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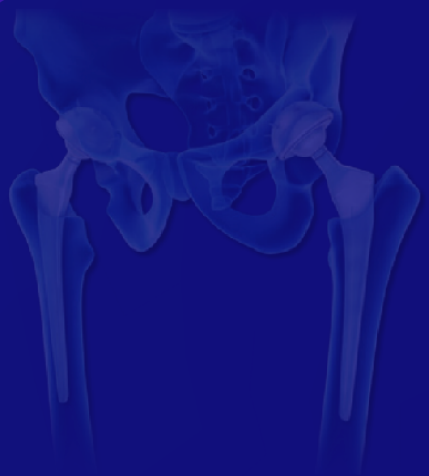

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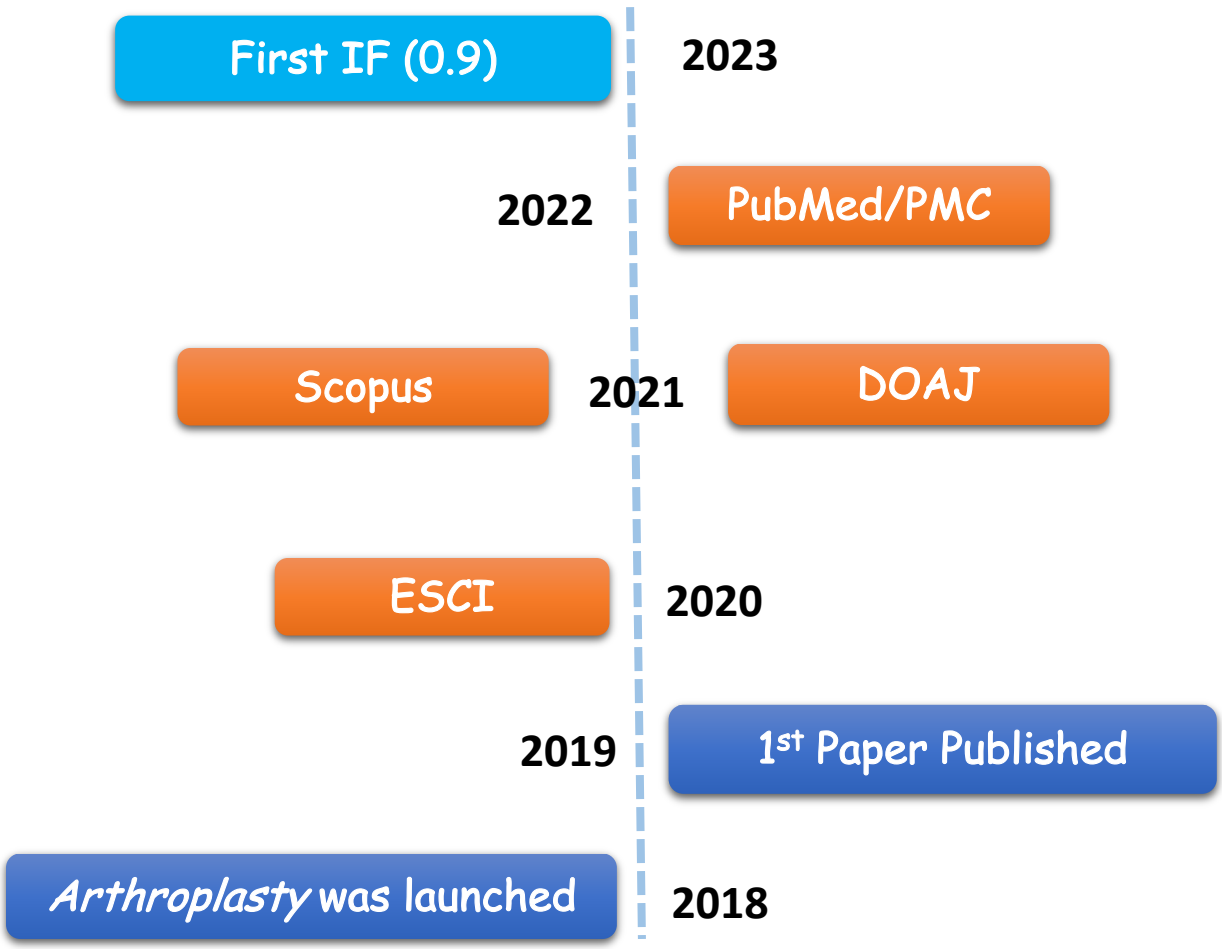
Arthroplasty is the official journal of the Arthroplasty Society In Asia (ASIA), aiming at publishing the latest research advances and clinical developments in the management of joint diseases and recovery. We publish original articles and reviews concerning joint replacement or the treatment of its complications, including clinical applications, surgical experience, and prosthetic design. The journal will especially focus on novel advances in the field of arthroplasty, including new technologies, biomaterials, prosthetic design, etc.

Indexing



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Selected Articles

Selected Articles

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Paper 1

Highly Cited Papers

Reducing the risk of infection after total joint arthroplasty: preoperative optimization

Brielle Antonelli and ***Antonia F. Chen***

Full text

Abstract: Total joint arthroplasty (TJA) is one of the most commonly performed procedures in orthopedic surgery, and as the demand for TJA increases over time, the number of concurrent complications such as surgical infection will also increase. There are multiple risk factors that independently increase the risk of surgical site infection (SSI) and periprosthetic joint infection (PJI) after surgery. These modifiable risk factors can be identified in preoperative clinic screening visits that gives physicians the opportunity to provide specific intervention that can decrease patient infection risk. The risk factors that are known to significantly increase the risk of PJI and/or SSI include MSSA/MRSA colonization, rheumatoid arthritis, cardiovascular and renal disease, obesity, diabetes mellitus, hyperglycemia, anemia, malnutrition, tobacco use, alcohol consumption, depression, and anxiety. Patients who present with one or more of these risk factors require intervention with a multidisciplinary approach including patient education, counseling, and follow-up. Preoperative patient optimization for high risk TJA patients can significantly decrease PJI and SSI risk while improving surgical outcomes and patient care.

Keywords: TJA, arthroplasty, infection, SSI, PJI, Total hip arthroplasty

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Highly Cited Papers

Paper 2

Patient satisfaction and total hip arthroplasty: a review

Lauren Okafor and ***Antonia F. Chen***

Full text

Abstract: Primary total hip arthroplasty (THA) has been recognized as a reliable intervention for patients with end-stage osteoarthritis. Despite several notable advances in this procedure, studies have identified at least 7% of patients who remain dissatisfied. There is no general consensus on how to measure patient satisfaction in orthopedic surgery. However, validated tools have been used in multiple studies to further investigate this problem. A comprehensive review was conducted to examine the factors associated with patient satisfaction following THA. Associations in literature included patient expectation, age, sex, pain management, patient comorbidities (medical or psychiatric that existed prior to surgery), and length of stay. The continuous collection of patient satisfaction data using validated and reliable measurement tools is necessary to improve this important patient-reported outcome after THA.

Keywords: THA, Patient satisfaction, Patient satisfaction, Orthopedic surgery, Outcomes

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Paper 3

Editor Choice Paper

Artificial intelligence in diagnosis of knee osteoarthritis and prediction of arthroplasty outcomes: a review

*Lok Sze Lee, **Ping Keung Chan**, Chunyi Wen, Wing Chiu Fung, Amy Cheung, Vincent Wai Kwan Chan, Man Hong Cheung, Henry Fu, Chun Hoi Yan & Kwong Yuen Chiu*

Full text

Abstract

Background: Artificial intelligence is an emerging technology with rapid growth and increasing applications in orthopaedics. This study aimed to summarize the existing evidence and recent developments of artificial intelligence in diagnosing knee osteoarthritis and predicting outcomes of total knee arthroplasty.

Methods: PubMed and EMBASE databases were searched for articles published in peer-reviewed journals between January 1, 2010, and May 31, 2021. The terms included: 'artificial intelligence', 'machine learning', 'knee', 'osteoarthritis', and 'arthroplasty'. We selected studies focusing on the use of AI in diagnosis of knee osteoarthritis, prediction of the need for total knee arthroplasty, and prediction of outcomes of total knee arthroplasty. Non-English language articles and articles with no English translation were excluded. A reviewer screened the articles for the relevance to the research questions and strength of evidence.

Results: Machine learning models demonstrated promising results for automatic grading of knee radiographs and predicting the need for total knee arthroplasty. The artificial intelligence algorithms could predict postoperative outcomes regarding patient-reported outcome measures, patient satisfaction and short-term complications. Important weaknesses of current artificial intelligence algorithms included the lack of external validation, the limitations of inherent biases in clinical data, the requirement of large datasets in training, and significant research gaps in the literature.

Conclusions: Artificial intelligence offers a promising solution to improve detection and management of knee osteoarthritis. Further research to overcome the weaknesses of machine learning models may enhance reliability and allow for future use in routine healthcare settings.

Keywords: Artificial intelligence, Machine learning, Arthroplasty, Replacement, Total knee arthroplasty, Osteoarthritis

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Editor Choice Paper

Paper 4

Robotic-assisted unicompartmental knee arthroplasty: a review

Pei Liu, Fei-fan Lu, Guo-jie Liu, Xiao-hong Mu, Yong-qiang Sun, Qi-dong Zhang, Wei-guo Wang & ***Wan-shou Guo***

Full text

Abstract

Purpose: Presented here is an up-to-date review concerning robotic-assisted unicompartmental knee arthroplasty (rUKA), including its rationale, operative system, pros and cons. Methods: We did a systematic research in electronic databases, including PubMed, Cochrane Library, Web of Science, and Embase up to March 30, 2020 to retrieve literature pertaining to rUKA. The search strategies "(robotic* AND knee arthroplasty OR knee replacement)" and "(knee arthroplasty OR knee replacement NOT total)" were used. Studies describing rUKA and clinical trials, dry bone or cadaveric researches regarding technologies, positioning, alignment, function, or survivorship of implants were included in this review. All retrieved studies were first browsed for eligibility on the basis of title and abstract, and the selected studies were further evaluated by reading full text for final inclusion.

Results: Robotic-assisted technology has been found to increase the accuracy of bone preparation and implant placement, reduce technical variability and outliers, and enhance reproduction of limb alignment. Additionally, early clinical outcomes were excellent, but mid-term follow-up showed no superiority in component survivorship. The potential drawbacks of the robotic-assisted technology include relatively-low time- and cost-effectiveness, development of some rUKA-related complications, and lack of support by high-quality literature.

Conclusion: This review shows that rUKA can decrease the number of outliers concerning the optimal implant positioning and limb alignment. However, due to absence of extensive studies on clinical outcomes and long-term results, it remains unclear whether the improved component positioning translates to better clinical outcomes or long-term survivorship of the implant. Nevertheless, since an accurate implant position is presumably beneficial, robotic-assisted technology is worth recommendation in UKA.

Keywords: Robotic assisted surgery, Robotic, Unicompartmental knee arthroplasty

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Editor Choice Paper

Paper 5

Development and internal validation of machine learning algorithms to predict patient satisfaction after total hip arthroplasty

Siyuan Zhang, Jerry Yongqiang Chen, Hee Nee Pang, Ngai Nung Lo, Seng Jin Yeo & ***Ming Han Lincoln Liow***

Full text

Abstract

Background: Patient satisfaction is a unique and important measure of success after total hip arthroplasty (THA). Our study aimed to evaluate the use of machine learning (ML) algorithms to predict patient satisfaction after THA.

Methods: Prospectively collected data of 1508 primary THAs performed between 2006 and 2018 were extracted from our joint replacement registry and split into training (80%) and test (20%) sets. Supervised ML algorithms (Random Forest, Extreme Gradient Boosting, Support Vector Machines, Logistic LASSO) were developed with the training set, using patient demographics, comorbidities and preoperative patient reported outcome measures (PROMs) (Short Form-36 [SF-36], physical component summary [PCS] and mental component summary [MCS], Western Ontario and McMaster's Universities Osteoarthritis Index [WOMAC] and Oxford Hip Score [OHS]) to predict patient satisfaction at 2 years postoperatively. Predictive performance was evaluated using the independent test set.

Results: Preoperative models demonstrated fair discriminative ability in predicting patient satisfaction, with the LASSO model achieving a maximum AUC of 0.76. Permutation importance revealed that the most important predictors of dissatisfaction were (1) patient's age, (2) preoperative WOMAC, (3) number of comorbidities, (4) preoperative MCS, (5) previous lumbar spine surgery, and (6) low BMI (< 18.5).

Conclusion: Machine learning algorithms demonstrated fair discriminative ability in predicting patient satisfaction after THA. We have identified modifiable and non-modifiable predictors of postoperative satisfaction which could enhance preoperative counselling and improve health optimization prior to THA.

Keywords: Machine learning, Artificial intelligence, Total hip arthroplasty, Satisfaction, Patient-reported outcome measures

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Editor Choice Paper

Paper 6

The direct anterior approach to the hip: a useful tool in experienced hands or just another approach?

*John Realyvasquez, **Vivek Singh**, Akash K. Shah, Dionisio Ortiz III, Joseph X. Robin, Andrew Brash, Mark Kurapatti, Roy I. Davidovitch & Ran Schwarzkopf*

Full text

Abstract

The direct anterior approach (DAA) to the hip was initially described in the nineteenth century and has been used sporadically for total hip arthroplasty (THA). However, recent increased interest in tissue-sparing and small incision arthroplasty has given rise to a sharp increase in the utilization of the DAA. Although some previous studies claimed that this approach results in less muscle damage and pain as well as rapid recovery, a paucity in the literature exists to conclusively support these claims. While the DAA may be comparable to other THA approaches, no evidence to date shows improved long-term outcomes for patients compared to other surgical approaches for THA. However, the advent of new surgical instruments and tables designed specifcally for use with the DAA has made the approach more feasible for surgeons. In addition, the capacity to utilize fuoroscopy intraoperatively for component positioning is a valuable asset to the approach and can be of particular beneft for surgeons during their learning curve. An understanding of its limitations and challenges is vital for the safe employment of this technique. This review summarizes the pearls and pitfalls of the DAA for THA in order to improve the understanding of this surgical technique for hip replacement surgeons.

Keywords: Direct anterior approach, Total hip arthroplasty, Hip replacement

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Editor Choice Paper

Paper 7

Obesity, preoperative weight loss, and telemedicine before total joint arthroplasty: a review

Michael W. Seward *& Antonia F. Chen*

Full text

Abstract: The preoperative period prior to elective total joint arthroplasty (TJA) is a critical time for lifestyle interventions since a scheduled surgery may help motivate patients to lose weight. Weight loss may reduce complications associated with obesity following TJA and enable patients with severe obesity (body mass index [BMI]>40 kg/m2) to become eligible for TJA, as many institutions use a 40 kg/m2 cut-off for offering surgery. A comprehensive review was conducted to (1) provide background on complications associated with obesity following TJA, (2) synthesize prior research on the success rate of patients losing weight after being denied TJA for severe obesity, (3) discuss bariatric surgery before TJA, and (4) propose mobile health telemedicine weight loss interventions as potential weight loss methods for patients preoperatively. It is well established that obesity increases complications associated with TJA. In total knee arthroplasty (TKA), obesity increases operative time, length of stay, and hospitalization costs as well as the risk of deep infection, revision, and component malpositioning. Obesity may have an even larger impact on complications associated with total hip arthroplasty (THA), including wound complications and deep infection. Obesity also increases the risk of hip dislocation, aseptic loosening, and venous thromboembolism after THA. Synthesis of the only two studies (n =417), to our knowledge, that followed patients denied TJA for severe obesity demonstrated that only 7% successfully reduced their BMI below 40 kg/m2 via lifestyle modifications and ultimately underwent TJA. Unfortunately, bariatric surgery may only increase certain post-TKA complications including death, pneumonia, and implant failure, and there is limited research on preoperative weight loss via lifestyle modification. A review of short-term mobile health weight loss interventions that combined personalized counseling with self-monitoring via a smartphone app found about 5 kg of weight loss over 3-6 months. Patients with severe obesity have more weight to lose and may have additional motivation to do so before TJA, so weight loss results may differ by patient population. Research is needed to determine whether preoperative mobile health interventions can help patients become eligible for TJA and produce clinically significant weight loss sufficient to improve postoperative outcomes.

Keywords: Arthroplasty, Dietitian, Knee osteoarthritis, Mobile applications, Obesity, Osteoarthritis, hip, Preoperative period, Smartphone, Telemedicine, Weight loss

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2022 Best Paper

Paper 8

A preliminary study on the application of deep learning methods based on convolutional network to the pathological diagnosis of PJI

Ye Tao, Hanwen Hu, Jie Li, Mengting Li, Qing-Yuan Zheng, Guoqiang Zhang & ***Ming Ni***

Full text

Abstract

Objective: This study aimed to establish a deep learning method based on convolutional networks for the preliminary study of the pathological diagnosis of prosthetic joint infections (PJI).

Methods: We enrolled 20 revision patients after joint replacement from the Department of Orthopedics, the First Medical Center, General Hospital of the People's Liberation Army, from January 2021 to January 2022 (10 of whom were confirmed to be infected against 2018 ICM criteria, and the remaining 10 were verified to be non-infected), and classified high-power feld images according to 2018 ICM criteria. Then, we inputted 576 positive images and 576 negative images into a neural network by employing a resNET model, used to select 461 positive images and 461 negative images as training sets, 57 positive images and 31 negative images as internal verification sets, 115 positive images and 115 negative images as external test sets.

Results: The resNET model classification was used to analyze the pathological sections of PJI patients under high magnification felds. The results of internal validation set showed a positive accuracy of 96.49%, a negative accuracy of 87.09%, an average accuracy of 93.22%, an average recall rate of 96.49%, and an F1 of 0.9482. The accuracy of external test results was 97.39% positive, 93.04% negative, the average accuracy of external test set was 93.33%, the average recall rate was 97.39%, with an F1 of 0.9482. The AUC area of the intelligent image-reading diagnosis system was 0.8136.

Conclusions: This study used the convolutional neural network deep learning to identify high-magnification images from pathological sections of soft tissues around joints, against the diagnostic criteria for acute infection, and a high precision and a high recall rate were accomplished. The results of this technique confirmed that better results could be achieved by comparing the new method with the standard strategies in terms of diagnostic accuracy. Continuous upgrading of extended training sets is needed to improve the diagnostic accuracy of the convolutional network deep learning before it is applied to clinical practice.

Keywords: PJI (Prosthetic Joint Infections), Deep learning, Infected area, Neutrophil count

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Paper 9

Outcomes of novel 3D-printed fully porous titanium cup and a cemented highly cross-linked polyethylene liner in complex and revision total hip arthroplasty

Ittai Shichman, Lindsey Somerville, William Lutes, Stephen A. Jones, Richard McCalden & ***Ran Schwarzkopf***

Full text

Abstract

Introduction: A novel fully porous acetabular titanium shell has been designed to reduce stiffness mismatch between bone and implant and promote osseointegration in complex (cTHA) and revision total hip arthroplasty (rTHA). A highly cross-linked polyethylene (XLPE) liner is cemented within the cup to reduce wear rates and increase survivorship. This study reported the outcomes of an XLPE liner cemented into a novel 3D-printed fully porous cup in cTHA and rTHA.

Methods: Presented was a multicenter retrospective review of 40 patients (6 cTHA and 34 rTHA) who underwent THA with a fully porous titanium acetabular cup and cemented XLPE liner. Data were collected on demographics, surgical information, outcomes, including osseointegration and migration and implant survivorship.

Results: On average, patients were 71.42 ± 9.97 years old and obese (BMI: 30.36 ± 6.88 kg/m2) and were followed up for a mean time of 2.21 ± 0.77 years. Six patients underwent cTHA and 34 patients underwent rTHA. The mean hospital length of stay was 5.34 ± 3.34 days. Three (7.5%) 90-day readmissions were noted. Harris Hip Scores improved, on average, from 53.87 ± 12.58 preoperatively to 83.53 ± 12.15 postoperatively ($P < 0.001$). One case of acetabular shell aseptic loosening with migration was noted. Thirty-nine of the 40 acetabular components were fully osseointegrated without migration. Two patients underwent re-revision surgery for PJI and one patient received acetabular shell+liner re-revision due to aseptic loosening. Kaplan-Meier analysis showed an all-cause revision-free survival rate of 95.0% at 6 months and 1 year, and 92.0% at 4-years. Aseptic acetabular cup, liner dislocation/loosening, and fracture-free survival were 100% at 6 months and 1-year, and 97.1% at 2 years.

Conclusion: The combined use of a novel 3D-printed fully porous titanium acetabular shell and cemented XLPE acetabular liner yielded excellent rates of osseointegration, and all-cause and acetabular aseptic loosening survivorship at a minimum 1-year follow-up. Further long-term studies are needed to assess the longevity of this construct.

Keywords: Complex primary THA, Revision THA, Bone loss, Paprosky, Aseptic loosening

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Paper 10

Association of preoperative variables of ipsilateral hip abductor muscles with gait function after total hip arthroplasty: a retrospective study

Tadashi Yasuda, *Satoshi Ota, Shinnosuke Yamashita, Yoshihiro Tsukamoto & Eijiro Onishi*

Full text

Abstract

Background: This study aimed to identify the association of preoperative variables of ipsilateral hip abductors with gait function after total hip arthroplasty (THA).

Methods: This study enrolled 42 patients who underwent unilateral primary THA for osteoarthritis. Gait speed and Timed Up-and-Go test were conducted 6 months postoperatively. Preoperative composition of the glutei medius and minimus and the upper portion of gluteus maximus was evaluated by computed tomography. Cross-sectional area ratio of individual composition to the total muscle was calculated. Preoperative variables associated with gait speed and Timed Up-and-Go test after THA were identified by using stepwise regression analysis.

Results: Faster gait speed and shorter Timed Up-and-Go test correlated with smaller cross-sectional area of low-density lean tissue or intramuscular adipose tissue (low-density lean tissue plus intramuscular fat) in the glutei medius and minimus and lower cross-sectional area ratio of low-density lean tissue to the total glutei medius and minimus. Faster gait speed and shorter Timed Up-and-Go test also correlated with larger cross-sectional area of lean muscle mass in the gluteus maximus, higher cross-sectional area ratio of lean muscle mass to the total gluteus maximus, and lower cross-sectional area ratio of intramuscular fat or intramuscular adipose tissue to the total gluteus maximus. Faster gait speed additionally correlated with larger total cross-sectional area of the gluteus maximus. Regression analysis showed that the total cross-sectional area of the gluteus maximus and the low-density lean tissue cross-sectional area of the glutei medius and minimus were the explanatory variables of gait speed and Timed Up-and-Go test after THA, respectively.

Conclusion: There was a potential association between preoperative composition of ipsilateral hip abductors and gait function 6 months after THA. This study indicates a predictive role of preoperative assessment of ipsilateral hip abductor composition in the recovery of gait function after THA.

Keywords: Gait function, Gait speed, Hip abductor, Hip joint, Muscle composition, Timed Up-and-Go test, THA

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Paper 11

Could surgical transepicondylar axis be identified accurately in preoperative 3D planning for total knee arthroplasty? A reproducibility study based on 3D-CT

Kai Lei, Liming Liu, Jiangming Luo, Chao Ma, Qing Feng, Liu Yang & ***Lin Guo***

Full text

Abstract

Background: Surgical transepicondylar axis (sTEA) is frequently used for positioning of femoral component rotation in total knee arthroplasty (TKA). Previous studies showed that intraoperative identification of sTEA was not reliable. While surgeons or engineers need to identify sTEA with three-dimensional (3D) computer-aid techniques pre- or intraoperatively, the reproducibility of sTEA identification on preoperative 3D images has not been explored yet. This study aimed to investigate the reproducibility of identifying sTEA in preoperative planning based on computed tomography (CT).

Methods: Fifty-nine consecutive patients (60 knees involved) who received TKA in our center from April 2019 to June 2019 were included in this study. Six experienced TKA surgeons identified sTEA three times on 3D model established on the basis of knee CT data. The projection angle of each sTEA and the posterior condyle axis on the transverse plane were measured and analyzed.

Results: The overall intra-observer reproducibility was moderate. The median intra-observer variation was 1.27°, with a maximum being up to 14.07°. The median inter-observer variation was 1.24°, and the maximum was 11.47°. The overall intra-class correlation coefficient (ICC) for inter-observer was 0.528 (95% CI 0.417, 0.643).

Conclusion: The identification of sTEA on a 3D model established on the basis of knee CT data may not be reliable. Combined with the previous cadaveric and surgical studies, caution should be exercised in determining femoral component rotation by referencing sTEA both preoperatively and intraoperatively.

Keywords: Total knee arthroplasty, Femoral component rotation, Transepicondylar axis, Reproducibility, Three-dimensional

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Paper 12

Pre- and postoperative physiotherapy using a digital application decreases length of stay without reducing patient outcomes following total knee arthroplasty

Max Hardwick-Morris, *Simon Carlton, Joshua Twiggs, Brad Miles & David Liu*

Full text

Abstract

Introduction: Total Knee Arthroplasty (TKA) for both patients and the surgical team is a journey spanning many months, rather than purely a hospital episode of care. To improve patient outcomes and reduce costs in TKA, greater emphasis should be placed on the pre- and postoperative periods as, historically, innovation has focused on the intraoperative execution of the surgery. The purpose of this study was to determine if a pre- and postoperative physiotherapy program delivered via a digital application could reduce hospital length of stay (LOS) without compromising patient outcomes.

Methods: A retrospective series of 294 patients who underwent TKA from a single-surgeon in a single-centre was examined. This included 232 patients who underwent a pre- and postoperative physiotherapist-led program delivered via a digital application and 62 patients who underwent a conventional pre- and postoperative protocol. 2:1 nearest neighbour propensity score matching was performed to establish covariate balance between the cohorts. Data collected included pre- and postoperative Knee Injury and Osteoarthritis Outcome Score (KOOS), KOOS for Joint Replacement (KOOS, JR), and acute, rehabilitation, and total LOS.

Results: No significant difference in KOOS or KOOS, JR scores was observed at 12-month follow-up. A significantly reduced rehabilitation (P = 0.014) and total LOS (P = 0.015) was observed in the patients who received the digital physiotherapy program.

Conclusion: There may be significant economic benefits to a pre- and postoperative physiotherapy program delivered via a digital application. Our results suggest that a digital physiotherapist-led patient program may reduce the need for inpatient rehabilitation services without compromising patient outcomes.

Keywords: Rehabilitation, Total knee arthroplasty (TKA), Digital application, Patient outcomes, Length of stay

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Paper 13

Does resilience predict hospital length of stay after total knee arthroplasty? A prospective observational cohort study

***Marie K. March**, Alison R. Harmer, Bijoy Thomas, Amy Maitland, Deborah Black & Sarah Dennis*

Full text

Abstract

Background: Resilience, or the ability to bounce back from stress, is a key psychological factor that is associated with ongoing functional independence and higher quality of life in older adults in the context of chronic health conditions. Emerging research has explored resilience and patient-reported outcomes after TKA. Our primary aim was to explore the relationship between resilience and acute hospital length of stay after total knee arthroplasty (TKA).

Methods: A prospective observational study recruited 75 participants one month before total knee arthroplasty from two Australian hospitals. Two preoperative psychological measures were used: the Brief Resilience Scale, and for comparison, the Depression, Anxiety and Stress Scale-21 (DASS-21). We collected sociodemographic, medical and surgical details, patient-reported pain, function, fatigue and quality of life one month before TKA. Health service data describing acute hospital length of stay, inpatient rehabilitation use, and physiotherapy occasions of service were collected after TKA. Non-parametric analysis was used to determine any differences in length of stay between those with low or high resilience and DASS-21 scores. Secondary regression analysis explored the preoperative factors affecting acute hospital length of stay.

Results: No significant difference was detected in length of stay between those with a low or a high resilience score before TKA. However, the group reporting psychological symptoms as measured by the DASS-21 before TKA had a significantly longer acute hospital length of stay after TKA compared to those with no psychological symptoms [median length of stay 6 (IQR 2.5) days vs. 5 (IQR 2) days, respectively (Mann-Whitney U = 495.5, P=0.03)]. Multivariate regression analysis showed that anesthetic risk score and fatigue were significant predictors of length of stay, with the overall model demonstrating significance ($\chi 2$=12.426, df = 4, P=0.014).

Conclusion: No association was detected between the brief resilience score before TKA and acute hospital length of stay after TKA, however, symptoms on the DASS-21 were associated with longer acute hospital length of stay. Preoperative screening for psychological symptoms using the DASS-21 is useful for health services to identify those at higher risk of longer acute hospital length of stay after TKA.

Keywords: Psychological resilience, Length of stay, Arthroplasty, Mental health, Health services research, Psychology, Total knee replacement

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Paper 14

Incidence and risk factors for acute kidney injury after total joint arthroplasty

*Chun Wai Hung, Theodore S. Zhang, Melvyn A. Harrington & **Mohamad J. Halawi***

Full text

Abstract

Background: Acute kidney injury (AKI) is one of the most common medical causes for readmission following total joint arthroplasty (TJA). This study aimed to (1) examine whether the incidence of AKI has changed over the past decade with the adoption of modern perioperative care pathways and (2) identify the risk factors and concomitant adverse events (AEs) associated with AKI.

Methods: 535,291 primary TJA procedures from the American College of Surgeons National Surgical Quality Improvement Program from 2011 to 2018 were retrospectively reviewed. The annual incidence of AKI was analyzed for significant changes over time. Matched cohort analyses were performed to identify the risk factors and AEs associated with AKI using multivariate logistic regression.

Results: The mean incidence of AKI was 0.051%, which remained unchanged during the study period ($P = 0.121$). Factors associated with AKI were diabetes (OR 1.96, $P = 0.009$), bilateral procedure (OR 6.93, $P = 0.030$), lower preoperative hematocrit level (OR 1.09, $P = 0.015$), body mass index (OR 1.04, $P = 0.025$), and higher preoperative BUN (OR 1.03, $P = 0.043$). AKI was associated with length of stay (LOS) > 2 days (OR 4.73, $P < 0.001$), non-home discharge (OR 0.25, $P < 0.001$), 30-day readmission (OR 12.29, $P < 0.001$), and mortality (OR 130.7, $P < 0.001$).

Conclusion: The incidence of AKI has not changed over the past decade, and it remains a major bundle buster resulting in greater LOS, non-home discharge, readmissions, and mortality. Avoidance of bilateral TJA in patients with DM and high BMI as well as preoperative optimization of anemia and BUN levels are advised.

Keywords: Acute kidney injury, Arthroplasty, Bundle buster, Incidence, Optimization

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Paper 15

Slight femoral under-correction versus neutral alignment in total knee arthroplasty with preoperative varus knees: a comparative study

Kai Lei, Li-Ming Liu, Peng-Fei Yang, Ran Xiong, De-Jie Fu, Liu Yang & ***Lin Guo***

Full text

Abstract

Background: This study aimed to compare the short-term clinical results of slight femoral under-correction with neutral alignment in patients with preoperative varus knees who underwent total knee arthroplasty.

Methods: The medical records and imaging data were retrospectively collected from patients who had undergone total knee arthroplasty in our hospital from January 2016 to June 2019. All patients had varus knees preoperatively. Upon 1:1 propensity score matching, 256 patients (256 knees) were chosen and divided into a neutral alignment group (n=128) and an under-correction group (n=128). The patients in the neutral group were treated with the neutral alignment. In the under-correction group, the femoral mechanical axis had a 2° under-correction. The operative time, tourniquet time and the length of hospital stay in the two groups were recorded. The postoperative hip-knee-ankle angle, frontal femoral component angle and frontal tibial component angle were measured. Patient-reported outcome measures were also compared.

Results: The operative time, tourniquet time and the length of hospital stay in the under-correction group were significantly shorter than the neutral alignment group ($P<0.05$). At the 2-year follow-up, the under-correction group had a larger varus alignment ($P<0.05$) and a larger frontal femoral component angle ($P<0.05$), and the frontal tibial component angles of the two groups were comparable. Compared with the neutral alignment group, the slight femoral under-correction group had significantly better patient-reported outcome measures scores ($P<0.05$).

Conclusion: For varus knees treated with total knee arthroplasty, alignment with a slight femoral under-correction has advantages over the neutral alignment in terms of the shorter operative time and better short-term clinical results.

Keywords: Total knee arthroplasty, Knee replacement, Varus knee, Under-correction, Mechanical alignment, Adjusted mechanical alignment, Propensity score matching

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Paper 16

Does robotic technology successfully restore the joint line after total knee arthroplasty? A retrospective analysis

Varun O. Agrawal, *Anup P. Gadekar & Narendra Vaidya*

Full text

Abstract

Background: Our study aims to determine the effectiveness of robotic technology for total knee arthroplasty in the successful restoration of the joint line of the knee with respect to that of a normal human anatomical knee. The restoration of the joint line is an important technical goal on which the postoperative outcomes and the success of the surgery depend.

Methods: Sixty-four postoperative plain anteroposterior radiographs of 60 patients, who received total knee arthroplasty by using the robotic technology were analyzed and compared with 66 similar radiographs of 60 patients who received the conventional method. The distances of the lateral epicondyle to the joint line (LEJL) and proximal tibiofibular joint to the joint line (PTFJJL) were calculated and analyzed.

Results: We found that the mean value of LEJL minus PTFJJL in the robotic group was 0.334 ± 0.115 (mean ± SD), while in the conventional group, it was 2.304 ± 0.308. The difference between the two groups was statistically significant. The mean ratio (LEJL:PTFJJL) in the robotic group was also equal to 1.017 ± 0.042.

Conclusion: From these findings it could be concluded that the robotic technology significantly increases the accuracy of the total knee arthroplasty and, compared to the conventional method, achieves an almost anatomical position of the joint line.

Keywords: Robotic-assisted knee arthroplasty, Robotic technology, Joint line restoration, TKR, TKA, Total knee replacement

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Paper 17

Morphometric analysis of the Filipino knee and its implication in total knee arthroplasty prosthesis design

Cleff Lucero Flores & ***Jose Antonio G. San Juan***

Full text

Abstract

Background: Prosthesis factors account for a quarter of the dissatisfaction rates among post-total knee replacement (TKR) patients. In the Philippines, the available prostheses have pre-determined sizes and dimensions that are based on Caucasian morphometric data. This can pose a problem, since according to previous studies Asian knees have smaller dimensions compared to Caucasians. Since there is a paucity of research looking into the fitness of these prostheses to the Filipino knee, this study was pursued.

Methods: This study measured 675 knees of 675 adult Filipinos from January 2018 to December 2020. The morphometric measurements were performed on T1-weighted magnetic resonance images. The distal femoral morphometry included: the anteroposterior distance, lateral and medial anteroposterior distances, mediolateral distance, anterior and posterior mediolateral distances, and the femoral aspect ratio. The proximal tibial morphometry included: the anteroposterior distance, mediolateral distance, the medial and lateral anteroposterior distances, and the tibial aspect ratio. The patellar height, width, and thickness were also determined. Statistical analyses were done by using SPSS (version 26) and Microsoft Excel (version 2016).

Results: The mean femoral medial and lateral anteroposterior distances were 57.6 mm and 57.1 mm, respectively. The femoral mediolateral distance was 69.3 mm, and the mean femoral aspect ratio was 1.21. The mean proximal tibial antero-posterior and mediolateral distances were 45.3 mm and 71.9 mm, respectively. The mean tibial aspect ratio was 1.66. Most TKR prostheses can be fitted to the Filipino knee but underhang on the mediolateral aspect is commonly observed in both the femoral and tibial components. The mean patellar height and width of Filipinos were 39.6 mm and 42.6 mm, respectively while the average thickness was 23.1 mm.

Conclusion: Most prostheses available in the Philippine and Asian markets can be fitted into Filipino knees albeit the underhang observed in the mediolateral aspects of both femoral and tibial components. Potential patellar complications are unlikely given the adequate thickness. To avoid the potential mismatch, the best approach is to design a prosthesis aptly suited for the Filipino knees.

Keywords: Filipino knee morphometry, Prosthesis design, Total knee arthroplasty

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Paper 18

Robotic-assisted revision total knee arthroplasty: a novel surgical technique

Hui-Ling Joanne Ngim, *Dirk Van Bavel, Richard De Steiger & Andrew W. W. Tang*

Full text

Abstract

Background: Revision total knee arthroplasty is a challenging procedure. The robotic-assisted system has been shown to enhance the accuracy of preoperative planning and improve reproducibility in primary arthroplasty surgeries. The aim of this paper was to describe the surgical technique for robotic-assisted revision total knee arthroplasty and the potential benefits of this technique.

Methods: This single-centre retrospective study included a total of 19 patients recruited from April 1, 2021 to April 30, 2022. Inclusion criteria were patients who had Mako™ robotic-assisted revision total knee arthroplasty done within the study period with a more than 6 months follow-up. Statistical analysis was done using Microsoft Excel 16.0.

Results: All 19 patients were followed up for 6 to 18 months. All patients in this study had uneventful recoveries without needing any re-revision surgery when reviewed to date.

Conclusion: With the development of dedicated revision total knee software, robot-assisted revision TKA can be a promising technique that may improve surgical outcomes by increasing the accuracy of implant placement, and soft tissue protection and achieving a better well-balanced knee.

Keywords: Robotic surgery, Revision total knee arthroplasty, Surgical technique

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Paper 19

Epidemiology of total hip arthroplasty: demographics, comorbidities and outcomes

Ishan Patel, *Fong Nham, Abdul K. Zalikha & Mouhanad M. El-Othmani*

Full text

Abstract

Background: Primary THA (THA) is a successful procedure for end-stage hip osteoarthritis. In the setting of a failed THA, revision total hip arthroplasty (rTHA) acts as a salvage procedure. This procedure has increased risks, including sepsis, infection, prolonged surgery time, blood loss, and increased length of stay. Increasing focus on understanding of demographics, comorbidities, and inpatient outcomes can lead to better perioperative optimization and post-operative outcomes. This epidemiological registry study aimed to compare the demographics, comorbidity profiles, and outcomes of patients undergoing THA and rTHA.

Methods: A retrospective review of discharge data reported from 2006 to the third quarter of 2015 using the National Inpatient Sample registry was performed. The study included adult patients aged 40 and older who underwent either THA or rTHA. A total of 2,838,742 THA patients and 400,974 rTHA patients were identified.

Results: The primary reimbursement for both THA and rTHA was dispensed by Medicare at 53.51% and 65.36% of cases respectively. Complications arose in 27.32% of THA and 39.46% of rTHA cases. Postoperative anemia was the most common complication in groups (25.20% and 35.69%). Common comorbidities in both groups were hypertension and chronic pulmonary disease. rTHA indications included dislocation/instability (21.85%) followed by mechanical loosening (19.74%), other mechanical complications (17.38%), and infection (15.10%).

Conclusion: Our data demonstrated a 69.50% increase in patients receiving THA and a 28.50% increase in rTHA from the years 2006 to 2014. The data demonstrated 27.32% and 39.46% complication rate with THA and rTHA, with postoperative anemia as the most common cause. Common comorbidities were hypertension and chronic pulmonary disease. Future analyses into preoperative optimizations, such as prior consultation with medical specialists or improved primary hip protocol, should be considered to prevent/reduce postoperative complications amongst a progressive expansion in patients receiving both THA and rTHA.

Keywords: Hip, Arthroplasty, Demographics, Epidemiology, Outcomes

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Paper 20

Long-term clinical results of alumina ceramic medial pivot total knee arthroplasty: a 10-year follow-up study

Hideki Ueyama, *Shigeru Nakagawa, Yuichi Kishimura, Yukihide Minoda, Suguru Nakamura, Junichiro Koyanagi, Mitsuyoshi Yamamura & Yoshinori Kadoya*

Full text

Abstract

Background: The newly-designed alumina ceramic medial pivot total knee prosthesis was introduced to reduce polyethylene wear and better fit the anatomical morphology of the Asian population. This study aimed to clarify the long-term clinical results of alumina medial pivot total knee arthroplasty over a minimum follow-up period of 10 years.

Methods: The data of 135 consecutive patients who underwent primary alumina medial pivot total knee arthroplasty were analyzed in this retrospective cohort study. Patients were examined over a minimum 10-year follow-up period. The knee range of motion, Knee Society Score (KSS) knee score, Knee Society Score function score, and radiological parameters were assessed. The survival rate was also evaluated by using reoperation and revision as endpoints.

Results: The mean follow-up period lasted 11.8 ± 1.4 years. Patients who were not followed accounted for 7.4% of the total cohort. Knee and function scores of KSS improved significantly following total knee arthroplasty ($P < 0.001$). In 27 individuals (28.1%), a radiolucent line was observed. Aseptic loosening occurred in three cases (3.1%). The survival rates for reoperation and revision were 94.8% and 95.8% 10 years after the operation, respectively.

Conclusion: During a minimum 10-year follow-up period, the present model of alumina medial pivot total knee arthroplasty showed good clinical outcomes and survival rates.

Keywords: TKA, Medial pivot, Ceramic, Long-term result, Survival rate, Longevity

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Validation of a preoperative formula to estimate postoperative pelvic sagittal alignment and mobility before performing total hip arthroplasty for patients with hip osteoarthritis

*Hiroki Tanabe, **Yasuhiro Homma**, Naotake Yanagisawa, Taiji Watari, Seiya Ishii, Yuichi Shirogane, Tomonori Baba, Kazuo Kaneko & Muneaki Ishijima*

Full text

Abstract

Background: Although it is important to consider pelvic alignment and mobility in the standing and sitting positions before THA, it is not known how to preoperatively predict individual postoperative pelvic alignment and mobility. The purpose of this study was to investigate the pelvic alignment and mobility before and after THA, and to develop a predictive formula using preoperative factors to calculate postoperative sagittal alignment and mobility.

Methods: One hundred seventy patients were assessed. The 170 patients were randomly divided into a prediction model analysis group (n = 85) and an external validation group (n = 85). In the prediction model analysis group, preoperative spinopelvic parameters were used to develop the predictive formulas to predict the postoperative sacral slope (SS) in standing and sitting positions and ΔSS. These were applied to the external validation group and assessed.

Results: R2 in multiple linear regression models for postoperative SS in standing, SS in sitting and ΔSS were 0.810, 0.672, and 0.423, respectively. The values of predicted and postoperative parameters were very close with no significant difference: SS in standing (33.87 vs. 34.23, P = 0.834), SS in sitting (18.86 vs. 19.51, P = 0.228), and ΔSS (15.38 vs. 14.72, P = 0.619).

Conclusion: The present study showed that the pelvic alignment and mobility after THA can be predicted using preoperative factors. Although a model with higher accuracy is needed, it is important to use a predictive formula to estimate the postoperative condition before performing THA.

Keywords: Total hip arthroplasty, Pelvic alignment, Pelvic mobility, Sagittal balance, Predictive formulas, Validation

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Paper 22

Biomechanical analysis of different levels of constraint in TKA during daily activities

Gianluca Castellarin, ***Edoardo Bori****, Laurence Rapallo, Silvia Pianigiani & Bernardo Innocenti*

Full text

Abstract

Background: Numerous total knee prosthetic implants are currently available on the orthopedic market, and this variety covers a set of different levels of constraint: among the various models available, a significant role is covered by mobile bearing cruciate-retaining design with an ultra-congruent insert, mobile bearing cruciate-retaining design, fixed-bearing posterior stabilized prosthesis and fixed-bearing constrained condylar knee. A biomechanical comparative study among them could therefore be helpful for the clinical decision-making process. This study aimed to compare the effect of these different levels of constraint in the knee biomechanics of a patient, in three different configurations representing the typical boundary conditions experienced by the knee joint during daily activities.

Methods: The investigation was performed via finite element analysis with a knee model based on an already published and validated one. Four different types of prosthesis designs were analyzed: two mobile-bearing models and two fixed-bearing models, each one having a different level of constraint. The different designs were incorporated in to the 3D finite element model of the lower leg and analyzed in three different configurations reproducing the landing and the taking-off phases occurring during the gait cycle and chair-rising. Implant kinetics (in terms of polyethylene contact areas and contact pressure), polyethylene and tibial bone stresses were calculated under three different loading conditions for each design.

Results: The tibial stress distribution in the different regions of interest of the tibia remains relatively homogeneous regardless of the type of design used. The main relevant difference was observed between the mobile and fixed-bearing models, as the contact areas were significantly different between these models in the different loading conditions. As a consequence, significant changes in the stress distribution were observed at the interface between the prosthetic components, but no significant changes were noted on the tibial bone. Moreover, the different models exhibited a symmetrical medial and lateral distribution of the contact areas, which was not always common among all the currently available prostheses (i.e. medial pivot designs).

Conclusion: The changes of the prosthetic implant did not induce a big variation of the stress distribution in the different regions of the tibial bone, while they significantly changed the distribution of stress at the interface between the prosthetic components.

Keywords: TKA, levels of constraint, tibial stress, polyethylene stress, kinetics

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Paper 23

Spinal anesthesia is a grossly underutilized gold standard in primary total joint arthroplasty: propensity-matched analysis of a national surgical quality database

Andre C. Ferreira, Chun Wai Hung, Ramesh B. Ghanta, Melvyn A. Harrington & ***Mohamad J. Halawi***

Full text

Abstract

Background: There is currently no consensus regarding the optimal anesthetic technique for total hip and knee arthroplasty (THA, TKA). This study aimed to compare the utilization rates and safety of spinal vs. general anesthesia in contemporary THA/TKA practice.

Methods: Using the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP), a retrospective review of 307,076 patients undergoing total hip or knee arthroplasty under either spinal or general anesthesia between January 2015 and December 2018 was performed. Propensity matching was used to compare differences in operative times, hospital length of stay, discharge destination, and 30-day adverse events. The annual utilization rates for both techniques between 2011 and 2018 were also assessed.

Results: Patients receiving spinal anesthesia had a shorter length of stay ($P < 0.001$) for TKA while no statistical differences in length of stay were observed for THA. Patients were also less likely to experience any 30-day complication (OR = 0.82, $P < 0.001$ and OR = 0.92, $P < 0.001$ for THA and TKA, respectively) while being more likely to be discharged to home (OR = 1.46, $P < 0.001$ and OR = 1.44, $P < 0.001$ for THA and TKA, respectively). Between 2011 and 2018, spinal anesthesia utilization only increased by 1.4% for THA ($P < 0.001$) and decreased by 0.2% for TKA ($P < 0.001$), reaching 38.1% and 40.3%, respectively.

Conclusion: Spinal anesthesia remains a grossly underutilized tool despite providing better perioperative outcomes compared to general anesthesia. As orthopedic surgeons navigate the challenges of value-based care, spinal anesthesia represents an invaluable tool that should be considered the gold standard in elective, primary total hip and knee arthroplasty.

Keywords: Anesthesia, Arthroplasty, Outcomes, Utilization, Value care

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Paper 24

Long-term outcomes of arthroscopic synovectomy and core decompression through multiple small bone holes for early-stage avascular necrosis of the femoral head

Quanbo Ji, Xiaoya Li, Song Luo, Lei Geng, Peng Ren, Ming Ni, Qingyuan Zheng, Peng Xin, Yan Wang & ***Guoqiang Zhang***

Full text

Abstract

Objective: This study described a minimally invasive approach for the management of early-stage avascular necrosis of the femoral head, which integrated arthroscopic intra-articular decompression and core decompression by drilling multiple small holes.

Method: A total of 126 patients with 185 hip avascular necrosis were included between March 2005 and January 2008, and the hips were classified, based on the Association Research Circulation Osseous staging system, into stage I (n = 43), stage II (n = 114), and stage III (n = 28). Arthroscopic intra-articular inspection and debridement, along with drilling of multiple small holes for core decompression, were performed. The Modified Harris hip score system and radiographs were used to assess the pre- and post-surgery outcomes.

Results: One hundred and three patients (involving 153 hips) were followed up successfully for an average of 10.7 ± 3.4 years (range: 9–12 years). After surgery, the overall survival rate was 51.6% (79 hips), and the clinical survival rates were 79%, 72%, 52%, 32%, and 10% for patients with stage I, IIa, IIb, IIc, and III, respectively. The outcomes of patients with Association Research Circulation Osseous Stages I or IIA were better than those of other stages, while hips with a large necrotic area had poor results. This approach preserved the original biomechanical strength of the femoral head after core decompression and eliminated arthritis factors in the hip joint.

Conclusion: The core decompression with multiple small-size holes is an effective method for treating early-stage avascular necrosis of the femoral head, particularly in those with pathological changes in the hip joint.

Keywords: Synovectomy, Core decompression, Avascular necrosis of femoral head, Hip

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Paper 25

Long-term clinical results of alumina ceramic medial pivot total knee arthroplasty: a 10-year follow-up study

Hideki Ueyama, *Shigeru Nakagawa, Yuichi Kishimura, Yukihide Minoda, Suguru Nakamura, Junichiro Koyanagi, Mitsuyoshi Yamamura & Yoshinori Kadoya*

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Abstract

Background: The newly-designed alumina ceramic medial pivot total knee prosthesis was introduced to reduce polyethylene wear and better fit the anatomical morphology of the Asian population. This study aimed to clarify the long-term clinical results of alumina medial pivot total knee arthroplasty over a minimum follow-up period of 10 years.

Methods: The data of 135 consecutive patients who underwent primary alumina medial pivot total knee arthroplasty were analyzed in this retrospective cohort study. Patients were examined over a minimum 10-year follow-up period. The knee range of motion, Knee Society Score (KSS) knee score, Knee Society Score function score, and radiological parameters were assessed. The survival rate was also evaluated by using reoperation and revision as endpoints.

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