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Thomas G. Wilson

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Case Report: Optimal Time between Procedures for Contralateral Total Knee Arthroplasty

Thomas G. Wilson

University of North Dakota

PERMISSION

Title Optimal Time between Procedures for Contralateral Total Knee Arthroplasty

Department Nursing

Degree Master of Science

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Abstract

Osteoarthritis (OA) can be defined as degenerative joint disease that is caused by the breakdown of joint cartilage and the underlying bones due to friction as a result of aging and repeated back and forth motion of the joint. This can occur in any of the joints but those most commonly affected are the hands, knees, hips, and spine. The most common symptoms associated with OA are pain and stiffness which can ultimately limit or reduce mobility and quality of life. It is primarily a disease of aging and occurs most often in older adults. An effective surgical intervention for treating symptomatic, end-stage knee osteoarthritis is known as Total Knee Arthroplasty (TKA), which is commonly used to improve mobility and relieve pain and remains the gold standard (Duchman, Gao, Pugely, Martin, & Callaghan, 2014). This paper is going to examine a case report highlighting a controversy in treatment strategy regarding the optimal timing of surgery on the contralateral knee after the first TKA for patients with symptomatic bilateral OA undergoing staged TKAs. A literature review looking at the two different methods of Staged-Bilateral TKAs (BTKA), same hospitalization but days apart vs. separate hospitalization, factors influencing medical decision making including risk factors for patient selection, perioperative complications, and functional outcomes. Understanding the factors that influence the medical decision making and the rationale for the different treatment strategies will help primary care providers to better educate, answer questions, and provide better overall care for their patients undergoing TKA or BTKA.

Case Report: Optimal Time between Procedures for Contralateral Total Knee Arthroplasty

Background

The case study in this report involves a 67-year-old male that presents in clinic for a pre-operative physical and clearance for a scheduled right total knee arthroplasty (TKA). He has symptomatic end-stage knee osteoarthritis and is still recovering from a left TKA approximately eight weeks prior to this visit. In obtaining a health history, he did complain of right knee osteoarthritis symptoms of pain with increased ambulation, stiffness at rest and in the morning upon waking, and occasional swelling of the knee joint. These symptoms have become resistant to nonsurgical treatments, including ibuprofen/NSAIDS, ice pack therapy, and elevation of the extremity. He is not yet fully recovered from his recent LTKA, but has completed his rehabilitation, feels much better, and only uses a cane for walking assistance at times due to the degenerative disease that remains in his right knee. His physical examination was mostly unremarkable except for mild BP elevation and mild inflammation of left knee post-replacement. Since this patient had a staged bilateral TKA approximately eight weeks ago and now presents for pre-op clearance for a second primary knee joint replacement surgery on the contralateral side, the question regarding the optimal timing interval for patients between surgical procedures would seem prudent in caring for this and other patients in the future.

This report will further examine the controversy in treatment strategy regarding the optimal timing of surgery on the contralateral knee after the first TKA for patients with symptomatic bilateral osteoarthritis (OA) undergoing staged bilateral TKA (BTKA) by discussing the two types of BTKA (simultaneous and staged), the factors involved in medical decision making such as patient selection criteria for BTKA, risk factors, complications, and

outcomes associated with the type of bilateral total knee arthroplasty the patient is eligible to undergo.

Pre-Operative History and Physical Examination

PATIENT NAME: J. D.

AGE: 67

SEX: Male

DOB: xx/xx/1949

CHIEF COMPLAINT: Pre-Operative evaluation for Right Total Knee Arthroplasty (TKA)

HISTORY OF PRESENT ILLNESS: This is a 67-year-old Caucasian male that is here for a pre-op physical and clearance for a RTKA which is scheduled with Dr. G. at Altru Hospital on 2/28/2016. He states he “feels good” but has had several months of right knee joint pain that is deep, achy, and exacerbated with longer walks or climbing stairs. He will get occasional mild swelling in the right knee from increased activity. He also notices stiffness during rest as well as upon waking in the morning, but this usually lasts a short time. Treatments he has tried include ice packs, elevation of the extremity, and ibuprofen. He states that all of these “help”, but do not alleviate the pain completely (9-10/10 to 4/10). Mr. J. D. is s/p Left TKA (12/21/15) and states that he had nausea as a post-op complication, otherwise it went well. He has completed the rehabilitation program for his s/p LTKA and had complaints of mild numbness and swelling in his left knee, however this has improved with ibuprofen prn.

PAST MEDICAL HISTORY:

Medical:

- Diabetes Mellitus, Type 1 – diagnosed at age 25, insulin pump x 3yrs
- Hypertension
- Hyperlipidemia
- Polyosteoarthritis

Surgical:

- s/p Appendectomy
- s/p Inguinal Herniorrhaphy B/L
- s/p Right Meniscectomy
- s/p Left TKA – (Dr. G., Altru Hospital - 12/21/15)

- s/p Insulin Pump - 2013

Medications:

- Losartan 10mg PO once daily in the morning
- ASA 81mg PO once daily in the morning
- Simvastatin 80mg PO once daily at bedtime
- Novolog Insulin via pump

Allergies: NKDA

FAMILY HISTORY: Noncontributory. Daughter is healthy.

PSYCHOSOCIAL HISTORY: Mr. J.D. is married and lives with his wife in Grand Forks. He has a daughter who is married and also lives in Grand Forks. His wife is a retired Registered Nurse. He is a retired accountant, but does do some work occasionally with his son-in-law who has a new construction business. He has a 20-pk year history of smoking cigarettes and consumes one alcoholic drink per day. He stays active with walking, but this has decreased due to the increased symptoms he's experiencing in his right knee. He tries to maintain a low sodium, diabetic diet, but is not always consistent.

REVIEW OF SYSTEMS:

Constitutional: "I feel good." Denies headache, fever, chills, night sweats, sore throat, cough, dyspnea, chest pain, or abdominal pain. No insomnia or sleep disturbances. Good appetite.

Eyes: Denies visual changes, blurred vision, or eye drainage. Wears prescription eyeglasses.

E/N/T: Denies ear pain, hearing loss or changes. Denies nasal/sinus congestion or drainage, sore throat, swelling, or voice hoarseness. Denies any current dental problems.

Cardiovascular: Denies chest pain, pressure, palpitations, or history of arrhythmia.

Respiratory: Denies cough, dyspnea, wheeze, or hemoptysis. Denies obstructive sleep apnea.

Gastrointestinal: Denies abdominal pain, nausea, vomiting, GERD, constipation or diarrhea.

Genitourinary: Denies dysuria or hematuria.

Musculoskeletal: Positive for Left knee numbness, swelling, and pain with ambulation. Positive history of severe osteoarthritis. He is s/p LTKA on 12/21/15. Uses cane with ambulation at times.

Integumentary: Denies rashes or changes in moles. No skin lesions or concerns at this time.

Neurological: Denies headaches, dizziness, or tremors. Positive for numbness in Left knee.

Hematologic/Lymphatic: Denies easy bruising on ASA. Denies coagulopathy/blood disorders or lymphadenopathy.

Endocrine: Denies thyroid problems, temperature intolerances. Positive for T1DM, insulin pump.

Allergic/Immunologic: Denies seasonal allergies or asthma. Denies frequent/recurrent infection.

Psychiatric: Denies anxiety, depression, mental illness, illicit drug, or alcohol abuse.

PHYSICAL EXAMINATION:

General: Mr. J. D. is a pleasant, well-groomed, Caucasian, 67-year-old male, who appears his stated age. He is alert, oriented, cooperative, and sitting in chair in the exam room in no acute distress. He is a good historian and answers all questions appropriately.

Vital Signs: BP 158/94; P 76 and regular; R 20 and regular; T 98.8°F.

Skin: Warm, dry, and intact. No lesions or rashes noted. No cyanosis, pallor, or jaundice.

Brittle yellowish toenails bilaterally.

HEENT: Head: Normocephalic, atraumatic. Eyes: Symmetric, PERRL, sclera white, conjunctiva pink; wearing eyeglasses. Ears: Symmetric, nontender, hearing is appropriate to conversation. No erythema or fluid noted, canals patent, TMs intact bilaterally. Nose: No drainage, mucosa pink and moist, and septum midline, nares patent bilaterally.

Frontal/Maxillary sinuses non-tender to palpation. Mouth/Throat: Buccal mucosa and gingiva pink, moist without any lesions. Pharynx clear without erythema. Tongue and uvula are midline, pink, and moist. Swallow reflex appropriate.

Neck: Supple. Trachea midline, thyroid nonpalpable, smooth, nontender to palpation, no goiter. LNs not enlarged and nontender to palpation.

Respiratory: Normal chest wall appearance and symmetric expansion. Lung fields CTA bilaterally. Regular, easy respirations.

Cardiovascular: Normal S1, S2, RRR, no murmur, rub, or gallop. Radial and DP pulses 2+, equal and symmetric. Trace edema noted Left knee.

Abdomen: Flat, soft, nontender, nondistended, bowel sounds positive in all four quadrants. No guarding or rebound. Insulin pump port in place noted at right lateral abdomen and RLQ blood sugar sensor also in place and intact.

Genitalia: Deferred; not examined.

Rectal: Deferred; not examined.

Musculoskeletal: Moves all extremities. Left knee with trace edema/swelling, slightly warm to palpation, no erythema, well-healed surgical scar anterior knee s/p LTKA. Right

lower extremity is within normal limits. Able to step up and step down from exam table unassisted without difficulty.

Neurological: Alert and oriented x 3; normal speech pattern; mood and affect appropriate to situation. No tremors. CN II-XII grossly intact. Motor: 5/5 UE's and 4/5 LE's. Sensory intact to sharp and light touch stimulation. DTRs 2+ B/L and symmetrical.

Laboratory Data:

- CBC: WBC 8500; RBC 3.0; Hct 34.5; Hgb 12.0; Plt 400, otherwise WNL.
- CMP: Na 140, K 3.9, Cl 105, CO₂ 28, Cr 0.8, BUN 9, Gluc 96
- ECG: normal sinus rhythm, no ectopic beats, no ischemia.

ASSESSMENT/PLAN:

1. **Osteoarthritis of knee, unspecified, ICD-10:M17.9** – s/p LTKA 12/21/15, finished rehab, some c/o numbness/swelling, mild pain with ambulation, otherwise appears to be healing well. His Right knee has increased symptoms of pain with ambulation not well relieved with rest, ibuprofen, ice pack, or elevation. Has RTKA scheduled with Dr. G. on 2/28/16 (approximately 8 weeks post LTKA). Based on this patient's history and physical exam, ECG, lab data, and his overall health I feel he is an appropriate candidate for his scheduled RTKA. Discussed with patient and he is in agreement with this plan.
2. **Essential (Primary) Hypertension, ICD-10: I10** – BP is elevated (150s/90s) in the office today, he reports home BPs have been in the normal range. Continue home BP checks, amlodipine and low-dose ASA for cardiovascular protection.
3. **Type 1 Diabetes Mellitus without complications, ICD-10:E10.9** – good overall control, on Novolog insulin via insulin pump. Good B/L foot exam, reviewed DM complications. Continue current plan of care.

4. **Hyperlipidemia, unspecified, ICD-10:E78.5** – continue exercise regimen, Therapeutic Lifestyle Changes (TLC), and statin therapy.
5. Patient is to RTC as needed or in 6 months for routine follow-up and associated lab work.

Literature Review

One of the most common causes of disability among older adults is osteoarthritis of the knee (OA). The prevalence of OA will continue to rise as the aging of the “baby boomer” generation and the obese population increase (Maradit Kremers et al., 2015; Van Manen, Nace, & Mont, 2012). Roughly 27 million U.S. adults are affected by osteoarthritis currently and it is predicted that the number of U.S. adults with OA will reach 67 million by the year 2030 (Van Manen et al., 2012). While it is important to note that in 2008, the American Academy of Orthopaedic Surgeons (AAOS) issued clinical practice guidelines for non-operative treatment options for patients with OA of the knee, this paper will focus on the most effective operative treatment for end-stage degenerative osteoarthritis, the total knee arthroplasty (TKA) (S. Memtsoudis et al., 2009; Van Manen et al., 2012). The TKA was first performed in the 1970’s and now the operation is commonly performed with more than 620,000 procedures performed in the U.S. in 2009 (Weinstein et al., 2013). TKA is “beneficial to a majority of recipients and is cost effective for quality of life assessments” (Van Manen et al., 2012, p. 713). The goals of TKA are to reduce pain, return to the activities of daily living, restore mechanical alignment in the joint, preserve the joint line, balance the ligaments, and restore a normal Q angle (Van Manen et al., 2012). For primary care providers the decision when to move forward with TKA is “a complex process” for the provider and the patient in which factors are taken into account like “severity of symptoms, age, comorbidities, and socioeconomic variances” (Van Manen et al.,

2012, p. 714). As with the patient in this case, the medical decision making regarding this patient who had a staged bilateral TKA approximately eight weeks ago and now presents for pre-op clearance for second primary knee joint replacement surgery on the contralateral side. This situation represents a complex process as to what the optimal timing interval would be for patients between surgical procedures.

A literature review was conducted to determine the optimal timing of surgery on the contralateral knee after a patient has undergone their first TKA in a staged BTKA and the rationale for this medical treatment strategy. A search was conducted utilizing the University of North Dakota Harley E. French Library of the Health Sciences website. A systematic search of the literature was performed using the online database CINAHL employing Boolean/Phrase search mode and terms of *knee AND arthroplasty AND bilateral* with limitations of Peer Reviewed, English language, as well as publication date to within the last seven years, a total of 114 articles were generated. After adding the term *AND staged* to the previous terms, the number of articles was reduced to fifteen. After reviewing the list of generated articles, three articles were selected and considered relevant to the purpose of this case report. From the three selected articles, eight additional relevant articles were found in a review of the articles reference sections. The grading system this author chose to use in regard to gaining a better understanding of the quality and validity of the research evidence within the literature articles was the American Academy of Orthopaedic Surgeons (AAOS) Evidence Rating System which utilizes an “ABCI” rating system, where “consistent Level I studies” are considered “Good evidence” and given the highest evidence rating and recommendation of “A - Recommends” (*Total Knee Replacement | Performance Measurement Set | PCPI Approved January 2013*, 2012). The rating and recommendation of “B - Suggested” is given for “consistent Level II and III studies” and

considered “Fair evidence” (*Total Knee Replacement | Performance Measurement Set | PCPI Approved January 2013, 2012*). The rating and recommendation of “C – Option” is given for “Level IV or V studies” and considered “Poor quality evidence” (*Total Knee Replacement | Performance Measurement Set | PCPI Approved January 2013, 2012*). The lowest rating and recommendation of “I – Neither not recommended nor recommended” is given to studies “when there is insufficient or conflicting evidence” (*Total Knee Replacement | Performance Measurement Set | PCPI Approved January 2013, 2012*). The AAOS Evidence Rating System is used in conjunction with the Level of Evidence chart, which is an adaptation of “The Oxford 2011 Levels of Evidence” from the Oxford Centre for Evidence-Based Medicine (OCEBM) (“Level of Evidence | The Journal of Bone & Joint Surgery,” 2016). This chart assists in grading the level of evidence on a scale of “Level I-V”, in which “Level I” is the highest level of evidence given to studies such as randomized controlled trials (RCTs) (“Level of Evidence | The Journal of Bone & Joint Surgery,” 2016). A grade of “Level II” is given to studies such as prospective cohort studies, control arm of randomized trial, or observational studies with dramatic effect (“Level of Evidence | The Journal of Bone & Joint Surgery,” 2016). A grade of “Level III” is given to studies such as retrospective cohort studies, or case-control studies (“Level of Evidence | The Journal of Bone & Joint Surgery,” 2016). A grade of “Level IV” is given to studies such as a case series or historically controlled studies (“Level of Evidence | The Journal of Bone & Joint Surgery,” 2016). A grade of “Level V” is the lowest level of evidence and is given to mechanism-based reasoning studies (“Level of Evidence | The Journal of Bone & Joint Surgery,” 2016). This Level of Evidence chart also takes into account and consideration of the type of study (Diagnostic, Prognostic, Therapeutic, and Economic) as well as the primary research question (“Level of Evidence | The Journal of Bone & Joint Surgery,” 2016) when

grading the quality, strength, and validity of research articles for an appropriate level of evidence. This can be very important when there is limited research in higher level studies.

Differences in Staged BTKA

There are two versions of staged bilateral TKA and the primary difference between the two involves the timing in which the second surgery is performed on the contralateral knee after a patient has undergone their first TKA. In a same-admission staged BTKA, the patient has a TKA on the primary knee and then will stage the second TKA for the contralateral knee generally within an interval of two to seven days apart (S. Memtsoudis et al., 2009). In a staged BTKA, the patient will undergo a TKA during one hospital admission, recover from the surgery and complete rehabilitation before undergoing a second surgery on the contralateral knee. This is where the treatment strategy regarding the optimal timing of surgery on the contralateral knee is largely controversial.

Risk Factors | Complications

In a retrospective cohort study (Level III) performed by Poultsides, Memtsoudis, Do, Sculco, and Figgie (2015), they compared 30-day mortality, in-hospital complication rates, and blood transfusion rates between patients undergoing same-admission staged BTKA and patients undergoing BTKA staged within 1 year. They examined institutional data for patients undergoing same-admission staged (n=149) and those undergoing staged BTKA (n=1557) from 1998-2011. While the age of the groups were similar, the same-admission staged group were more likely to be males and had more medical comorbidities such as CAD with inducible ischemia, CHF, COPD, uncontrolled DM, renal failure, morbid obesity, history of VTE, or older than 75 years. Regression models looked at the association between surgery type and occurrence of complications. The results showed no difference in 30-day mortality between the groups (0% vs.

0.06%; $p=0.754$) and no difference in local complication rates (0.7% vs. 0.8%; $p=1.000$).

However, the same-admission staged group was shown to be three times more likely to develop a minor complication and two times more likely to develop a major complication. More acute post-op anemia and blood transfusion occurred in this group as well. The authors concluded that patients with higher comorbidity burden may benefit by undergoing staged BTKA within 1 year rather than same-admission staged BTKA due to the increased perioperative morbidity association.

S. Memtsoudis et al. (2009), performed a retrospective cohort study (Level III) that looked at a nationwide sample of inpatient data from 1998-2006 and identified patients that underwent unilateral (UTKA) and BTKA procedures performed on the same day (simultaneous) and separate days (staged) during the same hospitalization. In-hospital mortality and complications that were procedure-related were calculated and compared between the groups. Independent risk factors for morbidity and mortality were also identified. The results of the study revealed an increased incidence of both perioperative complications and in-hospital mortality among those hospital patients undergoing BTKA compared to those hospital patients undergoing UTKA procedures. Their results also showed that staged procedures performed during the same hospitalization were associated with a higher incidence of “most studied in-hospital complications when compared with simultaneous surgeries, and offered no mortality benefit (0.29% for simultaneous and 0.26% for staged BTKA; $P=0.2875$)” (S. Memtsoudis et al., 2009, p. 1213). These findings are consistent with a number of studies in the literature reviewed that undergoing BTKA, simultaneous or staged same-admission procedures, “carried an increased adjusted risk of in-hospital mortality and greater incidence of in-hospital complications when compared to unilateral TKA procedures” (S. Memtsoudis et al., 2009, p. 1215). However, the

caveat to a study by Poultsides et al. (2015) was that for BTKA (same-day or simultaneous) in one hospitalization to be “performed safely without increased perioperative morbidity and mortality compared with staged BTKA is if a selective preoperative screening process for a potential candidate is used” (Poultsides et al., 2015, p. 191). S. Memtsoudis et al. (2009), notes that one reason why a selective preoperative screening process is done is to further minimize potential unfavorable outcomes related to this elective surgical procedure. They also concluded that more studies are needed to determine if conditions for BTKA (staged or simultaneous) during one hospitalization can be performed devoid of increased risk and until then, they cannot recommend them based upon their findings. Also, in a consensus statement by S. G. Memtsoudis et al. (2013), there was a general agreement that the greater the comorbidity burden, the higher the risk for adverse outcomes and emphasized the importance of patient selection for when considering candidates for BTKAs.

In a retrospective cohort study (Level III), Barrett et al. (2006) examined when BTKA is indicated, if it is preferable to perform BTKA (simultaneous) during the same hospitalization or to stage the procedure in two separate hospitalizations. They also analyze what is known regarding reports of higher risk of pulmonary embolism (PE) after simultaneous BTKA. They looked at 122,385 U.S Medicare enrollees with the ICD-9-CM procedure code “81.54” indicating (total knee replacement) and tied it to their surgeon’s CPT code “27447” indicating the TKA for the years 1999, 2000, and 2001. They compared two groups, patients that had simultaneous BTKA (n=8324) and patients that had staged BTKA (n=17,996), with “regard to their demographic attributes, comorbidities, geographic distribution, hospital and surgeon volume, and probability of PE in the first three months preoperatively” (Barrett et al., 2006, p. 2147). The results of their study showed that high-volume hospitals and surgeons were more

likely to perform simultaneous BTKA than their low-volume counterparts (Barrett et al., 2006). In terms of geographical patterns, hospitals in the northeastern states were most likely to perform simultaneous BTKA. Gender also played a role as the number of simultaneous BTKAs were performed on men than on women. Lastly, the probability of having a symptomatic PE in the first three months after a TKA was 1.44% for those patients who underwent a simultaneous BTKA, 0.87% for patients who underwent unilateral TKA, and 0.54% for patients who underwent the first of two staged TKAs (Barrett et al., 2006). Of importance is that “the difference among the three groups was highly significant (log-rank $p < 0.0001$)” (Barrett et al., 2006, p. 2149). They found that the group that underwent the staged procedures “there was no clinically meaningful differences in the rate of PE after the procedure according to how far apart the procedures had been staged” (Barrett et al., 2006, p. 2149). In terms of probability of PE in patients that underwent unilateral or staged procedure “in the first three months after the first (or only) procedure was 0.81%” (Barrett et al., 2006, p. 2149). Barrett et al. (2006), postulate that “the increased operative time involved in a simultaneous bilateral procedure, the surgical intervention in both lower extremities (where emboli typically originate) and perhaps a more prolonged period of relative immobility constitute possible explanations” for the higher probability of PE after simultaneous BTKA in comparison with the probability after a unilateral TKA (Barrett et al., 2006, p. 2150). The implications of these data are significant in the medical decision making when providing treatment to patients with symptomatic degenerative bilateral knee osteoarthritis, especially when considering discussing surgical treatment options such as TKA with your patient.

Functional Outcome

Maxwell et al. (2013), performed a prospective cohort study (Level II) that looked at the “relationship between the pre-operative pain status of the contralateral knee and the risk of poor post-operative functional outcome in patients who underwent knee arthroplasty” (Maxwell et al., 2013, p. 989). They analyzed 271 subjects out of 3026 enrolled in the Multicenter Osteoarthritis Study (MOST) aged 50-79 years and “who either already had, or were at risk for, knee osteoarthritis” (Maxwell et al., 2013, p. 990). These subjects had a previous knee arthroplasty since they enrolled. In terms of demographics, 86% of the patients were white, 72% were female, and the mean age was 67 years. Pain severity of the contralateral knee was measured prior to the TKA utilizing the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pain scale, their scores were grouped into four categories (0, 1-4, 5-9, and 10-20). The Patient Acceptable Symptom State (PASS) outcome tool and a clinical performance of walking speed was used to determine poor post-arthroplasty function six months or more after TKA. The relationship between the severity of contralateral knee pain and the functional outcomes were evaluated using Poisson regression. Their findings revealed that 72 out of 264 (27%) patients showed poor post-arthroplasty function as they were unable to attain the threshold PASS score, and 76 out of 250 (30%) patients demonstrated a slow walking speed (Maxwell et al., 2013). A relationship emerged demonstrating that as the “pain in the contralateral knee increased, there was a steady increase in the proportion with poor post-arthroplasty function ($p < 0.0001$ for PASS and $p = 0.04$ for slow walking speed) among those with unilateral knee arthroplasty” (Maxwell et al., 2013, p. 991). In comparison with patients without pre-arthroplasty pain in the contralateral knee, “those in the highest category of contralateral pain severity had 4.1 times the risk (95% CI, 1.5 to 11.5) of having poor self-reported post-arthroplasty function (Maxwell et al., 2013, p. 989). Patients who have had a TKA bilaterally at the time of outcome collection were

less likely to report poor function than those who have had one knee replaced (Maxwell et al., 2013). These authors concluded that “pre-operative pain in the contralateral knee is strongly associated with self-reported post-arthroplasty functional outcome and may therefore be a useful indicator of prognosis or a potential target of perioperative intervention”(Maxwell et al., 2013, p. 989).

Optimal Timing

Ishii, Noguchi, Takeda, Sato, and Toyabe (2014), performed a prospective cohort study (Level II) that evaluated the time between the first and second surgeries for staged BTKAs when the timing interval is determined by the patient for the second surgery. In addition, correlations between the timing of the second surgery and the characteristics of the patient were analyzed. The sample consisted of patients (n=86; 10 males/76 females) with bilateral knee osteoarthritis and no significant differences between right or left knees before the patients underwent the first TKA. The follow-up interval after the first TKA had a mean of 96 months. In this study, the first TKA and the timing of the second (contralateral) TKA were determined solely by the patient, which was dependent upon the patient’s perception of their ability to tolerate the post-operative effects of knee surgery, primarily the symptoms of pain and limitations to activities of daily living (Ishii et al., 2014). Their results showed that the median time between the first TKA and second contralateral TKA procedure for staged BTKA was approximately 1 year (12.5 months), with 50% of the patients the second TKA within 12 months. There were no significant correlations between timing of the second procedure and patient characteristics such as BMI, age, or gender. A few limitations that may affect this study include a small sample size (n=86), sociocultural differences and economic factors more specific to Japan may have influenced the patient’s timing interval for surgery and thus may not be as generalizable to patients living

outside of Japan, in the U.S. such economic factors like work leave policies and high deductible insurance costs, as well as the ability for the patient to determine the timing of their second TKA were perhaps biased by the patient characteristics (Ishii et al., 2014).

S. G. Memtsoudis et al. (2013) developed a consensus statement from the consensus conference on various topics surrounding BTKA and the controversy that surrounds aspects of medical decision making. Forty experts were asked to summarize the current body of literature on each of the selected topics in the form of a white paper. A thorough literature review was conducted and white papers were peer reviewed. One of the aspects involves same-day BTKAs in which the experts concluded that if a patient is not deemed a suitable candidate for same-day BTKA, a second TKA should be scheduled no sooner than three months after the first (S. G. Memtsoudis et al., 2013). They also agree that same-day BTKAs increase medical risk, and thus a systematic approach to the management of patients should be taken to minimize complications (S. G. Memtsoudis et al., 2013). Another topic relevant to this patient case involves the optimal time interval between procedures if simultaneous BTKAs are not deemed appropriate (S. G. Memtsoudis et al., 2013). The authors provide recommendations on a theoretical basis as there is a lack of specific evidence on this. However, 81% of expert participants on the panel agreed that patients not deemed a candidate for same-day BTKA, a second TKA should be scheduled for 3 months or later (S. G. Memtsoudis et al., 2013). In addition, staging within one hospitalization should not be routinely performed and used only in rare circumstances. The authors further note that there is a lack of data on the subject of “appropriate timing between stages for staged BTKAs, and no definitive conclusions can be drawn” (S. G. Memtsoudis et al., 2013, p. 2654). In spite of inconclusive data, there is some evidence to suggest that “staging BTKAs during the same hospitalization or within 3 months of the first surgery may be associated with a greater risk

of mortality and complications” (S. G. Memtsoudis et al., 2013, p. 2654). Also, it is debatable whether a rapid staged surgical strategy (within the same hospitalization but days apart) should be used in patients not adequately deemed as candidates for same-day surgery (S. G. Memtsoudis et al., 2013).

Summary

While the treatment strategy regarding the optimal timing of surgery on the contralateral knee after the first TKA for patients with symptomatic bilateral OA undergoing staged BTKAs is still largely controversial, primarily due to a lack of specific evidence on this issue, much of the literature suggests that the second TKA should be scheduled 3 months or later after the primary TKA procedure. The research indicates that there is a higher likelihood of better functional outcomes after the first surgical knee has healed and regained its function. Primary care providers will be better able to educate, answer pertinent questions, and provide better overall care for their patients planning to undergo TKA or BTKA by understanding the various factors that influence medical decision making and the rationale for the different treatment strategies.

Learning Points

- Patients not deemed a candidate for same-day BTKAs, should be scheduled for second TKA no sooner than 3 months after the first.
- There is no consensus to assist providers and their patients in their medical decision-making process concerning whether to proceed with same-day BTKAs or staged BTKAs
- Literature is lacking on the management of patients undergoing BTKAs.
- Pre-arthroplasty function is a strong predictor of post-arthroplasty function.
- Pre-operative pain in the contralateral knee is strongly associated with self-reported post-arthroplasty functional outcome.

References

- Barrett, J., Baron, J., Losina, E., Wright, J., Mahomed, N., & Katz, J. (2006). Bilateral Total Knee Replacement: Staging and Pulmonary Embolism. *THE JOURNAL OF BONE AND JOINT SURGERY*, 88-A(10), 2146-2151. doi:doi:10.2106/JBJS.E.01323
- Duchman, K. R., Gao, Y., Pugely, A. J., Martin, C. T., & Callaghan, J. J. (2014). Differences in short-term complications between unicompartmental and total knee arthroplasty: a propensity score matched analysis. *J Bone Joint Surg Am*, 96(16), 1387-1394. doi:10.2106/JBJS.M.01048
- Ishii, Y., Noguchi, H., Takeda, M., Sato, J., & Toyabe, S. (2014). Time between the first and second operations for staged total knee arthroplasties when the interval is determined by the patient. *Knee*, 21(1), 221-223. doi:10.1016/j.knee.2013.04.014
- Level of Evidence | The Journal of Bone & Joint Surgery. (2016). Retrieved from [www.http://jbjs.org/level-of-evidence](http://jbjs.org/level-of-evidence)
- Maradit Kremers, H., Larson, D. R., Crowson, C. S., Kremers, W. K., Washington, R. E., Steiner, C. A., . . . Berry, D. J. (2015). Prevalence of Total Hip and Knee Replacement in the United States. *J Bone Joint Surg Am*, 97(17), 1386-1397. doi:10.2106/JBJS.N.01141
- Maxwell, J., Niu, J., Singh, J. A., Nevitt, M. C., Law, L. F., & Felson, D. (2013). The influence of the contralateral knee prior to knee arthroplasty on post-arthroplasty function: the multicenter osteoarthritis study. *J Bone Joint Surg Am*, 95(11), 989-993. doi:10.2106/JBJS.L.00267

- Memtsoudis, S., Ma, Y., Gonza' lez Della Valle, A., Mazumdar, M., Gaber-Baylis, L., MacKenzie, C., & Sculco, T. (2009). Perioperative Outcomes after Unilateral and Bilateral Total Knee Arthroplasty. *ANESTHESIOLOGY*, *111*(6), 1206-1216.
- Memtsoudis, S. G., Hargett, M., Russell, L. A., Parvizi, J., Cats-Baril, W. L., Stundner, O., . . . Consensus Conference on Bilateral Total Knee Arthroplasty, G. (2013). Consensus statement from the consensus conference on bilateral total knee arthroplasty group. *Clin Orthop Relat Res*, *471*(8), 2649-2657. doi:10.1007/s11999-013-2976-9
- Poultides, L. A., Memtsoudis, S. G., Do, H. T., Sculco, T. P., & Figgie, M. P. (2015). Perioperative morbidity and mortality of same-admission staged bilateral TKA. *Clin Orthop Relat Res*, *473*(1), 190-197. doi:10.1007/s11999-014-3757-9
- Total Knee Replacement | Performance Measurement Set | PCPI Approved January 2013.* (2012). Paper presented at the Total Knee Replacement Workgroup.
- Van Manen, M., Nace, J., & Mont, M. (2012). Management of Primary Knee Osteoarthritis and Indications for Total Knee Arthroplasty for General Practitioners. *The Journal of the American Osteopathic Association*, *112*(November), 709-715.
- Weinstein, A. M., Rome, B. N., Reichmann, W. M., Collins, J. E., Burbine, S. A., Thornhill, T. S., . . . Losina, E. (2013). Estimating the burden of total knee replacement in the United States. *J Bone Joint Surg Am*, *95*(5), 385-392. doi:10.2106/JBJS.L.00206