burdens on affected individuals. PRISM, developed by a multidisciplinary team, integrates physical therapy exercises, lifestyle modifications, and cognitive-behavioral strategies to comprehensively manage knee OA symptoms. The series, conducted with 7 participants over a 6 week period, assesses the impact of PRISM on pain reduction and increased knee joint range of motion. Primary findings reveal significant improvements in both pain levels and mobility, suggesting that PRISM may offer a promising and holistic approach to managing knee OA. However, challenges related to adherence and the need for further comparative research are acknowledged. This case series provides valuable insights into the potential of PRISM as an innovative intervention, warranting additional exploration and validation in larger and more diverse populations.*

Aim of Series:

The aim of this series is to investigate the effectiveness of the PRISMS intervention in managing knee osteoarthritis symptoms. By evaluating the outcomes of seven patients undergoing the intervention, we aim to assess the impact of Paraffin wax therapy, Rest, Isometric exercises, Stretching, Strengthening, and Mobilization on pain levels, muscle strength, and range of motion. This series seeks to provide evidence supporting the use of the PRISMS intervention as a holistic approach to knee osteoarthritis management.

Keywords- Osteoarthritis, OA of knee, PRISM intervention, Knee joint, Range of motion of knee

I. INTRODUCTION

Knee osteoarthritis (OA) is a persistent condition characterized by pain, disability, and decreased quality of life. It affects a significant portion of the population, with a global prevalence of around 3.8% when adjusted for age. It's projected that around 10% of individuals aged 55 and above will develop knee OA.[1]

Traditional treatments encompass non-pharmacological strategies, medication, and surgical options. Manual therapy, a common practice for musculoskeletal issues, falls within non-pharmacological interventions. Exercises, a fundamental non-drug therapy, are endorsed by international guidelines for managing OA patients. They aid in enhancing functionality and overall well-being, offering a safer alternative to drug-based approaches.[2]

Knee osteoarthritis (OA) leads to disability primarily due to pain, quadriceps dysfunction, and compromised proprioception. Additionally, it hampers the quadriceps muscle's ability to regulate force in OA patients. Despite these challenges, exercise therapy has proven effective in alleviating pain and enhancing function in knee OA patients. Pain, a prevalent factor contributing to physical inactivity in this population, varies in pattern and severity, impacting range of motion (ROM) and quality of life. Furthermore, muscle weakness associated with knee OA contributes to joint stiffness and reduced ROM during daily activities. Chronic pain experienced by knee OA patients leads to decreased joint usage and subsequent muscle weakness over time, further exacerbating the condition. [3]

It is imperative to implement both primary and secondary prevention measures to combat the increasing prevalence of osteoarthritis (OA), driven by factors such as an aging population, rising obesity rates, and sedentary lifestyles. While strategies devised for knee OA may not be universally applicable to other joints due to anatomical and physiological distinctions, tailored approaches are crucial. Primary

prevention strategies aim to mitigate the onset of specific diseases by reducing risks through behavioral modifications or minimizing exposure to disease agents. Examples include preventing knee injuries and obesity during adolescence, which are pertinent to OA prevention. Secondary prevention involves identifying and addressing risk factors in individuals already at risk. Three key factors with potential for both primary and secondary intervention are obesity, trauma, and impaired muscle function. [4]

Osteoarthritis (OA) is increasingly affecting younger individuals, ranking among the top 20 diseases in the 40 to 45-year-old age group, with an estimated rise in prevalence from 26.6% in 2012 to 29.5% by 2032 among those aged 45 years and older. Common symptoms experienced by OA patients include joint pain and stiffness. Pain typically occurs during weight-bearing activities and subsides with rest, although it may become less predictable over time. Stiffness is most pronounced in the morning or after prolonged periods of sitting. Radiographic features of OA include narrowing of joint space, deterioration of articular cartilage and meniscus, and bony changes such as subchondral bone sclerosis and osteophyte formation. Synovitis, triggered by a macrophage-mediated innate immune response due to damaged joint tissues, is common in OA patients. Physical examination often reveals small or absent knee effusions, which feel cool to the touch. This differentiation is crucial for clinicians in distinguishing OA from other joint-related conditions causing pain. [5]

While osteoarthritis (OA) is primarily attributed to articular cartilage degeneration and acute injury, its underlying causes are multifaceted and involve various factors such as genetic predisposition, metabolic syndrome, biomechanics, chronic inflammation, and gut microbiota. Metabolic disorders, particularly obesity and diabetes, are increasingly recognized as contributors to the onset and progression of OA, often stemming from unhealthy diets and sedentary lifestyles. Genetic factors have long been associated with OA development. Mechanical loading also plays a significant role, as joints endure constant stress, but abnormal mechanical loads can lead to cartilage damage. Gender disparities in OA risk are often overlooked, yet emerging evidence indicates variations in OA incidence and severity between males and females, with a higher age-adjusted prevalence observed in female patients. [5]

Paraffin bath therapy induces temperature rises of 7.5°C within the joint capsule and 4.5°C within the muscles. This treatment locally relaxes smooth muscle fibers in arterioles, leading to peripheral blood vessel vasodilation. Consequently, this process generates hyperemia, enhances tissue fluid transduction, increases lymph flow, and facilitates the absorption of exudates. [6]

Manual therapy can serve as a component of a comprehensive conservative treatment plan for knee osteoarthritis, employing multiple modalities. [7].
Isometric resistance training enhances functional capacity and alleviates knee joint pain in individuals with knee osteoarthritis. [8]

Individuals with knee osteoarthritis experience a reduction in the range of motion for flexion and extension in the joint. The loss of knee extension range of motion is a common occurrence in OA, potentially affecting the flexibility and stiffness of the hamstring muscles due to prolonged shortening. The interaction between aging and OA further exacerbates these effects on the knee joint. However, these alterations in tissue characteristics have not been extensively studied in the OA population. Stretching exercises represent a viable approach to improving range of motion in both the short and long term. [9]

Gait patterns exhibit disparities between older individuals with and without knee osteoarthritis (OA). Those with knee OA typically demonstrate reduced gait velocity and shorter step lengths compared to their counterparts without the condition. [10].

Changes in gait variables, such as reduced gait velocity and shorter step lengths, are linked to pain and uneven loading at the knee in individuals with knee osteoarthritis (KOA). Proprioceptive neuromuscular facilitation (PNF) stretching emerges as a preferred intervention for KOA rehabilitation, exhibiting greater effectiveness in pain relief compared to traditional stretching methods. Studies indicate that pain relief and decreased loading on the medial compartment of the knee positively influence gait patterns among older adults, leading to increased gait velocity and step length. These improvements are crucial for enhancing overall quality of life and delaying disability onset. In summary, PNF stretching has the potential to alleviate pain, balance knee loading, and enhance gait patterns, particularly during obstacle negotiation, in older adults with KOA. [10]

PRISM INTERVENTION OVERVIEW :

Paraffin wax is a type of wax derived from petroleum. In the context of knee osteoarthritis treatment, paraffin wax therapy involves immersing the affected joint in warm liquid paraffin wax to alleviate pain, stiffness, and inflammation.

REST

Rest refers to the cessation or reduction of physical activity involving the affected joint to allow for recovery and pain relief. Resting the knee joint can help prevent further aggravation of inflammation and discomfort.

ISOMETRIC

Isometric exercises involve the contraction of muscles without movement of the corresponding joint. These exercises aim to strengthen the muscles surrounding the knee joint while minimizing stress on the joint itself.

STRENGTH

Strengthening exercises focus on targeting specific muscle groups to increase their strength and endurance. In the context of knee osteoarthritis, strengthening exercises aim to improve the stability of the knee joint and support its function.

MOBILIZATION

Mobilization involves gentle movement or manipulation of the knee joint to improve its range of motion, flexibility, and function. Mobilization techniques may include passive stretching, joint mobilization, and manual therapy.

STRETCHING

Stretching involves elongating the muscles surrounding the knee joint to improve flexibility, reduce stiffness, and enhance range of motion. Stretching exercises may target specific muscle groups or encompass broader muscle groups.

METHODOLOGY :

Subject:- Subjects were taken according to the inclusion and exclusion criteria, those who satisfied the criteria were allowed to perform the series.
Study Design – Case Series
Study Duration – 6 weeks
Sampling Technique – Purposive Sampling
Sample Population – 7 Cases
Study Setting – Rama Hospital & Research Center (Rama physiotherapy OPD)

SELECTION CRITERIA

INCLUSION CRITERIA

- Participants agreed with the purpose of the study.
- Osteoarthritis of knee joint
- Age group 40-60
- Female
- Tenderness
- Pain
- Stage 1 and 2 OA

EXCLUSION CRITERIA

- Injury patients
- Male
- Other pathological conditions
- Infection
- Stage 3 and 4 OA

VARIABLES

INDEPENDET

- Age
- Gender
- Participants

DEPENDENT

- Scale result
- Pain

EQUIPMENTS

1. Wax bath
2. Orthopedic wax
3. Exercise Mat
4. Goniometer
5. Medicine ball
6. Towel/Cloth
7. Couch
8. Paint brush

DESCRIPTION OF PATIENTS

CASE 1

Patient 1- A 55-year-old female, housewife, presented with bilateral knee pain, reporting a Numeric Pain Rating Scale (NPRS) score of 5 for the right knee and 6 for the left knee. Additionally, her right knee had limited range of motion (ROM) at 120 degrees and her left knee at 100 degrees.

CASE 2

Patient 2- A 60years old female, housewife, reported similar symptoms with NPRS scores of 6 for the right knee and 4 for the left knee. Her ROM measurements were 90 degrees for the right knee and 110 degrees for the left knee.

CASE 3

Patient 3, a 65-year-old woman, working women experienced heightened knee pain, registering NPRS scores of 7 for the right knee and 9 for the left knee. ROM assessments indicated limited movement, with measurements at 110 degrees for the right knee and 70 degrees for the left knee.

CASE 4

Patient 4, aged 58, working women reported moderate knee discomfort, reflected by NPRS scores of 4 for the right knee and 2 for the left knee. ROM measurements were 100 degrees for the right knee and 90 degrees for the left knee, indicating restricted movement.

CASE 5

Patient 5, a 63-year-old female, housewife presented with significant knee pain, scoring 7 for the right knee and 8 for the left knee on the NPRS. ROM assessments showed limited flexibility, with measurements at 110 degrees for both the right and left knees.

CASE 6

Patient 6, aged 57, housewife, reported moderate knee pain, registering NPRS scores of 3 for the right knee and 2 for the left knee. ROM measurements were 100 degrees for the right knee and 120 degrees for the left knee.

CASE 7

Patient 7, a 61-year-old working woman, experienced severe knee pain, scoring 7 for the right knee and 5 for the left knee on the NPRS. ROM assessments revealed limited movement, with measurements at 110 degrees for both the right and left knees.

ALL ABOVE PATIENTS WERE DIAGNOSED WITH OSTEOARTHRITIS AND WE FOLLOWED THE TREATMENT PROCEDURE AS GIVEN BELOW;

PROCEDURE:-

Subjects were selected by Inclusion and Exclusion criteria. Total 7 subjects were taken,In this Case series. The PRISMS (Paraffin wax therapy, Rest, Isometric Strengthening, Mobilization, Stretching) intervention were given to these 7 patients for 6 weeks. In the management of knee osteoarthritis, an array of therapeutic interventions exists to alleviate pain, enhance joint function, and improve quality of life for affected individuals. One such comprehensive approach is the PRISM intervention. This multifaceted intervention aims to address the diverse aspects of knee osteoarthritis, encompassing pain management, joint flexibility, and functional mobility enhancement.

By meticulously preparing before applying the PRISM intervention, healthcare providers can ensure the safety, efficacy, and patient-centeredness of the treatment approach. These preparations lay the groundwork for the successful implementation of the intervention and contribute to the overall management of knee osteoarthritis.

OUTCOME MEASURE :

1. **Numeric pain rating scale;**

In a Numerical Rating Scale (NRS), patients are asked to circle the number between 0 and 10 that fits best to their pain intensity .Zero usually represents 'no pain at all' whereas the upper limit represents 'the worst pain ever possible'.

2. **Goniometer;**

A goniometer is a device used in physical therapy to measure a joint's range of motion (ROM). There are two "arms"—one that is stationary and one that is movable—that are hinged together. At the knee joint, most functional activities require up to 120 degrees of knee flexion, rather than the full 135 degrees, however, virtually all functional activities require full knee extension.

The following treatment table protocol was given to the subjects given below;

WEEK	PARAFFIN WAX BATH THERAPY	REST	ISOMETRIC	STRENGTHENING	MOBILIZATION	STRETCHING
Week 1	4 sessions of 10 minutes each	Emphasize rest, avoid strenuous activities	Quad Sets: 3 sets of 10 reps (quadriceps)	Leg Raises: 2 sets of 10 reps (quadriceps, hip flexors)	Patellar Mobilization: 2 minutes	Static Stretching: 2 sets, 30 seconds each stretch (quadriceps, hamstrings, calf muscles)
Week 2	Continue with 4 sessions of paraffin wax therapy	Continue rest as needed	Hamstring Contractions: 3 sets of 10 reps (hamstrings)	Leg Press: 2 sets of 12 reps (quadriceps, hamstrings, gluteus maximus)	Grade 2 Mobilization: 5 minutes	Dynamic Stretching: 2 sets, 30 seconds each stretch (quadriceps, hamstrings, calf muscles)
Week 3	4 sessions of paraffin wax therapyWeek 3	Maintain balance between activity and rest	Hamstring Curls: 3 sets of 12 reps (hamstrings)	Step-ups: 2 sets of 12 reps (quadriceps, hamstrings, gluteus maximus)	Grade 3 Mobilization: 10 minutes	PNF Stretching: 2 sets, 30 seconds each stretch (quadriceps, hamstrings, calf muscles)
Week 4	4 sessions of paraffin wax therapy	Emphasize rest after exercise sessions	Squats: 3 sets of 10 reps (quadriceps, gluteus maximus)	Leg Press: 2 sets of 12 reps (quadriceps, hamstrings, gluteus maximus)	Grade 3 Mobilization: 10 minutes	Foam Rolling: 2 sets, 60 seconds each (quadriceps, hamstrings, calf muscles)
Week 5	4 sessions of paraffin wax therapy	Ensure adequate rest between sessions	Single-leg lifts: 3 sets of 10 reps (hamstrings, gluteus maximus)	Step-ups with Overhead Press: 2 sets of 12 reps (quadriceps, hamstrings, gluteus maximus, deltoids)	Grade 3 Mobilization: 10 minutes	Dynamic Stretching Routine: 2 sets, 30 seconds each stretch (quadriceps, hamstrings, calf muscles)
Week 6	Final 4 sessions of paraffin wax therapy	Maintain balance between activity and rest	Eccentric Squats: 3 sets of 10 reps (quadriceps, gluteus maximus)	Squat Jumps: 2 sets of 10 reps (quadriceps, hamstrings, gluteus maximus)	Review and Reinforce Grade 3 Mobilization Techniques	Static stretching : 1 session, 30 minutes(quadriceps, hamstrings, calf muscles, hip flexors)

DATA ANALYSIS :

Data analysis was done using SPSS Statistics (software package used for statistical analysis 2019 version-Rev.) Descriptive statistics was done to determine the demographic characteristics of the subjects recruited in this series, paired sample t-test used. Paired sample t-test

used in hypothesis tests to help you decide whether to reject or fail to reject a null hypothesis.

PATIENTS	NUMERIC PAIN RATING SCALE (pre intervention)		NUMERIC PAIN RATING SCALE (post intervention)	
	Right knee	Left knee	Right knee	Left knee
PATIENT 1	5	6	2	2
PATIENT 2	6	4	3	1
PATIENT 3	7	9	3	5
PATIENT 4	4	2	1	1
PATIENT 5	7	8	3	4
PATEINT 6	3	2	1	1
PATIENT 7	7	5	2	2

TABLE-1

PATIENTS	GONIOMETER (pre intervention)		GONIOMETER (post intervention)	
	Right knee	Left knee	Right knee	Left knee
PATIENT 1	120	100	125	120
PATIENT 2	90	110	110	120
PATIENT 3	110	70	120	100
PATIENT 4	100	90	110	100
PATIENT 5	110	110	115	120
PATEINT 6	100	120	110	125
PATIENT 7	110	110	120	115

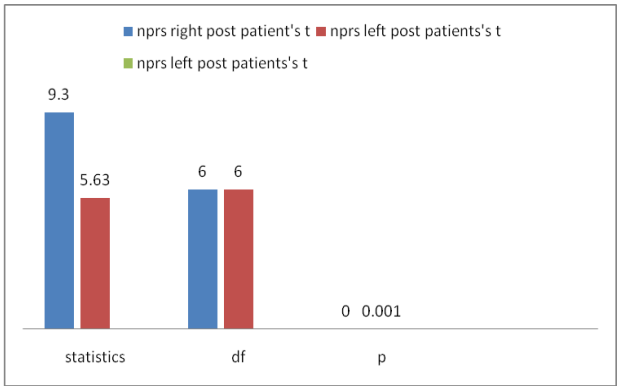
TABLE-2

RESULTS

Paired Samples T-test

Statistic	df	p
NPRS Right pre NPRS right post patient's t		
9.30	6.00	<0.001
NPRS left pre NPRS left post patient's t		
5.63	6.00	0.001

TABLE-3

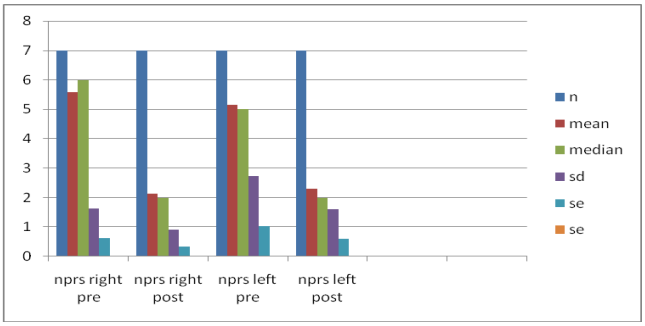


Statistics	df	p
GONIOMETER Right pre GONIOMETER Right post patient's t		
-5.29	6.00	0.002
GONIOMETER left pre GONIOMETER left post patient's t		
-3.75	6.00	0.009

Descriptives

	N	MEAN	MEDIAN	SD	SE
NPRS Right pre	7	5.57	6.00	1.618	0.612
NPRS right post	7	2.14	2.00	0.900	0.340
NPRS left pre	7	5.14	5.00	2.734	1.033
NPRS left post	7	2.29	2.00	1.604	0.606

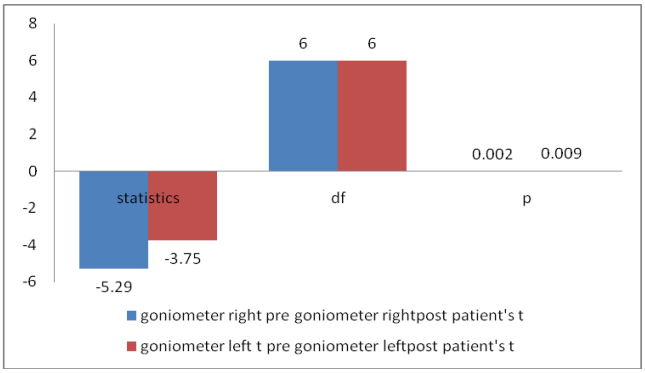
TABLE-4



Paired Samples T-test

Statistics	df	p
GONIOMETER Right pre post patient's t	-5.29	6.00 0.002
GONIOMETER left pre patient's t	-3.75	6.00 0.009

TABLE-5

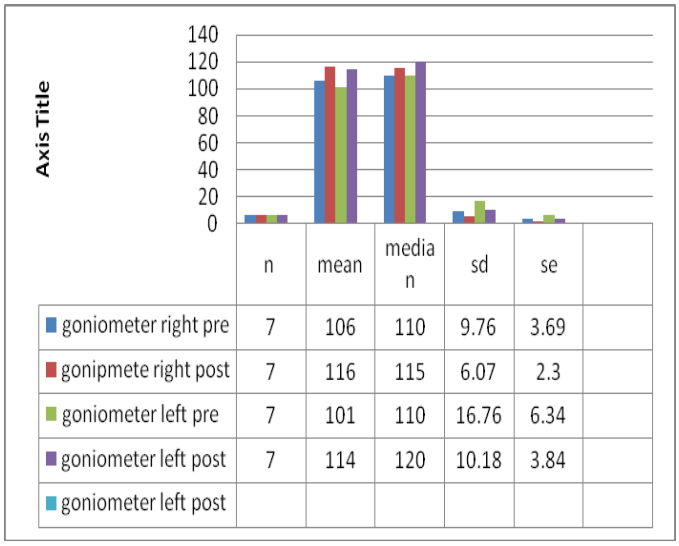


S. no.	AGE	weight	HEIGHT	GENDER	BMI	PRE -NPRS		Pre-goniometer		POST-NPRS		POST-GONIOMETER	
						RT KNEE	LT KNEE	RT KNEE	LEFT KNEE	RT KNEE	LEFT KNEE	RT KNEE	LEFT KNEE
1	45	65	5.2	F	26.2	5	6	120	100	2	2	125	120
2	42	70	5	F	30.1	6	4	90	110	3	1	110	120
3	60	60	4.9	F	26.9	7	9	110	70	3	5	120	100
4	58	75	5.5	F	27.5	4	2	100	90	1	1	110	100
5	40	80	4.8	F	39.5	7	8	110	110	3	4	115	120
6	40	67	5.1	F	27.9	3	2	100	120	1	1	110	125
7	42	58	5.3	F	22.7	7	5	110	110	2	2	120	125

DESCRIPTIVES

	N	MEAN	MEDIAN	SD	SE
GONIOMETER Right pre	**7**	**106**	**110**	**9.76**	**3.69**
GONIOMETER Right post	**7**	**116**	**115**	**6.07**	**2.30**
GONIOMETER left pre	**7**	**101**	**110**	**16.76**	**6.34**
GONIOMETER left post	**7**	**114**	**120**	**10.18**	**3.84**

TABLE 6



MASTER SHEET

In all the participants, results are significant at 5% level of significant

DISCUSSIONS

The PRISMS intervention, comprising Paraffin wax therapy, Rest, Isometric exercises, Stretching, Strengthening, and Mobilization, presents a comprehensive approach to managing knee osteoarthritis symptoms. In this case SERIES involving seven patients, the effectiveness of PRISMS was evaluated through various outcome measures including pain levels, and range of motion. The data analysis reveals intriguing insights into the intervention's impact on patients' well-being. While there were fluctuations in pain levels between the two sets of measurements, overall, there was a noticeable reduction in pain from the initial to subsequent assessments. This suggests that the intervention may have contributed to alleviating knee discomfort over time. Additionally, consistent muscle strength and improved range of motion across both sets of measurements indicate positive outcomes in enhancing functional mobility and joint flexibility among patients.

Furthermore, the analysis underscores the importance of individualized treatment approaches in managing knee osteoarthritis. Each patient exhibited unique responses to the

intervention, highlighting the necessity of tailored care plans that address specific needs and goals. Factors such as patient compliance, adherence to exercises, and the presence of side effects also play crucial roles in treatment outcomes. By closely monitoring these variables, healthcare providers can optimize the delivery of PRISMS and maximize its therapeutic benefits for patients with knee osteoarthritis.

In conclusion, the PRISMS intervention offers a promising strategy for effectively managing knee osteoarthritis symptoms and improving patients' quality of life. Through a multidimensional approach encompassing various therapeutic modalities, PRISMS addresses the multifaceted nature of the condition, targeting pain reduction, and functional enhancement. Moving forward, further research and clinical trials are warranted to validate the long-term efficacy and sustainability of PRISMS in a larger patient population. Nevertheless, this case series underscores the potential of PRISMS as a valuable intervention in the comprehensive management of knee osteoarthritis.

II. CONCLUSION

Hence we concluded that overall, based on result of this series , it can be said that “PRISMS INTERVENTION FOR KNEE OSTEOARTHRITIC PATIENTS TO REDUCE PAIN AND INCREASE JOINT RANGE OF MOTION is significantly observed so the null hypothesis is rejected and alternate hypothesis is accepted.

PRISMS intervention offers a promising approach to managing knee osteoarthritis symptoms through its comprehensive and holistic treatment modalities. By addressing pain, muscle weakness, and joint dysfunction, the intervention aims to improve functional outcomes and enhance quality of life for patients with knee osteoarthritis.

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