THINGS YOU SHOULD KNOW ABOUT ASIAN KNEE BEFORE DOING TOTAL KNEE REPLACEMENT

Total Joint Replacement
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Introduction:

Medical literatures has documented some unique features of the Asian knee. These features need to be addressed when performing TKA on Asians. The senior writer of this paper has performed over 3,000 TKA on Americans and over 5000 TKA on Asians. This enabled us to document specific anatomical, systemic, functional and revision surgery features. The objective of this exhibit is to introduce surgeons to these features and recommend specific modifications for each feature to improve clinical outcome.

SYSTEMIC FEATURES

Metabolic Differences

Asians demonstrate a greater prevalence of MS than whites or blacks in a knee OA population undergoing TKA. Recognizing MS as a risk factor for OA, so indirectly asians demonstrates a greater prevalence of OA

Ligamentous laxity

japanese shows higher ACL laxity than caucasians [2]

Significant deference in ACL laxity between Malaysian and Caucasian [3]

systemic laxity might dictate usage of more constrained implants
i.e. PS is more prefered than CR similar to rheumatoid patients

Osteoporosis

our patients have significant osteopenia,
which increases the incidence of periprosthetic fractures postoperativly
in many occasions ***stemmed primary*** is required
we are reporting unique pattern of periprosthetic fractures associated with severe osteoporosis which is ***insufficiency fracture***

Insufficiency fracture

A unique periprosthetic femoral fracture above a TKA

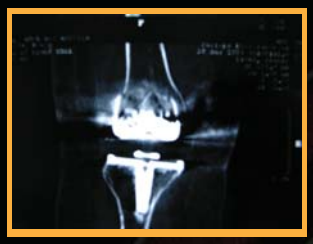
- Unique pattern of fracture
- Series of over 5000 TKA
- 10 cases insufficiency fracture
- Difficult to diagnose
- Will discuss; Diagnosis, management and prevention

Risk Factors

- Osteoporosis
- Over weight
- Gross varus deformity

Diagnosis

No trauma
Sudden unset of pain
Patient suddenly can not walk
Knee instability
Deformity



wrongly diagnosed as MCL insufficiency

Extensive bone loss laterally

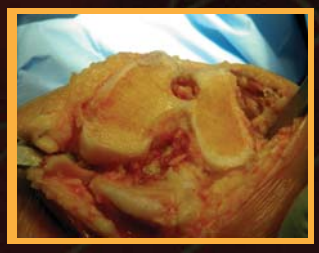
Results

8 cases revised with CCK implant.
. 2 case revised with Rotating hinge.
. One of those LCCK cases had infection after revision.
Implant was removed and re-revised after 2 months.

Streubel and associates concluded that Extreme distal periprosthetic supracondylar fractures of the femur are not a contra-indication to lateral locked plating. These fractures can be managed with internal fixation, with predictable results, similar to those seen in more proximal fractures. In the fracture described in our study this is not applicable as the lateral condyle is already compressed with reduction in its volume and no internal fixation can solve this problem [4]

Prevention

- Use stem in high risk patients.
- Minimal bone cut in severe deformity
- Do not lateralize, Centralize.
- Maximize bone coverage



ANATOMICAL FEATURES

Anatomical considerations to be in mind

Anatomical feature of distal femur

- Urabe et al. showed that the anteroposterior and metaphyseal widths of the anterior and resected condyles were longer in Caucasian women than in Japanese women, but the posterior condyle was longer in Japanese women [5]
- "We found a progressively decreased in the aspect ratio (ML/AP %) with an increasing anteroposterior dimension both in the tibia and femur" . Narrow femur [5]
- ***Chinese females had a significantly narrower distal femur than white*** [6]

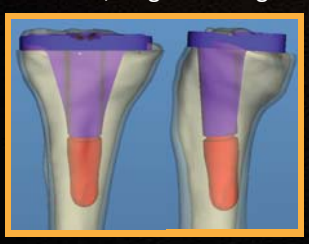
If missed

Significant overhang or undersized implant with loose flexion gap

Anatomical features of the Tibia

- We found that the ML (73.5+/-5.6 mm) and AP (47.3+/-3.8 mm) average dimensions of our study population were smaller than the dimensions of the symmetric commercially available Morphometry of proximal tibia to design TKA for Korean. Kwak et al. Knee. 2009 Feb 19
- *The tibial shaft axis was located anterolateral to the center of the tibial plateau in our Chinese study subjects. Accordingly, an anterolaterally offset tibial keel or stem seems to be a more suitable choice for Chinese patients undergoing primary or revision total knee arthroplasty* [7]

unpredicted offset => impingement stem or varus, valgus malalignment



Anatomical features ; tibio - femoral

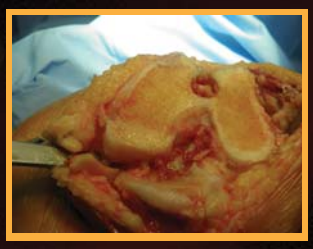
- Femoral tibial mismatch ; big femur and small tibia. Problem worse in revision cases
- Mostly small sizes and 4 mm increment does not allow good gap matching
- Tibio -femoral angle is different ."Japanese subjects had a significantly higher (p = 0.04) varus alignment (1.64 +/- 0.43 degrees standard error) than Caucasians"

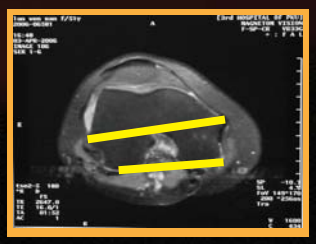
2009 Orthopaedic Research Society

Posterior condylar axis differences between Caucasians & Asians

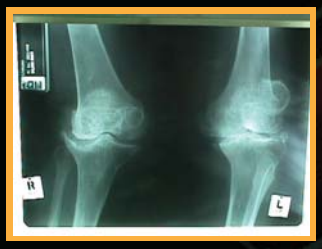
- Berger et al: 3.5+ /-1.2 [8]
- PCA of Chinese is larger than that of Caucasian
- That means 3 degree external rotation maybe not enough for Chinese patients
- Zhang et al: CT Male 83 knees, Female, 103 knees: 5.6+/-2.1[6]
- Zhou, et al: MRI, 4.1+/-1.7 [7]

Following posterior condylar axis can lead to internal rotation errors and patellofemoral maltracking





ADVANCED DISEASE FEATURES



cosiderable number of our patients have bone loss and severe deformities in which we manage both problems as following

management of bone loss

-minimal bone cut
-grafting in young patients
-screws and cement in older patients
-avoid blocks
-3D MRI or CT
-good preoperative planning
-be prepared for the possibility of more consrained prothesis

management of severe deformities

- cruciate retainig prothesis has minimal role.
-extensive soft tissue release

in our statistics we released the MCL in 82 % of the patients.

inadequate release

varus malaligment although implant was put in a good position with resultant instability

TENSORS CAN BE USED

REVISION SURGERY FEATURES

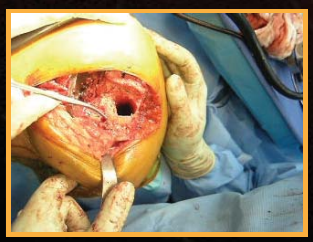
Special Features

- Systemic features; osteopenia and laxity
- Neglected cases features

Systemic features

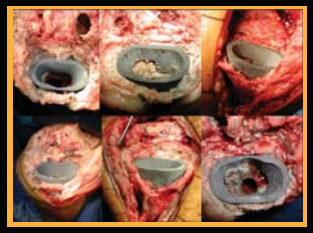
Osteoporosis

Bone extremely soft forcing surgeons to depend on metaphysis and diaphysis for fixation filling between the cortex and never



TM cones (smaller please)

consider metaphyseal cones
small stems 8mm



remember
anterior entery point to avoid impingement of the stem due to the anterior bowing

Neglected cases is challenging



FUNCTIONAL FEATURES

activities of daily living requires full flexion more than expected
the following factors are the key to acheive full flexion
1-preoperative range of motion
2-surgical technique(quad.release)
3-patient selection (thin,motivated)
4-postop rehabilitation &pain management
5-implant design(friendly to deep flexion

quadriceps release

we believe that quadriceps release improves the post operative range of motion tarabichi et al [9]



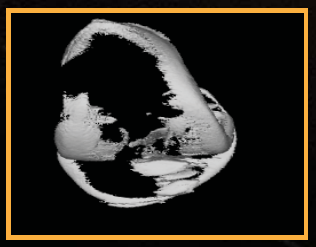
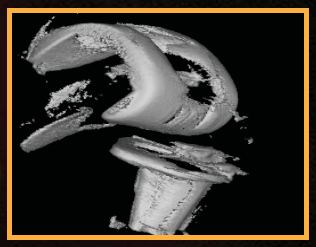



Activities of daily living for Muslims in the Middle East ORS 2007

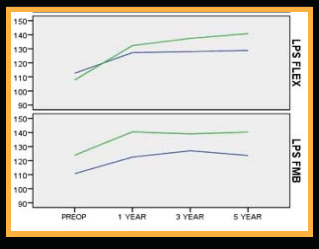
A kinematic comparison between normal knees and high flexion total knee arthroplasties
Stacey M. Smith, aRobert A. Cockburn, bJanet Krevolin, aRebecca M. Li, cSamih Tarabichi, aUrs P. Wyss [10]

TIBIO-FEMORAL MOVEMENT IN LIVING KNEE WITH FULL FLEXION AFTER TKA ISTA 2005

C-arm SIREMOBIL Iso-C3D

Achieving full flexion after TKA AAOS 2009



we have reported achieving full flexion after primary total knee replacement [11]

Full flexion and frequent kneeler

- If patient kneels at least five times daily
- Patients were considered to have full flexion if they were able to flex the knee to at least
- 130 degree sit on the ground with calf touching thigh for at least one minute.
- 977 patients had simultaneous bilateral knee replacements (1954 implants).
- The majority of the patients had bilateral total knee replacements simultaneously (85%).
- Modified subvastus approach were used plus or minus quads mobilization .All surgery were performed by a single surgeon.

METHODS AND MATERIALS

- Pre-operative and post-operative ranges of motion were documented on lateral x-ray
- Data were processed in Dundee.

RESULTS

- (58%) of case assessed post-operatively obtained full flexion as defined above.
- The majority of the cases with full flexion had full movement pre-operatively, except for 485 cases.

RECOMMENDATIONS FOR SURGEONS

- Use transepicondylar axis or whitside's line rather than posterior condylar angle
- If between sizes use the bigger one with minimal bone cutting
- Don't lateralize in obese patients with long standing varus deformity and osteoporosis with the possibility of primary stemming
- Aim for full flexion
- Do extensive releases and minimize bone cuts and use tensors if needed.
- PS is more convenient and safer than CR in our Asian population
- In advanced disease use PSI or navigation to properly adjust your axes.
- In revision surgery consider anterior entery point,and be prepared for smaller sizes.

NEEDS FROM INDUSTRY

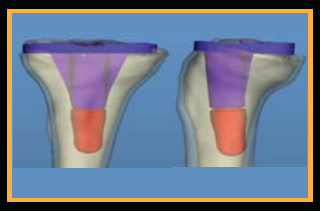
- Narrower femoral components.
- Smaller sizes increment for the small sizes .Asian plus implants!
- True modularity to accommodate different femur and tibial sizes (specially in revision).
- Implant design should accommodate for rotation between the femur and the tibia
- Stem-able and peg-less primary femur
- Femoral component which is notch free
- Should allow precise control of the thickness of bone cuts
- Should allow adjustment of external rotation angle and tibial slope angle
- better and easier soft tissue balancing
- rotation should be allowed in deep flexion
- More extensive training
- Special Asian surgical technique manuals
- Acknowledge the differences.

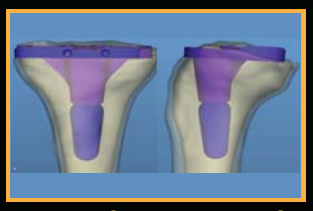
Revision implants

- Larger selection of sizes
- Address canal offset
- More consideration to smaller sizes

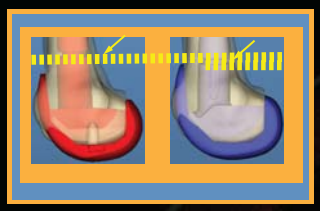
Smaller housing

Tibial offset

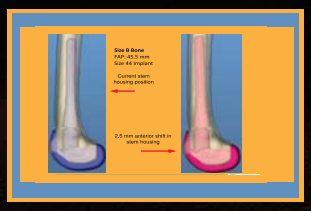




Smaller femoral housing



anterior femoral offset



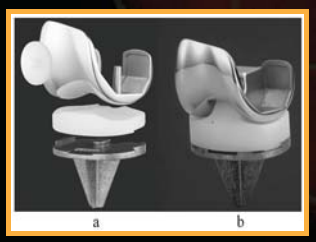
STEPS IN THE WAY

KYOCERA

THE BISURFACE TOTAL KNEE REPLACEMENT: A UNIQUE DESIGN FOR FLEXION[12]

using the pcl sacrificing philosophy withbone preservation

FLEXIBLE NICHIDAI KNEE



it was developed to fit the asian knee ,through thin anterior chamber and a deep patella groove ,thin both distal and posterior condyles,the tibial component has a wide cross keel[13]

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