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The effect of prehabilitation program regarding compression therapy on post-surgical swelling and pain among patients with total knee arthroplasty

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Abstract---Background: Total knee arthroplasty is a medical treatment that involves removing the diseased knee and replacing it with a prosthesis. Following a total knee arthroplasty, postoperative knee swelling and pain are frequent. Compression therapy is often offered as part of rehabilitation to improve postoperative patient- knee pain and swelling. Aim: To investigate the effect of a rehabilitation program regarding compression therapy on post-surgical swelling and pain among patients with total knee arthroplasty. Research design: To achieve the goal of this study, a quasi-experimental research design was used. Setting: This study was carried out in Orthopedic Surgery Department at Ain Shams University Hospital. Subjects: The study included a purposive sample of 100 adult patients who were randomly and equally divided into two groups (50 each), the first was the control group and the second was the study group (compression therapy group). Tools of data collection: Four tools were utilized; Tool (I): Structured interviewing questionnaire consisted of two parts: Part (1): Patients' personal data sheet and Part (2): Patients' medical data sheet Tool (II): Range of motion scale, Tool (III): Swelling measuring

scale, Tool (IV): Visual Analogue Scale (VAS) for pain. Results: The current study revealed that Patients' ranges of motion improved significantly, and postoperative knee swelling was significantly reduced. in the compression therapy group when compared with the control group. A significant difference existed between the compression therapy group and the control group regarding post-total knee arthroplasty pain mean scores. Conclusion: A prehabilitation program regarding compression therapy has a positive effect on reducing post-surgical swelling and pain among adult patients with total knee arthroplasty. Recommendation: It is recommended to use compression therapy for patients with total knee arthroplasty to reduce post-surgical swelling and pain.

Keywords---compression therapy, pain, rehabilitation program, swelling, total knee arthroplasty.

Introduction

Patients with knee osteoarthritis feel pain, swelling, restricted joint motion, and stiffness because the synovial joint is inflamed. Osteoarthritis is a common chronic condition in older persons over 65 years of age. Previous research has suggested practical physical therapy interventions, including manual therapy, physical agent treatment, the use of braces and orthoses, aerobic walking, strengthening training, balance training, home exercises, self-management programs, and weight reduction programs (Chughtai et al., 2019). Although these physical therapy methods have yielded worthwhile benefits, individuals with end-stage knee osteoarthritis continue to think about getting a total knee arthroplasty (TKA) to enhance their quality of life and physical function (Goh et al., 2019).

Major complications are rare, but haemarthrosis, swelling, and lymphoedema may affect the patient in the early postoperative period and lead to prolonged rehabilitation. Cold therapy, compression therapy, immobilization, elevation of the affected limb, and other measures can be performed to reduce post-operative swelling (Brock et al., 2017). Swelling, which has a prevalence of 90.7% after total knee arthroplasty (TKA), is a significant post-operative problem and the most common patient-reported complication (Szots et al., 2015).

According to Linda et al. (2021), swelling can make it difficult to move the knee, create pain and discomfort, and make rehabilitation more difficult and time-consuming. Swelling is brought on by intra-articular hemorrhage and inflammation of the periarticular tissues. A body mass index (BMI) of 30 kg/m2 is a marker of obesity, and the proportion of TKA patients who are obese is increasing (Odgaard et al., 2017). In 2016, 39.8% of Danish TKA patients were obese.

The risk of post-surgical problems following TKA is especially high in obese patients with a BMI of 30 kg/m2 (Ayyar, Burnett R, Coutts et al., 2018). Due to readmissions and unplanned outpatient visits, the increased complication rate among obese patients has socioeconomic repercussions (Schairer et al., 2014),.

According to Rossman et al. (2016), swelling in the operated leg was a factor in 25.2% of visits to the emergency room 90 days after surgery, with a 10% readmission rate (Rossman et al., 2016). Within 30 days of their primary knee replacement surgery in 2016, 8.2% of Danish patients were readmitted (Odgaard et al., 2017). Although the readmission rate for obese Danish TKA patients is unknown, several studies (Zusmanovich et al., 2018; George et al., 2018) have shown that obesity increases the risk of readmission and other problems following TKA.

After TKA, post-surgical swelling may be more successfully treated (Rossman et al., 2016). Cold compression, cryotherapy, elastic bandaging, compression bandages, and compression therapy are techniques for reducing and preventing edema (Brock et al., 2017). The Centre for Planned Orthopaedics at Naestved Hospital also recommends the use of foot pumps, knee movements, raising the leg above the heart, rest, and mobilization as additional treatment options. While it is possible to reduce post-operative knee swelling after TKA, more study is needed to identify potential therapies that could do so. By applying controlled pressure to the leg, which encourages the blood to travel up toward the heart, a compression stocking is a practical intervention to reduce swelling (Lim and Davies, 2014).

A Danish randomized controlled study (RCT) examined the impact of wearing a medical elastic compression stocking for 4 weeks following surgery and discovered the stocking had no clinically significant impact on post-surgical swelling. Although 70% of the swelling following surgery had already happened on that day, Due to inconsistent results in the medical literature and varied technique, the effectiveness of compression therapy in TKA is still unknown (Brock et al., 2017).

TKA is a surgical treatment that involves implanting a prosthesis instead of a damaged knee. Due to improvements in surgical and artificial prosthesis design over the past few decades, it has been proposed as an effective treatment for reducing pain and restoring physical function in patients with end-stage knee osteoarthritis (Kim et al., 2020 Lei et al., 2020). 3.48 million primary TKA operations are anticipated to be done in the US by 2030, an increase of 673% (Kurtz. et al., 2017). In Korea, primary TKA is carried out in more than 75,000 instances per year (Statistics Korea).

Patients continue to experience persisting limitations in physical function, muscle strength, and balance until the first year following surgery, despite studies of relevant outcomes in terms of pain, functional recovery, and quality of life after a successful TKA (Jiang et al., 2017). Numerous physical therapy approaches have been shown in prior research to help patients with TKA achieve effective physical and functional outcomes (Berghmans et al., 2018). Although preoperative physical function and muscle strength may influence postoperative results, the majority of physical therapy therapies for TKA rehabilitation concentrate on the immediate aftermath of surgery (Devasenapathy et al., 2019).

For those with severe knee arthritis, knee replacement surgery can reduce discomfort and enhance the quality of life. Total knee arthroplasty (TKA), also referred to as total knee replacement, is one of the most popular orthopedic

procedures. This orthopedic procedure has the best success rate. The procedure has an excellent track record in the medical literature, with positive long-term results and low complication rates (Li et al., 2020). However, because of intraarticular hemorrhage and periarticular tissue inflammation, postoperative knee swelling is a prevalent complication. Quadriceps weakness and atherogenic reflex inhibition brought on by pain lead to poor functional performance, which can delay rehabilitation, lengthen hospital stays, and worsen patient-reported outcomes. Furthermore, greater rates of wound dehiscence and infection are linked to severe knee swelling (Wu et al., 2020).

Three reasons could account for this phenomenon. First, lifting the leg increases the flow of blood into the intrathoracic veins from the lower limb vasculature, which increases cardiac preload. Furthermore, straight leg elevating is connected to a rise in systemic vascular resistance. The gravity impact will also greatly lessen the blood shift to the ischemic limb when the leg is lifted during deflation (Sonbol & Ghareeb, 2021).

Jiang et al., (2018) found that knee swelling after TKA results in a decrease in knee-extension strength and functional performance impeding postoperative mobilization and training. Knee swelling after total knee arthroplasty (TKA) is caused by intraarticular bleeding and inflammation of the periarticular tissues. Doiron-Cadrin et al., (2020) discovered that a high-compression bandage from the toes to the middle of the thigh can sustain compression for at least 48 hours and minimize intraarticular postoperative hemorrhage. Although the non-elastic qualities of the dressing may cause discomfort during knee flexion, this tight compression bandage does not prevent the patient from moving around (Vasta et al., 2021).

Venous ulcers and lymphedema are well-established conditions for compression bandage therapy. By increasing the calf muscle pump's efficiency and allowing blood to flow from the superficial to deep venous systems, the application of this external compression promotes venous return and lowers hydrostatic pressure in the leg. Inelastic bandages are preferred in arthroplasty because they offer a low, comfortable resting pressure yet activate the deep venous system and calf muscle pump more effectively when walked on than their elastic counterparts do (Bjork & Ehmann, 2019).

Prehabilitation (or preoperative rehabilitation), which entails medical or behavioral support interventions like physical therapy, exercise, and lifestyle changes carried out before surgery, has been used with positive results in patients with cancer, cardiopulmonary diseases, and musculoskeletal diseases (Durand et al., 2019). Preoperative rehabilitation programs for patients scheduled for TKA have been shown to reduce postoperative pain, range of motion (ROM), stiffness, muscle strength, length of hospital stay (LOS), and health-related quality of life; however, the effectiveness of preoperative interventions varied with intervention protocols such as intensity, frequency, the content of the program, and duration of intervention, and is still debatable. Furthermore, a rehabilitation program for patients who are candidates for TKA has been shown to provide benefits in terms of early-phase outcomes after TKA (Sharma et al., 2019).

Staff nurses play a crucial part in maintaining and enhancing post-operative care as TKA patients' quality of life improves significantly. These treatments may involve limb placement, methods for reducing swelling, assistance with the use of wheelchairs and canes, teaching patients how to utilize elastic bandages, and postoperative range-of-motion exercises for patients (Guo et al., 2021).

Significance of the study

Total knee arthroplasty alters postoperative complications, as observed by knee function and the occurrence of swelling and pain (Lei et al., 2021). Post-operatively, all researchers studied and performed change position only or wearing compression without standards program of care, this led to slow improvement of knee range of motion and recovery in the postoperative period (Cabral et al., 2019). Consequently, the study aimed to investigate the effect of a rehabilitation program regarding compression therapy on post-surgical swelling and pain among patients with total knee arthroplasty.

The aim of the study

To investigate the effect of a rehabilitation program regarding compression therapy on post-surgical swelling and pain among patients with total knee arthroplasty.

Study hypotheses

Compression therapy used postoperatively is expected to help patients who have total knee arthroplasty experience less discomfort and swelling.

Research design

The quasi-experimental research design was utilized to fulfill the aim of this study.

Subjects and Methods

Setting

This study was carried out in Orthopedic Surgery Department at Ain Shams University Hospital. This setting was selected due to the high prevalence of patients in the selected setting, and also because it serves the biggest region of the population.

Subjects

A purposive sample of 100 adult patients underwent the study; they were randomly and equally split into two groups, each with 50 participants; the first group served as the control group, and the second was the study group (compression therapy group).

Randomization

Using a random sample technique, the participants were selected. The randomization was done by letting each lady choose a piece of paper. The study group consists of adult patients who select the paper with the letter S, whereas the control group consists of the paper holding the letter C. The trial group receives compression therapy, whereas the control group receives only routine medical attention.

Sample size calculation

The level of significance for power analysis, 0.95(=1-0.95=0.5), at alpha, was used to calculate the sample size. 0.05 (one-sided) was chosen as the significance level, and 0.001 was chosen as the level of extreme significance.

Inclusion criteria included

- Patients are older than 21.
- Patients who consent to participate in the study
- Patients undergoing their first operation on one or both legs
- On the same operation day

Exclusion criteria included

- Patients are suffering from another chronic disease
- The patients unable to be cooperating and use the compression therapy were excluded from the study sample.

Tools of the study

Four tools were used to collect the data for the study as the following:

The tool I

A structured interview questionnaire was developed by the researchers after reviewing the related literature and research studies (Wu et al., 2020; Sonbol & Ghareeb, 2021; & Guo et al., 2021); it included two parts:

- Part (1): Patients' data sheet: It included personal data of patients such as age, educational level, occupation, and residence.
- Part (2): Patients' medical data sheet: It included past and medical data-related items such as previous orthopedic problems, body mass index (BMI), knee pain duration, and the affected limb

Tool (II):- Range of motion scale for each leg

The superior arm of the goniometer was positioned with the greater trochanter of the femur, the axis was aligned with the center of the patella, and the inferior arm was aligned with the lateral malleolus to measure the range of motion in both knees. Using a goniometer, the researcher calculated the range of motion. The

patient was positioned supine with the movable arm of the goniometer aligned with the lateral malleolus of the ankle, the axis of the device placed on the lateral epicondyle, and the stationary arm of the device on the greater trochanter of the femur (Krkaya et al., 2021). Flexion happens in the hip, and the knee is where the angle is measured. At evaluation and discharge, the range of motion was evaluated.

Tool (III):- Swelling measuring scale

The researchers used a tape measure to measure the circumference of each leg, taking measurements at the patella's center and 10 cm above the proximal pole of the thigh and Utilizing it to determine whether the affected limb is swollen (Brodovicz et al., 2009).

Tool (IV):- Visual Analogue Scale (VAS) for pain

A widely used standardized scale for determining pain severity is called the VAS (Visual Analogue Scale). The severe pain from the previous day, as well as pain during physical therapy, was mentioned. The test-retest reliability, however, was (r = 0.94). Participants could rate their pain on the VAS using a single, 11-point numerical scale, selecting a number between 0 and 10. To assess the degree of pain before and after each session, VAS was used in this study. Participants were asked to choose a number twice daily that accurately indicated their level of pain. The NRS uses a 0–10 scale to classify different degrees of pain: none (zero), minor pain (1-3), substantial pain (4), and severe pain (zero) (5) (Freyd, 1923).

Validity of the tools

Three experts in the fields of medical surgical nursing and surgery evaluated the tools' content validity as well as their clarity, comprehensiveness, appropriateness, and relevance. To guarantee sentence clarity and content appropriateness. No modifications were made by the panel's judgment.

Reliability of the tools

The Visual Analogue Scale (VAS) for measuring pain had a r = 0.94 reliability score. With a total score of Cronbach's alpha of 0.87, the swelling measuring scale reliability is regarded as good. The reliability of a structured interview questionnaire was (r = 0.93).

Methods

To perform the study, a letter of official approval was received from the director of the orthopedic surgical department and post-operative care unit at Ain Shams University Hospital. After fully explaining the steps of this study and how they might affect the patient's outcome, participants who wished to participate in the study provided their oral consent.

Ethical Consideration

Each participant completed an oral permission form following a discussion of the study's goals and advantages. It was emphasized by the researchers that each patient had the right to resign from the study at any time and for any reason, and that participation in it was purely optional. Also guaranteed were anonymity and confidentiality.

A pilot study

10% of the study subjects—10 patients, five from each group—were subjected to it, adding to the main study. The purpose of the pilot study was to determine the tools' clarity, applicability, feasibility of use, and amount of time required to complete each tool. In light of the results of the pilot study, no changes were made.

Data Collection Procedures

The researchers visited the settings they had previously selected twice a week, from 9 am to 12 pm. From the beginning of May to the end of September 2021, five months of data collection were involved. About 30 to 35 minutes were needed to complete each interview tool. Before presenting the study's goal to each patient they visited, the researchers introduced themselves. The researchers conducted in-person interviews with the patients while also reading them the questions and possible answers to help them complete the tools. The assessment, implementation, and evaluation phases made up the study's implementation process.

Assessment phase

By having brief conversations with the patients at first, the researcher developed positive relationships with them. The survey questions (demographic and medical data sheet) were answered by the researchers. The investigation's objective and subject matter were described.

Implementation Phase
For the compression therapy group

Compression therapy (group 2) and the control group (group 1), who received standard care, were given to the patients in separate groups. The day before the procedure, the researchers visited with the patients to gather data. The data was gathered from the nurses' records, and each patient was dealt with individually. The entire data collection process took around 45 minutes. The researchers provided full instructions to the patients under study to aid in their understanding of the procedures that were carried out on them. They were able to cooperate and work together as a result.

Patients performed compression therapy

In the beginning, the researcher offered the patients an explanation of the procedures "with the assistance of physiotherapist in the study setting" and provided them with a coloring book that made it easier for them to comprehend what they had to do.

Compression therapy instructions

Patients in group 2 who normally would have received a wool and crepe bandage instead received a compression bandage over the hydrocolloid surgical wound dressing. On the injured leg, a gentle inner layer was applied with a 50% bandage overlap from the toes to the groin. Then, with another 50% bandage overlap, the outer compressive layer bandage was firmly put over the top. Before wrapping the bandage around the leg, the bandage was fully stretched to ensure that the application had sufficient compression.

Its length up the thigh made its application after the tourniquet was released necessary. The nurses were shown a training video on proper bandage application and given a tutorial on bandage application with real-life bandage application and feedback to achieve uniformity in bandage application. After the surgery, the hydrocolloid wound dressing was left in place after the bandage was removed. Pre-, post-1, post-2, and post-28-day postoperative assessments of swelling, discomfort, and range of motion were conducted.

For the control group

Every patient in the control group had a face-to-face discussion with the researchers during which they introduced themselves, discussed the study's goals, and obtained their verbal consent. Following this, the researchers used the same methods to gather data on the patient's personal and medical information, VAS scores, and assessments of swelling, pain, and range of motion done before, after 1, after 2, and after 28 days following the procedure. The control group got standard care, which included adhering to surgical protocol, assessing postoperative progress, determining the location of discharge, taking medications, and engaging in simple exercise interventions.

Statistical Design

All the data was tallied and examined. For statistical analysis, SPSS software version 19 was used. Frequency and percent were used to express categorical data. The mean and standard deviation (SD) were used to express numerical data. The T-test was used to compare the three sets of numerical data that were analyzed. The Chi-square test was developed to compare numerical data groups. If the P-value was less than 0.05, it was regarded as significant, if it was less than 0.001 it was considered highly significant, and if it was more than 0.05, it was considered non-significant.

Results

According to Table 1: there were no statistically significant differences between any of the groups, the mean ages in years for control and compression therapy groups were (45.56 ± 5.33 and 50.12 ±3.33, respectively), and the majority were females and worked. Concerning residence, 60% and 58% of the studied nurses in both control and compression therapy groups were living in urban areas respectively.

According to Table 2, it was observed that all group's average BMIs were 28.45±4.23 and 24.67±12.21 respectively. Concerning previous orthopedic problems, the right leg was the affected leg in more than three-fifths (62%) of patients in the control group compared to about two-fifths (58%) in a compression therapy group, who experienced knee pain for more than five years in the past. Figure (1) portrays that after four weeks following the operation, there was a statistically significant difference in knee swelling among both groups. In comparison to the control group, the compression group showed a substantial improvement postoperatively (P 0.003*).

Figure (2): Illustrates that after four weeks of operation, there was a statistically significant difference in the knee range of motion (degrees) between both control and compression therapy groups. The table also shows that the compression therapy group significantly improved compared to the control group in terms of range of motion at four weeks following arthroplasty (P 0.022*).

Figure (3) demonstrated that concerning the mean pain scores after four weeks following the operation, there was a statistically significant difference between the analyzed groups. When comparing the compression therapy to the control group after four weeks postoperatively, with a reduction in the mean analog pain levels.

Table (3) shows a statistically significant association between the BMI, ages of control, and compression therapy groups after four weeks postoperatively.

Table 1
Demographic data of both studied groups (no=50 each group)

Demographic data	Control group (N=50)		Compression therapy (N = 50)		P. value
	No.	%	No.	%	
Age (years):					
> 21	3	6.0	2	4.0	0.446
< 30	5	10.0	6	12.0	
< 40	10	20.0	12	24.0	
<55	32	64.0	30	60.0	
Mean ±SD	45.56 ± 5.33		50.12 ±3.33		
Sex					
Female	31	62.0	32	64.0	0.564
Male	19	38.0	18	36.0	
Occupation					

Work	34	68.0	33	66.0	0.336
Not work	16	32.0	17	34.0	
Residence					
Urban	30	60.0	29	58.0	0.543
Rural	20	40.0	21	42.0	

Table 2
Medical data of both studied groups (no=50 each group)

Medical data	Control group (N=50)		Compression therapy (N = 50)		P. value
	No.	%	No.	%	
BMI Mean ±SD	28.45±4.23		24.67±12.21		0.288
knee pain > 5 Yrs.	24	48.0	25	50.0	0.352
Previous orthopedic problems					
No	48	96.0	49	98.0	0.774
Yes	2	4.0	1	2.0	
Affected limb					
Right	31	62.0	29	58.0	0.889
Left	19	38.0	21	42.0	

Chi square test ** The significant level < 0.05*

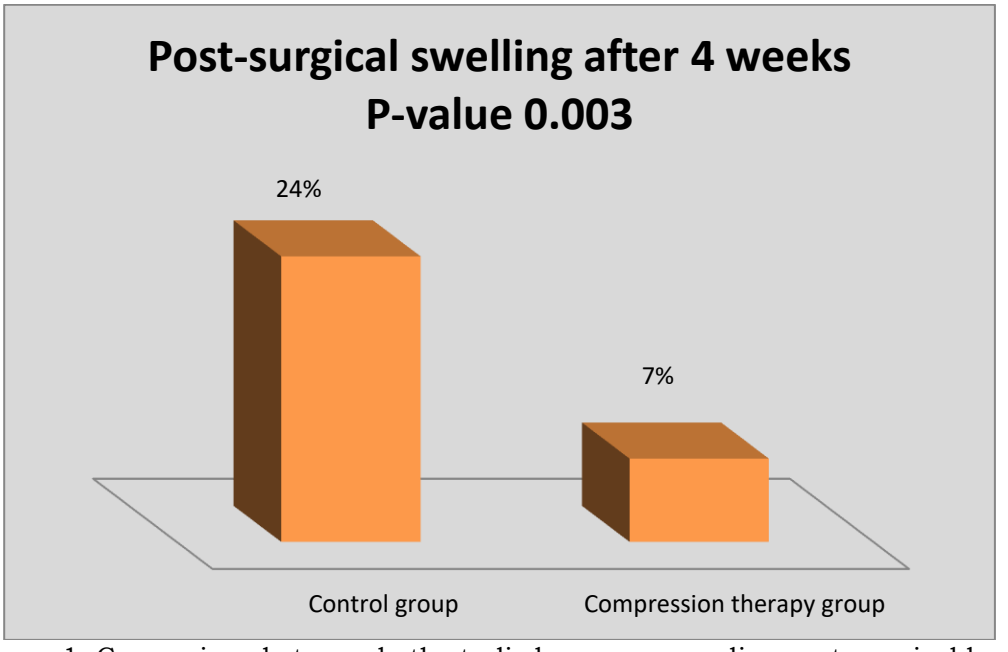

Figure 1. Comparison between both studied groups regarding post–surgical knee swelling after four weeks (no=50 each group)

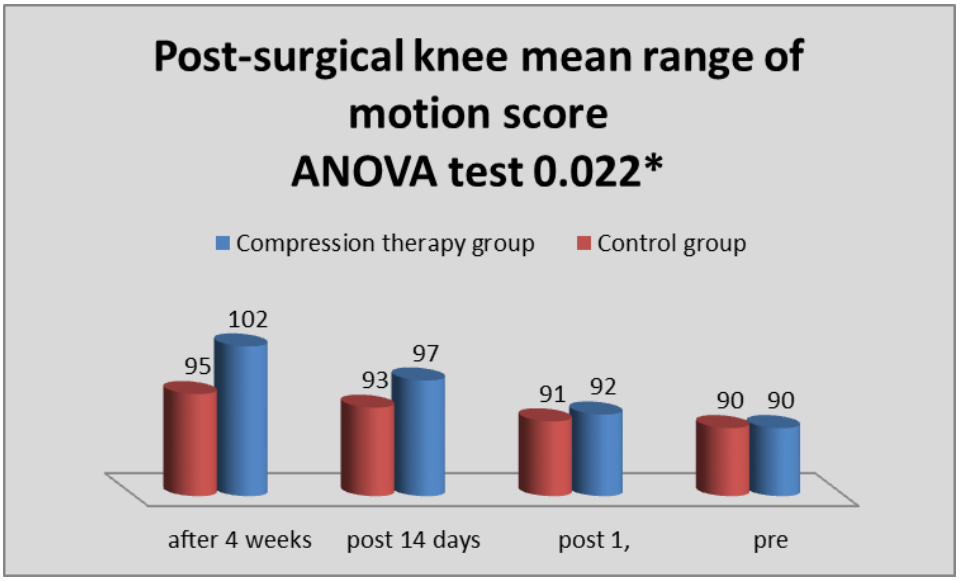

Figure 2. Differences between both studied groups regarding post–surgical knee range of motion pre, post-1, post-14 days, and after 4 weeks (no=50 each group)

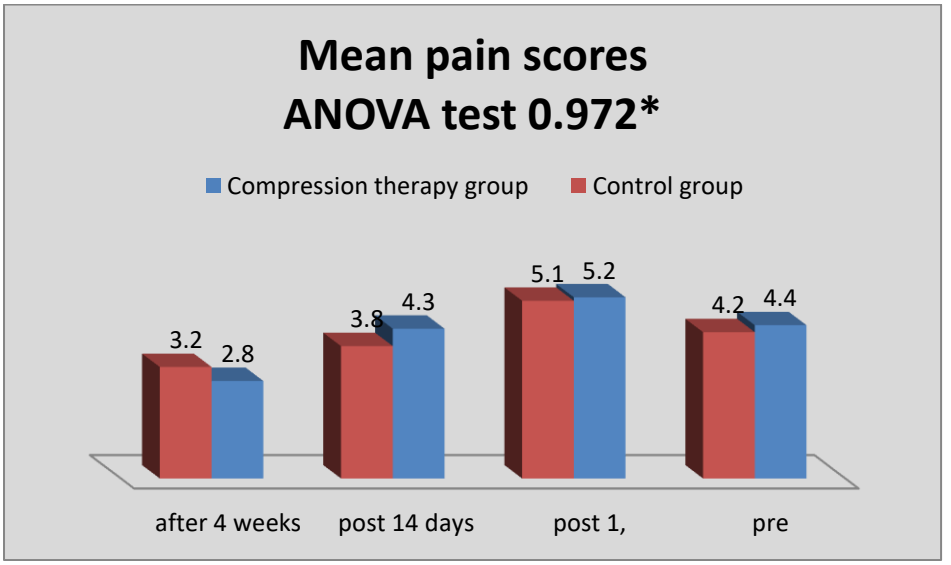

Figure 3. Differences between the both studied groups regarding mean analog pain scores pre, post 1, post 14 days, and after 4 weeks (no=50 each group)

Table 3
Correlation between BMI & patients' ages of both studied groups after 4 weeks postoperatively (no=50 each group)

Items	BMI Mean ±SD	Age Mean ±SD
Control group	30.07±1.32 *p<0.05**	44.13 ± 6.38 *p<0.001***
Compression therapy	20.43±12.22** *p<0.001*	50.13 ±3.56 *p<0.001***

*ANOVA test * Correlation is significant at the 0.05 level. ** Correlation is significant at the 0.01 level.*

Discussion

The current study's findings showed that there were no statistically significant differences between any of the groups. This is crucial to guarantee the comparability of the two groups and shows that the randomization of the groups was successful. This is supported by Boonchoo et al., (2019), who made sure that the data were reliable and had good randomization. According to the current study's findings, the mean ages in years for the compression therapy and control groups were 45.56 5.33 and 50.12 3.33, respectively. This result conflicts with that of Brophy et al. (2014), who asserted that the majority of TKA patients in their study had mean ages and standard deviations of 59 10 years.

However, Hansen et al., (2019) statement that TKA patients were among those who were much younger than older patients does not line up with this. According to the study, surgery is a sign of knee injury in younger people rather than the cause of early osteoarthritis of the knee. Surgery should be used to treat meniscal and ligament tears as the underlying clinical issue. Surgery cannot be used to heal these wounds since osteoarthritis may develop over time and make TKA among the injured sufferer necessary.

The majority of the nurses evaluated in both the compression therapy and control groups were found to be female, according to the findings of the present study. This data conflicts with that of Miozzari et al., (2021), who claimed that males are more likely than women to have had previous knee surgery before TKA and that the impact of past knee surgery is more pronounced on men as those patients undergo TKA. According to this study from Keenan et al., (2019) women and people older than 47 have a significantly higher risk of undergoing a complete arthroplasty too soon. When designing an intervention for isolated medial compartment osteoarthritis, these risk factors should be taken into account beforehand.

The implications are troubling considering the rising prevalence of knee surgery, particularly ligament restoration in young and female patients. Although the prevalence of obesity and the population's aging has increased the need for knee arthroplasty, the rising volume of ligament and meniscal surgery may also be a factor driving up the demand for knee arthroplasty in a younger demographic

(Rice et al., 2019). Additionally, obese patients are expected to have a 2.8 higher likelihood of utilizing a walking aid following therapy than non-obese women (Bjork & Ehmann, 2019). According to the researcher, having a higher BMI results in the freshly replaced knee being subjected to too much pressure, which may affect how quickly and successfully the rehabilitation proceeds.

The majority were found to be employed, per the findings of the present investigation. This agrees with Jenny et al., (2021) findings that nonsporting patients made up the majority of those undergoing total arthroplasty patients. Additionally, Kort et al., (2020) concluded that TKA might be a useful tool for some patients to continue working but might not have an impact on patients who are already unemployed.

Regarding the medical information of the total knee arthroplasty patients under study, it was found that the average BMI for each group was 24.67 12.21, and 28.45 4.23, respectively. Accordingly, Hayes et al., (2020) concluded that overweight people with a BMI of more than 27 kg/m2 are more prone to display signs of knee osteoarthritis. Because the joint is bearing too much weight, there is a link between the two. Boyce et al., (2019) claim that obese individuals are undergoing TKA procedures at a higher rate is not supported by the evidence.

Regarding previous orthopedic issues, more than three-fifths of patients in the control group had their right leg impacted, as opposed to more than two-fifths of patients in the compression therapy group, who had knee pain for more than five years in the past. According to the results of this investigation, the right leg was the one that was most damaged. Similar findings were made by Burgess et al., in 2021, who discovered that the right leg's knee was the one most commonly impacted by osteoarthritis. But Rohner et al., (2019) observed no difference between the two legs in terms of the indication of TKA, therefore this is not consistent with their findings.

In the current study, around 25% of patients in each group had knee pain in the previous five years. This is in agreement with Rice et al., (2019) who verified that osteoarthritis is a chronic condition accompanied by persistent pain. In this regard, Doiron-Cadrin et al. (2020) discovered that osteoarthritis outbreaks typically precede by 6 to 12 weeks in their study subjects with osteoarthritis.

The current study's findings show that there was a statistically significant difference in knee swelling between the two groups four weeks after surgery. The compression group had a significant improvement following surgery in contrast to the control group. According to the study, adding compression therapy to the treatment regimen may duplicate the advantages, reduce postoperative swelling, and improve strength, mobility, and fitness.

In this regard, Hendrickx et al., (2020) provided evidence that postoperative knee swelling is a prevalent concern caused by intra-articular hemorrhage and periarticular tissue inflammation. According to Cook et al., (2019), using an inelastic, short-stretch compression bandage after TKA is a safe procedure that patients can tolerate and ascertain its impact postoperatively, a bigger, multicenter investigation is required. According to Liu et al. (2020), the use of

inelastic bandages is recommended in arthroplasty because they have a low, comfortable resting pressure but activate the deep venous system and the calf-muscle pump more effectively during ambulation than their elastic counterparts do.

Additionally, Matthews et al., (2019) stated that the auxiliary posture (using seats, the legs are situated as the manufacturer specifies.) appears to be more effective when compared to straight leg raising, addressing the prevention of cardiovascular unfavorable effects linked with deflation. Another study conducted by Osman (2020) found no evidence of a significant impact of leg raising on postoperative swelling. Wearing elastic compression after arthroplasty swelling had no effect, according to Christensen et al.'s study from 2021.

In the current study, there was a statistically significant improvement between the two investigated groups and a difference in the knee range of motion (degrees) between the control and compression therapy groups after four weeks of surgery. Anti-inflammatory medications, ice, and elevation can all help to reduce swelling so that the knee can have more range of motion. The physical therapist may fully focus on developing a range of motion after the swelling is under control (Warren et al., 2019).

According to Hsu et al., (2019), a range of 67 -93 is required to have a regular gait, ascend and descend stairs, and get up from a chair. Normally, the range of motion for healthy knees is between 0-140. Total knee replacement patients are not expected to fully recover their range of motion, although they are urged to achieve a range of 0-120. In the first three months after surgery, closed manipulation works best (Ding et al., 2020). According to the study, manipulation is extremely unpleasant and should only be used as a last resort if the patient is not benefiting from the physical therapist's rehabilitation efforts in a satisfactory manner. Additionally, another study found that using a compression bandage increased patients' range of motion and reduced the time of stay in the hospital (Charalambides et al., 2018).

In a similar vein, Weißenberger et al. (2020) found that measures such as compression boost the formation of a considerable improvement, reduction in tissue pressure, ensure the expansion of the damaged joint, and enhance easy and safe range of motion. According to the researcher, the compression therapy group's improved post-arthroplasty knee function is a success since they gain from its powerful and advantageous effects.

Concerned about post-arthroplasty pain, the current study's findings revealed that, after four weeks postoperatively, compression therapy was associated with lower mean analog pain levels compared to the control group. From the perspective of the researcher, it supported compression therapy's beneficial effectiveness in reducing post-arthroplasty knee pain. Similar findings were made by Anderson et al. (2018), who discovered that the use of a compression bandage and local anesthetic infiltration was linked to a significant reduction in pain levels at 8 h but not 24 h after surgery.

Since there were no known complications and the compression bandage was simple to use and well tolerated by patients. Additional studies outside of orthopedic surgery undertaken by (Reich-Schupke et al., 2019) have shown the benefit of using compression stockings e.g. after vein surgery, with reduced swelling and pain.

These results are in line with those of Reynaud et al. (2020), who discovered that lifting the leg can be administered to patients having arthroplasty surgery safely because no negative effects were noticed. Furthermore, Crawford et al., (2020) observation that the most recent recommendation on the use of compression in avoiding post-arthroplasty pain showed that this element should be used in conjunction with raising leg treatments was supported by the study's findings.

Regarding the association between BMI and the patients' mean age in the compression therapy and control groups. The findings of this study showed that four weeks following surgery, there was a statistically significant correlation between the BMI, ages, and both control and compression therapy groups. In this particular case, Keeney et al. (2019), discovered that there was consistent evidence that total knee arthroplasty in morbidly obese patients was associated with several risks, including 30-day mortality and surgical site infection, patient age, and having a lower absolute physical function improvement. Several institutions have established formal or unofficial cutoff points for TKA in patients with high BMI, typically at the level of morbid obesity.

The use of compression therapy among arthroplasty patients led to a considerably improved postoperative outcome, which included reduced discomfort, swelling, and increased range of motion. According to the researchers, it demonstrated the effectiveness of compression therapy and its good outcomes. The study's findings are also in line with those made by Li et al., (2021), who found that compression therapy might enhance and increase the angle of the afflicted knee following arthroplasty and have a positive impact on gait and everyday activities for patients.

Additionally, Sidhu et al. (2019), who evaluated the effectiveness of compression with elevated leg practice for the avoidance of post-arthroplasty problems, concluded that it is more effective than previously thought. Compression therapy and low-intensity resistance training were used to reduce discomfort and enhance leg function following arthroplasty. The swelling was also reduced.

Conclusion

Based on the findings of the current study, it was concluded that a rehabilitation program regarding compression therapy has a positive effect on reducing post-surgical swelling and pain among adult patients with total knee arthroplasty. In addition, there was a statistically significant association between the BMI, ages of control, and compression therapy groups after four weeks postoperatively.

Recommendation

According to the study's findings, researchers strongly suggested the following:

- Patients who had a total knee replacement should benefit from compression therapy to lessen pain and swelling following the procedure.
- Create a source of Arabic-colored images with all the necessary instructions for applying compression therapy for patients having a total knee replacement.
- To generalize the study outcomes, it is advised that the study be applied again on a bigger sample drawn from various Egypt geographical regions.

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