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What's new in adult reconstructive knee surgery.

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Specialty Update

What's New in Adult Reconstructive Knee Surgery

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The purpose of this update is to review the research on several topics in adult knee reconstruction published during the year 2011. The keywords "knee" and "arthroplasty" and "prospective" and "randomized" were used to perform a search in the National Library of Medicine's PubMed database, limited to manuscripts published in *The Journal of Bone and Joint Surgery* (American and British volumes) and *The Journal of Arthroplasty* in 2011. The resulting twenty-five studies are all discussed in this review of adult reconstruction of the knee and are included in the complete bibliography at the end of the manuscript.

Total Knee Arthroplasty Design: Attempting to Improve Biomechanical Function

The design of total knee arthroplasty implants takes two major issues into consideration: functionality and implant survival. Attempts to improve the functionality of the knee after total knee arthroplasty have focused on improving flexion and more "natural" biomechanical characteristics. The study of early and intermediate-term results allows for the evaluation of design changes aimed at improving functionality. On the other hand, the study of the survival of these implants, which may be unrelated to their intermediate-term functionality, requires long-term assessment. The following publications addressed the relatively early results of total knee arthroplasty implants designed to improve functionality.

The introduction of high-flexion total knee arthroplasty designs was intended to increase the range of motion that is allowed by the mechanical restraints of the implants. Although these designs received tremendous early enthusiasm and support, many authors were skeptical, believing that other, non-implant-related factors were to blame for suboptimal motion after total knee arthroplasty. Hamilton et al.[1] conducted a randomized, prospective study in which a standard rotating-platform total knee arthroplasty was compared with a similar high-flexion rotating platform design. During a pre-study power analysis, the authors decided that a 6° difference in flexion would be considered to be clinically important. A total of 142 patients were included in the study, and the end points included clinical knee scores, active and passive flexion, and flexion on radiographs up to one year postoperatively. The authors were unable to find any differences in terms of knee scores or flexion at one year of follow-up, with both groups averaging about 120° flexion. The high-flexion implant group experienced a significant increase in patellar crepitus in comparison with the standard implant group postoperatively (17% versus 3%). The authors suggested that the increased cost, increased osseous resection, and increased crepitus associated with the high-flexion design were not compensated for by any clinically important benefit. Seng et al.[2] also conducted a randomized prospective clinical trial of a fixed-bearing high-flexion design in which the standard-flexion design from one manufacturer was compared with the high-flexion design from a different manufacturer. Seventy-six patients were enrolled, and sixty-three patients were followed for five years. The patients were assessed on the basis of clinical scores, knee flexion measurement, and radiographs. Although the authors found no differences in clinical knee scores, they did identify a significant improvement in flexion (average improvement, 10°) in the high-flexion group at all postoperative time points, which also correlated with improved quality-of-life measures in the high-flexion group. Although the authors demonstrated that improved flexion correlated with improved quality of life, their results must be considered with caution.

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What's New in Adult Reconstructive Knee Surgery

Their patients were from a predominantly Asian population that highly values and utilizes the ability to squat and kneel, 17% of the patients were lost to follow-up, and the authors used a standard knee design from one manufacturer and a high-flexion design from a different manufacturer. It is difficult to conclude that the high-flexion design in isolation was responsible for the observed clinical effects.

Attention has also been placed on design features that attempt to substitute or replace the cruciate ligaments. Pritchett[3] performed a prospective study in which the knees of 440 patients undergoing a staged bilateral total knee arthroplasty were randomized to treatment with various total knee implants. Knee designs included an anterior cruciate ligament-posterior cruciate ligament (ACL-PCL)-retaining total knee implant, a medial-pivot total knee implant, a PCL-retaining total knee implant, a PCL-substituting total knee implant, and a mobile-platform total knee implant. Patients received random pairings of the different prostheses to allow for various implant comparisons. At follow-up intervals ranging from four to nine years, patients were asked which knee they preferred. The ACL-PCL-retaining and medial-pivot designs fared equally in a direct comparison and were also both preferred with significance when compared with all other designs, including PCL-retaining, PCL-substituting, and mobile-platform designs. Patients did not reveal preferences between PCL-retaining and PCL-substituting designs. The authors concluded that patients undergoing total knee arthroplasty preferred ACL-PCL-retaining implants and medial-pivot implants over PCL-retaining or substituting designs. The authors also cautioned that their study did not address complications or differences in terms of survival between the various implant designs. Ward et al.[4] similarly compared the functionality of knee designs in a prospective randomized study of twenty-eight total knee arthroplasties with a posterior-substituting or bicruciate-substituting design. They specifically focused on the postoperative patellar tendon angle during extension, flexion, and step-up exercises at one and seven weeks after surgery. They found that the bicruciate-substituting total knee arthroplasty provided for a higher patellar tendon angle in extension, preventing the kinematic alteration that was observed in the patellar tendon angle in knees with a posterior-substituting design. This observation was likely a result of anterior cam engagement. The authors stated that other implant design features, such as variation in the trochlear anatomy, could have accounted for their results. Furthermore, it is not clear that the patellar tendon angle is an important predictor of function or implant survival after total knee arthroplasty as their groups did not differ with respect to the Oxford Knee Score.

In an effort to compare the early functional results of fixed and mobile-bearing total knee arthroplasty designs, Ball et al.[5] conducted a prospective randomized clinical trial that included ninety-five total knee arthroplasties that were performed at two institutions. The authors assessed the patients at various intervals after total knee arthroplasty with use of various scoring scales, range-of-motion tests, and functional tests of extensor mechanism function. They found that there were no differences between fixed and mobile-bearing designs when measured on the basis of scoring systems or knee motion testing; however, the mobile-bearing implant group had significantly better stair-climbing scores. Although no dislocations were observed in the mobile-bearing implant group, the authors suggested care in interpreting their results given the small number of patients.

Total Knee Arthroplasty Materials and Design: Attempting to Improve Implant Survival

The design process for attempting to improve any product includes stages of design, production, use, evaluation, and redesign. For total knee implant design, one of the goals of these iterations is to improve component survival. However, designing implants for improved survival depends on iterations that are about ten to twenty years long. Unfortunately, the changes that are needed to improve function and survival are not necessarily equivalent and in some cases may be counteractive. Small changes in design aimed at improving function could have severely deleterious consequences in terms of survival. For these reasons, long-term prospective studies with good follow-up are critical for the continued development of total knee implants.

Cement fixation of total knee implants has been considered by some to be inferior to biologic fixation in terms of long-term implant survival. Park and Kim[6] helped to address this question by conducting a prospective study of fifty patients undergoing bilateral knee replacement, with one knee having fixation of the total knee implant with cement and the other having fixation of an identical design without cement. The mean age of the patients at the time of bilateral arthroplasty was fifty-eight years, and the mean duration of follow-up was fourteen years. The patients were evaluated with use of various scoring systems, examination of knee motion, satisfaction scores, and radiographic analysis. There were no significant differences between groups as there was no evidence of osteolysis, with all components surviving at the time of the most recent follow-up, except for one tibial component in the cementless group. The authors reported no advantage in association with the use of cementless implants. However, it is important to note that the average age of the patients at the time of the most recent follow-up was only seventy-two years, leaving the possibility that there could be large differences in implant survival between the fixation groups over the next fifteen years.

While most tibial implants used in the United States are metal-backed and modular, some proponents of monoblock implants have raised the concern that backside wear of the polyethylene could result in increased long-term failure rates resulting from aseptic loosening. Robinson and Green[7] used a prospective bilateral total knee arthroplasty model to compare a metal-backed modular tibial implant with an all-polyethylene tibial implant of the same design. Forty-seven patients

What's New in Adult Reconstructive Knee Surgery

were randomized to receive one of each type of tibial implant on each side and were followed for a mean of twelve years with revision for any reason and revision because of aseptic loosening as end points. Both metal-backed and all-polyethylene total knee implants had an overall survival rate of 98% (with the exclusion of a single deep infection) with revision for any reason as the end point and a survival rate of 100% with revision because of aseptic loosening as the end point. The authors concluded that the adjusted coronal articular radii did not affect implant survival and that the modular and all-polyethylene implants demonstrated equivalent survival. Care must be taken to acknowledge that these results may not apply to all modular tibial locking mechanisms and, furthermore, that differences in implant survival may be demonstrated at a longer follow-up interval.

In addition to the potential functional benefits of mobile-bearing total knee arthroplasty, there is a theoretical possibility that mobile-bearing total knee arthroplasties will demonstrate increased survival because of their altered polyethylene wear patterns. Woolson et al.[8] reported the minimum ten-year results for 107 consecutive knees that were randomized to receive either a mobile or fixed-bearing total knee replacement. Among the fifty patients who were available for follow-up, the authors found no differences in terms of Knee Society scores, knee motion, or pain scores. Two knees in the mobile-bearing group were revised because of aseptic loosening of the tibial component (one knee) or a fracture of the femoral component (one knee). In this study, mobile-bearing total knee arthroplasty did not appear to have any advantages in terms of function or implant survival. Additional follow-up is necessary to determine whether the one knee with aseptic loosening in the mobile-bearing group is representative of lower implant survival in the mobile-bearing group as a whole. Kim et al.[9] used a prospective bilateral total knee arthroplasty model to compare the outcomes of posterior cruciate-sacrificing mobile-bearing total knee arthroplasties with posterior-stabilized mobile-bearing total knee arthroplasties. One hundred and seven female patients with a mean age of sixty-seven years were randomized to one design of total knee implant in one knee and the other design in the contralateral knee. At a mean of 7.4 years, all patients returned for evaluation on the basis of the Knee Society score, Hospital for Special Surgery score, knee motion, radiographs, and implant survival. The authors identified no significant differences in terms of any score, function, or outcome, with both groups demonstrating a survivorship of approximately 97%.

Oh et al.[10] conducted an interesting study to determine whether a newer-generation total knee arthroplasty design offered any advantage in terms of function or implant survival in comparison with a previous-generation implant system. This randomized, prospective study included ninety-one patients who received either an Insall-Burstein total knee implant or a NexGen Legacy total knee implant, both of which are posterior-stabilized implants that are manufactured by Zimmer (Warsaw, Indiana). All patients had a preoperative diagnosis of osteoarthritis and were followed for a mean of ten years after surgery on the basis of knee scores, functional scores, knee motion, and implant survival. At the time of the most recent evaluation, the authors found no significant differences between the groups, with both groups having a 100% survival rate. Longer-term studies will be necessary to determine whether the changes made to this specific line of implant will result in improved survival.

While implant materials and bearing surfaces have dominated the literature on hip arthroplasty, there have been few prospective studies evaluating bearing surfaces in the knee arthroplasty literature. Hui et al.[11] conducted a prospective, randomized double-blind study in which oxidized zirconium femoral components were compared with cobalt-chromium femoral components. Forty consecutive patients undergoing cruciate-retaining bilateral total knee arthroplasty received an oxidized femoral component on one side and a cobalt-chromium femoral component on the contralateral side. Patients were followed for five years, and the results were evaluated on the basis of knee scores, radiographic wear, and patient preference. At five years, there were no significant differences between the two types of implants on the basis of clinical or radiographic evaluation. However 38% of the patients preferred the knee with the cobalt-chromium implant, whereas 18% preferred the oxidized zirconium implant; this difference was significant ($p = 0.02$). Longer-term outcomes are necessary to evaluate a difference between these implant materials in terms of survival.

Computer Navigation

The allure of computer-navigated total knee arthroplasty lies in the attempt to improve the alignment and, consequently, the survival of implants. Thus far, the data on computer navigation have been mixed, with many groups demonstrating a reduction in malaligned outliers but most groups finding no apparent effect on survival. Most studies to date have not included enough follow-up time to truly demonstrate any advantage provided by computer navigation in terms of survival. With increasing concern regarding cost-efficiency, there is a great interest in understanding the true benefits of computer navigation.

Two randomized prospective studies in 2011 demonstrated that computer navigation provided little if any benefit to patients undergoing total knee arthroplasty. Barrett et al.[12] conducted a multicenter randomized prospective study in which computer-assisted surgery was compared with conventional instruments. Knee Society scores, alignment on radiographs, and function were evaluated up to one year after surgery for patients with osteoarthritis who underwent total knee arthroplasty at eight institutions. The only measure that demonstrated a significant difference between groups was the coronal alignment of the tibia, with the computer-assisted surgery group having a greater percentage of knees within 2° of neutral (88% compared with 74%). However, the authors also noted that the operative time associated with computer-assisted surgery was twenty-one minutes longer and that the time to the first bone cut during computer-assisted surgery was

What's New in Adult Reconstructive Knee Surgery

twelve minutes longer in comparison with the conventional instrumentation group; both differences were significant. The importance of this study is in its multicenter design, of which there are very few in the literature on computer-assisted surgery. The authors maintained that, for standard total knee arthroplasty, there are no clinically meaningful advantages of computer-assisted surgery. Hiscox et al.[13] also performed a double-blind prospective randomized study that evaluated computer-assisted surgery for total knee arthroplasty. One hundred and forty-one patients were randomized to computer-assisted surgery or conventional cutting guides and were followed for one year with regard to functional and clinical results. In addition to alignment on radiographs, the authors assessed the first fifteen patients in each arm with use of computed tomography to evaluate implant rotation. At one year of follow-up, the authors were unable to identify any significant advantage of computer-assisted surgery and actually found that prostheses that were implanted during computer-assisted surgery were, on the average, in more varus mechanical alignment than those implanted with conventional techniques (1.9° versus 0.9°). Although the authors found slightly higher general health scores among the patients managed with computer-assisted surgery, they hypothesized that this finding was due to the increased number of bilateral total knee arthroplasties in that group. They concluded that computer-assisted surgery provides no short-term benefit for patients undergoing total knee arthroplasty, whereas it carries the burden of an additional twelve minutes of operative time.

Conversely, two prospective studies on Asian populations demonstrated some advantages of computer navigation. Huang et al.[14] compared computer-assisted navigation with conventional navigation in a prospective series of patients with genu varum who were undergoing bilateral knee arthroplasty. A total of 226 knees (113 patients) were enrolled in the study. The groups were compared with regard to radiographic alignment of the extremity and the implant. The authors found that computer-assisted surgery was most useful for patients with a preoperative varus deformity of >20°, in whom it provided a greater percentage of knees within 3° of a neutral mechanical axis (89% compared with 44%). However, they found no significant improvements in terms of alignment among knees with a mild or moderate varus deformity. Zhang et al.[15] also used a bilateral knee model to compare computer-assisted surgery with conventional total knee arthroplasty. Thirty-two patients were included in the study, and blinded evaluators examined postoperative radiographs and axial computed tomography scans to assess extremity and component alignment. The authors found that whereas 28% of the implants in the conventional group deviated from a neutral mechanical axis by >3°, no knees in the computer-assisted surgery group demonstrated such a deviation. In addition, the computer-assisted surgery group appeared to have a lower coefficient of variation with regard to coronal alignment measures. However, the use of computer-assisted surgery added a mean of thirty-two minutes to the operative time (mean, ninety compared with fifty-eight minutes). The authors concluded that computer-assisted surgery provides for greater consistency in terms of coronal plane alignment to within 3° of a neutral mechanical axis. Harvie et al.[16] questioned the relative efficacy of differing computer-assisted surgery systems and conducted a prospective study in which a full navigation system was compared with an articular surface-mounted system from the same company. Forty patients were included in the study and were randomly assigned to treatment with one of the computer-assisted surgery systems. The patients were followed postoperatively for one year on the basis of Knee Society scores and computed tomographic analysis of alignment. The authors found no differences between the systems in terms of patient outcomes or three-dimensional alignment of implants. However, the authors found that the articular surface-mounted system was associated with a significantly shorter operative time (122 compared with 132 minutes).

Patellofemoral Considerations

Despite substantial clinical research regarding patellofemoral resurfacing after total knee arthroplasty, there is still disagreement over the role of the patellofemoral joint in contributing to anterior knee pain. While some surgeons believe that the patella is not a major source of pain after total knee arthroplasty or unicondylar replacement, others routinely resurface the patella and avoid unicondylar replacement given the underlying assumption that the patella is a major pain generator. Breeman et al.[17] conducted a multicenter randomized control trial, starting in 1999 in the United Kingdom, in which knees with resurfaced patellae were compared with knees with unresurfaced patellae. The study, which represents the largest trial regarding patellar resurfacing to date, included 1717 patients who were followed with a variety of outcome measures, including the Oxford Knee score, the need for reoperation, cost efficacy, and other secondary measures. The authors identified no significant differences between the groups with regard to any of the outcome measures that were assessed. Although there were more patella-related reoperations in the group that did not have resurfacing, the difference was not large enough to achieve significance. One could conclude that patients in whom the patella is resurfaced and those in whom it is not resurfaced fare quite similarly after total knee arthroplasty.

van Jonbergen et al.[18] questioned the ability to prevent anterior knee pain after total knee arthroplasty by applying electrocautery around the periphery of the patella. A patient-blinded, parallel-group, randomized controlled trial involving 262 patients was conducted. All patients underwent a total knee arthroplasty without resurfacing of the patella. Half of the patients received circumpatellar electrocautery, and the other half did not. The authors assessed the patients for postoperative anterior knee pain, knee scores, and the osteoarthritis index for one year after surgery. Quite surprisingly, they noted a large difference between the groups, with a significantly reduced

WHAT'S NEW IN ADULT RECONSTRUCTIVE KNEE SURGERY

prevalence of anterior knee pain among patients who received circumpatellar electrocautery (19% versus 32%). The relative risk reduction among patients having electrocautery was 40%, and the number needed to treat was 7.7. It appears that applying circumpatellar electrocautery to the unresurfaced patella reduces anterior knee pain after total knee arthroplasty.

Perioperative Management

With the dramatic success of perioperative pain protocols, much clinical research has focused on nonsurgical perioperative interventions that augment the immediate outcome after total knee arthroplasty. While some of these protocols are aimed at preventing undesired symptoms, others are aimed at reducing complications such as anemia and hypothermia. Once a field that focused only on surgical details, adult reconstruction surgery is now clearly attentive to every aspect of perioperative care in an attempt to improve patient outcomes.

Surgeons generally prefer to have a low temperature set in the operating room to compensate for the excessive heat retained by the exhaust suit. However, there is obvious concern that a colder room could cause a decrease in the patients' perioperative temperature. Deren et al.[19] randomized sixty-six patients undergoing arthroplasty to an operating room set at 17°C (62.6°F) or an operating room that was prewarmed to 24°C (75.2°F). All patients were warmed with use of a standard operating room active warming blanket and had core temperature measurements at varying points during surgery to assess for differences between the groups. By the end of surgery, there was no significant difference in patient core temperature (36.35° versus 36.16°) when the patients in the prewarmed room were compared with those in the cooler room. The authors concluded that prewarming the operating room for adults undergoing a joint arthroplasty does not have a clinically relevant effect on patient core temperature. However, it is important to note that the study did provide for local active patient warming, which probably mitigated the effects of room temperature.

Joo et al.[20] studied the effect of a multimodal periarticular drug injection to reduce perioperative pain after total knee arthroplasty. They randomized 286 patients undergoing simultaneous bilateral total knee arthroplasty, with one knee receiving the drug cocktail and the other knee receiving a saline solution injection. The drug cocktail contained bupivacaine (200 mg), morphine (10 mg), methylprednisolone acetate (40 mg), and epinephrine (300 μg). All patients received a standard postoperative pain regimen, including patient-controlled analgesia, and were monitored for pain scores, patient satisfaction scores, knee motion, and blood loss. The authors could not identify any significant differences between the knees receiving the multimodal periarticular injection and those receiving the placebo injection. Although previous studies have suggested the efficacy of multimodal periarticular injections after total knee arthroplasty, this specific prospective randomized study did not show a clinical improvement in comparison with placebo.

The use of parenteral tranexamic acid to reduce blood loss after total knee arthroplasty has gained substantial recent interest. MacGillivray et al.[21] compared tranexamic acid with placebo in a prospective randomized study of sixty patients undergoing simultaneous bilateral knee replacement. All patients received two doses of either tranexamic acid at a dosage of 15 mg/kg, tranexamic acid at a dosage of 10 mg/kg, or placebo perioperatively. One dose was given ten minutes before deflation of the first tourniquet, and a second dose was given three hours later. The authors found that tranexamic acid treatment was associated with a reduction in blood loss after total knee arthroplasty, with a 50% reduction in the 15-mg/kg group. Unfortunately, the study included routine autotransfusion of blood from a reinfusion drain, which made postoperative analyses quite complex. Furthermore, the study was only powered to detect a 300-mL difference in blood loss, which translates to a 30% difference in blood loss compared with controls. Although this lack of power made it difficult to adequately compare the groups, it also highlighted the efficacy of tranexamic acid in reducing blood loss as significance was achieved in the high-dose group despite the large difference required by the power of the study.

Finally, there is great interest in the necessity and efficacy of prolonged supervised physical therapy after total knee arthroplasty. Russell et al.[22] conducted an interesting study in which patients were prospectively randomized to receive either six weeks of conventional physical therapy or six weeks of Internet-based telerehabilitation. The telerehabilitation group received instructions on self-applied techniques for forty-five minutes from a physical therapist communicating via video conference. The authors assessed the patients with use of an osteoarthritis index, functional scales, pain intensity scales, range-of-motion testing, strength, and gait at baseline and six weeks after total knee arthroplasty. They found that the control group of thirty-four patients and the telerehabilitation group of thirty-one patients demonstrated similar results on most postoperative assessment measures, although the patients in the telerehabilitation group demonstrated better outcomes on the Patient-Specific Functional Scale and the stiffness subscale. They concluded that the outcomes observed in patients having telerehabilitation were comparable and were not inferior to those of patients having conventional therapy. With cost-control measures and technological progress, the future of rehabilitation after arthroplasty may rely considerably on computer-based techniques.

Wound Management and Inflammation After Total Knee Arthroplasty

The treatment of wounds and the control of perioperative inflammation have recently gained increased attention as efforts to reduce drainage, dehiscence, and infection have intensified. Intraoperative techniques such as synovectomy and the use of drains hypothetically could affect postoperative outcomes by altering the degree of inflammation and effusion. Additionally, variations in wound closure techniques could decrease the drainage, dehiscence, and cost after total knee arthroplasty.

What's New in Adult Reconstructive Knee Surgery

While some surgeons perform a complete synovectomy with every total knee arthroplasty in an effort to remove the inflammatory generator, others have not used this technique and doubt its efficacy. Tanavalee et al.[23] randomized sixty-seven knees to synovectomy or no synovectomy during unilateral total knee arthroplasty for the treatment of osteoarthritis. They evaluated serial serum markers of inflammation, local skin temperatures, and Knee Society scores for twenty-six weeks after total knee arthroplasty to discern differences in inflammation between the groups. They identified typical elevations of serum markers in both groups, with peaks and durations that did not show a significant difference. Interestingly, at the twenty-six-week mark, the skin temperature mirrored the erythrocyte sedimentation rate, which was still exceeding preoperative values in both groups. Given the lack of significant differences between groups, the authors concluded that a synovectomy at the time of total knee arthroplasty for the treatment of osteoarthritis does not provide any clinical benefit or decrease the intensity of inflammation after surgery.

Li et al.[24] considered the postoperative effects of using wound drains at the time of total knee arthroplasty. Over a two-year period, 100 patients were randomized to receive a wound drain or no drain after unilateral primary total knee arthroplasty. The authors compared the groups with regard to blood loss, knee motion, wound-healing, infection-related complications, and the need for transfusion after surgery. The drain group had an average increase of approximately 300 mL in blood loss after total knee arthroplasty (853 versus 535 mL) and also required significantly more transfused blood after surgery. There were no differences between the groups in terms of the prevalence of thrombosis, the rate of infection, or range of motion. This study supports the claim that wound drains do not improve outcomes after total knee arthroplasty and may even increase blood loss and transfusion requirements. However, it is important to note that the study was severely underpowered in its ability to identify differences between groups in terms of the infection rate.

With the consideration that prolonged wound drainage leads to increased rates of deep infection, there is an effort to improve wound closure techniques after total knee arthroplasty. Eggers et al.[25] performed a randomized prospective study of seventy-five patients to evaluate four different wound closure techniques. All patients had a deep capsular closure with use of a bidirectionally barbed suture material and an interrupted 2-0 suture for subcutaneous closure. Four groups of approximately twenty patients each underwent cutaneous closure with either a Dermabond high-viscosity tissue adhesive (2-ocytl-cyanoacrylate; Ethicon, Somerville, New Jersey), a Histoacryl Blue tissue adhesive (n-butyl-2-cyanoacrylate; B. Braun, Melsungen, Germany), staples, or 4-0 resorbable suture material. Groups receiving an adhesive cutaneous closure had a subcutaneous layer augmented with more 2-0 suture. All patients were followed for functional and clinical outcomes, and closure times and cost were assessed. The authors identified no differences in clinical or functional outcomes; however, the use of adhesives or staples appeared to cost less than the use of suture because of improvements in operative time. Interestingly, the group receiving staples demonstrated a significant increase of about ten hours in the length of stay, and the authors suggested that the physical appearance and persistent drainage in this group may have contributed to patient resistance to earlier discharge. Although this was an excellent study comparing closure techniques, it was underpowered to distinguish differences in the rate of dehiscence and infection after total knee arthroplasty. ■

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