Instrument Set for Anterior Cruciate Ligament Reconstruction: Double-bundle technique
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The complex anatomy of the anterior cruciate ligament (ACL) can be divided into 2 functional bundles. Initial experiences with open reconstruction of the anterior cruciate ligament using a double-bundle technique were gathered in the 1980s.

However, as a consequence of the arthroscopic techniques for single-bundle reconstruction emerging at the time, the double-bundle technique was not pursued further.

A large number of biomechanical studies have, nevertheless, shown that with reconstruction of both bundles of the anterior cruciate ligament (the anteromedial and the posterolateral bundle), restoration of the functions of the knee joint is more effective than with a single-bundle technique. In addition, arthroscopic techniques have also been gradually improved, which now also enable a double-bundle technique to be performed arthroscopically.

With single-bundle reconstruction, the reciprocal tension behavior of the two functional bundles is not restored. Flexion tightens the anteromedial bundle while extension and rotation tighten the posterolateral bundle. Single-bundle reconstruction can, however, only satisfy part of the complex requirements.

Comparative clinical studies of the single-bundle and double-bundle techniques have successfully shown that reconstruction using the double-bundle technique provides significantly better stability results for the knee joint when a pivot-shift mechanism is simulated as well as improved AP stability.

The continued advances in arthroscopic techniques and new findings focus increasing attention on the anatomically correct position of the tunnels.

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To facilitate the arthroscopic performance of this technique, KARL STORZ, in cooperation with Prof. Dr. Wolf Petersen and PD Dr. Thore Zantop, has developed a range of instruments and implants perfectly adapted to meet the demands of the technique.

The instrument set for arthroscopic cruciate ligament reconstruction using the double-bundle technique is characterized by its precision and takes anatomical variability into account. It is the complement to the portfolio of instruments available for cruciate ligament reconstruction.

**Advantages**

- Fully compatible with the instruments normally used for cruciate ligament reconstruction
- Easy handling
- Developed using anatomical specimens and clinical testing
- Variability in spacing of tunnels
Surgical procedure

Advantages
• Anatomical surgical procedure
• Only semitendinosus tendon required for graft preparation
• Greater freedom when selecting the femoral tunnel position as both tunnels are drilled via the medial portal
• Excellent visualization of lateral condyle wall and ACL insertion via anteromedial portal
• Reproducible femoral landmarks: intercondylar line and transition between cartilage and bone

Indications
• Symptomatic anterior instability with anterior cruciate ligament rupture

Contraindications
• Children who have not reached skeletal maturity
• Multi-ligament interventions
• Osseous defects found during revision situations

Technique
Positioning of arthroscopic portals:
• High anterolateral portal
• Low anteromedial ‘drilling portals’
• Skin incision medial to tibial tuberosity for removal of tendons

Removal and preparation of grafts. Both grafts (AM and PL) are prepared as double-strand grafts with a FLIPPTACK® and MINI-ENDOTACK®.
Creation of an anteromedial femoral tunnel with a normal femoral target guide (e.g. 28729 ZD) via medial anteromedial access.

- Knee at flexion exceeding 110°
- Predrill with larding wire 28729 E, then redrill with cannulated 4.5 mm drill bit (28729 BA)

One of the special femoral target guides (e.g. 28729 WV) is now used to create the posterolateral tunnel. This allows a second Kirschner wire (28729 E) to be positioned at a specific distance from the AM tunnel. The target guide is available with different drilling distances in order to cater for the individual anatomy of the femoral ACL insertion (8-10 mm).

- Knee at 110° flexion
- Target guide is virtually horizontal in joint
- Predrill with Kirschner wire 28729 E, then redrill with cannulated 4.5 mm drill bit (28729 BA)
- Check tunnel positions via AM portal
Measure tunnel length (AM between 35 and 45 mm; PL between 30 and 45 mm) and drill blind-hole threads according to transplant diameter (length 28 mm).

The special double-bundle target guide 28729 WT is used to create the tibial tunnel. The target guide is equipped with a hook for fixing in the cruciate ligament stump as well as a target opening. Level with the exit of the larding wire there is a little wing, which can be positioned at the anatomical landmark for the AM bundle (Anterior horn of lateral meniscus).

The second longitudinal opening can then be hooked into the drilled Kirschner wire for the AM tunnel. This allows the Kirschner wire to be drilled for the PL tunnel at a specific distance from the AM tunnel.

Depending on the size of the knee joint and the tunnel diameters, the position can be varied based on the longitudinal form.
Check position of larding wire. The position of the wires should be corrected if there are any signs of impingement.

Redrill using appropriate drill bits depending on the graft diameter.

Insert grafts and femoral fixation using the FLIPPTACK®.

Tibial hybrid fixation of both grafts with MEGA FIX® (diameter 6 mm) and MINI ENDOTACK®.
- The AM graft is tensioned at 45° flexion and fixed.
- The PL bundle is tensioned at 15° flexion and fixed.

Double-bundle graft in situ.
Instruments

28729 AB  **Tendon Stripper**, graduated, diameter 7 mm, length 30 cm

28729 AC  **Slotted Tendon Stripper**, graduated, diameter 7.5 mm, length 30 cm

28729 SH  **Tendon Hook**

28729 D  **Drilling Wire**, spiral shape, with eyelet, diameter 2.4 mm, length 38 cm, for use with Bone Drills 28729 BA – BH, Collar Burrs 28729 BKC – BKF/BLC – BLF and Drills 28729 GA – GE

28729 SB  **Tendon Board**, including FLIPPTACK® Retainer 28729 SC
28729 SBD  **Tendon Board Add-on**, for the double bundle retainer technique, including FLIPPTACK® Retainer 28729 SC
28729 SC  **FLIPPTACK® Retainer**
28729 SD  **Tendon Thickness Tester**, for determination of tendon thickness size 4 – 7 mm at intervals of 0.5 mm
28729 FK  Thread Clip

28729 FT  FLIPPTACK®, extracortical fixation button, 4 x 12 mm, sterile

28729 FF  Thread Catcher, for cruciate ligament reconstruction, working length 23 cm

NEW

28729 WX  Femoral Target Guide Attachment, for ACL reconstruction via a medial port, with 5 mm offset, for use with Handle 28729 ZG

NEW

28729 WY  Same, with 6 mm offset
28729 WZ  Same, with 7 mm offset
28729 VX  Same, with 8 mm offset
28729 VY  Same, with 9 mm offset
28729 VZ  Same, with 10 mm offset
Femoral Target Guide Attachment, for the double bundle technique, with 8 mm offset, for use with Handle 28729 ZG

Same, 9 mm offset

Same, 10 mm offset

Handle, with ratchet, for use with Inserts 28729 ZM – ZQ, WX – WZ, VY – VZ, WU – WW, WA – WD

Tibial Target Guide, for the double bundle technique, exit point from the tibial plateau adjustable between 8 – 10 mm

Larding Wire, pyramidal tip, diameter 2.4 mm, length 32 cm, package of 10, for use with Bone Drills 28729 BA – BH, Collar Burrs 28729 BKC – BKF/BLC – BLF and Drills 28729 GA – GE

Nitinol Guide Wire, diameter 1.1 mm, length 38.5 cm

Nitinol Guide Wire, short, diameter 1.1 mm, length 25.5 cm
28729 BA  **Bone Drill**, cannulated, diameter 4.5 mm, for use with Drilling Wire 28729 D and Larding Wire 28729 E

28729 BB  **Same**, diameter 5 mm

28729 BI  **Same**, diameter 5.5 mm

28729 BC  **Same**, diameter 6 mm

28729 BK  **Same**, diameter 6.5 mm

28729 BD  **Same**, diameter 7 mm

28729 BL  **Same**, diameter 7.5 mm

28729 BE  **Same**, diameter 8 mm

28729 BM  **Same**, diameter 8.5 mm

28729 BF  **Same**, diameter 9 mm

28729 BN  **Same**, diameter 9.5 mm

28729 BG  **Same**, diameter 10 mm

28729 BO  **Same**, diameter 10.5 mm

28729 BH  **Same**, diameter 11 mm

28171 SGN  **SILGRASP® Suture Grasper**, straight jaws, sheath diameter 3 mm, straight, handle with cleaning connector, working length 14 cm

28729 P  **Tissue Forceps**, 1 x 2 teeth, medium, distal curved to left, length 14.5 cm

28729 L  **Length Gauge**, for cruciate ligament reconstruction, graduated, working length 23 cm
28729 MT  MINI-ENDOTACK®, tibial fixation button, 8 x 12 mm, sterile

28729 KK  Knot Holder, small, 1 x 1 mm, working length 14.5 cm

28729 SM  Positioning Device, for use with MINI-ENDOTACK® 28729 MT, color code: red

28729 MM  Button Wrench, for use with MINI-ENDOTACK® 28729 MT, color code: red

28729 TM  Tensiometer, gauge for measuring and controlling the tension of the graft
28789 SK  CROSSDRIVE® Screwdriver, cannulated, size 8 – 11, for use with bioresorbable MEGA FIX® screws diameter 8 – 11 mm

28770 SK  CROSSDRIVE® Screwdriver, cannulated, size 7, for use with bioresorbable MEGA FIX® screws diameter 7 mm

28760 SK  CROSSDRIVE® Screwdriver, cannulated, size 6, for use with bioresorbable MEGA FIX® screws diameter 6 mm

28729 N  Notcher, with fine-like blade to assist screw insertion, working length 15 cm

28729 NN  Bone Wedge Chisel, for creating a bone wedge in cruciate ligament surgery, with wide handle, working length 13 cm

28729 NM  Chisel, for creating a bone wedge in cruciate ligament surgery, working length 13 cm

174800  Metal Mallet, with plastic replacement head, length 22.5 cm
### Bioresorbable Interference Screws

#### Mega Fix® B

- **2870619 B** | MEGA FIX® B, bioresorbable interference screw, diameter 6 mm, length 19 mm, sterile
- **2870623 B** | Same, diameter 6 mm, length 23 mm
- **2870719 B** | Same, diameter 7 mm, length 19 mm
- **2870723 B** | Same, diameter 7 mm, length 23 mm
- **2870728 B** | Same, diameter 7 mm, length 28 mm
- **2870819 B** | Same, diameter 8 mm, length 19 mm
- **2870823 B** | Same, diameter 8 mm, length 23 mm
- **2870828 B** | Same, diameter 8 mm, length 28 mm
- **2870923 B** | Same, diameter 9 mm, length 23 mm
- **2870928 B** | Same, diameter 9 mm, length 28 mm

#### Mega Fix® P

- **2870823 P** | MEGA FIX® P, perforated, bioresorbable interference screw, diameter 8 mm, length 23 mm, sterile
- **2870828 P** | Same, diameter 8 mm, length 28 mm
- **2870923 P** | Same, diameter 9 mm, length 23 mm
- **2870928 P** | Same, diameter 9 mm, length 28 mm
- **2870935 P** | Same, diameter 9 mm, length 35 mm
- **2871028 P** | Same, diameter 10 mm, length 28 mm
- **2871035 P** | Same, diameter 10 mm, length 35 mm
- **2871135 P** | Same, diameter 11 mm, length 35 mm

#### Mega Fix® C

- **2870619 C** | MEGA FIX® C, bioresorbable composite interference screw, diameter 6 mm, length 19 mm, sterile
- **2870623 C** | Same, diameter 6 mm, length 23 mm
- **2870719 C** | Same, diameter 7 mm, length 19 mm
- **2870723 C** | Same, diameter 7 mm, length 23 mm
- **2870728 C** | Same, diameter 7 mm, length 28 mm
- **2870819 C** | Same, diameter 8 mm, length 19 mm
- **2870823 C** | Same, diameter 8 mm, length 23 mm
- **2870828 C** | Same, diameter 8 mm, length 28 mm
- **2870923 C** | Same, diameter 9 mm, length 23 mm
- **2870928 C** | Same, diameter 9 mm, length 28 mm

#### Mega Fix® CP

- **2870823 CP** | MEGA FIX® CP, perforated, bioresorbable composite interference screw, diameter 8 mm, length 23 mm, sterile
- **2870828 CP** | Same, diameter 8 mm, length 28 mm
- **2870923 CP** | Same, diameter 9 mm, length 23 mm
- **2870928 CP** | Same, diameter 9 mm, length 28 mm
- **2870935 CP** | Same, diameter 9 mm, length 35 mm
- **2871028 CP** | Same, diameter 10 mm, length 28 mm
- **2871035 CP** | Same, diameter 10 mm, length 35 mm
- **2871135 CP** | Same, diameter 11 mm, length 35 mm
Literature


Additional literature:
- ENDOWORLD®:
  - MEGA FIX® Composite (ART 41)
  - UNIDRIVE® S III ARTHRO – Your Complete Solution for Arthroscopy (ART 46)
- Doctor to Doctor Manual:
  - W. Petersen, T. Zantop: Anatomical Double-Bundle Reconstruction of the Anterior Cruciate Ligament

It is recommended to check the suitability of the product for the intended procedure prior to use.