

TKA in the Severe Varus Knee

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Val d'Iserre Knee Course
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Shore Hospital



The Severe Varus Knee

- * Preoperative Assessment
- * Surgical Technique
- * Implant Selection
- * Literature
- * Conclusions



“What is Severe?”

- * Fixed deformity
- * Mechanical axis > 10 degrees varus
- * Lateral Thrust

- * Potential Difficulties with:

Bone

- * Defects
- * Deformity

Soft tissues

- * Lateral stretching
- * Medial tight
- * Ligament Balancing



Goals of TKR

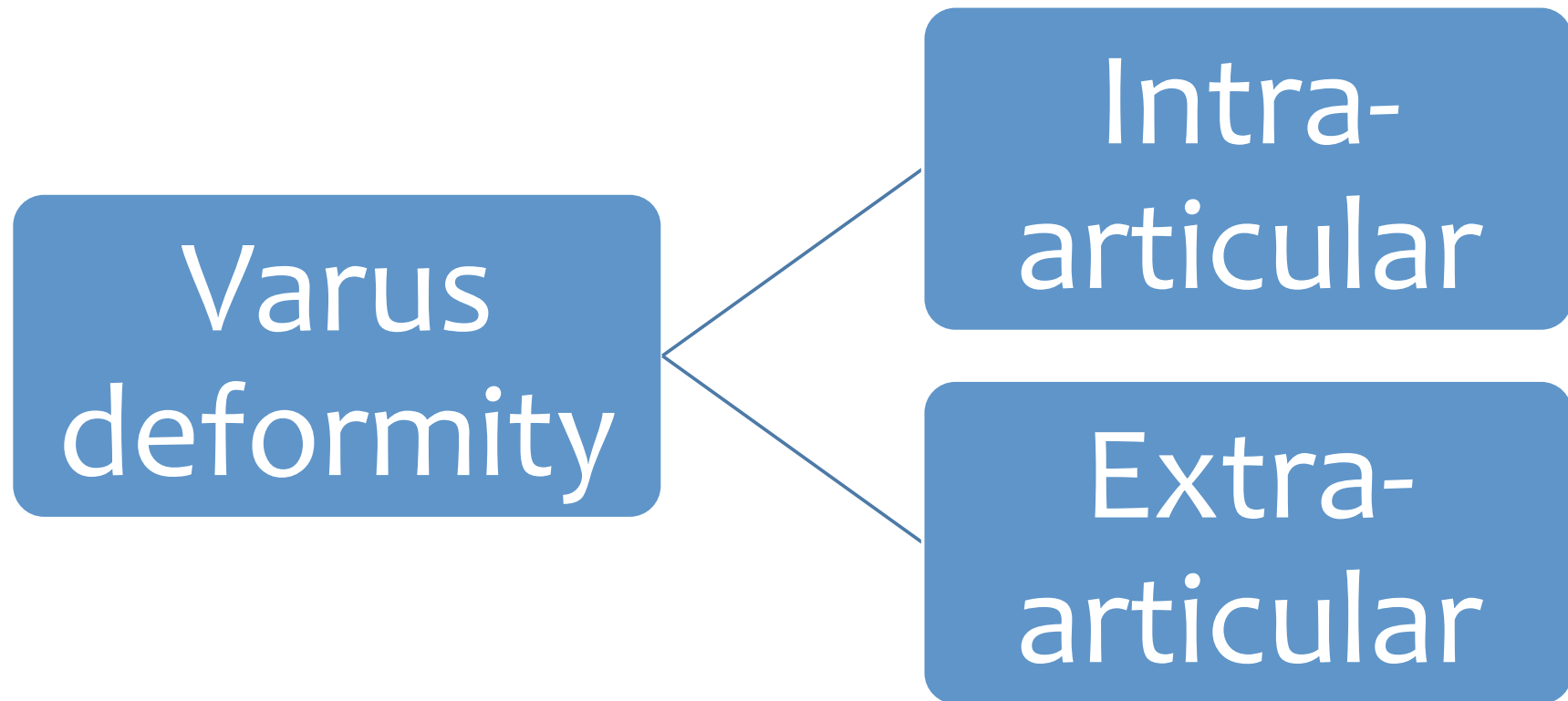
- * Objective
 - * Neutral /near neutral alignment
 - * Stable & well balanced
 - * Good ROM
- * Subjective
 - * Happy patient
 - * Pain free with unrestricted function



Surgeons challenges

- * Is it possible to correct an extra articular deformity within confines of the ligamentous attachments AND balance the joint
- * Will bony cuts remove collateral attachments?
- * Should an extra-articular deformity be corrected prior to or at the same time

Challenges with Bone



Extraarticular Deformity

Common Causes



Prior HTO- collapse



Prior Trauma



Congenital
Bowling

Extraarticular Deformity

Common Causes



Paget's Disease



Hypophosphataemic Rickets

Implications of Extraarticular Deformity

- * Adds to the intraarticular deformity
- * May not be possible to compensate with bony cuts
- * Reduced access to medullary canal due to distorted anatomy or pre-existing implants
- * IM guides and stems



Full Length Radiographs

- * Should be routine in:
 - * Severe deformity
 - * History of previous trauma
- * Assess severity of deformity and relative contribution of:
 - * Extraarticular
 - * Intraarticular
- * Estimate bony cuts & resultant gaps
- * Determine if osteotomy required



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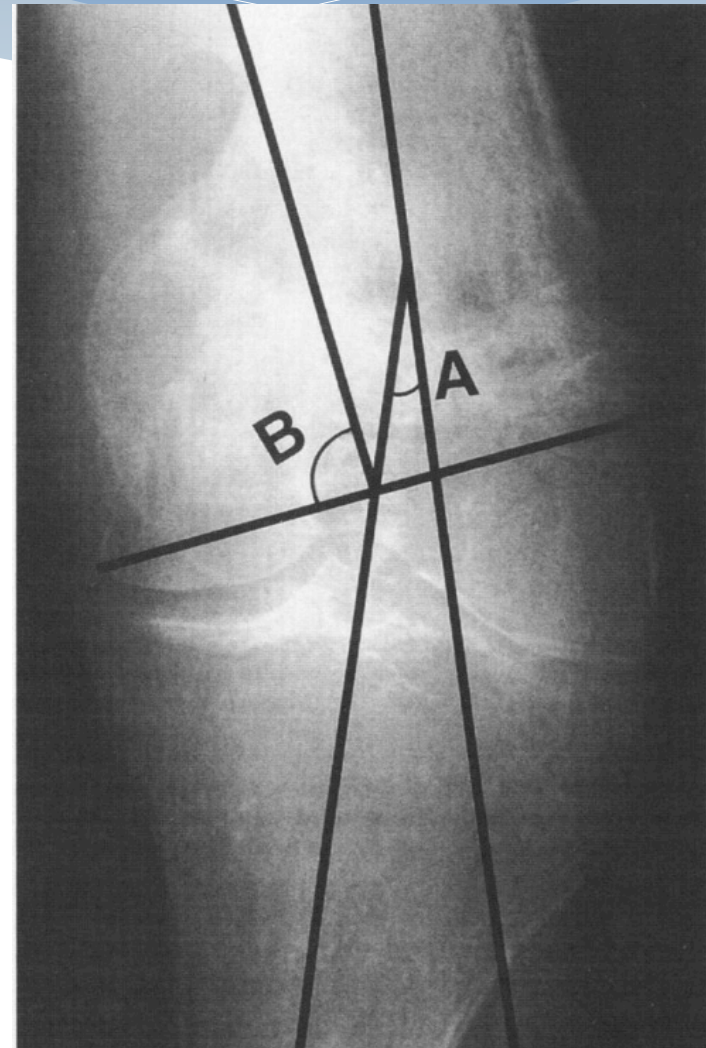
Femoral Deformity: Preoperative Planning

- * Deformity assessment on full length radiographs
- * Proposed distal femoral cut is drawn perpendicular to the mechanical axis of the femur
- * If distal cut likely to compromise the attachment of the lateral collateral ligament on the lateral epicondyle, a corrective osteotomy is considered

Femoral Deformity: Preoperative Planning

- * Femoral Osteotomy Indicated
- * Staged or Combined

Site of Deformity
Age of Patient
Surgeon Expertise



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Tibial Deformity: Preoperative Planning

- * Consider tibial osteotomy
 - * Distal tibial axis does not pass through tibial plateau
 - * Deformity $> 30^{\circ}$
 - * Deformity close to the joint line



Indications for Correction of Extraarticular Deformity

- * Deformity compromises TKR technique
 - * Ligament attachments
 - * Large discrepancy in cuts
 - * Compromises Balancing
- * Younger patients in whom knee varus is mostly due to extraarticular deformity

Role of Navigation in Extra-articular deformity

- * Navigation establishes mechanical axis irrespective of extra-articular deformities
 - * Bypasses canal
- * Intramedullary guides are not required with navigation
- * Accurate assessment of gap imbalance

Navigation-assisted total knee arthroplasty in knees with osteoarthritis due to extra-articular deformity

**Fabio Catani · Vitantonio Digennaro ·
Andrea Ensini · Alberto Leardini · Sandro Giannini**

* 20 patients with mean varus deformity of $10.4^{\circ} \pm 8.3^{\circ}$ preop

* Results:

Mean alignment post-op: 0.8 ± 1.2 in varus.

KSS score increased from 48 to 91 postoperatively ($p < 0.05$)

Mean range of motion improved from a 7–74 mean range pre-operatively to 0–94 post-operatively.

Navigation is an effective technique for knees with extra-articular deformities

The Varus Knee: Other Issues

- * Medial Contracture
- * Lateral Laxity
- * Flexion deformity
- * Medial bone erosion

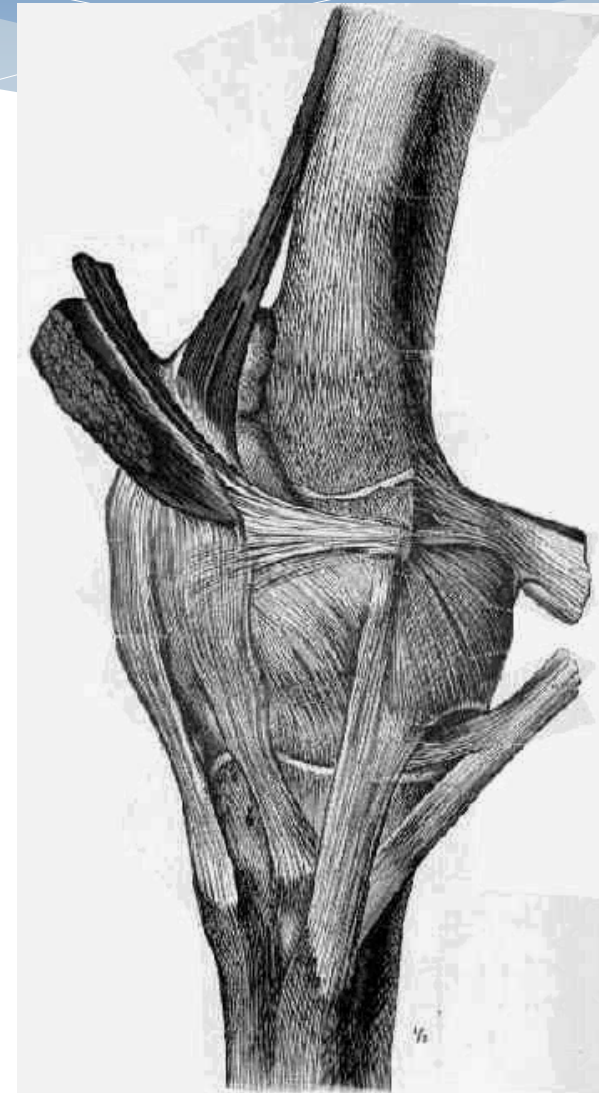


Surgical Technique

- * Routine Bony Cuts (Navigation)
 - * Conservative medial
- * Gap Balancing Assessment
- * Medial soft tissue release
- * Correction of sagittal plane deformity
 - * Flexion Contracture
- * Management of Tibial bone defect

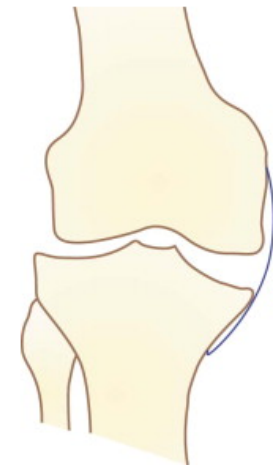
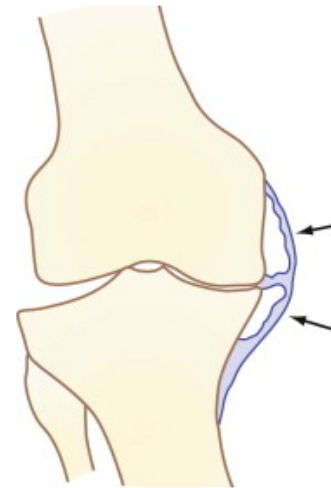
Medial Soft Tissue Release

- * Osteophytes
- * MCL
 - * Deep
 - * Superficial
 - * Posteromedial Capsule
- * Semimembranosus
- * Pes Anserinus
- * Other techniques



Medial Release: Routine Aspects

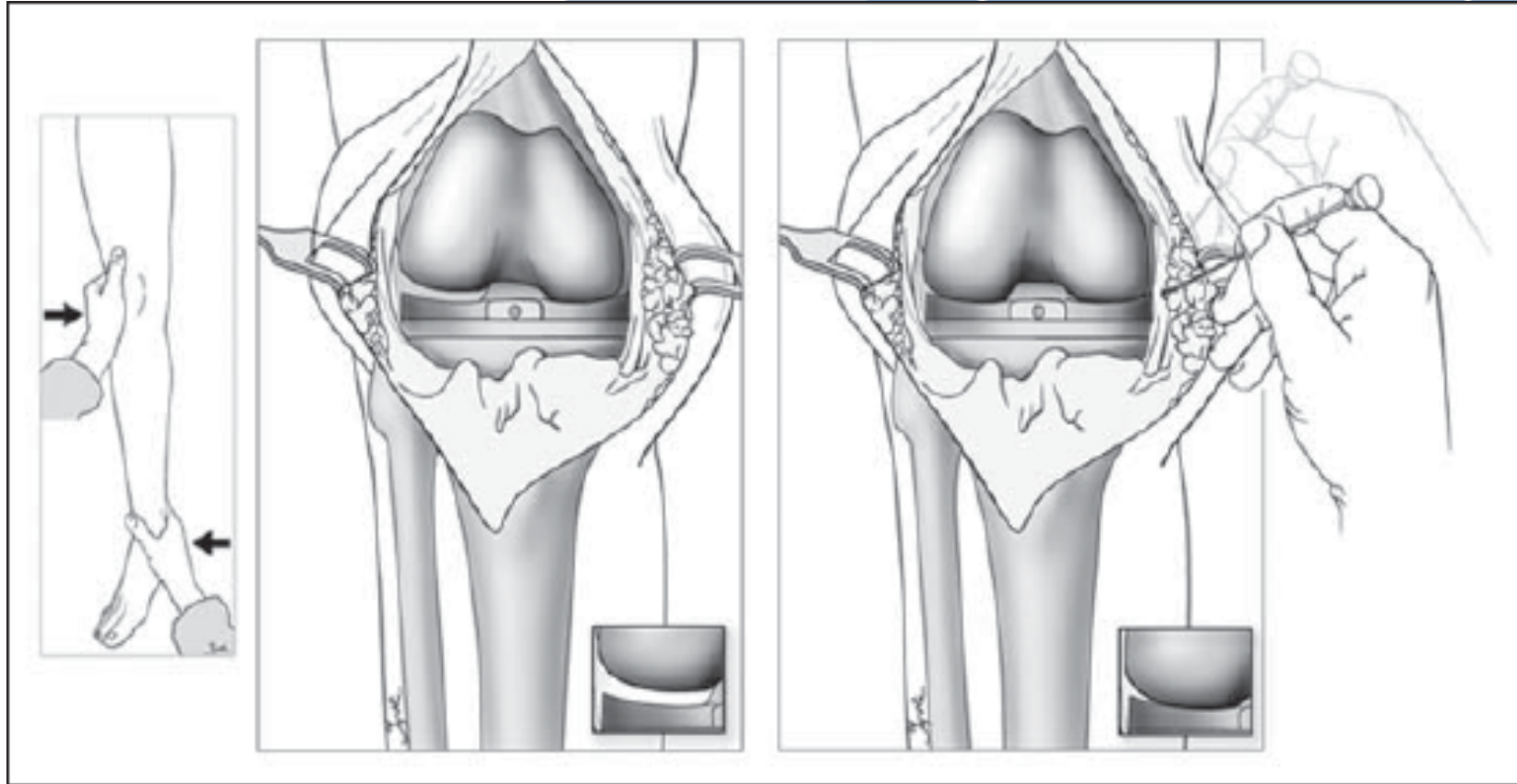
- Release of Deep MCL sufficient to perform bony cuts
- Exposure & Removal of Osteophytes



Medial Release: Supplementary Techniques

- * Release of Posteromedial Capsule
 - * Tibial side
 - * Tight in extension
- * Release of Superficial MCL
 - * Distal Elevation or “Pie-Crust”
- * Release of Semimembranosus
 - * Posteromedial tibia
 - * Residual tightness in extension

Pie crusting of MCL



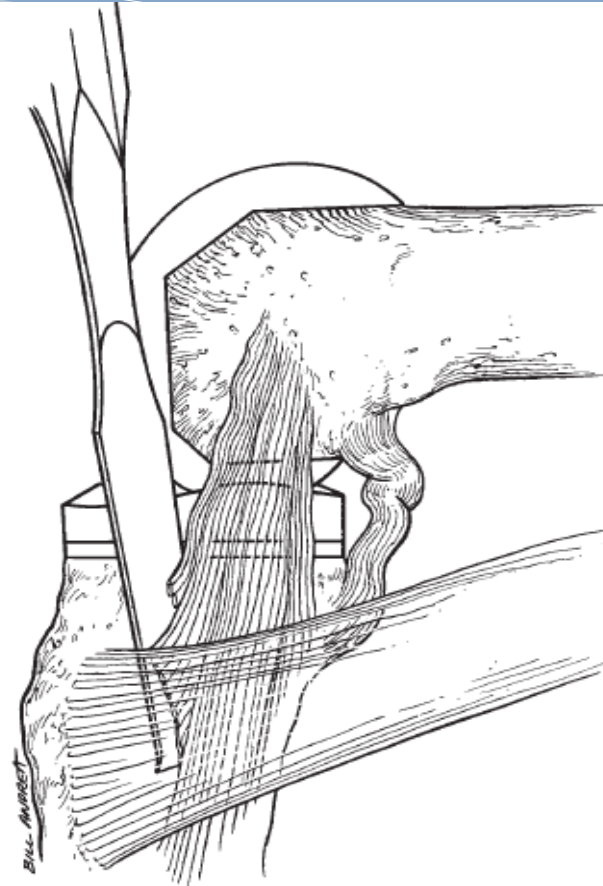
With the trial implants in situ, valgus stress is applied to the knee and the tight fibres of MCL are released using 19 G needle

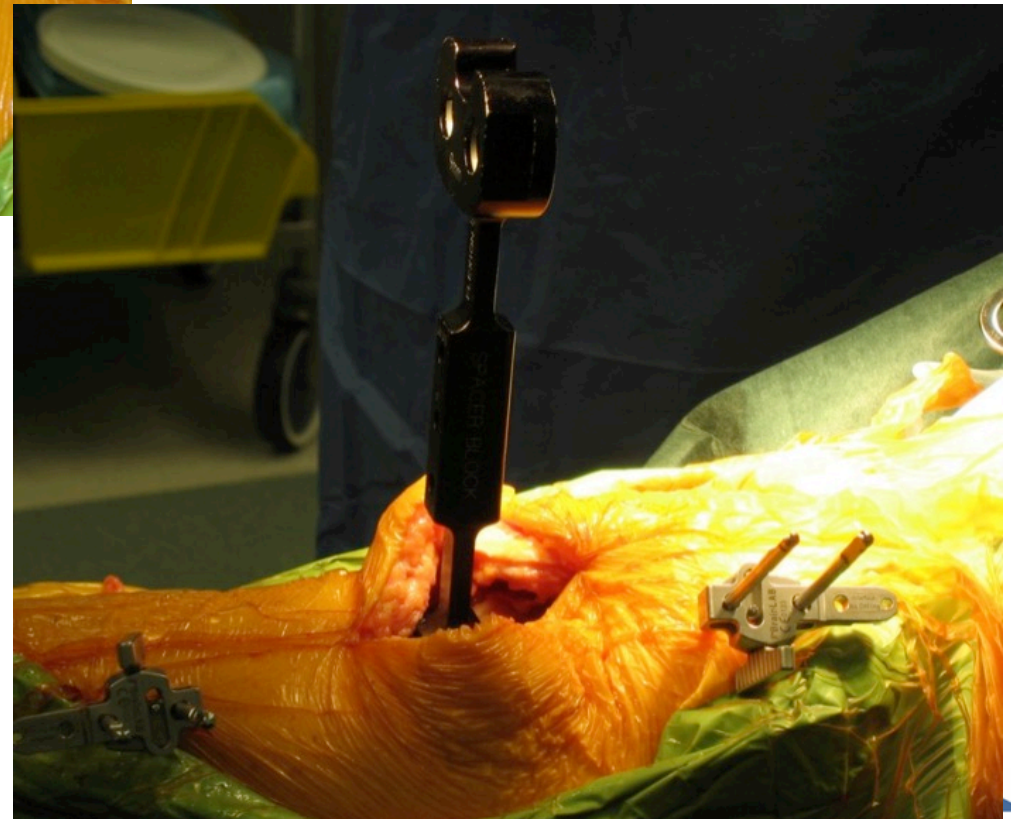
*Bellemans, Johan. "Multiple needle puncturing: balancing the varus knee." *Orthopedics* 34.9 (2011): 693.

Subperiosteal Release of MCL

Subperiosteal release of MCL is as an alternative to Pie Crusting of MCL

NB Avoid complete release causing instability





Summary of Sequence

- * Standard Bony cuts
- * Deep MCL Release & Osteophyte Removal
- * Gap Assessment with Blocks / Navigation
- * Posteromedial Capsule
- * Superficial MCL
- * Semimembranosus

Correction of Sagittal Plane Deformity

- * Usually associated with flexion deformity
- * Strategies include:
 - * Removal of posterior osteophytes
 - * Release posterior capsule
 - * Downsize femur
 - * Increased distal resection
 - * NB Correct varus deformity prior to performing additional distal femoral resection
- * Occasional hyperextension deformity
 - * Conservative distal resection

Management of Tibial Bone Defects

Management Depends on:

- Size of defect
 - Depth
 - % Surface Area
 - Age
- Contained vs Uncontained

<5 mm

- Filling of the defect with cement

≥5mm

- Bone grafting/ metal augments
- Unloading of the defect with stemmed tibial implant

Consider Downsizing Tibial Component
Cut in slight varus



“Reduction Osteotomy” of Proximal Tibia

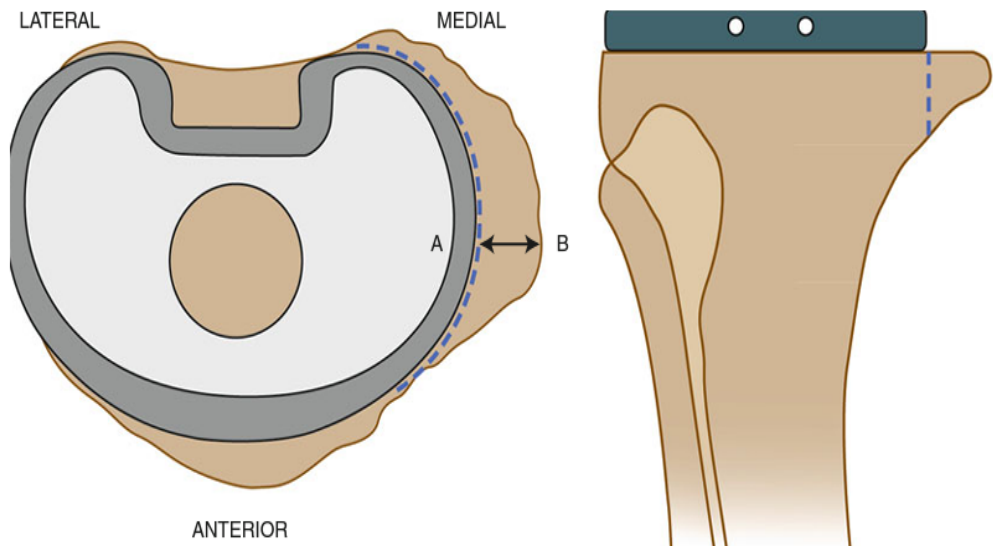
- * Principle: Excision of postero-medial flare of tibial plateau in order to decompress the medial structures.
- * Indication: Residual varus $>2^{\circ}$ after adequate medial release.

Technique of reduction osteotomy

- Downsizing the tibial base plate
- Lateralization of base plate
- Resection of uncovered medial bone

Reduction osteotomy can achieve deformity correction in a predictable manner

using the “2-mm excision for 1° degree correction” formula especially in knees with <math><15^\circ</math> preoperative varus deformity



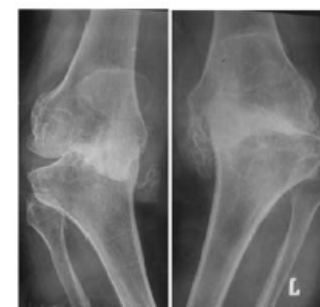
*Dixon, M. C., et al. "The correction of severe varus deformity in total knee arthroplasty by tibial component downsizing and resection of uncapped proximal medial bone." *The Journal of Arthroplasty* 19(1): 19-22.

Total Knee Arthroplasty for Profound Varus Deformity

Technique and Radiological Results in 173 Knees with Varus of More Than 20°

Arun B. Mullaji, FRCS Ed, MCh Orth, MS Orth, D Orth, DNB Orth,
Vinod Padmanabhan, MS Orth, and Gaurav Jindal, MS Orth

- Equivalent Protocol & Sequence
- In all cases:
 - Reduction Osteotomy PM Tibial Flare
 - Posteromedial Release
 - Deep MCL & Semimembranosis
- Superficial MCL partially detached in 4 and completely in 2 cases → instability
- Pes detached in 3
- Tibial Osteotomy in 6
- 1.7% Tibial Loosening



A

B

Type of Implant

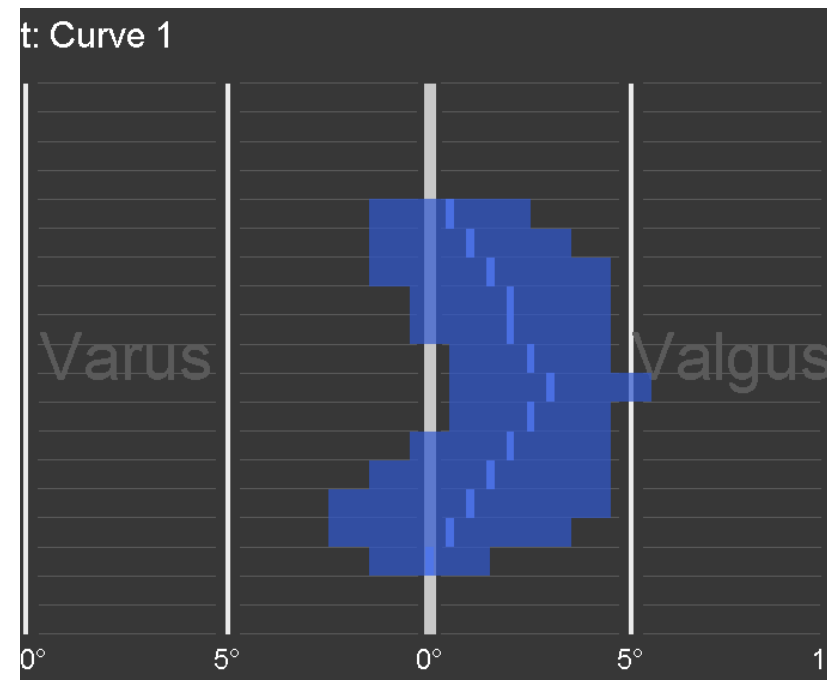
- * Surgeon Preference
- * PCL Contracture associated with deformity
- * PCL release assists with deformity correction & balancing

- * Scuderi et al J Arthroplasty 2007

“Severe varus deformities are associated with fixed flexion deformity with is easier to correct with excision of the PCL and using a posterior stabilised implant”

Other Issues

- * Leg Lengths
 - * Preoperative counselling
 - * Particularly unilateral surgery
- * Residual lateral laxity
 - * What is acceptable?
 - * Stable in extension
- * Quantify with navigation
- * Sekiya *et al* (2009) observed in large varus knees, large lateral ligamentous laxity immediately after surgery will diminish to a normal level by 3 months after surgery, provided proper valgus alignment is maintained.



Severe Varus Knee: Summary

- * Fixed Varus common
- * Careful preoperative & intraoperative assessment
 - * Site of deformity
 - * Surgical Plan
 - * Be aware of all options
- * Standard surgical algorithm
- * Good outcomes



Thank You