



The Dreaded Double Scar

Sajjad Haider, MD; Jennifer Mitchell, MD, FAAFP, FAMSSM

Texas Tech University Health Sciences Center

Department of Family and Community Medicine, Sports Medicine Fellowship



HISTORY AND PHYSICAL

History:

19 year old female soccer athlete with Right Knee ACL tear

- Contact injury during a game; foot planted and knee twisted in opposite direction
- Immediate swelling with restricted range of motion
- Difficulty bearing weight due to pain

Physical Exam:

Weight 52.2 Kg, 150# Height 154.9 cm, 61" BMI 21.7

Thigh Circumference 36.8cm, 14.5"

Large knee effusion

Lacked 30 degree extension, flexion to 90 degree

Medial joint line tenderness with Mc Murray test positive

Medical Collateral Ligament (MCL) tenderness

Valgus stress: pain, no laxity

Lachman's positive

TESTS/RESULTS/DIAGNOSIS/TREATMENT

Knee x-ray:

No obvious osseous abnormalities, possible osteochondral-type defect depression of lateral femoral condyle

MRI:

ACL, full-thickness tear near femoral attachment

Medial meniscus, displaced bucket handle tear

MCL, diffuse partial tear

LCL, partial tear

Slightly depressed osteochondral fracture, lateral femoral condyle

Differential diagnosis:

ACL injury, possible MCL injury

Medial Meniscal Injury

Fracture of Femur or Tibia

Final Diagnosis:

Contact ACL tear with complex constellation of associated injuries

Treatment:

Pre-operative plan for left knee arthroscopic reconstruction with semitendinosus hamstring autograft.

Patient voiced desire for as minimal scar as possible

Operative findings:

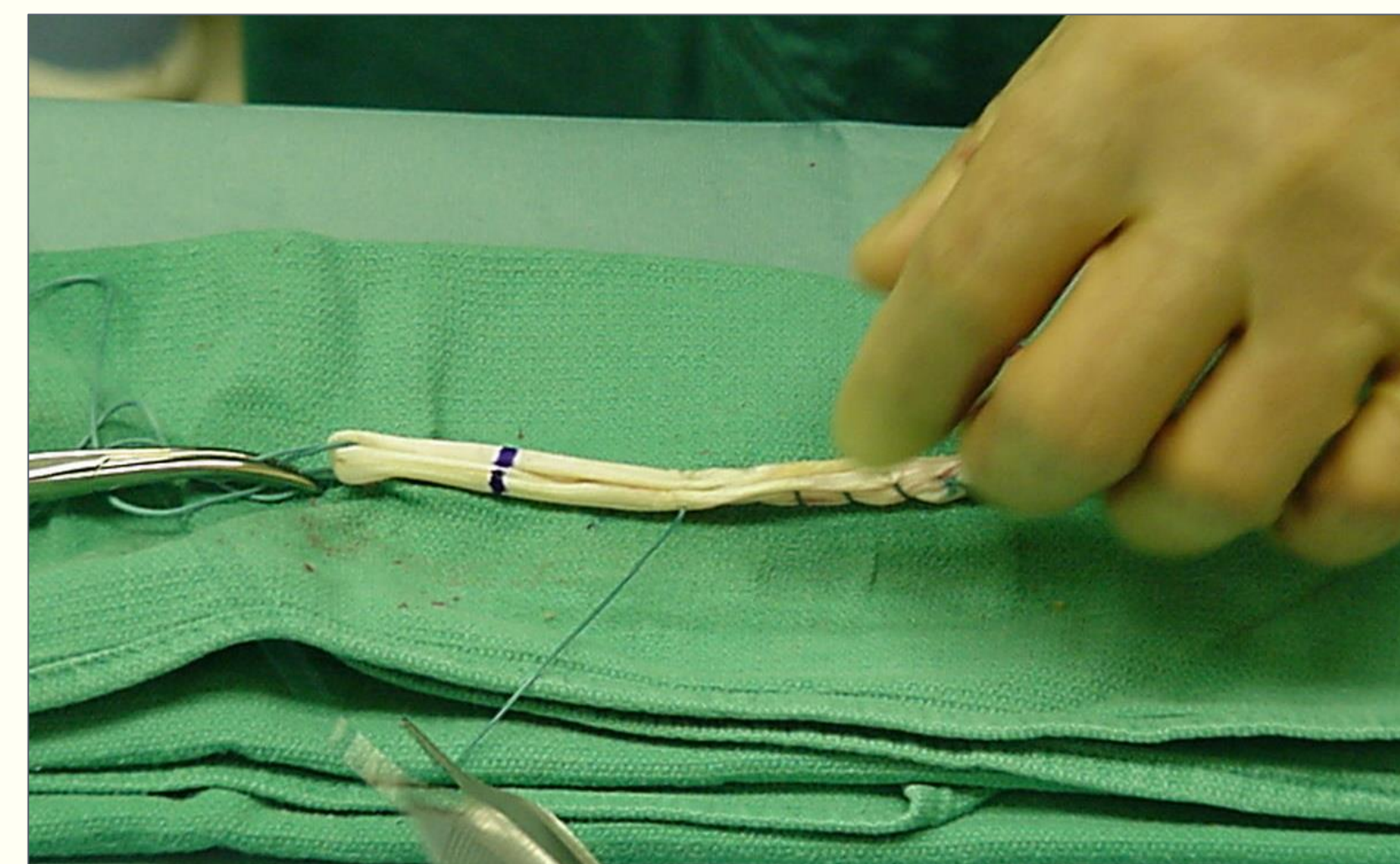
Reconstruction of ACL with bone tendon bone autograft

Medial meniscus repair

Lateral meniscus repair

CASE

- Pre-operative Plan: Semitendinosus Tendon Autograft
- Standard acceptable harvest diameter, > 7 mm
- Intra-operative issue: Hamstring harvest significantly small, less than 5 mm



Harvested Hamstring Graft

Result:

Procedure converted to Patellar bone - Tendon - bone autograft resulting in 2 scars



Dreaded Double Scar

ACL Reconstruction Surgery

- One of most commonly reconstructed ligaments
 - Over 200,000 cases annually
 - 50% of sports related knee injuries
 - \$1 billion / year US health care cost
- Reconstruction to restore functional stability and minimize osteoarthritis later in life
- Graft material
 - Allograft (cadaver, synthetic); losing favor
 - Autograft
 - Bone tendon bone
 - Hamstring
 - Quad tendon

DISCUSSION

Concerns related to conversion of hamstring to BTB include:

- Two post-operative scars
 - Potential for future confusion of actual procedure done previously
 - Cosmetically unappealing to some female athletes
- Comorbidities of **both** surgical procedures
- Prolonged tourniquet and anesthesia time

Improved prediction parameters may limit athletes being subjected to the potential of a failed hamstring harvest.

In order to avoid this perplexing situation, pre-operative estimation of hamstring tendon size would be ideal.

The most common methods of accomplishing this include imaging (ultrasound, MRI, or CT) and anthropometrics plus patient specific factors (height, weight, BMI, age, sex, thigh circumference, etc.).

In 2014, Conte, et al. published a systematic review with the goals to determine:

The minimal diameter quadruple-strand hamstring autograft to significantly decrease graft failure

A method to reliably predict the size of hamstring grafts by either imaging or anthropometric methods.

They determined the following:

An MRI study with software to measure cross-sectional area (CSA) of the semitendinosus tendon may be added to routine pre-operative planning without much additional effort.

The MRI CSA is better than anthropometric determinants.

Anthropometric data could be useful for hamstring graft prediction and height was the most common predictor of larger grafts. A patient height of 185 cm or greater correlated with a predicted graft diameter of 8.0mm.

Since no head to head comparisons exist, either method could be a useful tool to identify patients at risk of smaller sized grafts.

Ideally quadrupled hamstring grafts of >8mm diameter are especially protective against graft failure especially in young (<20 yo) patients.

Sumanont, et al. in a 2019 study, advocate for the use of pre-operative ultrasound measurement of the semitendinosus to determine whether length will be adequate to create a 4 strand graft with diameter of ≥ 8 mm.

In a clinical correlation study comparing anthropometric measurements to intraoperative graft length from 2015, Sudararajan, et al. determined adequate graft dimensions (>7mm), most closely associated with a patient height of > 170 cm. They felt a graft length of 33 cm was ideal for a 4 strand graft using their recommended surgical technique and 19 out of 20 females (95%) had inadequate graft length compared to 66 of 88 (75%) males.

CONCLUSION

Our patient was 154 cm (61") tall so did not meet height cutoff determinants from either of these studies. Potentially, an imaging study prior to surgery might have predicted an inadequate hamstring graft, thus directing toward a decision for BTB grafting preoperatively.

Primary care sports medicine physicians may be able to better advocate for their patients undergoing ACL reconstruction surgery by realizing a female less than 170-185 cm (66" - 73"), might benefit from preoperative imaging to assess whether hamstring graft is a reasonable option for graft choice, thus avoiding the dreaded double scar.

OUTCOME

The patient had a successful bone-tendon-bone autograft repair of her damaged ACL. She went on to complete rehabilitation, after the surgical correction and returned to the soccer field the next year for a complete season. Unfortunately, the next year she tore the other ACL during practice just after the 5th game of the season. She had that side repaired and completed rehabilitation, only to suffer her third ACL tear, again on the right knee, during the season opening game of her senior year. This time she opted to not have surgery, with the hope of some playing time using a knee brace. She ultimately returned to the pitch for Senior Day and was able to play during that game. She then underwent her third ACL repair after her senior soccer season was complete.

REFERENCES

1. Duchman KR, Lynch TS, Spindler KP. Graft selection in anterior cruciate ligament surgery who gets what and why? *Clin Sports Med.* 2017;36:25-33.
2. Widner M, Dunleavy M, Lynch S. Outcomes following ACL reconstruction based on graft type: are all grafts equivalent? *Curr Rev Musculoskelet Med.* 2019;12(4):460-465.
3. Conte EJ, Hyatt AE, Gatt CJ, Dhawan A. Hamstring autograft size can be predicted and is a potential risk factor for anterior cruciate ligament reconstruction failure. *Arthroscopy.* 2014;30(7):882-890.
4. Sumanont S, Mahaweerawat C, Boonrod A, Thammaroj P, Boonrod A. Preoperative ultrasound evaluation of the semitendinosus tendon for anterior cruciate ligament reconstruction. *Orthop J Sports Med.* 2019;7(1):1-5. DOI:10.1177/2325967118822318
5. Sundararajan SR, Rajagopalakrishnan R, Rajasekaran S. Is height the best predictor for adequacy of semitendinosus-alone anterior cruciate ligament reconstruction? A study of hamstring graft dimensions and anthropometric measurements. *International Orthopaedics.* 2016;40:1025-1031. DOI:10.1007/s00264-015-2882-8.