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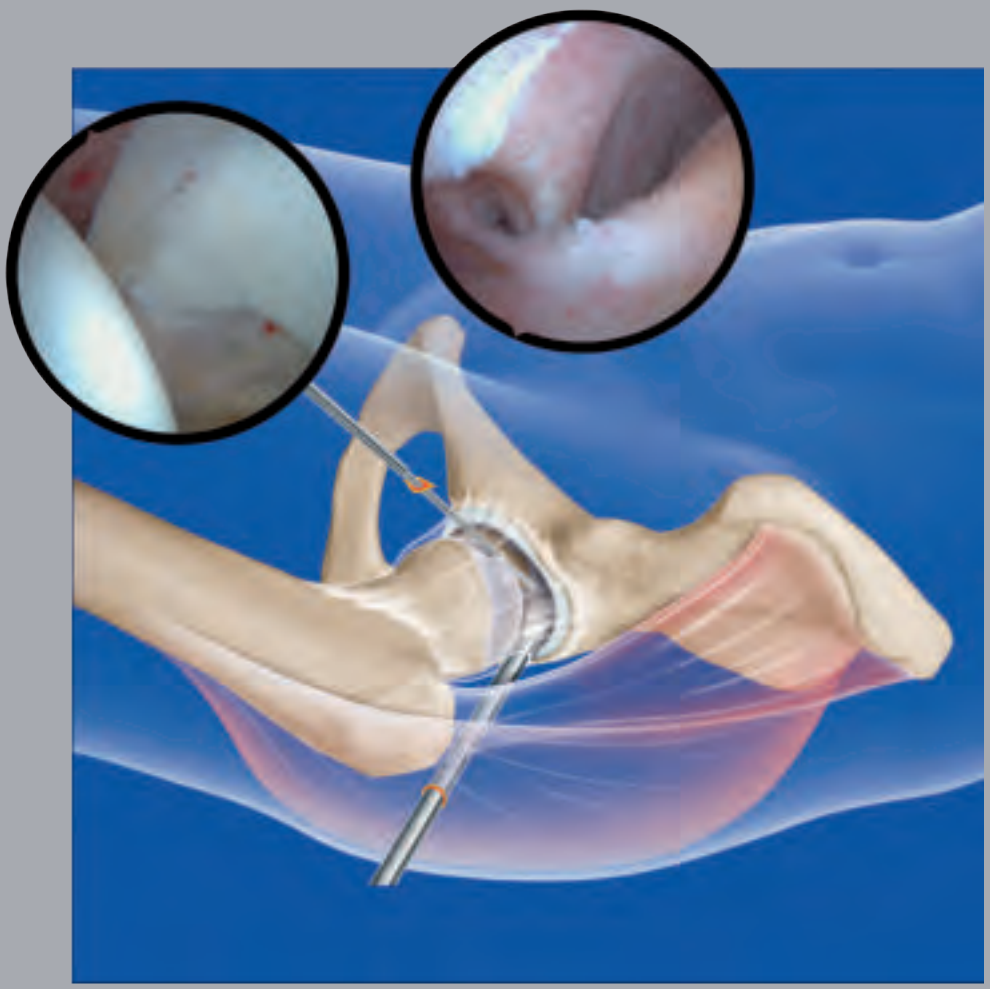
A GUIDE TO HIP ARTHROSCOPY

Preparations, Positioning, Diagnosis, Indications and Technique – Tips and Tricks



Manfred LAIS

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1.0 Introduction

Endoscopic procedures on the knee and shoulder joints have been a standard part of the orthopedic surgical repertoire for many years. Because of its anatomy and location, the hip joint was long considered unsuitable for endoscopic surgery. Pioneers such as *Thomas Byrd, Richard Villar,* and more recently *Marc Philippon* and *Michael Dienst* supplied the essential ideas that have significantly advanced the practice of hip arthroscopy.

The development of suitable instruments and improved positioning have contributed greatly to these advances. Inspection under traction has broadened our understanding of diseases of the acetabulum and femoral head. Arthroscopy of the peripheral compartment allows for precise evaluation of the femoral head-neck junction.

Increasingly, hip arthroscopy has evolved in recent years from a diagnostic tool to a reconstructive procedure that has benefited greatly from decades of experience in knee and shoulder surgery.

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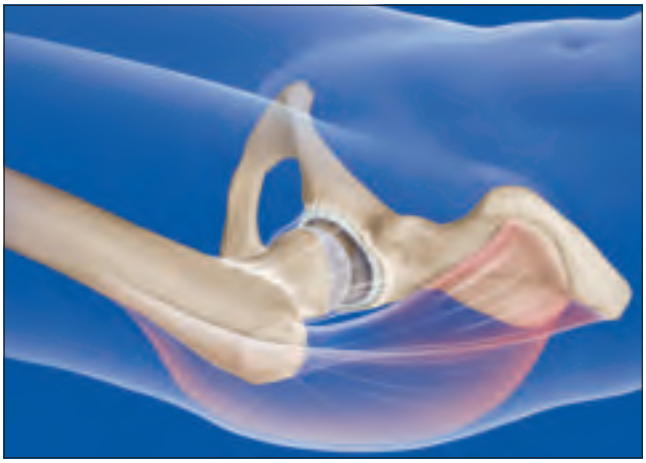

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2.0 Anatomy

The hip joint is formed by the articulation of the femoral head and acetabulum. Because more than half of the femoral head is contained within the acetabulum, the hip is classified as a spheroidal (cotyloid) joint, which permits a wide range of movements. Two-thirds of the femoral head is covered with hyaline cartilage (**Fig. 1**).

The acetabulum has a crescent-shaped articular surface (lunate surface), which is also covered with cartilage. At its center is an inferiorly open notch, the acetabular fossa (**Fig. 3**). This fossa gives rise to the ligamentum teres of the femoral head. The transverse acetabular ligament forms the inferior border of the fossa. The acetabulum is surrounded by a ring of cartilage, the acetabular labrum.

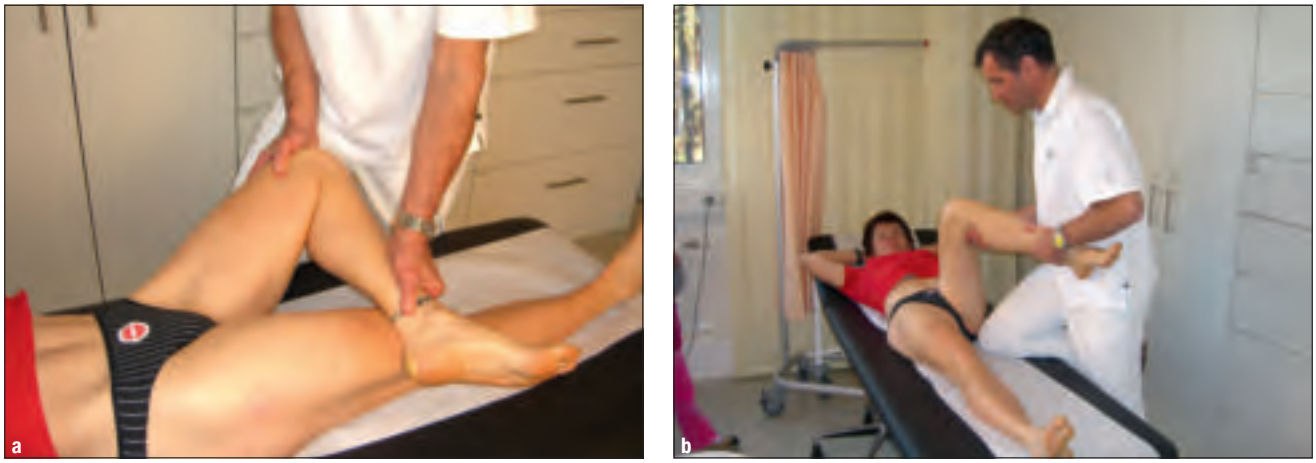
The hip joint is covered by a thick muscular layer consisting of extensor, flexor, abductor and adductor groups. These muscles give the hip a large range of motion.

The deep acetabulum, powerful ligaments (iliofemoral and pubofemoral ligaments), and acetabular labrum stabilize the hip joint.

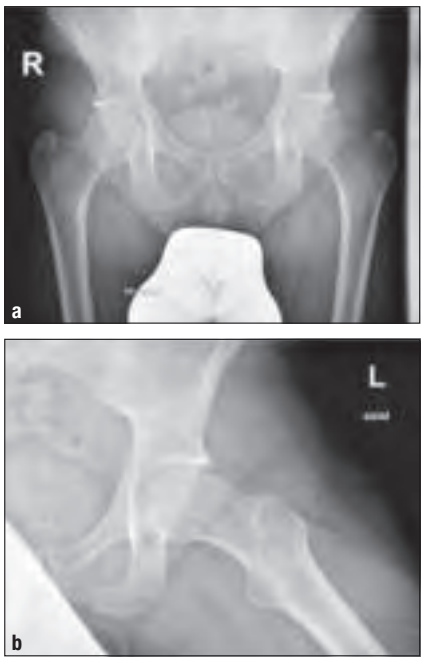
3.0 History and Examination

Growing numbers of patients are seeking treatment for groin pain. Their complaints are rarely referable to a specific trauma. Most patients complain of increasing pain over a long period of time. The symptoms in these patients, who are frequently quite young, are often related to strenuous sports activities that involve rotational movements of the hip. Middle-aged patients often report a long symptomatic period in which groin pain is accompanied by increasing limitation of motion.

Groin complaints may also have other causes, which should be considered in the differential diagnosis. A detailed history and thorough physical examination allow us to determine whether the complaints originate from the spinal column, abdomen, tendon attachments (adductors), pelvis, or hip joint. The corresponding clinical tests in internal and external rotation and flexion provide very reliable indicators of hip pathology.



4 Physical examination of the hip in external rotation (**a**), internal rotation and flexion (**b**).



5 **Standard views:** AP pelvic radiograph (**a**) and axial Lauenstein view (**b**). Femoroacetabular impingement (FAI), cam impingement, joint space narrowing, incipient degenerative changes.

6 **MR arthrography:** labral tear in the left hip with cam impingement.

4.0 Diagnostic

Available imaging modalities consist of radiographic and magnetic resonance studies. The basic workup consists of a conventional AP pelvic radiograph and a Lauenstein view. These images can be used to determine various reference angles (CCD angle*, CE angle** and the alpha angle of Notzli). Changes in the shape of the acetabulum (e.g., coxa profunda), changes in the acetabular rim (cysts, osteophytes, ossification of the labrum), and femoral head pathology can be accurately evaluated on conventional radiographs.

The most useful MRI technique in the hip is MR arthrography (with intra-articular contrast medium), which can detect loose bodies and lesions of the labrum orligamentum teres. As in the shoulder, differential diagnosis is aided by infiltrating the hip joint with a local anesthetic (“pain test”).

5.0 Technical Requirements, Preoperative Planning and Preparations

5.1 Preliminary Remarks

Arthroscopy of the hip joint differs in several respects from endoscopic procedures on the knee or shoulder and should be performed only by an experienced endoscopist. The hip joint is located deeper in the body, “buried” beneath a thick soft-tissue envelope. This circumstance, along with the proximity of the neurovascular bundle, places high demands on the experience of the surgeon. One should never underestimate the complexities of positioning and equipment setup for this procedure in the operating room.

5.2 Facilities and Equipment

Hip arthroscopy requires careful preoperative planning. It also requires a large operating room and a suitable operating table with traction. At our center we use a standard C-arm fluoroscopic unit to monitor joint distraction and instrument positions and to check resection limits on the femoral neck and acetabular rim.

Essential equipment includes an arthroscopy unit with camera, 30° and 70° endoscopes, a cold-light source, a shaver unit with various attachments, a double roller pump, and an electrosurgical unit with assorted electrodes.

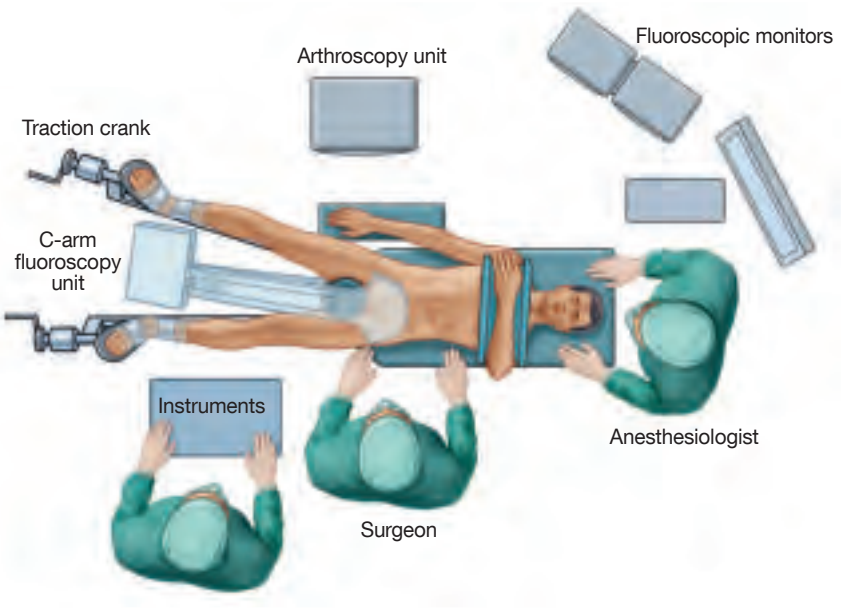
Useful aids to the operation are special cannulated trocars with extra-long high-flow sheaths, endoscopic knives for incising the joint capsule, and a Half Pipe® system (KARL STORZ) for instrument insertion. Standard arthroscopic instruments are also needed (punches, graspers, microfracture instruments, suture forceps), and extra-long models are required for certain indications.

* Centrum-collum-diaphyseal angle
** Center-edge angle of Wiberg

5.3 Positioning

Besides special instruments and equipment, hip arthroscopy also requires an accurate positioning technique. In principle, almost any operating table can be fitted with a traction unit. Before doing the first operation, we recommend that you simulate patient positioning and use of the fluoroscopic unit in order to minimize preparation time and shorten the traction time.

We prefer the supine position (**Fig. 7**) and start the procedure in the central compartment of the hip joint. Secure fixation of the foot and padded countertraction are essential for preventing soft-tissue injuries and avoiding stretch and compression injury to nerves. Traction is applied to the leg through a footplate fastened to a special shoe of our own design, which has yielded very good results (**Fig. 8a–e**). We have not had positive experience with standard leather straps. Countertraction is produced by a thick, rolled pad (approximately 20–25 cm in diameter) slipped over the perineal post. Both legs are extended on leg holders, with the operative leg initially placed in a position of abduction and slight flexion. Joint distraction can be improved by internally rotating the leg and adducting it against the fulcrum of the padded post. The procedure is monitored by C-arm fluoroscopy, and leg traction is applied under fluoroscopic control.



7 Operating room setup with positions of the surgeon, scrub nurse, anesthesiologist, and equipment including the arthroscopy unit and standard C-arm unit.

8 Special shoe with matching metal plate. Various sizes are available.

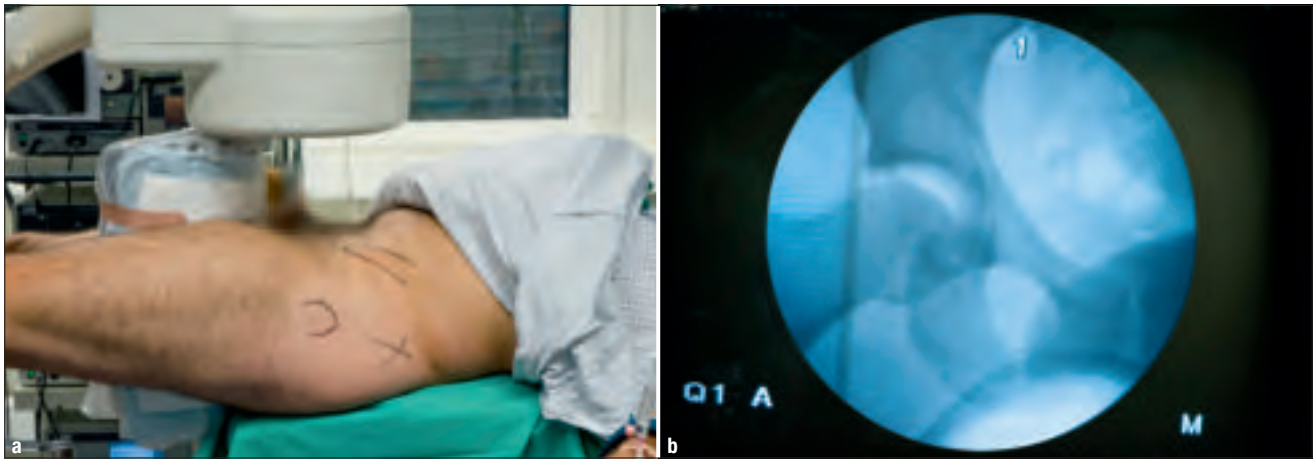
8 The special shoe is fixed to the traction unit of the operating table.

The joint space should be distracted to 1.5–2 cm to avoid iatrogenic damage to the articular cartilage or labrum with the arthroscope. A traction force of 40–60 kp is required in muscular patients. In occasional cases where adequate traction cannot be produced, we initially omit endoscopy of the central compartment and start the procedure in the peripheral compartment.

Before the operative area is prepped and draped, key landmarks (greater trochanter, anterior superior iliac spine, femoral neurovascular bundle) are marked on the skin with a sterile pen (**Fig. 10**).

All of our patients receive a femoral-sciatic nerve block prior to hip arthroscopy. Since we cannot place a tourniquet on the hip, the anesthesiologist induces controlled hypotension (< 100 mmHg systolic) to maintain a bloodless field.

9 Positioning the patient on the operating table.



10 Key anatomic landmarks (anterior superior iliac spine and greater trochanter) are marked on the skin (**a**). The joint is distracted under fluoroscopic control (**b**).

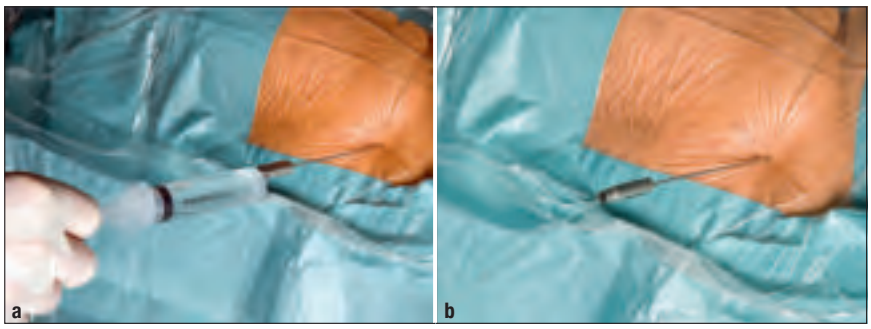
5.4 Portal Placement

The palpable prominence of the greater trochanter is a useful guide in placing the first portal. To place the anterolateral portal, the arthroscopic needle is introduced approximately 1 cm cranial to the greater trochanter. The femoral neck is palpated with the needle, which is then advanced into the central compartment of the hip joint under fluoroscopic guidance. Usually this can be done without difficulty when sufficient traction is applied.

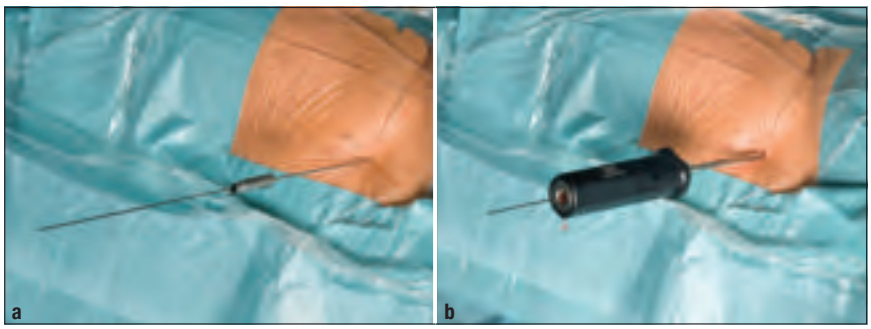
Central Compartment

11 The skin is prepped and draped.

12 Left hip. **Preparation of the anterolateral portal.** The arthroscopic needle is inserted approximately 1 cm cranial and 1 cm anterior to the greater trochanter. The femoral neck is palpated with the needle under fluoroscopic control, and the needle is advanced into the hip joint.



13 Intra-articular placement is confirmed by distending the joint with physiologic saline solution.

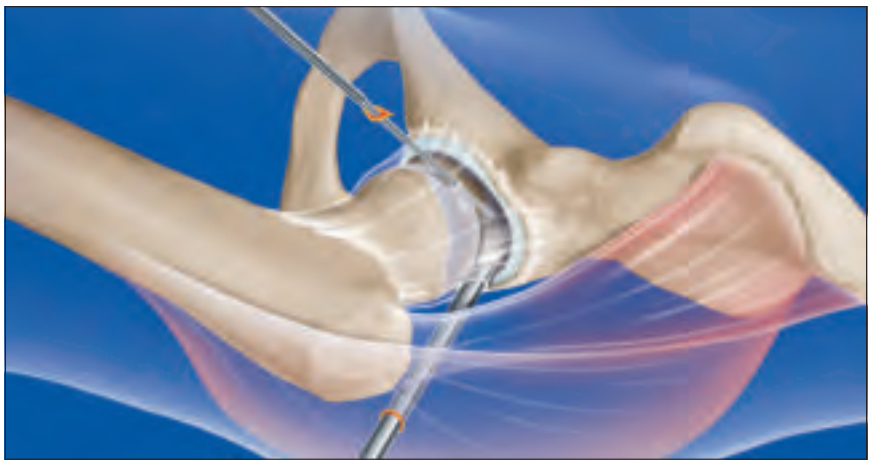


14 The guidewire is passed into the joint through the cannulated arthroscopic needle (**a**). The needle is removed, and the cannulated trocar is carefully advanced to dilate the capsule (**b**). The guidewire remains in place.

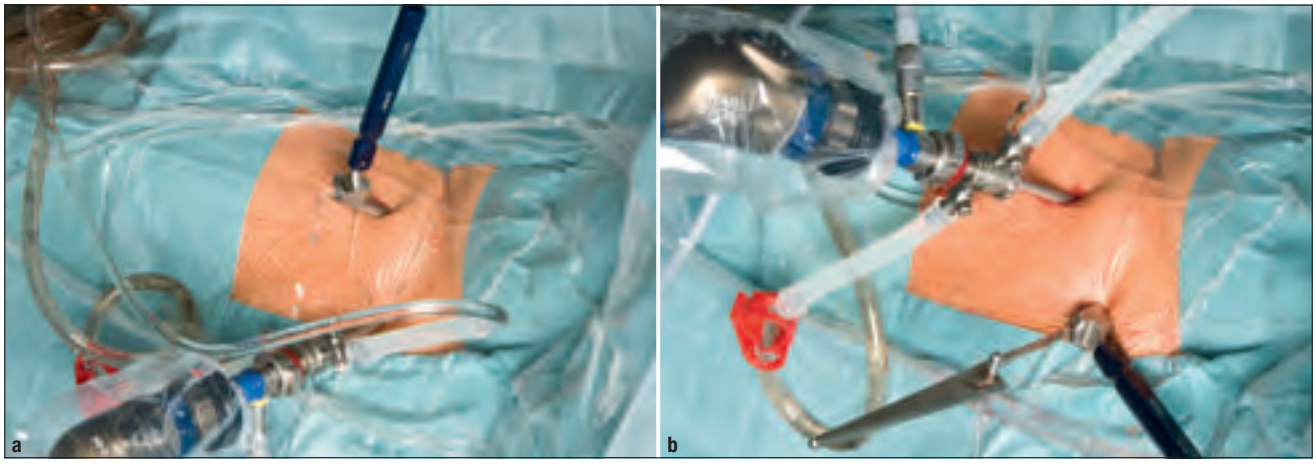
15 The obturator and arthroscope sheath are carefully advanced over the guidewire into the joint (**a**), aided if necessary by fluoroscopic guidance. The obturator is removed, and the 70° endoscope is introduced (**b**). The arthroscopy pump is connected and the joint is irrigated. The irrigating fluid pressure should be approximately 60–90 mmHg.

16 **The second portal** (anterior portal) **is placed under endoscopic vision with the help of an aiming device.** The arthroscopic needle is inserted approximately 3–4 cm anterior to the first portal. The guidewire is passed into the joint. The needle is removed, and the capsule is dilated by advancing the obturator on a handle. The guidewire is left in place. A cannulated shaver blade can now be introduced over the guidewire.

17 Correct intra-articular position of the arthroscopic needle for creating the anterior portal.



18 The two standard portals – anterolateral and anterior – for hip arthroscopy (left hip).



19 The Half Pipe® system (KARL STORZ) is used for instrument insertions. The various instruments (probes, shavers, etc.) are introduced through a simple, trough-shaped guide tube.

The arthroscope is moved to the anterior portal.

Indications for hip arthroscopy:

- Femoroacetabular impingement (FAI)
- Labral tears
- Intra-articular loose bodies
- Cartilage damage
- Ligamentum teres pathology
- Synovial diseases
- Psoas tendinitis
- Suppurative arthritis of the hip

6.0 Indications for Hip Arthroscopy

To achieve success in hip arthroscopy, rigorous criteria should be applied in selecting patients for the procedure. An accurate history combined with a thorough physical examination and proper imaging studies are the keys to a good outcome.

The most frequent indication for hip arthroscopy is **femoroacetabular impingement** (FAI). Bone spurs on the femoral neck (**cam impingement**) can be effectively treated by arthroscopic trimming. It is also common to find acetabular rim changes (**pincer impingement**) with associated **labral tears or separations** and corresponding bone spurs on the acetabular rim, which can be treated by rim trimming, (partial) resection of the labrum, or the refixation of a torn labrum. The results of FAI treatment are good, provided the articular cartilage is not extensively damaged.

Intra-articular loose bodies are an ideal but somewhat rare indication for hip arthroscopy. Endoscopic removal can be accomplished without difficulty.

Ruptures of the ligamentum teres are also rare. The torn ligament structures are resected. The results are very good.

FAI is frequently associated with **cartilage damage** on the acetabular side of the joint. The damage tends to be located in the principal weight-bearing zone. Often the articular cartilage is “peeled back” at its junction with the labrum, and the lesion may extend to the center of the acetabulum. Endoscopic treatment employs techniques such as cartilage shaving, microfracture, and abrasion techniques like those familiar in knee surgery. The results depend on the size and location of the damage.

Synovial pathology (synovitis, chondromatosis, rheumatologic diseases, pigmented villonodular synovitis) is a good indication for a minimally invasive technique. The treatment of choice is arthroscopic inspection of the affected areas, biopsy, and partial synovectomy.

Refractory cases of **psoas tendinitis** or **psoas tendon snapping** can be effectively treated by endoscopic tenotomy.

Purulent inflammations of the hip can be treated by arthroscopic irrigation.

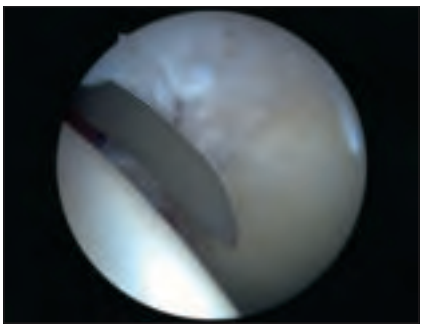
Osteoarthritis of the hip is **not** a good indication for hip arthroscopy. The results are often disappointing. A joint space measuring at least 1.5–2 mm should still be visible on radiographs. The results are rarely satisfactory in joints with extensive cartilage damage or areas of exposed bone. In selected cases, and especially in young patients, complaints may be improved somewhat by opening the joint capsule and removing (unstable) bone spurs from the acetabulum along with unstable cartilage areas. Simultaneous trimming of the femoral neck may improve the range of hip motion. These patients should be counseled preoperatively to have realistic expectations about the outcome.

7.0 Evaluating the Central Compartment

As in the knee and shoulder joints, arthroscopy of the hip permits a very precise evaluation of anatomic structures and any lesions that are present. The diagnostic survey is performed through the anterior and anterolateral portals. To increase the maneuverability of the endoscope and instruments, we enlarge both portals by incising the joint capsule. We split the ischiofemoral ligament with an endoscopic knife, making a 2- to 3-cm-long incision parallel to the acetabular labrum.

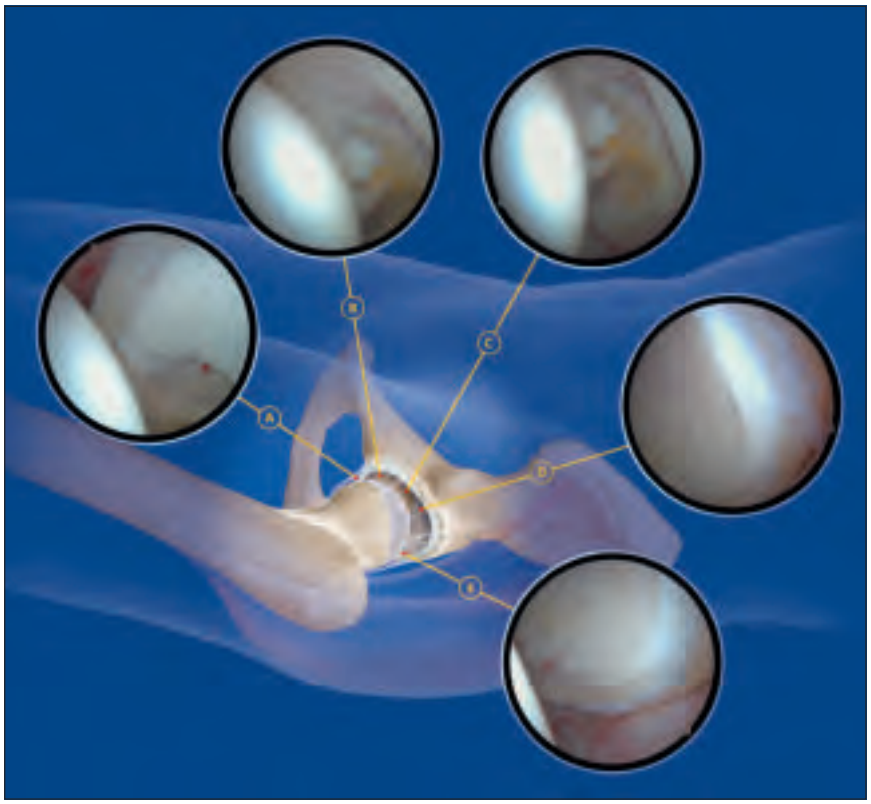
We can inspect most of the femoral head and acetabulum with the 70° endoscope in the anterolateral portal (**Fig. 21 A**). The ligamentum teres (**B, C**) can also be optimally evaluated through this portal. We take special care to evaluate the acetabular labrum (**D, E**) and especially its attachment to the adjacent cartilage. On inspecting the main weight-bearing zone of the acetabulum, it is common to find cartilage damage and whole areas of cartilage separation from the acetabular floor. The horseshoe-shaped lunate surface can be evaluated as far as the transverse ligament by rotating the arthroscope, and it can be probed with an arthroscopic hook.

Moving the arthroscope to the anterior portal, aided by the Half Pipe®, can improve visualization of the acetabular fossa, labrum, and ligamentum teres in many cases. If the traction table allows for rotation of the hip, we can clearly evaluate almost all of the femoral head, acetabulum, and ligamentum teres. Optimum visualization of the anatomic structures is essential for detecting and treating acetabular pathology (labral tears, cartilage damage, ligamentum teres lesions, synovitis, loose bodies).



20 Following correct placement of the anterior portal, an approximately 2- to 3-cm incision is made in the capsule with a special endoscopic knife to improve instrument maneuverability within the joint. The arthroscope is moved to the anterior portal so that the position of the lateral portal can be optimally assessed, and the capsule is again incised.

Additional portals (e.g., posterolateral) may be necessary in some cases.



21 Femoral head and anterior acetabular rim (**A**). Acetabular fossa with ligamentum teres (**B, C**). Lateral acetabular rim with labrum (**D, E**).

8.0 Operative Treatments in the Central Compartment

When the joint is adequately distracted, almost the entire acetabulum can be evaluated. We give special attention to the labrum and its attachment to the acetabular rim. The principal indication for hip arthroscopy is femoroacetabular impingement (FAI). This process involves repetitive contact of the femoral neck with the acetabular rim, causing damage to the labrum and cartilage. Bone spurs on the femoral neck lead to loss of femoral head sphericity. As the head becomes more distorted, it tends to compress the acetabular rim and labrum during rotational movements of the hip.

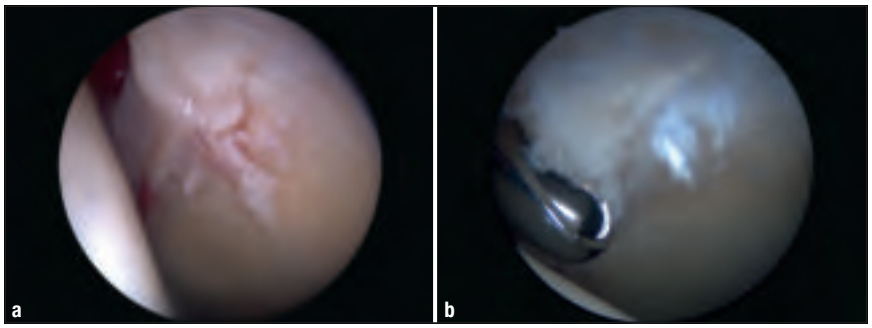
Studies by Prof. *Ganz* and his group in Bern, Switzerland, have identified FAI as a major cause of osteoarthritis of the hip. Inspection of the anterosuperior acetabular rim often reveals bony prominences, osteophytes, and ossification of the labrum, which are responsible for pincer impingement. Careful rim trimming may berequired.

Degenerative changes, tears, and even complete separations of the labrum are good indications for endoscopic treatment. Smaller tears are debrided with a shaver. In some cases it is both possible and reasonable to reattach the labrum to the freshened acetabular rim with sutures. Labral pathology is often associated with cartilage damage. It is common to find cartilage peeled away from the acetabulum. There is controversy as to whether the separated cartilage should be reattached. Techniques of microfracture and abrasion arthroplasty, familiar in knee surgery, can be used in areas of exposed bone. Lesions of the ligamentum teres are also accessible to endoscopic treatment. When chondromatosis is present, the acetabular fossa should always be scrutinized for loose bodies. Synovial changes are often found throughout the joint and even in the acetabular fossa. The treatment of choice consists of one or more excisional biopsies and partial synovectomy. A posterolateral portal gives optimum access to the acetabular fossa and is easily established under arthroscopic vision. Work is greatly facilitated by the use of curved instruments.

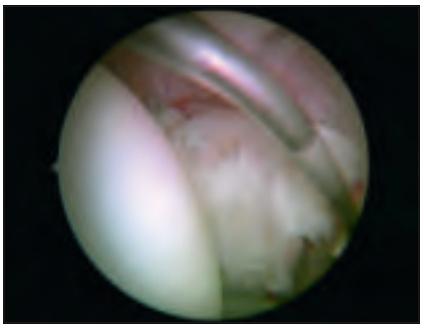
Coxa saltans (snapping hip), caused by snapping of the iliopsoas tendon or inflammation of the psoas tendon, is treated by fenestrating the anterior capsule and releasing the tendon.

Once arthroscopy of the central compartment is completed, we feel that the periphery should be thoroughly inspected and any pathology treated since most damage on the acetabular side of the joint relates in some degree to bony changes on the femoral neck.

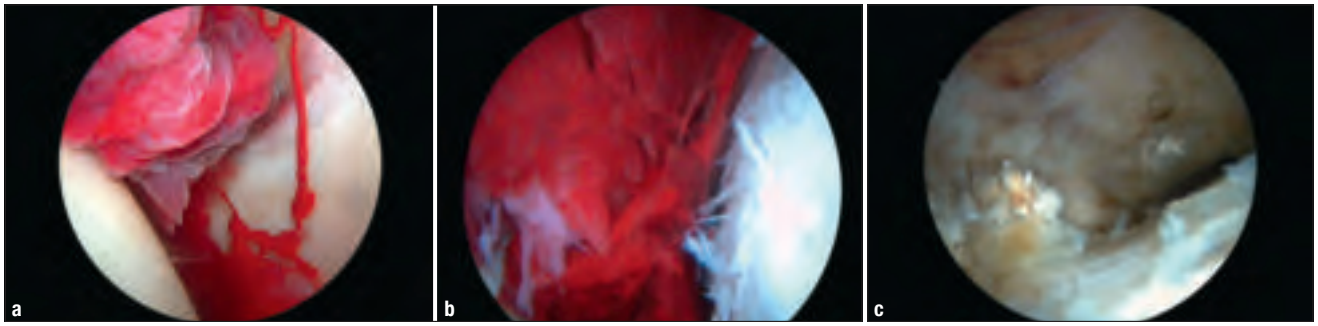
22 Cartilage damage, acetabular rim of the left hip, cartilage separation, microfracturing.



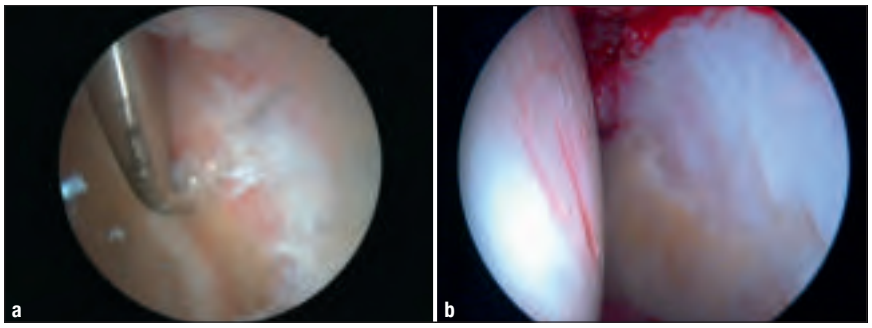
23 Left hip. Degenerative changes in the labrum, debrided with the shaver.

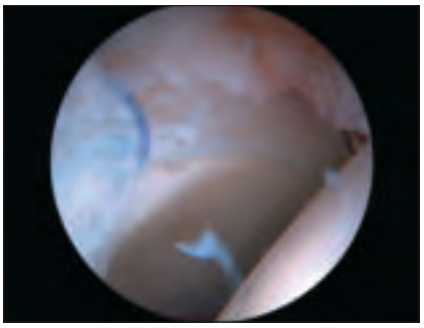


24 Left hip. Rupture of the ligamentum teres.



25 Left hip. villous synovitis (**a**). Osteoarthritis of the femoral head with synovitis (**b**). Right hip. Chondrocalcinosis of the hip.



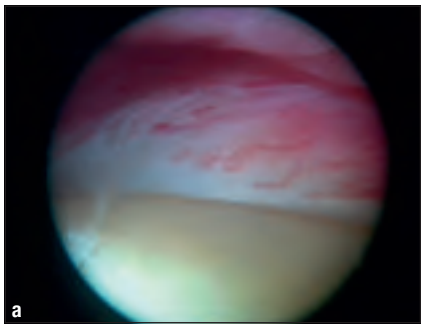


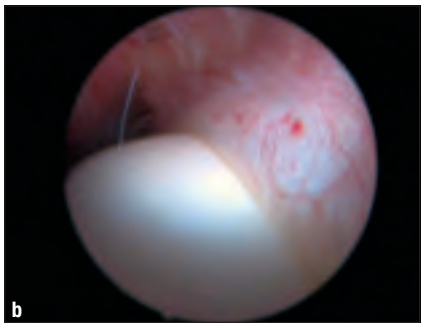
26 Left hip. Grade 4 cartilage damage, main weight-bearing zone is the superior acetabular rim, microfracture (**a**).
Follow-up arthroscopy 4 months after cartilage treatment shows definite reparative fibrocartilage (**b**).

27 Right hip. Suture repair of the labrum.

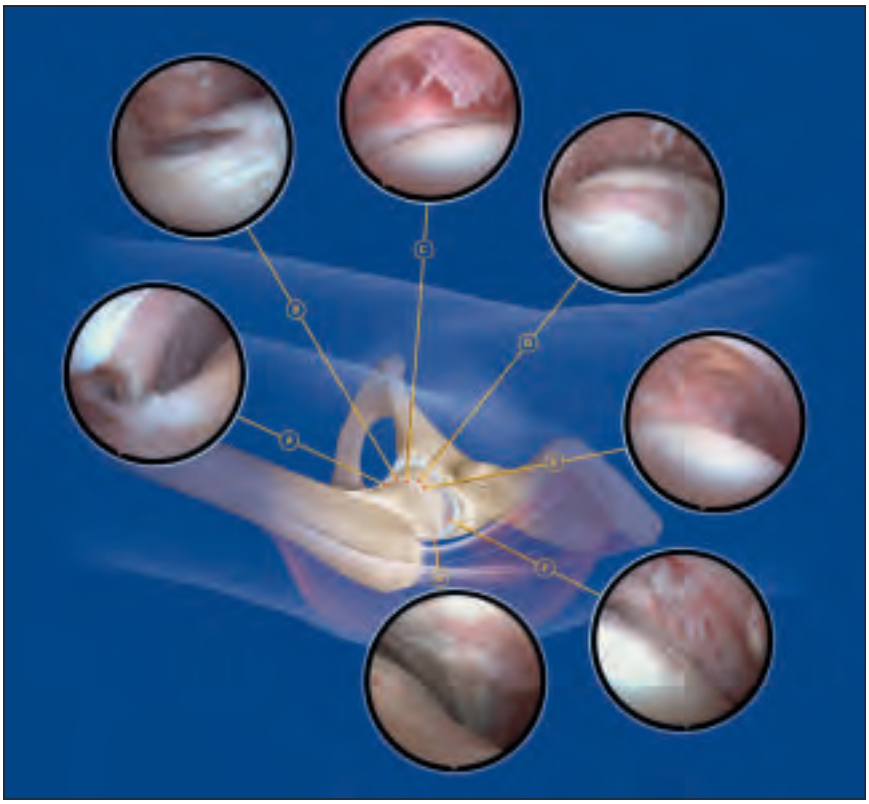
9.0 Evaluating the Peripheral Compartment

The peripheral compartment, unlike the central compartment, can be optimally evaluated without traction. We remove the traction unit from the table and secure the hip in approximately 30–40° of flexion. This position relaxes the anterior capsule and enables us to advance the arthroscope into the peripheral part of the joint through our standard anterolateral portal. The anterior portal is used mainly for instrument passage and can be slightly enlarged if needed. In most cases, the visualization of peripheral structures is limited by the capsule and synovium. A capsulotomy and wide resection of the zona orbicularis are necessary to expose the femoral head, acetabular rim, and femoral neck. While working in the peripheral compartment, we take the opportunity to evaluate the anatomic structures in that region by placing the joint in various positions of flexion, extension, and rotation. An intraoperative impingement test can be performed by simultaneous maximum flexion and internal rotation. With a normal acetabular depth, a large portion of the femoral head will be contained within the acetabulum. The diagnostic sweep should cover the lateral, anterior, and medial portions of the femoral neck and head (**Fig. 28**). The two standard portals (anterolateral and anterior) are generally sufficient but may be supplemented by additional portals if needed. In some cases the iliopsoas tendon can be identified anteriorly if the capsule is thin.





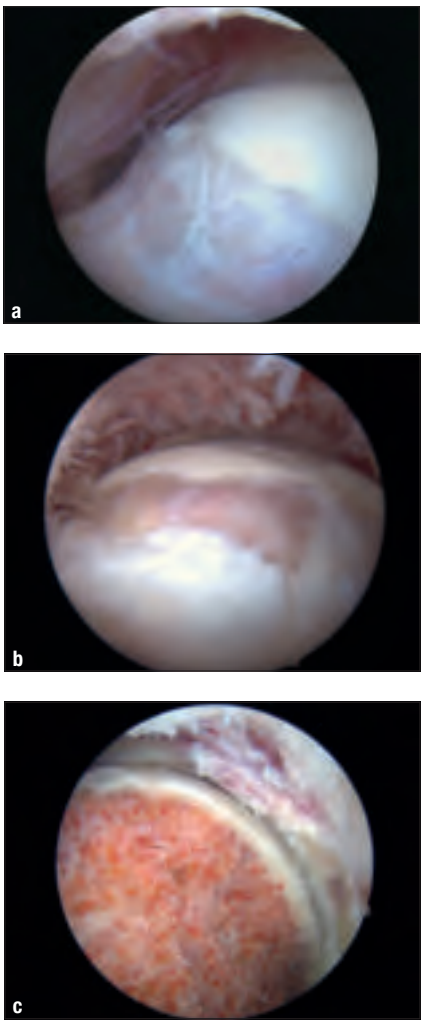
29 Left hip joint without traction. Femoral head is in the acetabulum (**a**). Labrum and femoral head cartilage appear intact (**b**).



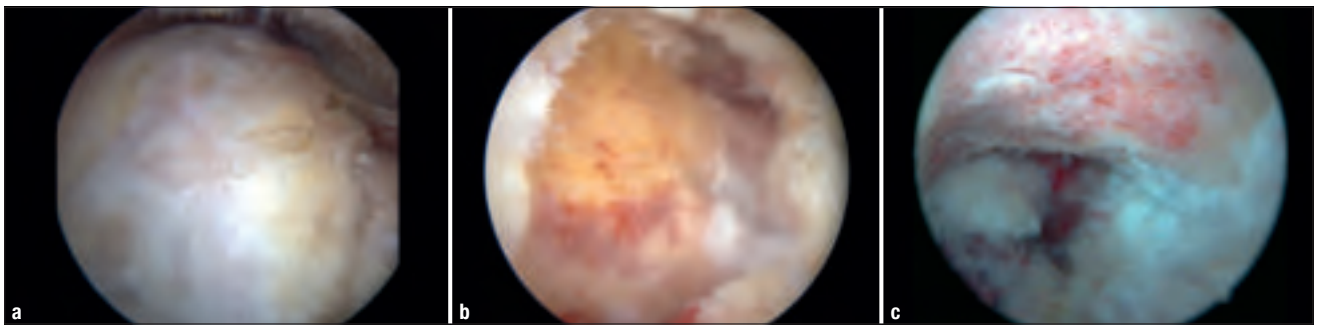
28 Anterior femoral neck with zona orbicularis (**A**). Medial femoral neck with medial synovial plica (**B**). Anterior acetabular rim with labrum and capsular attachment (**C, D, E**). Lateral femoral head region with labrum (**F**), lateral femoral neck (**D**).

10.0 Operative Treatments in Peripheral Compartment

Pathologic processes in the peripheral compartment mainly involve the junction of the femoral head and neck. The principal indication is femoroacetabular impingement (FAI). Impingement due to femoral neck changes is called cam impingement. Bony changes in the proximal femur are the most common lesions and usually have an indeterminate cause. They may relate to growth disturbances or disorders in childhood such as Perthes disease. A nonspherical head-neck junction tends to compress the acetabular rim, especially in flexion and internal rotation, causing damage to the acetabular rim, labrum, and cartilage. The treatment of choice is to burr away the abnormal bone and recontour the femoral neck. The limits of the resection should be clearly identified before trimming is begun. Good visibility is important in order to preserve the anterior and posterolateral blood vessels that supply the femoral head. We begin medially and anteriorly in the area of the medial synovial plica and work in a lateral and posterolateral direction. The posterolateral area is particularly difficult to visualize, and often it is helpful to extend the hip joint and rotate it internally. Sometimes we facilitate resections in this area by creating an auxiliary portal and retracting the lateral capsule with a trocar. During the treatment of cam impingement, the result should be repeatedly checked fluoroscopically as the correction proceeds. We feel that an arthroscopic impingement test is also advised. Other indications in the peripheral compartment are synovial pathology and loose bodies.



30 Left hip (**a–c**). Normal-appearing head-neck junction. The labrum is intact with no cartilage damage (**a**). Pronounced villous synovitis, cam deformity, cartilage damage on the femoral head (**b**). Appearance after cam resection (**c**).



31 Right hip (**a–c**). Cam impingement (**a**). Anterior resection zone (**b**). Posterolateral resection, opened cyst in the femoral neck (**c**).

11.0 Postoperative Care and Rehabilitation

Hip arthroscopy should be done as an inpatient procedure (3–5 days). A femoral-sciatic nerve block has proven very effective for postoperative pain reduction. A drain can be placed in the peripheral compartment for 24–48 hours. The hip is positioned in slight flexion and is cooled for the first few postoperative days. Physical therapy and manual lymph drainage are started on the day of the operation. The rehabilitation program starts on the first postoperative day by ambulating the patient at approximately 50% weight bearing. NSAIDs are usually adequate for postoperative pain relief and are continued for 3–4 weeks to prevent heterotopic ossification. Thromboprophylaxis is continued for the same period. While the patient is still hospitalized, the hip joint should be passively mobilized on a motorized splint. Muscle stimulation has also proven beneficial. The patients continue this regimen on an ambulatory basis after discharge. Most patients achieve full weight bearing by 4–5 weeks. Close cooperation among the patient, surgeon, and physical therapist is the basis for a successful outcome.

12.0 Complications

The complication rate of hip arthroscopy is much higher than in comparable endoscopic procedures. Most complications relate to positioning flaws. Optimum fixation of the well-padded foot and very soft padding on the perineal post will prevent skin injuries of the foot and compression injuries to the pudendal nerve. Operating times of 3 hours or more are not uncommon initially. We believe that iatrogenic cartilage injuries are the most frequent complication. The traction unit should maintain adequate joint distraction for a prolonged period of time; otherwise cartilage lesions, especially on the femoral head, will be unavoidable.

The instruments used in hip arthroscopy are subject to much greater stresses than in knee surgery, for example. Guidewires and capsulotomy knives are susceptible to breakage, and broken instrument fragments can be difficult to retrieve. Major soft-tissue swelling can be avoided by adjusting the irrigating fluid pressure to the viewing conditions. Visualization is aided by having the anesthesiologist lower the blood pressure to less than 100 mmHg systolic. The risk of heterotopic ossification can be significantly reduced by continuing anti-inflammatory medications for several weeks.

13.0 Summary

- Careful patient selection is the key to a good outcome.
- Well-coordinated teamwork between the surgeon, assistant, circulating nurse, and anesthesiologist is essential for a successful operation.
- Hip arthroscopy has a very long learning curve. Experience in knee and shoulder endoscopy is a great advantage.
- Logistical requirements in the operating room are much more complex than in comparable procedures on the knee or shoulder.
- Correct positioning will shorten the procedure time and lower the complication rate.
- Traction times should be kept to under 1 hour.
- Most complications in hip arthroscopy stem from faulty positioning.
- Osteoarthritis is **not** an indication for hip arthroscopy.
- Very obese patients are poor candidates for hip arthroscopy.

14.0 References

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HPS-HIP PORTAL SYSTEM

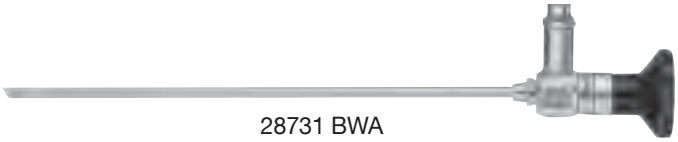
Standard Basic Hip Set

28140 A		**Standard Basic Hip Set**
		consisting of:
	28731 BWA	**HOPKINS® Wide Angle Forward-Oblique Telescope 30°,** enlarged view, diameter 4 mm, length 18 cm, **autoclavable,** fiber optic light transmission incorporated, color code: red
	28731 CWA	**HOPKINS® Wide Angle Lateral Telescope 70°,** enlarged view, diameter 4 mm, length 18 cm, **autoclavable,** fiber optic light transmission incorporated, color code: yellow
2x*	28140 GW	**Guide Wire,** diameter 1.5 mm, working length 40 cm, package of 6
2x	28140 DB	**Puncture Needle,** diameter 2.1 mm, working length 21.3 cm, for use with Guide Wire 28140 GW and Obturator 28140 DO
2x	28140 DO	**Obturator,** for use with Puncture Needle 28140 DB
	28140 W	**Changing Rod,** diameter 4.8 mm, working length 31 cm, for use with Arthroscope Sheaths 28130 CR/R and 28131 CR/R
	28140 WK	**Changing Rod,** cannulated, diameter 4.8 mm, working length 31 cm, for use with Arthroscope Sheaths 28130 CR/R and 28131 CR/R as well as Guide Wire 28140 GW
	28130 R	**High-Flow Arthroscope Sheath,** with snap-in coupling mechanism, diameter 6 mm, working length 13.5 cm, one stopcocks, **rotatable,** for use with HOPKINS® telescopes 0°, 30°, 70° and Obturators 28130 BC/BT, 28140 O, color code: red
	28131 CR	**High-Flow Arthroscope Sheath,** with snap-in coupling mechanism, diameter 5.5 mm, working length 13.5 cm, two stopcocks, **rotatable,** for use with HOPKINS® telescopes 0°, 30°, 70° and Obturators 28130 BC/BT, 28140 O, color code: blue
	28130 BC	**Obturator,** blunt
2x	28140 D	**Gasket Attachment,** with cone, including Gasket 28140 GU, for use with all Arthroscope Sheaths
4x	28140 GU	**Gasket,** for single use, unsterile, single-packaged, for use with Gasket Attachment 28140 D
	28140 O	**Obturator,** cannulated, with handle, diameter 4.8 mm
	28140 Z	**Aimer, complete,** for portal placement in hip arthroscopy, for use with KARL STORZ arthroscope sheaths with a working length of 13.5 cm including: **Aimer,** with attachment for bullets **Bullet,** short, working length 10.5 cm **Bullet,** long, working length 14.5
	28146 E	**Pointed Knife,** straight, working length 11.5 cm
	28140 HD	**Half Pipe®,** for use in hip arthroscopy, handle rotated 90°, handle axis 120°, working length 95 mm
	28140 HC	**Same,** working length 120 mm
	28140 GH	**Half Pipe®,** for use in hip arthroscopy, handle axis 90°, with extra slim distal design, working length 95 mm
	28140 T	**Probe,** graduated, length of hook 3 mm, diameter 1.5 mm, working length 18 cm
	28140 TL	**Same,** working length 21.5 cm
	28140 TA	**Probe,** graduated, length of hook 3 mm, angled downwards 10°, diameter 1.5 mm, working length 20 cm
	28140 TB	**Same,** angled downwards 20°
	28728 KB	**Curette,** oval, large, curved, 30° upwards, working length 13 cm

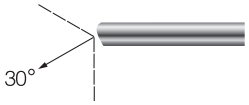
* No. of items recommended

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

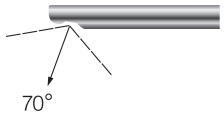
Instruments for Hip Arthroscopy



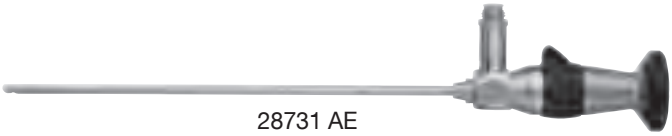
28731 BWA



28731 BWA **HOPKINS® Wide Angle Forward-Oblique Telescope 30°,**
enlarged view, diameter 4 mm, length 18 cm, **autoclavable,**
fiber optic light transmission incorporated,
color code: red



28731 CWA **HOPKINS® Wide Angle Lateral Telescope 70°,**
enlarged view, diameter 4 mm, length 18 cm, **autoclavable,**
fiber optic light transmission incorporated,
color code: yellow



28731 AE

28731 AE **ENDOCAMELEON® ARTHRO HOPKINS® Telescope,**
diameter 4 mm, length 18 cm, **autoclavable,**
variable direction of view from 15°–90°,
adjustment knob for selecting the desired direction of view,
fiber optic light transmission incorporated,
color code: gold

28140 GW

28140 GW **Guide Wire,** diameter 1.5 mm, working length 40 cm,
package of 6

28140 DO

28140 DB

28140 DB **Puncture Needle,** diameter 2.1 mm, working length 21.3 cm,
for use with Guide Wire 28140 GW and Obturator 28140 DO

28140 DO **Obturator,** for use with Puncture Needle 28140 DB

28140 W

28140 W **Changing Rod,** diameter 4.8 mm, working length 31 cm,
for use with Arthroscope Sheaths 28130 CR/R and 28131 CR/R

28140 WK **Changing Rod,** cannulated, diameter 4.8 mm, working length 31 cm,
for use with Arthroscope Sheaths 28130 CR/R and 28131 CR/R
as well as Guide Wire 28140 GW

Instruments for Hip Arthroscopy

28130 CR

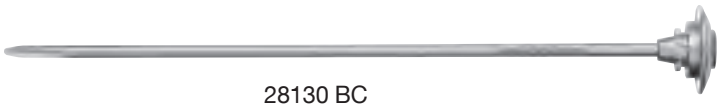
28130 CR **High-Flow Arthroscope Sheath,** with snap-in coupling mechanism, diameter 6 mm, working length 13.5 cm, two stopcocks, **rotatable,** for use with HOPKINS® telescopes 0°, 30°, 70° and Obturators 28130 BC/BT, 28140 O, color code: red

28130 R **Same,** one stopcock

28131 CR

28131 CR **High-Flow Arthroscope Sheath,** with snap-in coupling mechanism, diameter 5.5 mm, working length 13.5 cm, two stopcocks, **rotatable,** for use with HOPKINS® telescopes 0°, 30°, 70° and Obturators 28130 BC/BT, 28140 O, color code: blue

28131 R **Same,** one stopcock



28130 BC

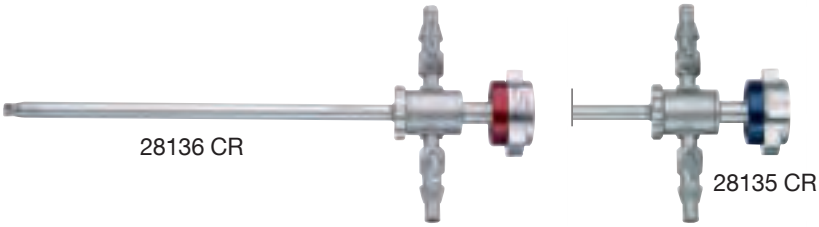
28130 BC **Obturator,** blunt

28130 BT **Same,** semi-sharp

28140 O

28140 O **Obturator,** cannulated, with handle, diameter 4.8 mm

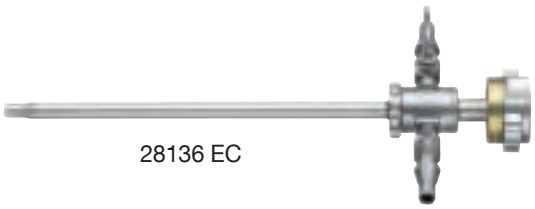
Instruments for Hip Arthroscopy



28136 CR 28135 CR

28136 CR **High-Flow Arthroscope Sheath,** with snap-in coupling mechanism, diameter 6 mm, working length 13.5 cm, two stopcocks, **rotatable,** for use with HOPKINS® telescopes 0°, 30°, 70° and Obturators 28126 BC/BT/BS, 28134 O, color code: red

28135 CR **High-Flow Arthroscope Sheath,** with snap-in coupling mechanism, diameter 5.5 mm, working length 13.5 cm, two stopcocks, **rotatable,** for use with HOPKINS® telescopes 0°, 30°, 70° and Obturators 28126 BC/BT/BS, 28134 O, color code: blue



28136 EC

28136 EC **Arthroscope Sheath ENDOCAMELEON®,** with snap-in coupling mechanism, diameter 6 mm, working length 13.5 cm, distal tapered, with irrigation holes, two stopcocks, **rotatable,** for use with ENDOCAMELEON® ARTHRO HOPKINS® Telescope 28731 AE and Obturator 28134 O with cannulated handle or Obturators 28126 BC/BT

28134 O

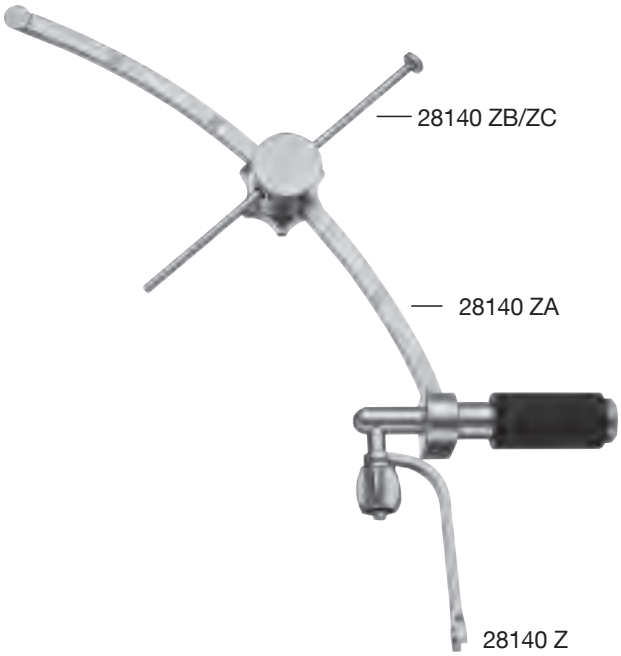
28134 O **Obturator,** cannulated, with handle, for use with Arthroscope Sheaths 28126 B/CR/R, 28129 CR, 28135 CR, 28136 CR, 28136 EC, 28229 DR as well as Guide Wire 28140 GW

28140 D 28140 GU

28140 D **Gasket Attachment,** with cone, including Gasket 28140 GU, for use with all Arthroscope Sheaths

28140 GU **Gasket,** for single use, unsterile, single-packaged, for use with Gasket Attachment 28140 D

Instruments for Hip Arthroscopy



28140 Z **Aimer, complete,** for portal placement in hip arthroscopy, for use with KARL STORZ arthroscope sheaths with a working length of 13.5 cm
including:
Aimer, with attachment for bullets
Bullet, short, working length 10.5 cm
Bullet, long, working length 14.5 cm

28146 E

28146 E **Pointed Knife,** straight, working length 11.5 cm

28728 KB

28728 KB **Curette,** oval, large, curved, 30° upwards, working length 13 cm

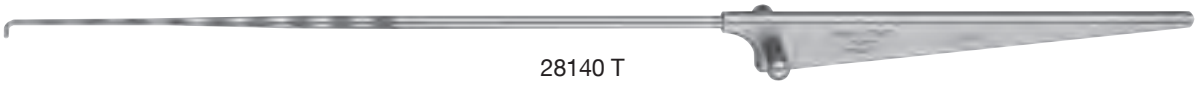
Instruments for Hip Arthroscopy

28140 HD 28140 HC 28140 GH

28140 HD **Half Pipe®,** for use in hip arthroscopy, handle rotated 90°, handle axis 120°, working length 95 mm

28140 HC **Same,** distal end flat, atraumatic tip, working length 120 mm

28140 GH **Half Pipe®,** for use in hip arthroscopy, handle axis 90°, with extra slim distal design, working length 95 mm



28140 T

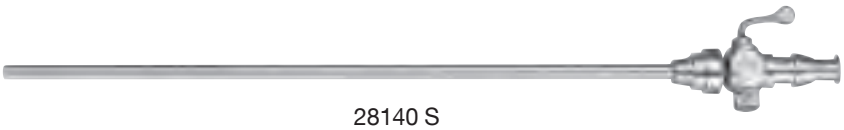
28140 T **Probe,** graduated, length of hook 3 mm, diameter 1.5 mm, working length 18 cm

28140 TL **Same,** working length 21.5 cm

28140 TA **Probe,** graduated, length of hook 3 mm, angled downwards 10°, diameter 1.5 mm, working length 20 cm

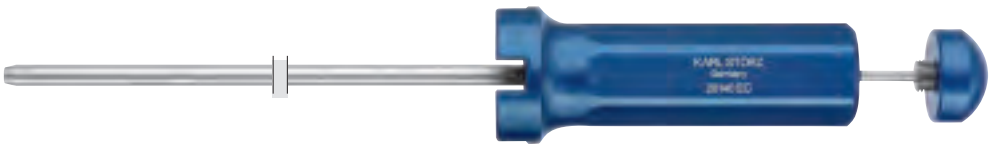
28140 TB **Same,** angled downwards 20°

Instruments for Hip Arthroscopy



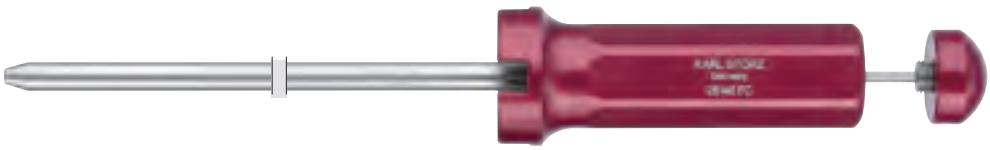
28140 S

28140 S **Evacuation Cannula,** with LUER-Lock and one stopcock, working length 18 cm, for use with Arthroscope Sheaths 28130 CR/R and 28131 CR/R



28140 EC 28140 EP

28140 EB 28140 EO



28140 FC 28140 FP

28140 FB 28140 FO

28140 EC **Dilator,** with integrated handle, long, diameter 6 mm, for use with Threaded Cannula 28140 SB and Obturator 28140 EP

28140 EP **Obturator,** cannulated, for use with Dilator 28140 EC

28140 EB **Dilator,** with integrated handle, short, diameter 6 mm, for use with Threaded Cannula 28140 SA and Obturator 28140 EO

28140 EO **Obturator,** cannulated, for use with Dilator 28140 EB

28140 FC **Dilator,** with integrated handle, long, diameter 8.1 mm, for use with Threaded Cannula 28140 SD and Obturator 28140 FP

28140 FP **Obturator,** cannulated, for use with Dilator 28140 FC

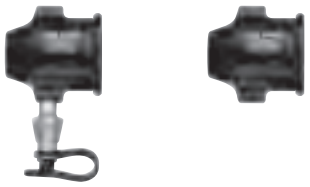
28140 FB **Dilator,** with integrated handle, short, diameter 8.1 mm, for use with Threaded Cannula 28140 SC and Obturator 28140 FO

28140 FO **Obturator,** cannulated, for use with Dilator 28140 FB

Instruments for Hip Arthroscopy

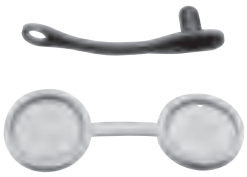
28140 SA

28140 SA	**Cannula,** with thread, transparent, inner diameter 6.1 mm, working length 9 cm, for single use, unsterile, single-packaged, for use with Dilator 28140 EB
28140 SB	**Same,** working length 12 cm, for use with Dilator 28140 EC
28140 SC	**Cannula,** with thread, transparent, inner diameter 8.25 mm, working length 9 cm, for single use, unsterile, single-packaged, for use with Dilator 28140 FB
28140 SD	**Same,** working length 12 cm, for use with Dilator 28140 FC



28179 DG 28179 OG

3x* 28179 DG	**Valve Housing,** with LUER-Lock, for use with Set of Gaskets 28179 GU/GS
3x* 28179 OG	**Valve Housing,** without LUER-Lock, for use with Cannulas and Set of Gaskets 28179 GU/GS



28179 GU

28179 GU	**Set of Gaskets,** 10x 2 sealing caps, unsterile, for use with Valve Housing 28179 DG/OG
28179 GS	**Set of Gaskets,** 10x 2 sealing caps, sterile, for use with Valve Housing 28179 DG/OG

* No. of items recommended

Instruments for Hip Arthroscopy

28728 G

2x* 28728 G **Handle,** for use with Mirror Attachments 28728 MA/MC and Suture Curette 28728 K

28140 MB **Mirror Attachment,** curved, 10° upwards, diameter 6.2 mm, working length 28 cm, for use with Handle 28728 G

28171 KPN

28171 KPN **SilCut® Punch,** through-cutting, cutting width 3.4 mm, curved jaws, 15° upwards, sheath diameter 3 mm, straight, handle with cleaning connector, working length 19 cm

28171 KUN **SilCut® Punch,** through-cutting, cutting width 3.4 mm, straight jaws, sheath diameter 3 mm, 15° curved upwards, handle with cleaning connector, working length 19 cm

28171 KGN **SilGrasp® Foreign Body Grasper,** aggressive, straight jaws, sheath diameter 3.5 mm, straight, handle with cleaning connector, working length 19 cm

28171 KGSN **Same,** with ratchet

* No. of items recommended

Instruments for Hip Arthroscopy

28140 CD

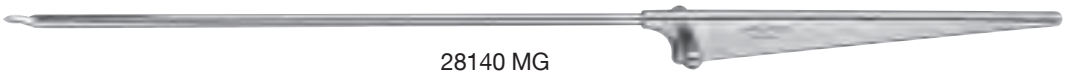
28140 CD **Microfracture Chisel,** curved 30°, working length 18 cm

28140 CE

28140 CE **Microfracture Chisel,** angled 70°, working length 12 cm

533 TVA

533 TVA **Adaptor, autoclavable,** permits telescope changing under sterile conditions



28140 MG

28140 MG **Pointed Knife,** curved, double-edged, working length 18 cm

UNIDRIVE® S III ARTHRO SCB

The aim of all arthroscopic procedures is the same: to complete the procedure quickly and with minimal trauma, thereby reducing patient time under anesthesia.

With the UNIDRIVE® S III ARTHRO SCB, KARL STORZ has developed a motor system that is customized to meet these requirements.

- Easy to use
- Automatic handpiece recognition
- Control of rotation speed similar to the multifunctional handpiece
- Up to 15,000 rpm
- Comprehensive portfolio of single-use and reusable blades
- Communication with ARTHROPUMP® Power

UNIDRIVE® S III ARTHRO SCB

Recommended System Configuration

Special Features:

- **Arthroscopic motor system for all joints**
- **Stable torque throughout entire speed range**
- **Motors with speed ranging from max. 6000 rpm to max. 7000 rpm**
- **Multifunctional handpiece with accessories:**
  - **– Jacobs chucks**
  - **– Pin drivers**
  - **– Sagittal saws**
  - **– Synthes-style drivers**
- **Various control options possible**
  - **– Hand controls**
  - **– Footswitch**
  - **– Touch Screen**
- **Fast and easy change of blade via quick coupling**
- **Single-use and reusable blades available**

28 7230 01-1 **UNIDRIVE® S III ARTHRO SCB,**
with color display, touch screen operation,
two motor outputs, integrated SCB module,
power supply 100 – 120/230 – 240 VAC, 50/60 Hz
including:
SCB Connecting Cable, length 100 cm
Mains Cord

Specifications:

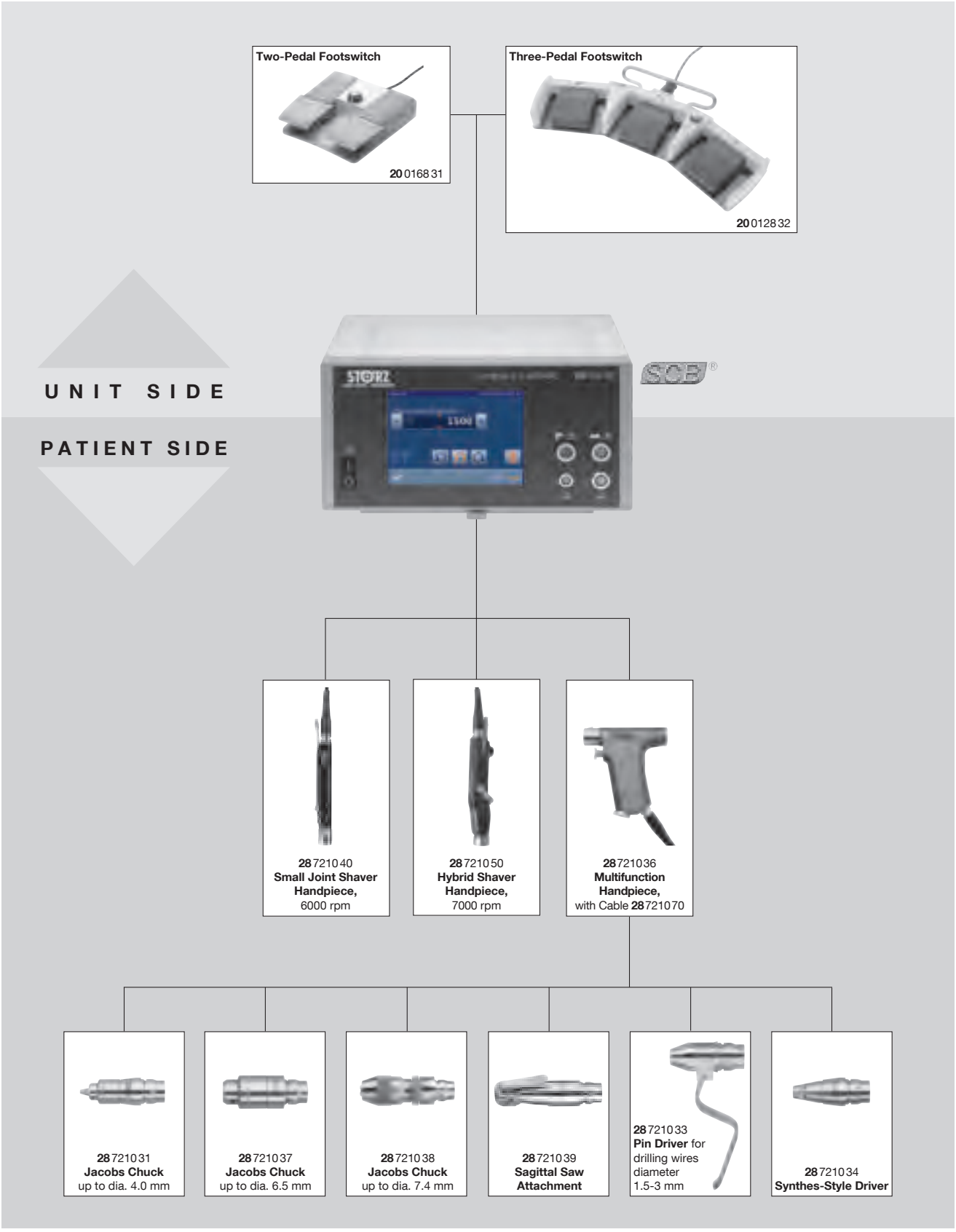
Operating Mode	- counter Clockwise - clockwise - oscillating
Connections	- small joint handpiece - hybrid handpiece - multifunction handpiece - footswitch - KARL STORZ-SCB

Power Supply	100-127 / 220-250 VAC, 50/60 Hz
Dimensions w x h x d	305 x 165 x 280 mm
Weight	5.2 kg
Certified to	IEC 601-1, CE acc. to MDD

System requirements:
SCB control NEO System with installed SCB control NEO Software Release **20** 0900 01-44 or higher

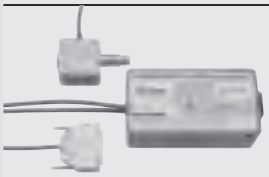
UNIDRIVE® S III ARTHRO SCB

System Components



Optional Accessories

for Multifunction Handpiece 28721036

	**28**721031	**Jacobs Chuck,** up to diameter 4.0 mm
	**28**721037	**Jacobs Chuck,** up to diameter 6.5 mm
	**28**721033	**Pin Driver,** for drilling wires diameter 1.5 – 3 mm
	**28**721038	**Jacobs Chuck,** keyless, up to diameter 7.4 mm, for use with Multifunction Handpiece SL **28**721036
	**28**721039	**Sagittal Saw Attachment,** keyless, with tilt lever, for use with Multifunction Handpiece **28**721036 and Saw Blades 28207 only
	**28**721034	**Pin Driver,** for Synthes attachments
	**28**721071	**Connecting Cable,** for FMS pump

for UNIDRIVE® S III ARTHRO SCB shaver handpieces and blades

	28205 SA	**Irrigation Adaptor,** for validated cleaning of shaver handpieces
	28205 SAA	**Irrigation Adaptor,** for validated cleaning of outer blades
	28205 SAI	**Irrigation Adaptor,** for validated cleaning of inner blades

Shaver Blades

Working length 180 mm

28208 BKS **Aggressive Cutter,** for single use, sterile, diameter 4.5 mm, working length 180 mm, package of 6, for use with POWERSHAVER SL SCB and UNIDRIVE® S III ARTHRO, color code: green

28208 CCS **Full Radius Resector,** for single use, sterile, diameter 4.5 mm, working length 180 mm, package of 6, for use with POWERSHAVER SL SCB and UNIDRIVE® S III ARTHRO SCB, color code: yellow

28208 CDS **Same,** diameter 5.5 mm

28208 DCS **Aggressive Full Radius Resector,** for single use, sterile, diameter 4.5 mm, working length 180 mm, package of 6, for use with POWERSHAVER SL SCB and UNIDRIVE® S III ARTHRO, color code: blue

28208 EGS **Curved Full Radius Resector,** for single use, sterile, diameter 4.5 mm, working length 180 mm, package of 6, for use with POWERSHAVER SL SCB and UNIDRIVE® S III ARTHRO, color code: light blue

28208 EHS **Curved Aggressive Full Radius Resector,** for single use, sterile, diameter 4.5 mm, working length 180 mm, package of 6, for use with POWERSHAVER SL SCB and UNIDRIVE® S III ARTHRO SCB, color code: light green

28208 IDS **Semi Hooded Barrel Burr,** for single use, sterile, diameter 5.5 mm, working length 180 mm, package of 6, for use with POWERSHAVER SL SCB and UNIDRIVE® S III ARTHRO SCB, color code: pink

Working length 120 mm

28208 AKS **Aggressive Cutter,** for single use, sterile, diameter 4.5 mm, working length 120 mm, package of 6, for use with POWERSHAVER SL SCB and UNIDRIVE® S III ARTHRO, color code: green

28208 CKS **Full Radius Resector,** for single use, sterile, diameter 4.5 mm, working length 120 mm, package of 6, for use with POWERSHAVER SL SCB and UNIDRIVE® S III ARTHRO, color code: yellow

ARTHROPUMP® Power

The Clever System for Arthroscopic Fluid Management

✓ INNOVATIVE

The new generation of the ARTHROPUMP® is an intelligent double roller pump which ensures a constant balance between inflow and outflow to create a static intraarticular image.

When operated in combination with the POWERSHAVER SL, the ARTHROPUMP® Power can communicate with the shaver system and react to changes in pressure and flow parameters to ensure a consistently good image. The hemostasis and lavage modes ensure that a clear arthroscopic image can be rapidly restored even during bleeding or in case of an increased fluid loss.

✓ SIMPLE

The pump parameters can be set intuitively via touchscreen. An introductory animation gives the user a step-by-step guide to the installation of the tubing sets. Pressure and flow parameters can be adjusted according to the surgeon's wishes at any time via the interactive screen by the operating team's circulating nurse. The continuous, clearly legible display enables constant monitoring of the operating parameters.

The functions of the pump (hemostasis, lavage) and those of the UNIDRIVE® S III ARTHRO can be controlled by the pump's four-pedal footswitch.

✓ POWERFUL

Any changes in pressure and flow values are corrected immediately and efficiently by the ARTHROPUMP® Power.

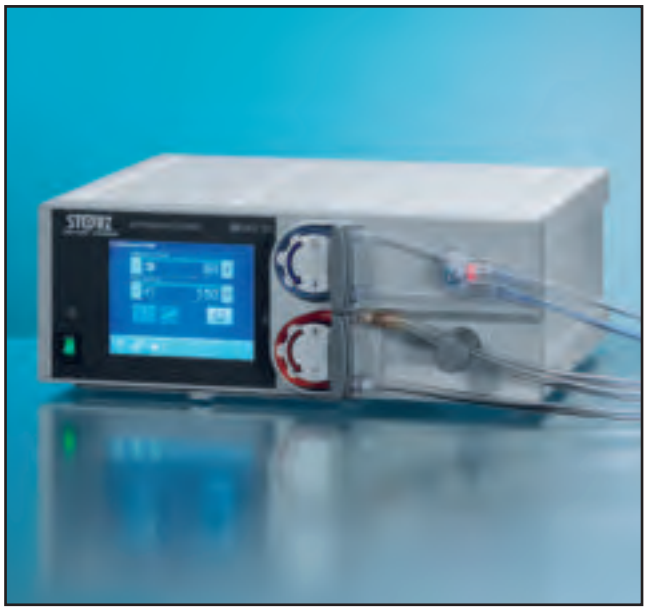
✓ COST-EFFECTIVE

Optimal fluid consumption thanks to the constant comparison of pressure and flow values.

The consistently good view also enables the surgeon to work more efficiently and consequently, to shorten the operating time.

✓ SAFE

The ARTHROPUMP® Power features an automatic pressure control in order to ensure optimal patient protection.



ARTHROPUMP® Power

Fluid Management System,
Recommended Set Configuration

28 3407 20-1

28 3407 01-1 **ARTHROPUMP® Power,**
power supply 100 – 240 VAC, 50/60 Hz

including:

Connecting Cable, to UNIDRIVE® S III ARTHRO SCB and POWERSHAVER SL SCB

SCB Connecting Cable, length 100 cm

Four-Pedal Footswitch

Tubing Set Irrigation*, sterile, for single use, package of 3

Tubing Set Suction*, sterile, for single use, package of 3

Specifications:

Pressure regulated	- Normal: 20-200 mmHg - Hemostasis: +20% - +90% - Shaver: +0% - +80%
Flow regulated	- Normal: 10-200 ml/min - Shaver: 50-500 ml/min - Lavage: 150-500 ml/min

Power supply	100-240 VAC, 50/60 Hz
Dimensions w x h x d	447 x 155 x 313 mm
Weight	8.8 kg
Certified to:	IEC 601-1, CE acc. to MDD

* mtp medical technical promotion gmbh,
Take-Off GewerbePark 46, 78579 Neuhausen ob Eck, Germany

Accessories

for ARTHROPUMP® Power

For single use

Continuous-Flow – Irrigation and Suction

031328-10*	**Tubing Set Irrigation,** with two puncture needles, for single use, sterile, package of 10
031228-10*	**Tubing Set Suction,** with two suction tubes, for single use, sterile, package of 10

Single-Flow – Irrigation

031328-10*	**Tubing Set Irrigation,** with two puncture needles, for single use, sterile, package of 10

Tubing Set Irrigation

031328-01*

Tubing Set Suction

031228-01*

* mtp medical technical promotion gmbh,
Take-Off GewerbePark 46, D-78579 Neuhausen ob Eck, Germany

Accessories
for ARTHROPUMP® Power

Day Set

Continuous-Flow – Irrigation and Suction

031261-10*	**Pump Tubing Day Set,** with two puncture needles, for day use, sterile, package of 10, for use with Patient Tubes 031162-01 or 031162-10
031162-10*	**Patient Tube**,** for single use, sterile, package of 10, for use with Pump Tubing Day Set 031261-01 or 031261-10
031228-10*	**Tubing Set Suction**, with two suction tubes, for single use, sterile, package of 10

Single-Flow – Irrigation

031261-10*	**Pump Tubing Day Set,** with two puncture needles, for day use, sterile, package of 10, for use with Patient Tubes 031162-01 or 031162-10
031162-10*	**Patient Tube**,** for single use, sterile, package of 10, for use with Pump Tubing Day Set 031261-01 or 031261-10

Pump Tubing Day Set

031261-01*

Patient Tube

031162-01*

Tubing Set Suction

031228-01*

** Also in conjunction with 031161-10, 031167-10, 031168-10

* mtp medical technical promotion gmbh,
Take-Off GewerbePark 46, D-78579 Neuhausen ob Eck, Germany

Overview of KARL STORZ Arthroscopy and Sports Medicine

- **HOPKINS® Telescopes and Sheaths**
- **SilCut® 1 Punches**
- **SilCut® Punches, Forceps and Scissors**
- **Joint and Bone Reconstruction**
- **Instruments for Meniscus and Patella Surgery**
- **Instruments for Cruciate Ligament Reconstruction**
- **Instruments for Hip Arthroscopy**
- **Instruments for Wrist Arthroscopy and for Treatment of the Carpal Tunnel Syndrome**
- **Instruments for Rheumatology**
- **Spine Surgery**
- **HD Imaging with Operating Microscopes**
- **VITOM® System – Visualization System for Open Surgery with Minimal Access**
- **Holding Systems**
- **RECON Joint and Bone Reconstruction**
- **Extracorporeal Shock Wave Therapy ESWT**
- **KARL STORZ OR1 NEO™, Telepresence, Hygiene, Endoprotect1**

Notes: