### Initial Experience with Custom-Fit Total Knee Arthroplasty

**SUMMARY**

The prevalence of malalignment after total knee arthroplasty (TKA) can be as high as 25% at some centers (Knee. 2003 Mar;10[1]:55-60, and J Arthroplasty. 2001 Aug;16[5]:635-40). Typically, one of the goals is restoration of the mechanical axis to $\pm 3^\circ$ of varus or valgus. One potential way to more accurately restore mechanical alignment and reduce outliers is through a custom-fit technique. This involves custom-made tibial and femoral cutting guides, which are blocks that are constructed from a three-dimensional model of the arthritic knee. Other potential advantages of this technique are that it may decrease operating time, decrease blood loss, and lower the risk of fat embolism since intramedullary rods are not needed (Orthopedics. 2008 Sep;31[9]:927-30, Int Orthop. 2009 Dec;33[6]:1571-5, and J Arthroplasty. 2008 Jan;23[1]:26-9). Because there have been only a few studies on this topic, Bali et al. reviewed their initial experience with twenty-nine custom-fit TKAs to see how well this technique restored the mechanical axis and whether it had any advantages concerning blood loss and the duration of surgery.

This was a prospective study of twenty-nine patients who were treated with this custom-fit technique between May 2010 and March 2011. Customized cutting blocks were based on a preoperative magnetic resonance image. The authors also analyzed ten patients who had undergone a previous TKA with conventional or computer-assisted techniques. Long-leg radiographs made at the six-week evaluation indicated that twenty-nine of thirty-two knees had the mechanical axis restored to within $3^\circ$ of neutral. Compared with the ten patients with a previous TKA, the mean blood loss and surgical time were less in knees that had undergone a custom-fit TKA. The authors concluded that this new technology appeared to be safe and accurate and might save time and reduce blood loss.

**DISCUSSION**

There are few studies that have been conducted concerning this custom-fit technology, and many of them have been small studies. The results of the present study are encouraging but still involve another very small population (twenty-nine TKAs) and therefore only represent the potential benefits of this technology. Additional, careful prospective randomized studies need to be performed to evaluate...
the true benefit of these techniques. It would have been nice if these authors had compared their study group to other patients who received conventional TKAs. In addition, the expense of this technology relative to the potential benefit needs to be addressed.

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**Body Mass Index and Total Knee Arthroplasty Outcomes**

**SUMMARY**

Recently introduced legislation in the United Kingdom proposes limiting access to total knee arthroplasty (TKA) on the basis of the patient’s body mass index (BMI). Baker et al. aimed to establish the relationship between BMI and patient-reported outcome measures (PROMs) in patients treated with primary TKA. Using PROM data linked to the National Joint Registry, the authors explored three BMI groups (with data being adjusted for age, sex, and various measures of overall health). Preoperative and postoperative PROMs declined as BMI increased; however, the improvements in PROMs from preoperatively to postoperatively were similar regardless of BMI. To put it simply, obese and morbidly obese patients experienced overall improvements similar to those of their normal-weight counterparts.

**DISCUSSION**

Insufficient evidence is currently available to definitively determine the effect on function and quality-of-life outcomes in obese patients undergoing TKA. Baker et al. performed a tightly controlled retrospective study; inclusion and exclusion criteria required primary TKA, osteoarthritis diagnoses only, and completion of all PROM assessment less than ninety days before surgery and between six and twelve months after surgery. For all PROMs, there was a constant trend of decreasing preoperative and postoperative scores with increasing BMI, regardless of sex or age. The rates of commonly reported complications did not generally differ by BMI group, except in the case of wound complications. These complications increased significantly as BMI increased, although the authors note a possibility of bias in reporting due to presurgical expectations of more wound difficulties in obese and morbidly obese patients.

The design of this study has several advantages: (1) a large number of patients were included (N = 13,673), (2) the data were extracted from a well-established registry, and (3) this is the first analysis (that Baker et al. were aware of) that uses PROMs exclusively instead of surgeon-derived outcomes. As such, this study offers a unique patient’s view of TKA outcomes and satisfaction.

Limitations include (1) the short follow-up, although most patients will have experienced likely improvements and PROMs will have begun to plateau by six to twelve months, and (2) the inability of Baker et al. to assess implant survival rates.

The discussion, arguments, and policy decisions regarding access to TKA will continue, the findings of this study by Baker et al. notwithstanding. It is important to note that this study was well organized and well conducted and that, regardless of BMI, patients tend to experience similar levels of improvement in their quality of life and function following TKA.
A Meta-Analysis Comparison of Navigated Versus Conventional Total Knee Arthroplasty

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SUMMARY
It is believed that the successful outcome of a total knee arthroplasty (TKA) depends on implant alignment (Clin Orthop Relat Res. 1994 Feb;299:31-43). Some studies have shown that placing implant components within 3° of the mechanical axis can reduce the risk of abnormal wear and implant failure (J Bone Joint Surg Br. 1991 Sep;73[5]:709-14, and Clin Orthop Relat Res. 1988 Jan;226:43-8). For the past fifteen years, computerized navigation has been used during TKA in an effort to improve implant alignment. Some studies have shown that use of navigated TKA has led to improved alignment (J Bone Joint Surg Am. 2007 Feb;89[2]:261-9, and J Arthroplasty. 2007 Jan;22[1]:8-13). There have been some randomized controlled trials (RCTs) comparing navigated TKA with conventional techniques. Because of this, Hetaimish et al. performed a systematic review and meta-analysis to compare navigated and conventional TKA with regard to mechanical alignment.

The authors performed an extensive search of the literature from 1986 to the present for prospective RCTs comparing navigated and conventional TKA that reported on limb alignment. They assessed a total of twenty-three studies (twenty English-language, one French-language, and two German-language studies). The RCTs encompassed a total of 2541 patients, of whom 1374 were treated with navigation-assisted TKA and 1302 were treated with conventional systems. The authors found that 30.1% of the patients in the conventional group had deviations in the coronal plane of >3° from the neutral mechanical axis compared with 12.8% of the patients treated with navigation-assisted procedures. Similar results were found for femoral and tibial coronal-plane alignment as well as for femoral and tibial slope. Thus, their meta-analysis demonstrated that navigated TKA provides significant improvements in prosthetic alignment.

DISCUSSION
I like the authors’ way of evaluating these studies, but the conclusion that navigation may lead to improved alignment variables and decreased outliers is not new. The question is whether these improvements lead to better functional measurements. The authors acknowledge that there is a lack of data in the literature to assess this, with only conflicting results from different studies with varying methodological strengths. Therefore, more clinical evaluations need to be performed until navigated TKA is generally accepted. It is certainly surprising that at fifteen years after its introduction into the field, <5% of TKAs in America are performed using computerized navigation assistance.

High-Flexion Versus Conventional TKA: Not Clinically Different in the Medium Term

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SUMMARY
Kim et al. conducted a randomized controlled trial of simultaneous bilateral total knee arthroplasty (TKA) in 100 patients, each of whom received a high-flexion TKA in one knee and a conventional TKA in the other knee. The primary goal was to compare the function, pain, motion, and activity scores, along with survivorship and osteolysis, at medium-term follow-up (minimum, ten years).

years). There were no significant differences between the two groups regarding functional outcomes, knee motion, survivorship, or the prevalence of osteolysis. The authors concluded that the concept of lower polyethylene wear, and thus less osteolysis, in high-flexion TKA needs longer-term follow-up to substantiate.

DISCUSSION

High-flexion TKA systems have been developed to enhance knee flexion (and thus improve knee function and patient satisfaction) and to decrease polyethylene wear (and thus decrease aseptic loosening and eventual failure). There are several scientific advantages of this study on such TKA systems: (1) the single-surgeon, single-center design provides consistency in surgical technique; (2) the follow-up is long enough to evaluate flexion, function, survivorship, osteolysis, and loosening; (3) there is a reduction in variability through use of a single TKA design; (4) the subjects acted as their own control because of simultaneous bilateral implantation; (5) the clinical evaluator was blinded to implantation site; and (6) consistent postsurgical protocols were followed. Limitations include the lack of assessment of interobserver variability for the imaging studies and the fact that it was frequently difficult for patients to discern differences in functional outcomes between knees.

It is interesting to discover that, after controlling as many factors as possible (such as consistency of surgical technique, postoperative protocols, and implant design), the study results showed that there was no significant difference between high-flexion and conventional TKA. It raises a question: Is the bulk of variability in outcomes for TKA possibly due to those three factors of surgical technique, postoperative protocols, and implant design?

What Is the Best Method to Image Periprosthetic Osteolysis Around Total Knee Arthroplasties?


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SUMMARY


With fluoroscopically guided radiography, the sensitivity for detecting osteolysis around a TKA is still low (between 17% and 56%) (J Knee Surg. 2006 Oct;19[4]:259-64, and J Orthop Surg Res. 2008 Oct 3;3:47). Computed tomography (CT) scans with metal artifact suppression can improve this sensitivity to >70% (J Orthop Surg Res. 2008 Oct 3;3:47). Other reports have shown that magnetic resonance imaging (MRI) with metal artifact reduction protocols can also assist in diagnosing osteolytic defects (J Arthroplasty. 2006 Apr;21[3]:460-3, and J Arthroplasty. 2006 Sep;21[6]:826-31). Because the use of MRI and CT was reported only in small studies, Solomon et al. used a cadaver model to compare the sensitivity and specificity of osteolysis detection using these two imaging methods with those of standard radiography.

The authors used six cadaver knees with an implanted TKA (cemented and uncemented) and then made twenty lesions of <2 cm3 at predefined tibial and femoral locations. They were able to measure the true size of each lesion by making molds of the defect, and they then made new lesions that were enlarged to between 2 and 5 cm3. They further combined some of the lesions to produce nine lesions of >5 cm3. In all, they evaluated fifty-four simulated osteolytic lesions. The radiographic evaluation was made using fluoroscopically guided anterior, posterior, and lateral views. CT scans and MRI evaluations were then also made according to specific protocols.

Overall, the mean sensitivity of osteolytic lesion detection was 48% for anteroposterior radiographs, 66% for combined anteroposterior and lateral radiographs, 83% for CT, and 89% for MRI. The authors did not find any significant difference between CT
Duke University published a paper, *Effects of Advanced Medical Technologies*, in 2006 that suggested about 90% of patients who are indicated for hip or knee replacement don’t go through with the procedure, in part due to the *unawareness of the benefits of surgery*.\(^1\) Bernstein Research published a paper, *Orthopaedics: Ortho Patient Survey Highlights Economic Sensitivity of Markets*, in 2011 suggesting that patients are deciding to move forward with surgery primarily for pain relief and secondarily because of *new technology*.\(^2\)

New technology was the second most chosen option behind pain relief. Patients need to be educated about the benefits of surgery and want to know about technological advances. *Zimmer*® Patient Specific Instruments (PSI) and *eLIBRA*® Dynamic Knee Balancing System are the new technologies that a surgeon, hospital or surgery center can use to educate patients about the benefits of knee replacement surgery. Best of all, the *Zimmer* PSI solution, unlike other technologies in the marketplace such as robotics, is NOT bait-and-switch marketing hype. *Zimmer* PSI is available for BOTH partial-and total-knee replacement candidates, and by combining *Zimmer* PSI with *Zimmer*’s wide range of knee implant shapes and sizes, surgeons are able to customize surgery for excellent patient fit, which can lead to better outcomes.

**PSI NexGen® Knee and PSI Natural-Knee® System features:**

*Zimmer* PSI streamlines total and unicompartmental knee replacement surgery by ensuring accurate and reproducible jig fixation and resection cut-guide placement. Through a patient’s MR or CT image, the surgeon is able to pre-operatively plan the placement of the *Zimmer* knees based on the patient’s mechanical axis and other bony landmarks. PSI simplifies the knee surgery from start to finish without compromising a surgeon’s decision making, surgical technique or intraoperative flexibility.
Why would Zimmer PSI be important to me?

In the surgeon’s hands, Zimmer PSI has the opportunity to offer surgical simplicity and surgical efficiency. By pre-operatively planning such parameters as resection depths, component rotation, femoral flexion and tibial posterior slope, a surgeon will potentially know the femoral and tibial knee implant sizes as well as the placement of these components as referenced to the patient’s mechanical-axis. For the femur, this eliminates the need to drill the femoral canal or to use an A/P Sizer to measure for femoral knee implant size. Tibial pre-operative planning allows similar knowledge going into the case.

The surgical simplicity and efficiency potentially allows parallel similarity for the hospital or surgery center. Less instrumentation would need to be washed, sterilized and/or otherwise prepared for surgery - possibly resulting in a cost savings.
What is the eLIBRA System?
The eLIBRA System is a dynamic soft-tissue knee balancing system that employs a disposable electronic force measurement to position the femoral knee implant in proper balance with the angle of the tibial cut and the force from the ligament tension. It is designed to improve post-operative stability by enhancing the repeatability of the soft-tissue balance.

What is the clinical relevance of the eLIBRA System?
Femoral malrotation, flexion instability, and improper patella tracking are three of the most common causes of revision of total knee procedures. It has been shown that the three traditional anatomic femoral landmarks used to determine femoral rotation can create inaccurate flexion gap symmetry ten to fifty percent of the time. The eLIBRA System offers a measurable, objective, and actionable approach to femoral rotation based upon patient-specific soft-tissue balance and allows for consideration of optimal patella tracking.

References:
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DISCUSSION
This is an excellent study that shows the low sensitivity and specificity of radiography to detect osteolysis around either cemented or uncemented TKAs. MRI and CT were equally efficacious at this type of detection. There are limitations of this study; it still involved a cadaveric model and the creation of only a small number of idealized defects. However, the results could be easily corroborated in clinical scenarios. Another issue is whether MRI or CT should be used. The lack of radiation exposure with MRI needs to be balanced against the fact that certain patients (those with a pacemaker or stents and those who are claustrophobic) may not be able to easily undergo MRI. Also, in most cases when a revision TKA is being planned, one does not necessarily need to know the extent of very small osteolytic lesions because these can be managed in a straightforward manner, and therefore the indications for appropriate use of these ancillary tests need to be rigorously defined before subjecting patients to unnecessary evaluations.

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SUMMARY
There can be a tremendous amount of blood loss after unilateral total knee arthroplasty (TKA), ranging in various reports from 300 to more than 2000 mL (J Bone Joint Surg Am. 1990 Aug;72[7]:1010-2, and J Arthroplasty. 1998 Jan;13[1]:70-6). In addition, the rate of transfusion has been reported as between 35% and 53% at various institutions (J Arthroplasty. 2004 Apr;19[3]:281-7, J Bone Joint Surg Am. 1999 Jan;81[1]:2-10, and Transfusion. 2003 Apr;43[4]:459-69). To combat this, various centers will use autologous blood predonation. However, there is concern about overcollection and wastage, which may occur between 40% and 80% of the time (J Bone Joint Surg Am. 1999 Jan;81[1]:2-10, Anesth Analg. 2002 Apr;94[4]:815-23, and Arch Pathol Lab Med. 1993 Jun;117[6]:573-7). Because of these issues, Noticewala et al. determined the prevalence of allogeneic blood transfusion after unilateral TKA and sought to develop a model capable of predicting which patients would need this blood on the basis of a comprehensive evaluation of thirty-one preoperative and intraoperative parameters.

The authors retrospectively examined all primary TKAs performed between January 2002 and September 2010 by three surgeons. Patients were transfused on the basis of the surgeon’s discretion, which included a combination of clinical findings and laboratory values. The authors identified 644 procedures for analysis and found a prevalence of allogeneic transfusion of 11%. It is of note that this rate trended downward for the duration of this study and was only 7.8% in the most recent one-year period. The authors found that age, comorbidity, preoperative hemoglobin concentration, and surgical time were significant predictors of requiring allogeneic blood. Their predictive model was 90% effective and approximately 50% specific.

DISCUSSION
This is an excellent attempt to provide an equation as part of a clinical decision-making algorithm. As the authors also point out, this type of work needs to be validated with more data, including data from multiple institutions. For example, the transfusion rate was extremely low (11%) and considerably lower than that in many other reported studies. Therefore, one can question how valid this model is for the typical centers that have much higher rates. In addition, even the authors’ transfusion rate has changed with time, so that data from the early 2000s are quite different from the most recent data, as the authors acknowledge, and this might invalidate some of the findings.

I enjoyed reading this study, and it raises a lot of questions. Most centers are tending to discourage the use of automatic predonation of blood before joint arthroplasty, and this work makes us think about which patients are the most likely candidates for this type of blood use.
Indigent Patients with Psychopathology Have Low Outcomes

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SUMMARY
There are few studies that have evaluated the effects of low socioeconomic status or psychopathological distress on the outcomes of total knee arthroplasty (TKA). The links between these factors and a negative effect on general health and overall mortality have been established (Ann N Y Acad Sci. 1999;896:131-44, Ann N Y Acad Sci. 1999;896:226-45, and BMC Public Health. 2011 Feb 28;11:138). Because there is little known concerning the prevalence of psychopathology in the indigent population undergoing TKA, Ellis et al. identified patients with various Axis-I psychological diagnoses (somatization, depression, anxiety, and panic) and evaluated their functional outcomes.

Consecutive patients undergoing TKA between July 2006 and January 2010 were identified to determine whether they were indigent and also whether they had an Axis-I psychopathological diagnosis on the bases of various criteria. The authors evaluated various outcome measures (i.e., Short Form [SF]-36, Western Ontario and McMaster Universities Osteoarthritis Index, and Knee Society score) and compared indigent patients with and without psychopathology.

Of 187 indigent patients enrolled, 154 (82%) were available for follow-up at one year. Fifty-four patients (35%) were diagnosed with at least one Axis-I psychological disorder, and these patients showed significantly lower SF-36 mental component summary scores, both at baseline and at one year postoperatively (p < 0.001). The Knee Society score also differed significantly between the two groups at both baseline and the one-year follow-up evaluation (p = 0.003 and p = 0.001, respectively). Thus, the authors showed a high prevalence of this psychopathology in the indigent population, and they believe that this may result in lower patient-perceived outcome scores at one year.

DISCUSSION
This is an interesting topic. We do not often appreciate the number of patients who have these various Axis-I psychopathological disorders when we are performing lower-extremity arthroplasty procedures. We also need to realize that the mental state of these patients may be a major factor leading to lower outcomes. This retrospective review on this topic is a nice first step, and it should spur interest in performing larger analyses and attempts to understand this phenomenon in more detail. We need to be able to identify which patients will or will not do well after TKA so that we can plan appropriate interventions ahead of time or perhaps not even consider the surgery. I would like to see similar studies in the future that are larger, analyze more factors, and are perhaps performed at multiple centers, and at longer follow-up.

Opening the Door to an Infection?

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SUMMARY
The authors asked two very simple questions: “How many times is the operating room door opened in primary and revision total joint arthroplasty?” “Why was the door opened?” The results were striking: the door was opened sixty times during primary total joint arthroplasties and 135 times during revision procedures. Given the operative times involved, this represented nearly one door opening per minute (0.69 to be exact). The door openings were primarily performed by the circulating nurse and the manufacturer’s representatives to obtain supplies, for questions/comments about the case, for paperwork completion, and for personnel to scrub in or out of the case. However, in 47% of the door openings, there was no clear reason why the door had been opened.
DISCUSSION

While there are many factors that may contribute to a periprosthetic joint infection, contamination at the time of surgery is certainly among those factors that are important. Traffic in the operating room may raise bacterial counts near the operative field by disrupting laminar flow and increasing contamination from outside the room, leading to greater contamination of the surgical site and an increased risk of periprosthetic joint infection. At many institutions, joint arthroplasty operating rooms are treated differently, with signs on the doors or other special treatment to reduce operating room traffic. However, as the number of procedures performed at many hospitals has increased dramatically, in many ways we “take these cases for granted” and perhaps not as seriously as we had in the past. While these procedures are performed more frequently, we must educate our colleagues in the operating room that these cases are still different in view of the severe ramifications if a deep infection occurs.

There are many things that can be done to reduce the number of door openings. Our colleagues in the operating room should be educated on the dangers of repeated door openings, and implants and other supplies that may be needed during the case can be brought into the room before the patient enters. As the authors comment, preoperative planning and anticipation as well as better preoperative communication between the surgeon and the staff may greatly decrease the number of door openings to achieve infection-control goals.

Given all of the factors that are outside of the surgeon’s control regarding a complication such as infection, everything that we can do as health care providers to protect our patients must be done. I know what I am going to be paying attention to tomorrow in my operating room!

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Severity of Osteoarthritis as a Predictor of Success of Total Knee Arthroplasty

SUMMARY

It is important to use the most appropriate indications when considering total knee arthroplasty (TKA). There have certainly been a wide variety of populations analyzed with respect to this procedure (Clin Orthop Relat Res. 2006 May;446:34-9, and J Rheumatol. 2011 Aug;38[8]:1765-9). In addition, recent studies of patients undergoing TKA have suggested that those with early radiographic signs of knee osteoarthritis will have poorer outcomes than those with more severe arthritis (Ann Rheum Dis. 2009 May;68[5]:642-7, and Semin Arthritis Rheum. 2012 Feb;41[4]:568-75). Riddle et al. evaluated the severity of tibiofemoral arthritis before TKA, including separate evaluation of the number of radiographically normal medial and lateral compartments.

This study was conducted as part of the Osteoarthritis Initiative (OAI), which is a publicly and privately funded prospective four-year longitudinal cohort study of 4796 people aged forty-five to seventy-nine years who have or are at risk for knee osteoarthritis. The authors evaluated ninety-six patients who had radiographs made less than one year before TKA surgery. The surgeons evaluated the Kellgren-Lawrence (K-L) and Osteoarthritis Research Society International (OARSI) arthritis grades.

The authors found that in 85% (eighty-two of ninety-seven) of the TKAs, at least one tibiofemoral joint compartment had no joint space narrowing. Twenty-three (24%) of the ninety-six surgically treated knees had no joint space narrowing in the medial compartment, and sixty-four (67%) had no tibiofemoral narrowing in the lateral compartment. A total of 5% of the surgically treated knees had no joint space narrowing in either the medial or lateral compartments.

These authors found that the proportion of patients with a K-L grade of three or greater among those planning for a TKA was less than that expected from literature-based estimates, as only 81% of the knees had a K-L grade of 3 or greater before surgery. This is certainly quite interesting data, and it confirms the findings of some other reports (Ann Rheum Dis. 2009 May;68[5]:642-7, Semin Arthritis Rheum. 2012 Feb;41[4]:568-75, and J Rheumatol. 2011 Jul;38[7]:1390-5). We really must be
Concerned that these patients with lesser grades of osteoarthritis will not perform as well with a TKA. There are certainly some limitations of the study, such as the small sample size and the variability of radiographic readings between observers as well as the lack of evaluations of the patellofemoral joint, yet this work appears to be quite robust and certainly appears to hold up to scrutiny. Surgeons must be aware of this work so that they can consider other procedures (such as unicompartmental arthroplasty, when indicated, as well as other joint-preserving procedures) for these patients with early osteoarthritis. Performing TKAs on almost radiographically normal patients should be considered inappropriate.

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SUMMARY

Bae et al. report the results of a single surgeon’s twenty-year experience with primary total knee arthroplasty (TKA). The dataset of 2042 patients (3014 TKAs) provides a large population for survival analysis. The authors were able to discover that patients older than sixty years had a higher survival rate, that sex and diagnosis did not influence the survival rate, and that implant design did influence the survival rate. Using life-table and Kaplan-Meier methods of survival analysis, Bae et al. determined that the survival rate decreased over time (or, in other words, the failure rate increased more rapidly over time).

DISCUSSION

Bae et al. begin with a clear and concise introduction of survival analysis as it pertains to TKA and, in particular, they point out the flaws present in many such published analyses. By using such a large dataset of primary TKA cases, Bae et al. were able to investigate the influence of several variables (sex, age, diagnosis, and implant design) on survival. Life-table analysis showed a ten-year survival rate of 93.8% (95% confidence interval [CI], 92.5% to 95.2%), a fifteen-year survival rate of 83.5% (95% CI, 80.3% to 86.8%), and a twenty-year survival rate of 70.9% (95% CI, 62.7% to 79.2%). The annual rate of failure (the number of failures per year) increased from 1.09% at eight years to 5.29% at eighteen years.

Study limitations include the use of multiple implant designs, and the fact that it was a retrospective study with uncontrolled variables, although the “uncontrolled variables” such as age, sex, diagnosis, and activity level were investigated for their influence on survivorship as completely as the data would allow. Advantages include the fact that this was a single surgeon’s experience, the dataset was large and well maintained, and careful attention was paid to censored data.

Bae et al. conclude that although TKA demonstrates long-term durability, complication rates increase more rapidly over time and survival rates decrease more rapidly over time. Neither of these conclusions should be surprising, especially when coupled with the finding that older patients have higher survival rates than younger patients. Younger patients are more apt to use and/or abuse their TKA and thus encounter more complications and more failures during the longer “lifetime” of their implants.