Clinica Ortopedica e
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Università degli Studi di Pavia

Fondazione IRCCS Policlinico
San Matteo

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Fixed Unicompartmental Knee Arthroplasty in Young Osteoarthritic Knee

F. Benazzo, SMP Rossi, M. Ghiara

Disclosure

- LimaCorporate Consultant, Conceptor
- Zimmer Consultant, Conceptor
- Ceramtec Consultant
- Fidia Consultant

UNI and Young Patients Focus on

- Dilemmas
- Indications and contraindications
- Implant selection with specific indications
- Up-to-date indications (combined implants, ACL reconstruction, postrauma/osteotomy)
- Return to sport

Dilemmas

2012

- Surgeons, given identical information, do not concur on treatment for patients with the same pathology.
- Decision making process heavily influenced by radiographic findings but individual surgeons are consistent with their own treatment choice.
- **Consensus treatment for medial osteoarthritis of the knee remains in question.**

Dilemmas

Review

Uncertainties surrounding the choice of surgical treatment for 'bone on bone' medial compartment osteoarthritis of the knee

Andrew Price [a,b,*], David Beard [a,b,*], Emmanuel Thienpont [b]

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- If a more standardised approach to offering this surgical care is to be achieved, then improved decision support for patients around this specific treatment choice will be required.
- Comprehensive comparative data across the three treatment options (UKA;TKA;HTO) is not available.

Dilemmas

Uni vs TKR

- preservation of bone stock and soft tissues,
- more natural gait pattern and kinematics,
- improved range of motion
- reduced operative time
- reduced incision size.

Dilemmas

Gait:

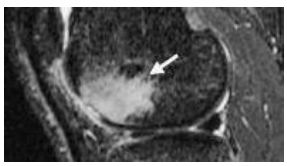
No differences were noted between the groups (UKA or HTO) other than at 3 months after surgery when there was a significant difference in the time-distance variable of gait in favor of UKR. This became insignificant at 1-year and 5-year follow-up

Borjesson M, Weidenhielm L, Mattsson E, Olsson E:
Gait and clinical measurements in patients with knee osteoarthritis after surgery: a prospective 5-year follow-up study.
Knee 2005, 12:121-127

Indications

Classic:

- Unicompartmental degenerative disease (medial or lateral) with mild degeneration of the opposite side
- Painful osteonecrosis/osteochondritic involvement of the femoral condyle, with or without rim narrowing



Indications

Classic:

- Deformity of the anatomical axis of the limb due to narrowing of the joint line for the degenerative disease and not to deformity of the tibia (schuss x-rays view)
- Deformity correctable manually (stress x-rays) and therefore surgically, with the thickness of the implant

Indications

Classic:

- Healthy (functionally valid) ACL
- Full or almost full flexion (ROM almost normal)
- Finger sign positive
- Age > 60 years
- BMI < 30
- Varus /valgus deformity < 10°
- Flexion contracture < 10°

Indications

Enlarged:

- Age < 60 years
- BMI >30 … < 32
- Presence of degenerative patello-femoral joint without anterior knee pain (no full-thickness chondral lesions or lateral facet involvement)

Indications

Enlarged:

- ACL deficient knee➔ <u>frequent in young patients</u>

- low demanding patients → tibial slope < 7°
- Possibility of ACL reconstruction together with the UNI

Indications

<u>ACL and Tibial slope:</u>

- >7° should be avoided
- particularly if the anterior cruciate ligament is absent at the time of implantation.
- An intact anterior cruciate ligament, even when partly degenerated, was associated with the maintenance of normal anteroposterior stability of the knee for an average of sixteen years following unicompartmental knee arthroplasty.

Hemigou P, Deschamps G:
Posterior slope of the tibial implant and the outcome of unicompartmental knee arthroplasty.
J Bone Joint Surg Am 2004, 86:506-511

Implant selection

1) Resurfacing
2) Measured resection

Different philosophies
Slightly different indications

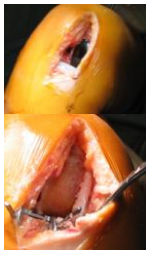
➔Choice is a matter of age

Implant selection

Resurfacing:

- *"la uni c'est du resurfaçage"* by Philippe Cartier

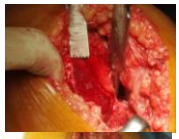
➔ bone sparing and of respecting the joint physiology
➔ respect of the so called "Cartier angle"(angle of tibial varus deviation)
➔ Reaming of the cartilage surface on the femoral side.



Implant selection

Measured resection:

- Implants and concepts that are closer to a total knee design and philosophy
- Tibial cut at 90° and a parallel cut on the femoral side (based upon the tibial cut)



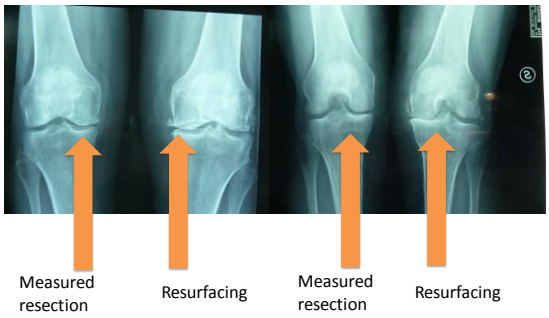
Implant selection

Indications

Our experience : resurfacing in case of more degenerated OA with condylar recession

➔Less bone to be removed

➔Easier to avoid overcorrection



Implant selection

Fixed vs mobile

- Good results with both implants
- Different philosophies
- Different techniques

Implant selection

Indications:

- No specific indications according to each specific design

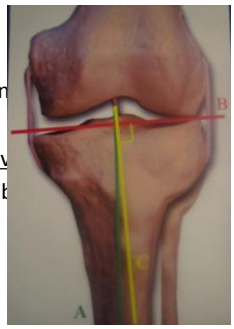
Our opinion:

- ACL concomitant reconstruction, partially deficient ACL: fixed bearing
- Lateral OA: fixed bearing

Surgical technique: medial Uni

No matter the implant design

- Tibial sagittal plane: slope = n
- Tibial coronal plane: - 90°
  - Pristine v
- Osteophytes removal from tib release



Surgical technique: medial Uni

No matter the implant design

- Femur: central /slightly lateral positioning of the femoral component on the condyle, avoiding notching with the tibial spine
- Balancing: slight looseness to avoid lateral overloading (1-2 mm)

Surgical technique: lateral Uni

No matter the implant design

- Femur: no osteophyte removal from femoral condyle. The osteophytic overgrowth can be used to support the femoral component particularly on hypoplastic condyles
- The component must be implanted as lateral as possible
- Some remaining valgus (no full correction)

Up-to-date indications

Uni solo: “one finger sign” + slight AKP with only medial facet involved

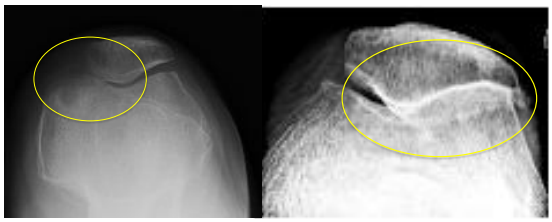
Beard et al
The influence of the presence and severity of pre-existing patellofemoral degenerative changes on the outcome of the Oxford medial unicompartmental knee replacement

Pre-operative clinical and radiological assessment of the patellofemoral joint in unicompartmental knee replacement and its influence on outcome JBJS Br, 2007

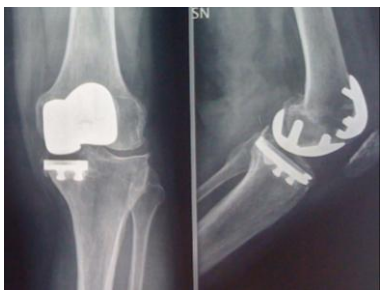
F. Benazzo, S. M. P. Rossi, L. Piovani, A. Combi, S. Perle
Bi-uni und bi-uni + femoropatellarer Gelenkersatz 2012

Up-to-date indications

Up-to-date indications



Up-to-date indications



Up-to-date indications

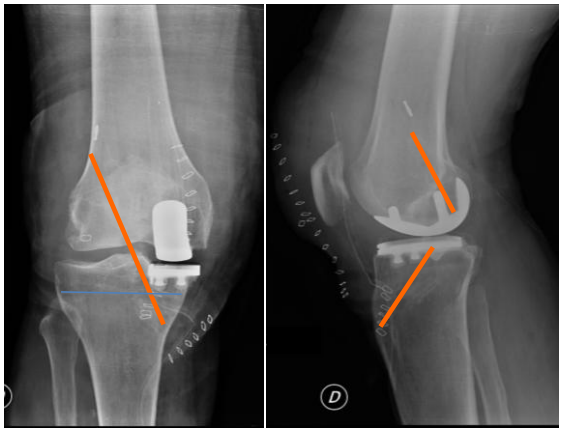
Considerations

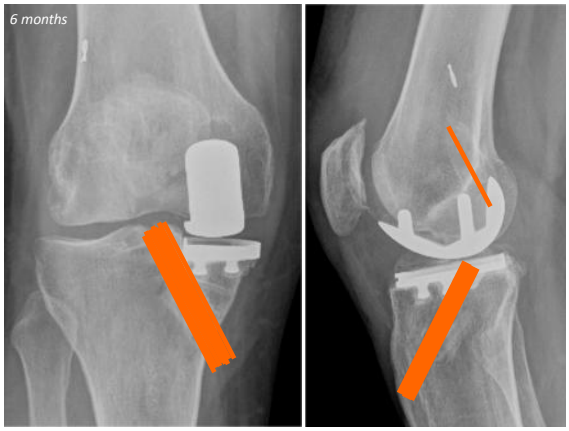
- Uni insufficient to improve patellar tracking and provide pain relief if lateral facet involved
- TKA is an overkilling solution: ACL sacrificed, lateral compartment sacrificed

Up-to-date indications

Uni and acl: technical issues

- tunnel positioning
- approach
- stability of the implant





Up-to-date indications

Uni + ACL Trans-tibial approach

Problems:

- Tunnel widening
- Possible secondary impingement with metal back
- Possible tibial baseplate subsidence

Up-to-date indications

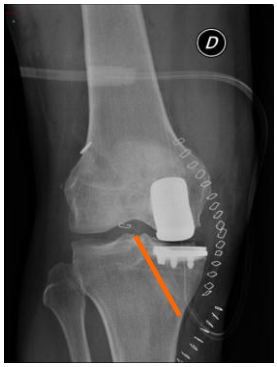
Our solution: Acl trans-am reconstruction

- Tunnel widening: unavoidable
- Prosthesis site placement: unchangeable
- Transfer tibial tunnel from medial site closer to tt, producing an anatomic foot print

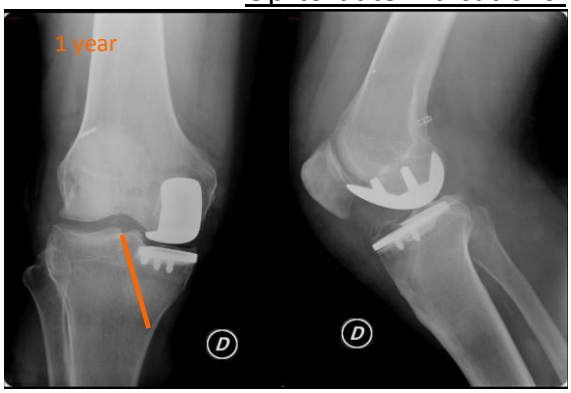
Move away tunnel from prosthesis

Reduce likelihood of impingement between new-ACL and baseplate

Up-to-date indications



Up-to-date indications



Lateral UNI

➔ Lateral arthritis: 10% of patients with knee OA

- Valgus knee
- Post-traumatic
- Post-osteotomy

Lateral UNI

Lateral UNI

Lateral UNI

Lateral UNI

Return to sport

- More patients returned to or increased sports following UKA (P=.0003), but no sooner than TKA patients.
- Patient-perceived Oxford and modified Grimby scores were better and sporting activity was greater following mini-incision UKA compared to TKA.

Walton et al
Patient-perceived outcomes and return to sport and work: TKA versus mini-incision unicompartmental knee arthroplasty.
J Knee Surg. 2006 Apr;19(2):112-6.

Return to sport

- The majority of patients returned to sports and recreational activity UKA
- However, the numbers of different disciplines patients were engaged in decreased as well as the extent of activities.
- Activities in which most patients participated were primarily low- or midimpact.
- Patients scored higher on the SF-36 than age-related norms, which might be due to the patient-selection process for unicompartmental knee arthroplasty and geographical differences.

Naal et al
Return to sports and recreational activity after unicompartmental knee arthroplasty.
AJSM, 2007

Conclusion

- UKA is a valid option to address the unicompartmental degenerated knee
- Age is not anymore a limitation, assuming that surgery is correctly performed
- Young patients can benefit from this procedure, including those who seek for sport activities

VuMedi Webinar
HTO vs UKR

Mobile UKR

D Murray

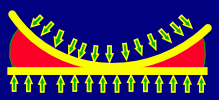
Disclosure:
Personal & Institutional support - Biomet

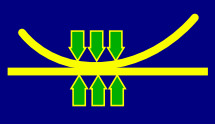
High Activity patients

- Concern
  - ? Causes UKR wear & failure
- Fixed bearing UKR
  - Wear inevitable esp second decade
  - Small contact area, high contact stress
  - Thin polyethylene
- Normal Knee
  - Wear prevented by meniscus
  - Reproduce function of meniscus

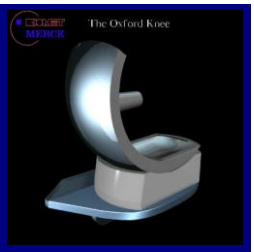
Minimise wear

- Reproduce meniscus
  - Full congruent contact in all positions
- Only achieved with
  - Mobile bearing
  - Spherical femur



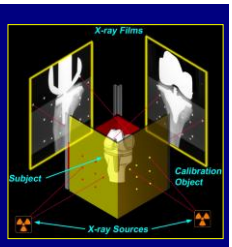


Oxford knee 1976
Articulation unchanged



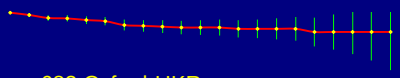
- Femur spherical (1mm error)
- Tibia flat
- Mobile Bearing
  - Fully congruent - low wear
  - Unconstrained - low loosening

20 year wear in vivo



- RSA (Kendrick et al 2010)
- 7 knees, Phase 2
- Wear 0.4mm (max 0.6mm)
- Rate 0.02mm/yr (max 0.03)
- Order of magnitude less than fixed
- Ideal for young active patients

Independent Results (Svard 2006)



Survival %

683 Oxford UKR

20 yr survival 92% CI 15

Better than other UKR

No failures due to wear

OA progression 2% at 20 yrs

Years

Phase 1 study (Svard 2013)

- 1983 to 1988 – 25 to 30 years ago
- 125 implants (104 patients)
- 80% Dead, alive reviewed mean 25yr
- 90% Definitive knee replacement with no revision & Good/Excellent HSS score
- No TKR has better results

Medial OA – optimal treatment

- Young (? <60 25% of cases)
  - –UKR v Osteotomy
  - –Debate – no good comparative evidence
- Old (? >60 75% of cases)
  - –UKR v Osteotomy
  - –UKR better - no debate

UKR v HTO in elderly

- UKR definite solution
  - – Rapid recovery, Low morbidity, Good function
  - – 90% patients die with without revision and with good clinical outcome
- HTO
  - – Results not so good
  - – 15yr Comparative study (Weale 1994)
  - – Meta-analysis (Virolainen)

UKR v HTO in young Controversial issues

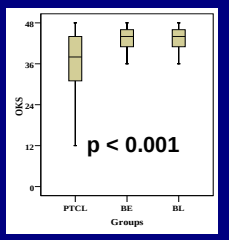
- Bone-on-bone or Partial thickness
- Activity level
- Extent of varus deformity
- ACL deficiency

UKR v HTO in young - Indications

- Bone – on – bone medial OA
  - UKR reliably relieve symptoms, good long term results
  - HTO – not so reliable
- Partial thickness cartilage loss
  - Diagnose – Xray or arthroscopy
  - UKR not reliable – contra-indicated
  - ? HTO ideal if associated with Varus

PTCL compared to Bone Exposed (BE) & Bone loss (BL)

- PTCL worse score and greater variability than BE or BL (OKS 36 v 43)
- PTCL 21% worse or no substantial improvement (ΔOKS<6). BE & BL all substantial improvement
- 4 complications (pain related) all PTCL (14%)



Gulati et al (2010)

Partial thickness loss

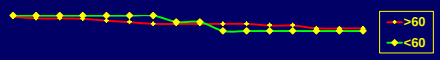
- UKR
  - Not reliable – contraindicated
  - Rare to have severe symptoms
- HTO
  - PTCL + varus ? Best indication
  - PTCL without varus ? Not indicated

Bone-on-bone HTO v UKR

- No RCT in young
- Age matched comparison (mean 55yr)
  - Distraction osteoclasis 76, 6yr mean
  - Oxford UKR 78, 6yr mean
  - OKS (0-48) - HTO 27 UKR 38
  - Perhaps not highly active
- HTO 10yr survival 66%
  - Other series 60% - 80%

Oxford age < 60yrs

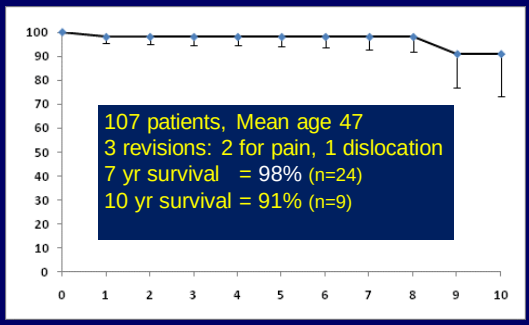
(mean 55, n=52, Price et al ESSKA 2000)



- 15yr 92%
- No significant difference (p=0.8)
- Appears to be reliable in young patients (50s)

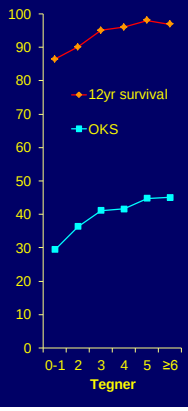
Years post operation

<50yr, 7 centre study



High level activity subgroup

- Does it compromise UKR outcome?
- Analysis of 1000 Oxford UKR with 5 to 15yr follow-up
- Overall with increased activity
  - Increased 12yr survival (p=0.025)
  - Increased OKS (p<0.01)
- High activity does not cause failure
- Pandit 2014



High level activity in UKR

- High activity group patients (Tegner ≥ 5)
  - (Tegner 5 = Heavy labour, competitive cycle, jog uneven ground)
  - n=115
  - 12 year survival 97.3% (95%CI: 92-99).
  - OKS 45 (SD 5)
  - KSS-O 82 (SD 16) KSS-F 95 (10)
- Activity does not compromise outcome
- Not contraindication, can be recommended

High activity in HTO

- Tegner score ≥ 5
- Bone on bone arthritis
- 12 year survival ??? – not nearly 97%
- Mean 6 year clinical follow-up
  - OKS ??? – not as good as 45

Activity - summary

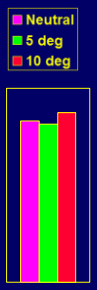
- UKR function well so high activity achieved
- High activity does not cause failure
- Is high activity so reliably achieved after HTO and if so is long term survival so good?

Tibia vara & medial OA

- Determine site and severity of deformity
- Intra-articular (usually 5º to 10º)
  - Corrected by operation
- Extra-articular (usually 0º to 10º)
  - Tibia vara
  - Not corrected by operation,
- Alignment restored to pre-disease state
- ? Does tibia vara compromise outcome?

Tibia Vara & Oxford UKR

- Incidence of tibia vara
  - 5º tibia vara 20%
  - 10º tibia vara 5%
- Tibia vara
  - Does not cause long term failure
  - Does not compromise function
- Tibia vara not contra-indication

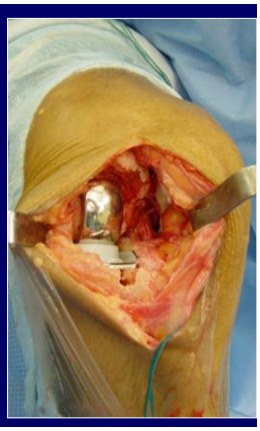


ACLD & medial OA

- Primary ACLD with secondary medial OA
- Postero-medial tibial defect
- Combined UKR & ACLR if
  - Young and active
  - Bone on bone
  - Normal MCL & lateral side (stress Xray)

Technique

- Depends on presenting symptoms
- Pain
  - Simultaneous procedure
  - Open, BTB
- Instability
  - ACL first
  - Arthroscopic, Hamstring
  - UKR if symptoms persist



Results
(Weston-Simons 2013)

- 52 cases
- Mean age 51yr (36-57)
- Mean follow up 5yr (1 – 10)

- 10yr survival 91%
  - 2 failures – infected, lat OA

- Mean OKS 41
- 98% pleased
- Kinematically normal

Other factors to consider

- Predictability – UKR better
- Speed of recovery - UKR better
- Cosmesis - UKR better
- Ease of revision
  - UKR usually simple (fracture & infection)
  - HTO variable (? Opening wedge easier)

Summary

- Medial OA, bone-on-bone, intact ACL
  - UKR better (function, survival, etc)
- Partial thickness loss
  - UKR contraindicated
  - ? HTO if associated varus
- Very young (<40), Very high activity (contact sport), ACLD deficient
  - Still debatable (we do UKR)

The Role of Osteotomy around the knee

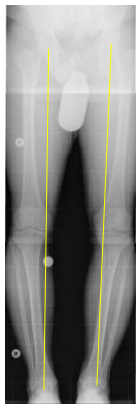
Ph. Lobenhoffer

Disclosures:
I have no financial relationship to techniques or products mentioned in this presentation

AO Trauma Europe

sports medicine
Hannover – München - Innsbruck – Bozen

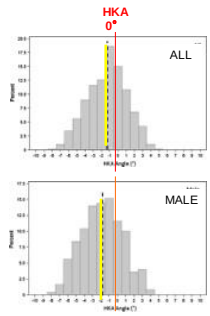
Frontal plane alignment



HKA: mechanical axis femur / tibia

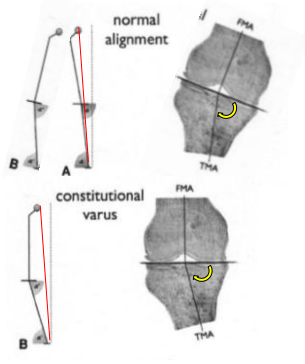
Constitutional Varus deformity:

- 32% males
- 17% females

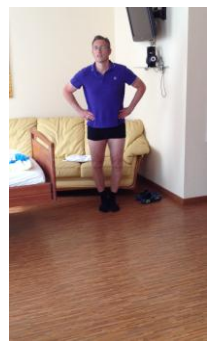


Bellemans CORR 2012

Constitutional Varus

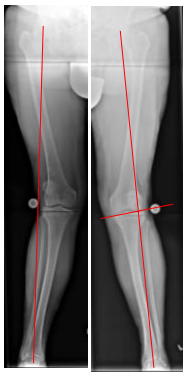


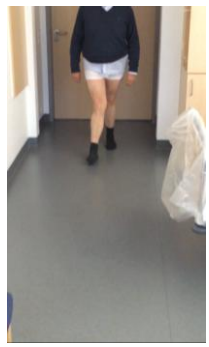
J. Victor CORR 2013



knee outwards
foot inwards
WBL shifts medial

Constitutional Valgus





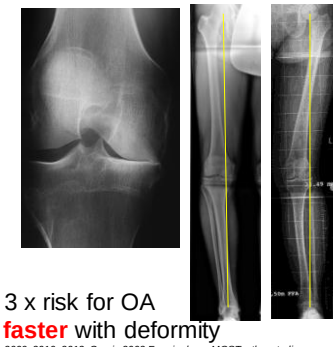
Knee inwards
foot outwards
WBL shifts lateral

Epidemiology

Osteoarthritis is a disease of mechanics

D.T. Felson JAMA 2013

A frontal plane deformity more than 3° leads to osteoarthritis and should be corrected



4 degrees of deformity: 3 x risk for OA
Progression **10 to 20 x faster** with deformity

Felson 2013, Brouwer 2007, Sharma 2001, 2009, 2010, 2012, Cerejo 2002 Framingham, MOST, other studies

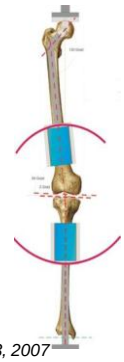
Biomechanical Study

6 human knees

Axial load in mechanical testing system (mts) in extension

Bi-cardanic fixation

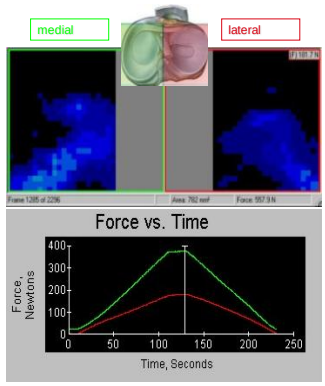
Ligaments and menisci intact

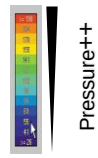


Agneskirchner, Hurschler, Lobenhoffer , Arthroscopy 23, 2007*

Varus Malalignment

0%

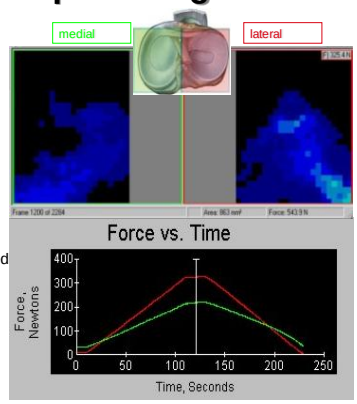




Agneskirchner, Hurschler, Lobenhoffer Arthroscopy 23, 2007

Open wedge HTO

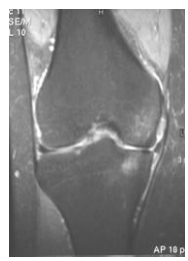
WBL to 62%
HTO 9mm,
MCL 100% released



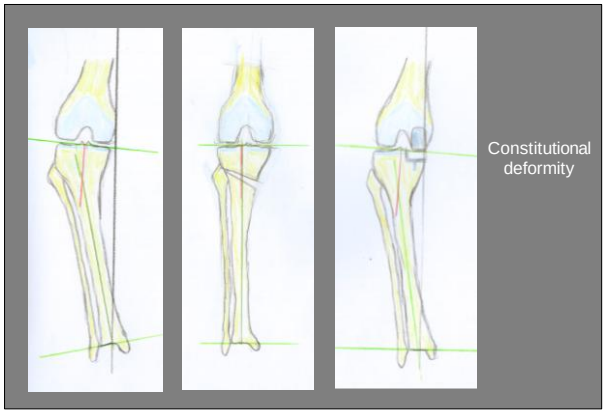
Agneskirchner, Hurschler, Lobenhoffer Arthroscopy 23, 2007

Indication for osteotomy

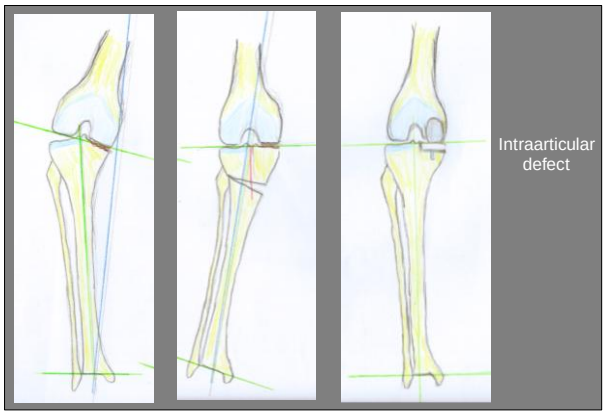
- Congenital deformity
- Posttraumatic deformity
- Unilateral Osteoarthritis



Frontal plane alignment and correction



Frontal plane alignment and correction



Patient criteria

Metaphyseal deformity (TBVA)

Tibial Bone Varus Angle

Tibial **B**one **V**arus **A**ngle	**Good / excell. 10-y. results**
>5°	83%
2-5°	71%
0-2°	56%
<0°	36%

Bonnin,Orthopäde 2004
Niemeyer Arthroscopy 2009

HTO Survival Rate

	5 Jahre	10 Jahre	> 10 Jahre
Insall	85%	66%	
Yashuda	63%	18%	
Berm			
Ruda			
Matth			
Rinin			
Ivarss			
Herni			
Aglie			
Levig			
Gstöt			
Van F			
Akizuki		98%	90%
Flecher			85%
Billings	85%	53%	

Cochrane Database :
Brouwer et al 2007
Silver Evidence:
70% of patients benefit from an osteotomy for 10 years

HTO Survival Rate

	5 Jahre	10 Jahre	> 10 Jahre
Insall	85%	66%	
Yashuda	63%	18%	
Akizuki		98%	90%
Flecher			85%
Billings	85%	53%	

Spahn G, KSSTA 2013
46 studies HTO

5-8 years after HTO:
91% no further surgery

9 – 12 years after HTO:
84% no further surgery

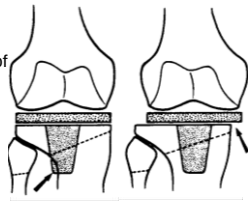
Valgus HTO Closed Wedge



Lateral translation of shaft

Impaction medial hinge

Loss of correction

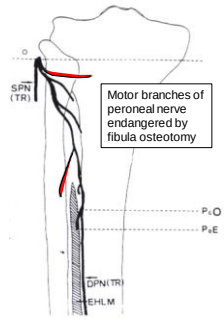


Pape et al. Orthopäde 2/2004
42 Pat RSA-Analysis HTO
Convent. implant > 8° correction

week 0 – 3:
3 mm. fragment movement

HTO lateral closed wedge
Lesions of peroneal nerve

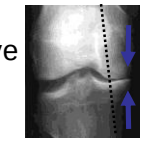
Coventry 1988	**3.3%** 30 Osteotomies
Jackson 1974	**11,9 %** 229 Osteotomies
Vainionpää 1981	**2%** 103 Osteotomies
Aydogdu 2000	**27%** (EMG) 11 Osteotomies



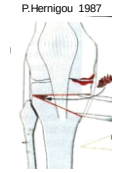
Kirgis, A., JBJS 1992

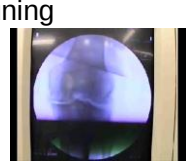
Open Wedge HTO

No fibula osteotomy
No risk for peroneal nerve
No muscle detachment
Only 1 osteotomy cut
Intraoperative fine-tuning
No leg shortening



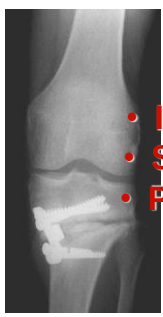
W. Blauth 1986
P.Hernigou 1987





GC Puddu 1999

Problems Open Wedge Osteotomy



- **Stability**
- **Implant failure**
- **Slope increase**
- **Pseudarthrosis**

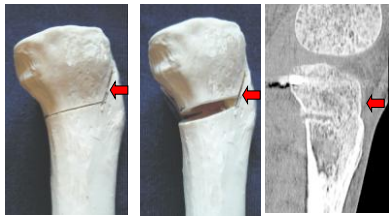
Lobenhoffer KSSTA 2003, Paccola KSSTA 2004, Jakob A´scopy 2004

Open wedge biplanar Tomofix

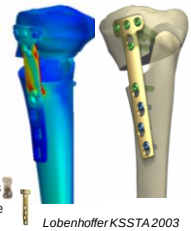
Increased stability

Rapid healing full weight-bearing

Locking screws



3 weeks postop

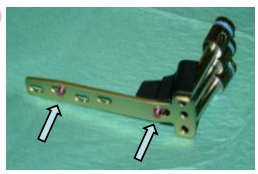


Hannover 1998 – 2000: 101 HTO spacer plates 6 implant failures

Hannover 2001 – 2006: 807 HTO with Tomofix no implant failure

Lobenhoffer KSSTA 2003

Percutaneous Plate fixator Tomofix

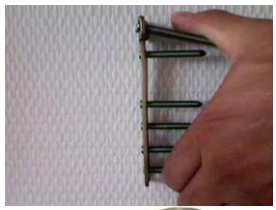


Distance holders

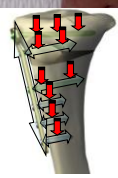
- Subcutaneous placement
- No compression of MCL, Pes anserinus

Spontaneous bone healing

No substitute or graft necessary



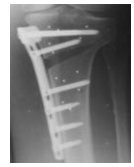
Elastic motion induces callus formation



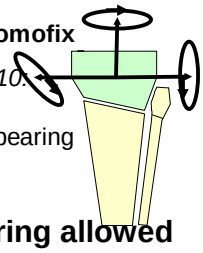
2 Y. postop

Stability

RSA studies



Heerwaarden 2006:
42 cases open wedge Tomofix
no relevant migration,
no difference to closed wedge Tomofix



Heerwaarden Acta Orthop Scan2010:
14 vs 23 patients
full weight-bearing /partial weight bearing

no differences after one year

Immediate full weight bearing allowed

Brinkman, Lobenhoffer, Agneskirchner, Staubli, Wymenga, Heerwaarden JBJS (Br) 12, 2008

TomoFix TM retrospective study

Functional outcome assessment in patients treated with open wedge high tibial osteotomy (HTO) for knee osteoarthritis using Tomofix™.

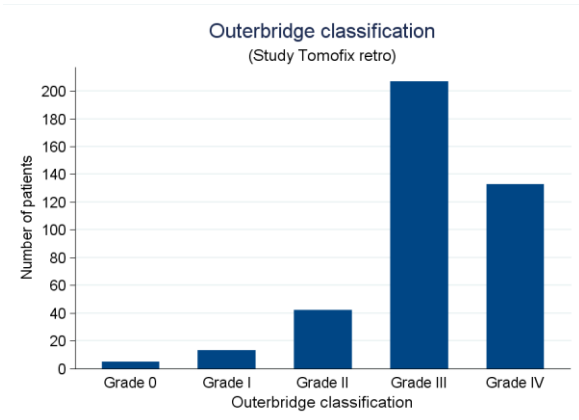
533 patients, 3 centers, op. 4/2004 to 4/2006

75% follow-up rate, BMI 27, 9,8 mm opening

AO Foundation
Clinical Investigation

- **D. Freiling**
- **S. Meyer**
- **S. Friedmann**
- **P. Lobenhoffer**
- **A.Staubli**
- **S. Schröter**
- **D. Hoentzsch**

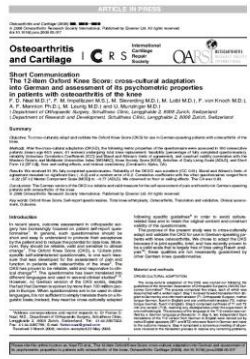
Flörkemeier et al, KSSTA 1/2013



Oxford Knee Score (OKS)

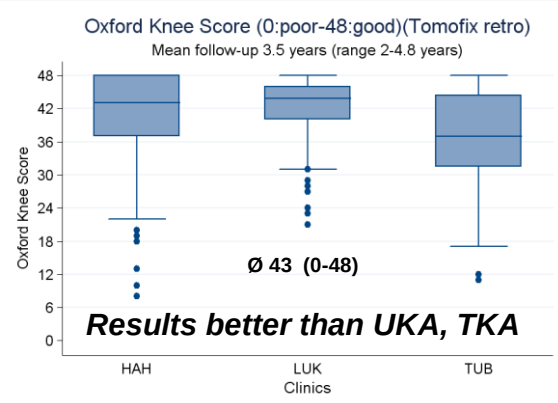
- Subjective score
- Internationally accepted
- Available in Englisch
- Translated/Validated by AOCID
- 12 questions, 5 answers
  - (excellent 4 P., bad 0 P.)
  - 48 points: excellent result
  - 0 points: bad result
- Comparison with Unicondylar and Total Knee

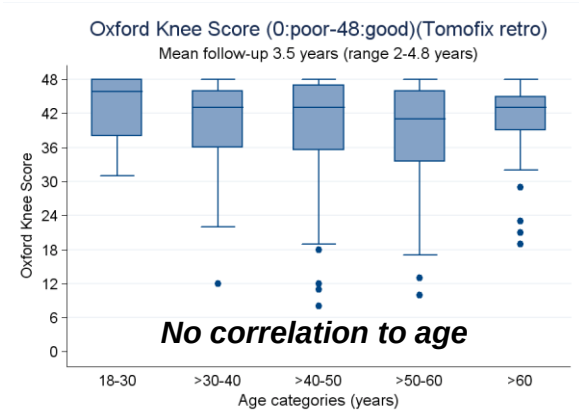
- Present version of OKS:
- 48 points best result
- 0 points worst results

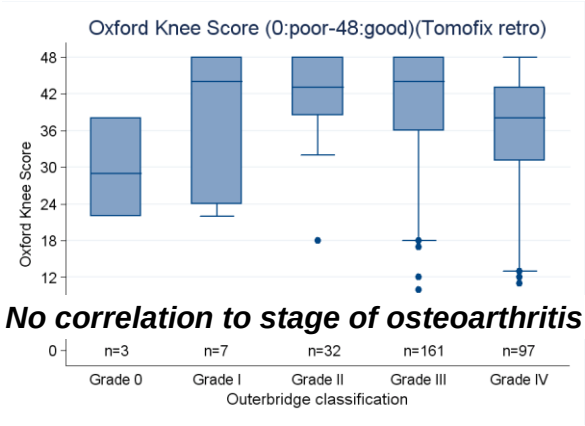


Osteoarthritis and Cartilage

Short Communication
The 12-item Oxford Knee Score: cross-cultural adaptation into German and assessment of its psychometric properties in patients with osteoarthritis of the knee



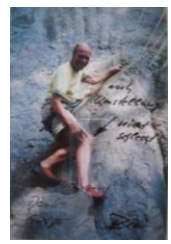




No correlation to stage of osteoarthritis

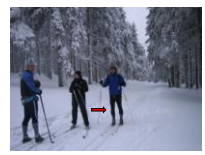
Activity

6 Mo. after Tomofix both sides



6 Mo. after Tomofix right side

3 Mo.after Tomofix right side



3 Mo. after Tomofix right side

Studies Tomofix

Salzmann GM, Imhoff, AB et al AJSM 2009

65 patients Tomofix 36 months postop

91% engaged in sports activity

2 sessions /4 hours per week

Lysholm 70, Tegner 4,3

Downhill skiing, mountain biking

W., U., 51 y., male
former German champion 400 m running
orthopaedic surgeon
2 x arthroscopic debridement, medial meniscectomy

Medial pain
ADL

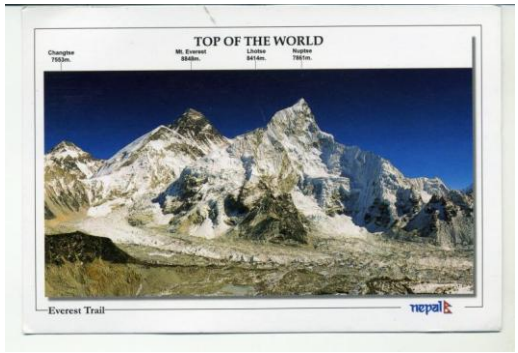
W., U., 51 y.

PreOP Plan Software: 7° correction, 10 mm opening

W., U., 51 y.

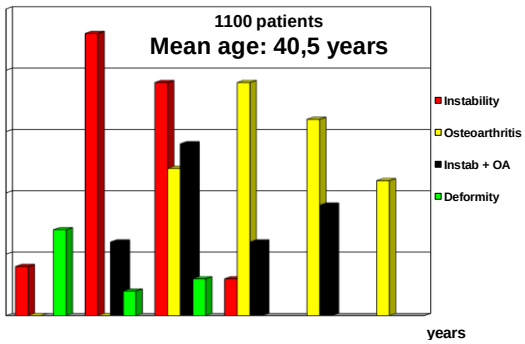
FWB and working 5 weeks postop

W., U., 51 y., male, 9 months postop



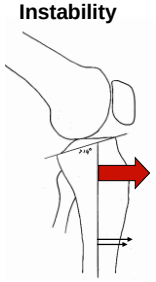
9 months postop: 10 days trekking up to 6000 m.
no pain!

Age of osteotomy patients Hannover

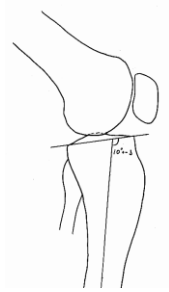


Effect of Tibial Slope on Stability

PCL Instability

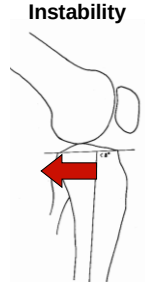


Flexion Osteotomy: Slope increase



10°

ACL Instability



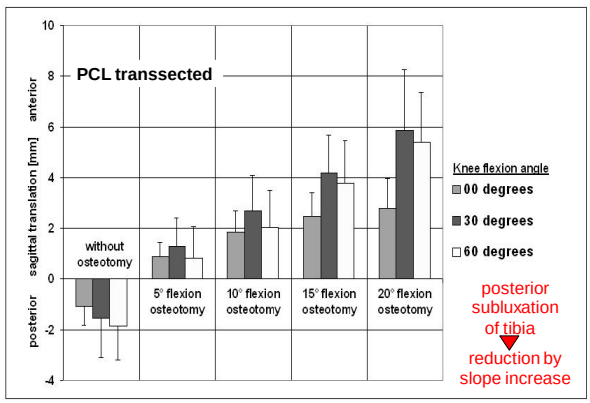
Extension Osteotomy: Slope reduction

Biomechanical Study

- Human cadaver joints
- Flexion osteotomy
- Gradual increase of slope (0° ⇒ 5 ° ⇒ 10° ⇒ 15° = 20°)
- Computer-regulated isokinetic extension movement of knee (Knee Kinemator)

J. Agneskirchner, C. Hurschler, A. Imhoff, P. Lobenhoffer
Winner of AGA DonJoy Award 2004
Archives Orthop Trauma Surg 4/2004

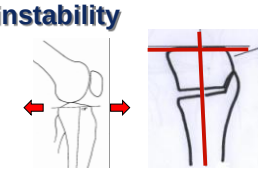
Results Kinematics



Slope reduction in anterior knee instability

Tibial Slope	Anterior Translation force
0°	130 N
5°	235 N
10°	340 N
15°	443 N
20°	541 N

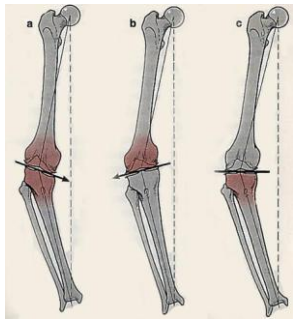
70 Kg, 20° Flexion, monopedal stance

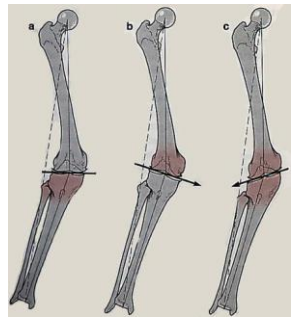


10° slope difference produce 6,8 mm. anterior translation of tibia in monopedal stance

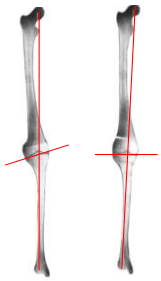
M. Bonnin, Lyon 1990

Site of deformity





What have we learnt?



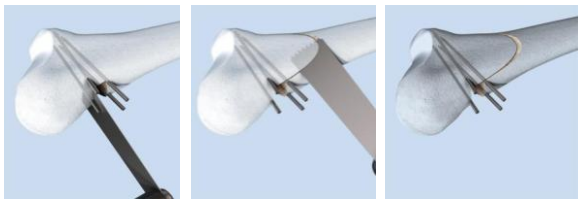
Not all deformities can be adressed at the tibia

The importance of the joint line

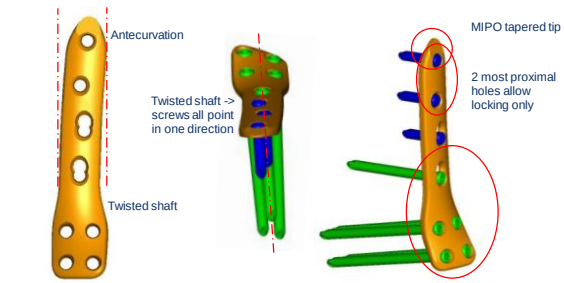
Femur biplanar closed wedge osteotomy technique

post 2/3 femur: transverse bone cuts of closing wedge along K-wires

ant 1/3 femur: ascending bone cut parallel to posterior femur cortex



Design new Tomofix MDF plate



Optimal anatomic fit

Even load distribution for increased stability

Less invasive

Optimized for osteotomies

46

www.sportsclinicgermany.com

M.S., male, 46 y., tennis trainer

M.S.,male, 46 y.

Double osteotomy

LDFA 90°

MPTA 82°

Femur closed wedge 7 mm
Tibia closed wedge 11 mm

Double osteotomy

Femur closed wedge
7 mm
Tibia closed wedge
11 mm

1 week postop

Double osteotomy

4 days postop

Double osteotomy

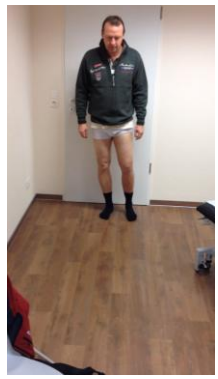
Femur closed wedge
7 mm
Tibia closed wedge
11 mm

6 weeks postop

Double osteotomy

6 weeks postop

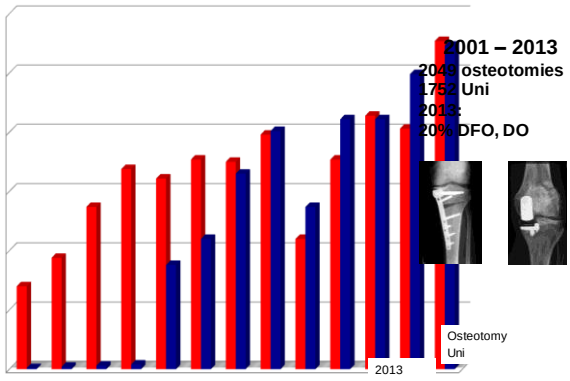
Double osteotomy



Left side:
Femur closed wedge
7 mm
Tibia closed wedge
11 mm

6 weeks postop left side

Osteotomy versus Uni



Key Points

Renaissance of osteotomy

- Osteotomy around the knee works
- Best indication metaphyseal deformity
- HTO can treat ACL/PCL deficiency
- Plate fixator/biplanar technique is safe
- Osteotomy stimulates regeneration in involved compartment

Thank you


Kniegelenknahe Osteotomien
Thieme
관절 절골술
Kniegelenknahe Osteotomien
ies around the Knee
KSSTA
Knee Surgery Sports Traumatology Arthroscopy
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Technical Pearls in OW HTO Avoiding Complications

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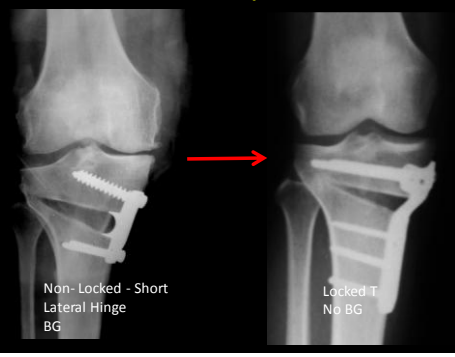
Complications

1. Overstuffing the joint
2. Lateral cortex break (6-20%)
3. Intra-articular Fracture (3%)
4. Changing the slope (1%)
5. Delayed (12%) / Nonunion (3%)
6. Loss of correction (1%)
7. Joint Line Tilt.

Martin et al, JAAOS 2014

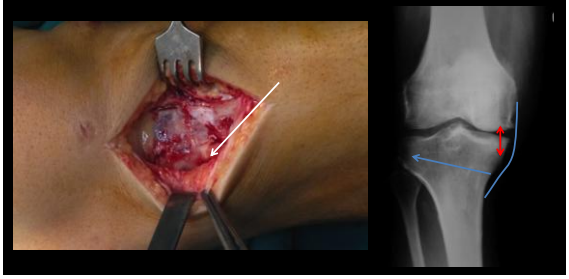
Technique



1- Overstuffing

- Proper MCL release

Lobenhoffer et al, 2007



MCL Release

2- Lateral cortex break

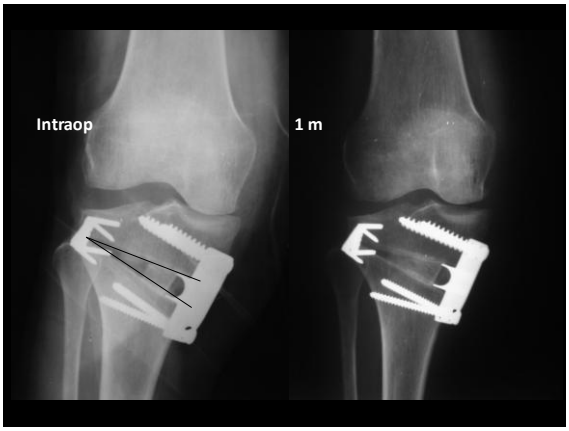
- 1 cm from lat. Cortex
  - Too short – Intra-artic fr.
- Lateral Hinge
  - Non-Locked plates
- Locked plates:
  - change principle - procedure
  - Positional Fixation – plate

Lateral cortex break

- Osteotomy too long
- Large opening
- Opening of lateral cortex.

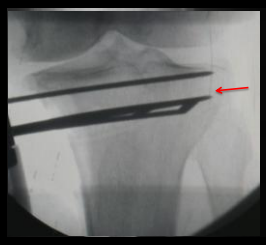
Lat. break - Ttt

- Expose Lateral hinge
- Axial & Valgus Pr.
  - Lat. cortex
- Staples



3- Intra-articular fractures

- Osteotomy:
  - Too high
  - Too short
- Use Image intensifier
- Saw Under Wire

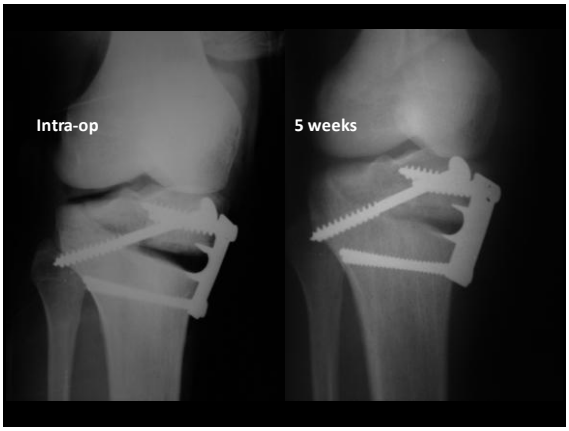


Intra-articular Fr.

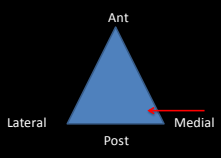
7 wks

Displaced:

Loosen screws, valgus force, Lag screw.



4- Changing the slope



- Inc Slope:
  - PCL deficient
- Dec Slope
  - ACL Def

PCL/Varus:

5- Delayed healing:

- 65% Locked plates
  - 10% length

Roderer et al, 2014

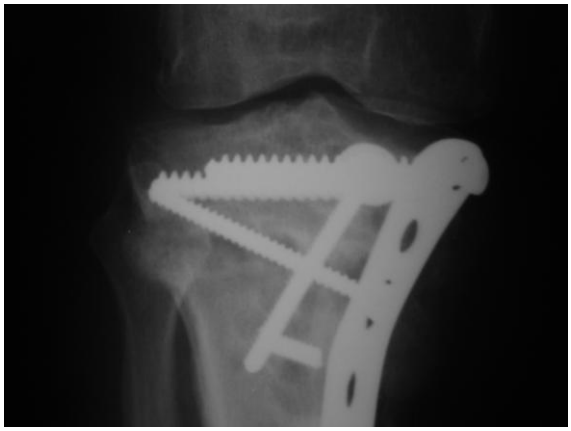
5- Non Union

13 m

- Mechanical
  - Inadequate fixation
  - Lateral cortex break
- Not Biological
  - No BG
    - El-Assal et al. KSSTA 2010

Long fixation ± grafting

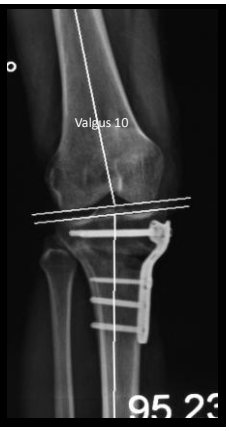
2.5 m



6- Loss of Correction:

- Undercorrection
- Weak fixation
  - Osteoporotic bone
- Locked plates

7- Joint Line Tilt:



Summary

- MCL release
- Locked Plates:
  - Lateral Cortex Break
  - Intra-artic Fr.
- Slope
- Delayed / Nonunion
- Loss of correction
- Joint Line Tilt