Εμβιομηχανικά Δεδομένα και Κλινικά Αποτελέσματα από τη χρήση του Buttonhole Soffix

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ACL Tear : A Silent Epidemic

ACL Tear Incidence (USA)

30/100.000/ year = 75.000/year

ACL Reconstructions (USA)

105.000/year

Success Rate 85%

15000 failures/year

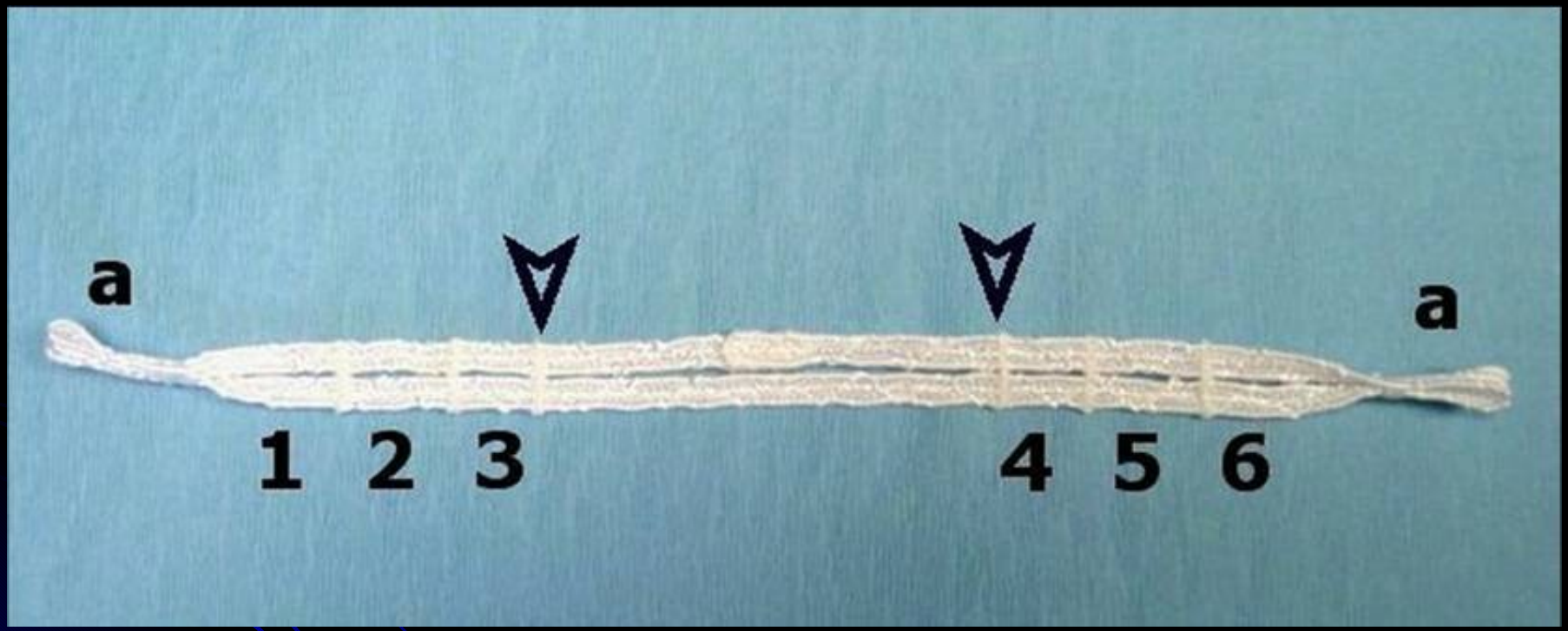
Graft Options

- ✓ Autograft – BPTB, QHT, Quadriceps
- ✓ Allograft – BPTB, Achilles Tendon
- ✓ Xenograft – Bovine
- ✓ Synthetic Grafts – Prosthetic Ligament, Ligament Augmentation Device, Scaffold
- ✓ Tissue Engineering– Future of ACL reconstruction

Hamstrings vs BPTB

- ✓ 7 prospective studies comparing BPTB and QHT grafts
- ✓ 4 have found similar laxity values and functional results between the two types of graft tissues
- ✓ 3 found statistically tighter instrument measured values with the BPTB graft that did not correlate with functional outcome

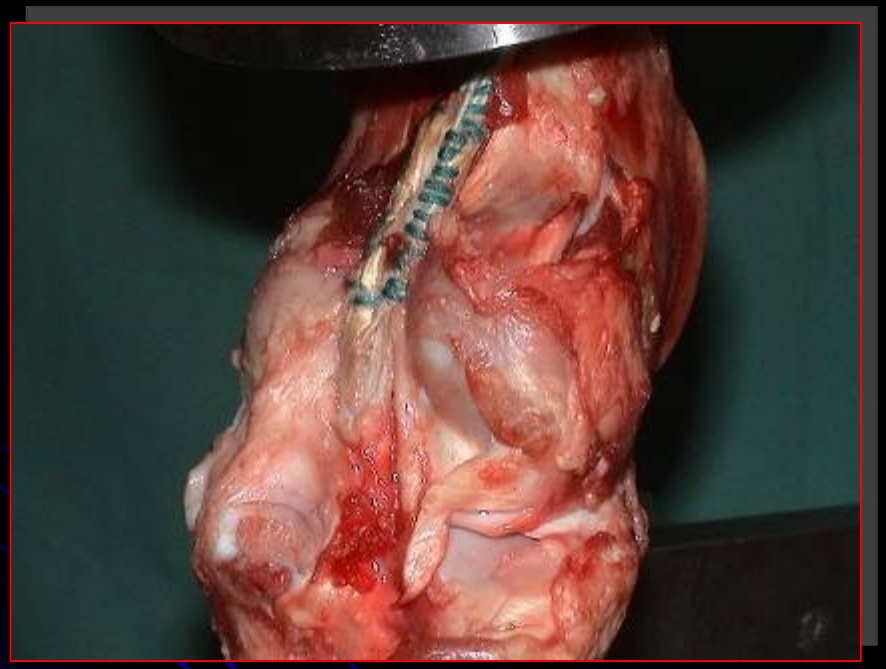
Buttonhole Soffix



Forces on the Cruciate Ligaments During Activities of Daily Living

Activities	ACL (N)	PCL (N)
Level walking	169	352
Ascending stairs	67	641
Descending stairs	445	262
Descending ramp	93	449
Ascending ramp	27	1215

Reconstruction of the ACL in a Porcine Knee using a Equine Tendon-Soffix Graft and an Over the Top Route



Mean UTL = 1360 N
Structural Stiffness = 34 N/mm

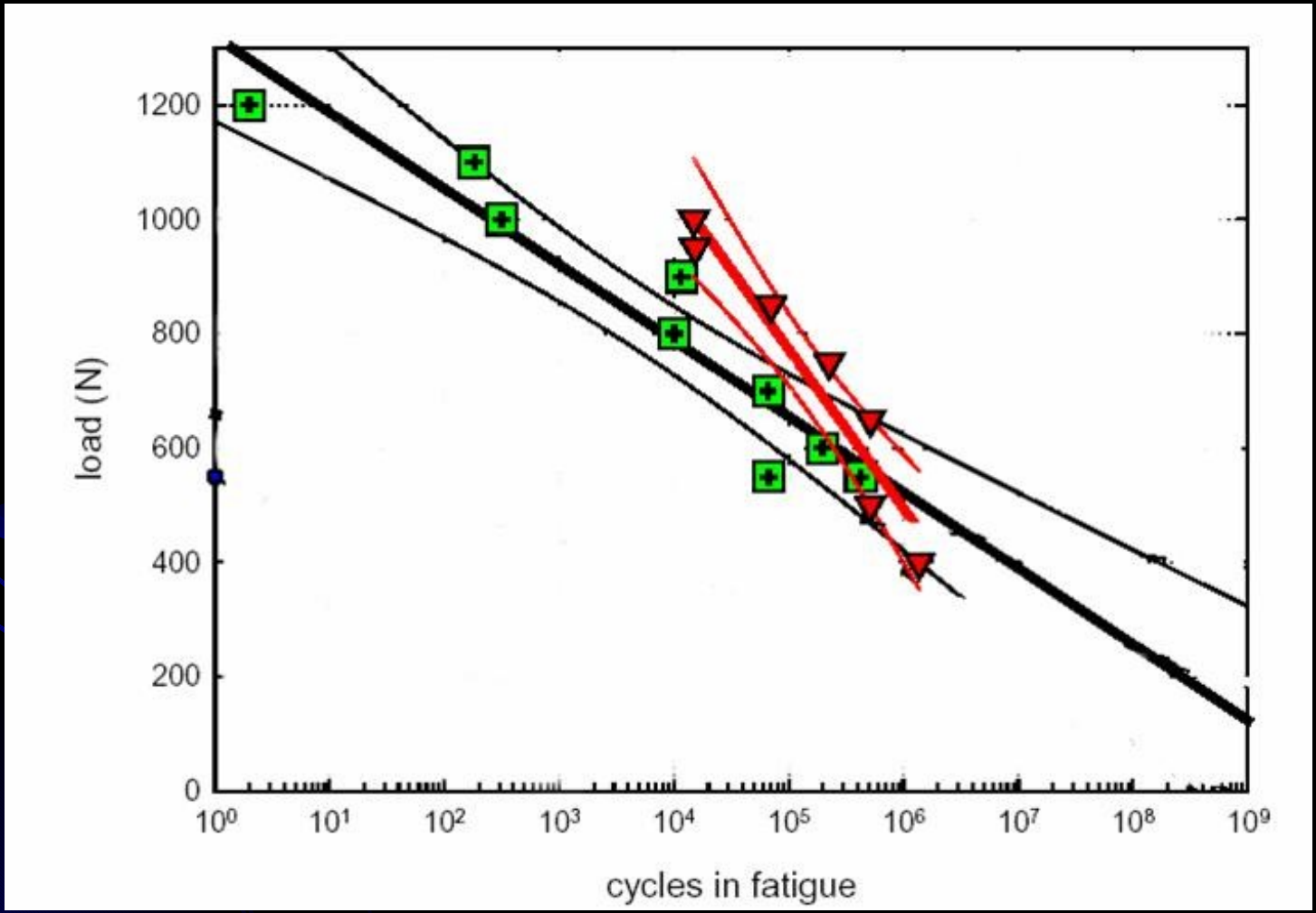
Ultimate Tensile Testing

* Mean UTL of Soffix = 1229 N
* Mean UTL of 4 strand STG-Soffix = 1186 N

Cyclic Loading Results

- No Failures of construct after 3000 cycles
- Mean Elongation after 3000 cycles = 4.9 mm
- Minimal elongation after initial 250 cycles

Buttonhole Soffix: Biomechanical Properties



Polysulphone Bollards

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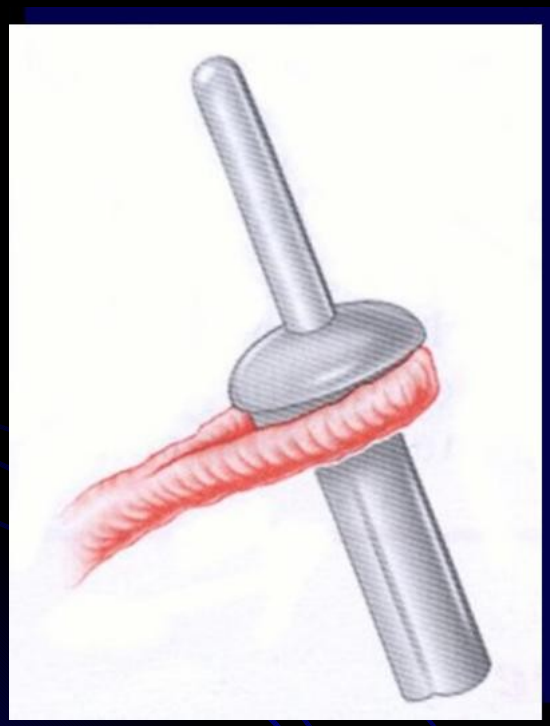

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A. Amis et al. JBJS, 1987

The Buttonhole Soffix Surgical Technique

- ✓ Primary ACL Reconstruction
- ✓ Revision ACL Reconstruction

Surgical Technique

1. Hamstring tendon graft harvesting and preparation

1. Tibial Tunnel drilling

Surgical Technique

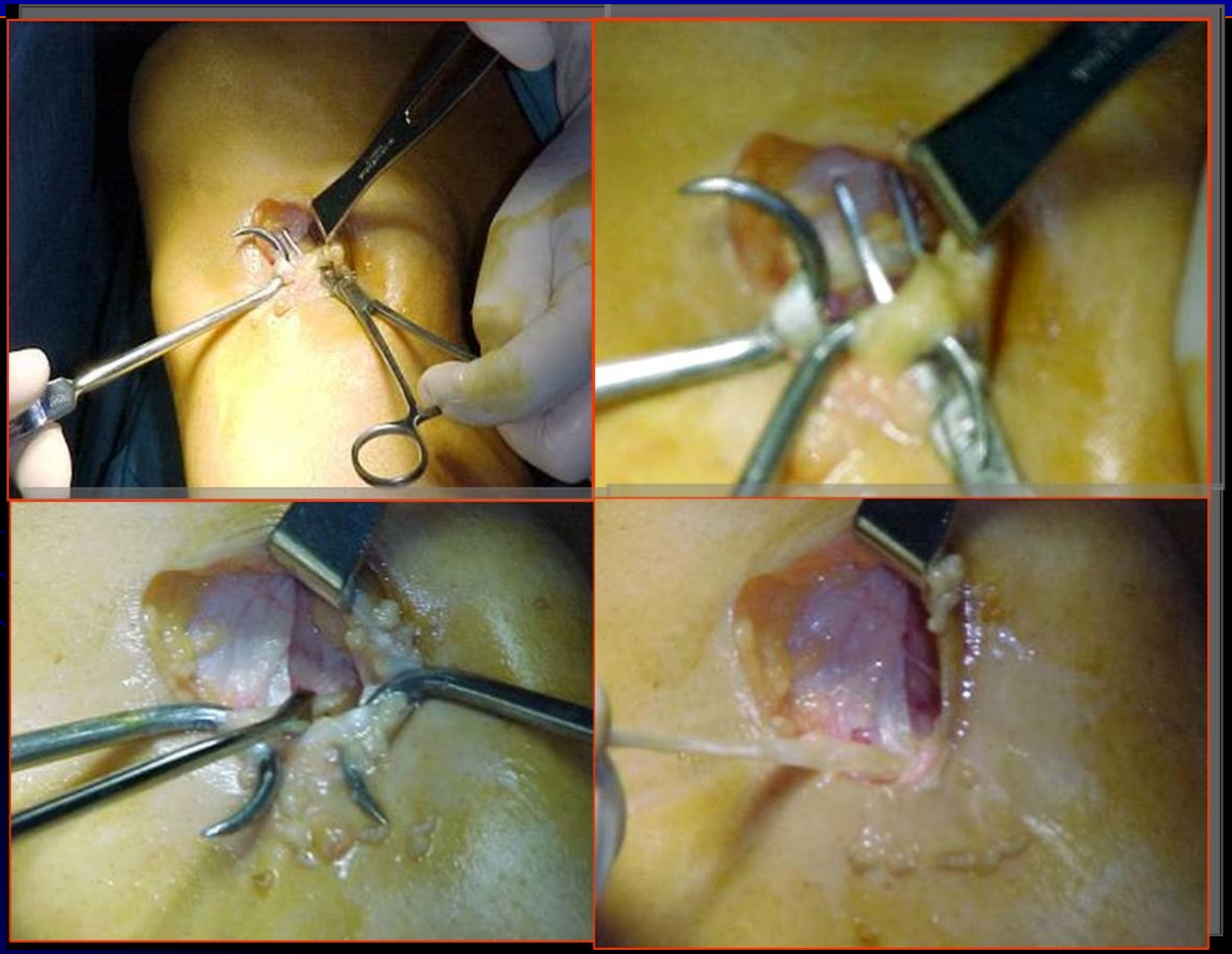
1. Over the Top Femoral Route

4. Tibial Tunnel Drilling

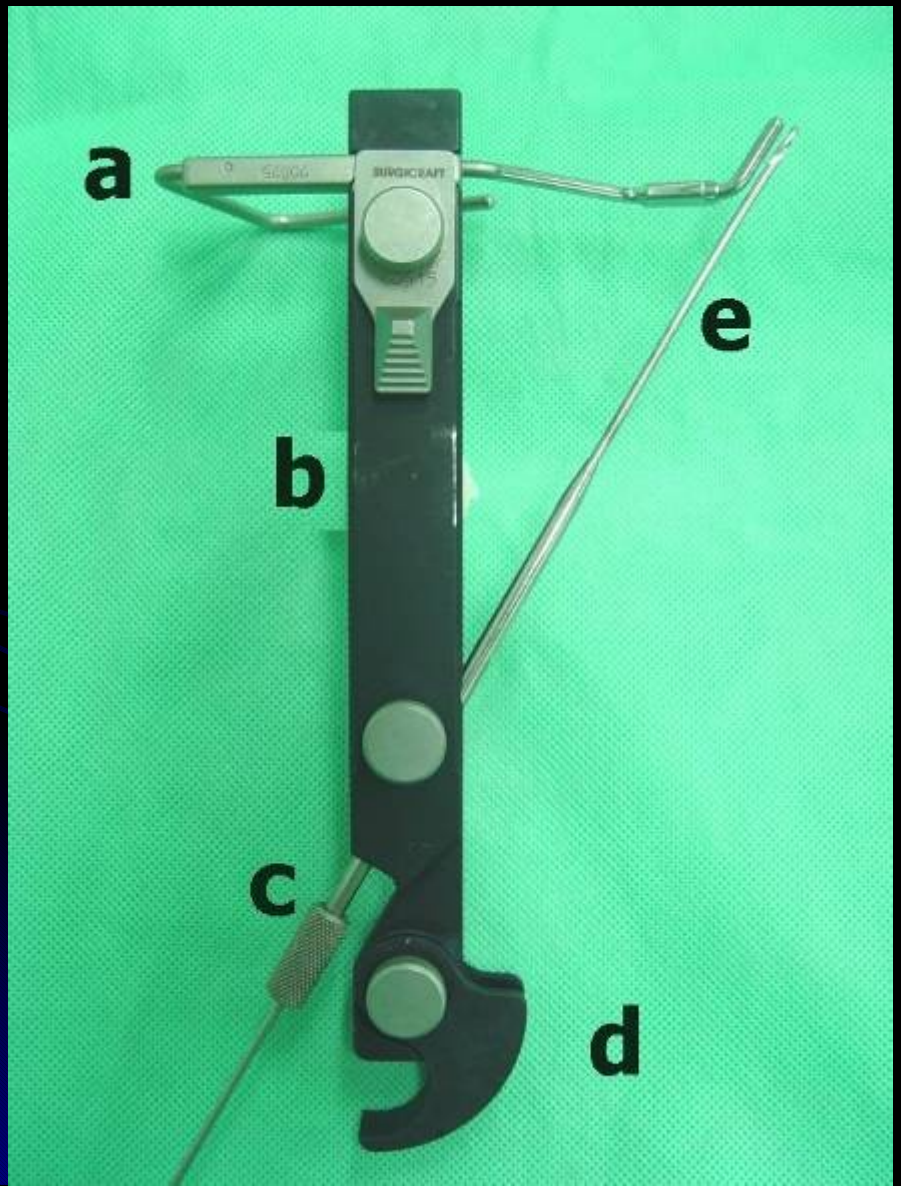
5. Graft Passage

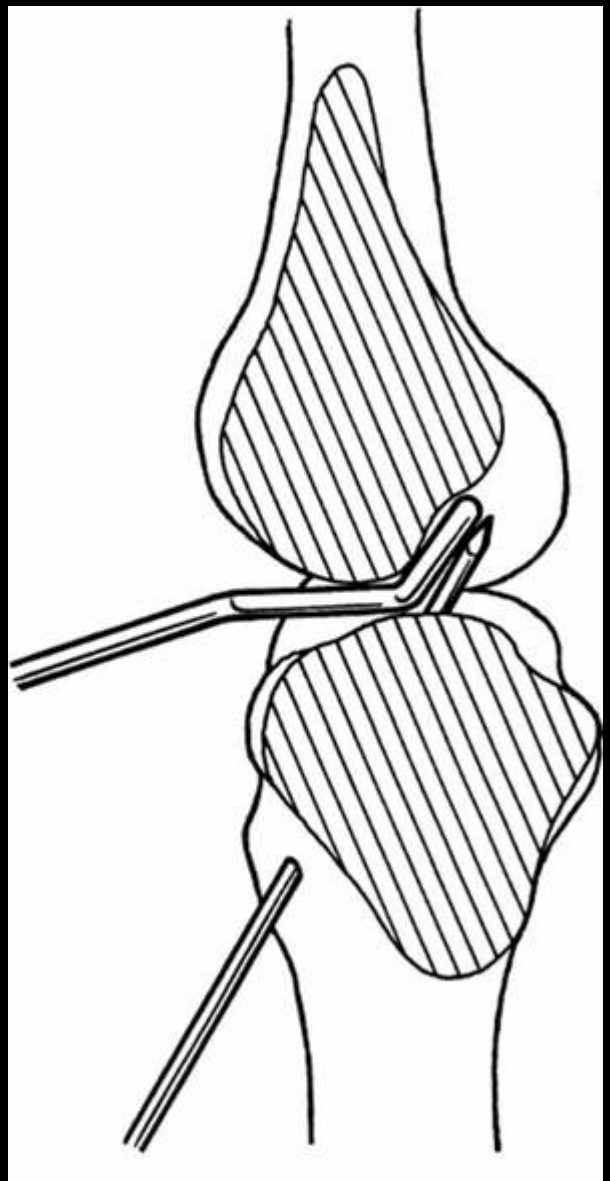
6. Fixation

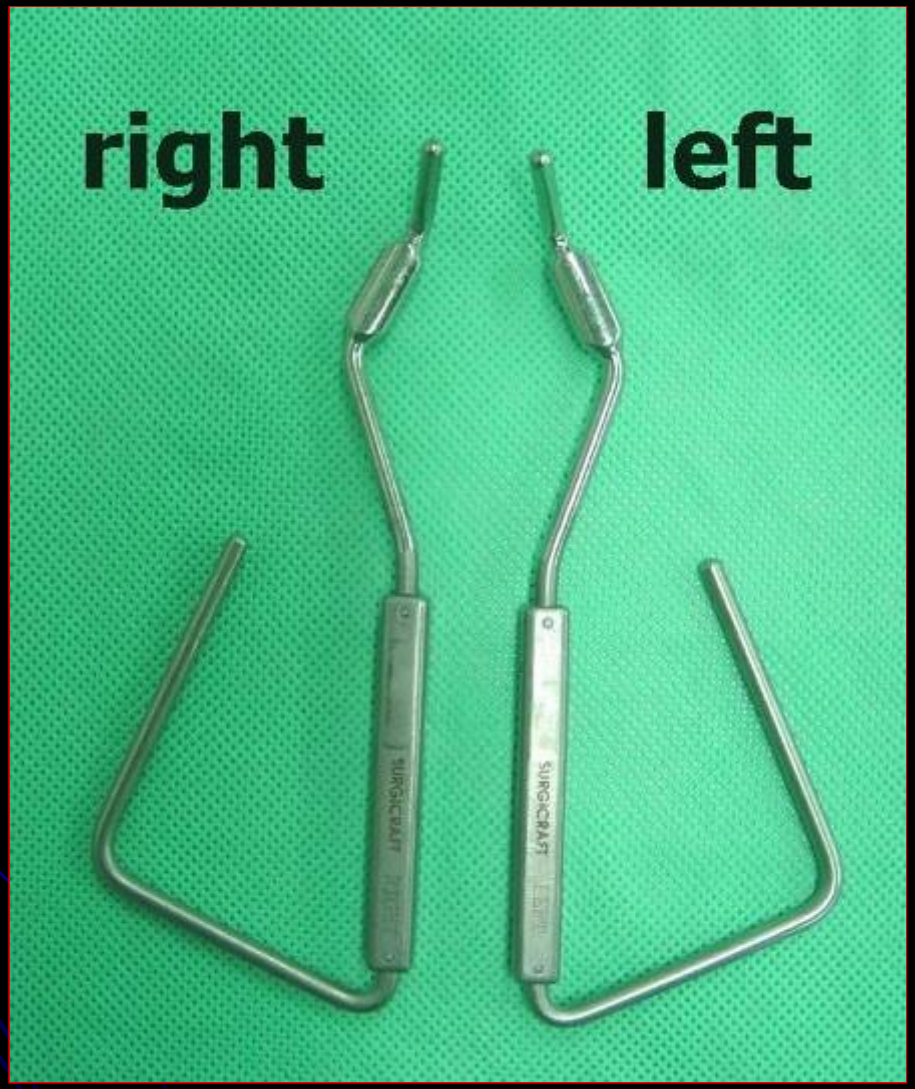
Harvesting of Semitendinosus-Gracilis Tendons



The Buttonhole Soffix Surgical Technique



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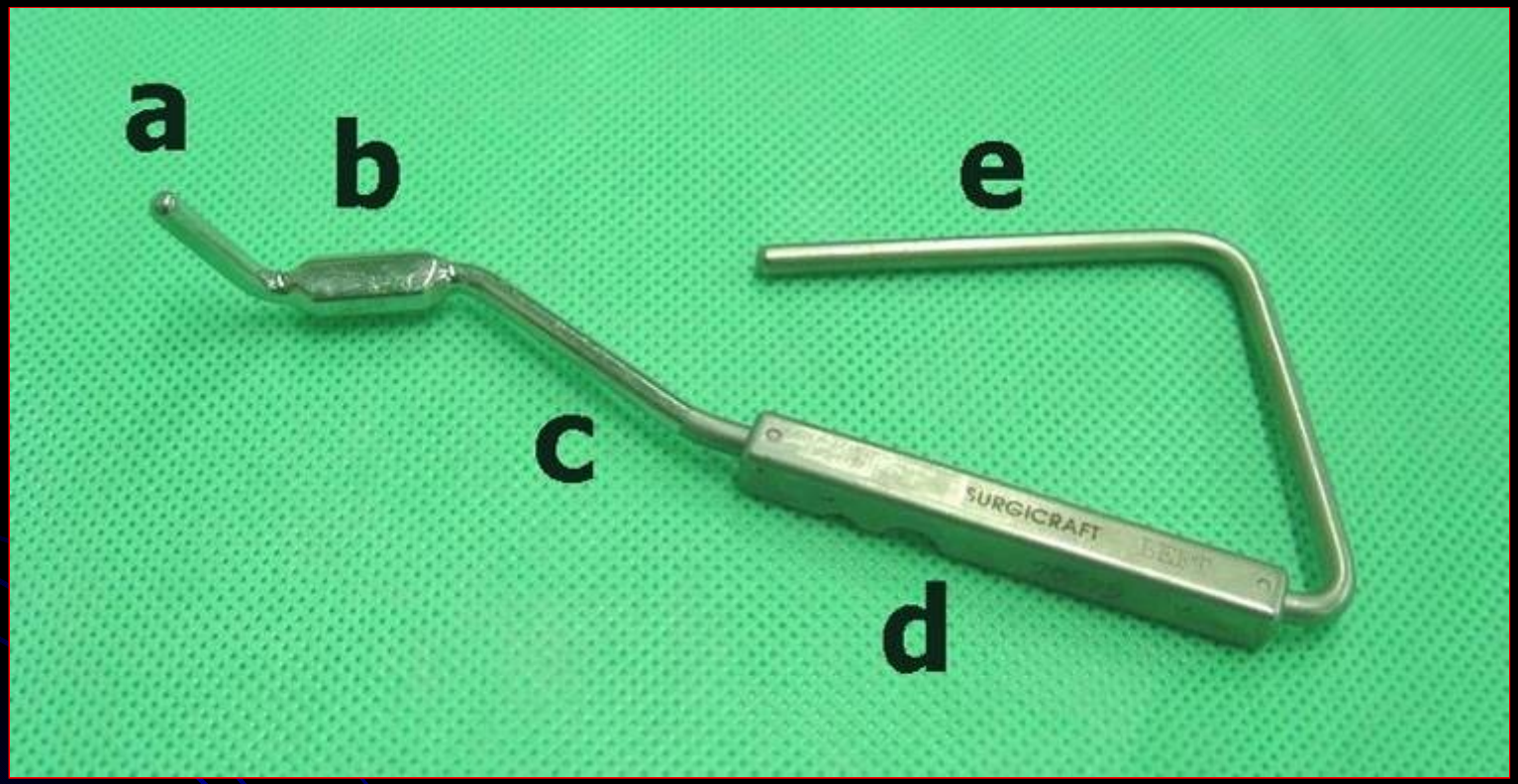
a
b
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c
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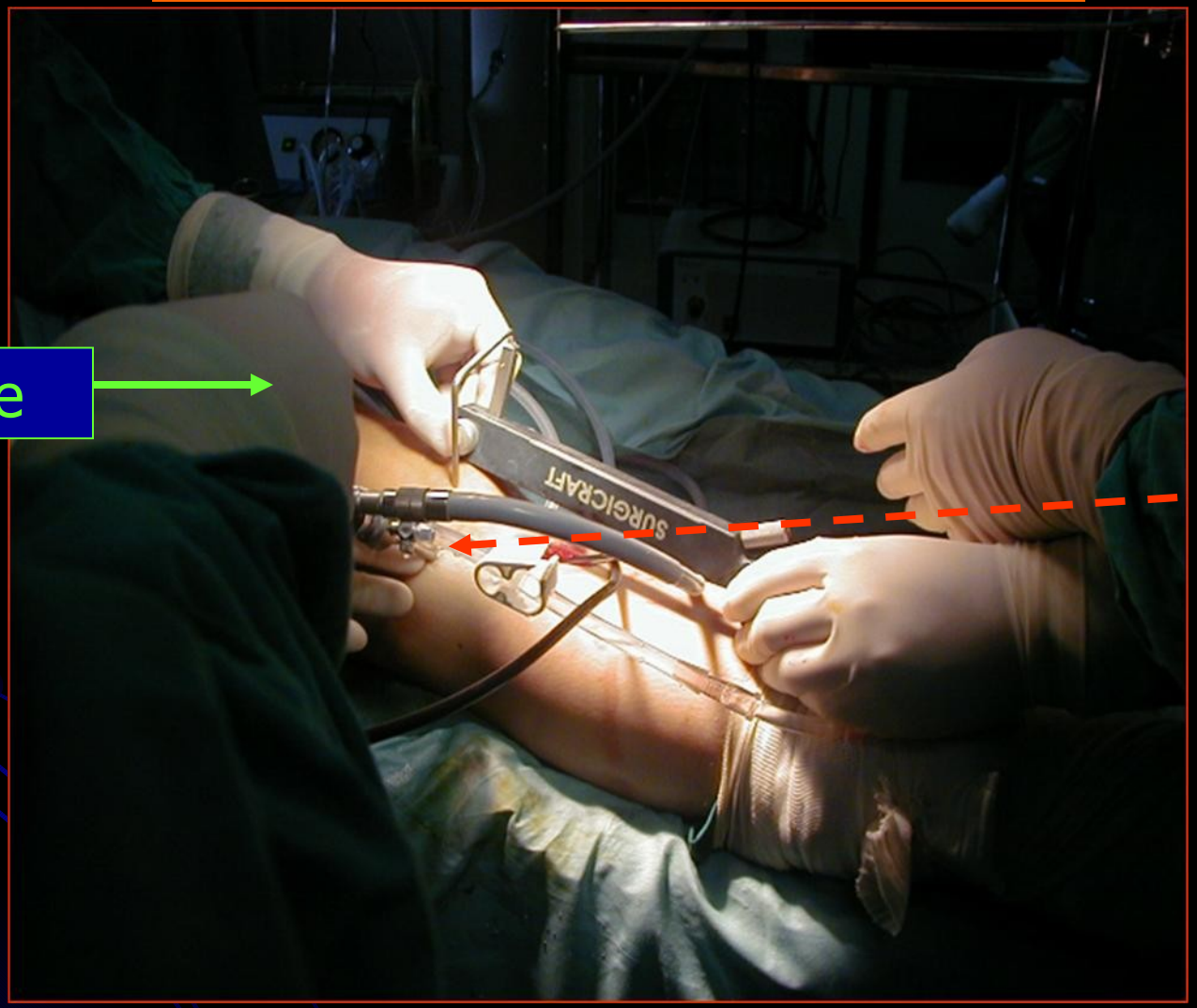
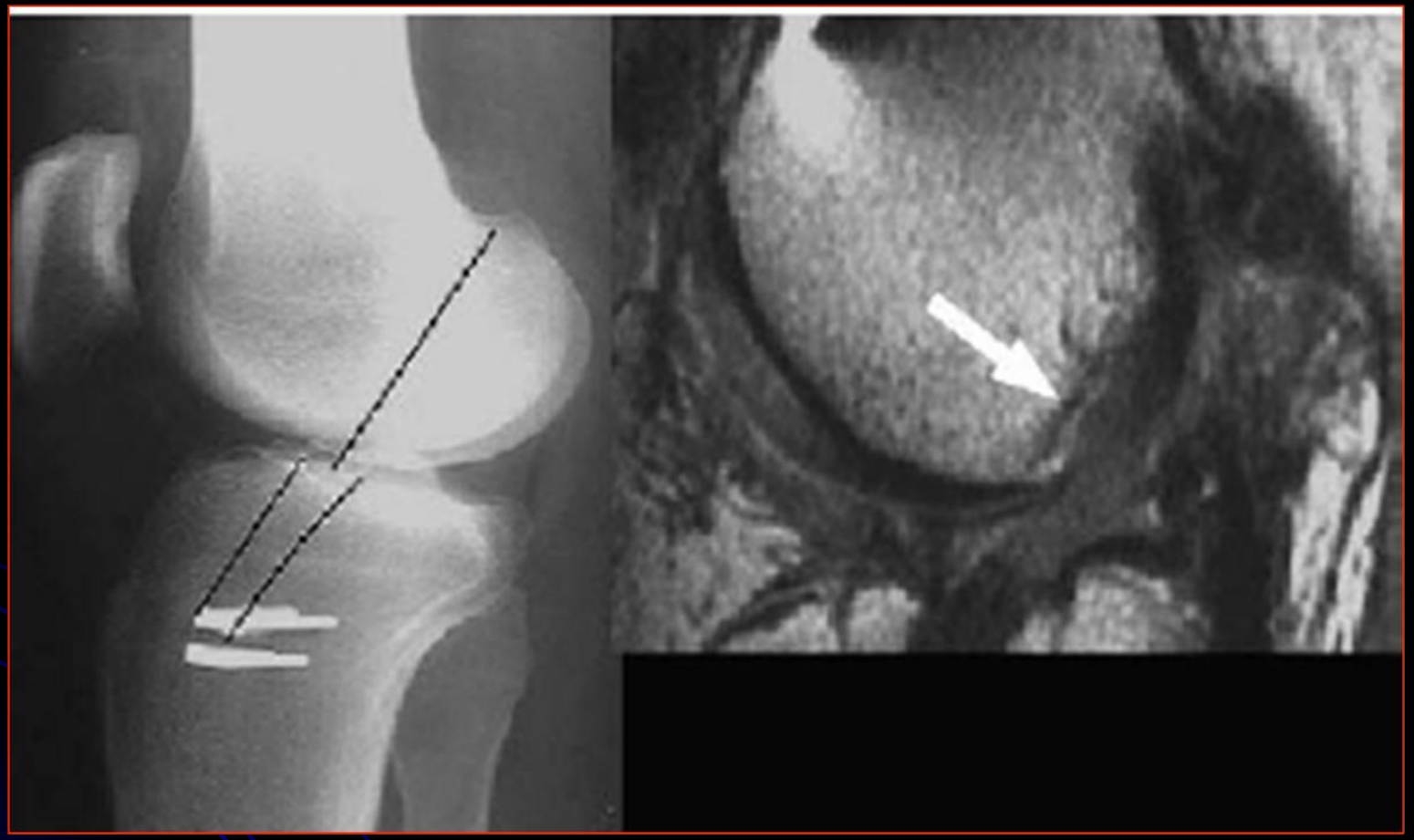
d

Tibial tunnel drilling

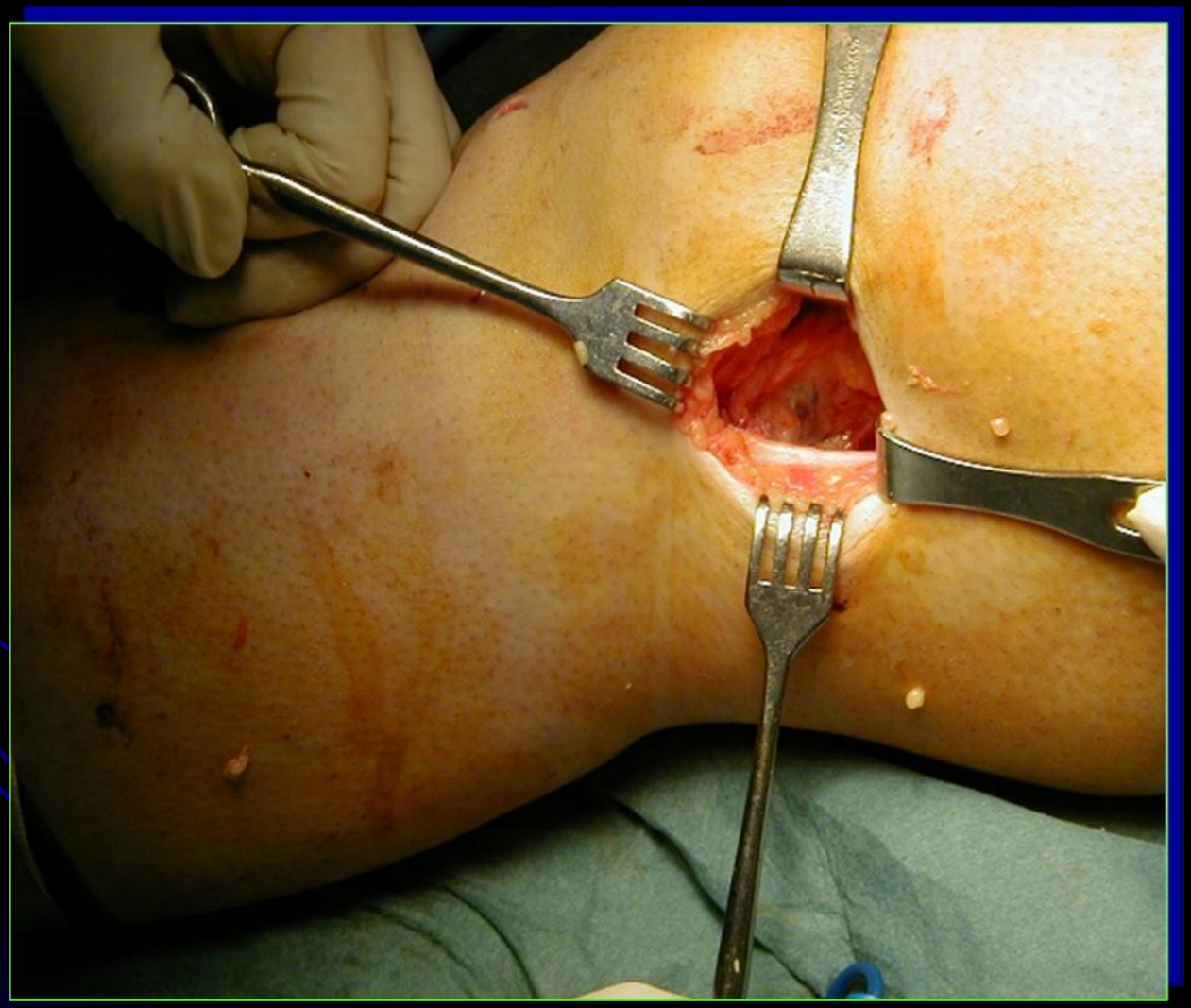


Tibial Tunnel Placement



Moderate impingement

Lateral femoral skin incision to locate the "over the top" route



Posterior capsule penetration and groove fashioning at the "over the top" position

Graft passage

Graft-Soffix Complex Preconditioning

1. Pre-implantation Preconditioning

   (300 N Maximum Manual Pulling Force)

2. Intraoperative Preconditioning

3. Fixation under tension

Purpose

1. Evaluate the efficacy of ACL Reconstruction using the BH Soffix Surgical Technique

1. Present the Midterm Results

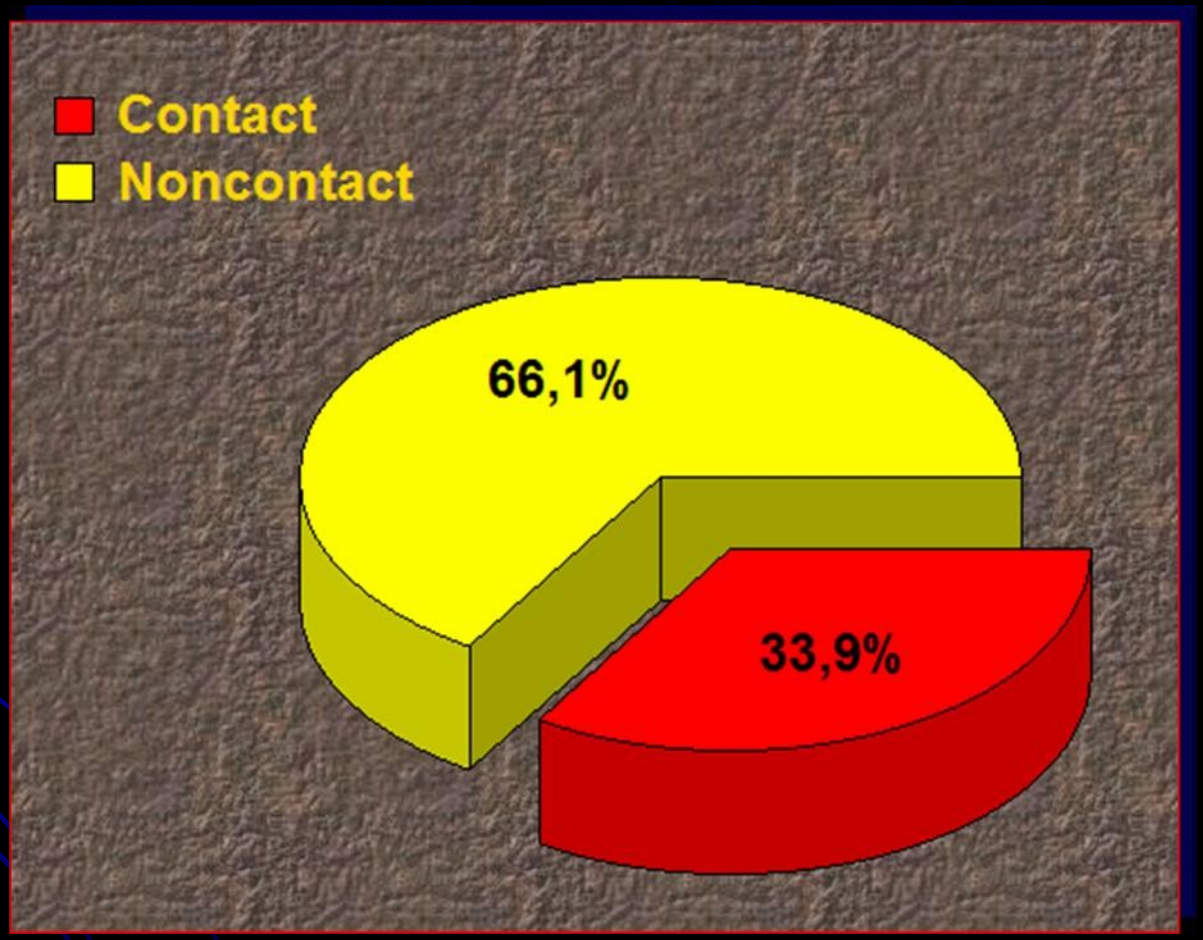
Study Population

- ✓ 127 patients operated between 1998-2002
- ✓ 112 (88.1%) assessed
- ✓ 103 men (92%)
- ✓ 9 (8%) women
- ✓ Mean age at operation 26±7 years (19-46 years)

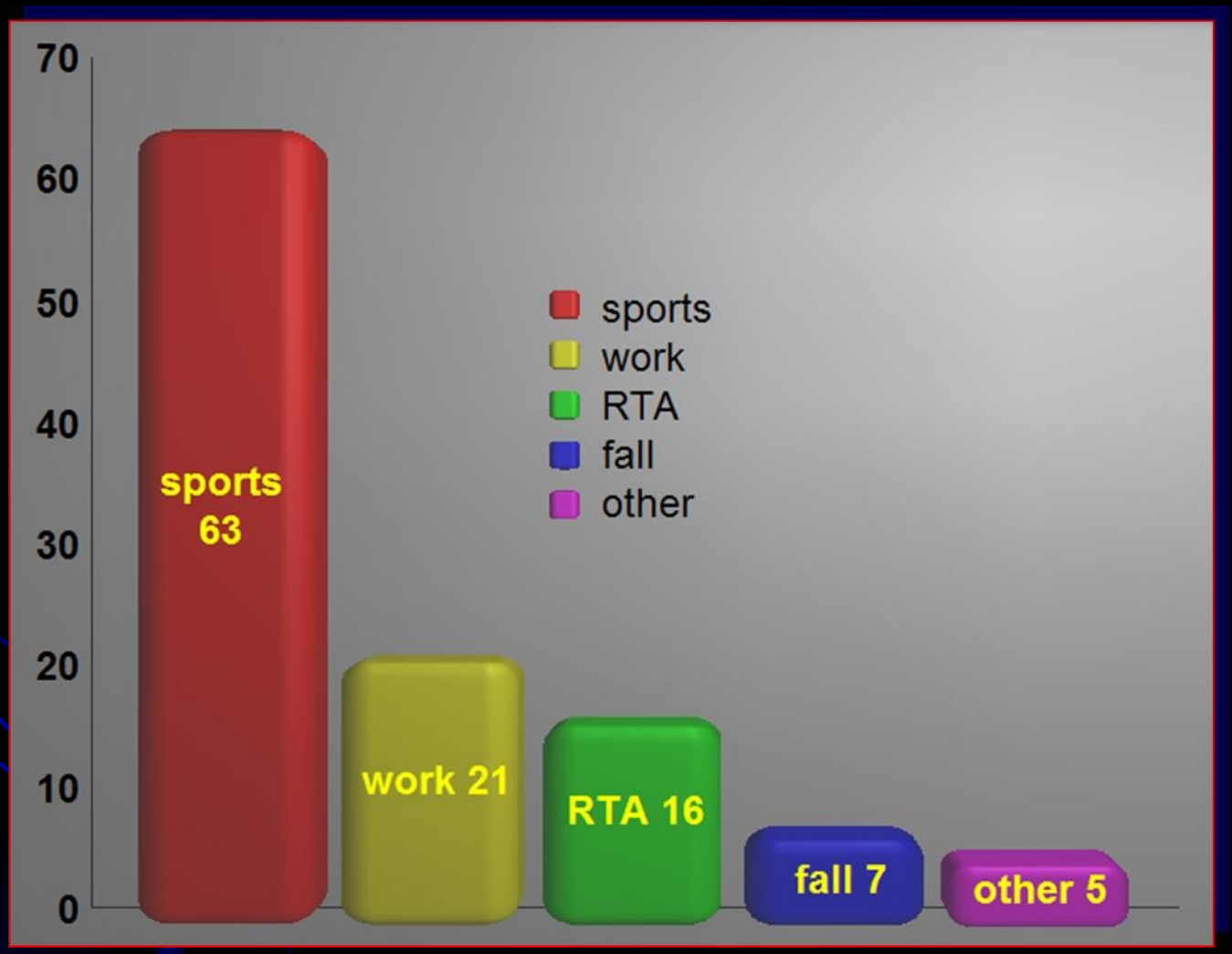
Methods

- ✓ Prospective Study
- ✓ No Control Group (Level IV)
- ✓ Chronic ACL injuries
- ✓ Unilateral Hamstring ACL reconstruction using the BH Soffix

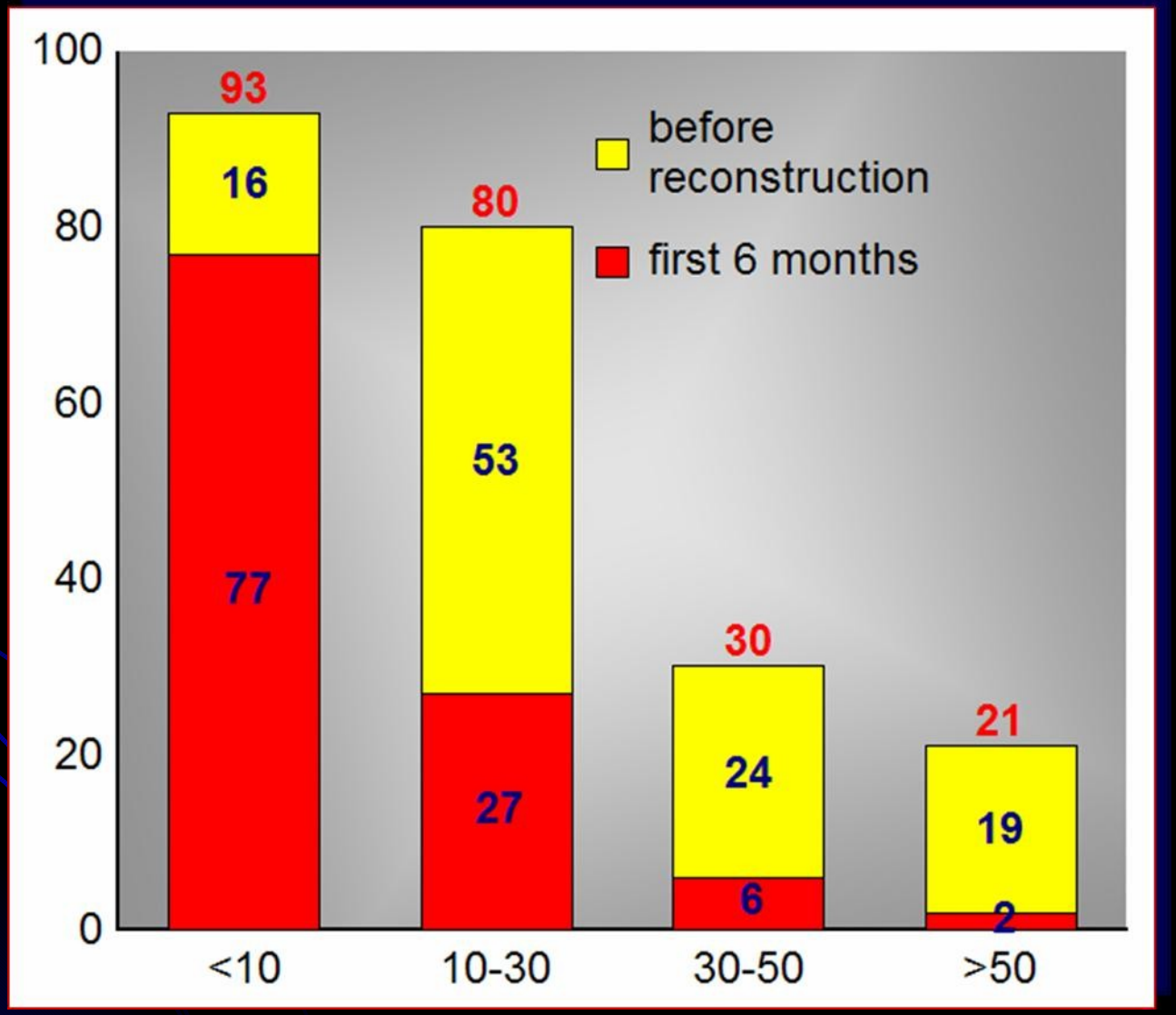
Mechanism of Injury



Mechanism of Injury



Episodes of giving way



Surgical Technique

- ✓ Quadrupled Hamstring Tendon Autograft
- ✓ Buttonhole Soffix Fixation Device
- ✓ Tibial tunnel = graft size
- ✓ Over-the-Top Femoral Fixation

Rehabilitation

- ✓ Brace Wearing in Full Extension for 1 week
- ✓ Early Full Weight Bearing
- ✓ Closed Chain Exercises for 3 months
- ✓ Jogging > 4 months
- ✓ Return to full activity, cutting & contact sports after 1 year

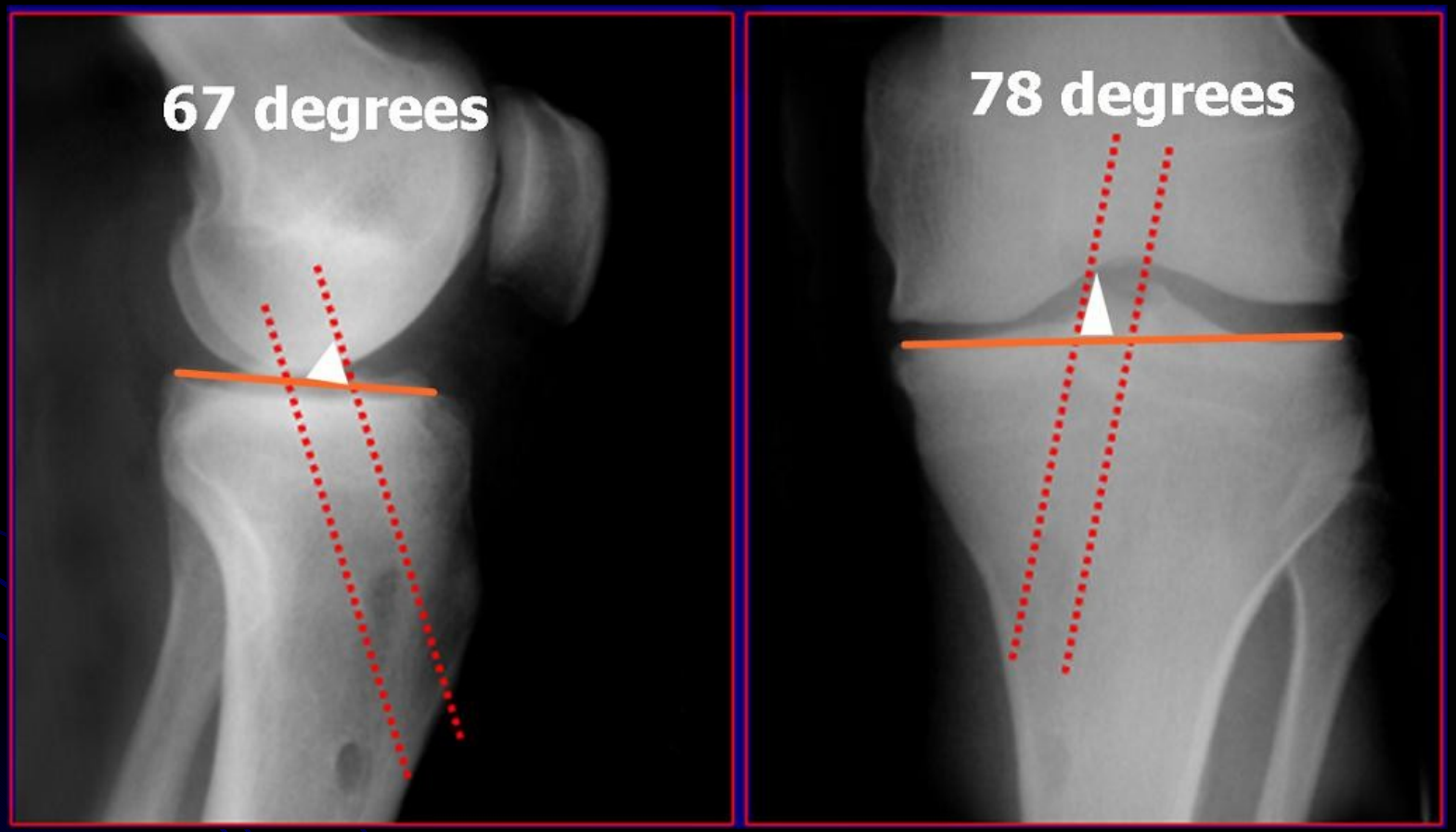
Graft Position

Tibia

48 ± 3%

Harner, 1994

Postoperative Knee Radiograph



Complications I

- One deep infection (washout and graft preservation)
- No neurovascular complications
- No graft fixation failure (bollard or loop)

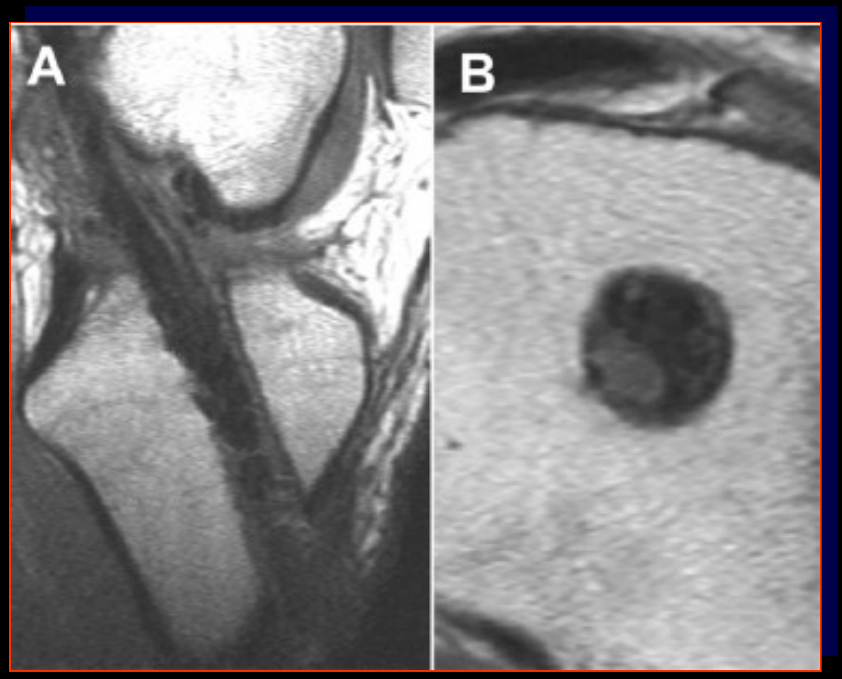
Complications I

- ✓ 9 patients underwent arthroscopic evaluation due to secondary meniscal injuries
- ✓ The graft failed in 8 patients due to
  - a new injury (4 cases)
  - graft loosening (2 cases)
  - biological failure (2 cases)

Tibial site bollard prominence

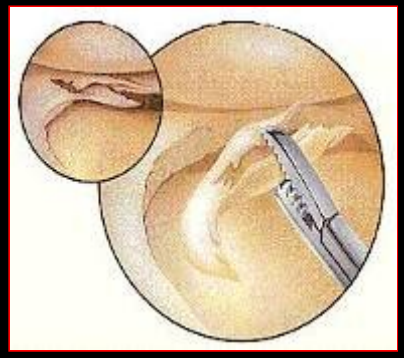
Tunnel Expansion

- ✓ No significant tunnel expansion
- ✓ Mean Increase in Tunnel Cross Sectional Area = 33%



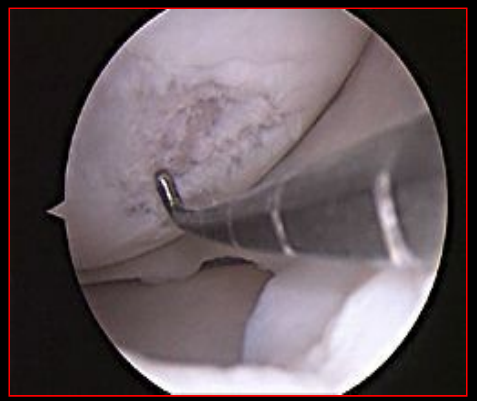
Accompanying Injuries: Menisci

Medial Meniscus	45	(35.4%)
Lateral Meniscus	33	(25.9%)
Both Menisci	11	(8.6%)

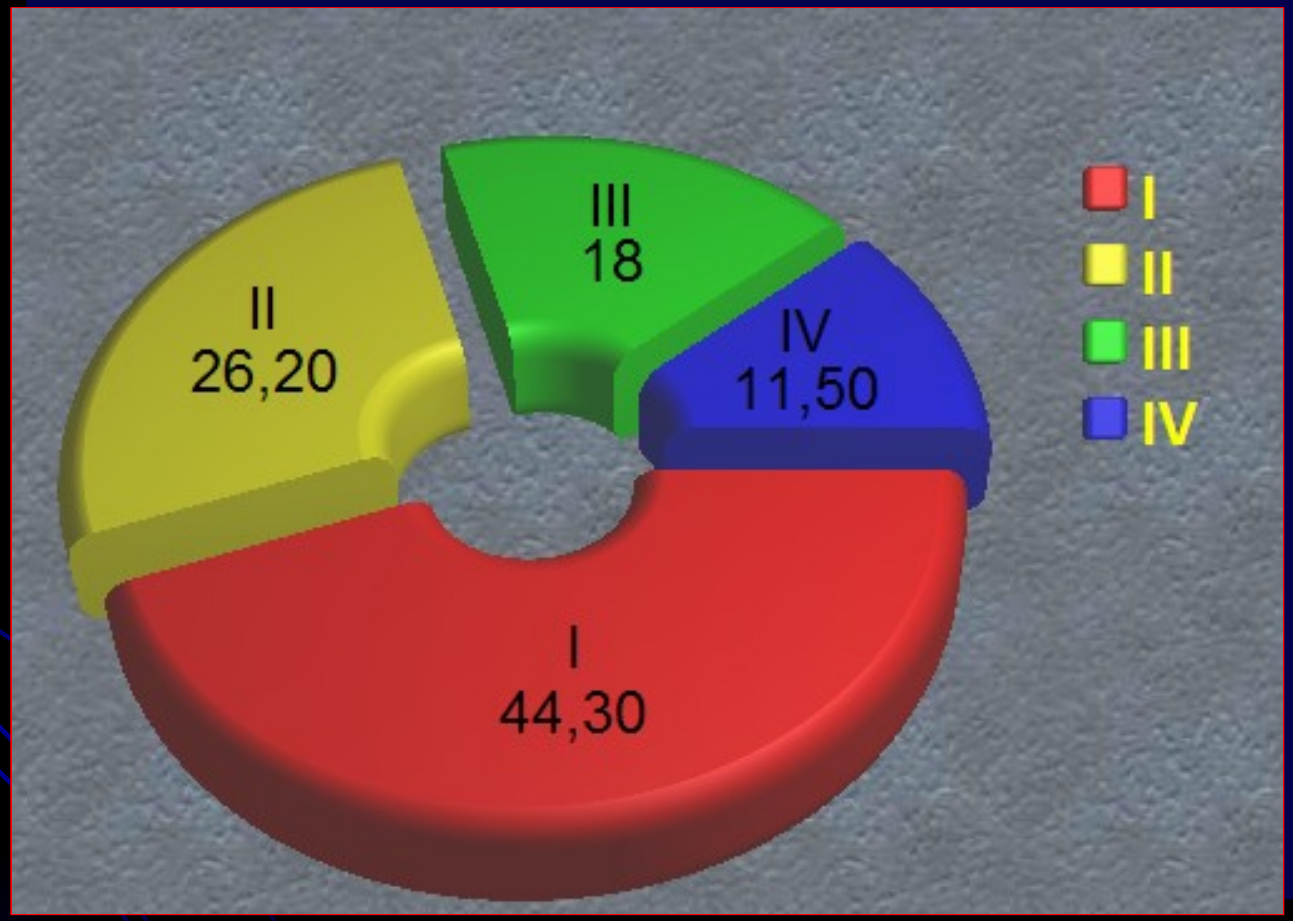


Accompanying Injuries: Cartilage

MFC	34	(26.7%)
LFC	19	(14.9%)
Both FC	8	(6.2%)
Patella	52	(40.9%)



Articular Cartilage Injuries of the Femoral Condyles (after Outerbridge)



Outcome Assessment

- ✓ Independent Examiner in a dedicated Research Clinic
- ✓ History & Physical Examination
- ✓ KT-2000 arthrometric SSD
- ✓ IKDC Score
- ✓ Lysholm Score
- ✓ Tegner Activity Scale

Results

- ✓ Time from injury to reconstruction was 26±7 months (9-62 months)
- ✓ Follow up for 3-5 years (mean 47±11 months)

Subjective Satisfaction

Most patients (106, 94.6%) would have had the same operation again if it were necessary.

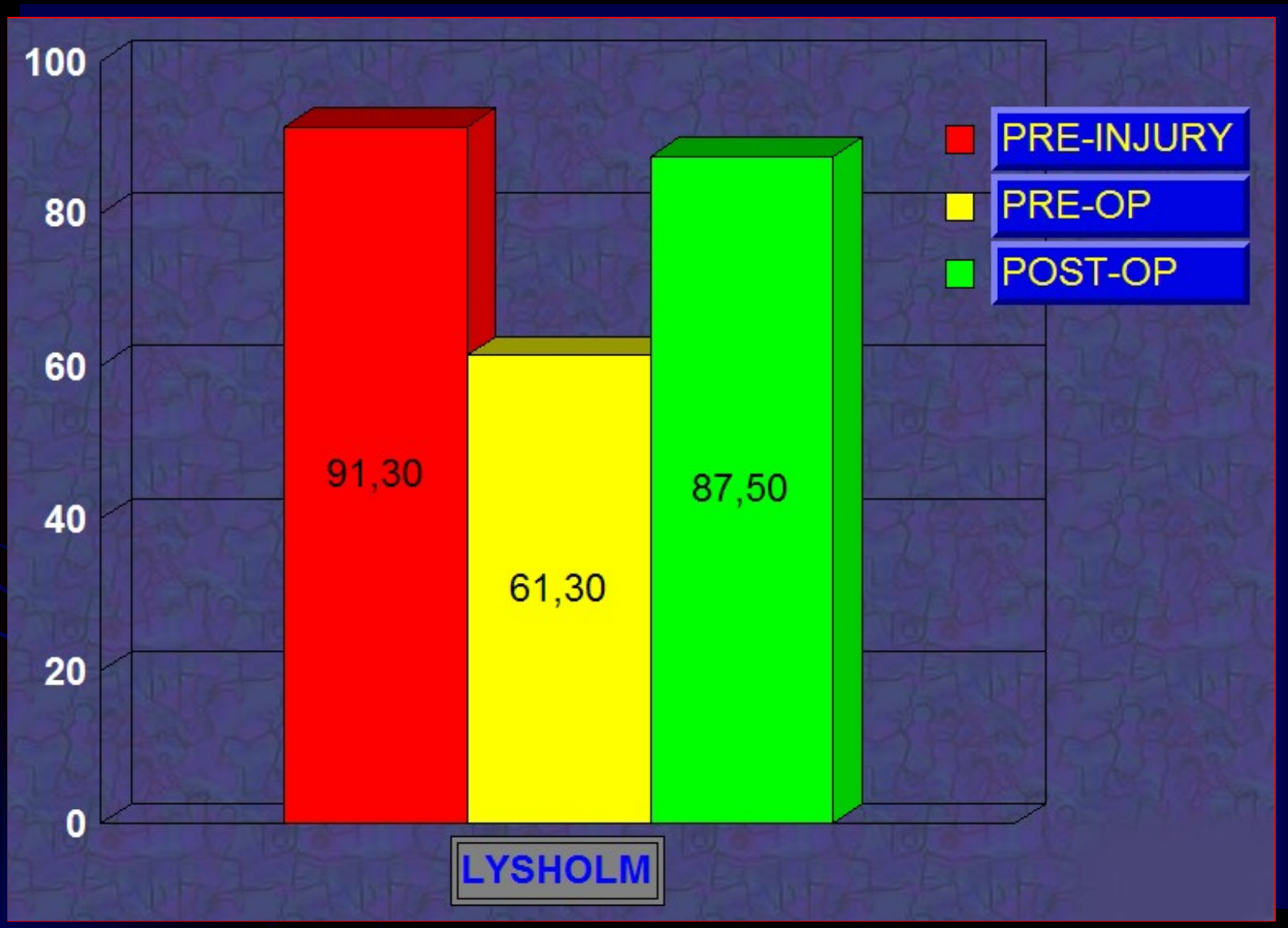
The 10-point VAS score was 8.4

(range, 4-10; SD, 1.2)

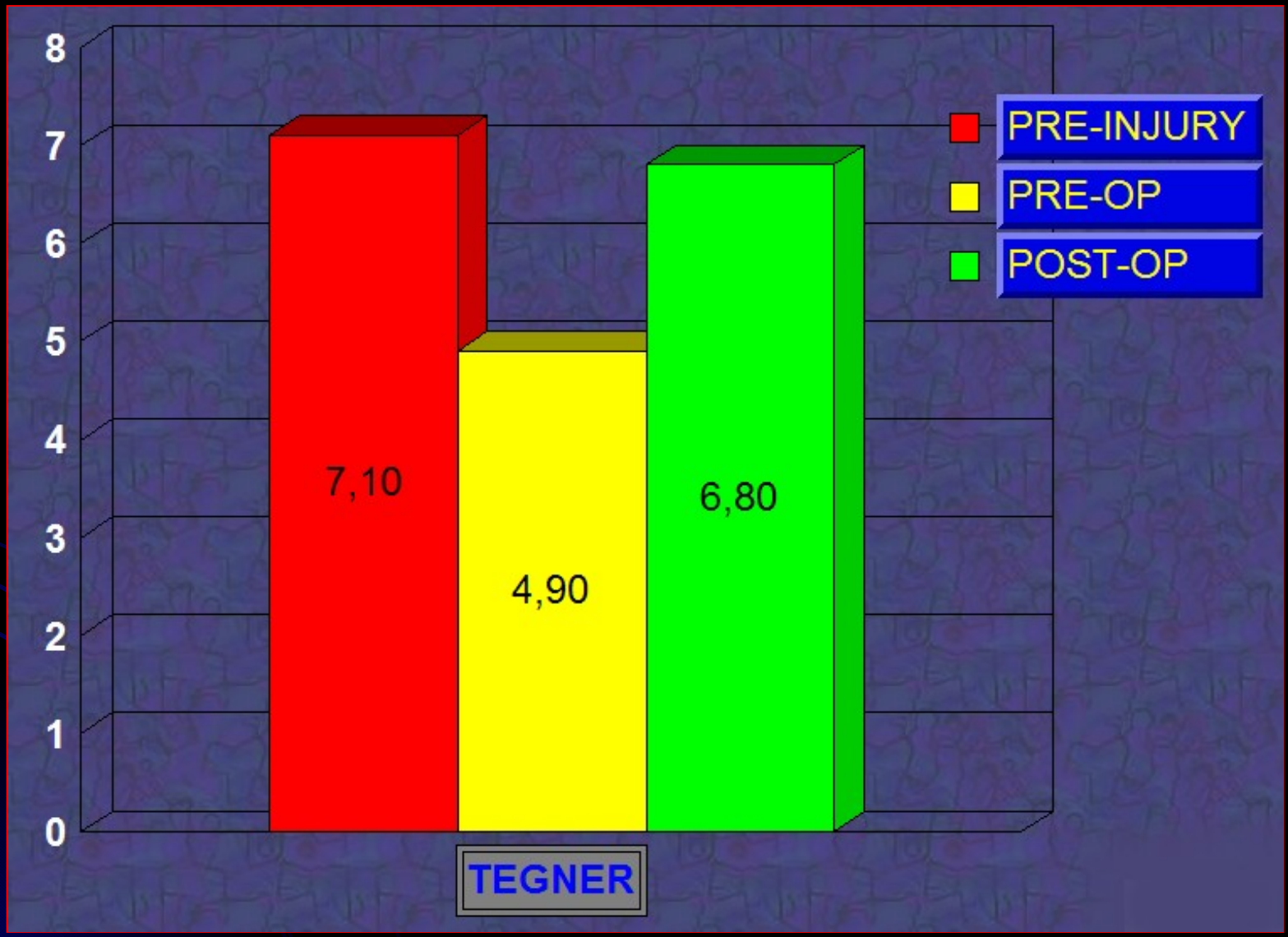
Range of Knee Motion

- ✓ Loss of flexion>10 — *3 patients*
- ✓ Loss of extension >5 — *1 patient*

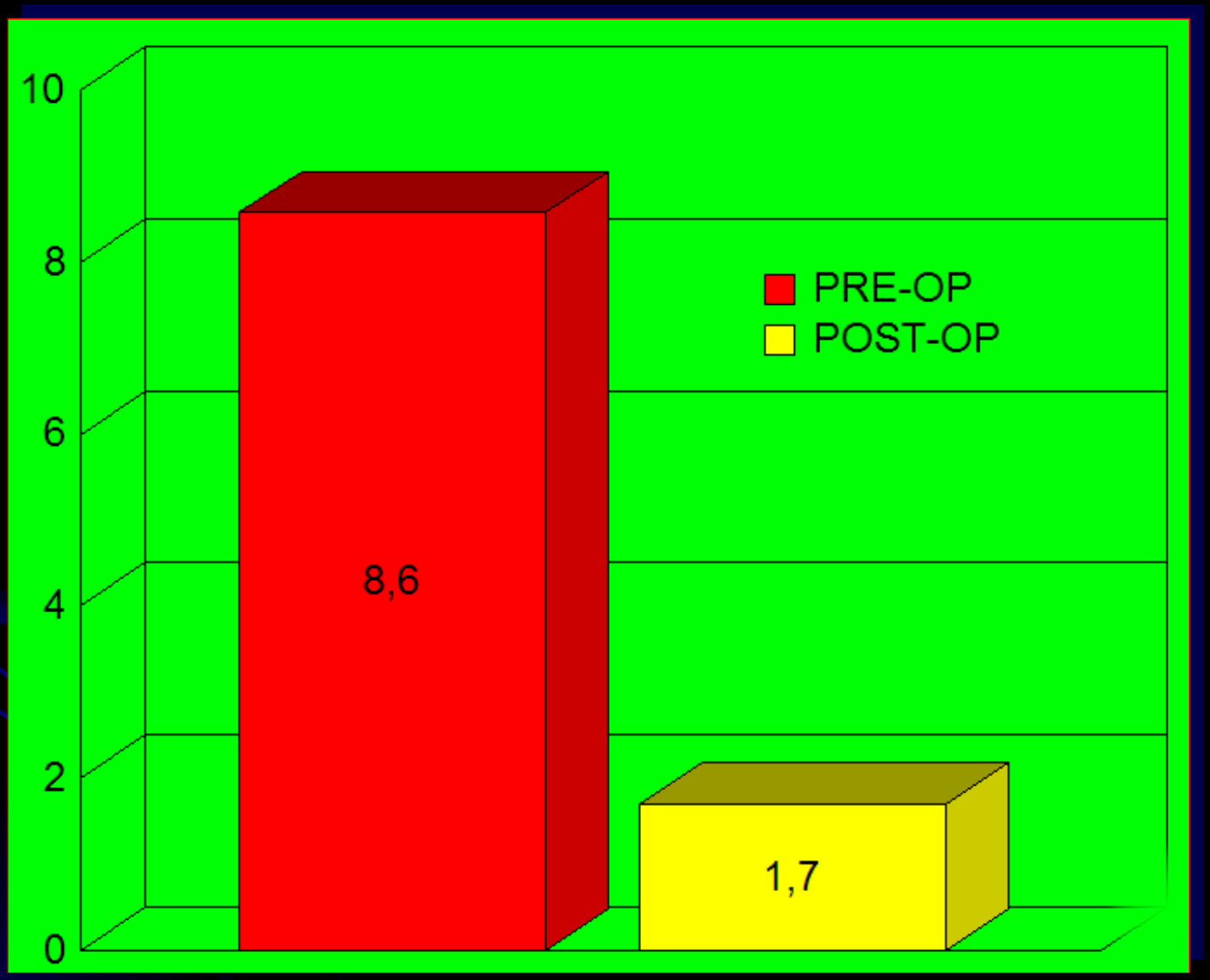
Lysholm Score



Tegner Activity Score



Side to Side Difference



Side to Side Difference

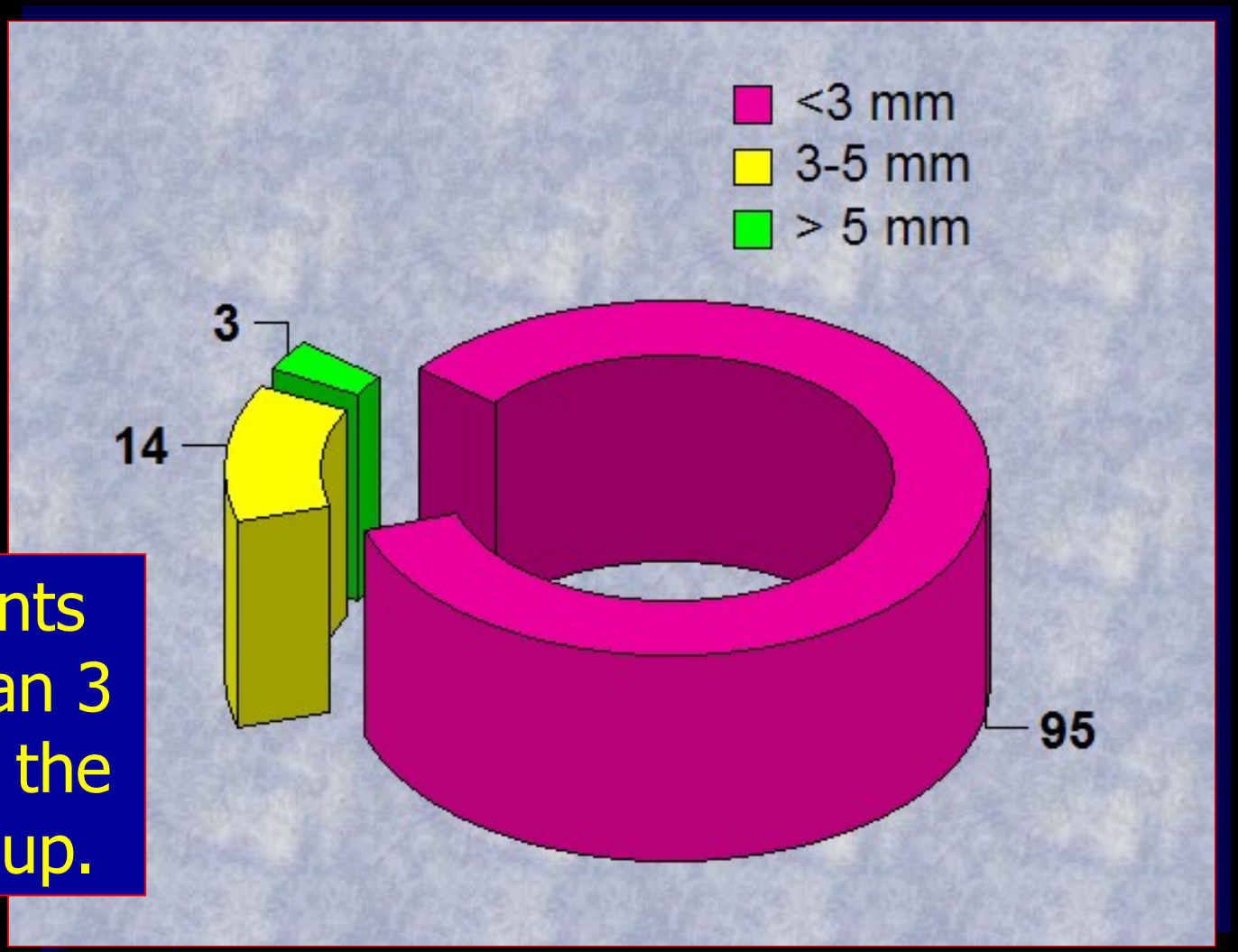
The KT-2000 SSD measurement improved from 8.56±2.3 mm (range 5.3-12.1) preoperatively to 1.7±0.9 mm (range -1.4-5.3) postoperatively

Side to Side Difference at Last F-Up

The SSD on maximum manual testing was

- ✓ <3 mm in 95 patients (84.8%)
- ✓ 3-5 mm in 14 patients (12.5%)
- ✓ > 5 mm in 3 patients (2.7%)

Side to Side Difference



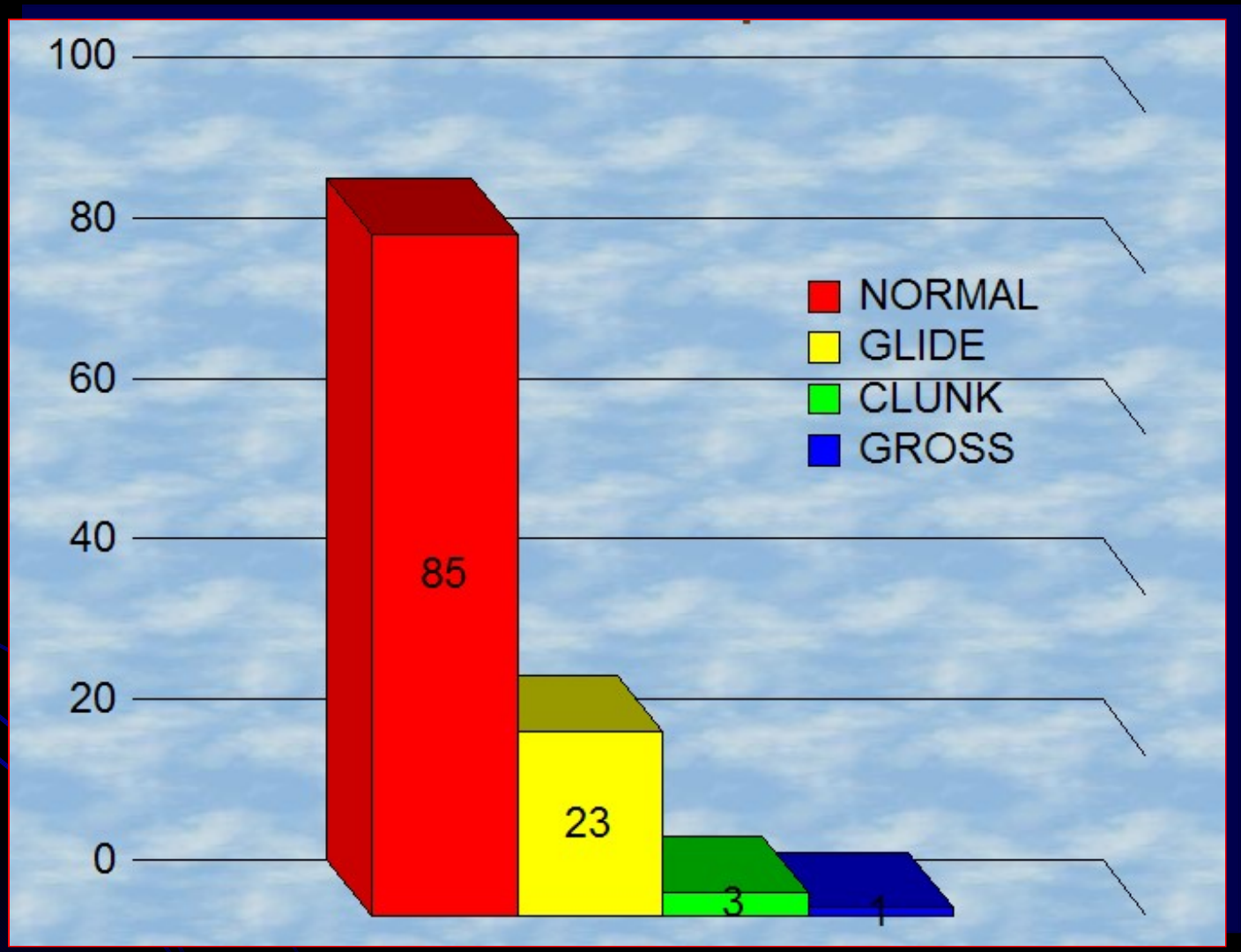
Most patients had less than 3 mm SSD at the last follow-up.

Pivot Shift

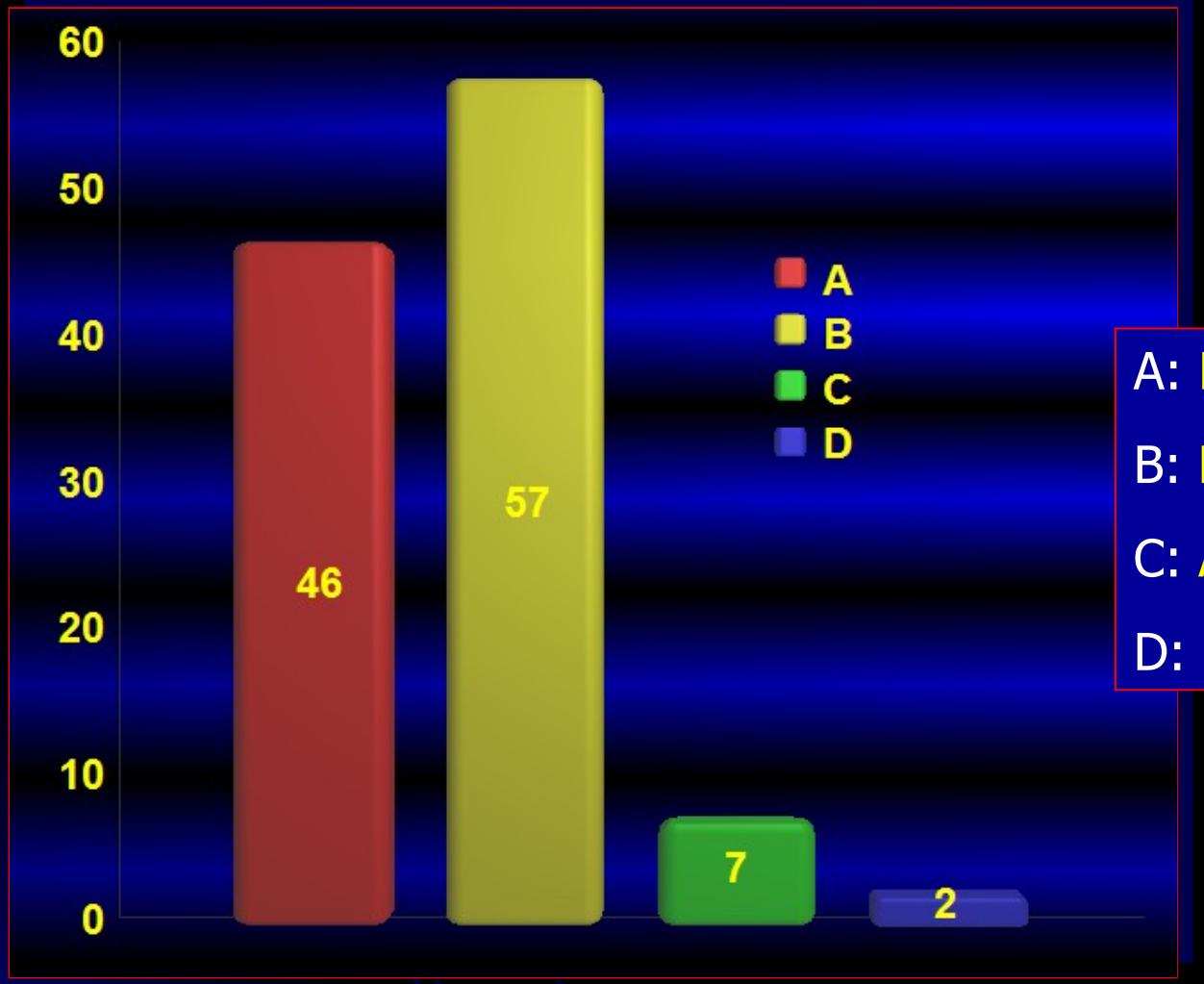
The pivot shift test was regarded as:

- ✓ normal in 85 patients (76%)
- ✓ glide (+) in 23 (20.5%)
- ✓ clunk (++) in 3 (2.6%)
- ✓ gross (+++) in 1 (0.9%)

Pivot Shift



IKDC Evaluation



A: Normal

B: Nearly Normal

C: Abnormal

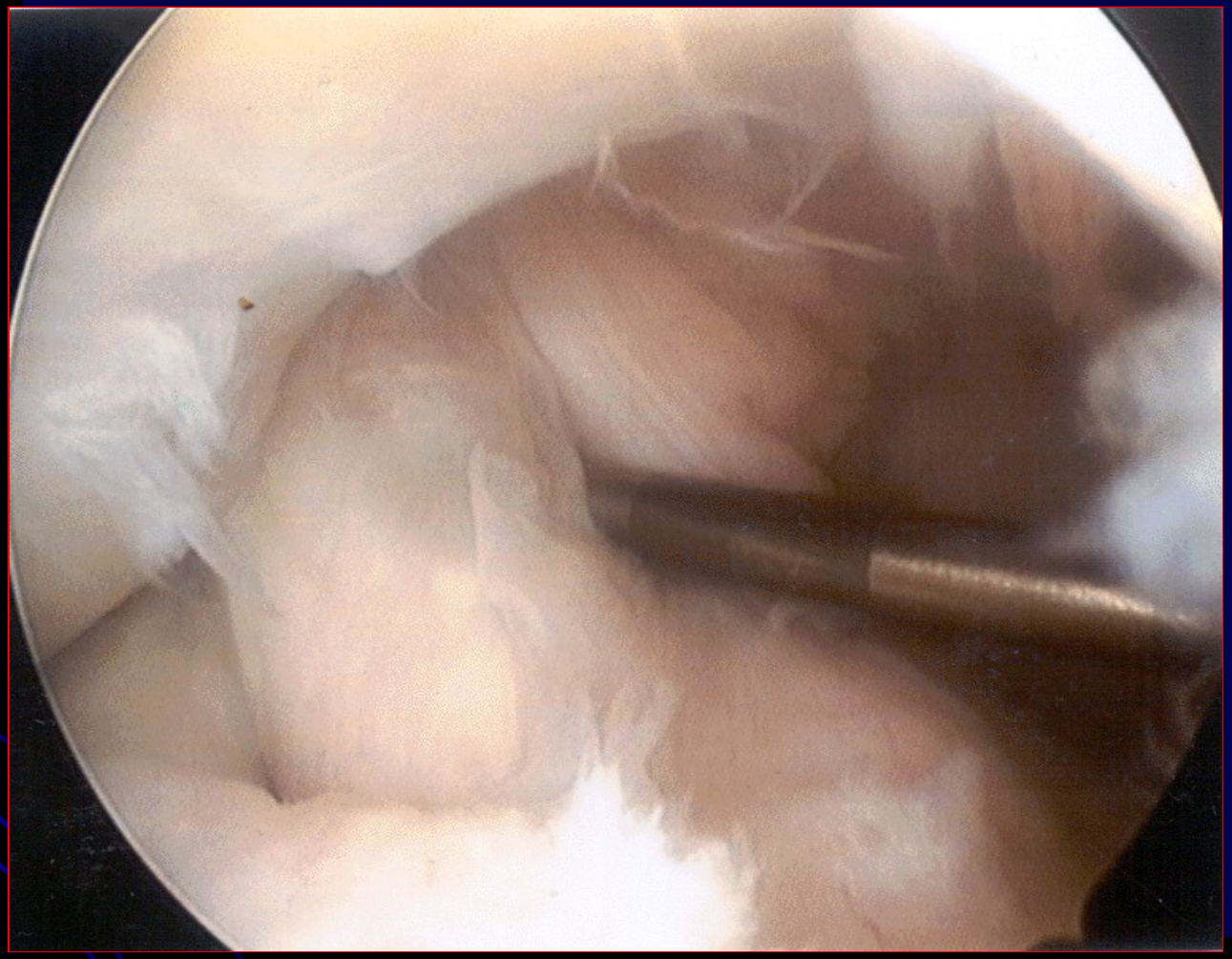
D: Severely Abnormal

Donor Site Morbidity

- ✓ 4 patients complained of anterior knee pain, but kneeling was restricted in just 2
- ✓ Kneeling pain 12 patients
- ✓ No local tenderness
- ✓ Harvest site morbidity

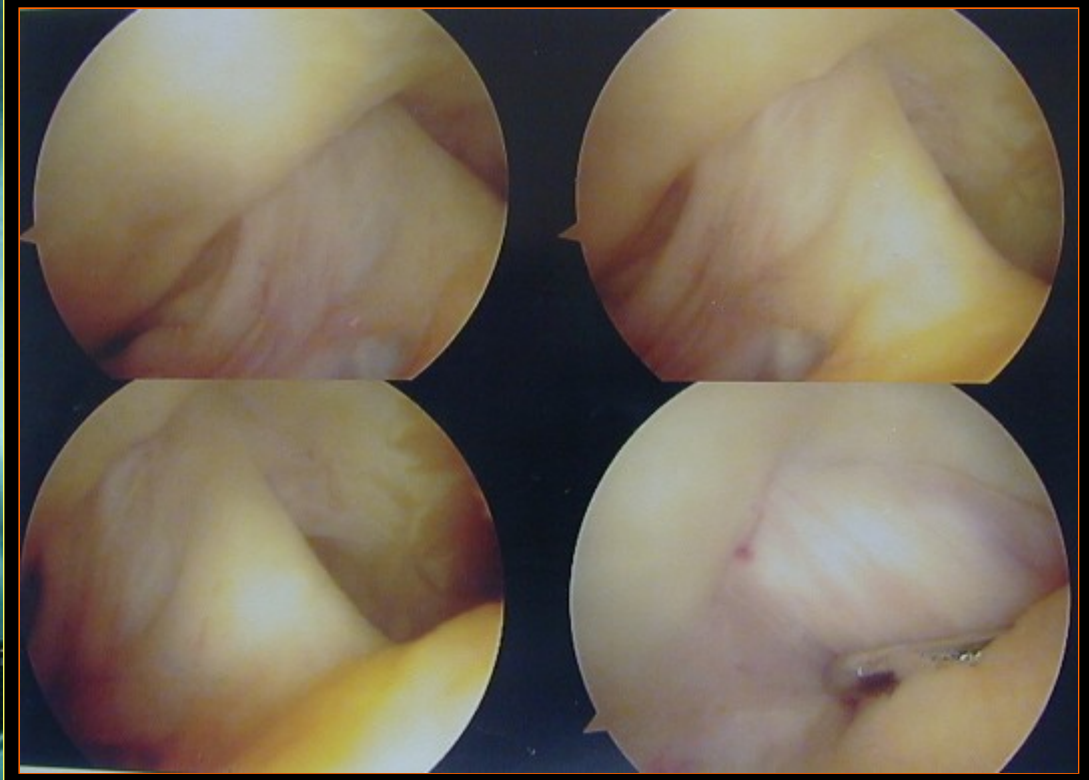
  7 patients nearly normal and 105 normal
- ✓ 2 cases of temporary saphenous neuralgia

RESULTS



Second look arthroscopy 4 years after the index operation.


I101



Discussion

- ✓ BH Soffix is an effective means of ACL Reconstruction
- ✓ The technique provides excellent stability and good functional results

ACL BH Soffix Reconstruction

- ✓ Low complication rate
- ✓ Most patients were IKDC A and B

Discussion

The success of ACL reconstruction depends on:

1. Patient choice
2. Chronicity of the injury
3. Graft type
4. Graft fixation
5. Surgical Technique
6. Accompanying injuries

Discussion

High incidence of secondary injuries may

lead to secondary osteoarthritis and pain

compromising the results of the reconstruction

Over the Top Route

The OTT route is recommended

- in ACL revision surgery
  (when the posterior femoral wall is deficient)
- in children with open physes and
- in double bundle ACL reconstructions

Nevertheless, almost all arthroscopic techniques using a femoral tunnel reference the OTT site

Over the Top Route

An in vitro comparison of over-the-top and femoral tunnel through-the-condyle ACL reconstructions failed to show any statistical differences in the joint kinematics when either reconstruction was compared.

Brower RS, Melby A 3rd, Askew MJ, Beringer DC. In vitro comparison of over-the-top and through-the-condyle anterior cruciate ligament reconstructions. *Am J Sports Med* 1992; 20:5, 567-574

A main advantage of the OTT technique is that it is highly reproducible and does not rely on locating an 'isometric' point.

The cruciate ligaments are not isometric and the isometric patterns of their fibres vary.

Over the Top Route

In all published clinical studies the OTT femoral route provided at least equal results with other surgical techniques

1. Marcacci M et al. Arthroscopic intra- and extra-articular anterior cruciate ligament reconstruction with gracilis and semitendinosus tendons. Knee Surg Sports Traumatol Arthrosc 1998;6(2):68-75
2. Karlson JA et al. Anterior cruciate ligament reconstruction using gracilis and semitendinosus tendons. Comparison of through-the-condyle and over-the-top graft placements. Am J Sports Med 1994;22(5):659-66
3. Jonsson H et al. Over-the-top or tunnel reconstruction of the anterior cruciate ligament? A prospective randomised study of 54 patients. J Bone Joint Surg Br 1994;76(1):82-7

Comparison of our study with other published series

The major finding is the similarity

in the final outcome between our study

and most published series using both

a hamstring and BPTB autograft

Summary and Conclusions

The Soffix Technique for ACL reconstruction:

- Is a reproducible technique with over the top routing
- Quick learning curve
- Dedicated instrumentation allows impingement free siting
- Soffix and frame facilitates construction of hamstring graft and allows good fixation
- High initial UTL with biomechanical testing
- Good results for primary and revision reconstruction

Thank You