Updates in Orthopedic Surgical Care

Joseph Gatti, MS, LAT, ATC, EMT-B
Mid-Atlantic Surgical Systems

Duquesne University
November 16, 2019
Introduction

- BS Mercyhurst College
- MS University of Pittsburgh
- UPMC Sports Medicine 1998-2018
  - Pittsburgh Public City School 1998-2000
  - Duquesne University 2003-2018
- Mid-Atlantic Surgical Systems (MASS) (Arthrex) 2018-present
Objectives

- Job description
- Surgical techniques
- Demonstrations
- Q&A
Disclaimer

- This presentation is for informational purposes only and represents my experiences in the orthopedic implant industry.
- My experiences are based upon my role as an Arthrex Technology Consultant.
- My employer is a local distributor for Arthrex.
- All information is readily available to the general public.
MASS Team

1. Sports
   a. Shoulder
   b. Knee
   c. Hip
2. DEX
   a. Foot/ankle
   b. Hand/wrist
3. Biologics
4. Arthroplasty
5. Capital
6. Office staff
MASS Team

- Product Manager
- Territory manager
  - Usually a sports person
  - Sales responsibility
- DEX
  - Sales responsibility
- Medical Education Specialist
Medical Education Specialist

- Case coverage
  - OR/product management
- Logistics
  - Inventory
  - Weekly meeting
  - Sample ordering
- Journal Club
- Labs
- Team Certification
- Indirect sales through education on new products/techniques
There's more than one way to skin a cat.
Glenohumeral Instability

What makes a good anchor

Tie or not to Tie???????????
Movement-induced knot migration after anterior stabilization in the shoulder.

Kim SH¹, Crater RB, Hargens AR.

Author information
1 Department of Orthopaedic Surgery, Seoul National University College of Medicine, Seoul National University Hospital, Seoul, South Korea.

Abstract
PURPOSE: This study compared the status of suture knots immediately after repair and after shoulder motion to evaluate the possibility of movement-induced knot migration to a location nearer the glenoid.

METHODS: We included 10 shoulders from 5 cadavers in the study. After posterior capsulotomy, a Bankart lesion was created. A capsulolabral repair was then performed with 3 knot-tying suture anchors. All knots were positioned on the capsular side, far from the articular surface. After the repair was complete, a photograph was taken with a metal rod placed to reference absolute distance. After passive pendulum motion was applied, another photograph was taken. The length of the suture strand from the knot base to the anchor insertion site was measured during both the initial repair and post-motion periods.
Why Knotless

maintained after motion at the shoulder.

**CLINICAL RELEVANCE:** Movement-induced knot migration may be detrimental to articular cartilage in the event that a knot becomes interposed between the glenoid and humeral head.

Copyright © 2013 Arthroscopy Association of North America. Published by Elsevier Inc. All rights reserved.

PMID: 23317565   DOI: 10.1016/j.arthro.2012.10.011

[Indexed for MEDLINE]
Why Knotless

Knot Strength Varies Widely Among Expert Arthroscopists.

Hanypsiak BT, Delong JM, Simmons L, Lowe W, Burkhart S.

Author information
1 Mt Sinai Hospital, New York, New York, USA Arthrex Incorporated, Naples, Florida, USA
   warthog23@me.com.
2 Medical University of South Carolina, Charleston, South Carolina, USA.
3 Arthrex Incorporated, Naples, Florida, USA NOVA Southeastern University, Fort Lauderdale, Florida, USA.
4 University of Texas Medical Center at Houston, Houston, Texas, USA.
5 San Antonio Orthopedic Group, San Antonio, Texas, USA.

Abstract

BACKGROUND: While most surgeons can tie visually appealing knots under an arthroscope, few surgeons have undergone an objective evaluation of their ability to consistently tie knots with maximum loop and knot security.

PURPOSE/HYPOTHESES: The purpose of this study was to evaluate and compare variations in ultimate load to failure, 3-mm displacement (clinical failure), and knot stack thickness of a traditional knot with a knotless knot fixation device in anterior cruciate ligament (ACL) reconstructions.
CONCLUSION: Considerable variations in knot strength exist between arthroscopic knots tied by surgeons. Study findings revealed that surgeons were unable to tie 5 consecutive knots of the same type consistently; that for both ultimate load and clinical failure load, surgeons with <10 years in practice were able to tie knots more consistently than surgeons with >10 years; and that surgeons performing >200 arthroscopic shoulder cases annually failed to tie stronger or more consistent knots than their counterparts performing fewer cases.

CLINICAL RELEVANCE: This variation in knot tying has the potential to affect the integrity of arthroscopic repairs. Independent objective testing of the ability to tie secure knots as part of a surgeons’ training may be necessary.
PushLock

- Knotless
- Capture labrum and/or capsule
- Adjust tension prior to anchor insertion
- “Suture First”
- Various suture configurations
  - Simple, mattress, cinch
- Various suture
  - FiberWire, LabralTape, FiberStick, FiberLink
PushLock

https://www.arthrex.com/resources/animation/HAQm7ZkhmkymbQE3lAffnQ/pushlock-knotless-instability-repair

https://www.arthrex.com/resources/video/lQV5Pow8T0udMwFUqzSBLA/knotless-labral-repair-using-24-mm-biocomposite-pushlock-suture-anchor
Knotless SutureTak

- Knotless
- Maintain drill hole and anchor insertion trajectory
- Control tensioning under direct visualization
- "Anchor First"
- Various suture configurations
  - Simple, mattress
- Ideal to lever humeral head out of the way
  - 6 O’clock position
- 57 lbs
Knotless SutureTak


https://www.arthrex.com/resources/animation/2d7_0mxWw0edpgFLMMBz5A/knotless-suturetak-anchor

https://www.arthrex.com/resources/video/Q7V8gRgw0W3kAFYRHJAyg/knotless-suturetak-replissage
Knotless FiberTak

- Knotless
- Soft (suture) anchor
- Minimal bone removal
- Maintain drill hole and anchor insertion trajectory
- Control tensioning under direct visualization
- Various suture configurations
  - Simple, mattress
- More points of fixation than larger BC anchors
- Idea to lever humeral head out of the way
  - 6 O’clock position
- 48 lbs
Knotless FiberTak

https://www.arthrex.com/resources/video/M-yNazFZDUaYNqFoyKzSLQ/tensio
nable-knotless-bankart-repair-using-the-knotless-18-mm-fibertak-implant-syste
m
Glenohumeral Instability Summary

Go knotless

- No knot migration to articular surface
- Consistent tensioning
- Ability to tension under direct visualization
- Smaller anchor provides more points of fixation
Rotator Cuff Repair
AC Joint Repair

- New techniques and instrumentation allow this to be done arthroscopically or at least arthroscopically assisted.
- If done with clavicle fracture, surgeons will do the procedure “open” in order to place a plate on the clavicle.
AC Joint Repair

ACL

- Tunnel drilling
- Fixation
- Tensioning
Transtibial ACL

- Original ACL technique
- Reliable and reproducible
- 1 trajectory
- Interference screws for fixation
- Done in hyperflexed position
Flexible Reamer

- More anatomic
- Independent tunnel drilling
- Atraumatic passage through medial portal and around medial condyle
- No need for hyperflexion during drilling
- Can use Interference screw or TightRope for femoral fixation
Flexible Reamer

https://www.arthrex.com/resources/video/21I7T4cwUESTsQFdyCPLxA/flexiblereamer-system-for-btb-acl-reconstruction
FlipCutter

- Anatomic femoral socket creation
- Independent tunnel drilling
- No need for hyperflexion during drilling
- Can use Interference screw or TightRope for femoral fixation
- All-in-one guidepin and reamer
- Inside/out drilling
FlipCutter

FlipCutter Reamer Option
FlipCutter

Anterior cruciate ligament femoral tunnel length: cadaveric analysis comparing anteromedial portal versus outside-in technique.

Lubowitz JH, Konicek J.

Author information

1 Taos Orthopaedic Institute Research Foundation, Taos, New Mexico 87571, USA. jlbowitz@kitcarson.net

Abstract

PURPOSE: The purpose was to measure anterior cruciate ligament (ACL) femoral tunnel lengths comparing anteromedial (AM) portal and outside-in techniques.

METHODS: ACL femoral guide pins were drilled into 12 cadaveric knees through the AM portal technique and then the outside-in technique in each specimen. Pin intraosseous distance was measured in millimeters by a MicroScribe 3-dimensional digitizer (Immersion, San Jose, CA).

RESULTS: With the AM portal technique, the mean ACL femoral tunnel distance was 30.5 mm. With the outside-in technique, the mean ACL femoral tunnel distance was 34.1 mm. The difference was statistically significant (P = .04).

CONCLUSIONS: Our results show that the outside-in technique for creating the ACL femoral tunnel results in a longer mean tunnel length than the AM portal technique for creating the ACL femoral tunnel. The outside-in technique best prevents excessively short tunnels.

CLINICAL RELEVANCE: Our results have clinical relevance for surgeons who desire to perform independent, rather than transtibial, drilling of the ACL femoral tunnel and desire adequate length of tendon graft within the femoral bone tunnel.
Graft Fixation

- Metal Interference screw
- Biocomposite Interference screw
- Adjustable Cortical Fixation (TightRope)
  - Ability to retension
  - Circumferential graft incorporation in tunnel
- Combination of BC screw and TightRope
Suspensory Versus Interference Screw Fixation for Arthroscopic Anterior Cruciate Ligament Reconstruction in a Translational Large-Animal Model

Patrick A. Smith, M.D.a,b, James P. Stannard, M.D.a,c, Ferris M. Pfeiffer, Ph.D.a,c, Keiichi Kuroki, D.V.M., Ph.D.c, Chantelle C. Bozynski, D.V.M., M.S.c, James L. Cook, D.V.M., Ph.D.a,c.*

Published Online: February 04, 2016

https://doi.org/10.1016/j.arthro.2015.11.026

Purpose

To compare all-inside cortical-button suspensory fixation in sockets versus interference screw fixation in tunnels with respect to clinical, histologic, and biomechanical assessments of all-soft tissue (AST) tendon autografts used for anterior cruciate ligament (ACL) reconstruction in a canine model.

Methods

By use of a validated “hybrid” double-bundle ACL reconstruction technique (reconstruction of the anteromedial bundle with preservation of the native posterolateral bundle), dogs were randomly assigned to undergo either suspensory fixation in sockets (n = 6) or interference screw fixation in tunnels (n =
Conclusions

Suspensory fixation of AST grafts in sockets was associated with superior tendon-to-bone healing compared with interference screw fixation in tunnels, with 4-zone direct graft healing to bone seen for femoral and tibial sockets only in the suspensory-fixation group. Biomechanical properties were similar between groups.

Clinical Relevance

These data provide evidence suggesting that an all-inside ACL reconstruction technique using adjustable-loop cortical-button suspensory fixation in bone sockets has potential clinical advantages for ACL reconstruction using AST grafts.
Adjustable-Loop Femoral Cortical Suspensory Fixation for Patellar Tendon Anterior Cruciate Ligament Reconstruction: A Time Zero Biomechanical Comparison With Interference Screw Fixation

Dayne T. Mickelson, MD, Thomas Lefebvre, MD, Ken Gall, PhD, more...

First Published May 15, 2018 | Research Article | https://doi.org/10.1177/0363546518771365

Abstract

Background:

Adjustable-loop cortical buttons for femoral fixation of bone-tendon-bone grafts have potential advantages over interference screw fixation; however, these devices have not been benchmarked biomechanically against interference screws.
Conclusion:

Adjustable-loop cortical buttons and interference screws have similar time zero failure loads, although cyclic displacement was higher with the adjustable-loop cortical buttons. The mean difference in displacement was less than 1 mm compared with the interference screw.

Clinical Relevance:

Adjustable-loop cortical buttons may be an acceptable alternative to an interference screw for femoral fixation of bone-tendon-bone grafts in anterior cruciate ligament reconstruction. The clinical relevance of the observed differences in cyclic displacement is unknown and should be evaluated in future studies.
Resources
ACL Back Up
Interference Screw Fixation with and without SwiveLock® Anchor Backup Fixation

Artrex Research and Development

Objective

Compare the biomechanical strength characteristics of a tibial ACL interference screw reconstruction with and without a SwiveLock anchor backup fixation.

Methods and Materials

Twenty (20) proximal porcine tibias were potted in fiberglass resin and prepared with 9 mm diameter through holes, using standard ACL reconstruction instrumentation (AR-1900S).

Bovine extensor tendons were used as graft material, and each tail was whipstitched using 92 Fiberloop® sutures, as shown in Figure 1. The graft was doubled and passed through the tunnel such that the tendon loop was a 30 mm length above the proximal orifice and the tendon and whipstitched suture tails protruded from the distal orifice.

Figure 1. A bovine extensor tendon graft prepared for insertion into a porcine tibia sample.

Biomechanical testing was performed using an INSTRON 8871 ServoHydraulic Materials Testing System (SN: 8871P1071) with a 5kN load cell (SN: 40446) secured to the cross-head. A fixed-angle fixture was attached to the testing surface for the purpose of securing the bone samples at an angle, such that the direction of pull was in line with the tibial tunnel. The tendon graft loop was captured by a hook fixture suspended from the crosshead with a cable and released. The sample orientation and fixation is shown in Figure 2.

Figure 2. A porcine tibia sample positioned in the INSTRON machine for biomechanical testing.

The samples with the SwiveLock® anchor backup fixation had a significantly higher ultimate load (1007 ± 176N, p-value = 0.005) and yield load (642 ± 172N, p-value = 0.048) than that of the control group (778 ± 139N and 496 ± 133N, respectively). Furthermore, the SwiveLock anchor backup fixation samples had a lower average cyclic displacement (2.1 ± 0.5 mm) than that of the control group (3.3 ± 2.1 mm), although this comparison was not significant (p = 0.185).

Figure 3. Graphical representations of the ultimate and yield loads.

Ultimate Load

A preload of less than 5N was applied to each sample prior to testing. Testing began with 10 cycles between 10N and 50N, at 1Hz, to remove any slack from the system. The pre-cyclic loading was followed by cyclic loading between 50N and 250N, for 500 cycles, at 1Hz.

Load and displacement data were recorded at 500Hz, and the mode of failure was recorded for each sample at the time of testing. Additionally, digital video tracking was used to measure graft displacement at the proximal tunnel orifice during cyclic loading. All outcome measures for both sample groups were compared using t-tests (α = 0.05).
ACL Summary

- Independent tunnel drilling
  - Various options for tunnel drilling
- No need for hyper flex positioning
- Various options for graft fixation
- Ability to retention with TightRope
- Secondary fixation
Meniscal Repair

Meniscal Cinch II

- All inside
- Single hand use
- Low profile implant
- Various stitch configurations
Meniscal Cinch II

https://www.arthrex.com/resources/video/CNt5-qjmTUEWvieGpVImNwQ/menis-cal-cinch-ii-system
Achilles Rupture

- Wound complications
- Sural nerve involvement
- Knot tying
- RTP
- Cosmesis
PARS Achilles SpeedBridge™

- Possibly reduce wound problems
- Possibly preserve blood supply and sheath to reduce scar adhesions
- Possibly reduce risk of rerupture
- Knotless
- As strong as open repair
- Possibly reduce OR time
- Possibly early mobilization leads to better outcomes and happier patients …
Open vs. PARS

270 patients

Krackow

82% return to baseline activities after 5 months

No significant differences between groups in rates of rerupture, sural neuritis, wound dehiscence, infection, or reoperation

PARS

98% return to baseline activities after 5 months

Clinical Outcomes and Complications of Percutaneous Achilles Repair System Versus Open Technique for Acute Achilles Tendon Ruptures. Foot Ankle Int. 2015 Jun 8 ePub; Hsu AR, Jones CP, Cohen BE, Davis WH, Ellington JK, Anderson RB
PARS Achilles Midsubstance

Syndesmosis

- Screw fixation
TightRope XP

- Decreased chance of malreduction
- No need for 2nd surgery
- Quicker RTP
- Better clinical outcomes
- No medial incision
- Versatile
Abstract

Background:

Ankle syndesmotic injuries are complex and require anatomic reduction and fixation to restore the normal biomechanics of the ankle joint and prevent long-term complications.

Purpose:

The aim of this study is to compare the accuracy and maintenance of syndesmotic reduction using TightRope versus syndesmotic screw fixation.
Results:

Forty-six of 55 eligible patients participated in the study; 23 patients were in the TightRope group and 23 in the syndesmotic screw group. The average age was 42 years in the TightRope and 40 years in the syndesmotic screw group, and the mean follow-up time was 2.5 years (range, 1.5-3.5 years). The average width of normal syndesmosis was 4.03 ± 0.89 mm. In the TightRope group, the mean width of syndesmosis was 4.37 mm (SD, ±1.12 mm) ($P = .30$, t test) compared with 5.16 mm (SD, ±1.92 mm) in the syndesmotic screw group ($P = .01$, t test). Five of 23 ankles (21.7%) in the syndesmotic screw group had syndesmotic malreduction, whereas none of the TightRope group showed malreduction on CT scans ($P = .04$, Fisher exact test). Average time to full weightbearing was 8 weeks in the TightRope group and 9.1 weeks in the syndesmotic screw group. There was no significant difference between the TightRope and syndesmotic screw groups in mean postoperative AOFAS score (89.56 and 86.52, respectively) or FADI score (82.42 and 81.22, respectively). Regression analysis confirmed malreduction of syndesmosis as the only independent variable that affected the clinical outcome (regression coefficient, −12.39; $t = −2.43$; $P = .02$).

Conclusion:

The results of this study indicate that fixation with TightRope provides a more accurate method of syndesmotic stabilization compared with screw fixation. Syndesmotic malreduction is the most important independent predictor of clinical outcomes; therefore, care should be taken to reduce the syndesmosis accurately.
Improved Reduction of the Tibiofibular Syndesmosis With TightRope Compared With Screw Fixation: Results of a Randomized Controlled Study

Canadian Orthopaedic Trauma Society; David Sanders, MD, FRCSC,* Prism Schneider, MD, PhD, FRCSC,† Michel Taylor, MD, MSc, FRCSC,* Christina Tieszer, MSc, CCRP,* and Abdel-Rahman Lawendy, MD, PhD, FRCSC*
Results: Overall, the rate of malreduction using screw fixation was 39% compared with 15% using TightRope fixation ($P = 0.028$, $\chi^2$). Analysis of computed tomography results was performed using a 2-mm translation or 10-degree rotation threshold for malreduction and included fibular translation (anterior, posterior); syndesmosis distance (anterior, posterior, and mid); medial compression; and rotation (fibular and articular). Patients in group T had greater anterior translation ($5.4 \pm 1.8$ mm) compared with the contralateral limb ($4.3 \pm 1.3$ mm, $P < 0.01$) or group S ($4.6 \pm 1.5$ mm, $P = 0.05$). Group T syndesmoses also had greater diastasis compared with control limb ($4.1 \pm 1.3$ vs. $3.3 \pm 1.4$ mm, $P < 0.01$) and less fibular medialization compared with group S ($1.04 \pm 1.8$ vs. $0.3 \pm 1.8$ mm, $P = 0.05$). Functional outcome measures demonstrated significant improvements over time, but no differences between fixation groups. Foot and Ankle Disability Index scores at each time interval were $44 \pm 22$ (T) versus $45 \pm 24$ (S) (6 weeks), $76 \pm 14$ versus $73 \pm 17$ (3 months), $89 \pm 10$ versus $86 \pm 13$ (6 months), and $93 \pm 9$ versus $90 \pm 14$ (12 months) (all $P > 0.2$). The reoperation rate was higher in the screw group compared with TightRope (30% vs. 4%, $P = 0.02$) with the difference driven by the rate of implant removal.
TightRope XP

https://www.arthrex.com/resources/video/Oxd5AmA1dEa97wFgvDENPw/syn
desmosis-repair-featuring-the-syndesmosis-tightrope-xp-implant-system
Internal Brace

- What is it?
- How did it start?
Internal Brace


https://www.arthrex.com/resources/video/Tw3hDxdpq0-63gFfUAjmyA/atfl-and-cfl-with-internalbrace-ligament-augmentation-repair
Ultimate Failure (Newtons)*

*reference:
Viens NA, Wijdicks CA, Campbell KJ, Laprade RF, Clanton TO.
Internal Brace Resources
Internal Brace Summary

- “Seat Belt” to protect the graft while healing
- Allows graft to heal while initiating rehab sooner
- Indications are constantly evolving
Biologics

- Another lecture
- Weakness used to be anchors
- Then weakness was suture
- Now failure is biological tissue
Resources

https://www.arthrex.com

https://www.orthoillustrated.com

https://m.youtube.com/channel/UCfia3nqVECdumJM2VsNYrKg
Questions