EFOST

5th Advanced Course on Knee Surgery

Hamstring versus patellar graft in ACL reconstruction

Nicola Maffulli

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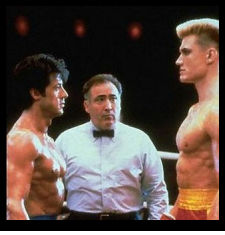
Barts and The London School of Medicine and Dentistry

- Just some concepts … before disputes…



- There is no black or white…

... Only infinite shades of gray

FEATURES OF AN IDEAL GRAFT

- Easily accessible
- Easily to revise
- Reproduce the normal anatomy of the ACL
- Achieve immediate rigid fixation
- Get a quick "Osteointegration" and healing at s
- Final characteristics of the mechanical and ultr equivalent to the ACL of the young adult

The NEW ENGLAND JOURNAL of MEDICINE

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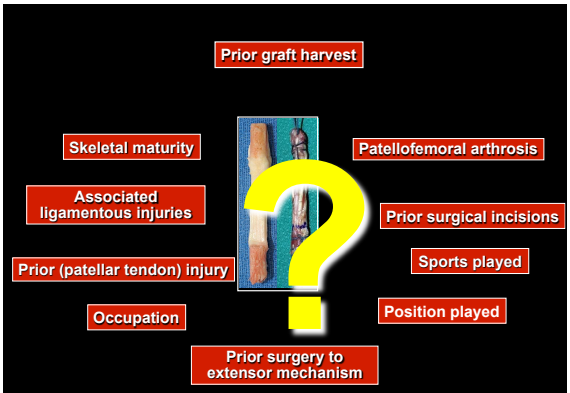
ORIGINAL ARTICLE — A Correction Has Been Published

A Randomized Trial of Treatment for Acute Anterior Cruciate Ligament Tears

Richard B. Frobell, Ph.D., Ewa M. Roos, P.T., Ph.D., Harald P. Roos, M.D., Ph.D., Jonas Ranstam, Ph.D., and L. Stefan Lohmander, M.D., Ph.D.

N Engl J Med 2010; 363:331-342 | July 22, 2010

In young, active adults with acute ACL tears, a strategy of rehabilitation plus early ACL reconstruction was not superior to a strategy of rehabilitation plus optional delayed ACL reconstruction. The latter strategy substantially reduced the frequency of surgical reconstructions.



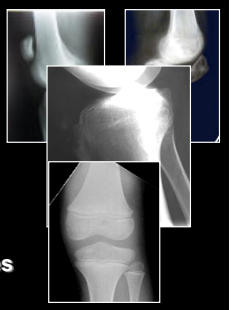
ACL OUTCOMES STUDY
Autograft Vs. Allograft
Results
COMPLICATIONS

NO SIGNIFICANT DIFFERENCES:

- Hardware Problems
- Wound Problems
- Recurrent Effusion
- Recurrent Injury

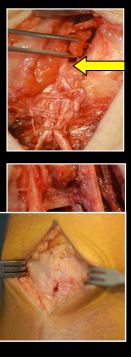
Radiographic Factors Influencing Graft Choice

- Patella alta
- Patella baja
- Osgood-Schlatter's
- Sinding-Larsen Johansson
- Presence of open physes



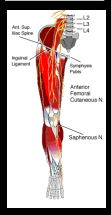
Patellar Tendon Graft Harvest

- Tendon defect repaired with #1 vicryl
- Patellar defect filled with autologous chips and bursal tissue closed:
  - Improved healing of bony defect
  - Improved cosmesis? *(data lacking)*
  - Spur formation at inferior pole if proximal tendon not carefully closed
  - Extra bone obtained from tibia
- Repair paratenon to enhance healing

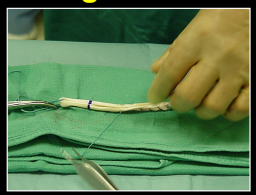


Hamstring Graft Harvest

- 3 cm incision medial to tibial tubercle
  - Oblique or transverse incision *may* reduce risk of nerve injury
- Superficial bursal tissue elevated and tendons identified
- Flex knee to ↓ tension on saphenous n.
- Incision in sartorial fascia between or above semitendinosus and gracilis

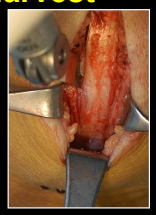


Hamstring Graft Harvest



Quadriceps Tendon Harvest

- 3-4 cm incision superior to patella
- Parallel 10 mm incisions 80 mm long in the central quadriceps tendon to a depth of 6-7 mm
- 25 mm x 10 mm bone plug cut at 45°
- #5 non-absorbable suture woven into tendinous end, and through bone plug



Complications of Patellar Tendon Graft Harvest

Patellar Fracture

- Overall incidence: 0.23%-2.3%
- Configuration as a function of time:
  - Longitudinal: intraoperatively
  - Stellate: early postoperatively
  - Transverse: late postoperatively
- Postoperative fractures occur at mean of 8 weeks

Postoperative x-rays recommended to document intact bone

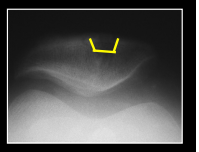
Patellar Fracture

Risk Factors

- Direct trauma
- Hypoplastic patella
- Squared bone cuts
- Transverse bone cut
- Large plug harvest
- Vertical deep saw cuts
- Incomplete saw cuts with dull saw
- Levering of patellar bone with osteotome
- Bone harvested *proximal* to patellar equator

Patellar Fracture

Preventive Measures



- Tapered bone cut
- Circular or trapezoidal defect
- Adequate visualization
- Remain below patellar equator
- High-speed saw
- Cut at an angle of 45˚
- Sawing < ⅓ of patellar depth

Late fractures *may* be prevented by bone grafting patellar defect

Patellar Tendon Rupture

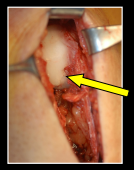
Aetiologic Factors

- Graft harvested with knee in full extension
- Dual horizontal incisions may lead to poor visualization
- Dual blade (catamaran) knife may cut tendon fibers distally

Tendon narrows distally and externally rotates 5°

Fat Pad Laceration

- Occurs from aggressive fat pad debridement during BTB harvest or notch debridement
- Results in fluid extravasation
- May result in fibrosis and patella baja



Tendon re-approximation and placement of bone wax in patellar defect will re-form "water-tight" seal

Nerve Injury

- Most commonly a neuropraxia to the infrapatellar branch of the saphenous n.
- May occur after BTB or STG graft
- Results in hypoesthesia lateral to wound

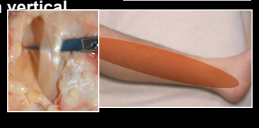
- Less common with transverse incisions
- *May* resolve in time

Warn patient preoperatively!

Complications of Hamstring Harvest

- Premature tendon transection due to:
  - Adhesions
  - Accessory semitendinosus insertion
  - Rigid tendon stripper
- Neuropraxia of saphenous nerve
  - Direct injury from medial incision
  - Indirect injury as it crosses gracilis tendon
  - Infrapatellar branch from vertical incision
- Accidental MCL harvest

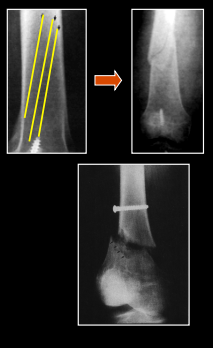




Peri-articular Fractures Related to Graft Choice

Factors:

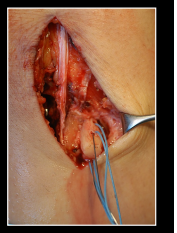
- Stress riser effect associated with multiple passes of Beath pin
- Thermal necrosis from drills
- Drill holes not filled with bone (i.e. hamstring, Achilles tendon)
- Diaphyseal hardware used for fixation
- Overly aggressive return to sports
- Inadvertent trauma



Graft-Tunnel Mismatch

Factors:

- Endoscopic ACL reconstruction
- Patella alta/patella baja
- Use of patellar tendon allografts
- Low tibial tunnel angle (≤50°) results in graft extrusion
- High tibial tunnel angle (≥60°) results in graft recession and difficulty with endoscopic femoral tunnel placement



2005

Hamstring Tendon Versus Patellar Tendon Anterior Cruciate Ligament Reconstruction Using Biodegradable Interference Fit Fixation

A Prospective Matched-Group Analysis

Michael Wagner, MD, Max J. Kääb, MD, PhD, Jessica Schallock, Norbert P. Haas, MD, PhD, and Andreas Weiler,* MD, PhD
From Sports Traumatology and Arthroscopy Service, Center for Musculoskeletal Surgery, Charité, Campus Virchow-Clinic, Humboldt and Free University of Berlin, Berlin, Germany

Conclusions: In this comparison of anterior cruciate ligament reconstruction with bone–patellar tendon–bone and anatomical hamstring tendon grafts, the hamstring tendon graft was superior in knee stability and function. These findings are partially contrary to previous studies and might be attributable to the use of an anatomical joint line fixation for hamstring tendon grafts. Thus, hamstring tendons are the authors' primary graft choice for anterior cruciate ligament reconstruction, even in high-level athletes.

2011

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Main results

Nineteen trials providing outcome data for 1597 young to middle-aged adults were included. Many trials were at high risk of bias reflecting inadequate methods of randomization, lack of blinding and incomplete assessment of outcome.

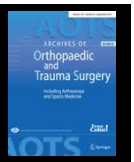
Pooled data for primary outcomes, reported in a minority of trials, showed no statistically significant differences between the two graft choices for functional assessment (single leg hop test), return to activity, Tegner and Lysholm scores, and subjective measures of outcome. There were also no differences found between the two interventions for re-rupture or International Knee Documentation Committee scores. There were inadequate long-term results, such as to assess the development of osteoarthritis.

All tests (instrumental, Lachman, pivot shift) for static stability consistently showed that PT reconstruction resulted in a more statically stable knee compared with HT reconstruction. Conversely, patients experienced more anterior knee problems, especially with kneeling, after PT reconstruction. PT reconstructions resulted in a statistically significant loss of extension range of motion and a trend towards loss of knee extension strength. HT reconstructions demonstrated a trend towards loss of flexion range of motion and a statistically significant loss of knee flexion strength. The clinical importance of the above range of motion losses is unclear.

Authors' conclusions

There is insufficient evidence to draw conclusions on differences between the two grafts for long-term functional outcome. While PT reconstructions are more likely to result in statically stable knees, they are also associated with more anterior knee problems.

2011



A systematic review of randomized controlled clinical trials comparing hamstring autografts versus bone-patellar tendon-bone autografts for the reconstruction of the anterior cruciate ligament

Shuzhen Li · Yueping Chen · Zonghan Lin · Wei Cui · Jingmin Zhao · Wei Su

Conclusions ACL reconstruction with HT autografts or BPTB autografts achieved similar postoperative effects in terms of restoring knee joint function. HT autografts were inferior to BPTB autografts for restoring knee joint stability, but were associated with fewer postoperative complications.

2012

Clinical Results and Risk Factors for Reinjury 15 Years After Anterior Cruciate Ligament Reconstruction

A Prospective Study of Hamstring and Patellar Tendon Grafts

Toby Leys,* MBBS, FRACS, Lucy Salmon,* BAppSci(Physio), PhD, Alison Waller,* BAppSci(Physio), James Linklater,† FRANZCR, and Leo Pinczewski,‡§ MBBS, FRACS
Investigation performed at North Sydney Orthopaedic and Sports Medicine Centre

Conclusion: Anterior cruciate ligament reconstruction using ipsilateral autograft continues to show excellent results in terms of patient satisfaction, symptoms, function, activity level, and stability. The use of HT autograft does, however, show better outcomes than the PT autograft in all of these outcome measures. Additionally, at 15 years, the HT graft–reconstructed ACLs have shown a lower rate of radiological osteoarthritis.

2012

Knee Surg Sports Traumatol Arthrosc. 2012 Aug;20(8):1520-7. doi: 10.1007/s00167-011-1735-2. Epub 2011 Nov 3.

Bone-patellar tendon-bone autograft versus hamstring autograft anterior cruciate ligament reconstruction in the young athlete: a retrospective matched analysis with 2-10 year follow-up.

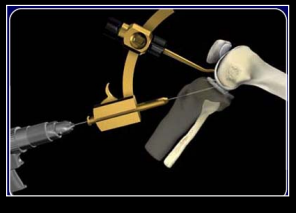
Mascarenhas R, Tranovich MJ, Kropf EJ, Fu FH, Harner CD.

CONCLUSIONS: Hamstring and bone-patellar tendon-bone autografts allow approximately 70% of young athletes to return to some degree of strenuous or very strenuous sporting activity, while only approximately half of patients were able to return to their pre-injury sporting activity level. Hamstring grafts lead to better preservation of extension, higher patient-reported outcome scores, and less radiographic evidence of osteoarthritis.

And also if you have already chosen…

There is no evidence that a double-bundle reconstruction provides a better clinical outcome than a single-bundle procedure.

A simple single-bundle reconstruction is a suitable technique, provided that it is performed in a technically correct fashion with up-to-date tunnel placement, using appropriate fixation techniques and rehabilitation programmes.



THE JOURNAL OF BONE & JOINT SURGERY (BR)

■ ANNOTATION

Double-bundle arthroscopic reconstruction of the anterior cruciate ligament

DOES THE EVIDENCE ADD UP?

U. G. Longo,
J. B. King,
V. Denaro,
N. Maffulli

From Keele University School of Medicine, Stoke on Trent, England

There is a trend towards the use of double-bundle techniques for the reconstruction of the anterior cruciate ligament. This has not been substantiated scientifically. The functional outcome of these techniques is equivalent to that of single-bundle methods. The main advantage of a double-bundle rather than a single-bundle reconstruction should be a better rotational stability, but the validity and accuracy of systems for the measurement of rotational stability have not been confirmed.

Despite the enthusiasm of surgeons for the double-bundle technique, reconstruction with a single-bundle should remain the standard method for managing deficiency of the anterior cruciate ligament until strong evidence in favour of the use of the double-bundle method is available.

Published Online October 11, 2011

British Medical Bulletin 2012; 103: 147–168

A systematic review of single-bundle versus double-bundle anterior cruciate ligament reconstruction

Umile Giuseppe Longo*, Stefan Buchmann*, Edoardo Franceschetti*, Nicola Maffulli*,†, and Vincenzo Denaro*

So, which graft should you use?

So, which graft should you use?

The one you are most comfortable with!

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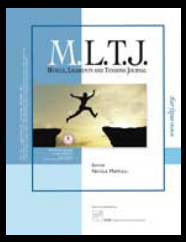
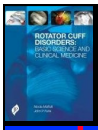


Thank you

Thank you



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