Medial Patello Femoral Ligament (MPFL) reconstruction with autologous gracilis tendon using the suture anchor technique

PD Dr. med Sven Scheffler
Medial Patello Femoral Ligament (MPFL) Reconstruction with Autologous Gracilis Tendon using the Suture Anchor Technique

Table of Contents

Scope ........................................................................................................... 5
Introduction ................................................................................................. 5
Patient Preparation ....................................................................................... 6
Surgical Technique ....................................................................................... 7
   1. Graft harvest and preparation ............................................................ 7
   2. Patella Preparation ............................................................................. 8
   3. Femoral Tunnel Preparation ............................................................... 9
   4. Preparing the Femoral Tunnel ............................................................ 10
   5. Separation of layer 2 from the joint capsule (layer 3)......................... 12
   6. Fixation of graft to suture anchors ..................................................... 13
   7. Positioning the graft ......................................................................... 14
   8. Suturing ............................................................................................. 15
Ordering Information ..................................................................................... 16
Indications for Use ....................................................................................... 17
References ................................................................................................. 18

This surgical technique was prepared under the guidance of Dr. Sven Scheffler. Created under close collaboration with the physician, it contains a summary of medical techniques and opinions based upon his training and expertise in the field, along with his knowledge of Smith & Nephew’s BIOSURE® PK interference screw.

Smith & Nephew does not provide medical advice and recommends that surgeons exercise their own professional judgement when determining a patient’s course of treatment. Smith & Nephew does not recommend any particular product or surgical technique for a specific patient. This surgical technique is presented for educational purposes only. For more information on the products in this surgical technique, including indications for use, contraindications, effects, precautions and warnings, please consult the products’ Instructions for Use (IFU).
For illustrative purposes only. Results may vary.
Scope / Introduction

Scope

The aim of the medial patello femoral ligament (MPFL) reconstruction is to re-establish the alignment of the patella in the trochlear groove across the entire range of motion. The technique herein described is a mini-open procedure using a free gracilis tendon graft for anatomical reconstruction of the MPFL employing the suture anchor technique.

Introduction

Patellofemoral instability can be caused by congenital anomalies or through traumatic patellar dislocations\(^1-4\) with the latter being associated with rupture of the MPFL in over 96% of patients\(^5, 6\). In patients with recurrent dislocations, an increasing insufficiency of the medial patellar restraints can be observed. The combination of MPFL insufficiency with instability predisposing factors, such as trochlea dysplasia or patella alta, results in recurrent and continuous patellar dislocations\(^7, 8\). It is therefore crucial to restore sufficient function of the MPFL.

Previously the focus was to correct the extensor mechanism by re-establishing proper alignment of the patella, or by arthroscopically tightening the medial joint capsules either alone or in combination with a lateral release. However, anatomical, biomechanical and clinical studies have shown that these procedures are not able to reliably restore patellofemoral stability\(^9-13\), especially in the presence of dysplastic trochlea\(^14\). MPFL reconstruction maintains patellofemoral function even in the presence of dysplastic trochlea\(^15, 16\) and provides good mid and long-term stability, with significant improvements in knee function\(^16-18\).

This guide illustrates mini-open MPFL reconstruction using the suture anchor technique. This technique is advantageous in that the suture anchors allow for easy fixation, the creation of a bony groove improves graft incorporation, and the overall reconstruction mimics the anatomic fixation of the natural MPFL.

Prepared in Consultation with:
PD Dr. med. Sven Scheffler
Sporthopaedicum
Bismarckstrasse 45-47
10627 Berlin, Germany
Patient Preparation

Supine position, arthroscopy table, lowered position of contralateral leg for improved access to medial side of the operated leg.

Sandbag for positioning the leg in 20° flexion.

Tip:
The lowered contralateral leg allows for easy access when imaging.

Note:
The reconstruction procedure is preceded by a standard diagnostic knee arthroscopy to evaluate patellofemoral anatomy and cartilage status. Any other lesions in the knee are treated as preferred.
Surgical Technique

The surgical technique is composed of 8 surgical steps.

1. Graft harvest and preparation

   a. Harvest the gracilis tendon in the standard fashion. A minimum length of 21 cm is required.

   b. The tendon is fitted with high strength #2 ULTRABRAID® suture at one end of the gracilis tendon (Fig 1).

   c. Measure the diameter of the combined tendon end of the graft using a slotted sizing block which will provide the diameter required for femoral drilling.
2. Patella Preparation

a. Position the knee in 20° of flexion

b. Make an approximately 2 cm long skin incision along the proximal third of the medial patellar (Fig 2).

c. Make a sharp incision directly onto the medial edge of the patella removing all soft-tissue (Fig 3).

d. Create a 1 cm long osteal trough using a rongeur in the proximal third of the medial patellar edge (Fig 4).

**Important:**
Ensure the knee capsule is kept intact during osteal trough preparation.
3. Patella Anchor Positioning

a. Take an OSTEORAPTOR® drill guide and drill (reusable).

b. Locate the proximal end of the newly formed bony ridge. Place the drill sleeve on top of the patella to ensure proper tunnel depth. Drill a tunnel at a 45° angle parallel to the frontal plane of the patella to the depth indicated by the positive stop of the OSTEORAPTOR drill guide and drill (Fig 5).

c. Insert an OSTEORAPTOR suture anchor (2.9 mm) preloaded with two ULTRABRAID® high strength sutures at a 45° angle parallel to the frontal plane of the patella through the drill guide and tap it into the pre-drilled hole.

d. Place a second suture anchor in identical fashion at the distal end of the bony groove (Fig 6).
4. Preparing the Femoral Tunnel

a. Fully extend the knee so that a strictly lateral image of the knee joint can be obtained.

b. Place a 2.4 mm eyelet Kirschner wire (K-wire) against the skin at the anatomical femoral footprint of the intact MPFL.

c. Use an image converter to confirm the position of the K-wire. Locate the MPFL anatomic femoral footprint at 1 mm anterior to the extension of the posterior cortex, 2.5 mm distal to the posterior origin of the medical femoral condyle, and just proximal to the level of the most dorsal point of Blumensaat’s line\textsuperscript{16, 20} (Fig 7).
Surgical Technique

d. Make a 1 cm stab incision of the skin over the MPFL anatomic femoral footprint.

e. Reconfirm positioning of the K-wire with the image converter.

f. Drill the eyelet K-wire out of the lateral cortex in a 45° proximal and 20° anterior direction to prevent damage to the femoral notch and its ligaments (Fig 8).

g. Over-ream the K-wire with a cannulated headed reamer of matching graft diameters up to the contralateral cortex (Fig 9). Remove the headed reamer, leaving the K-wire in place.

h. Place a nitinol wire in the femoral tunnel to facilitate later interference screw fixation.

i. Use the K-wire to shuttle a doubled passing suture through the femoral tunnel (Fig 10).

Tip:
The placement of nitinol wire in the femoral tunnel allows for easy location of the femoral tunnel, easing screw placement.
5. Separation of layer 2 from the joint capsule (layer 3)

a. Identify the three soft-tissue layers of the medial capsular ligaments at the patellar skin incision.

Layer 1: superficial retinaculum

Layer 2: MPFL and medial collateral ligament

Layer 3: Medial patellomeniscal and patellotibial ligament/joint capsule.

b. Using a long, straight Kocher clamp, carefully separate layer 2, whilst preserving the joint capsule. Exit at the medial epicondylar skin incision (Fig 11).

c. Use the Kocher clamp to route the loop of the passing suture between layers 2 and the joint capsule, exiting at the patellar skin incision.
6. **Fixation of graft to suture anchors**

a. Position the knee in 20° of flexion.

b. Position the gracillis tendon graft in the osteal ridge of the medial patellar facet.

c. Fix the graft to both suture anchors into the bony trough so that the augmented end has the appropriate length to be inserted into the femoral tunnel *(Fig 12)*.

d. Tightly pull the non-augmented tendon end in a parallel fashion and cut to an identical length *(Fig 13)*.

e. Using a #2 ULTRABRAID® COBRAID® suture both tendon ends together for easier graft placement in the femoral tunnel *(Fig 13)*.

f. Measure the diameter of the combined tendon end of the graft *(Fig 14)*.
7. Positioning the graft

a. Using the passing suture, pass both graft ends beneath the fascia (layer 2) until they exit the medial epicondylar skin incision, continuing until both tendon ends are pulled into the femoral tunnel (Fig 15 and 16).

Important:
Slowly pull the graft into the femoral tunnel to ensure untwisted graft placement.

Tip:
Graft placement can be eased by placing a clamp between the skin and the graft with the clamp resting against the skin incision. It acts as a pulley to help introduce the graft into the tunnel.

b. When the graft is fully inserted into the tunnel, a popping sensation can be felt.

c. Manually set the correct graft tension by placing the lateral patella facet flush with the lateral trochlear edge.

d. Position the knee at 30–45° of flexion and fix the graft with a BIOSURE™ PK interference screw matching the tunnel diameter (Fig 17).

Tip:
A BIOSURE driver with a thickening at 25 mm can be used to check proper screw insertion of 25 mm screws under fluoroscopic control. While leaving the screwdriver engaged to the interference screw, the knee must be able to be flexed to 90° without significant resistance. If this cannot be confirmed, the interference screw must be removed and graft tension readjusted before final fixation.
8. Suturing

a. Close the capsular layer at the patella with 2-0 resorbable sutures.

b. Place subcutaneous and intracutaneous skin sutures.

c. Apply sterile wound dressings and place the knee in a fixed 20° soft brace.
# Ordering Information

To order the instruments used in this technique, contact an authorised Smith & Nephew representative. Prior to performing this technique, consult the Instructions for Use documentation provided with individual components – including indications, contraindications, warnings, cautions and instructions.

## ACUFEX™ Director Elite Drill Guide System
<table>
<thead>
<tr>
<th>Reference #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>013499</td>
<td>Endoscopic Drill 6 mm</td>
</tr>
<tr>
<td>013660</td>
<td>Endoscopic Drill 7 mm</td>
</tr>
<tr>
<td>013661</td>
<td>Endoscopic Drill 8 mm</td>
</tr>
<tr>
<td>013662</td>
<td>Endoscopic Drill 9 mm</td>
</tr>
</tbody>
</table>

## Graft Harvesting/Preparation Instruments

<table>
<thead>
<tr>
<th>Reference #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7207179</td>
<td>Large Tendon Stripper, closed, 7.4 mm I.D. x 13.5&quot; working length</td>
</tr>
<tr>
<td>013550*</td>
<td>Tendon Stripper, closed, 6.4 mm I.D. x 12&quot; working length</td>
</tr>
<tr>
<td>013554*</td>
<td>Tendon Stripper, slotted, 5 mm I.D. x 12&quot; working length</td>
</tr>
<tr>
<td>72202452</td>
<td>ACUFEX™ GRAFTMASTER™ III Preparation board</td>
</tr>
<tr>
<td>72202316</td>
<td>ACUFEX GRAFTMASTER™ III Sliding base (2)</td>
</tr>
<tr>
<td>72202315</td>
<td>ACUFEX GRAFTMASTER™ III Tissue grasper (2)</td>
</tr>
<tr>
<td>72202317</td>
<td>ACUFEX GRAFTMASTER™ III Cutting strip</td>
</tr>
<tr>
<td>72202319</td>
<td>ACUFEX GRAFTMASTER™ III Slotted Sizing block</td>
</tr>
<tr>
<td>72202441</td>
<td>ACUFEX GRAFTMASTER™ III System Tray</td>
</tr>
</tbody>
</table>

## Drill-Tip Passing Pins

<table>
<thead>
<tr>
<th>Reference #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7208678</td>
<td>2.4 mm x 15&quot; [38 cm] Graduated Drill-Tip Passing Pin, sterile, single use</td>
</tr>
</tbody>
</table>

## Sutures

<table>
<thead>
<tr>
<th>Reference #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7210914</td>
<td>ULTRABRAID® #2 white suture and needle assembly, 38&quot;, white, single package, sterile (10 per box)</td>
</tr>
<tr>
<td>7210915</td>
<td>ULTRABRAID® #2 COBRAID® suture and needle assembly, 38&quot;, co-braid blue, single package, sterile (10 per box)</td>
</tr>
</tbody>
</table>

## Interference Screw

<table>
<thead>
<tr>
<th>Reference #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>72202260</td>
<td>6 mm x 25 mm BIOSURE PK Screw, sterile</td>
</tr>
<tr>
<td>72202263</td>
<td>7 mm x 25 mm BIOSURE PK Screw, sterile</td>
</tr>
<tr>
<td>72202267</td>
<td>8 mm x 25 mm BIOSURE PK Screw, sterile</td>
</tr>
<tr>
<td>72202272</td>
<td>9 mm x 25 mm BIOSURE PK Screw, sterile</td>
</tr>
</tbody>
</table>

## OSTEORAPTOR® Drill Guides and Sleeves

<table>
<thead>
<tr>
<th>Reference #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>72201389</td>
<td>Inline Drill Guide – Fishmouth Tip</td>
</tr>
<tr>
<td>72201388</td>
<td>Inline Drill Guide – Spike Tip</td>
</tr>
<tr>
<td>72201390</td>
<td>Inline Drill Guide – Crown Tip</td>
</tr>
<tr>
<td>72201395</td>
<td>Inline Spade Drill Bit</td>
</tr>
<tr>
<td>72201392</td>
<td>Inline Obturator – Blunt Tip</td>
</tr>
<tr>
<td>72202404</td>
<td>Inline Twist Drill Bit</td>
</tr>
</tbody>
</table>

## BIOSURE® Drivers

<table>
<thead>
<tr>
<th>Reference #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>72201887</td>
<td>BIOSURE® Driver</td>
</tr>
<tr>
<td>EU000542</td>
<td>BIOSURE Driver with thickening at 25 mm (MTO)</td>
</tr>
<tr>
<td>72201888</td>
<td>BIOSURE Ratchet Driver (Requires Part Number 7207707)</td>
</tr>
<tr>
<td>7207707</td>
<td>Ratcheting Handle with Hudson Adaptor</td>
</tr>
</tbody>
</table>

## Slotted Sizing Block

<table>
<thead>
<tr>
<th>Reference #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7209214</td>
<td>Slotted Sizing Block</td>
</tr>
</tbody>
</table>

## BIOSURE® Guide Wires

<table>
<thead>
<tr>
<th>Reference #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7211137</td>
<td>Guide Wire, 1.2 mm x 9&quot;, sterile (5 per box)</td>
</tr>
<tr>
<td>7211138</td>
<td>Guide Wire, 1.2 mm x 12&quot;, sterile (5 per box)</td>
</tr>
<tr>
<td>72201201</td>
<td>Guide Wire, 1.2 mm x 18&quot;, sterile (5 per box)</td>
</tr>
</tbody>
</table>

## OSTEORAPTOR® Suture Anchor

<table>
<thead>
<tr>
<th>Reference #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>72201995</td>
<td>OSTEORAPTOR 2.9 Suture Anchor with two ULTRABRAID #2 Sutures (white/COBRAID-blue)</td>
</tr>
<tr>
<td>72201996</td>
<td>OSTEORAPTOR 2.9 Suture Anchor with two ULTRABRAID #2 Sutures (white/COBRAID-black)</td>
</tr>
</tbody>
</table>
Indications for Use

BIOSURE® PK Screw

Indications for Use
The BIOSURE PK Screw is indicated for the reattachment of ligament, tendon, soft tissue, or bone to bone during cruciate ligament reconstruction surgeries of the knee. All screws with a diameter of 9 mm or less and a length of 25 mm or less are also intended for use in the following procedures:

Knee
• ACL repairs
• PCL repairs
• Extra-capsular repairs
  – Medial collateral ligament
  – Lateral collateral ligament
  – Posterior oblique ligament
• Patellar realignment and tendon repairs
  – Vastus medialis obliquus advancement
• Iliotibial band tenodesis

ULTRABRAID® Suture

Indications for Use
The Smith & Nephew ULTRABRAID Suture is indicated for use in approximation and/or ligation of soft tissues, including allograft tissue for orthopedic surgeries.

OSTEORAPTOR® Suture Anchor

Indications for Use
The Smith & Nephew OSTEORAPTOR Suture Anchor is intended for the reattachment of soft tissue to bone for the following indications:

Knee
• Extra-capsular repairs
  – Medial collateral ligament
  – Lateral collateral ligament
  – Posterior oblique ligament
• Patellar realignment and tendon repairs
  – Vastus medialis obliquus advancement
• Iliotibial band tenodesis
References


