Influence of vastus medialis obliquus deficiency on patellar bone strain after TKA

Adeliya Latypova, Francesc Levrero Florencio, Dominique Pioletti, Brigitte Jolles, Alexandre Terrier

EPFL, CHUV

Introduction: The causes of anterior knee pain (AKP) after TKA with non-resurfaced patella remains unclear. Weakness of Vastus Medialis Obliquus (VMO) has been frequently associated with patellofemoral pain (PFP) syndrome. It has been shown that VMO weakness may lead to the patellar maltracking. However, there is limited knowledge of its influence on the strain state of the patellar bone. Strain can be used to assess tissue damage. Furthermore, changes in strain state can influence the metabolic activity of the bone cells that are known to be mechanosensitive. This bone remodeling activity may be linked with AKP. In this study we assessed the influence of VMO deficiency on the strain state of the patellar bone using 3D musculoskeletal and numerical model of the knee with a TKA with non-resurfaced patella.

Methods: A subject-specific 3D musculoskeletal numerical model of the knee after TKA with a non-resurfaced patella was developed from CT sequences of a cadaver. The model included the femur, the tibia, the patella with cartilage and the four heads of the quadriceps. A postero-stabilized knee prosthesis was inserted under supervision of a knee surgeon. The patellar bone was modeled as linear elastic material with non-homogeneous mechanical properties extracted from CT data. A loaded squat movement controlled by the elongation of the Vastus Intermedius (VI) was simulated from full extension to 90° of flexion. Forces in the muscles were assigned proportional to their ratios found in literature. Two situations were compared: a normal and a deficient VMO. Deficiency of VMO was simulated by reducing its ratio by 50%. In the superior-posterior quarter of the patella, two regions of interest (ROI) were defined: medial and lateral. Octahedral shear strain volume of strained bone were predicted and compared in these 2 ROI for the normal and deficient VMO.

Results: Since the patellar bone experienced relatively small strains below 70° of flexion, the comparison was performed from 70° to 90° of flexion. The volume of highly strained bone in the lateral part of the patella was 2-fold larger in the case of VMO deficiency than for a normal VMO. Conversely, it was twice smaller in the medial part for deficient VMO than for a normal VMO. The medial side of the patella experienced higher strains than the lateral side, in both cases.

Conclusions: Deficiency of VMO caused increased bone strain in the lateral part and decreased strain in the medial part of the patella. Increased bone strain may be associated with anterior knee pain development.
Radionuclide Bone Scintigraphy accuracy in the detection of aseptic loosening of total knee arthroplasty

Jean-Romain Delaloye, Ariane Boubaker, Salim Adib, Brigitte Jolles  
CHUV

Introduction: Aseptic loosening is the major cause of total knee arthroplasty (TKA) revision and is widely investigated pre-operatively by radionuclide bone scintigraphy. However literature about the accuracy of this tool is scarce. Our purpose was to evaluate the validity of radionuclide bone scintigraphy in the detection of aseptic loosening of TKA using intra-operative findings as a gold standard.

Method: Retrospective study of 31 radionuclide bone scintigraphies performed on our patients prior to surgical TKA revision. All blinded examinations were interpreted by two experienced nuclear medicine physicians and the interobserver agreement was determined by κ statistics. Sensibility, specificity and accuracy of radionuclide bone scintigraphy for detecting TKA loosening was assessed using intra-operative findings as the reference.

Results: Thirty one patients were included in the study. The mean patient age at the time of surgical revision was 70.1 ± 10.0 years. Radionuclide bone scintigraphy and surgical revision were respectively performed 4.7 ± 4.1 years and 5.4 ± 4.1 years after primary TKA.

The sensibility, specificity and accuracy of radionuclide bone scintigraphy for detecting TKA loosening, respectively, were 70.6%, 60.5% and 63.3% for reader 1 and 100%, 41.9% and 58.3% for reader 2. Separate analysis of femoral and tibial components showed that the tibial plate had the poorest accuracy in both readers.

κ value of 0.38 reflected a fair agreement between both nuclear medicine physicians.

Conclusion: Radionuclide bone scintigraphy reliability for detecting aseptic TKA loosening was low and the interpretation of the images was partially interobserver dependent. Therefore, surgical revision of a TKA should not be initiated only on the basis of this examination and new tools have to be developed in the future.
FM03 Revision of UKA: Is There a Difference Compared to Primary TKA and Revision TKA?

Alexandre Lunebourg, Sébastien Parratte, Vanessa Pauly, Xavier Flecher, Jean-Manuel Aubaniac, Jean-Noël Argenson
Hôpital Ste Marguerite

Introduction: Unicompartmental knee arthroplasty (UKA) is an alternative procedure to total knee arthroplasty (TKA) for the treatment of osteoarthritis localized to one compartment. Nevertheless, because UKA procedures are rising, revisions of UKA are also increasing. In the literature, revision of UKA is presented less difficult than revision of TKA and results after revision of UKA are better than after revision of TKA, but worse than after primary TKA, but there is no study which compares directly results for these 3 categories of patients. Therefore, we aimed to compare in this monocentric study the patient function, quality of life and complications of revision UKA versus primary TKA and revision TKA.

Materials and Methods: This retrospective study reviewed patients operated for revision of UKA with TKA in our institution between 1998 and 2009. On 54 UKA (54 patients) revised by a TKA (Group R-UKA), 48 patients have been included in our study. 5 patients were lost of follow up and 1 patient died at 7 months after surgery without local complication of the prosthesis. This group of patients has been matched with 2 other groups regarding age, sex and BMI: one group of primary TKA (Group P-TKA) and one group of revision of TKA with TKA (Group R-TKA). Cemented implants were used in the three groups with standard PS implants in the P-TKA group, and PS augmented implants in the R-UKA group in 59% of the cases and in 100% in the R-TKA group. At last follow-up patients were analyzed clinically and radiographically with the KOOS, the Charnley score and the Knee Society (KS) Score by an independent observer.

Results: At a mean follow-up of 8 years (2 to 14 years) after revision, the improvement of the KSS was comparable in the two groups R-UKA and R-TKA, but results were better in the group of primary TKA. At the last follow-up, 56% of patients presented a B or C Charnley’s category in the two groups R-UKA and R-TKA while only 20% of patients in the group P-TKA were B or C. Range of motion was 104° in the group R-UKA, 102° in the group R-TKA and 125° in the group P-TKA (p<0.001). Results of the five items of KOOS were statistically comparable in the two groups R-UKA and R-TKA, but worse than in the group P-TKA. We observed more complications in the groups R-UKA and R-TKA than in the group P-TKA.

Discussion and Conclusion: Even if a revision of UKA is technically less complicated, results of our study show that functional scores and rate of complications after revision of UKA are worse than a primary TKA but are comparable to a revision of TKA. UKA is a bone preservative technique but surgeons cannot advocate that results of revision will be as good as a primary TKA.
Gait analysis and patients outcome after TKA comparing dependent vs. independent bone cut technique: A preliminary study

Hermes H. Miozzari, Sagawa Juniory Yoshimasa, Pierre Hoffmeyer, Domizio Suva, Stéphane Armand, Katia Turcot

Introduction: Total knee arthroplasty (TKA) can be performed using independent or dependent bone cuts. While with the first technique the ligament balancing is performed after all bone cuts were made, with the latter technique bone cuts rely on the first cut after adequate ligament balancing. The hypothesis is that patients operated with dependent bone cuts have a better stabilization of the knee in flexion. Therefore, the aim of this study was to determine if the use of a bone dependent technique has an influence on patients’ outcomes in terms of biomechanical gait, pain, function, quality of life and satisfaction following TKA.

Materials and Methods: Forty patients (69 ± 7 years old; 24 women / 16 men) were evaluated before (V1), three months (V2) and one year (V3) following a primary TKA using the same implant (P.F.C.® Sigma®, DePuySynthes Orthopaedics, Warsaw, USA). Thirty patients were operated using independent bone cuts (group 1). Ten patients were operated using the dependent bone cuts using the Specialist® TRAM (DePuy France S.A.S., Saint-Priest, France) for a ligament balancing technique (group 2). A three-dimensional motion analysis system was used to measure the gait of individuals in terms of spatio-temporal, kinematics and kinetics parameters. The pain and functional levels were assessed using the Western Ontario and McMaster Universities Arthritis Index (WOMAC); the quality of life was assessed by the SF-12 questionnaire. The global satisfaction of patients as well as their satisfaction related to pain and functional levels were evaluated at each follow-up evaluation using a 5-Likert scale (very unsatisfied; unsatisfied; neutral; satisfied; very satisfied). To evaluate patients’ evolution, repeated measures ANOVA were performed using surgical techniques as the categorical predictor factor.

Results: No significant difference was found between both groups of patients in terms of age, body mass index, pain and functional levels at baseline evaluation. Moreover, no surgical technique effect was observed for biomechanical gait and clinical outcomes as well as for patients’ satisfaction level at both follow-up evaluations. However, considering all patients (i.e., groups 1 and 2 combined) a significant increase of the gait velocity (V1: 1.07 m/s; V2: 1.08 m/s; V3: 1.19 m/s) was found at one year following TKA compared with preoperative and the early follow-up evaluations. Maximal knee flexion was also significantly improved at one year following TKA compared with early follow-up (V1: 46°; V2: 45°; V3: 48°). In addition, significant improvements were observed for the mean scores of the WOMAC (pain & function) at both follow-up evaluations. Finally, patients reported to be satisfied to very satisfied at one year post-TKA in 82.5%.

Conclusion: In this preliminary study, our hypothesis was not confirmed. There was no significant difference between both surgical techniques in patients’ outcomes following TKA. However, the assessment of gait, pain, and function at three months and one year following TKA demonstrated significant improvements. Further studies with a larger sample of patients and with the assessment of more specific outcomes are needed to confirm our results.
FM05 Short Term Outcome of Bi-cruciate Stabilized Total Knee Replacement measured using the Knee injury and Osteoarthritis Outcome Score (KOOS)

Matthias Christen¹, Bernhard Christen², Emin Aghayev³
¹Salemspital, ²Orthopädische Klinik Bern, Salemspital, ³Institute for Evaluative Research in Orthopaedic Surgery, University of Bern

Background: Total knee replacement is the gold standard treatment for patients suffering from advanced symptomatic knee osteoarthritis. The main goals of knee prosthetics are pain reduction and restoration of knee motion. New implants on the market such as the bi-cruciate stabilized Journey knee implant promise a reconstruction of a more physiological function of the knee with a close to normal range of motion and therefore higher patient satisfaction.

Purpose: The aim of this study was to analyze the patient-based Knee Injury and Osteoarthritis Outcome Score (KOOS) outcome after total knee replacement with the bi-cruciate stabilized Journey knee prosthesis.

Study Design: Prospective, consecutive case-series.

Patients: Ninety nine patients, who received bi-cruciate stabilized Journey total knee prosthesis between January 1st 2006 and May 31st 2012, were included in the study. All patients were operated by a single surgeon. There were 61.1% females and the overall average age was 68 years (range 41-83 years). Left knee was replaced in 55.6%.

Methods: The patients filled in KOOS questionnaire pre- and 1 year postoperatively. Range of motion (ROM) was studied preoperatively and at 1-year follow-up. The pre- and postoperative KOOS subscores and ROM were compared using the Wilcoxon signed rank test.

Results: There significant improvement of all KOOS subscores. Ninety percent of patients have reached the minimum of clinically relevant 10 points in symptoms, 94.5% in pain, 94.5% in activities of daily living, 84.9% in sports and recreation, and 90% in knee related quality of life. Postoperatively, the average passive ROM was 131° (range 110-145°) and the average active ROM 122° (range 105-135°). The highest correlation coefficients for ROM and KOOS were observed for the activity and pain subscores. Very low or no correlation was seen for sport subscore.

Conclusions: Bi-cruciate stabilized knee prosthesis offers a solid outcome at 1 year based on the results measured with the KOOS evaluation questionnaire. The Patients showed a generalized improvement in all domains measured in the KOOS of minimally 35, and up to over 52 points, which was statistically significant. Patients described the level of functionality close to double compared to the preoperative status. Despite the good to excellent patient-described results, studies show a high complication rate using the Journey knee implant.

Key words: total knee replacement; Knee Injury and Osteoarthritis Outcome Score; Journey; bi-cruciate stabilized knee prosthesis; short term results
FM06 5 years post-operative results of a new ultra-congruent postero-stabilized TKA with mobile-bearing using gait analysis

Antoine Eudier¹, Kamiar Aminian², Nicole Fleury¹, Caroline Voracek¹, B M Jolles¹
¹CHUV and University of Lausanne, ²EPFL-CBT-LMAM

Introduction: In order to address the more specific needs of the young and active patients suffering from severe knee osteoarthritis, a new total knee arthroplasty (TKA) has been designed. The FIRST knee prosthesis (Free Insert in Rotation Stabilized in Translation, Symbios SA) is an ultra congruent, postero-stabilized total knee arthroplasty with a mobile bearing expecting to reduce significantly polyethylene wear, to improve the range of motion and the overall stability of the knee while ensuring a physiological ligament balance. Gait analysis has proven to give really objective outcome parameters after lower limb surgery. Using an ambulatory device, our goal was to compare subjective and objective results of this new TKA with standard models used all over the world.

Materials and Methods: Clinical prospective monocentric cohort study of 126 consecutive patients undergoing a FIRST TKA for primary osteoarthritis. Mean age of the cohort is 69.7 ± 8.3 years (47-88) and mean BMI is 28.6 ± 5.6 kg/m² (18.7-69). Follow-ups of the study were done at 6 weeks, 12 weeks, 6 months, 1 year and 5 years. Data included subjective evaluations (EQ-5D and WOMAC scores), semi-objective questionnaires (KSS score and radiography evaluation of the position of the components, of the patella and any loosening sign) and objective gait parameters from 2 walking trials of at least 30 meters long, performed at different speeds with an ambulatory gait analysis system (Physilog®, BioAGM CH). The outcomes of 89 patients after 5 years of follow-up are reported here and compared to the results of a randomized controlled clinical trial performed in the same center just before this study comparing 29 NexGen® postero-stabilized TKA (Zimmer Inc) with a fixed bearing to 26 NexGen® postero-stabilized TKA with a mobile bearing using the same methods.

Results: Post-operative subjective and semi-objective scores (EQ-5D, WOMAC and KSS scores) are improved for all types of TKA (p>0.05). FIRST 5 years mean results included VAS 1.45 (SD 2.03), KSS function 83.64 (SD 20.46), KSS operated knee 87.78 (SD 13.10) and EQ-5D 73.31 (SD 18.20). No radiological loosening was observed in the FIRST implants cohort after 5 years of follow-up. As for the ambulatory gait analysis, the comparison of several temporal and spatial gait parameters at different walk paces (slow, normal and fast) showed significant differences between the 3 types of prosthesis in favour of the FIRST TKA in term of Gait cycle time (GCT) (s): 1.12 (SD 0.04), Limp (%GCT): 1.24 (SD 1.35), Stride length (m) :1.37 (SD 0.02), Gait speed (m/s): 1.22 (SD 0.04) and Knee maximum rotation angular velocity (°/s): 363.35 (SD 10.11)

Conclusions: We present the updated results of a new total knee arthroplasty, based on an ultra-congruent, postero-stabilized and mobile bearing that showed very encouraging clinical outcomes: we confirm similar subjective and semi-objective results in comparison with widespread TKA designs but statistically significantly better objective gait outcomes after five years of follow-up for the FIRST TKA. The validity of these positive results will have to be confirmed by updating the results of the FIRST TKA in the future. To our knowledge this is the first study to report the complete outcome of a new TKA since its introduction using gait analysis.
Differences in patient characteristics prior to TKA between Switzerland and the US

Hermes H. Miozzarì, Patricia D. Franklin, Leslie Harrold, David C. Ayers, Pierre Hoffmeyer, Anne Lübbeke

Introduction: Total knee arthroplasty (TKA) results, including patient-reported outcome measures (PROMs), complication rates, and specific implant survival rates are often generalized across countries. However, patient- and environment-dependent factors may differ considerably between countries and continents resulting in differences in the longevity of specific implants and the national revision burden. Reports from national registries mostly lack detailed patient-information especially information on BMI, co-morbidities, pain and function level.

Objectives: Our objective was to describe and compare preoperative patient characteristics prior to TKA from two large cohort studies, one in Switzerland (with patient characteristics comparable to those reported in the Swedish and Danish registries) and the second a national cohort from the US.

Methods: Patient characteristics were collected prospectively on all elective primary TKAs performed (1) at a large tertiary center in Geneva, Switzerland between 1/2009 and 12/2011 and (2) in FORCE-TJR, a diverse, national sample of more than 100 surgeons in the U.S. between 6/2011 and 8/2012. Information was obtained on age, sex, BMI, diagnosis, medical co-morbidities (diabetes, cardiac disease and stroke), and patient-reported outcome measures including the WOMAC pain and function (reduced form-Swiss; estimated from KOOS-US), and a global health questionnaire, SF-12 (SF36/US) physical and mental component scores. Higher scores indicate less pain and better function/health. We calculated risk ratios, and mean differences, as well as effect sizes to compare preoperative scores.

Results: Overall, 2508 TKAs from the U.S. cohort and 855 TKAs from the Swiss cohort were evaluated. Patients undergoing primary TKA in the U.S. compared to those in Switzerland were younger (mean age 67 vs. 72 yrs.; 23% US <60 years vs. 10% Swiss), more obese (BMI ≥35: 27% vs. 17%), and had more cardiac disease. Patients in the U.S. had higher preoperative WOMAC pain scores (52 vs. 41 points) indicating less knee-specific pain at time of TKA. While significant pre-operative physical disability (SF) was reported in both countries, the US reported poorer scores (33 vs. 35).

Conclusion: We found substantial differences in baseline characteristics with younger age, greater obesity, and more cardiac disease in the US TKA patients. While preoperative knee pain was greater in the Swiss cohort, similar and significant disability was reported in both countries. Further research is needed to understand the differing pain reports. These findings have potentially important implications for the comparison of TKA results, especially complication and revision rates and postoperative clinical outcomes, reinforcing the need for adequate risk adjustment in cross-cultural comparisons.
FM08 Total Knee Arthroplasty: Do custom cutting blocks improve the clinical outcome of patients?

Frédéric Vauclair1, Krzysztof Piasecki1, Nicole Fleury1, Kamiar Aminian2, Brigitte Jolles1

1CHUV, 2EPFL

Introduction: Anatomical reconstruction of limb mechanical axis is known to play a central role in longevity of total knee arthroplasty (TKA), particularly in young active patients. This is why TKA using custom made cutting blocks have been developed recently. The purpose of this study was to evaluate the mechanical axis reconstruction as defined by a CT-Scanner, together with the functional outcome and gait analysis, after a TKA implantation with 3D preoperative planning and custom instrumentation.

Methods: We prospectively followed a consecutive cohort of 103 patients who have undergone a posterior-stabilized TKA implantation with custom made instrumentation for primary knee osteoarthritis. Custom cutting blocks were manufactured using a preoperative CT-scan with a 3D planning of femoral and tibial bone cuts. Operative technique, implants and postoperative care were the same as those used for standard cuts in our department. The outcomes were measured using both clinical (WOMAC/ KSS) and radiological pre- and post-operative scores (6 weeks - 3 and 6 months - 1 year).

At one year we did CT-scanners to get precise implant position data, together with a gait analysis. Finally, the results were compared with those of our registry of 420 standards TKA.

Results: Patients had a mean age of 69.4 +/- 9.70 years. The clinical scores and the gait analysis did not show significant difference with those of the patients in our registry. However, the mean flexion range was 126.8° with the custom ancillaries in comparison to the 120.4 °of the patients in the registry, which is a clinically significant difference.

The mean HKA measured on post-operative CT-scan was at 0.5° +/- 2.2 in comparison with the planned axis. The mean femoral varus-valgus was at 0.3° +/- 1.3, the mean femoral flexion at 2.1° +/- 2.2, the mean femoral axial rotation at 0.7° +/- 1.7, the mean tibial varus-valgus at 1.0° +/- 1.6 and the mean tibial slope at 0.0° +/- 2.5 in comparison with the planned values.

Conclusion: The range of flexion-extension was improved significantly in the group with custom ancillaries. The mechanical axis reconstruction and implant position appeared also to be improved by this new instrumentation in comparison with our knee implant register, with a reduction of the magnitude of the variations of the desired position of the implants.
FM09 Improved positioning of the tibial component in unicompartmental knee arthroplasty with patient-specific cutting

Mai Lan Dao Trong\textsuperscript{1}, Christian Diezi\textsuperscript{2}, Gerhard Goerres\textsuperscript{3}, Näder Helmy\textsuperscript{2}
\textsuperscript{1}Bürgerspital Solothurn, \textsuperscript{2}Orthopädie Bürgerspital Solothurn, \textsuperscript{3}Radiologie Bürgerspital Solothurn

Introduction: Unicompartmental knee arthroplasty (UKA) has undergone a recent resurgence in popularity. Numerous authors have cited alignment as an important prognostic factor in the survival of UKA. Limb alignment affects not only the longevity of UKA by increasing wear of the polyethylene, but also affects the unreplaced contralateral compartment. Malpositioning of the components produce unequal wear patterns, thus further leading to early failure and additionally influencing clinical outcome as well. Data shows in up to 100\% a malpositioning of the tibial implant. With the introduction of patient specific instrumentation (PSI) this rate could decrease dramatically.

Objectives: This study is the first to investigate component alignment of medial UKAs implanted through a patient-specific cutting block technique.

Methods: We investigated pre- and postoperative CT-scans of medial UKAs implanted with patient-specific cutting blocks and compared the accuracy of postoperative outcome with the preoperative planning. We included 25 knees from 24 patients (10 male, 14 women, mean age 70 y, range 59-86 y). CT-scans were made from the operated knee pre- and postoperatively with additional images from the ipsilateral hip and ankle to measure the mechanical axis (HKA). Postoperative tibial varus/valgus, posterior slope and rotational alignment was measured through 3-dimensional reconstruction and compared to the preoperative planning. Additionally, we compared the HKA measured by CT-scans with conventional long-leg standing x-rays.

Results: Postoperative HKA showed mean values of 177°±2.8° (preoperative planning 175.4°±2.5°). The measurements of HKA with conventional x-rays showed comparable results with 177.3°±2.8°. The difference between the final bone cut compared to the preoperative planning showed for the tibial varus/valgus a mean of 0.5°±1.2° (2.9°±0.7 varus planned), for the tibial posterior slope 0.7°±2.0° (4.6°±1.3° planned), and for the tibial implant rotation a mean difference of 1.6°±3.5° external rotation (0° planned).

Conclusion: This study shows excellent results in rotational and varus/valgus alignment of the tibial implant in patients undergoing medial unicompartmental knee arthroplasty. Considering the crucial role of correct alignment of implant positioning for the survival of UKAs, the patient-specific cutting block technique seems to be a promising technique to optimize implant positioning.
FM10 Unicompartmental knee arthroplasty after 85 years old

Victoria Duthon¹, Vincent Villa², Philippe Neyret², Pierre Hoffmeyer³
¹Hôpital Cantonal de Genève, ²Centre Albert Trillat, Hospices Civils de Lyon, ³Hôpitaux Universitaires de Genève

Introduction: The unicompartmental knee arthroplasty (UKA) continues to gain popularity as a viable treatment option for arthritis isolated to one compartment. It has been reported to provide decreased perioperative morbidity, faster recovery, quicker and easier rehabilitation, and excellent longterm survival: these advantages may benefit octogenarians. Then we hypothesized that UKA is may be a viable alternative to total knee arthroplasty (TKA) as the definitive treatment of localized arthritis in patients over 85 years old.

Methods: From 1993 to 2011, patients over 85 years old with severe unicompartmental knee osteoarthrosis were included, even if mild patello-femoral osteoarthritis was present. Other inclusion criteria were: pre-operative hip-knee-ankle angle less than 10°, no ligament laxity, good range of motion (at least 90° of knee flexion and less than 5° of extension loss), no inflammatory joint disease. The main complaint was severe localized pain. UKA were implanted by a short medial arthrotomy for medial femoro-tibial arthritis, versus lateral arthrotomy for lateral femoro-tibial arthritis.

Results: UKA were implanted in 26 consecutive patients, representing 31 knees: 24 medial UKA and 7 lateral UKA. 92% of patients were females. All patients were 85 years old or older (mean 87 y.o, range 85-91 y.o). Mean body mass index was 23. In the postoperative days, only one patient needed a blood transfusion, and none had deep venous thrombosis or infection. Knee Society knee and function scores improved at an average of 3.5 years follow up (range 1–10 years). 90% of patient were satisfied or very satisfied and would have surgery again. The mean postoperative knee range of motion was full extension and 130° of flexion. Only one of the 31 knees (3%) required revision surgery into total knee arthroplasty for an early implant failure. At final follow up, 8 patients (11 knees) had died with all having the index UKA in place and functioning well; mean postoperative survival was 5.4 years.

Conclusion: Although total knee replacement has proved to have a high success rate in elderly patients, UKA can be expected to provide reliable and durable results in certain patients of this age group. Lower morbidity and faster recovery after UKA may benefit octogenarians and UKA should be regarded as a definitive treatment option in appropriated selected patients over 85 years-old.
FM11 10 year results of the tension controlled, ligament balanced total knee arthroplasty

Joachim Stephan Klenk¹, Bernhard Christen², Henk Eijer³, Andreas J. Schuster¹
¹Spital Ziegler, Spital Netz Bern AG, ²Orthopädische Klinik Bern, ³Regionalspital Emmental AG

Introduction: Posterior cruciate ligament (PCL)-retaining prostheses are commonly used and give good outcomes. After 10 years of total knee arthroplasty (TKA) in situ wear, radiolucent lines and osteolysis become more frequent and are main reasons for TKA revisions. Only few long term data on soft tissue orientated surgical technique are currently available. This study investigated the 10 year results of primary TKA using the ligament balancing technique.

Methods: As part of a cross-sectional retrospective investigation this study evaluated the data on patients treated in 2 Swiss clinics with the first series of balanSys total knee prostheses (Mathys Ltd. Bettlach, Switzerland) using the soft tissue orientated surgical technique. Between 1998 and 2003, 408 cases (361 patients) were operated and received the implant with either a fixed (78.2%) or a mobile (21.8%) bearing polyethylene inlay. At the 10 year follow-up (FU) examination, range of motion (ROM), knee society score (KSS), visual analogue scale (VAS) for pain and satisfaction were determined and radiographs were evaluated. Safety evaluation included postoperative complications and revisions.

Results: Out of 408 cases, 137 were lost to FU due to death, 21 due to unknown address. In 43 cases a phone interview was done, 57 indicated at least if the implant is in situ. Finally, 128 cases (82 female; 46 male) performed the FU after 11.2 (±1.1) years. Patients’ mean age at FU was 79.6 (±6.6) years. Mean total KSS was 155.8 (±25.9) points and mean passive flexion was 114.7 (±12.3)°. VAS mean scores for pain and satisfaction were 1.5 (±2.2) (best 0) and 8.7 (±2.2) (best 10), respectively. No radiolucent lines were found under the femoral and tibial component in 92.7% and 68.3%, respectively. Out of all implants 22 (15 mobile, 7 fixed bearing) were revised due to limited ROM (6), instability (4), infection (3), loosening (3), prosthesis size (2) or others (4). Only 18 minor complications were mentioned, e.g. fall (12), mobilisation under anesthesia (1), infection (1), others (4).

Conclusion: This study suggests that TKA’s performed with the PCL-retaining prosthesis by using a soft tissue oriented surgical technique is a safe procedure and associated with very good long term results (KSS and VAS) as well as only few complications in this elderly population. Long term results of implants in combination with a specific surgical technique are needed to draw conclusions on the clinical outcome and safety.
Decision making for Surgery in Trochlea dysplasia – Lateral Trochlea Tilt!

Gian Bühler¹, Holger Grehn¹, Thomas Boehm¹, Bereiter Heinz²
¹Kantonsspital Graubünden, ²Kantonsspital Gaubünden

Introduction: The lateral trochlea tilt is a helpful tool for surgical indication in patellofemoral instability with trochlea dysplasia.

The patellofemoral instability becomes more understood in the last years. And still it is a phenomenon because of the multifactorial causality. Beside the muscular imbalance, abnormalities in frontal (valgus/varus) or rotational axis, TTTG, MPFL tension, height and dysplasia of the patella is the Trochlea dysplasia one of the most challenging factors.

The current study aims to describe the measurements for the decision making if surgery for trochlea correction is necessary or less invasive surgery like MPFL reconstruction can be performed. To define the indication, after more than 20 years experiences in trochleoplasty, for this operation we created the lateral trochlea tilt measurement in addition to the classification according to D. Dejour.

Methods: We analysed in this retrospective cohort study MRI images from 30 knees with trochlea dysplasia and controlled this group with 60 normal knees without any patellofemoral symptoms. The two groups were matched regarding age, gender and the time the MRI was taken. The statistical analysis was performed with the Student’s t Test. For reliability all MRI were seen and measured by two observers. As in the Dejour classification known is the central height in relation to the medial and lateral condyle characterising the dysplasia. We defined the lateral trochlea tilt as the angle from the centre of the trochlea to the lateral condyle border in relation to the posterior condyle axis on axial MRI views. Patients with retropatellar instability due to trochlea dysplasia had a significant lesser lateral tilt compared to the control group. We performed in all cases with trochlea dysplasia with lateral tilt less than 10 degrees a modified trochleoplasty. The followup was 1 year. No patient had in the first year after surgery a relapse of instability.

Conclusion: In conclusion the lateral trochlea tilt can be used as an indicator for different surgical treatments. In cases with an angle less than 10 degrees and without severe cartilage pathology do we recommend the trochleoplasty and in cases with instability and an angle >10 degrees soft tissue balancing with MPFL reconstruction.
Introduction: Published data regarding the structure of the quadriceps tendon (QT) is diverse; authors report observing between two and four layers. Closer inspection of the quadriceps group reveals an intervening muscle (IM) between the vastus lateralis (VL) and vastus intermedius (VI), which cannot be clearly assigned to the former or the latter. The IM was previously attributed to VL, hence its role in the structure of the QT is unreported. The aim of this study was to investigate the layers of the quadriceps tendon with special emphasis on all components of the extensor apparatus.

Methods: Ten cadaveric lower limbs from seven specimens were investigated using macros dissection techniques. All muscle bellies of the extensor apparatus were identified and traced distally until they merged into the quadriceps tendon. Connections between the different aponeurotic layers of each muscle were studied from origin to insertion focusing on corresponding muscle fibers from the medial and lateral elements. The main fusing points of each layer were marked and recorded. Their distance to the patella and the distances between the fusion points were measured.

Results: All portions of the quadriceps muscle were fused over a region measuring 1.3 to 9 cm (mean 4.4 cm, SD +/- 2.1) proximal to the patella. The deepest layer of the QT was formed by lateral portions of the VI. Fibers of the deep medial aponeurosis of the VI fused with fibers of the IM in the deep middle layer, on average 5.6 cm above the patella (range, 3.0 to 9.0 cm, SD +/- 21.1). From the medial aspect another layer of the medial VI was found, in the distal aspect this turned into a tendinous gliding layer of the vastus medialis (VM) and merged with the aponeurosis of the VL in the superficial middle layer 2.3 cm (range, 1.2 to 4.1, SD +/- 0.9) distal to the meeting point of the deep middle layer. The superficial middle layer was joined on average 3.3 cm (range, 1.3 to 5.3, SD +/- 14.1) above the patella. The superficial layer of the QT was formed by the tendon of the rectus femoris.

Conclusion: The quadriceps tendon is formed by five elements which join each other proximal to the patella like a corn husk. Depending on the level of incision of the QT, one finds two, three or four layers. This may have caused confusion in the interpretation of the layers of the QT in previous literature.
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FM14 Measuring tibial torsion - evaluation of a new technique

David H. Friedrich, Stergios Lallos, Hans-Ulrich Stäubli
Salem Spital

Introduction: To successfully plan a derotational osteotomy or to reduce a fracture of the tibia, an exact assessment of torsion is necessary. Measuring tibial torsion by CT imaging using the conventional methods of Jakob and Elgeti, rely on measuring the angle between the tibial plateau and the malleolar axis. The shortcomings of these approaches are, that the reference lines used are difficult to place, tibial dysplasia is not taken into account for and there is no possibility to determine the level of maltorsion. We hypothesize, that these shortcomings may be overcome by using two new reference lines along the medial cortex of the proximal and distal tibia.

Methods: A retrospective study was performed bilaterally on 30 torsional CTs, which were routinely made during 2011 and 2012 as part of our preoperative diagnosis (19 men and 11 women). The tibial torsional angle was measured between the proximal reference lines according to Elgeti (tangential to dorsal proximal tibial condyle) (PE) and to Jakob (transversing the widest part of the tibial plateau) (PJ) and distally using a transmalleolar reference line (DM). Two further reference lines were placed tangential to the medial cortex of the tibia. The proximal cortical tangent (PC) was placed just proximal of the tibial tuberosity, where the tibia flattens out. The distal cortical tangent (DC) was placed just proximal of the medial malleolus, where the tibia is still flat. Angles were measured between the reference lines and statistically analyzed.

Results: All results are in mean and standard deviation. Men were 39 ± 12 years and women 35 ± 13 years old. The mean external torsion using PE and DM was 34 ± 10.4° for the right side and 28.3 ± 8.7° for the left side. Using PJ and DM we found a torsion of 35.6 ± 11.5° for the right side and 29.3 ± 10.4° for the left side. Using the medial tibial cortices PC and DC a torsion of 20.0 ± 8.1° for the right side and 24.3 ± 8.7° were measured. The external torsion between PE and DC was 60.5 ± 8.4° for the right and 64.8 ± 8.1° for the left side.

Conclusion: Our measurements of tibial torsion using PEDM and PJDM reflect those of other groups (28.8° and 30° respectively). Measurements of tibial torsion using the PC and DC yield a smaller standard deviation, compared to measurements using PEDM and PJDM indicating a preciser, probably simpler measuring technique. The PC correlates well to PE and PJ, as does the DC to the DM, showing clinical relevance, as PE, PJ and DM are reference lines attempting to reflect the axis of articulation. As the PC and DC reference lines are tangents along the medial tibial cortex, which may be easily appreciated in clinical examination, they may offer additional information to torsion without using radiography. Although the PC and DC reference lines do not reflect an axis of articulation, they may be useful to find the correct torsion during surgery, where determination of torsion may be difficult.
Factors influencing posterior tibial slope and tibial rotation in opening wedge high tibial osteotomy: A cadaveric study

Matthias Jacobi¹, Vincent Villa², Nikolaus Reischl³, Philippe Neyret⁴, Emanuel Gautier⁵, Robert Magnusson⁶

¹Orthopädie am Rosenberg, ²Hôpital de la Coix-Rousse, Lyon, ³Physiomur, ⁴Hôpital de la Croix-Rousse, Lyon, ⁵HFR, Hôpital cantonal Fribourg, ⁶Ohio State University, Columbus

Introduction: Opening wedge high tibial osteotomy (HTO) is an accepted treatment option for medial compartment knee osteoarthritis with associated varus lower limb axis in younger, more active patients. A concern with the use of this technique is that posterior tibial slope (PTS) and tibial rotation can be altered.

Methods: A cadaveric model and surgical navigation system were used to evaluate the influence of certain intra-operative factors of the degree of PTS and tibial rotation change observed during medial opening HTO. Parameters evaluated included: degree of osteotomy opening, knee flexion angle, location of limb support (thigh versus foot), performance of a posteromedial release, the status of the lateral cortical hinge, and the degree of osteoarthritis present in the knee.

Results: Combining measurements of all specimens and parameters, a mean PTS increase of 2.7 ± 3.9 degrees and a mean tibial internal rotation of 1.5 ± 2.9 degrees were observed. Clinically significant changes in tibial slope (greater than 2 degrees) occurred in 50.4% of corrections, while significant changes in tibial rotation (greater than 5 degrees) occurred in only 11.9% of corrections. Patients with significant osteoarthritis and concomitant flexion contracture, cases where large corrections were required, and procedures in which the lateral cortical hinge was disrupted were associated with increased PTS change. The other factors evaluated did not exert a significant influence of the degree of PTS change observed.

Conclusion: Surgeons should be vigilant for possible PTS change, particularly in high-risk situations as outlined above. We recommend routine use of an intra-operative measure of PTS to avoid inadvertent slope change.
A simple arthroscopic fixation technique of intercondylar eminence fractures in children without remaining artificial fixation devices

Stefan Brunner¹, Carlo Camathias²
¹Orthopädie Kantonsspital Aarau, ²Orthopädie UKBB

Introduction: Growth disturbances are the main fear while treating eminence fractures in children. Different epiphyseal sparing techniques are described to reduce this risk, but leaving non-resorbable screws or sutures necessitate removing. The purpose of this study was to compare an established fixation technique with one using absorbable threads and transosseous fixation without compromising the physis.

Methods: We retrospectively analyzed 11 cases (McKeever Type II or higher) since 2005 treated with either non-absorbable thread fixation and tibial screw fixation (Group A, n=5, mean age 13.2 years, mean follow up 58.2 months) or with absorbable thread and transosseous fixation (Group B, n=6, mean age 12.0 years, mean follow up 20 months).

Results: No significant difference in both groups concerning function according to the IKDC (Group A: three A, two B, Group B: four A, two B), laxity or stability comparing the different operation techniques was found. Complete osseous integration of the fracture was achieved in every case within three months. Lysholm score in Group A was 86.9 (range 68-100), in Group B 92.8 (range 70-100) with no significant difference. There was no significant difference in ACL side to side laxity in every case.

Conclusion: Treatment of intercondylar eminence fracture with absorbable thread and extraarticular transosseous fixation is simple and leads to a high rate of good results. Furthermore there is no need for metal removal and no persistent artificial material within or about the knee joint.
FM17  Management of Schatzker VI tibial plateau fractures: Case series and review of literature

Roland Gardon¹, Yvan Arellatz²
¹Hôpital du Valais, ²Hopital du Valais

Introduction: Management of high energy intra-articular fractures of the proximal tibia is a challenging condition. The treatment of such fractures, need to pay specific attention to the soft tissue envelope around the knee with an acceptable reduction. They are only a few papers in the literature concerning the hybrid external fixation method treating this type of fractures.

Methods: We present a case series of 5 patients were admitted to our hospital, a level I trauma centre, with a closed Schatzker VI tibial plateau fracture between march 2010 to november 2012. All patients were treated with a hybrid external fixator (Tenxor Stryker-Howmedica) and the reduction was performed most often by closed means or through mini-open reduction. Mean follow-up was 23.5 months (range 7 to 32 months) and were evaluated with radiographs.

Results: In 2 cases the hybrid fixation was the final treatment and in 3 cases we removed the temporary hybrid fixation which was followed by re-osteosynthesis by LCP plate. Radiographic evidence of union was observed at 5.8 months (range 3 to 9 months). No pin track infection was observed.

Conclusion: We found the hybrid external fixation method as a suitable solution for closed Schatker VI tibial plateau fractures in terms of radiologic consolidation with acceptable reduction. It can be used as a final solution or as temporary fixation followed by removal and re-osteosynthesis by plate. It has theoretical advantages in terms of the soft tissues but the benefit over internal fixation has not been yet demonstrated in terms of improved outcome in the literature.