Understanding a Patient’s Surgical Journey
What joint replacement surgery entails and the role massage therapy plays pre- and post-surgery

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Joint Replacements
Many patients struggle with joint pain and disability. Daily activities, such as rising from a chair, bending and walking are difficult. Although massage therapy decreases pain and improves quality of life in many people, some experience no relief from complementary therapies or from western medicine. **Joint replacement surgery becomes the final choice when all other options fail.**

Massage therapists serve an important role in helping patient's transition from pre-surgery pain to post-surgery rehabilitation. The goal of this article is to understand the most common causes of joint pain, non-surgical and surgical treatment options, and the effects of massage therapy before and after joint surgery. In addition, this article describes current research regarding the various surgical approaches, as well as joint replacement components (including metal-on-metal implants). By understanding patients' pre-surgical journey of pain and disability, you can help them **walk the post-surgical road to recovery.**

**Joint Replacement**

Our focus will be on the two primary joints involved in ambulatory movement: the hip and knee. The hip joint supports the body, and is important in balance and posture. The knee is the largest joint in the body and supports a significant proportion of body weight. Healthy hip and knee joints allow for smooth, unrestricted movement.

Injury to the hip or knee, or change to these joints brought on by disease, often produces pain and disability. Over time, pain and dysfunction can become severe and significantly limiting. When quality of life is compromised and all non-surgical treatments fail to alleviate the pain, an individual may decide to undergo a joint replacement, or **arthroplasty**, which is Latin for “joint repair.”

Joint replacement entails replacing diseased parts of a joint with prosthetic implants. Surgeons performed more than 427,900 hip and 675,300 knee replacement operations in the United States (Steiner et al., 2012). By 2030, researchers predict the demand for hip and knee replacement surgery will increase by 175 percent and 674 percent, respectively (Kurtz et al., 2007). A recent study suggested that total hospital charges could reach $80.2 billion by 2015 (Kim, 2008).

**Osteoarthritis.** Arthritis is the primary cause of joint pain and disability. Although more than 100 different types of arthritis exist, osteoarthritis (OA) is the most common type of arthritis worldwide, and the leading chronic illness in the United States. An estimated 27 million Americans over age 25 have symptoms of osteoarthritis (Lawrence, Felson, Helmick, Arnold, Choi, Deyo, Gabriel, Hirsch, Hochberg, Hunder, Jordan, Katz, Kremers & Wolfe, 2008). Pain from osteoarthritis is the primary reason people undergo joint replacement surgery.

According to the Arthritis Foundation, osteoarthritis most commonly affects hip and knee joints (arthritis.org). One in four people will likely develop hip arthritis in their lifetime (Murphy, Helmick, Schwartz, Renner, Tudor, Koch, Dragomir & Kalsbeek, 2010) and one in two people will likely develop knee arthritis by age 85 (Murphy, Schwartz, Helmick, Renner, Tudor, Koch, Dragomir, Kalsbeek, Luta & Jordan, 2008).

Several factors account for the increasing demand for replacement surgery, including an aging “baby boom” population, increasing obesity and the demand for a better quality of life. Indeed, the increased demand for hip and knee replacement surgeries affects health care costs. Health economists estimate that the average hospital cost for the first (primary) hip or knee replacement falls between $18,000 and $19,000 (Steiner et al., 2012).
chronic, progressive cycles of inflammation and degeneration that affects the joint’s articular cartilage, bone, synovium and ligaments. Over time, the cyclic low-grade inflammation alters these structures, resulting in pain and dysfunction.

**Risk Factors**

Research identifies several factors for the development of osteoarthritis, including age, gender, joint trauma, obesity, genetics and muscle weakness. First, as people age, their risk of developing osteoarthritis increases until age 80 (at which point their risk levels off) (Buckwalter, Saltzman & Brown, 2004). Second, females face greater risk of developing osteoarthritis, especially after age 50. Third, joint trauma that results from prolonged, intense, high-level activity may increase the risk of developing osteoarthritis. Also, occupational activities, such as high impact loads, heavy lifting and jumping, to name a few, may lead to the development of osteoarthritis. Obesity, too, is an influential (yet modifiable) osteoarthritis risk factor. Research suggests that two out of every three people who are obese will develop knee osteoarthritis (Lawrence, et al., 2008). A loss of approximately 11 pounds, however, decreases the risk of developing knee osteoarthritis by 50 percent (Felson, Zhang, Anthony, Naimark & Anderson, 1992). In addition to the extra weight exerted on joints, obesity is linked to the production of metabolic mediators involved in osteoarthritis. Research suggests that adipose tissue is a source of pro-inflammatory and catabolic chemicals that promote synovial inflammation, cartilage degradation and bone remodeling (Sowers & Karlsson-Gutierrez, 2010).

Evidence of a genetic influence stems from various sources, such as epidemiological studies of families and twins, as well as molecular gene testing (Valdes & Spector, 2011). Family and twin studies suggest that certain osteoarthritic traits are inherited. For example, individual twins may develop osteoarthritis in the same joint, or have the same joint changes evident on x-ray. Also, specific genes may be associated with greater risk. Indeed, researchers report combinations of certain high risk genes are associated with osteoarthritis incidence/prevalence.

Finally, evidence links weak knee muscles with pain and dysfunction in people with osteoarthritis. In contrast, when quadriceps muscles are strengthened, osteoarthritis-associated symptoms improved (i.e., reduced pain and improved physical functioning) (Alnahdi, Zeni & Snyder-Mackler, 2012). Likewise, muscles strengthened by practicing yoga improved symptoms of knee osteoarthritis. Nambi and Shah (2013) demonstrated that Iyengar yoga, in combination with other techniques, reduced pain and improved functional ability. Certain yoga poses and movements also strengthen quadriceps, and increase both flexibility and blood flow.

**Signs and Symptoms**

Osteoarthritis is typically a slow, chronic destruction of joints marked by varying levels of pain and stiffness. Initially, people with osteoarthritis experience brief (less than one hour) joint stiffness in the morning (after waking) or after prolonged sitting. Over time, the pain and stiffness persist through the day, and eventually disrupts sleep at night and causes chronic dysfunction.

With hip osteoarthritis, pain occurs deep in the acetabulum (socket), and may extend to the groin or knee. With knee osteoarthritis,...
Crepitus (a crackling or grinding noise) may be heard with movement, and joints may swell and become inflamed.

Affected joints undergo cycles of inflammation, ineffective repair and degeneration that results in detrimental changes in cartilage and bone. Chronic loss of cartilage and hypertrophic changes in bone leads to bone-on-bone erosion. Bony deformities called osteophytes form on articulating bones. These changes are evident, along with joint space narrowing, when viewed on an x-ray. Degeneration of cartilage and appearance of osteophytes causes pain, loss of range-of-motion and altered gait.

In addition to cartilage and bone changes, muscles become tight in an attempt to protect the affected joint. In the hip, shortened muscles (erector spinae, iliopsoas and rectus femoris) produce an anterior pelvic tilt, resulting in abnormal joint loading and gait changes. In the knee, tight hamstrings produce chronic knee flexion, and weak quadriceps alter knee stability.

In general, osteoarthritis produces a cycle of dysfunction. Because osteoarthritis causes joint pain, the patient avoids movement of the affected joint. The reduction in movement produces muscle tightness, which leads to muscle weakness, restricted range-of-motion and more pain.

**Diagnosis and Treatment**

Medical providers make a diagnosis of osteoarthritis after careful examination and the evaluation of tests. A thorough medical history and physical exam reveal much about the patient’s condition, and x-rays provide visual evidence of joint deterioration. Unless the diagnosis is in question, MRIs (magnetic resonance imaging) or blood tests are unnecessary.

**Non-surgical treatment.** Treatment for osteoarthritis should start with safe, non-invasive therapies before advancing to surgical treatment. Non-surgical treatment includes conservative measures such as strengthening exercises, activity modification, weight loss, manual therapy, and the use of a cane or walker. Pharmacological treatment includes NSAIDS (non-steroidal anti-inflammatory drugs) such as over-the-counter Ibuprofen and prescription COX2-inhibitors such as Celebrex. Surgeons usually prescribe Tramadol for pain rather than opioid-based prescription drugs.

Several studies report positive results using massage therapy to treat patients with hip and knee osteoarthritis. For example, one case study reported massage helped a young adult with hip osteoarthritis (Cook & Heiderscheit, 2009). Therapists applied massage for three months to the patient’s iliopsoas muscle. The treatment reduced the patient’s pain and increased range-of-motion, strength, and function at a three-month follow-up.

A second study found that 20-minute massage applied twice weekly for 12 weeks improved knee symptoms (pain, stiffness, function) in patients with osteoarthritis (Atkins & Eichler, 2013), and a third study reported that Swedish massage applied to knee muscles one to two times per week (for eight weeks) resulted in significant reduction in pain and stiffness, as well as increased physical functioning and ROM (Perlman, Sabina, Williams, Njike & Katz 2006).

However, for those people who do not respond to non-surgical treatments, have joint damage evidence via x-ray, and experience significant pain and disability that affects quality of life, surgery may become necessary. Ultimately, though, the

"Although osteoarthritis is known as a degenerative joint disease, the condition is more complex than simply ‘wearing out’ the joint."
patient—not the surgeon—makes the decision on whether to have surgery.

**Surgical treatment—the hip.** Advanced, symptomatic osteoarthritis is responsible for 86 percent of total hip replacement surgeries (American Academy of Orthopaedic Surgeons, 2011). A smaller percentage of people have hip surgery for other reasons, including femur fractures, avascular necrosis, congenital deformities and rheumatoid arthritis. Some of these conditions warrant specific surgeries, such as partial hip replacement, which is beyond the scope of this article.

Two surgical options are available to treat severe osteoarthritis: total hip replacement and hip resurfacing. In total hip replacement surgery, the entire femur head and neck are removed and replaced with an artificial prosthesis. Alternatively, hip resurfacing entails the addition of a metal “surface” to the intact femur head. Resurfacing accounts for approximately 0.2 percent of all hip surgery procedures in the United States (Millennium Research Group, 2006), but is more popular in other countries. For example, resurfacing accounted for about 1 percent of all hip surgeries in both Australia and the United Kingdom (Australian Orthopaedic Association National Joint Replacement Registry, 2013; Full 10th NJR Annual Report, 2013).

**Total hip replacement.** Replacing a diseased acetabular and femoral articular cartilage requires that the surgeon have access to both structures. Thus, the surgeon cuts through skin, adipose, fascia, and the joint capsule to expose the hip joint. The surgeon then cuts the femur bone at the inferior neck, which allows for dislocation of the
joint (the femur head and neck are discarded). The surgeon inserts a metal spike into the femur, and attaches an artificial ball to the spike. Sometimes the surgeon applies special cement to secure the spike in the bone.

The surgeon then reshapes the acetabulum with special tools that ream the socket, and then inserts a metal cup that is either cemented in place or fixed with screws (the latter process is called cementless). In some replacement systems, the surgeon inserts a liner into the artificial acetabulum.

The spike and acetabular cup are typically made of a metal alloy (titanium, cobalt-chrome, etc.), and the artificial ball is composed of ceramic or metal alloy. The liner is made of polyethylene (plastic), ceramic or metal.

**Candidates for total hip replacement.** The best candidates for total hip replacement are people who are healthy, within normal weight and have solid bones. Healthy patients have strong immune systems that combat infections and stress. Because normal weight patients place less stress on joints (additional weight on the new joint increases the risk that the artificial joint may fail), surgeons often encourage patients with body mass index (BMI; body mass divided by height squared) greater than 35 to lose weight before surgery.

Additionally, good candidates should have solid bones, or an abundance of hip and femur bone (called bone stock). The surgeon needs plenty of solid bone in order to implant the artificial components. And finally, total hip replacement candidates can be any age, but risk of the new implant failing increases by 40 percent with each decade after 65 years of age.

**Hip resurfacing.** Similar to total hip replacement, the surgeon cuts through all joint-related tissues, dislocates the joint, and reshapes (reams) the acetabulum. In contrast to total hip replacement, the surgeon does not remove the femur head and neck. Rather, the surgeon reshapes the femur head, which is then covered with a metal cap (surface overlay) and secured (cemented).

The metal cap and acetabular cup are made of a metal alloy (typically cobalt-chrome). [Note: Future designs are likely to replace the metal cap with ceramic or similarly hard material.]

**Candidates for hip resurfacing.** The best candidates for hip resurfacing are people who are healthy, within normal weight and have solid bones. Additional evidence suggests that males fare better than female patients, and prosthesis failure rates are higher in women than in men, making women poor candidates for resurfacing.

When comparing men and women, a recent study reported that “resurfacing failure rates in women were unacceptably high,” and recommend that “resurfacing procedures are not undertaken in women” (Smith, Dieppe, Howard, Blom; on behalf of the National Joint Registry for England and Wales. 2012). The reason women have higher failure rates is unclear, but some research suggests that a small femoral head (typically implanted in women) may be problematic and bone loss (commonly seen after menopause) can contribute to increased risk of femoral neck fracture. Or, a combination of both of these factors may be at play.

In 2012, an FDA advisory panel suggested that young males are the best resurfacing candidates, and surgeons should use large-diameter femoral heads. Although surgeons do not stipulate an age cut-off, the typical resurfacing patient is under age 60. People over age 60 can receive resurfacing surgery provided they have solid bone stock.

**Replacement or Resurfacing—Which is Better?** Both total hip replacement and resurfacing have advantages and disadvantages.

**The advantages of total hip replacement:**
Currently, the outcomes for total hip replacement implants are better than resurfacing. In general,
FIGURE A. X-RAY OF PATIENT’S RIGHT HIP SHOWING OSTEOARTHRITIS.

FIGURE B. X-RAY OF RIGHT HIP WITH (NON-METAL) TOTAL HIP REPLACEMENT.

FIGURE C: X-RAY OF LEFT HIP WITH (METAL-ON-METAL) TOTAL HIP REPLACEMENT.

FIGURE D: X-RAY OF LEFT HIP WITH HIP RESURFACING COMPONENTS.
Total hip replacement implants remain functional for longer periods than most resurfacing implants, and present fewer issues related to implant failure (discussed in greater detail later in this course).

Surgeons can adjust a patient’s leg length to match the other leg during hip replacement surgery, too, which is nearly impossible to address during resurfacing surgery because the femur anatomy is preserved and there is less ability to adjust the length of the components.

Certain conditions, including avascular necrosis, Perthe’s disease, slipped capital epiphysis or high grade hip dysplasia, make hip replacement one of the only viable options, as resurfacing isn’t an appropriate treatment.

Most total hip replacement implants do not have metal articulating with metal, whereas all hip resurfacing implants have metal-on-metal contact. Concerns related to metal-on-metal implants include elevated blood levels of metal ions and adverse tissue reactions.

The advantages of hip resurfacing:

Surgeons do not remove the femur head and neck, thus preserving more bone compared to total hip replacement. However, this advantage may be negated if extra acetabular bone is removed to accommodate the large metal cap.

The stress load (force across the joint) on articulating surfaces may be better in resurfacing than total hip replacement, too, which possibly decreases bone loss over time (Kishida, Sugano, Nishii, Miki, Yamaguchi & Yoshikawa, 2004). In general, patients who undergo resurfacing may have better hip abduction, joint proprioception and lower dislocation rates.

Although surgeons and implant manufacturers promote the idea that patients can return to an active lifestyle after resurfacing surgery, this idea remains unclear. High impact activities (running, singles tennis) may, in fact, hasten the implant failure.

You need to remember that implant components in both total hip replacement and resurfacing consist of an artificial femur ball (or cap) that articulates with the artificial acetabulum. The ball (or cap) and acetabulum are made of either metal, polyethylene or ceramic. Each femur-acetabulum combination or system, is described as metal-on-metal, metal-on-polyethylene or ceramic-on-ceramic. Currently, all resurfacing systems use metal-on-metal, while approximately 35 percent of total hip replacement systems use metal-on-metal systems.

The metal-on-metal systems can wear, corrode and release metal debris. Reports of elevated AB
metal ions and tissue damage have raised concern among patients, doctors and government agencies. Metal ions in blood and urine are detected weeks to years following surgical implant of these components. Metal debris can cause adverse local tissue reactions near the implant, such as pseudotumors (non-malignant growths), which can cause pain and dysfunction (Bisschop, Boomsma, Van Raay, Tiebosch, Maas & Gerritsma, 2013).

Metal-on-metal implants may be more problematic in poorly functioning implants. According to Halab and colleagues (2001) (and cited in Basko-Plluska, et al., 2011) “the prevalence of metal allergy was approximately 25% among patients with a well-functioning hip arthroplastic implant and 60% among patients with a failed or poorly functioning implant.” According to the authors, it’s unclear “whether metal allergy causes device failure or whether device failure causes metal allergy.”

However, the concerns linked to metal-on-metal implants are neither simple nor easy to evaluate. Some patients with these implants develop pain and tissue damage, for example, whereas others remain asymptomatic. And symptoms do not always correlate with the absolute amount of metal ions in tissues.

The FDA recommends that asymptomatic patients with metal-on-metal implants follow up with their orthopedic doctor every one to two years, and patients that develop symptoms should seek medical evaluation. Symptoms include changes in skin (a new rash), nervous system (hearing or vision impairment), mental status (depression or cognitive deficits), and kidney (impairment) or thyroid (weight change, fatigue) function.

**Surgical approaches for the hip.** The location of the incision for total hip replacement and resurfacing determines the type of approach the surgeon uses. Although there are multiple approaches, the anterior and posterior approaches are the focus of this article. We’ll also focus some time on the less invasive surgery approach.

Each approach is named according to the location of the incision, with reference to the great trochanter. For example, the posterior approach incision is made posterior to the greater trochanter.

**Posterior Approach.** The posterior or traditional approach is the most widely used in the United States. The patient is placed in the prone position or on the side (lateral decubitus). The surgeon makes a 10- to 12-inch, curved incision over the buttocks (posterior to the greater trochanter). The surgeon cuts through the gluteus maximus, external rotator muscles and the posterior joint capsule.

Compared to other approaches, the advantages of the posterior approach are its long and successful history, the large, visual exposure of the acetabulum and femur it provides and the fact that the abductor muscles are not cut.

The disadvantages include the fact that the patient’s gluteus maximus and short external rotator muscles are cut (and may or may not be reattached), increasing the risk of posterior dislocation. The sciatic nerve is at risk of being inadvertently cut, as well, and the incision is long (compared to the other approaches). Because of the risk of dislocation, the patient must follow strict hip precautions. These include limited hip flexion and internal rotation up to one year after surgery.

**Anterior Approach.** The patient is placed in the supine position and the surgeon makes a 7- to 10-inch linear (straight) incision anterior to the greater trochanter, separating the vastus lateralis and rectus femoris (or rectus femoris and sartorius). The surgeon then cuts through the anterior joint capsule.

The advantages of the anterior approach are its long and successful history, the large, visual exposure of the acetabulum and femur it provides and the fact that the abductor muscles are not cut.

The disadvantages include the fact that the patient’s gluteus maximus and short external rotator muscles are cut (and may or may not be reattached), increasing the risk of posterior dislocation. The sciatic nerve is at risk of being inadvertently cut, as well, and the incision is long (compared to the other approaches). Because of the risk of dislocation, the patient must follow strict hip precautions. These include limited hip flexion and internal rotation up to one year after surgery.

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**Advantages of Total Hip Replacement and Hip Resurfacing**

**TOTAL HIP REPLACEMENT:**
- Better outcomes
- Ability to alter leg length
- Appropriate for certain conditions
- No metal-on-metal issues (in non-metal implants)

**HIP RESURFACING:**
- Bone preservation
- More natural hip stress load
- Better hip abduction, joint proprioception
- Low dislocation rate
approach are less muscle damage because muscles are spread/separated. There is also a low risk of dislocation (because external rotator muscles are not cut), and it’s more cosmetically appealing because a smaller incision is used.

The disadvantage is this approach is more technically demanding for the surgeon. The anterior approach makes it difficult for the surgeon to align the femur with the prosthetic implant, thus increasing the risk of fracture to the femur.

Although the risk of dislocation is low, the surgeon may place the patient on hip precautions, limiting hip hyperextension and excessive external rotation up to one year post-surgery, for example. Note that hyperextension and external rotation are movements used in some yoga poses (i.e., warrior pose), thus caution is warranted.

Less invasive surgery. This approach incorporates small incisions and minimally invasive techniques. Typically, small incision indicates that the incision is about half the length of the conventional (anterior and posterior, for example) approach. Minimally invasive usually indicates use of an innovative technique that produces less tissue trauma. In some medical clinics, “less invasive surgery may include unique pre- and post-operative pathways for anesthesia, nursing care and rehabilitation” (American Association of Hip and Knee Surgeons; accessed 11/01/13).

In hip replacement surgery, one type of less invasive surgery uses a single, small (4- to 6-inch) capsular incision and minimal muscle detachment, and has various names, including mini-anterior, mini-posterior, and mini-anterolateral surgery.

A second, less invasive technique incorporates two small (2- to 4-inch) incisions, one anterior and the other posterior to the greater trochanter. The anterior incision allows the surgeon access to the femur, whereas the posterior incision allows access to the acetabulum. This technique is called the two-incision minimally invasive surgery.

Advantages of the less invasive surgery are smaller, cosmetically appealing incisions, and less muscle damage. Also, the phrase “minimally invasive” provides a psychological advantage. In other words, some people equate the word “minimal” to “less pain.”

Less invasive surgery, however, potentially has more complications. First, a small incision produces a restricted visual field for the surgeon and can result in greater tissue trauma and nerve damage. Second, the surgeon may find that learning and applying the less invasive surgery is more technically demanding, requiring different instruments and specialized equipment.

Additionally, some less invasive surgery techniques may result in implant mis-alignment, fracture and prolonged time in the operating room. For the patient, more blood loss and extended time under anesthesia can occur.

Complications and Revision
Hip replacement surgery carries significant risk of negative outcomes. During the surgery (and soon after) there is risk of blood clots, fracture, infection, nerve injury, significant blood loss and complications related to anesthesia. Long-term complications include metal sensitivity, leg length differences, nerve palsy, scarring and pain. Complications associated with metal-on-metal hip implants are elevated metal ion levels in the joint, blood and systemic reactions, and possible transport of metal ions across the placenta. There is an increased risk of femoral neck fracture in hip resurfacing.

Some implants fail, necessitating a second hip replacement called a “revision” surgery. With a revision,
part or all of the implant components are replaced. In the United States, approximately 50,000 revisions occur each year (Steiner et al., 2012).

Revision surgery is more complex than the primary surgery, typically requiring a larger incision and delicate removal of the old components and cement. Replacing (grafting) bone from a bone bank might also be necessary.

The reasons for revision surgery are complex and involve multiple factors related to the patient, surgeon and implant. Patient-related factors include young age, highly active, diagnosed with inflammatory disorders such as avascular necrosis and rheumatoid arthritis, multiple comorbidities (sickle cell anemia and poor bone quality, for example) and prone to infections.

Surgeon-related factors range from less experience (fewer surgeries) to incorrect placement of implants, while implant-related factors include instability (implant movement) and bearing surface failure (i.e., the once-smooth surface cracks or becomes rough). This failure results in bone separation (osteolysis) and the implant loosening, two common reasons for revision (Prokopetz, Losina, Bliss, Wright, Baron & Katz, 2012).

In general, the longevity or survival of the patient’s implant is longer after primary surgery than after a revision surgery. Most primary total hip replacement implants survive 15 to 20 years. The longevity of the revision surgery is more variable: 35 percent to 100 percent fail within 10 years. A higher failure rate occurs in younger patients (Springer, Fehring, Griffin, Odum & Masonis, 2009) because patients less than 65 years of age tend to be more active, weigh more and live longer than older counterparts. Advancements in the technology of new implant designs, computer-assisted surgeries and more experience with minimally invasive surgery will likely increase the longevity of revision surgery.

**Surgical treatment—the knee.** Ninety-seven percent of total knee replacements are performed because of advanced, symptomatic osteoarthritis (American Academy of Orthopaedic Surgeons, 2011). A small percentage of patients undergo surgery due to ligament injuries, rheumatoid arthritis, dislocation and fractures.

Patients have two surgical options to treat severe osteoarthritis: total and partial knee replacement. In total knee replacement surgery, the distal femur, tibial plateau, and cruciate ligaments are removed and replaced with artificial prostheses. In contrast, only small areas of the knee (e.g., small sections of the tibia, femur or patella) are removed and replaced in partial knee replacement surgery.

**Total knee replacement.** With total knee replacement, the surgeon cuts through skin, adipose, fascia and the joint capsule; some surgeons invert or pull the patella to the side. Once the articular cartilage is exposed, the surgeon cuts through and removes the ends of the distal femur and proximal tibia bones. In most cases the surgeon removes the anterior and posterior cruciate ligaments, although some tibial component designs allow retention of ligaments. If the patella contains extensive osteoarthritic damage, the surgeon removes and resurfaces the posterior side (patellar component).

The surgeon inserts metal fitted components over the femur (femoral component) and tibia (tibial component), securing each compo-

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**Advantages of Total Knee and Partial Knee Replacement Surgery**

**TOTAL KNEE REPLACEMENT:**
- Longer prosthesis survival
- Better adjustment of leg length and knee angle deformities
- Successful history
- Appropriate for certain conditions (torn ACL, extensive osteoarthritis damage, and rheumatoid arthritis)

**PARTIAL KNEE REPLACEMENT:**
- Small incision
- Greater bone preservation
- Less traumatized tissue and blood loss
- Lower dislocation rate
- Quicker recovery
- More natural feel during movement and greater range of motion
The femoral component is typically an alloy of cobalt-chromium; the tibial component (also called a tray) may be cobalt-chrome or titanium. Some companies use a new metal called oxidized zirconium. The spacer (outlay) is made of a hard polyethylene (plastic). The patellar component is made of metal or plastic.

Candidates for total knee replacement. People who are healthy, within normal weight and have solid bones are good candidates for total knee replacement. Healthy patients have strong immune systems that combat infections and stress. Again, normal weight patients place less stress on joints, so patients with body mass index (BMI; body mass divided by height squared) greater than 35 are encouraged to lose weight before surgery. Patients also need good bone stock to secure the implants.

Candidates for total knee replacement can be any age, but risk increases with age. Total knee replacement surgery is contraindicated in patients with infections, compromised immune systems, renal insufficiency, allergy to metal implants and some other conditions. Total knee replacement surgery may be contraindicated in patients with major psychiatric disorders (including dementia), as well as neurological and muscular disorders because these conditions make rehabilitation difficult.

Partial knee replacement. Similar to total knee replacement, partial knee replacement surgery entails incisions through all joint-related tissues, although the incision may be smaller. In contrast to total knee replacement, only the arthritic-damaged surfaces are replaced or resurfaced (and the healthy cartilage is retained) in partial knee replacement surgery.

There are two major types of partial knee replacement systems: unicompartmental knee replacement surgeries. Unicompartmental surgery replaces a single area of the knee, such as the medial, lateral or patellar articulating surfaces. Bicompartmental surgery involves replacing two articulating surfaces. Typically, the cruciate ligaments remain intact in both uni- and bicompartmental surgeries.

The component materials used in partial replacement systems are similar to total knee replacement systems and include cobalt-chrome, titanium or oxidized zirconium.

Candidates for partial knee replacement. Only 10 percent to 15 percent of patients are suitable for partial knee replacement. Partial knee replacement is appropriate for patients with small arthritic areas, typically confined to one side of the knee and with mild varus (“bow-legged”) or valgus (“knock-knees”) deformity. Similar to total knee replacement, patients should be in good health, appropriate weight (BMI less than 35) and have good bone stock.

Partial knee replacement surgeries are not appropriate for patients with a torn anterior cruciate ligament, extensive osteoarthritis damage and rheumatoid arthritis. This surgery is also contraindicated in patients with infections, compromised immune systems and some other conditions.
“Knee replacement surgery carries risk of short- and long-term complications.”
Total or Partial Knee Replacement—Which is Better?
Both total and partial knee replacement surgeries have advantages and disadvantages.

The advantages of total knee replacement:
Total knee replacement components remain functional for longer periods than most partial knee components. For example, the nine-year failure rate for total knee replacement surgery ranges from 2.9 percent to 6.7 percent compared with 11.6 percent to 16 percent reported for partial knee replacement surgery (Full 10th NJR Annual Report, 2013).

Surgeons correct leg length and varus/valgus deformities better with total knee replacement surgery. Moreover, surgeons are more familiar, and commonly perform, total knee replacement surgeries.

Finally, patients with a torn anterior cruciate ligament, extensive osteoarthritis damage and rheumatoid arthritis can undergo total knee replacement surgery, whereas partial knee replacement surgery is not appropriate for these conditions.

The advantages of partial knee replacement:
Surgeons typically use smaller incisions and remove less bone with partial knee replacement surgeries. Because of less tissue disruption, patients experience less blood loss, lower dislocation risk, and recover quicker from surgery. Some patients report a more “natural feeling” knee and greater range-of-motion after receiving partial knee replacement.

Implant material concerns. Knee replacement components wear-out, produce debris and create metal sensitivity in some patients. Polyethylene wear is evident by the progressive growth of inflammatory tissue in and around the joint. The implant wear may be dependent on the manufacturer, implant design, skill of the surgeon and activity level of the patient.

Some knee replacement implants have problems with metal debris and corrosion. Savarino and colleagues (2010) measured serum chromium metal ion levels in patients that had stable or unstable components and reported that ion levels were significantly higher in patients with unstable components than in patients with stable components.

Surgical approaches—the knee
The location of the incision for total and partial knee replacements determines the type of approach the surgeon uses. There are two conventional approaches, medial and lateral, and a third technique called less invasive. Each approach is named according to the location of the incision in reference to the patella.

Scholars greatly debate the advantages and disadvantages of each approach, and various opinions result. Because of this complexity, the pros and cons of each approach are beyond the scope of this article.

Medial approach. With the patient in the supine position, the surgeon makes an 8- to 12-inch incision medial to the patella through skin and adipose; with the knee bent, a second incision is made through the joint capsule. To expose the knee’s articulating surfaces, some surgeons cut or lift a small segment of the distal quadriceps (rectus femoris or vastus medialis). This technique is commonly known as midvastus split or subvastus. In contrast, some surgeons do not cut the quadriceps, known as quad-sparing.

Lateral approach. With the patient in the supine position, the surgeon makes an 8- to 12-inch incision lateral to the patella, and with the knee bent, a second incision is made through the joint capsule. Surgeons either cut or spare the vastus lateralis and rectus femoris muscles.

Less invasive surgery. Similar to hip replacement surgery, “less invasive surgery” incorporates small incisions and minimally invasive techniques. The surgeon typically makes a 4- to 6-inch incision, compared with the conventional 8 to 12 inches.

In addition, the surgeon maintains minimal tissue trauma with small incisions to the extensor muscles and/or the suprapatellar bursa, a technique called mini-midvastus or mini-subvastus. Sparing the extensor muscles is called mini quadr-sparing. Unfortunately, the multiple names for similar surgeries create confusion in the media and research literature.

Complications and Revisions
Knee replacement surgery carries risk of short and long-term complications. During (and soon after) the surgery, there is risk of blood clots, fracture, infection, nerve injury, significant blood loss and complications related to anesthesia. Long-term complications are aseptic (no infection) component loosening, wound infection, polyethylene component wear, instability, pain and stiffness, osteolysis (bone loss), and bone-implant misalignment (Dalury, Pomeroy, Gorab & Adams, 2013). Additionally, there is risk of leg length differences, nerve palsy, scarring and pain.

If a complication results in the
If a complication results in the failure of the implant, a second surgery—or revision—is necessary. A recent study reported that many of the revisions that occurred within five years of surgery were the result of infection, and instability/malposition. Revisions after five years resulted from implant wear, loosening, and instability/malposition (Dalury, et al., 2013).

The longevity or survival of total knee replacement implants in patients at 10 years ranged from approximately 90 percent to 95 percent (Gøthesen, Espehaug, Havelin, Petursson, Lygre, Ellison, Hallan & Furnes, 2013), although survival is dependent on factors such as type of implant and surgeon experience. (Australian Orthopaedic Association National Joint Replacement Registry. Annual Report. Adelaide:AOA; 2013).

Patient-related factors, such as age, also influence the longevity of the implant. At five years, implant survival rates were lowest (92 percent) in patients aged 55 years or younger, compared with patients age 56 to 65 years (95 percent) and 65 years or older (97 percent) (Julin, Jämsen, Puolakka, Konttinen & Moilanen, 2010). The age-related risk may reflect a higher activity level, greater obesity or other factors. Other patient-related risks associated with implant longevity are poor patient health, comorbidities (e.g., diabetes), and higher body mass index (Paxton, Inacio, Khatod, Yue & Namba, 2010).

The rate of revision is higher after partial knee replacement. At ten years, an average 16.5 percent revision rate was reported for partial replacements, compared with 6.2 percent revision rate after total knee replacement (Pabinger, Berghold, Boehler & Labek, 2013).

Post-Surgery—Hip and Knee Rehabilitation and Conditioning

Massage and physical therapy play an important role in a patient’s recovery from hip and knee replacement surgery. Hospital-based massage therapists provide individualized therapy that is dependent on the patient’s needs, massage therapist’s training and hospital’s protocol. For example, the massage therapist may address a patient’s pain and edema by applying gentle back, foot or hand massage, or use manual lymphatic drainage. Hospital protocol may dictate the application of massage once or twice per day until discharge of the patient.

The hospital-based physical therapists provide therapy directed at post-surgical ambulation. For example, the physical therapist encourages the patient to conduct simple “muscle-waking” exercises, such as gluteal contractions, ankle circles, and heel slides (hip replacement patients), as well as quadriceps contractions, ankle pumps, and heal slides (knee replacement patients).

In time, the patient learns how to safely move to the edge of the bed, rise from a chair, and walk with crutches or a walker. Before discharge from the hospital, the patient must demonstrate (using crutches or a walker) the ability to walk a short distance, and ascend and descend stairs safely. Some doctors require patients to continue to use a walker or crutches for four weeks (hip replacement) or six to eight weeks (knee replacement) after surgery.

After discharge from the hospital, the patient will either go home or to an inpatient rehabilitation center. Patients that go home presumably have a partner or family member to assist the patient with dressing changes, meals and bathing. Physical therapists may come to the patient’s house several days per week to ensure the patient is moving properly and performing exercises. Patients that go directly to inpatient rehabilitation facilities have nursing staff trained to change wound dressings, assist in bathing and general ambulation, and physical therapists trained to properly strengthen and rehabilitate hips and knees.

Approximately two weeks after hip or knee surgery, patients attend outpatient physical therapy programs. Physical therapy is an essential part of the rehabilitation process. Patients participate in outpatient physical therapy for several weeks to increase strength and range-of-motion. A recent study demonstrated that the combination

“Massage and physical therapy play an important role in a patient’s recovery from hip and knee replacement surgery.”
of physical therapy and (modified) asana yoga benefitted total knee replacement patients (Bedekar, Prabh, Shyam, Sancheti & Sancheti, 2012). Specifically, the patients reported “better pain relief, less stiffness and better function.” The authors reported the yoga exercises did not produce any adverse effects.

Following outpatient therapy, the patient can resume normal activities, although some surgeons suggest patients practice precautions for approximately six months to one year post-surgery. For example, hip precautions following a posterior approach include avoiding greater than 90-degree hip flexion, crossing legs and inversion of the feet. Knee precautions include an avoidance of deep knee bends, and knee twisting and kneeling.

**Current Research—Benefits of Massage Therapy on Surgical Patients**

**Joint replacement surgery.** Research supports the use of massage therapy as a therapeutic benefit to replacement patients. For example, a recent study reported that combined massage and relaxation techniques benefitted patients that underwent either total hip or knee replacement surgery (Büyükyılmaz & Aştı, 2013).

Applications of 10-minute back massages (effleurage and pettrissage) and relaxation (rhythmic respiration, muscle relaxation exercises and listening to music) twice daily after surgery resulted in decreased anxiety and pain in patients, compared to patients receiving only conventional care.

Likewise, manual lymphatic drainage assists in functional recovery following joint replacement. A recent study examined the effects of manual lymphatic drainage in post-knee replacement patients (Ebert, Joss, Jardine & Wood, 2013). One group of patients received a standard 30-minute session (plus standard care) and a second group received only standard care. The authors reported that greater knee

“Research supports the use of massage therapy as a therapeutic benefit to replacement patients.”
Flexion occurred in patients who received manual lymphatic drainage (compared with patients that did not) four days post-surgery and six weeks after surgery. Moreover, manual lymphatic drainage patients reported “improved feeling of well-being and a more relaxed physical and/or mental state.”

**Massage and other surgeries.** The benefits of massage therapy are known to help various post-surgical patients. For example, massage reduced pain and anxiety, and increased a sense of well-being in post-mastectomy patients (Drackley, Degnim, Jakub, Cutshall, Thomley, Brodt, Vanderlei, Case, Bungum, Cha, Bauer & Boughley, 2012) and reduced pain, anxiety and tension in patients following cardiac surgery (Cutshall, Wentworth, Engen, Sundt, Kelly & Bauer, 2010; Braun, Stanguts, Casanelia, Spitzer, Paul, Vardaxis & Rosenfeldt, 2012).

Manual lymphatic drainage decreased swelling and pain following surgical mastectomy (Forschuk, Baruth, Prendergast, Holliday, Bareham, Brimmer, Schulz, Chan & Yammine, 2004), improved lymphedema in post-bariatric surgery patients (Bertelli, de Oliveira, Gimenes & Moreno, 2013) and in heart failure patients (Leduc, Crasset, Leelu, Baptiste, Koziel, Delahaie, Pastouret, Wilputte & Leduc, 2011), and decreased foot volume and improved quality of life in patients with chronic venous disease (Molski, Kruczyński, Molski & Molski, 2013).

Massage therapy may influence the progressive nature of scar tissue too. Martínez Rodríguez and Galán del Río (2013) proposed that specific scar modeling techniques might alter the formation of scar tissue due to myofascial injury. Further, Roh and colleagues (2007) reported improvement in scar-related characteristics, such as skin pigmentation, pliability and vascularity and scar height after daily massage for three months. Moreover, massage produced a significant decrease in depression in patients with burn scars (Roh, et al., 2007).

**Being Mindful Before and After Surgery**

The massage therapist must always work within the scope of practice when dealing with patients. Communicate with the patient’s surgical team (surgeon, physician assistant, physical therapist) to determine pre-surgical contraindications and when to initiate post-surgical massage therapy.

Remember, too, you need to be mindful of the patient’s needs before and after joint surgery, and plan ahead to best address each issue. Prior to surgery, the patient likely has high stress and anxiety, and fluctuating mood. The massage therapist can provide relaxation techniques and a safe environment to promote a sense of well-being.

The pre-surgical patient likely has relentless joint pain and muscle stiffness. Hydrotherapy soothes and warms muscles and joint structures; gentle massage increases heat and circulation to the affected area. Joint mobilization with deep pressure is contraindicated because of increased risk of tissue irritation. Also, avoid contact with the surgical site within 48 hours of surgery.

The patient is probably also taking pain and/or anti-inflammatory medications, so be aware of medication side effects and possible altered sensation.

After surgery, the patient may experience a psychological roller coaster of emotions, including relief once the surgery is complete. However, if the outcomes of the surgery
or recovery fall short of expectations, the patient may experience frustration and depression. The massage therapist can provide comfort and empathy through engaged listening and a calm environment. Gentle massage of the head, hands and feet can soothe and distract the patient.

Also, the post-surgical patient will have significant tissue trauma. The muscles and new joint must relearn to function and support the body once again. The massage therapist can provide brief, gentle touch to distal sites to help decrease pain and anxiety. Manual lymphatic drainage enhances lymph flow and decreases edema. Avoid the surgical site because of risk of infection and pain.

Be aware of post-surgical complications and joint precautions. The surgeon will provide the patient with instructions regarding possible post-surgical complications, such as symptoms of a blood clot and infection. Also, depending on the type of surgery and approach, the surgeon will provide hip or knee precautions. Follow the precautions when applying massage, stretching, passive and active movements.

The post-surgical patient will likely take medication for pain, blood clot prevention and infection. Once again, be aware of possible side effects, and the patient’s level of pain and sensation. Blood thinners are meant to prevent clots, but they also increase the risk of skin bruising. Therefore, adjust the pressure of the massage accordingly. If any unexplained swelling or pain arises, immediately refer the patient to the medical provider.

Also, make note of any co-morbidities that may influence your massage, such as diabetes and peripheral neuropathy. Massage can alter blood glucose levels and possibly hasten fatigue, and neuropathy can alter the level of sensation. The massage therapist must adapt both the massage (and awareness) to the each patient’s circumstances.

Once the risk of infection has passed, the massage therapist can initiate scar therapy with gentle intent. The massage therapist may perform assisted, then passive movements of the patient’s affected limb. Continue lymphatic drainage and support healing through awareness and touch.

In Summary
Osteoarthritis is a complex condition characterized by the slow, chronic destruction of joints, and is the primary cause of joint pain and disability. Aging, gender, joint trauma, obesity, genetics, and muscle weakness are risk factors for developing osteoarthritis. Non-surgical treatments to alleviate osteoarthritic pain include strengthening exercises, activity modification, weight loss, manual therapy, acupuncture and the use of a cane or walker. Joint replacement surgery is an option only when the osteoarthritis significantly affects the patient’s quality of life and loss of function interferes with daily activities.

Joint replacement surgery is common worldwide and successfully alleviates symptoms of osteoarthritis. Many factors influence the outcome of replacement surgery, such as patient-characteristics (age, activity level and co-morbidities, for example), prosthesis, surgical skill and post-surgery rehabilitation.

Surgical options are available for osteoarthritic hips and knees (e.g., total hip replacement, hip resurfacing; total and partial knee replacement). Total hip and total knee replacement surgeries are more common and have a longer survival rate than do resurfacing and partial knee replacement.

Massage therapy plays an important role in the patient’s pre- and post-surgical journey. Massage helps to decrease pain, anxiety, edema, and muscle stiffness, and increase mobility and sense of well-being. Manual lymphatic draining, specific muscle massage, stretching, and scar tissue massage are important techniques that massage therapists can incorporate into the
patient’s rehabilitation plan. Awareness and compassion are imperative. As a part of the health care team, massage therapists provide a valuable service to the patient’s road to recovery.

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REFERENCES


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**STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION**

(Required by 39 U.S.C. 3685) Date of filing: 1114
Title of publication: Massage Therapy Journal Publication No: 0895-0814
Frequency of issue: quarterly No. of issues published annually: 4
Annual subscription price: $25

Complete mailing address of known office of publication:
American Massage Therapy Association, 500 Davis St., Suite 900, Evanston, IL 60201-4695. Owner: American Massage Therapy Association, 500 Davis St., Suite 900, Evanston, IL 60201-4695.

Complete mailing address of headquarters or general business of the publisher: same as above.

Names and addresses of publisher and editor: publisher, American Massage Therapy Association; managing editor, Michelle Vallet, 500 Davis St., Suite 900, Evanston, IL 60201-4695. Owner: American Massage Therapy Association, 500 Davis St., Suite 900, Evanston, IL 60201-4695.

Known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities: None. The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes have not changed during the preceding 12 months.

Heading for numbers in red: Average No. copies each issue during preceding 12 months.
Heading for blue numbers: No. copies in single issue published nearest to filing date

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