# 16 Therapy for Unicompartmental Knee Arthroplasty: Pre-op, Day of, and Post-op

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## Introduction

Rehabilitation after unicompartmental knee arthroplasty (UKA) is a vital part of a successful outcome. Patients with degenerative joint disease of the knee have often undergone physical therapy prior to presenting to a surgeon, as therapy continues to be a mainstay of nonoperative treatment of degenerative joint disease. Patients who ultimately undergo a UKA will typically have a physical therapist work with them preoperatively, in the hospital or ambulatory surgery center (ASC) immediately after surgery, and may continue to do so in the weeks to months following surgery. The role of these three phases of therapy continues to evolve. As cost-saving measures continue to be implemented, and technology and telemedicine further develops, the role of formal physical therapy has been called into question in UKA patients.

In this chapter, we will review the three phases of physical therapy: preoperative, day of surgery, and postoperative. A standard physical therapy regimen will be outlined for patients undergoing UKA, which is often similar/identical to that implemented for patients undergoing total knee arthroplasty (TKA). In addition to detailing typical physical therapy protocols, we will review therapy adjuncts, technologies being utilized to replace formal therapy, and recent literature that calls into the question the utility of formal physical therapy in patients undergoing UKA.

## Preoperative Physical Therapy

Physical therapy prior to arthroplasty is a routine part of the treatment of symptomatic degenerative joint disease of the knee. Therapy is often a mainstay of treatment in these patients, and many will have worked with a physical therapist, at the direction of their primary care provider, prior to being referred to a surgeon. There are many adjuncts and modalities utilized by physical therapists, some of which will be discussed here. The utility of preoperative therapy has been questioned, and recent studies have called into question whether therapy prior to knee replacement surgery improves outcomes in patients who undergo either unicompartmental or total knee arthroplasty.

Osteoarthritis (OA) is a common diagnosis treated with physical therapy, and there exists a number of exercises that can be beneficial to, and are typically included in the treatment of, patients with OA [1]. Exercise has been shown to

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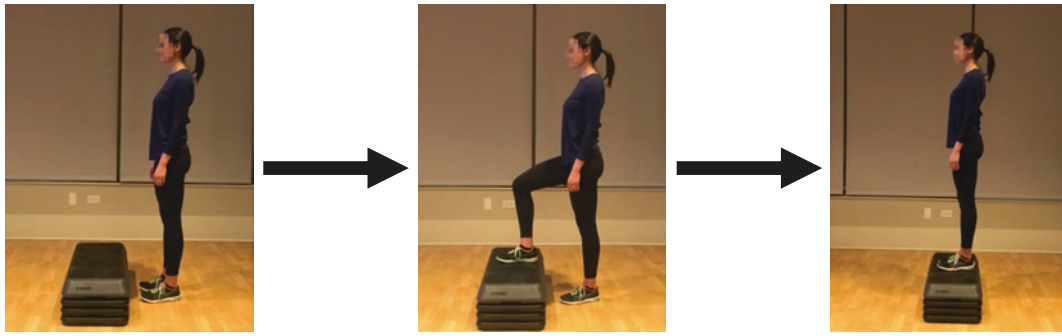

**Fig. 16.1** Step-ups. The patient stands upright in front of an elevated platform and steps reciprocally up and then back to ground level to gain strength and endurance

be effective across multiple studies; some of the common and evidence-based exercises include the following:

- Step-ups (Fig. 16.1)
- Quadriceps sets
- Seated leg press
- Partial squats
- Range of motion exercises (passive and active)
- Flexibility and stretching of calves, hamstrings, quadriceps
- Stationary biking

Exercise has been shown to increase function and decrease pain in the short term; however, the effect seems to diminish with time [2]. This is likely due to the progression of the degenerative changes within the knee. The mainstay of physical therapy, as demonstrated by the above list of exercises, is quadriceps strengthening. Quadriceps weakness can lead to functional deficits, and its function is important for proper knee kinematics. Difficulty with standard quadriceps strengthening exercises may be encountered due to pain, and techniques may need to be modified. Deep flexion, in particular, is frequently challenging and painful for those with degenerative joint disease, and modifications are frequently made to allow patients to perform partial exercises to avoid deep flexion and maintain the benefits of strengthening their quadriceps. This is especially true in patients who have multicompartmental degenerative changes, and patellofemoral disease is present. In patients with pure unicompartmental symptoms, deep flexion should theoretically be less difficult than someone with multicompartmental disease and may suggest that the physician should more closely evaluate the patellofemoral joint.

Aerobic exercise has many benefits including cardiovascular endurance, weight control, improved balance, and improvements in stiffness. Land-based aerobic exercises can be difficult for patients with knee arthritis due to the repetitive impact it has on the knee joint. Aquatic exercise has the benefit of added buoyancy and reducing the forces across the knee, while maintaining the benefits of aerobic exercise. Aquatic exercise has been shown to improve joint mobility, pain, physical function, and quality of life [3].

Therapeutic modalities are sometimes utilized by physiotherapists in the treatment of knee arthritis. Transcutaneous electrical nerve stimulation (TENS) is the application of an electrical current through the skin, with the aim of pain modulation [4]. Relief provided by TENS varies, and in most cases, it is a temporary solution and does not have any significant lasting effect for patients. In a systematic review, there was found to be no proven effect on outcomes with use of TENS; however, it is still a commonly employed modality by physiotherapists. Other therapeutic modalities include various forms of electrical stimulation, massage, proprioceptive training, acupuncture, and sleep behavioral training [4].

Much of the above-described therapy, and many of the modalities, can generally be applied to patients with knee arthritis. In patients with

unicompartmental arthritis, the use of bracing and footwear can theoretically provide more directed therapeutic benefits by unloading the affected compartment. For patients with medial compartmental disease, for example, a lateral wedge in the shoe can reduce the varus moment on the knee, thus unloading the force across the medial knee [5]. The reduction in medial force can reduce the pain from loading across the arthritic portion of the knee; however, there are conflicting studies, many of which show no benefit in lateral wedging [6, 7].

Knee unloading braces are used with similar philosophy in mind. A 2017 study in the United Kingdom looking at the cost-effectiveness of knee offloading braces found them to be cost-effective after 4 months of use, with the most beneficial duration being 7–12 months. The average length of use was 26 months, with a resulting increase in 0.44 quality-adjusted life year gains. The average cost saved was $822 (£625) per patient [8]. A 2006 study in the *Journal of Arthroplasty* confirmed that most knee offloading braces perform as advertised and do in fact increase condylar space on the offloaded side, with the majority of patients (>75%) experiencing pain relief with the use of the brace. They compared multiple different braces in a second arm of the study and found that not all braces achieve the same results; the Bledsoe brace (Breg, Inc.) produced the best results, followed by the Don Joy Ortho brace [9].

Although physical therapy is a standard part of patient care prior to UKA, and certainly may provide benefit to patients prior to surgery, there may not be benefit in the measured outcomes of UKA in patients who had preoperative physical therapy. In a small study of 39 patients, preoperative and postoperative measures of strength, self-selected walking speed, and oxygen cost of walking were measured. The group receiving therapy improved in the preoperative time period; however, at 3 months postoperatively, there was no difference in the groups [10]. Data for patients undergoing TKA showed that preoperative therapy do not seem to confer improved outcomes either. A 2015 systematic review in the *Journal of Arthroplasty* found no difference in the Western Ontario and McMasters Universities Arthritis Index (WOMAC) and SF-36 scores, no to slight improvement in strength, no difference in pain scores, no change in range of motion (one study found that preoperative therapy patients reached 90 degrees 1 day sooner), and no to slightly shorter hospital stay. One study did show less likelihood of discharge to a rehab facility [11].

Physical therapy is not without cost. Bradley et al. took a comprehensive look at the medical costs in the two years preceding UKA. They found that physical therapy had a per-patient average cost of $256 for Medicare patients [12]. In patients with degenerative changes severe enough to warrant a UKA, the efficacy of nonoperative treatments should be carefully analyzed.

Physical therapy for the arthritic knee certainly has an important role in the conservative management of knee pain. However, the role of therapy in patients with arthritis severe enough to warrant a UKA has not firmly been established. There is peaking interest in the various educational models used to instruct patients on exercise and therapy that may be performed without the use of formal physical therapy. The use of smartphones and tablets with clear, video-based instruction may be the new direction of preoperative therapy for patients who are on track for a UKA.

## Day of Surgery

As knee arthroplasty, particularly unicompartmental, has moved toward shortened in-hospital stay and has even become a procedure commonly performed as an outpatient, the extent of in-house physical therapy has decreased. The role of physical therapy while inpatient is to primarily ensure patients are safe to discharge home and able to recover with rehabilitation performed outside the hospital. Although published physical therapy protocols in the literature and textbooks for UKA are sparse, established protocols and discharge goals for total knee arthroplasty are available. In Giangarra's Clinical Orthopaedic Rehabilitation textbook [1], a standard outline of in-hospital

postoperative therapy and discharged goals is outlined. The goals are as follows:

- Range of motion: minimum of 60–90 degrees of flexion
- Ambulation: 150 ft. with a rolling walker assist
- Transfer: Independence with transfers alone or with caregiver, and minimally assisted to modified independence with stairs as needed for home environment, using assisted device and/or caregiver

Day of surgery discharge has become more common and often a goal of both patient and provider. Clearance by therapy at the surgical facility is an important landmark for a patient to reach prior to safe discharge home. Gondusky, et al. [13] published their perioperative pathway for safe and effective same-day discharge in UKA patients. Along with a comprehensive preoperative screening methodology and patient education, perioperative multimodal pain control regimen, and social support, a brief physical therapy session was included for all patients. In their protocol, the therapists assessed all patients for safety and mobility with crutches or a walker and provided in-home exercises. All patients were made weight bearing as tolerated after surgery and were given a knee immobilizer to wear until they were able to perform five normal straight leg raises. A regimented postoperative, at-home and outpatient, therapy protocol was initiated as well, which will be discussed in more depth later in this chapter.

Continuous passive motion (CPM) has been studied as a part of the immediate postoperative rehabilitation in arthroplasty. While literature on CPM in UKA is sparse, the effectiveness of it in total knee arthroplasty has not been well supported in recent literature. Joshi et al. [14], in a randomized prospective trial, looked at the use of CPM for their patients undergoing TKA and a standard physical therapy regimen. They found no difference in range of motion (at 6 weeks and 3 months), no clinically relevant benefits with respect to clinical outcomes, or discharge disposition. Interestingly, length of stay was longer for patients who received CPM, and as expected, there was an increased cost per patient of $235.50. A 2014 Cochrane review by Harvey et al. found no conclusive evidence to support CPM in TKA [15]. Whether or not this holds true after UKA remains unanswered, but due to the more invasive nature of TKA, it seems unlikely that UKA patients would see a benefit from CPM use.

## Postoperative Therapy

Therapy once discharged from the hospital or surgery center tends to follow a standard and routine pathway. Most patients have a physical therapist visit their home and engage them in at-home therapy for the first few weeks after surgery, although immediate outpatient therapy is becoming more common. Once able to safely leave home, most patients continue to have formal physical therapy at an outpatient rehabilitation center. Again, specific protocols and literature on therapy after UKA are sparse when compared to the available published literature on TKA. A standard TKA rehabilitation protocol focuses on much of the same exercises and modalities as those of preoperative therapy. Home therapy focuses on restoring and regaining range of motion, strength, and functional movement. Strengthening exercises used include the following, in addition to any modalities therapists see fit for a given individual patient [1]:

- Quadriceps sets (Fig. 16.2)
- Heel slides (Fig. 16.3)
- Straight leg raises
- Gluteal sets
- Low-load, long-duration strengthening exercises
- Recumbent biking
- Band exercises including standing terminal knee extension
- Hip abductor/adductor and external rotator strengthening (e.g., clamshell exercises)
- Ankle pumps

Knee range of motion is stressed with the final goal of restoring full extension and 120 degrees of flexion. Both active and passive range of motion

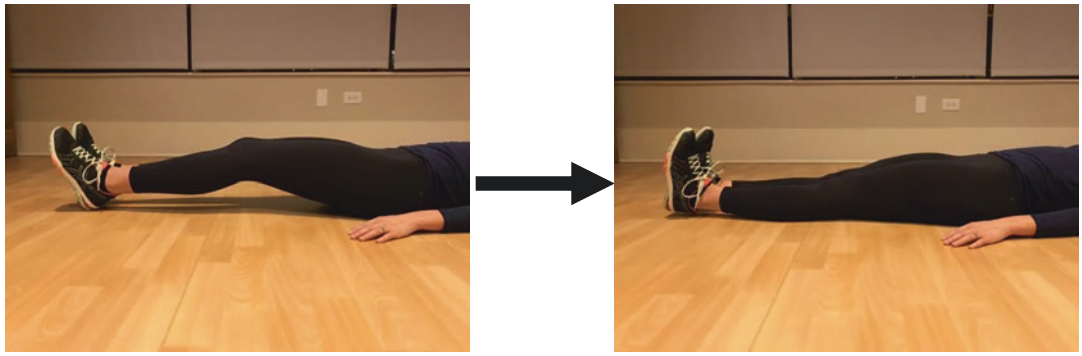

**Fig. 16.2** Quad sets. The patient lays supine with legs relaxed (flexion in left image exaggerated to demonstrate motion), and flexes their quadriceps, extending their leg and pushing their knee into the ground to improve terminal extension and regain quadriceps strength

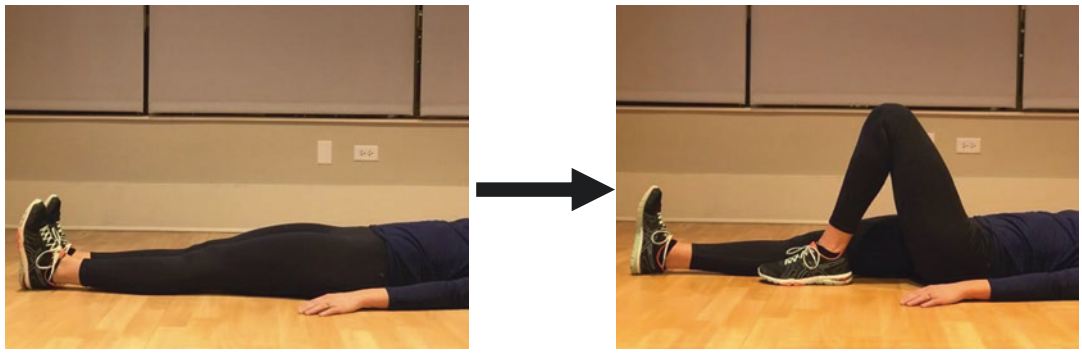

**Fig. 16.3** Heel slides. The patient lays supine and flex their knee, pulling their heel toward their body to improve knee flexion

are stressed. Stretching of the entire lower extremity is included and not solely focused on knee range of motion, but includes IT band stretching, hamstrings, gastroc-soleus, etc. Functional and proprioceptive work begins during this time period as well and includes the following:

- Progression to independence in activities of daily living
- Eliminating the need for assisted devices and restoring normal gait pattern
- Balance exercises
- Progressing ambulation distance and tolerance
- Functional practice for activities such as sit-to-stand, toilet transfers, bed mobility

The Gondusky pathway [13] for same-day discharge enrolls the patients in at-home physical therapy for the first 2–3 weeks. The therapist visits the patient's home on postoperative day 1, and, thereafter, three times per week for 1-hour visits. Once the initial at-home therapy is concluded, the patients are enrolled in outpatient physical therapy if transition to a home exercise program is not possible at that point. In their study, outpatient therapy lasted up to 3 months, but many patients were discharged from outpatient therapy sooner, and some progressed well enough in at-home therapy that they did not require outpatient therapy. The progression of ambulation without assistance was left up to the expertise of the therapists.

The standardized nature of postoperative therapy in total knee arthroplasty, costs associated with physical therapy, and the advent of more advanced smartphones and tablets with higher quality app design, video interfacing,

and advanced patient-physician communication tools, have led to the development of programs, which can both supplement and replace formal physical therapy. Chughtai et al. [16] studied 157 patients undergoing either TKA or UKA, using a tele-rehabilitation program. The program used an instructional avatar, three-dimensional motion measurement and analysis software, and a real-time tele-visit function. The patients undergoing UKA had an average of 3.2 office visits with a therapist. They found patients were very satisfied with the program, spent an average of 29.5 days partaking in therapy at an average of 26.5 minutes per day. Knee Society Score for pain improved by 350% and 27% improvement was seen for function in patients undergoing UKA compared to their preoperative values. WOMAC scores improved by 57% for UKA patients. Of note, they did not report objective measurements in range of motion, or data on return to activities, use of assisted devices, or complications associated with stiffness.

Jorgensen et al. [17] performed a randomized, prospective trial, evaluating two groups of patients undergoing UKA, those randomized to supervised progressive resistance, and those scheduled for unsupervised therapy. Their primary outcome was leg extension power at 10 weeks postsurgery. Patients in the unsupervised group were offered instruction in a home-based exercise program that consisted of 12 exercises, focusing mainly on knee range of motion, and blood and lymph circulation. Six weeks after surgery, they saw a therapist who gave them instruction for a new at-home program that was made up of six low-intensity strength exercises to be done three times per week. Patients in the supervised cohort were seen twice per week in combination with the at-home program given to the unsupervised group. At 10 weeks, there was a significant increase in leg power in the supervised group as compared to the unsupervised group. However, this difference did not reach significance, and at 1 year, leg extension power was equal in the two groups. The only statistically significant difference between the two groups at 10 weeks was an increased walking speed in the supervised group; however, this significance was lost at 1-year follow-up. The authors concluded that supervised therapy was not superior to an unsupervised home program.

The results of Jorgensen's study beg the question of whether formal therapy is necessary following UKA. Fillingham, et al. [18] performed a randomized clinical trial in patients undergoing UKA, randomizing them to 6 weeks of outpatient physical therapy or to an unsupervised home exercise program. Their primary outcome was range of motion, and they found that the unsupervised group gained 6.6 degrees of motion, while the formal physical therapy group gained 5.0 degrees. This difference did not reach statistical significance. Of note, the patients randomized to the unsupervised home-therapy group did have statistically significant greater preoperative knee range of motion. The differences in the other secondary outcome measurements failed to reach statistical significance. They also demonstrated a cost savings of over $1000 per patient in the unsupervised home-therapy program.

## Conclusion

Physical therapy continues to be a standard treatment modality in patients suffering from knee osteoarthritis. In patients who ultimately undergo UKA, the role of therapy is not clearly defined and may be unnecessary. Preoperative therapy has been shown to help in the short term, and there are benefits associated with use of therapy adjuncts such as off-loading braces. However, preoperative therapy has not reliably been shown to improve outcomes in patients undergoing UKA and TKA. A theoretical benefit of preoperative therapy is that introducing patients to exercises and rehabilitation techniques may reduce anxiety and help them recover from surgery.

As arthroplasty continues to move toward an outpatient procedure and in-hospital time decreases, the role of therapy in the immediate postoperative period may need to evolve. The primary role of day of surgery therapy at the hospital and ASC is to ensure patient safety for discharge home. Another important responsibility of

the immediately postoperative therapist is to provide education to the patient that reinforces their expected postoperative course. As reviewed in the postoperative therapy section above, instruction covering an at-home therapy program may be a vital part of preparing patients for a successful postoperative pathway.

The role of therapy after hospital discharge continues to evolve as well. As technological improvements have allowed for alternative delivery methods and cost-saving measures become more and more important, the role of formal physical therapy after UKA has come into question. There are data supportive of unsupervised, at-home therapy, which could replace formal physical therapy visits. Virtual therapy apps and detailed instructions on home-therapy exercises have shown similar outcomes as formal physical therapy. Rehabilitation after surgery is vital to a successful outcome, and the nature of this rehabilitation may involve more patient-directed, unsupervised therapy in the future.

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