Guest Editorial
What's New in Adult Reconstructive Knee Surgery

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Nonoperative Management of Osteoarthritis of the Knee

As surgical treatment advances, patients with knee osteoarthritis may exhibit increasing pessimism toward the nonsurgical interventions of muscle strengthening and weight loss, countered by unrealistic expectations of arthroplasty[1]. Orthopaedic surgeons should keep this in mind to enhance patient outcomes.

Physical Therapy

Physical therapy for knee osteoarthritis can be effective either in a controlled outpatient setting or in a home-based setting[2]. The guidance of a physical therapist in home-based exercise was shown to lead to greater improvement in range of motion, pain, and muscle strength compared with home exercise not led by a physiotherapist[3]. In a different study, individualized physical therapy was demonstrated to be cost-effective when compared with usual medical care[4]. In a cohort of 206 patients in a prospective randomized controlled trial (RCT), the exercise physical therapy group had improved Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores (−28.2 [95% confidence interval (CI), −49.2 to −7.1]) compared with controls[4].

Risk and Health Policy

One recent study found that patients scheduled for primary total knee arthroplasty (TKA) would gamble a 20% risk of death, give up 27% of a 10-year life span, or pay 23% of their income for perfect results from primary TKA[5]. This underscores patients' desire for successful TKA and the health system's responsibility for properly administrating delivery.

Using data from the National Surgical Quality Improvement Program (NSQIP) registry, the authors of 1 recent study found that length of stay for patients undergoing TKA decreased from 3.7 days for the period of 2006 to 2009, to 3.0 days for 2014 to 2016[6].

Following the bundled-payment program implementation for primary TKA, patient discharge to inpatient rehabilitation units decreased by 59% relative to baseline. This has unfortunately led to an unintended consequence of a further need for assistive care and a 28% decrease in recovered motor gains[7]. Furthermore, if patients are discharged to home, it may be critical for a subset to receive home-health-based therapy. The authors of 1 recent study found that, when compared with patients with ≤5 in-home health-care physical therapy sessions, patients with ≥14 visits had a 50% greater improvement in activities of daily living ($p < 0.0001$)[8].

Operative Management: Non-Arthroplasty Options

Kaplan-Meier survivorship of high tibial osteotomy for symptomatic osteoarthritis in varus knees was demonstrated to be 55% at 15 years, with increased risk of failure found for female sex (hazard ratio [HR], 2.37; 95% CI, 1.06 to 5.33; $p = 0.04$) and age (HR, 1.07 for each additional year of life; 95% CI, 1.03 to 1.11; $p = 0.001$)[9]. Injection of mesenchymal stem cells at the time of high tibial osteotomy may improve the amount and durability of articular cartilage at clinical follow-up[10].

Unicondylar Knee Arthroplasty

Outcomes and Design

The authors of a recent meta-analysis found that the survivorship of unicondylar knee arthroplasty in a general population was 95.3% at 5 years and 91.3% at 10 years[11]. An NSQIP database review of 8,029 patients indicated that obese patients may not be at increased risk of 30-day complications following unicompartmental knee arthroplasty[12]. However, in recent retrospective and prospective studies, 10-year all-cause survivorship of prostheses was 87.5% to 88.1%[13,14] for patients classified as obese, demonstrating clinical failure rates greater than those of nonobese counterparts[13].

Cementless Unicondylar Knee Arthroplasty

A retrospective review of 1,000 Oxford cementless unicondylar knee replacements[15] for standard indications[16] documented survivorship free of revision of 96.8% at a mean of 10 years.

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What's New in Adult Reconstructive Knee Surgery

A report using data from the Finnish Arthroplasty Register showed Kaplan-Meier survivorship of 93.7% at 3 years and 92.3% at 5 years for 1,076 cementless Oxford unicondylar knee arthroplasties[17]. Kamenaga et al. retrospectively reviewed a cohort of 120 patients who underwent cementless Oxford unicondylar knee arthroplasties and found a rate of valgus subsidence of the tibial component of 5% (6 of 120)[18]. The authors proposed that this phenomenon was due to tibial malpositioning, and pain resolved at 3 months postoperatively.

Computer or Robotic-Assisted Unicondylar Knee Arthroplasty

The learning curve associated with robotic unicondylar knee arthroplasty was reported as 6 cases to decrease operative time, but there was no effect of learning curve on implant position[19]. The rate of complications related to the use of standard computer-navigation pins placed in the tibia and femur for 2 robotic systems was 0.6%[20].

A prospective consecutive series of 73 conventional jig-based, mobile-bearing unicondylar knee arthroplasties followed by 73 fixed-bearing robotic-assisted unicondylar knee arthroplasties with implants from another manufacturer found that postoperative pain was reduced at day 0 through discharge in the mobile-bearing group. Additionally, the number of opioids administered was decreased, as was mean time to discharge[21]. Canetti et al.[22] reported a quicker return to sports after robotic-assisted lateral unicondylar knee arthroplasty compared with conventional unicondylar knee arthroplasty (mean [and standard deviation] of 4.2 ± 1.8 months compared with 10.5 ± 6.7 months; $p < 0.01$). Matched cohorts of 246 robotic-assisted unicondylar knee arthroplasties and 492 manual unicondylar knee arthroplasties from an administrative claims database were retrospectively reviewed[23]. There was a decreased rate of revision in the robotic-assisted cohort compared with the manually executed unicondylar knee arthroplasty cohort (0.81% compared with 5.28%, respectively). Additionally, the average cost, length of stay, and rate of readmissions were less in the robotic cohort. However, despite numerous favorable reports[24,25], many with substantial potential for bias[26], additional high-quality RCTs are needed to add scientific rigor to this area of study.

Unicondylar Knee Arthroplasty Compared with TKA

Patients undergoing unicondylar knee arthroplasty were 10.3% less likely ($p = 0.006$) to require a second opioid prescription after surgery compared with those undergoing TKA[27]. At 6 months postoperatively, patients who underwent unicondylar knee arthroplasty had improved single-limb support of 1.4% ($p = 0.006$) of the gait cycle compared with TKA patients, but there was no difference ($p = 0.194$) in quadriceps maximum voluntary contraction torque[28]. After propensity-score weighting, unicondylar knee arthroplasty patients and TKA patients experienced similar improvement from baseline in the overall Knee Society Score (KSS) at 2 years: 88.8 points (95% CI, 81.5 to 96.1) compared with 88.9 (95% CI, 82.4 to 95.4), respectively[29]. Regardless of whether patients underwent unicondylar knee arthroplasty or TKA, only the preoperative KSS function subscale was significantly associated with postoperative function ($p = 0.002$)[29]. A systematic review found that mortality, venous thromboembolism (VTE), and major cardiac events were less frequent after unicondylar knee arthroplasty. Revision rates were higher for unicondylar knee arthroplasty at 5 years in RCTs (risk ratio, 5.95; 95% CI, 1.29 to 27.59)[30]. Revision of a unicondylar knee arthroplasty to TKA, despite requiring more stems, augments, or sometimes constrained implants, demonstrated no significant difference with respect to the KSS, the Oxford Knee Score, the Short Form (SF)-36, and satisfaction at 2-year follow-up compared with primary TKA[31].

TKA: Perioperative

Risk Stratification, Readmissions, and Minimizing Complications

Alternative payment models have accelerated interest in perioperative risk optimization for patients undergoing knee arthroplasty. Bernstein et al. prospectively screened 314 preoperative patients for 19 separate risk factors, and 74% of the patients were found to have at least 1 risk factor[32]. After the implementation of optimization protocols, postoperative hospital length of stay decreased by a mean of 0.3 day ($p < 0.001$). Patient episodes also had less direct variable costs and fewer discharges to inpatient rehabilitation facilities. Another study recently identified malnourished patients, those with an albumin level of ≤3.4 g/dL, prior to lower-extremity arthroplasty. After nutritional optimization, there were fewer postoperative patient readmissions and lower 90-day total charges ($p < 0.001$)[33].

The risk of inferior patient-reported outcomes after TKA was found to increase in patients of advanced age[34]. At a patient age of 68 years, the Knee injury and Osteoarthritis Outcome Score (KOOS) domains of pain and activities of daily living, as well as the Lower Extremity Activity Scale (LEAS), reached an inflection point and then declined despite well-performed arthroplasty. At 70 years, KOOS symptoms declined as well.

Perioperative Care

Accelerated recovery protocols have improved the patient perioperative experience. An RCT demonstrated that a 50-patient cohort undergoing primary TKA who received a 10-mg dose of dexamethasone 1 hour pre- and postoperatively experienced significantly less nausea, had lower visual analog scale (VAS) pain scores, and had less opioid consumption than a control group[35]. Patients with elevated preoperative blood glucose levels may benefit from the perioperative restriction of carbohydrates. A 20-mg/dL decrease in perioperative blood sugar values was associated with the implementation of a carbohydrate-restricted diet[36]. Despite investigation in many RCTs, the best type of closure for preventing surgical site infection in primary TKA remains

What's New in Adult Reconstructive Knee Surgery

unclear[37]. In 1 study that included patients who underwent bilateral primary TKA, there were less-frequent dressing changes needed (59% versus 24% of knees prior to discharge; p = 0.02) with a subcuticular closure with tissue adhesive applied to the wound compared with control knees[38]. In another study, routine prophylactic measures reduced urinary retention more effectively than prophylactic tamsulosin after lower-extremity arthroplasty[39].

Blood Management

There is a strong recommendation for tranexamic acid (TXA) for safely reducing blood loss and transfusion after primary total joint arthroplasty in a wide variety of patients in recent prospective studies[40]. An RCT including 233 revision TKAs found no difference among 4 randomized dosing regimens of TXA[41]. However, a 2-center RCT including 640 patients[42] did find small differences (p < 0.0001) between intravenous (IV) and topical TXA dosing for primary TKA, with less blood loss, drain output, and transfusion in the IV TXA cohort. However, if oral TXA is given in multiple doses postoperatively, there may be little difference with IV TXA[40,43]. There is now expanded information that blood transfusion is a strong risk factor for the development of cardiac complications, infection[44], and VTE[45] after TKA.

Anesthesia and Pain Management

Seventy-five percent of American Association of Hip and Knee Surgeons members stated a preference for spinal anesthesia during TKA in a 2018 poll[46]. Meeting with an anesthesiologist in the outpatient clinic preoperatively may be helpful. The authors of 1 study found that a preference for general anesthesia among 62 patients decreased from 48% prior to meeting with the anesthesiologists to 18% after the preoperative meeting[47]. Patients with mild cognitive impairment are particularly vulnerable to functional cognitive decline after general anesthesia for TKA[48]. Selecting spinal anesthesia may help prevent cognitive decline after surgery. Neuraxial anesthesia may also benefit the health system; a large health-care database study demonstrated a 15% decrease in hospital costs when neuraxial anesthesia is utilized during arthroplasty surgery[49]. The medications utilized in spinal anesthesia are under debate[50]. Neurological recovery after mepivacaine spinal anesthetic allowed patients to discharge from the postanesthesia recovery unit 71 minutes faster compared with bupivacaine spinal anesthesia in an RCT including 32 patients[51]. Dexamethasone may increase readiness for discharge by reducing pain and pain medicine requirements[52,53].

Regional Blocks

The peripheral nerve adductor canal block (ACB) has gained favor because of hypothesized quadriceps muscle strength sparing when compared with a femoral nerve block. A double-blinded RCT including 30 patients confuses that hypothesis, finding no differences in opioid use, VAS for pain, or quadriceps strength at 24 or 48 hours postoperatively after TKA[54]. However, this study did not assess strength in the early hours after surgery. There was no clear benefit of a continuous ACB after TKA compared with a single-shot ACB in other RCTs[55,56].

ACB when combined with posterior capsular infiltration of local block was superior to local block alone, with lower VAS pain scores and better range of motion in the first 48 hours after surgery[57]. Another RCT indicated that there is less difference, but with a "lower worst pain" and "greater pain relief 24 hours after surgery" in the ACB-plus-local-block group[58]. There are various local-block cocktails, usually with an anesthetic, an anti-inflammatory, and epinephrine[59]. A recent RCT supports liposomal bupivacaine for early discharge[60], but 1 meta-analysis found that study results are inconclusive[61].

Opioid Pain Medications

In patients who were chronic opioid users prior to total joint arthroplasty, 1 study found that 72% stopped within 1 year after surgery[62]. However, preoperative opioid use was shown to be an independent risk factor for early revision TKA (odds ratio [OR], 1.53; 95% CI, 1.25 to 1.88; p < 0.001)[63]. Restrictive postoperative opioid prescribing protocols have been found to be effective and safe after TKA[64]. When specific institutional guidelines were implemented, prescribers reduced postoperative opioid prescriptions (difference of medians of 362 oral morphine equivalents), with no difference in refill rates[65].

TKA: Intraoperative

Surgical Technique for TKA

In addition to recovery protocols, surgical technique may also enhance early recovery. A meta-analysis demonstrated that a quadriceps-sparing approach was associated with a lower postoperative VAS for pain, a shorter hospital stay, and an increased KSS function score beyond 24 months postoperatively (weighted mean difference, 1.78; p = 0.0004)[66]. In a prospective computed tomography (CT) study, the differences in femoral-component positioning between measured resection, gap balancing, and CT placement of femoral components showed no statistical differences with any associated patient-reported outcomes[67]. Kinematic alignment appears not to impact long-term implant survivorship negatively in conventional or patient-specific instrumentation[68]. In an uncontrolled cohort, Howell et al. demonstrated implant survivorship of 97.5% at 10 years[69]. As production costs decrease, single-use instrumentation may become economically favorable[70,71].

Computer or Robotic-Assisted TKA

CT-based templating was predictive of the correct size of the femoral implant in 44% more cases and the size of the tibial component in 64% more cases than traditional templating[72]. Robotic-assisted final implants were found to be positioned more accurately and precisely than standard instrumentation as well[73,74].

What's New in Adult Reconstructive Knee Surgery

In a retrospective cohort of 390 knees at 10-year follow-up, there was no difference in survivorship or clinical outcomes between robotic and standard TKA[75]. In a prospective study of 40 consecutive TKAs by standard instrumentation followed by 40 consecutive robotic arm-assisted TKAs, the authors found a significant difference in multiple clinical parameters ($p < 0.001$), with reduced postoperative pain, decreased analgesia requirements, shorter time to straight-leg raise, decreased number of physical therapy sessions, and improved knee flexion at discharge associated with robotic arm-assisted TKA[73]. A meta-analysis of robotic versus standard instrumentation TKA reported little difference in clinical outcomes[76]. However, most studies were of low quality with risk of bias[26].

Outcomes and Design

At 10-year follow-up of an RCT, there was no difference in implant survivorship between fixed-bearing metal-backed (97%), mobile-bearing (97%), or all-polyethylene (95%) ($p = 0.89$) tibial implants in posterior-stabilized primary TKA[77]. The 10-year survivorship of a single-radius, cruciate-retaining TKA implant was 97.9% in an uncontrolled retrospective study[78]. A primary TKA system utilizing an oxidized zirconium (OxZr) femoral component showed survivorship free of revision for any reason at 15 years of 95.6%[79]. However, an RCT evaluating an OxZr compared with a cobalt-chromium femoral component did not show any clinical or radiographic superiority of either component design at a minimum of 10 years of follow-up[80]. At 6 years of follow-up, there was an osteolysis rate of 3.3% (4 of 122) in a group treated with a standard polyethylene tibial liner compared with 0% (0 of 123) in a highly cross-linked polyethylene group among patients who underwent posterior-stabilized TKA[81].

Conforming or ultracongruent polyethylene inserts in primary TKA have recently shown favorable outcomes and may result in improved range of motion when compared with more constrained implants[82-84]. An asymmetric conforming design may be of additional benefit. In a cohort of 303 patients, half of whom received a symmetric design and the other half, an asymmetric, the asymmetric design induced lower tibial bone stresses than the symmetric design[85].

Cementless TKA

At minimum follow-up of 17 years, the survivorship to revision for any reason of a primary TKA system utilizing an uncemented rotating-platform tibia was 97.4%[86]. A prospective study of 240 consecutive knees that underwent primary TKA with mostly uncemented components noted implant survivorship free of revision for any reason of 98.9% at 10 years[87].

The Patella in Primary TKA

The treatment of isolated patellofemoral arthritis remains controversial. Clement et al. found that the functional outcome of, and satisfaction from, patellofemoral arthroplasty was equal to TKA, with a shorter length of stay[88]. A study using data from the Australian Orthopaedic Association National Joint Replacement Registry showed a 14.8% rate of revision of patellofemoral arthroplasty to TKA. The risk of revision of the subsequent TKA was over twice as high as the risk of a primary TKA undergoing a first-time revision (HR, 2.39; 95% CI, 1.77 to 3.24; $p < 0.001$)[89].

Anterior knee pain, patellar crepitus, and clunk rates were found to be lower in cases in which the patella was resurfaced in primary TKA[90-92]. However, studies disagree as to whether patellar resurfacing is cost-effective for the health system[92,93].

TKA: Postoperative

Recovery, Discharge Readiness, and Rehabilitation

Patients can be reassured that returning to home after primary TKA with unsupervised home exercise is safe and effective[94-98]. Most will achieve patient-reported outcome scores and range of motion similar to those who go to outpatient therapy[97]. However, some may have higher satisfaction with group-based outpatient physical therapy[99].

Predictive models have been able to reliably predict fitness for outpatient surgery[100]. On the basis of a study using NSQIP data of 1,005 patients ≥80 years of age who underwent TKA compared with a large cohort of patients <80 years of age, older patients may be just as safe to go home early, with no difference in a multitude of complications found[101]. Other risk factors, such as psychosis, drug abuse, neurological disorders, and depression, may be more predictive of medical complication and subsequent admission to a skilled nursing facility[101-103].

Outpatient TKA

The U.S. Centers for Medicare & Medicaid Services (CMS) recently took TKA off the inpatient-only list. A recent nomogram noted simultaneous bilateral TKA, metastatic cancer, dependent functional status, and an age of >80 years as the greatest contributors to inpatient stay[104]. Further refinement of protocols is required in the Medicare population before safe widespread implementation of outpatient TKA can be achieved.

When given a questionnaire, >70% of 346 patients scheduled to undergo TKA did not believe that they would be able to do it as an outpatient[105]. In retrospective studies, 10% to 80% of TKA patients were appropriate for outpatient surgery[100,106,107]. This underscores the need for preoperative medical evaluation, a good scoring tool, patient education, and coordination of care. The Outpatient Arthroplasty Risk Assessment (OARA) score has been validated as effective in the identification of TKA patients who can safely undergo outpatient surgery[100].

Thromboembolic Prophylaxis

Aspirin and sequential compression devices are used as a VTE prophylaxis strategy in 85% of primary joint arthroplasties,

WHAT'S NEW IN ADULT RECONSTRUCTIVE KNEE SURGERY

according to a review of the American Board of Orthopaedic Surgery case database[108]. Notably, less aggressive VTE prophylaxis protocols were not associated with a higher rate of thrombosis[109] (absolute rate, 0.67%; OR, 0.70; 95% CI, 0.56 to 0.87).

Outcomes of Primary TKA in Obese Patients

In a large administrative health-care database study, 1,001 morbidly obese patients had a higher 10-year risk of death than did non-morbidly obese patients (relative risk, 1.50; 95% CI, 1.22 to 1.85). There was no difference in the rates of revision surgery for morbidly obese and non-morbidly obese patients[110].

Infection

A recent retrospective cohort study of 134 patients with acute periprosthetic joint infection (PJI) following primary TKA who were treated with debridement, antibiotics, and implant retention (DAIR) found an overall success rate of 66% at a mean of 5 years, with infection with Staphylococcus being a major risk factor for failure[111]. At a mean of 4.1 years postoperatively, those who experienced failure of DAIR and then went on to a 2-stage exchange had inferior functional outcome after 2-stage exchange compared with those who went directly to 2-stage exchange for PJI[112].

Infection-free survivorship after total joint arthroplasty appears to be higher when cefazolin rather than a non-cefazolin antibiotic is used as a prophylactic antibiotic. A retrospective registry study of 29,695 arthroplasties found that penicillin allergy testing, in order to allow the more routine use of cefazolin, could lead to a 1.19% higher rate of survival free of infection after total joint arthroplasty at ten years for the cefazolin group[113]. Prior infection in another joint yielded between a 3 and 15-fold higher risk of developing a PJI after primary TKA[114].

Revision TKA

The quadriceps snip is an adjunctive procedure to obtain enhanced exposure during revision TKA. In a retrospective review of 321 revision TKAs performed with a quadriceps snip, there were no clinical differences found between this cohort and a 1:1 matched control cohort[115]. Severe arthrofibrosis is a challenging diagnosis to treat in the setting of revision TKA. In 1 recent study, a hinged prosthesis allowed greater motion (difference in means, 8°; $p = 0.048$) than a constrained device but had a higher revision rate at 10 years (46% and 10%, respectively; $p = 0.03$) in this setting[116]. Improved early clinical outcomes of hinged components for arthrofibrosis were also noted at a mean follow-up of 2 years[117].

In patients <50 years of age at the time of revision TKA, survivorship free of re-revision was 66% at 10 years[118]. Patients undergoing revision TKA for any reason were demonstrated to have a higher risk of mortality than the general population at 10 years postoperatively. Those undergoing revision for infection or fracture had an increased mortality risk early after revision, with increasing risk over time[119].

Evidence-Based Orthopaedics

The editorial staff of *JBJS* reviewed a large number of recently published studies related to the musculoskeletal system that received a higher Level of Evidence grade. In addition to articles cited already in this update, 14 other articles with a higher Level of Evidence grade relevant to adult reconstructive knee surgery are appended to this review after the standard bibliography, with a brief commentary about each article to help guide your further reading, in an evidence-based fashion, in this subspecialty area.

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WHAT'S NEW IN ADULT RECONSTRUCTIVE KNEE SURGERY

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Evidence-Based Orthopaedics

Bohl DD, Li J, Calkins TE, Darrith B, Edmiston TA, Nam D, Gerlinger TL, Levine BR, Della Valle CJ. Physical therapy on postoperative day zero following total knee arthroplasty: a randomized, controlled trial of 394 patients. *J Arthroplasty.* 2019 Jul;34(7S):S173-7.e1. Epub 2019 Feb 13.

This prospective randomized study allocated patients to either a postoperative day 0 physical therapy cohort (193 patients) or postoperative day 1 physical therapy (201 patients). Both cohorts otherwise received similar postoperative protocols. With approximately 63% of patients leaving the hospital on postoperative day 1, the authors were unable to see any benefit in postoperative day 0 physical therapy ($p = 0.07$).

Di Martino A, Di Matteo B, Papio T, Tentoni F, Selleri F, Cenacchi A, Kon E, Filardo G. Platelet-rich plasma versus hyaluronic acid injections for the treatment of knee osteoarthritis: results at 5 years of a double-blind, randomized controlled trial. *Am J Sports Med.* 2019 Feb;47(2):347-54. Epub 2018 Dec 13.

What's New in Adult Reconstructive Knee Surgery

This randomized controlled trial included 192 patients who received blinded injections of either platelet-rich plasma or hyaluronic acid, with a mean follow-up of 64 months. No difference in clinical scores or outcomes was found, other than a decreased rate of surgical intervention at 2 years in the platelet-rich plasma group ($p = 0.03$).

George MD, Baker JF, Winthrop K, Alemao E, Chen L, Connolly S, Hsu JY, Simon TA, Wu Q, Xie F, Yang S, Curtis JR. Risk of biologics and glucocorticoids in patients with rheumatoid arthritis undergoing arthroplasty: a cohort study. *Ann Intern Med.* 2019 Jun 18;170(12):825-36. Epub 2019 May 21.

This retrospective study evaluated a cohort of 9,911 patients treated with biologic medications for rheumatoid arthritis who underwent TKA. The authors found no difference in the risk of PJI (0.35% to 3.67%) or hospital-based infection (6.87% to 8.9%) between the medications. However, there was a dose-dependent risk of increased periprosthetic and in-hospital infection with glucocorticoids. A dose of ≥10 mg per day was associated with a 1-year PJI risk of 3.83% and an in-hospital infection risk of 13.25%.

Koh IJ, Kim MS, Sohn S, Song KY, Choi NY, In Y. Duloxetine reduces pain and improves quality of recovery following total knee arthroplasty in centrally sensitized patients: a prospective, randomized controlled study. *J Bone Joint Surg Am.* 2019 Jan 2;101(1):64-73.

This RCT included 80 patients with central sensitization due to chronic pain who were undergoing TKA. The patients were randomized to receive either duloxetine, a selective serotonin norepinephrine reuptake inhibitor, or control. The patients who received duloxetine had better pain control after surgery at 2 to 12 weeks ($p = 0.05$) and also had better recovery according to physical and emotional function ($p < 0.05$).

Laoruengthana A, Jarusriwanna A, Rattanaprichavej P, Rasamimongkol S, Varakornpipat P, Pongpirul K. Timing of periarticular injection has no effect on postoperative pain and functional recovery in simultaneous bilateral total knee arthroplasty: a prospective randomized, double-blinded trial. *BMC Musculoskelet Disord.* 2019 Apr 11;20(1):162.

This RCT evaluated the postoperative clinical outcomes of 2 cohorts who received periarticular block either just after arthrotomy or after prosthetic implantation. The authors found no difference between the 2 groups in VAS for pain, maximal knee flexion, or early quadriceps function.

Lee YS, Fernando N, Koo KH, Kim HJ, Vahedi H, Chen AF. What markers best guide the timing of reimplantation in two-stage exchange arthroplasty for PJI? A systematic review and meta-analysis. *Clin Orthop Relat Res.* 2018 Oct;476(10):1972-83.

The authors of this paper performed a systematic review and meta-analysis to identify markers that best guide the clinician as to when to go forward with reimplantation in the setting of resection TKA for PJI. They found that, while many of the markers were beneficial, none were superior to the others. Looking at multiple markers to help make a decision is recommended.

Li HK, Rombach I, Zambellas R, Walker AS, McNally MA, Atkins BL, Lipsky BA, Hughes HC, Bose D, Kümin M, Scarborough C, Matthews PC, Brent AJ, Lomas J, Gundle R, Rogers M, Taylor A, Angus B, Byren I, Berendt AR, Warren S, Fitzgerald FE, Mack DJF, Hopkins S, Folb J, Reynolds HE, Moore E, Marshall J, Jenkins N, Moran CE, Woodhouse AF, Stafford S, Seaton RA, Vallance C, Hemsley CJ, Bisnauthsing K, Sandoe JAT, Aggarwal I, Ellis SC, Bunn DJ, Sutherland RK, Barlow G, Cooper C, Geue C, McMeekin N, Briggs AH, Sendi P, Khatamzas E, Wangrangsimakul T, Wong THN, Barrett LK, Alvand A, Old CF, Bostock J, Paul J, Cooke G, Thwaites GE, Bejon P, Scarborough M; OVIVA Trial Collaborators. Oral versus intravenous antibiotics for bone and joint infection. *N Engl J Med.* 2019 Jan 31;380(5):425-36.

One thousand and fifty-four patients were enrolled in this RCT, which included 2 cohorts. The first received IV antibiotics for bone or joint infection, and the second received oral antibiotics. The failures rate for the IV and oral groups were 14.6% and 13.2%, respectively. The authors concluded that oral antibiotics are noninferior for the treatment of bone and joint infection at 1 year.

Li M, Zeng Y, Wu Y, Si H, Bao X, Shen B. Performance of sequencing assays in diagnosis of prosthetic joint infection: a systematic review and meta-analysis. *J Arthroplasty.* 2019 Jul;34(7):1514-1522.e4. Epub 2019 Mar 7.

The ability to easily identify the bacteria causing PJI through their genetic fingerprint would revolutionize orthopaedics. This systematic review and meta-analysis found that the specificity of the synthesis sequencing was better than other methods (0.96 versus 0.829). Holding antibiotics prior to aspiration of the joint will improve the sensitivity of the test.

Liu G, Gong M, Wang Y, Xiang Z. Effect of methylprednisolone on pain management in total knee or hip arthroplasty: a systematic review and meta-analysis of randomized controlled trials. *Clin J Pain.* 2018 Oct;34(10):967-74.

Methylprednisolone given intravenously in the postoperative period after TKA significantly improved pain and reduced opioid administration in the first 24 hours. Additionally, there was evidence that postoperative nausea improved as well, with no apparent increase in postoperative complications.

Marson BA, Deshmukh SR, Grindlay DJC, Scammell BE. Alpha-defensin and the Synovasure lateral flow device for the diagnosis of prosthetic joint infection: a systematic review and meta-analysis. *Bone Joint J.* 2018 Jun 1;100-B(6):703-11.

This systematic review and meta-analysis found that the pooled sensitivity for the alpha-defensin test performed in a laboratory setting was 0.95 (95% CI, 0.91 to 0.98), and the specificity was 0.97 (95% CI, 0.95 to 0.98). It is important to note that the lateral flow cassette test does not perform at the same level and may have the same-to-lower performance of other common, less expensive tests run for PJI.

Panjwani TR, Mullaji A, Doshi K, Thakur H. Comparison of functional outcomes of computer-assisted vs conventional total knee arthroplasty: a systematic review and meta-analysis of high-quality, prospective studies. *J Arthroplasty.* 2019 Mar;34(3):586-93. Epub 2018 Dec 2.

Computer-assisted surgery (CAS) TKA is now a mature technique. This systematic review and meta-analysis was an attempt to capture high-quality randomized studies for review. They included a total of 3,060 knees in the 18 different randomized studies. With a mean of >8 years of follow-up, there was very little difference in patient-reported outcomes as measured by the WOMAC or the KSS between conventional and CAS TKA. The CAS TKAs did have superior outcomes in WOMAC scores in studies that reported at the >5-year and <8-year postoperative time periods. The authors did not report any radiographic outcomes or revision rates.

Richardson SS, Schairer WW, Sculco TP, Sculco PK. Comparison of infection risk with corticosteroid or hyaluronic acid injection prior to total knee arthroplasty. *J Bone Joint Surg Am.* 2019 Jan 16;101(2):112-8.

This retrospective study of a private insurer database reviewed the records of >58,000 patients who received a TKA. Of those, 16,565 received corticosteroid and 3,249, intra-articular hyaluronic acid injection. Within 3 months of TKA, both types of injections imparted an increased risk of PJI (OR, 1.21; $p = 0.014$; and OR, 1.55; $p = 0.029$, respectively). The authors concluded that patients should avoid any kind of injection into the knee within 3 months of TKA.

Sousa RJG, Abreu MA, Wouthuyzen-Bakker M, Soriano AV. Is routine urinary screening indicated prior to elective total joint arthroplasty? A systematic review and meta-analysis. *J Arthroplasty.* 2019 Jul;34(7):1523-30. Epub 2019 Mar 19.

What's New in Adult Reconstructive Knee Surgery

Ten papers were reviewed systematically to answer the question of whether routine urinary screening was indicated prior to elective total joint arthroplasty. In the total cohort of 28,588 patients, even if asymptomatic bacteriuria (ASB) was diagnosed, preoperative treatment with antibiotics had no change in the rates of PJI, and most infecting organisms of PJI were unrelated to those of ASB. It is important to note, however, that those patients with ASB did have an overall higher risk of PJI than those who did not.

Vertullo CJ, de Steiger RN, Lewis PL, Lorimer M, Peng Y, Graves SE. The effect of prosthetic design and polyethylene type on the risk of revision for infection in total knee replacement: an analysis of 336,997 prostheses from the Australian Orthopaedic Association National Joint Replacement Registry. *J Bone Joint Surg Am.* 2018 Dec 5;100(23):2033-40.

This review of the Australian Orthopaedic Association National Joint Replacement Registry divided study patients into 4 cohorts: (1) those with posterior-stabilized TKA (PS-TKA) with non-cross-linked polyethylene (NXLPE), (2) PS-TKA with cross-linked polyethylene (XLPE), (3) "minimally" stabilized TKA (MS-TKA) with NXLPE, and (4) MS-TKA with XLPE. MS-TKA with XLPE imparted the lowest risk of revision for PJI among the 4 groups, with PS-TKA with NXLPE performing the worst (HR, 2.02; 95% CI; 1.72 to 2.37; $p < 0.001$).