The Role of the Double-bundle ACL

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I or a member of my immediate family **DO NOT** have a financial interest or other relationship with a commercial company or institution.
What should be the true appearance of the ACL footprint?
The Role of the ACL
Anatomy
ACL Ruptures
Ways to Reconstruc	the Ruptured ACL
1. Trans-Tibia SB-ACLR
2. AM Portal-Over the Top
3. Standard SB-ACLR
4. AMB Reconstruction
5. ASB-ACLR

Sasaki, 2012

Jia-Kuo Yu
AIR: anterior intercondylar ridge
7. Oval Tunnels

8. Tripple Tunnels

Anatomic ACL reconstruction: rectangular tunnel/bone–patellar tendon–bone or triple-bundle/semitendinosus tendon grafting

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Abstract Anatomic ACL reconstruction is the reasonable approach to restore stability without loss of motion after ACL tear. To mimic the normal ACL like a ribbon, our preferred procedures is the anatomic rectangular tunnel (ART) technique with bone-patellar tendon-bone (BTB) graft or the anatomic triple bundle (ATB) procedure with a hamstring (HS) tendon graft. It is important to create tunnel apertures inside the attachment areas to lessen the tunnel widening. To identify the crescent-shaped ACL femoral attachment area, the upper cartilage margin, the posterior cartilage margin and the resident's ridge are used as landmarks. To delineate the C-shaped tibial insertion, medial intercondylar ridge, Parson's knob and anterior horn of the lateral meniscus are helpful. In ART-BTB procedure which is suitable for male patients engaged in contact sports, the parallelepiped tunnels with rectangular apertures are made within the femoral and tibial attachment areas. In ATB-HS technique which is mainly applied to female athletes engaged in non-contact sports including skiing or basketball, 2 femoral and 3 tibial round tunnels are created inside the attachment areas. These techniques make it possible for the grafts to run as the native ACL without impingement to the notch or PCL. After femoral fixation with an interference screw or cortical fixation devices including Endobutton, the graft is pretensioned in situ by repetitive manual pulls at 15–20° of flexion, monitoring the graft tension with tensioners on a tensioning boot installed on the calf. Tibial fixation with pullout sutures is achieved using Double Spike Plate and a screw at the pre-determined amount of tension of 10–20N. While better outcomes with less failure rate are being obtained compared to those in the past, higher graft tear rate remains a problem. Improved preventive training may be required to avoid secondary ACL injuries.

Introduction

Anterior cruciate ligament reconstruction (ACL-R) is a common surgical procedure in orthopaedic practice. It is our strong belief that a graft that is placed to mimic the native ACL is functionally capable of properly stabilizing the knee without loss of motion. Thus, anatomic graft placement is the key to successful ACL-R. In order to precisely mimic the fiber orientation of the native ACL, which is a flat ribbon-like structure [1], simply creating a single round tunnel in the attachment area is far from ideal. The tunnel aperture(s) should be adjusted to the shape of the attachment area, and the selected graft should
9. Old DB-ACLR-Femoral Side

Sasaki, 2012
Old DB-ACLR-Tibia
10. New DB-ACLR-Femoral Side
10. New DB-ACLR-Tibial Side
EBM (Evidence Based Medicine) for DB-ACLR
High-dose chemotherapy and autologous bone marrow or stem cell transplantation versus conventional chemotherapy for women with early poor prognosis breast cancer
Cindy Farquhar, Jane Marjoribanks, Anne Lethaby, Maimona Azhar
20 May 2016

Biologics or tocilizumab for rheumatoid arthritis in incomplete responders to methotrexate or other traditional disease-modifying anti-rheumatic drugs: a systematic review and network meta-analysis
Jasvinder S Singh, Alomgir Hossain, Elizabeth Tanjong Ghogomu, Ahmed Kotb, Robin Christensen, Amy S Mudano, Lara J
The importance of the Cochrane Database

- The Systematic Review Database of the 5 Continents Worldwide.
- Offer Evidences for Clinical Treatemnts and National Health Policy-making (Evidence-Based Medicine, EBM).

→ Cochrane Database of Systematic Review and EBM
Other Evidence for EBM

- Evidence of Level I, RCT Studies.
- Good Meta Analysis.
- Good Evidence of Level II.
EBM Showed the DB-ACLR was the Best One
1. DB-ACLR Showed Good Footprint Outline.
2. Better AP and Rotational Stability

- Pivot Shift: 2 no Diff, 7 DB Better than the SB.
- AP Stability: 8 DB Better than the SB, 1 no Diff.
3. Clinical Scoring was Better for the DB-ACLR

- From 2005, My Team Didn’t Found the Lysholm, Tegner and IKDC Diff between the SB and the DB.
- Mascarenhas (2015), Meta Analysis on 9 Systematic reviews: Objective IKDC Scoring, DB was Better.
4. **DB-ACLR Could Protect the Cartilage Better**

**Second-Look Arthroscopic Evaluation of Chondral Lesions After Isolated Anterior Cruciate Ligament Reconstruction**

**Single- Versus Double-Bundle Reconstruction**

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**Background:** Double-bundle (DB) anterior cruciate ligament reconstruction (ACLR) has been reported to yield better joint stability than the single-bundle (SB) ACLR, as confirmed under arthroscopy. Four-strand and 6- to 8-strand hamstring autografts, respectively, were used for transtibial SB and 4-tunnel DB reconstruction. Each graft was fixed with an EndoButton bioabsorbable interference screw and a staple. Cartilage status at 6 identified regions was evaluated by second-look arthroscopy and the Outerbridge classification. Other assessments at final follow-up included International Knee Documentation Committee (IKDC) score, Tegner and Lysholm scores, side-to-side difference on KT-2000 arthrometer, and range of motion.

**Results:** The mean time from reconstruction to second-look arthroscopy was 18.2 and 17.3 months for the DB and SB groups, respectively. Both groups had cartilage lesions at the patellofemoral joint (patella, 9 vs 13; trochlea, 5 vs 12) and the medial compartment (1 vs 2). Significantly less severe lesions were found in the DB group than in the SB group (mean grade: 0.33 vs 0.96; \( P < .05 \)). No significant differences were found between the 2 groups in terms of cartilage status at other regions, IKDC score, Lysholm score, Tegner score, KT-2000 arthrometer anterior laxity, or range of motion.

**Conclusion:** Chondral lesions were found postoperatively in both DB and SB ACLR groups with hamstring autograft. The DB ACLR led to less cartilage damage at the femoral trochlea at short-term follow-up.

**Keywords:** anterior cruciate ligament; double-bundle reconstruction; cartilage; second-look arthroscopy
5. More Evidences Showed DB-ACLR Better

前交叉韧带单束和双束重建比较研究的现状（2015-2016）

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关键词：膝关节；前交叉韧带；重建外科手术

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Comparative study on the clinic effects of arthroscopic reconstructions of single-bundle and double-bundle anterior cruciate ligament  YU Jia-kuo. Institute of sports medicine, the Third Hospital of Beijing University, Beijing 100191, China

KEYWORDS  Knee joint;  Anterior cruciate ligament;  Reconstruction surgical procedures

Zhongguo Cu Shang: China J Orthop Trauma, 2016, 29 (5); www.zggsszz.com

前交叉韧带（anterior cruciate ligament, ACL）是维持膝关节前后稳定性的主要结构之一，ACL断裂的患者，会继发半月板损伤和膝关节退变[1]。ACL断裂后进行关节镜下微创手术重建的数量也越来越多[2]。ACL重建的手术方法有多种[3-5]。近年来，对ACL重建术式的争论焦点多集中在单束重建或双束重建方面[6]。虽然被低估的程度没有显著差异(单束P=0.126,双束P=0.226)，但还是显示出文献报道的双束重建的手术数据更丰富和确切，使得双束重建手术文献汇总评分更高一些，因而被低估的程度还是小于单束重建的。
Management of ACL Injuries: Clinical Practice Guideline from the AAOS

Key Points for Practice

- The presence of a popping sensation in combination with swelling is a significant predictor of an ACL injury.
- Magnetic resonance imaging has a high sensitivity and specificity for confirming an ACL injury.
- If reconstructive surgery is indicated, it should be performed within the five months following injury.
- Early accelerated (19 weeks) and non-accelerated (32 weeks) rehabilitation programs may be beneficial after ACL reconstruction.

From the AFP Editors

Coverage of guidelines

Anterior cruciate ligament (ACL) injuries, an ACL injury. It also can help determine if other conditions are present, such as a meniscal injury; however, the sensitivity and specificity for this use are lower.

Treatment. Physicians performing ACL reconstruction should use autograft or allograft tissue that is processed correctly. Studies have found that the clinical outcomes are similar between the two; however, how the allograft is prepared (e.g., procurement, processing, storage, implantation) may cause some differences. Physicians should use bone-patellar
Physicians should use bone-patellar tendon-bone or hamstring-tendon auto-grafts, and should use a single- or double-bundle approach when performing intra-articular ACL reconstruction.
Cochrane in CORR®: Double-bundle Versus Single-bundle Reconstruction for Anterior Cruciate Ligament Rupture in Adults (Review)

Raman Mundi MD, Mohit Bhandari MD, PhD, FRCSC
Compared with SB-ACLR, the DB-ACLR Showed:

- Better AP Stability.
- Better Rational Stability.
- Could Recover to the Preinjured Sports Ability Better.
- Less Recontracted ACL Ruptures.
- Less Post Operation Meniscus Tears.
Conclusion

- DB-ACLR Had Showed Enough EBM Evidence.
- The Operative Techniques Were Complicated, Time Needed, Expensive, and Longer Learning Curve than TKA.
- SB-ACLR Was Clinically Needed for Many Patients Who not suitable for the DB-ACLR.
- No Diff between the SB and DB offen Caused by Study Design, bad Technique, not Accurate Evaluation, and so on.
- Good DB-ACLR Should Be Done for Top Athlete for Some Special Sports.
References
