

Total Knee Replacement Rehabilitation Program: cases study

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ABSTRACT

Background: To the total knee replacement rehabilitation program succor the patients from the pain and get a good life, total knee replacement rehabilitation program aids to get rid of osteoarthritis pains. One of the worth things about total knee replacement on osteoarthritis is its positive effect on the quality of life postoperative by particular rehabilitation program.

Aims: The overall aim of this study was improve the knowledge of appropriate rehabilitative exercises, influence of good clinical outcomes concerned by rehabilitation program. There was no significant risk for infection primary total knee Replacement by the rehabilitation Program, however, assisted to increase fast curable.

Methods: In an exploratory study, those are five patients from my country make total knee replacements after that I faced significant challenge in the rehabilitative program of those patients at their flats when I designed the rehabilitation program of various references. I have taken the approval of these cases orally from the patients themselves because they approached me personally after they received medical treatment at hospital. They are five patients came from my country, Yemen, to India for treatment at Maxcure Hospital, therefore they came to me for rehabilitation after TKR operations. If you want I can provide you with the pictures of the above mention cases.

Findings: Post surgery concentrated to three variables, pain reduce, muscles strengthening and full range of motion increase, pain reduce in third month was significantly lower than first and second month after rehabilitation program, in third month muscles strengthening was significantly higher than first and second month of the rehabilitation phases, range of motion was increase in third month more than first and second month according to the results after measurements. Furthermore there was a significant correlation between the reducing the pain and range of motion whenever the reduce the pain increased the range of motion (knee joints angles) Gradually in this program all of phases taken 3month, every phase one month of the rehabilitation program.

Tools: begin from strengthening exercise to full range of motion to measure the pain reduce used visual analog scale to measure muscle strength for (hamstring, quadriceps) have taken manual muscle test. To measure range of motion used goniometry machine. I had collected those samples from max cure hospital; Hyderabad as study it will help all the sports therapists and physiotherapists at my home country the Yemen after operations. Due to in our country did not have any special studies in the rehabilitation field therefore I have interested to in the knee rehabilitation also I had focused to knee rehabilitation at the master degree period.

Keywords: Rehabilitation program, Total Knee Replacement (TKR), Range of Motion (ROM), knee joints, muscles strengthening, pain and osteoarthritis

Introduction

Osteoarthritis:

Osteoarthritis is defined as a degenerative joint disease, which mainly affects the articular cartilage. It is associated with ageing and will most likely affect the joints that have been continually stressed throughout the years including the knees, hips, fingers, and lower spine region. Chronic rheumatic conditions (2016)

Osteoarthritis refers to the changes in the knee joint after meniscectomy include ridge formation narrowing of the joint space and flattening of the femoral condoyle. Investigations suggest that these changes are due to loss of the weight-bearing function of the meniscus.

The Causes of the Osteoarthritis:

On the other hand, several of the risk factors are well known: advanced age, injuries to joints, genetic predisposition, obesity, and adverse stress on joints. In the case of osteoarthritis in the knee joint, sport injuries and traffic accidents are a significant cause of this condition in later life. Was it possible to heal acute injuries through the formation of new, osteoarthritis kind of the hypo kinetic diseases? Osteoarthritis occurs to all of the joints.

Types of the treatments:

There are two types of curing from the osteoarthritis either physiotherapy (advised ultrasound heat, therapeutic exercises or hot bag instead by ultrasound there is deep heat or surgical operation.

Purpose of the study:

The current paper has concentrated to developing a rehabilitation program for post operation and the duration of the rehabilitation program to be practiced for the post operation period. This program is based on the standard references and is used for treatment of 5 patients from Maxcure Hospital outpatient, secretariat road, Hyderabad. The researchers have been enhancing to the increase range of motion for knee joints and manipulate the knee joints of the patients in post operation using the prescribed rehabilitation program.

Reviews of literature

(Samson et al 2010). Total knee replacement (henceforth TKR) in the morbidly obese: A literature review. As indicated by Samson and his partners the main reason to osteoarthritis that leads to TKR this work done by a literature review so from my opinion based to the a lot of studies in hypo kinetic diseases meats the morbidly obese important once of the factors leads to osteoarthritis then TKR. So the aim of this literature reviews to demonstrate the correlation between TKRs, chronic osteoarthritis and rehabilitation program.

Abstract

Background: The 'obesity epidemic' is expected to result in an increased incidence of knee osteoarthritis and hence total knee replacements (TKRs). Reviews have demonstrated the conflicting results of TKR for all obese (body mass index (BMI) >30). The aim of this literature review was to specifically evaluate outcomes of TKR in patients with morbid obesity (MO; BMI >40).

Methods:

A systematic review of medical databases (PubMed, Medline, Cochrane Library, and Science Direct) by use of keywords from January 1990 to September 2009 was undertaken.

Results:

Clinical and functional Knee Society Scores (KSS) improve after TKR for patients with MO. The post-operative functional KSS was, in general, less than in controls. Radiographic analysis was inconclusive because of small study populations and short duration of follow-up. All studies reporting complications noted a greater prevalence in MO patients (10-30%). Of concern was the significantly higher prevalence of deep prosthetic infection (3-9-times that of controls). The morbidly obese also had a significantly higher incidence of wound complications. TKR did not result in weight loss for MO patients, and therefore has no benefit on weight-related medical conditions. Bariatric surgery in MO under 65 years of age has been shown to be a cost-effective and clinically effective method of weight reduction. This surgery also results in significant improvement in weight-related medical conditions, the KSS and knee pain.

Conclusions:

Given the increase in complications for MO patients after TKR, these patients should be advised to lose weight before surgery and, if suitable, would probably benefit from bariatric surgery.

Dr Sartawi, (2017) a bone surgeon and head of department at Christie Clinic and director of the Burns Covent Hospital in America, said: "Coarseness is defined as the erosion of the soft cartilage that is coated to the surface of the joints' bones.

One of the most important reasons for their aging. Studies show that 40% of those over the age of 60 have a degree of roughness. Obesity is also another cause of knee stiffness among young people, because it places a large load on the knee joint, causing it to wear and wear. There are other causes such as accidents and fractures, infections with certain types of germs, rheumatic disease and genetic predisposition. "

(Hao, et al.2018). Risk factors for infection following primary total knee replacement.

Hao and his colleagues found out of their study on the risk factors for infections following the total knee replacement there was not significantly statistically between ages. Diagnosis, age, obesity and malnutrition. There found out by numerical outcomes there was significance risk factors for infection after total knee replacement. Those factors as following smoking, diabetes mellitus, steroid use, blood transfusion and total blood loss. Of this study we must know the deep infection resulting of the factors doesn't relating the diagnosis, obesity, age.

Purpose: Information about risk factors can be used to target preventive measure on susceptible patient subgroups. The purpose of study was to determine the risk factors for infection following primary knee replacement.

Methods: Between April 2014 and January 2016, total 1599 primary total knee replacements were carried out in 1374 patients; among them 1161 (933 female and 228 male) cases were available for final study. Patients were divided into without infection and had deep infection. Patients-related risk factors and provider-related risk factors were determined.

Results: Out of 1161 patients, 16 patients had deep infection with infection rate was 1.38 %. There was no significant statistically between age, diagnosis, obesity and malnutrition with infection. Total 16.6 % were smoker, among infected group 37.5% patients were smoker with odds ratio 3.01 and P value 0.013 (<0.05). In study 12.4% patients had diabetics mellitus, in infected group 25% had with odds ratio 2.35 and p value 0.016 (<0.05). Total 2.6% patients had history of steroid use, among infected group 12.5% patients with odds ratio 5.39 and p value less than 0.05. Regarding the provider-related risk factors, mean duration of surgery was 130.9 min and mean duration of hospital stay was 10.95 days with both had no significant statistically. Mean blood loss during surgery was 751.47 ml and mean amount of blood transfusion was 596.08 ml with both had association with infection ($p < 0.05$).

Conclusions: Smoking, diabetes mellitus, steroid use, total blood loss and blood transfusion were significance risk factors for infection after total knee replacement.

(Mistry et, al 2016) Rehabilitative Guidelines after Total Knee Arthroplasty: A Review.

Mistry et al. they said there are a lot of guidelines following total knee replacement arthroplasty. May contribute in inefficient recovery of the range of motion, muscles strength and flexibility. So the aim of these reviews was to highlight on the so many type rehabilitative modalities, such as therapeutic exercises, balance exercises, passive knee ROM exercises, aquatic therapy, cryo pneumatic therapy, neuromuscular electrical stimulation, and transcutaneous electrical nerve stimulation (TENS). From my opinion we take care of the transcutaneous electrical nerve stimulation TENS current and neuromuscular electrical stimulation because good connector to the electricity may cause the burn for the knee joints, therefore must alert to stay away from the implanted metal.

Rehabilitation following total knee arthroplasty (TKA) continues to pose a challenge for both patients and providers. In addition, guidelines vary considerably between institutions, which often leave therapy regimens to the discretion of the provider. The lack of clear guidelines for rehabilitation may contribute to inadequate recovery of strength and range-of-motion, resulting in less optimal functional outcomes. Therefore, the aim of this review was to highlight and discuss a variety of post-TKA rehabilitative modalities currently available and to provide evidence regarding efficacy and practicality. Specifically, we assessed the role of and evidence for exercise therapy, aquatic therapy, balance training, continuous passive motion, cold therapy and compression, neuromuscular electrical stimulation, transcutaneous electrical nerve stimulation, and instrument-assisted soft-tissue therapy. Additionally, we proposed general recommendations for rehabilitation after TKA, and as we specifically described active and obese patients, we have included guidelines for these subsets as well. Our review examines the various rehabilitative modalities to offer suggestions for recovery of strength and range-of-motion after TKA, with a focus on the early incorporation of exercise therapy, balance training, aquatic therapy, cryo pneumatic therapy, neuromuscular electrical stimulation, and transcutaneous electrical nerve stimulation. Dedication and commitment to rehabilitation may help patients attain and exceed their preoperative.

Conclusion

In conclusion, recovery of strength and ROM after TKA can be achieved by a combination of modalities. Not all forms of rehabilitation may apply to every patient who undergoes TKA, given the potential presence of additional co morbidities. The importance of joint strengthening and gradual introduction to a more active lifestyle cannot be over emphasized. Proper instruction and commitment to rehabilitation can potentially help patients achieve, or even surpass, their preoperative activity level.

(Yoshioka et.al 2016) Knee-Extension Training with a Single-Joint Hybrid Assistive Limb during the Early Postoperative Period after Total Knee Arthroplasty in a Patient with Osteoarthritis.

The Yoshioka and his partners described their experience with a knee-extension training program based on a single joint hybrid assistive limb (HAL-SJ) is a wearable robot suit that facilitates the voluntary control of knee joint motion. Man his age 76-year-old underwent HAL-SJ-based knee-extension training, which enabled him to perform knee function training during the acute phase after TKA without causing increased pain. Thus, he regained the ability to fully extend his knee postoperatively. HAL-SJ-based knee-extension training can be used as a novel post-TKA rehabilitation modality. Currently, no joint function exercises intended to maintain the range of passive knee extension obtained through surgery can be performed without pain, even when using active extension. Therefore, a new treatment strategy is needed to prevent the prolongation of extension lag after TKA. Currently, no joint function exercises intended to maintain the range of passive knee extension obtained through surgery can be performed without pain, even when using active extension.

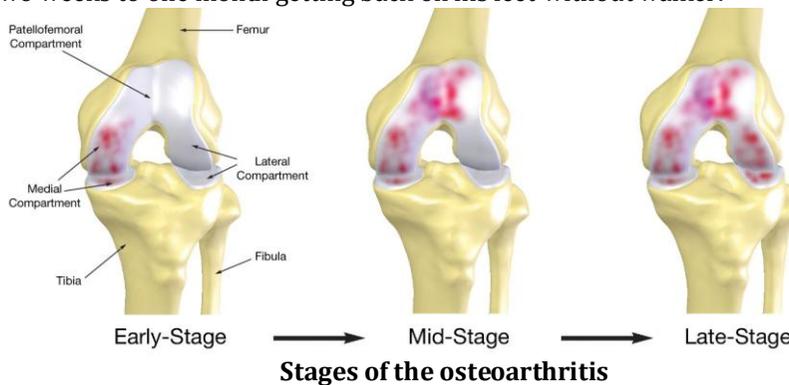
Therefore, a new treatment strategy is needed to prevent the prolongation of extension lag after TKA. Thus they decided to recommending to the using training program based on a single-joint hybrid assistive limb (HAL-SJ) is a wearable robot suit that facilitates the voluntary control of knee joint motion.

Abstract

The knee range of motion is an important outcome of total knee arthroplasty (TKA). According to previous studies, the knee range of motion temporarily decreases for approximately 1 month after TKA due to postoperative pain and quadriceps dysfunction following surgical invasion into the knee extensor mechanism. We describe our experience with a knee-extension training program based on a single-joint hybrid assistive limb (HAL-SJ, Cyberdyne Inc., Tsukuba, Japan) during the acute recovery phase after TKA. HAL-SJ is a wearable robot suit that facilitates the voluntary control of knee joint motion. A 76-year-old man underwent HAL-SJ-based knee-extension training, which enabled him to perform knee function training during the acute phase after TKA without causing increased pain. Thus, he regained the ability to fully extend his knee postoperatively. HAL-SJ-based knee-extension training can be used as a novel post-TKA rehabilitation modality.

Rehabilitation Program

- Let him Walks from one day after operation by walker.
- Training to use walking aids such as walker.
- Continue with knee range of motion exercise important to achieve 0 degree knee extension and 90 degree of knee flexion if possible and reach to 120 degree of knee flexion after one month.
- From two weeks to one month getting back on his feet without walker.



Phase 1:

First month

1) Ankle bump exercise
<ul style="list-style-type: none"> • move your foot to forward and backward either together or alternative • Move your feet to forward and backward either together or alternative for 20 repetitions.

Table No: 1 of 1st month

2) Quads sets
<ul style="list-style-type: none"> • Lying on your back • Put your ankle on the towel with strongly pressing on the towel • Hold for five seconds and repeat 20 times.

Table No: 2 of 1st month

3) Hip abduction and adduction exercises
<ul style="list-style-type: none"> • Lying on your back. • Move one leg inside the body center and outside it. • Repeat this exercise for 20 times.

Table No: 3 of 1st month

4) Heel Slides
<ul style="list-style-type: none"> • lying on the back keep your heel on the bed • bend and extend the leg
<ul style="list-style-type: none"> • If you have some difficulty in doing this exercise. You should using Theraband in • bend and extend the leg.
<ul style="list-style-type: none"> • Repeat 20 times.

5) Short Arc Quads
<ul style="list-style-type: none"> • Lying on your back.
<ul style="list-style-type: none"> • Put blanket or towel under the back of your knee and lift your foot on the straight • of the knee from the bed
<ul style="list-style-type: none"> • Hold for five seconds and relax repeat 20 times.

Table No: 4 of 1st month

6) Straight leg rise
<ul style="list-style-type: none"> • Laying on your back then bend the unaffected knee on the bed and with • affected leg straight and thigh the muscle and lifts your leg high on the unaffected leg.
<ul style="list-style-type: none"> • Hold for five seconds, relax and repeat 20 times.

Table No: 5 of 1st month

7) Scoot Stretch
<ul style="list-style-type: none"> • Sitting from the bed edge then get off.
<ul style="list-style-type: none"> • Bend surgical knee for your ability with keep your hand on the bed.
<ul style="list-style-type: none"> • Hold 10 second and repeat 10 times.

Table No: 6 of 1st month

8) Patella mobilization
<ul style="list-style-type: none"> • Put your index finger and thumb around the patella bone, • Push it up and down by alternately.
<ul style="list-style-type: none"> • Left and right repeat 10 times each direction.

9) Calf Stretch
<ul style="list-style-type: none"> • Put your hand on the wall and move back little. • press down on your toes to stretching calf muscle.
<ul style="list-style-type: none"> • Hold to 10 second and relaxe for 3 sets.

Table No: 7 of 1st month

10) Knee Extension Stretch
<ul style="list-style-type: none"> • Sit on the chair and put your leg on the opposite chair keep some weight • on the top your knee or press a little by your hand.
<ul style="list-style-type: none"> • Repeat this exercise 10 times for 3 sets.

Table No: 8 of 1st month

Phase 2:

Second month

1) Long arc quads: sitting
<ul style="list-style-type: none"> • Sit over the chair and raising your leg to up by angle 180 degree and back it slowly. • Repeat 20 times and relax 5 second.

Table No: 1 of 2nd month

2) Standing hamstring curl
<ul style="list-style-type: none"> • Stand beside the wall or support chair. • Bend your surgical knee for limited range of motion. • Holds 5 second and relax repeat for 20 times.

Table No: 2 of 2nd month

3) Terminal knee extension
<ul style="list-style-type: none"> • From the Standing position link the physio-band behind the surgical knee • when straight the knee by tight the muscle and not allowed to move forward
<ul style="list-style-type: none"> • Hold 5second and repeat 20 times.

Table No: 3 of 2nd month

4) Ankle mobility exercises (dorsiflexion , planterflaxion)
From standing position raise yourself based to toes and second time using the heels repeat 20 times.

Table No: 4 of 2nd month

5) Ball Squeeze
<ul style="list-style-type: none"> • Lying on your back then bend the legs and squeeze the ball between your knee joint.
<ul style="list-style-type: none"> • Holds for 5 seconds, repeat this exercise 20 times.

Table No: 5 of 2nd month

6) Side lying leg lift
<ul style="list-style-type: none"> • Lying on your side and first leg on top and it should be straight then bend the second leg.
<ul style="list-style-type: none"> • Lift the first leg to up and holds for 5 second, repeat this exercise 20 times.

Table No: 6 of 2nd month

Phase 3:

Third month

1) Bridge Exercise
<ul style="list-style-type: none"> • Lying on your back on the floor.
<ul style="list-style-type: none"> • Bend your knees, stable your feet flat on the floor.
<ul style="list-style-type: none"> • Lift the hips from the floor repeat the exercise from 15 to 20 repetitions.

Table No: 1 of 3rd month

2)Standing mini -squat
<ul style="list-style-type: none"> • From the Standing position on the chair behind.
<ul style="list-style-type: none"> • Place your hand on stable surface.
<ul style="list-style-type: none"> • Bend your knees and hip and stand again repeat this exercise 20 times.

Table No: 2 of 3rd month

3) Single leg step- up-lateral
<ul style="list-style-type: none"> • Stand aside next to the step,
<ul style="list-style-type: none"> • Put your foot on the step.
<ul style="list-style-type: none"> • Raises high and then go down Repeat this rinsing 20 times.

Table No: 3 of 3rd month

4) Single leg step- up-forward
<ul style="list-style-type: none"> • Stand in facing the step put your foot on the step
<ul style="list-style-type: none"> • go up and go down
<ul style="list-style-type: none"> • Repeat this exercise 20 times.

Table No: 4 of 3rd month

5) Resisted knee flexion
<ul style="list-style-type: none"> • Linking band in the sofa or chair,
<ul style="list-style-type: none"> • Sit in the chair opposite the band put the band around the ankle.
<ul style="list-style-type: none"> • Pull the band in back direction slowly and relax slowly.
<ul style="list-style-type: none"> • Repeat 20 times.

Table No: 5 of 3rd month

6) Balance single leg stance
<ul style="list-style-type: none"> Stand on first leg and be stable by hold the above chair. Hold for 10-20 seconds then change to second leg.

Table No: 6 of 3rd month

Results:

pain reduce, muscles strengthening and full range of motion increase, pain reduce in third month was significantly lower than first and second month after rehabilitation program, in third month muscles strengthening was significantly higher than first and second month of the rehabilitation phases, range of motion was increase in third month more than first and second month according to the results after measurements. Furthermore there was a significant correlation between the reducing the pain and range of motion whenever the reduce the pain increased the range of motion (knee joints angles) So and after three months got the significant outcomes according to three variables and three measurements it comes to following:

Measurements Results:

Those are tables show the distribution of the pain strength muscles and ROM of the variables after Program among three months.

1 st patients			
Variables	1 st Month	2 nd month	3 rd month
Pain	10	4	1
Muscles Strength	1	4	5
ROM (flexion)	20	90	130

Table No: 1 of Results for 1st patient among 3 months

2 nd patients			
Variables	1 st Month	2 nd month	3 rd month
Pain	9	3	0
Strength muscles	1	3	
ROM (flexion)	10	90	120

Table No: 2 of Results for 2nd patient among 3 months

3 rd patients			
Variables	1 st Month	2 nd month	3 rd month
Pain	8	3	0
Muscles Strength	1	3	5
ROM (flexion)	30	95	135

Table No: 3 of Results for 3rd patient among 3 months

4 th patients			
Variables	1 st Month	2 nd month	3 rd month
Pain	9	4	1
Muscles Strength	1	4	5
ROM (flexion)	15	85	115

Table No: 4 of Results for 4th patient among 3 months

5 th patients			
Variables	1 st Month	2 nd month	3 rd month
Pain	8	4	0
Muscles Strength	1	3	5
ROM (flexion)	25	80	105

Table No: 5 of Results for 5th patient among 3 months

Discussion:

This part of the study deals with the data analysis and discussion. We have observed the variables increasing such as ROM, from 1st moth still 3rd month. And hence represents the numerical collected into tables based to the outcomes every month that measured by scales

1-Pain

pain (VAS) refers to efficiency of the physiology of the person to relief pain and partial disappear after take of the program and the rehabilitative has very good physiological efficiency and effects relives of pain symptoms or signs .

As be seen from the above tables there is a big difference between 1st month and 3rd month of the decreasingly pain. This numerical value shows that the variation of the pain among three months.

2. Muscles strength

The muscle strength from variable of the study that determines the muscle strength by Manual muscle test, and increase the strengthening muscle by rehabilitation program after take investigations. Many studies have extensively explained the difference of muscles strengthening distribution in typically developing total knee replacement, as be seen from the below table there is a big difference between 1st month even 3rd month.

The value of the muscles strengthening (hamstring, quadriceps) of the rehabilitation program increasingly this numerical value shows in the tables also have taken the values by manual muscle test.

the average value of the post test about 4.6 as a result of this the variation of the muscle strength is about 1 the highest value of the pre test the 5- scored during the data collection and the highest value of the post test the 5 scored during the data collection .

3. ROM

As be seen from the below tables there is a big difference between 1st month and 3rd month rom.

The final values of the ROM of the variables indicate to increasingly the numerical value shows in the tables. As well as to improvement the flexibility of the knee joints

collection and extension The ROM of the individual when measured at the end of the rehabilitation program shows the increasing manner this increasing manner comes from the apply Range-of-motion exercises (also called strength or flexibility exercises) help maintain normal joint function by increasing and preserving joint mobility and flexibility.

Hence we can reach at conclusion that the rehabilitation Program is most effective prevention of excess futurity issues. Development muscle strength contributes to increased flexibility range of motion for joints.

Conclusion:

It is concluded that exercise rehabilitation program which includes three phases therapeutic exercises is useful in the rehabilitated of total knee replacement patients it has beneficial effects on various patients related postoperative patients. Therefore from the three phases of rehabilitation exercises relief the pain, reduce the swelling, increase range of motion for the knee joints and regain the knee joints function. Exercise also may to help maintain normal joint movement Increase muscle flexibility and strength help maintain weight to reduce pressure on joints, and give good life style.

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