

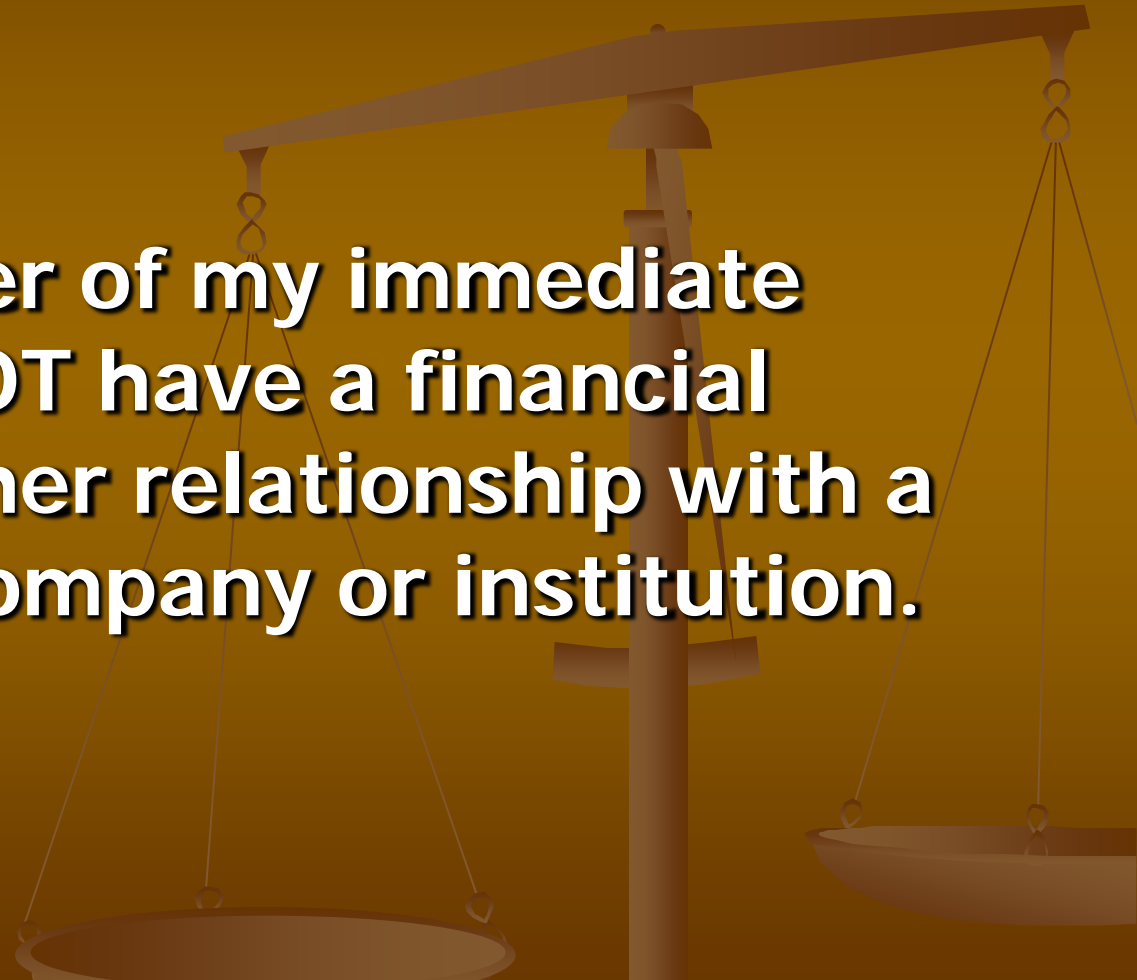
Ligament Balance For Varus Knee in Computer Navigation Total Knee Replacement

WP Yau and KY Chiu

Department of Orthopaedics and Traumatology
The University of Hong Kong

Financial Disclosure

- I (or a member of my immediate family) DO NOT have a financial interest or other relationship with a commercial company or institution.



Introduction

- Application of computer navigation technology in TKA has been proven to result in a significant reduction of the number of outliers in the alignment of the implanted prosthesis.
- There is an increasing application of computer navigation technology in optimizing ligament balance in TKA.
- We proposed a sequential medial release workflow in performing ligament balancing for varus osteoarthritis of knee under computer navigation guidance.
- The final status of ligament balance was measured at the end of procedure using computer navigation technology.

Method

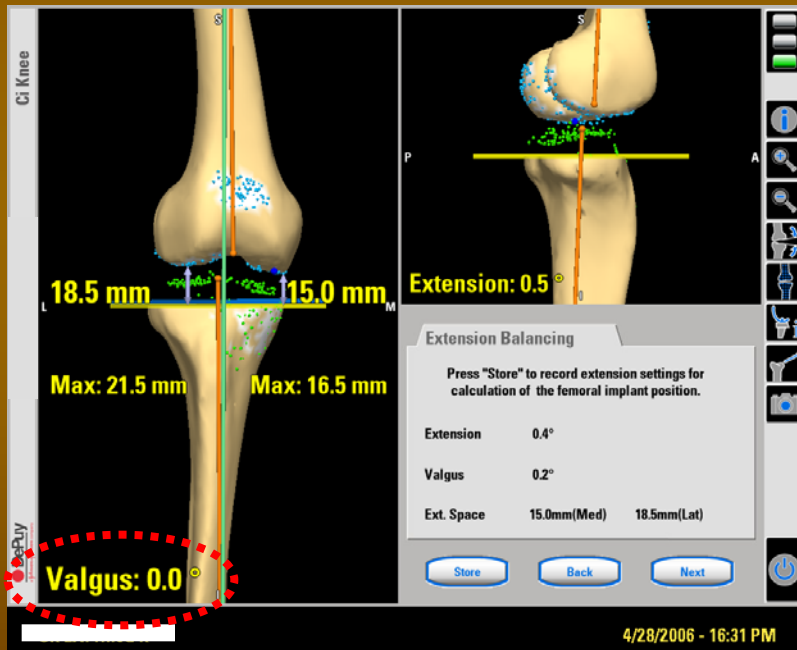
- Computer navigation PS TKR was performed in 25 primary OA Knee with varus deformity.
- Standard sized incision (10 – 15 cm) and medial para-patellar approach were adopted.
- Initial alignment of the knee and amount of flexion contracture were recorded.
- Preliminary tibial bone cut was performed to facilitate insertion of a Tensor / Balancer device.
- Knee Joint was distracted at full extension and 30 degrees knee flexion using the Tensor / Balancer device.

Sequential computer navigation controlled medial soft tissue release

1. Removal of the medial tibial and femoral osteophyte.
2. Removal of posterior tibial osteophyte.
3. Release of the posterior medial capsule tightness.
4. Release of the semimembranous tendon insertion on posterior medial aspect of proximal tibia.
5. Release of superficial medial collateral ligament down to the level of pes anserinus.
6. Medial tibial osteotomy and downsizing of the tibial component.

- The soft tissue release was considered to be adequate if the mechanical axis of the lower limb was brought to within two degrees from neutral alignment.
- Definite bone cut and implantation of prosthesis were performed as usual.
- At the end of procedure, the alignment of the implanted prosthesis, the medial and lateral collateral tension was measured again using computer navigation.
- A failure of proper ligament balance was defined as an imbalance of more than 3 degrees.

Varus Knee with No Significant Posterior Medial Capsule Tightness – Type 1



Full Extension

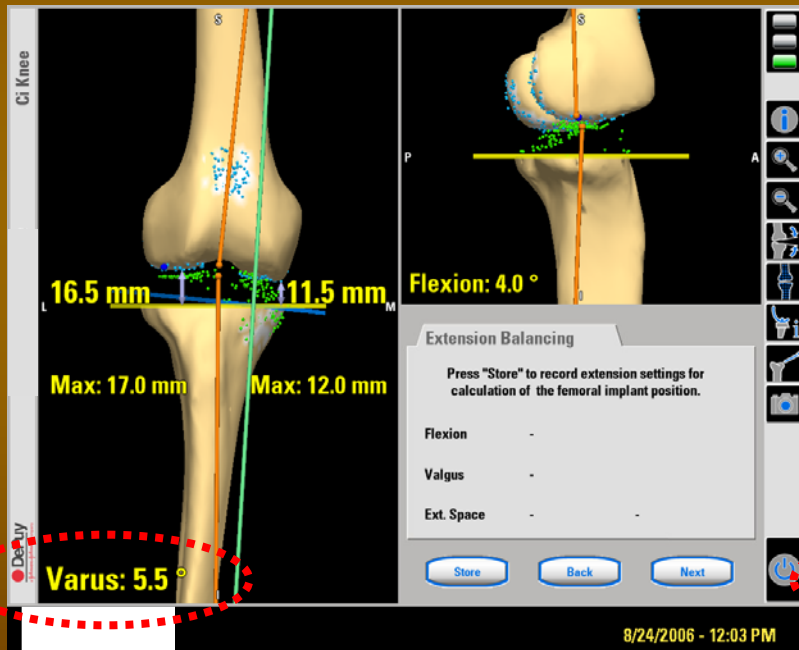
- No further soft tissue release was required

- Bone cuts and implantation carried out as usual

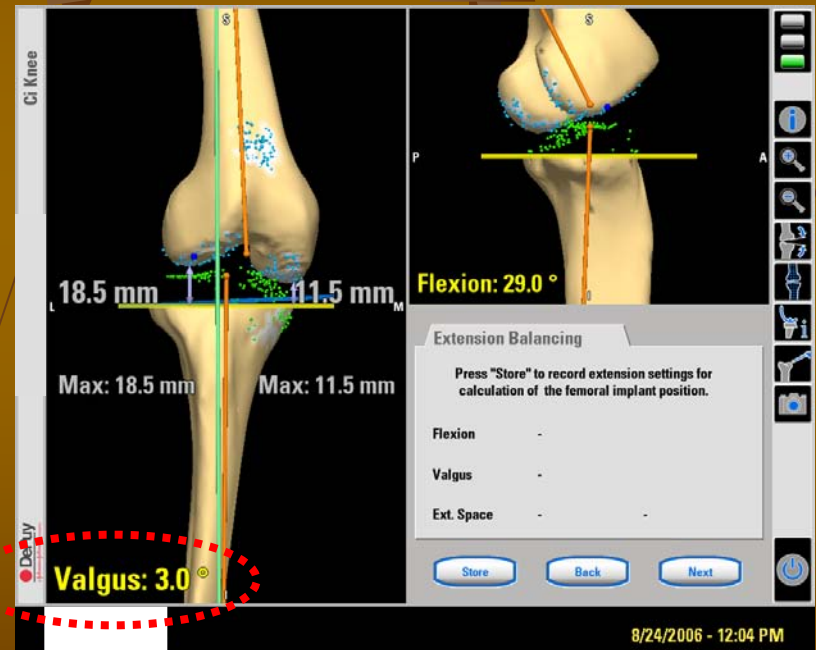
- 5 knees (20%)

Varus Knee with Significant Posterior Medial Capsule Tightness – Type 2

14 knees (56%)



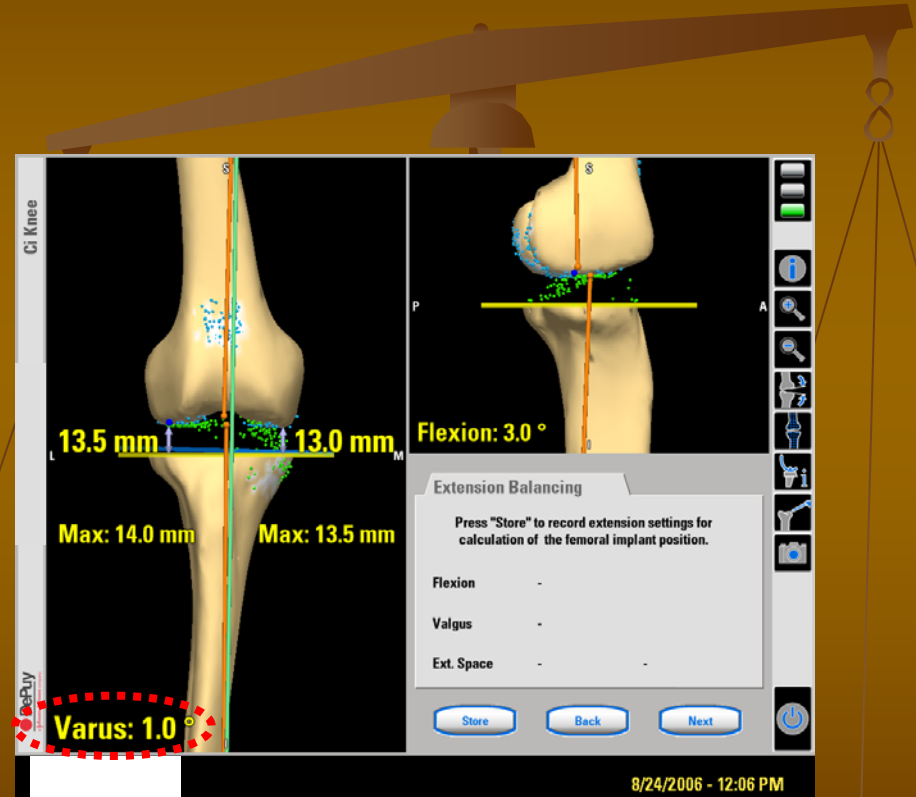
Full Extension



30 Degrees Flexion

Release in Varus Knee with Significant Posterior Medial Capsule Tightness – Type 2

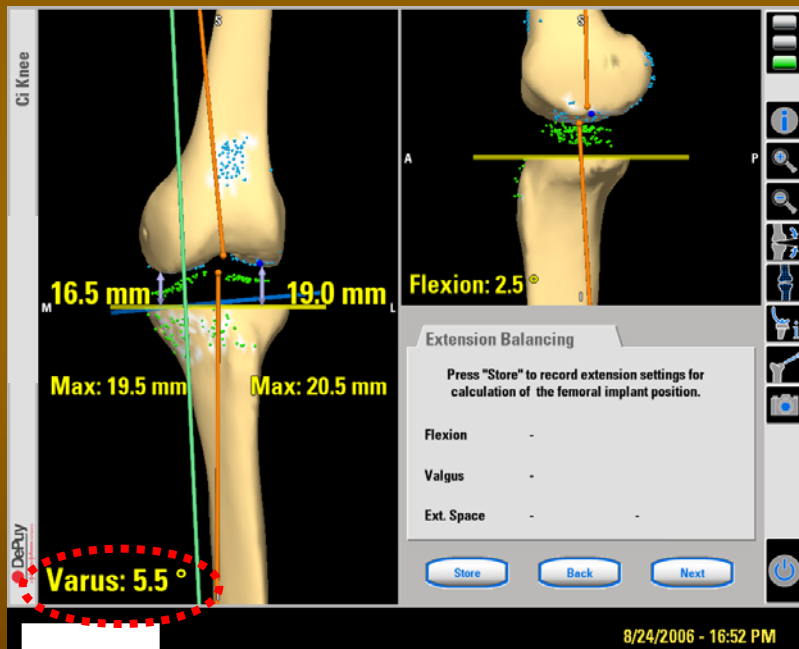
- Stepwise sequential release under navigation control
 1. Removal of Residual posterior tibia osteophyte
 2. Subperiosteal release of posterior tibial capsule down to 2- 3 cm from joint line
 3. Release of the Semimembranous tendon
- Target: +/- 2 degrees from the neutral alignment



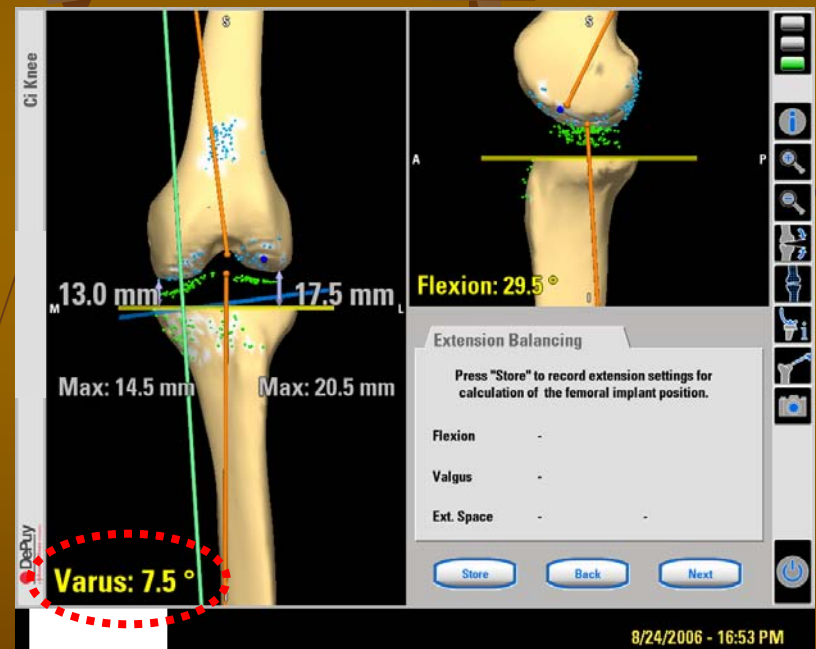
Full Extension

Varus Knee with Stretched Out Lateral Collateral Ligament – Type 3

6 knees (24%)



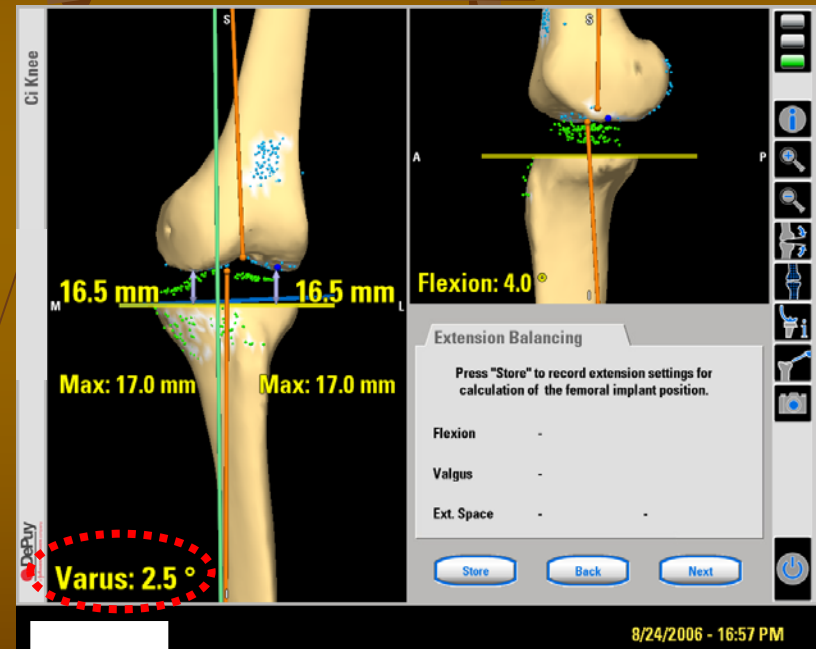
Full Extension



30 degrees Flexion

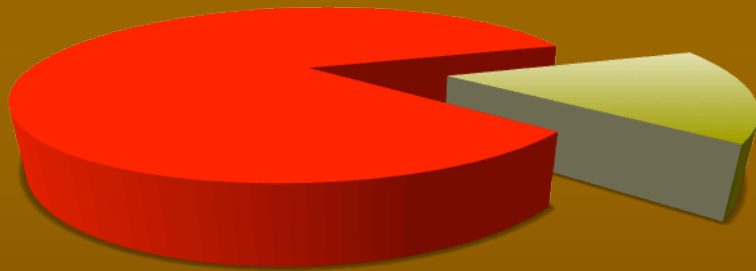
Release in Varus Knee with Lateral Collateral Ligament Stretched Out – Type 3

- Stepwise sequential release under navigation control
1. Release of superficial MCL down to a level 4 cm below joint line (Never detach it below the level of pes anserinus)
 2. Medial tibial reduction osteotomy (*Richard Scott 2004, JOA 19*)
- No need to use constrained prosthesis in all these 6 knees

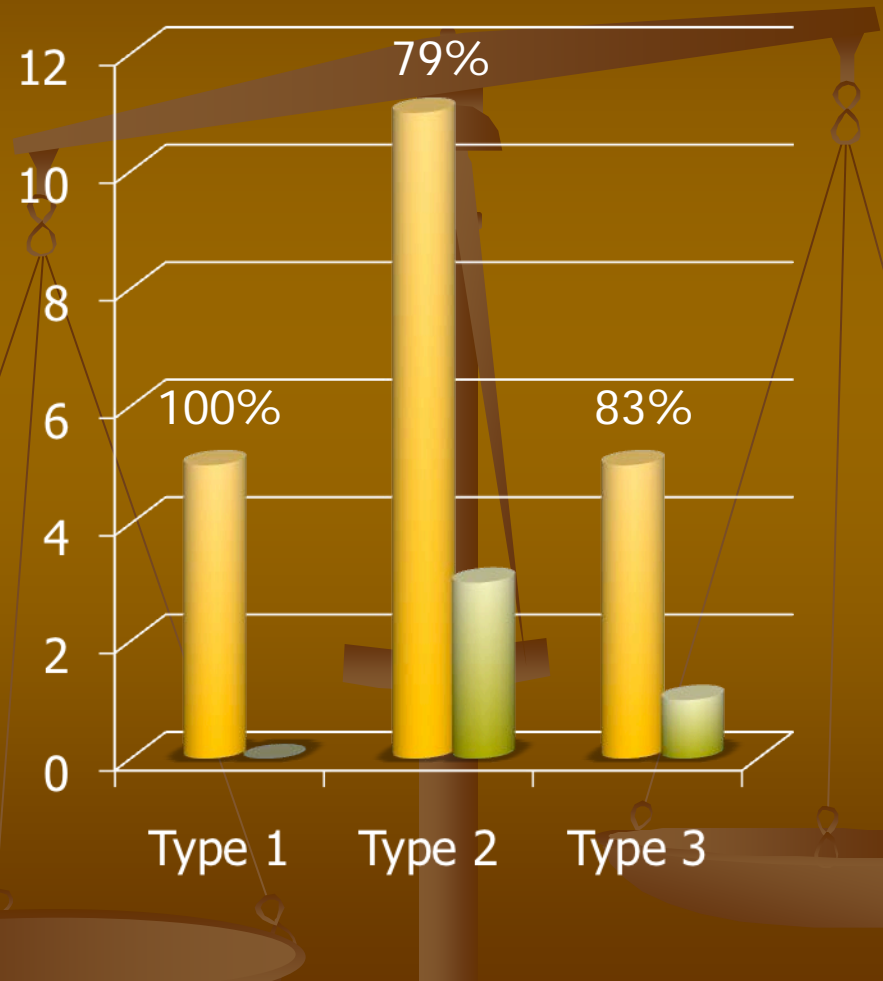


Result of Satisfactory Ligament Balance

Satisfactory Balance
84% (21 TKRs)



Failed Balance
16% (4 TKRs)



References:

- Sparmann M, Wolke B, Czupalla H, banzer D, Zink A. Positioning of total knee arthroplasty with and without navigation support: a prospective randomized study. *J Bone Joint Surg Br* 2003; 85:830-35.
- Matzilolis G, Krockner D, Weiss U, Tohtz S, Perka C. A prospective, randomized study of computer-assisted and conventional total knee arthroplasty: three-dimensional evaluation of implant alignment and rotation. *J Bone Joint Surg Am* 2007; 89:236-43.
- Dixon M, Parsch D, Brown R, Scott R. The correction of severe varus deformity in total knee arthroplasty by tibial component downsizing and resection of uncapped proximal medial tibia. *J Arthroplasty* 2004; 19:19-22.