Hip Joint Arthrosis (coxarthrosis)

Anatomy and Functions
The hip joint (fig. 1) connects torso and legs and consists of the acetabulum in the pelvic bone and the femoral head. All joint portions are covered with a cartilaginous sliding layer and are enclosed by the joint capsule. The synovial membrane produces a liquid that nurtures the cartilage which in the end serves as kind of a shock absorber. As more than half of the femoral head lies within the bony-connective-tissue socket you can also talk of nut lying in its shell.

Cartilage
All joint portions are covered with a cartilage cover.

Labrum
This ring-shaped cartilaginous sealing (labrum, fig. 2) forms the edge of this bony socket.

Capsule
The joint is enclosed by a connective-tissue capsule whose inner layer – the synovia – permanently produces the so-called synovial fluid.

Ligaments
The joint capsule is stabilized by strong ligament structures. Joint capsule, ligaments and surrounding musculature keep the joint in its position.

Fig. 1: X-ray image of healthy hip joint
Fig. 2: Labrum of the hip

Hip Joint Arthrosis (coxarthrosis)
Most common cause of a hip joint disorder is cartilage degeneration: i.e. arthrosis of the hip or coxarthrosis. In most cases the reason for this degeneration is known and a distinction is made between three main causes:

1. Mechanical hip dysfunctions (e.g. offset disturbance)
2. Circulatory disorders (e.g. osteonecrosis of the femoral head)
3. Inflammatory disorders (e.g. chronic polyarthritis)

But the mechanical hip disorder is by far the most common cause.
Hip Joint Arthrosis (coxarthrosis)

The Femoral Neck Offset

Figure 3 shows the normal form of femoral neck and femoral head in cross-section. The femoral head protrudes the femoral neck both at the front and the back side. This midsection of the femoral neck is called offset. There are often disease patterns where this passage is much flatter (offset disturbance, fig. 4); this is mostly the result of a growth disorder of sportily active patients in adolescence.

This offset disturbance leads to the femoral neck hitting the socket edge when bending forwards (fig. 5). The first thing which becomes injured is the “sealing ring” of the hip, the so-called labrum. An early symptom of this offset disturbance is groin pain. During the following course of disease the cartilage of the socket becomes destroyed. Without treatment this loss of protecting cartilage leads to an increasing arthrosis with stiffening of the joint. At the advanced stage, ball and socket become partly damaged and do not optimally fit into each other any longer. At the same time run-in- and stress pain starts, later pain occurs also at night and while at rest. All this finally results in reduction of the walking distance and in an enormous reduction of the quality of life.

Diagnosis

Diagnosis can be set by typical anamnesis, examination and by means of a normal x-ray image, whereby narrowing of the joint space between hip- and femoral bone is an indirect sign of cartilage loss. The MRI enables more precise examination of labrum and cartilage.
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Therapy of Offset Disturbance and Prevention for Hip Arthrosis

Therapy of this offset disturbance is always carried out surgically as there is no reliable conservative therapy known. This means restoration of the femoral neck offset and removal or suture of the torn labrum. With this the cartilage is protected and hip arthrosis prevented.

If a patient suffers from groin pain, differentiated assessment shows the dimensions of this growth disorder and already existing damages. Besides clinical examination and conventional x-ray images, the most important method here is MRI; and it is decisive that NMR is made with intra-articular contrast medium and on special sequences. This is the only possibility to achieve a differentiated result about labrum and condition of the cartilage.

In order to avoid early degeneration of the hip joint correcting surgery should be carried out. We offer you a new operation technique at the ARCUS Clinics to repair this defect by means of hip arthroscopy (p 76). The torn part of the labrum is removed under arthroscopic control and the lacking femoral neck midsection formed artificially. This takes away the femoral neck entrapment and degeneration of the hip can be stopped or avoided.
Hip Arthroscopy

In recent years, hip arthroscopy has become a standard surgery method when treating hip disorders. With this technique formerly common large incisions and resulting soft tissue damages as well as a long rehabilitation period can be prevented.

Indications for hip arthroscopy are:

- Loose joint bodies
- Labrum ruptures
- Degenerative changes
- Beginning hip arthrosis (p. 73)
- Movement restrictions of the hip
- Cartilage injuries
- Inflammations of the synovial membrane
- Tear of the central hip ligament (Lig. teres)
- Joint infections
- Impingement of the hip (see step-by-step plan for treatment of hip arthrosis p. 78)
- Problems after hip replacement surgery

The surgery technique is very challenging and requires long term experience. Therefore we are very proud that more than 100 hip arthroscopies are carried out at the ARCUS Clinics every year.

Fig. 1: Hip arthroscopy
Hip Arthroscopy

We would like to outline two common indications as example:

**Loose Joint Bodies**

The most common cause for loose joint bodies (fig. 2) are accidents, followed by degeneration of the joint and synovial joint diseases. The loose joint bodies may then get caught and with this damage the joint; therefore it is recommended to remove them. This is possible by arthroscopic surgery through two or three 1cm long incisions what is an excellent alternative to formerly usual open operations.

**Femoroacetabular Impingement of the Hip**

This so-called femoacetabular impingement of the hip joint occurs due to changed anatomical conditions at femoral neck and/or the socket edge. It stands for direct contact of the two bones the when bending forwards, whereby the cartilaginous rim of the socket (the so-called labrum), as well as the cartilage within the socket become entrapped. These problems often occur with young patients and symptoms are pain in the area of the hip and movement restrictions.

The labrum- and cartilage damage and the repeated bone contact results in continuous joint degeneration and finally in destruction of the joint by arthrosis.

Through small incisions (about 1cm length), disturbing bony protrusions at the femoral neck and the socket edge can be removed and labrum and cartilage be treated (fig. 3+4). In many cases this prevents progression of the arthrosis and restores pain free mobility.

**Arthroscopic Surgery Aftercare**

Restrictions after hip arthroscopy depend mainly on extent of the surgery. During the first 2-3 weeks, putting full weight on the hip is possible when limiting physical activity, i.e. no sports activities and additional stress. In this initial period, also walking on crutches can be of help. In case that bone has been removed from the femoral neck or bone stimulating techniques carried out, strict stress reduction might be necessary for 2-4 weeks. Physiotherapeutic treatment prevents these limitations to activity and therefore should be started the first postoperative day. Thrombosis prophylaxis during the period of load reduction reduces the risk of blood clots in the leg veins.
Step-by-step Plan for Treatment of Coxarthrosis

In case that joint arthrosis had been diagnosed, there was so far only the option of artificial hip joint replacement (THR) if conservative treatment methods such as physiotherapy, thalassotherapy, massages, pain medication etc. had already proven unsuccessful.

Furthermore, treatment did consider neither severity of the disease nor age of the patient. Therefore we developed a step-by-step plan which ensures stage-related therapy.

1. Moderate coxarthrosis with protrusions:
Considerable improvement of discomfort can be achieved by recovering the stage of compensated arthrosis with arthroscopic hip surgery (p. 76). Disturbing osteophytes at femoral neck and socket are removed and the contract capsule partly recessed what brings back movability. Additionally, removal of torn parts of the labrum and inflamed portions of the synovial membrane allow considerable pain reduction. And with this method even loose joint bodies can be removed what enables the patient to be physically active again and delay an artificial hip implant.

2. Advanced arthrosis with young patients (Female patients under 60, male patients under 65):
When the joint is completely destroyed, joint-preserving surgery no longer makes sense. However, in order to preserve as many bones as possible, younger patients are implanted a femoral head cap (fig. 2) - a resection of the femoral neck is not necessary. Advantage is here preservation of normal anatomy (offset, force transmission and size of femoral head) what is needed for the normal range of movement. The resulting stability enables sportive activity without limitations. Another important advantage is the protection of bone substance which might become decisive with regard to a future revision.

Not every hip arthrosis can optimally be treated with a femoral head cap. In such cases we alternatively use short-stem hip prostheses.

3. Advanced arthrosis with elderly patients (Female patients over 60, male patients over 65):
As the femoral neck is here not strong enough to carry surface replacement due to the reduced level of calcium carbonate in the bones, complete hip arthroplasty is the only option. This is another treatment where we achieve enormous progress, and besides better materials there have also been essential improvements with the operation technique. By developing the concept of minimally-invasive surgery (MIS) we only need very small incisions (6-8 cm). But the decisive advantage is the fact that almost no muscles have to be detached. This brings minimization of tissue trauma, an overall gentle operation method and less pain. Immediate full strain is possible and blood loss is reduced what in turn accelerates rehabilitation.
Total Endoprosthesis: Material and Fixation

Hip joint prosthesis: material and fixation

Continuous improvements in both surgical techniques and the quality of implants since the 1960s make this procedure one of the most common and most successful routine operations in orthopedic surgery (about 400,000 per year in Europe). The prosthesis is modeled on the actual human joint, i.e. it consists of a socket and a shaft to which a ball head is fitted. By means of pre-operative planning the model size and fixation method of the prosthesis is specified whereby individual requirements such as age, gender, shape of bone, body weight, etc. are taken into consideration. There are three different fixation techniques used with implantations:

- Cement-free endoprosthesis fixation: shaft and socket are press-fitted exactly into the bone (fig. 1 + 2).
- Cemented endoprosthesis fixation: hip socket and shaft are fixed with quick-hardening antibiotic bone cement (fig. 3).
- Hybrid endoprosthesis fixation: the socket is fixed cement-free; the shaft anchored using bone cement (fig. 4).

The cemented socket is made of polyethylene, the cemented shaft of a cobalt-chromium alloy. Titanium implants, often equipped with special macro- or micro-structured surfaces are particularly suitable for cement-free fixation thanks to their excellent integration into the bone.

As so-called slide bearings (joint portions with direct contact) between the socket and the artificial femoral head polyethylene/ceramic-, ceramic/ceramic- or metal/metal combinations are used. Thanks to latest developments in this area (e.g. Dur-asul™, Sulzer Orthopedics or especially hardened ceramics) the abrasion behavior of the components has been optimized to the extent that many years of usage are tolerated with almost no material wear.
Total Endoprosthesis: Material and Fixation

Resurfacing

Treatment of young patients with advanced hip joint arthrosis can – alternatively to the usual THR surgery - also be carried out by implanting a hip cap. Here the femoral head is covered with a metal cap with the advantage that practically no bone has to be sacrificed. Furthermore the physiological size of the femoral head is re-built what results in considerably improved mobility and stability. Most important requirement is a good bone quality as there is the risk of a femoral neck fracture when suffering from osteoporosis.

Another option for younger patients which cannot undergo implantation of a hip cap (e.g. with femoral head necrosis) is a short-shaft prosthesis. Here only a small part of the femoral neck has to be removed (p. 79, fig. 5).

Aftercare

Endoprosthetic operations are carried out exclusively on in-patient conditions. In order to ensure an optimal operation success, early postoperative mobilization by means of physiotherapy is recommended. Independent of the surgery method, full load is permitted almost immediately whereby walking on crutches is necessary for 3-4 weeks to protect the soft tissues.

Most patients stay in hospital for 7-10 days followed by 3-4 weeks of rehabilitation time. The progress of the patient is documented by regular out-patient control check-ups at close intervals. If necessary, mobilization therapy has to be continued on an out-patient basis.
Joint Replacement and Sports

Having a severe hip joint arthrosis, noticeable limitation of physical activities has to be expected. When the symptoms are gone after joint replacement surgery, the desire for more sportive exercise certainly comes up again. Internationally there is a broad consensus that at least so-called “low-impact” sports such as cycling, swimming, sailing, diving, playing golf and bowling can be supported. Sports such as tennis, basket ball and skiing however, are only possible to a limited extent. Completely avoided shall be contact sports such as foot ball or hand ball. Recommendations for those different sports are also dependent on the patient’s performance level. As a rule of thumb it can be said that sports practiced prior to surgery are allowed afterwards as well.