

8.1

COST-EFFECTIVENESS ANALYSIS OF ARTHROSCOPIC ROTATOR CUFF REPAIR SURGERY IN HONG KONG USING UTILITY SCORES

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Introduction: This study examines the value of surgical treatment for full-thickness rotator cuff tears from a societal perspective, through cost effectiveness analysis using utility scores, by relating surgical costs to increase in quality-adjusted life-years (QALYs).

Methodology: 43 patients who received arthroscopic rotator cuff repair treatment in our hospital from 2014 to 2016 for symptomatic full thickness rotator cuff tear that did not responded to conservative treatment were analysed. Effectiveness was expressed in gain in WORC and ASES scores, and quality-adjusted life years (QALYs) derived from SF-12 questionnaire. Patients were reviewed retrospectively at least 2 years after surgery, during which functional scores and quality of life data were collected. Gain in functional scores was measured for minimal clinically important difference (MCID). Changes in utility scores generated net QALYs. Direct costs were applied to generate an incremental cost-effectiveness ratio (ICER), and cost per QALY gained was compared with UK and US thresholds.

Results and Analysis: Significant improvements were noted in functional score at the review 2 year postoperatively, with gain in both ASES and WORC scores. MCID was achieved with WORC score. The estimated mean lifetime gain in QALYs from surgery was 0.81 by use of the SF-12. This yielded cost-effectiveness ratios of \$162306.5/QALY. The cost effectiveness of arthroscopic rotator cuff repair compares favorably with other common interventions in health care and reaches commonly accepted benchmarks for cost-effectiveness.

Discussion and Conclusion: Arthroscopic rotator cuff repair for symptomatic full-thickness tears produces net societal cost savings for patients and greater QALYs for our patients.

8.2

SCAPULAR KINEMATICS IN ATHLETES WITH AND WITHOUT ROTATOR CUFF TENDINOPATHY: A SYSTEMATIC REVIEW

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Introduction: Rotator cuff tendinopathy is one of the most frequently reported overuse injuries in overhead athletes. Altered scapular kinematics has been proposed to contribute to rotator cuff tendinopathy. This review aimed to systematically review the literature on three-dimensional (3D) scapular kinematics in overhead athletes with and without rotator cuff tendinopathy.

Methodology: Studies that investigated the changes in 3D scapular kinematics in overhead athletes with and without rotator cuff tendinopathy were searched with appropriate keywords via Cochrane Library, Medline, Embase and PubMed from inception to September 2017. Two authors independently assessed the level of evidence and methodological quality of the included studies.

Results and Analysis: Of 684 relevant studies, 9 studies (a total of 332 athletes, mean age 23.41±2.62 years old) were included in the final analysis. The level of evidence of all included studies was classified as Level 3, and the methodological quality was 8/11. Our findings showed the scapula was more upwardly rotated, anteriorly tilted and internally rotated in overhead athletes when compared to non-overhead athletes. However, conflicting results were reported when comparing the 3D scapular kinematics between athletes with and without rotator cuff tendinopathy.

Discussion and Conclusion: Adaptation of scapular kinematics was observed in overhead athletes. However, there is controversy in scapular kinematics among athletes with rotator cuff tendinopathy. More high quality studies are required to identify the changes in scapular kinematics among athletes with rotator cuff tendinopathy.

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8.3

ISOKINETIC FATIGUE RATIO OF SHOULDER ROTATORS IN ELITE SOFTBALL PLAYERS WITH AND WITHOUT ROTATOR CUFF TENDINOPATHY, AND ITS ASSOCIATION WITH THE SUBACROMIAL SPACE

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Introduction: Fatigue of the shoulder rotators may cause reduction of the subacromial space (SAS) and contribute to rotator cuff tendinopathy. This study aims to compare the isokinetic fatigue ratios of shoulder external rotators (ER) and internal rotators (IR) between elite softball athletes with and without rotator cuff tendinopathy; and to investigate their association with the SAS.

Methodology: Twenty-five elite softball players (14 asymptomatic and 11 with rotator cuff tendinopathy) and thirty-one asymptomatic sedentary controls participated in this study. Isokinetic fatigue ratio of shoulder ER and IR were measured concentrically at 180°/s; and ultrasound measurement of the SAS was taken during 0° and 60° of shoulder abduction.

Results and Analysis: Our findings showed no significant differences in the fatigue ratio of shoulder rotators among sedentary control and elite athletes with and without rotator cuff tendinopathy. Indeed, moderate correlation was found between ER/IR fatigue ratio ($r=0.575$, $p=0.031$) and change in SAS from 0° to 60° shoulder abduction in asymptomatic athletes, i.e. more reduction of SAS during 0° to 60° of shoulder abduction was associated with greater ER/IR fatigue ratio. However, such relationships could not be detected in athletes with rotator cuff tendinopathy and sedentary controls (all $p>0.199$).

Discussion and Conclusion: Shoulder rotators in elite softball athletes are not more enduring than in sedentary controls. Indeed, more reduction of the SAS during 0° to 60° of shoulder abduction was associated with greater ER/IR fatigue ratio. Our results provide information for the development of shoulder injury prevention program specific to softball athletes.

8.4

THE EFFECT OF SCAPULAR TAPING ON CORRECTING SCAPULAR DYSKINESIS AND PRESERVING THE SUBACROMIAL SPACE IN PATIENTS WITH ROTATOR CUFF TENDINOPATHY AND SCAPULAR DYSKINESIS

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8.5

RISK FACTORS FOR A LOSS OF EXTENSION AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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Introduction: Loss of the extension (LOE) is common after the anterior cruciate ligament (ACL) reconstruction. It has been reported to associate with various factors including anterior placement of tibial tunnel. The purpose of this study was to determine whether tibial tunnel position, along with other factors, is associated with early loss of knee extension after ACL reconstruction.

Methodology: Patients who have undergone ACL reconstructions in the United Christian Hospital (UCH) between Jan 2013 and Mar 2017 were retrospectively reviewed. They were excluded if they had revision ACL reconstruction, use of grafts other than the hamstring tendon, previous trauma or surgery in the ipsilateral knee, concomitant extra-articular procedure, or physiotherapy follow-up in other centres. LOE was defined as a loss of full extension of at least 5° from the anatomical zero position, and the range was retrieved from the physiotherapy progress note record at postoperative 4 weeks. Tibial tunnel position was determined by radiographic evaluation.

Results and Analysis: 27% of 148 patients had LOE of the reconstructed knees. Only preoperative LOE was significantly related to LOE at 4 weeks postoperatively ($P = 0.032$). No statistical significance was found for other risk factors (gender, early surgery, preoperative flexion loss, concomitant injuries, preoperative rehabilitation, concurrent meniscal procedures, graft size, length of hospital stay, postoperative physiotherapy), including tibial tunnel position ($P > 0.05$).

Discussion and Conclusion: LOE at 4 weeks after arthroscopic ACL reconstructions was significantly associated with preoperative extension loss. Anterior position of the tibial tunnel was not predictive for the postoperative extension lack.

8.6

COST-EFFECTIVENESS ANALYSIS OF AMBULATORY VERSUS IN-PATIENT ACL RECONSTRUCTION SURGERY IN HONG KONG

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Introduction: Local publications have not addressed the societal health impact of anterior cruciate ligament (ACL) injury. The purpose of this study was to compare the cost-effectiveness of ambulatory versus in-patient ACL reconstruction (ACLR).

Methodology: Three groups of patients, including (1) day surgery for ACLR (2) same day admission with one overnight stay and (3) in-patient stay of > two days were studied. Principal outcome measures included quality-adjusted life years (QALYs), average costs, incremental effectiveness (as measured by QALYs), and net health benefits. Surgical cost and hospital charges were derived from the Hospital Authority published rates for non-entitled persons. Student t test was used to determine cost differences among the three groups. Pearson's correlation coefficient was calculated to determine the relationship between length of procedure and operating room cost, as well as hospital charges.

Results and Analysis: A total of 84 patients were included in our study. Average outpatient ACLR costs were \$3800 lower than that for overnight admission ($p < 0.05$) and \$10000 lower than that for those admitted > two days ($p < 0.05$). Average hospital charges ranked the lowest for the outpatient ACLR group ($p < 0.05$). Concomitant intra-articular pathologies requiring additional procedures occurred more commonly in in-patient group.

Discussion and Conclusion: Our economic analysis revealed ambulatory and same day admission ACLR was more effective (same amount of improved QALYs but at a lower cost) than in-patient ACLR. Therefore, ambulatory or same day admission ACLR should be the preferred treatment strategy from a societal perspective.

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8.7

NEUROMUSCULAR ALTERATIONS OF LOWER LIMB DURING LANDING TASK IN PATIENTS AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: Altered lower limb biomechanics have been observed during landing task in patients with anterior cruciate ligament reconstruction (ACLR), which increases the risk of secondary ACL injury. However, the underlying neuromuscular alterations are not clear. Therefore, this review aims to evaluate the muscle activation pattern adopted by the involved limb of ACLR patients during landing task when compared with contralateral or healthy matched limbs.

Methodology: Database of PubMed, Embase, Medline, Scopus and ScienceDirect were systematically searched, yielding a total of 627 citations. Studies meeting the criteria underwent quality assessment using the modified Downs and Black checklist. Means and standard deviations for muscle timing and activation amplitude were extracted and a random-effects-model meta-analysis was performed.

Results and Analysis: 12 studies were included based on the selection criteria with total of 328 ACLR patients (178male, 150 female) in their post-op 6 months to 8.8 years. Muscle activation were all measured by electromyography (EMG). The involved limbs of ACLR patients demonstrated earlier onset in medial hamstrings prior to single-legged landing when compared with healthy controls (SMD =0.45, P=0.01), while decreased vastus medialis amplitude during single-legged landing when compared with the contralateral side (SMD=-0.25, P=0.008).

Discussion and Conclusion: ACLR patients display different muscle activation patterns with earlier hamstring onset and decreased quadriceps activation, which may affect knee stability during landing. Further researches are needed to fully understand these neuromuscular alterations after ACLR.

8.8

COMPARISON OF POST-OPERATIVE MEASUREMENTS AND KNEE KINEMATIC ANALYSIS AS A PREDICTOR FOR RETURN TO SPORT STATUS AFTER ACL RECONSTRUCTION

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Introduction: Anterior cruciate ligament reconstruction (ACLR) is performed to restore knee function and facilitate a return to sports participation after ACL tear. Meta-analysis reported 83% of elite athletes returning-to-sports after ACLR compared with 60% in non-elite athletes. Altered knee kinematics have been associated with ACLR. This study was to investigate the rates and predictors of return to play after ACLR, comparing knee kinematic analysis with other outcome measurements.

Methodology: Patients who received ACLR with 1-year follow-up were identified and examined. RTP information obtained. Statistical analysis done using repeated measure ANOVA and T-Test.

Results and Analysis: 41 patients included, 80% RTP. Logistic regression suggested that IE in single-leg-hop-test at 3 months postoperatively may help to predict RTP at 12 months post-op (p= 0.018).

Discussion and Conclusion: The IKDC was significantly higher in the RTP group. Single-leg-hop task at early post-op phase may help to predict non-RTP. This may help to identify patients who may have difficulty in RTP.

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8.9

VALIDATION OF AN OPTICAL TRACKING SYSTEM FOR PATELLOFEMORAL JOINT KINEMATICS IN ANTERIOR CRUCIATE LIGAMENT INTACT AND REMOVED KNEES- A CADAVERIC STUDY

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Introduction: Patellofemoral joint (PFJ) tracking and biomechanics is important when it comes to the etiology of PFJ problems. This research was to examine the reliability of PFJ using a customized algorithm based portable optical tracking system.

Methodology: Ten fresh-frozen cadaveric knees were placed on a customized testing jig. The kinematic data were acquired using a portable optical tracking system. The minimal detectable differences (MDDs) and intra class correlations (ICCs) of medial/lateral tilt, medial/lateral translation in PFJ at 0°, 30°, 60°, 90°, 120° of knee flexion were calculated. Mean and peak pressure in medial and lateral patellar compartment inserted between the patella and trochlea were also analyzed during knee flexion.

Results and Analysis: ICC values of medial/lateral tilt, medial/lateral translation in PFJ are greater than or equal to 0.982. The MDDs of medial/lateral tilt is 1.04° and 0.60 mm for medial/lateral translation. No significant differences were found between the ACL intact and deficient knees. Regarding the peak contact pressure, lateral PFJ compartment demonstrated averagely 0.28 MPa (SD=0.3) higher than those in medial compartment during the whole flexion procedure. For ACL intact and removed comparison, significant increased peak contact pressure were found in both medial and lateral patella facet ($P<0.05$).

Discussion and Conclusion: Excellent intra-rater reliability was achieved for this portable optical tracking system. Increased peak contact pressure in both medial and lateral patellar compartment indicated that removed ACL leads to altered contact pattern in the PFJ. The increased peak contact pressure may lead to the onset of PFJ degeneration after ACL injury despite of no significant kinematic alterations.

8.10

USE OF A NEW MRI INDEX IN ASSESSING SAGITTAL PATELLOFEMORAL ENGAGEMENT

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Introduction: Increased patellar height reduces engagement between patella and femoral trochlea groove - a risk factor of patellar instability. A new MRI index could be used to assess Sagittal Patellofemoral Engagement (SPE).

Methodology: MRI knee of patients with at least one episode of patella dislocation retrieved from CDARS from 1/4/2015 to 31/4/2018 were compared with a control group with normal image. SPE was measured in T2 weighted plain MRI as the ratio between trochlear cartilage length (TL) and patella articular cartilage (PL). SPE (TL/PL) less than 1/3 was considered to be significant.

Results and Analysis: A total of 27 knee MRI (17 left, 10 right) in 23 patients (4 males, 19 females) were reviewed. 4 patients had history of bilateral patella dislocation. Their mean age was 28.4 +/- 13.9 (Range 13 – 55). Control group included 27 patients with MRI knee labelled as normal study (11 left, 16 right, 6 males, 21 females), with mean age 36.6 +/- 14.4 (Range 15 – 58). The mean SPE was 0.22 (0.06 – 0.61) in disease group and 0.49 (0.23 – 0.79) in control group. 22 of 27 knees in patellar instability group had SPE <1/3 comparing with 4 of 27 knees in control. The SPE of disease group is statistically significantly lower than control group ($P<0.05$). The odds ratio of developing patellar instability with SPE <1/3 is 25.3.

Discussion and Conclusion: Sagittal Patellofemoral Engagement Index would be useful to evaluate functional engagement of patella with femoral trochlea in patients with patellar instability.

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8.11

DIGGING INTO THE ROOTS OF THE OPTIMAL REPAIR TECHNIQUE FOR POSTERIOR LATERAL MENISCUS ROOT TEAR: A TEN YEAR EXPERIENCE

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Introduction: Posterior lateral meniscus root tears (PLMRT) are commonly associated with anterior cruciate ligament (ACL) ruptures. The loss of transmission of hoop stress leads to early degeneration. In spite of this, the literature on the management of PLMRT remains sparse, with no consensus on how these injuries are best treated. A ten-year retrospective cohort study was performed to compare the outcomes of transtibial tunnel repair versus suture fixation for PLMRT in patients undergoing concomitant ACL reconstruction.

Methodology: The operative records from 3602 ACL reconstructions between 2008 and 2018 were reviewed to identify associated PLMRT. Patients were evaluated using International Knee Documentation Committee (IKDC), Tegner Activity scale (TAS), and Lysholm questionnaires. Anteroposterior (AP) laxity was measured using KT-1000 knee arthrometer. Pre and post operative MRI were reviewed to check the integrity of meniscomfemoral ligaments (MFL), and meniscal extrusion.

Results and Analysis: A total of 26 patients were included, with sixteen suture repair and ten transtibial tunnel repair. The baseline characteristics between two groups did not reveal any statistical difference. The transtibial tunnel group had a significantly longer operation duration compared with the suture group (141.9 versus 101.4 minutes, $P = 0.02$). The transtibial pullout repair had significantly less AP laxity than the suture repair when compared with the uninjured side (1.71 versus 2.85mm under 133N, $P = 0.04$). There were no statistical difference in the clinical scores or the MRI findings.

Discussion and Conclusion: Transtibial pullout repair has comparable clinical and radiological outcomes compared with suture repair in treating PLMRT, with superior AP laxity restoration but longer operative time.

8.12

COST EFFECTIVENESS ANALYSIS OF CARTILAGE REPAIR SURGERY FOR TREATMENT OF CARTILAGE DEFECTS OF THE KNEE IN HONG KONG

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Introduction: Damaged knee articular cartilage results in functional impairment and early onset of osteoarthritis. Microfracture (MFX), matrix-induced autologous chondrocyte implantation (MACI), and autologous matrix-induced chondrogenesis (AMIC) has been employed to treat this condition. In Hong Kong, there is no previous analysis for the costs and effectiveness of these treatments. The objective of this study was to estimate the cost effectiveness of these procedures in the public health service of Hong Kong.

Methodology: Patients were analyzed in this cross-sectional study if they received MFX, MACI or AMIC at the Queen Elizabeth Hospital between 2001 and 2015. Direct medical costs were calculated according to HA published rates and vendor price lists corrected to 2015. Clinical outcome was reported as knee-related functional outcome scores (KOOS and WOMAC) and general health status (SF-12). Results were expressed in gain in functional scores (pre-op vs 24 months post-op), and quality-adjusted life-years (QALYs), with utility scores derived from the SF-12 questionnaire.

Results and Analysis: All three procedures showed clinical improvement in all 70 patients, as measured by KOOS and WOMAC scores. Subgroup analysis revealed that improvement more than 30% was achieved in both the AMIC and MACI groups, but not the MFX group. The estimated cost per QALY and the relative ICER for AMIC was within the UK and US thresholds.

Discussion and Conclusion: The minimal clinically important difference (MCID) was achieved in both AMIC and MACI but not MFX, favouring AMIC and MACI over MFX. AMIC was shown to be more favourable than MACI in this cost effectiveness analysis.

COMPARISON OF GAIT BIOMECHANICS IN FEMALE RUNNERS WITH EXCESSIVE FOOT PRONATION USING TRADITIONAL PLASTER-MOLDED AND 3D PRINTED FOOT ORTHOSES

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Introduction: Runners with excessive foot pronation are usually prescribed foot orthoses. Clinically, foot orthoses can be fabricated using traditional plaster-molded (TPM) method or 3D printing (3DP) technology. However, the functional difference between the two types of orthoses remains largely unknown. Therefore, we examined the running biomechanics and comfort in runners with excessive foot pronation when running with TPM and 3DP orthoses in this study.

Methodology: 14 female runners presenting excessive foot pronation were asked to run on a self-paced instrumented treadmill in three conditions: (1) TPM orthoses; (2) 3DP orthoses; and (3) without orthoses (Ctrl). Within-subject difference in the peak rearfoot angle, vertical loading rates and perceived comfort were compared between the three conditions.

Results and Analysis: Lower rearfoot angle were found when running with TPM ($p=0.001$, $d=0.382$) and 3DP orthoses ($p=0.002$, $d=0.240$) than Ctrl. TPM orthoses exhibited slightly greater rearfoot angle reduction than 3DP orthoses ($p=0.043$, $d=0.149$). No significant difference was found in the vertical loading rates between the three conditions ($F=0.032$ - 0.178 , $p=0.838$ - 0.969). Participants perceived better "medial-lateral control" ($p<0.001$) and "heel cushioning" ($p<0.003$) when running with TPM or 3DP orthoses. Better perceived "arch height" ($p=0.011$, $d=1.358$) was reported when using TPM orthoses, but the improvement was marginally insignificant ($p=0.056$, $d=0.937$) in 3DP orthoses.

Discussion and Conclusion: 3DP orthoses demonstrate similar functional performance with TPM orthoses in terms of excessive foot pronation control and subjective perception of comfort in female runners with over-pronated feet.

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8.14

MENTAL HEALTH WITHIN HONG KONG RUGBY – A NATIONAL STUDY OF THE PREVALENCE OF SCREEN POSITIVE DEPRESSION AND THE IMPACT OF IMPENDING RETIREMENT FROM SPORT ON MENTAL HEALTH

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Introduction: The time post-retirement for ex-professional Rugby players has been shown to understandably be a time of difficulty, however there has been little research into the mental health of those approaching retirement. There is also minimal research into the mental health of current rugby players. The aim of this project was to ascertain how the current prevalence of screen-positive depression throughout Hong Kong Rugby compares to the general population, and whether mental health scores were affected by proximity to retirement from sport.

Methodology: A cross-sectional study was conducted using an online questionnaire including demographics, the PHQ-9 questionnaire and anticipated number of seasons they would continue playing Rugby.

Results and Analysis: 257 responses out of 905 invitations were collected (28.3%). The prevalence of screen-positive depression (PHQ-9 score >9) was 10.1% overall and 9.0% in top-level National and Premiership players so comparable, if not better, than the general population of Hong Kong at 10.7%. There was no statistical significance found between approaching the end of playing career and PHQ-9 score. Those with a history of concussion in the past 12 months had a significantly higher PHQ-9 score than those who did not ($p=0.02$).

Discussion and Conclusion: Although physical activity is known to be protective against depression, Rugby is a sport with a high injury and concussion rate; both of which have a known relationship with depression and this was reflected in this study. No evidence of poorer mental health scores in those players approaching retirement may be a favourable outcome, although players should be supported and prepared early for this difficult transition. Those who have been concussed should be monitored closely and mental health adequately assessed.

8.15

EFFECTS OF PLATELET RICH PLASMA ON TENDINOPATHY IN ELITE ATHLETES

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OPTIMAL CONDITION TO CREATE FEMORAL TUNNEL CONSIDERING COMBINED INFLUENCE OF KNEE FLEXION AND TRANSVERSE DRILL ANGLE IN ANATOMICAL SINGLE-BUNDLE ACL RECONSTRUCTION USING MEDIAL PORTAL TECHNIQUE: 3D SIMULATION STUDY

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Introduction: There has been no previous study using three-dimensional (3D) measurement on femoral tunnel characteristics according to the combined influence of various flexion angles of knee and transverse drill angles in single-bundle ACL reconstruction with transportal technique. The purpose of this study was to determine optimal condition of knee flexion angle and transverse drill angle to create secure femoral tunnel in single-bundle ACL reconstruction with transportal technique considering tunnel length, tunnel wall breakage, and graft bending angle.

Methodology: This study was conducted using simulation of 3D computed tomography of thirty subjects. Three variables of femoral tunnel changed according to combined influence of four flexion angles of knee and three transverse drill angles were measured: tunnel length, wall breakage, and graft bending angle.

Results and Analysis: There was no case of short femoral tunnel less than 25 mm at 120° and 130° of flexion. There was no case of breakage of femoral tunnel at 120° of flexion with maximum transverse drill angle (MTA) and MTA-10° and at 130° of flexion.

Discussion and Conclusion: Considering effect on graft bending angle, decrease of flexion angle and transverse drill angle could be appropriate in creating femoral tunnel. Increased flexion angle and transverse drill angle secured femoral tunnel having sufficiently long length without wall breakage. However, avoiding excessive flexion angle and maximum transverse drill angle could be recommended because they tended to cause more acute graft bending angle.