

TOTAL HIP REPLACEMENT



PATIENT INFORMATION



PETER BREHM
Die Präzision in Titan
für den Menschen

Patient information

Dear patient,

This patient information brochure provides you with general information about hip disorders and their treatment, including implantation of an artificial hip (total hip arthroplasty).

The patient information brochure is intended to supplement your personal consultation with your doctor and to help you get answers to your questions.

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1. Hip disorders

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- I What is aseptic necrosis of the femoral head?

How is the hip structured?

The hip represents the connection between the pelvis and the thigh. The anatomy of the hip joint allows a broad range of motion in the lower extremity. It is a special type of ball-and-socket joint that works like a nut in its shell. The joint consists of the joint socket (acetabulum) and the head of the thigh bone (femoral head) (Fig. 1).

All three bones of the pelvis, the ilium, pubic bone, and ischium, contribute to the structure of the acetabulum. The joint socket itself resembles a hollow hemisphere. A curved lip of fibrocartilage (labrum) extends around nearly the entire acetabulum and past the equatorial plane, enclosing the adjacent femoral head.

This is why the hip joint is often likened to a nut in its shell, and it allows motion in the form of flexion, extension, abduction, adduction, and rotation. Strong bands (ligaments) surrounding the hip act together with the musculature adjacent to the hip to prevent dislocation of the joint despite its great range of motion. The femoral head and acetabulum are almost completely covered with hyaline cartilage. A sturdy capsule encloses the entire hip joint.

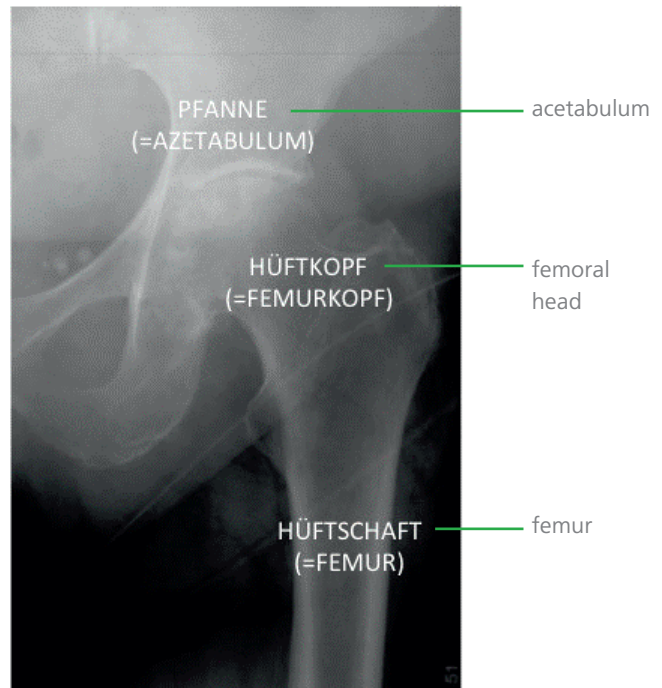


Fig. 1: Anatomy of the hip
(Courtesy of Kathi Thiele, MD, Charité, Berlin, Germany)

Reasons for a hip replacement

The need for an artificial hip may arise from malformations in childhood or from later disorders in adult life. With respect to the age of occurrence, hip dysplasia, a type of developmental malformation of the hip, warrants particular mention. Flattened hip sockets lead to abnormal stress concentrations that in turn cause the joint to wear out prematurely. Spontaneous separation of the femoral head in juveniles (slipped capital femoral epiphysis) has been observed less often but may also necessitate total hip arthroplasty later in life. In adults, degenerative changes in the joint (osteoarthritis) are the main reason for total hip arthroplasty. This disorder will be described in greater detail in the following section. Inflammatory (rheumatoid) disorders, infectious disorders such as bacterial infections, and trauma such as fractures can subsequently lead to significant joint destruction. Avascular necrosis of the femoral head also warrants mention. In this disorder, insufficient blood supply to bony portions of the femoral head leads to tissue death (necrosis). The exact causes are not fully understood, but diabetes mellitus, alcoholism, or systemic cortisone therapy can contribute to the occurrence of this disorder. Legg Calvé Perthes disease in childhood represents a special form of necrosis of the femoral head that can also lead to destruction of the hip joint.

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What happens in osteoarthritis of the hip?

Injury to the joint as well as chronic overuse and abnormal stress can result in damage to the surface of the cartilage with progressive joint degeneration (osteoarthritis). Physicians refer to this joint degeneration as osteoarthritis of the hip. The human body is unable to replace the loss of cartilage. Angular deformities lead to rapid progression of the disorder. The membrane lining the joint, the synovium, becomes inflamed and produces excessive amounts of synovial fluid, leading to hip effusion. The tension in the joint capsule leads to further symptoms and increasing pain, a condition occasionally referred to as "active osteoarthritis." The final stage of osteoarthritis can involve total loss of the cartilage with impaired motion and eventually stiffening of the joint. The initial pain on weight bearing is increasingly accompanied by pain at rest. Osteoarthritis is typically characterized by "start-up pain": The first few steps after getting out of bed in the morning or sitting for a long time are difficult as the joint seems to be "rusty in place."

What conservative treatment options are there for osteoarthritis of the hip?

Treatment is tailored to the cause and severity (stage) of the osteoarthritis. Physical therapy, pain medication, cushioning shoe inserts, and decreasing stress in daily life and at work are all helpful in managing early stage disease. The cause of the degenerative process should be determined early to allow consideration of surgical corrections to the femoral head or the joint socket (where the femoral head impinges on the acetabulum). As osteoarthritis progresses, the only treatment that remains is medical pain management. Physical therapy can counteract the stiffening of the joint and its effects on the spine or knee. Increasing pain is an indication for a total hip replacement.

What is aseptic necrosis of the femoral head?

Locally impaired perfusion in the femoral head leads to tissue death (necrosis). Cartilage and bone in the affected area lose their mechanical function. Motion in the affected hip becomes painful. Treatment follows the stage of the disorder and initially includes intravenous medical therapy or core decompression. With progressive deformity the only remaining option is a total hip replacement.

2. Facts about total hip arthroplasty

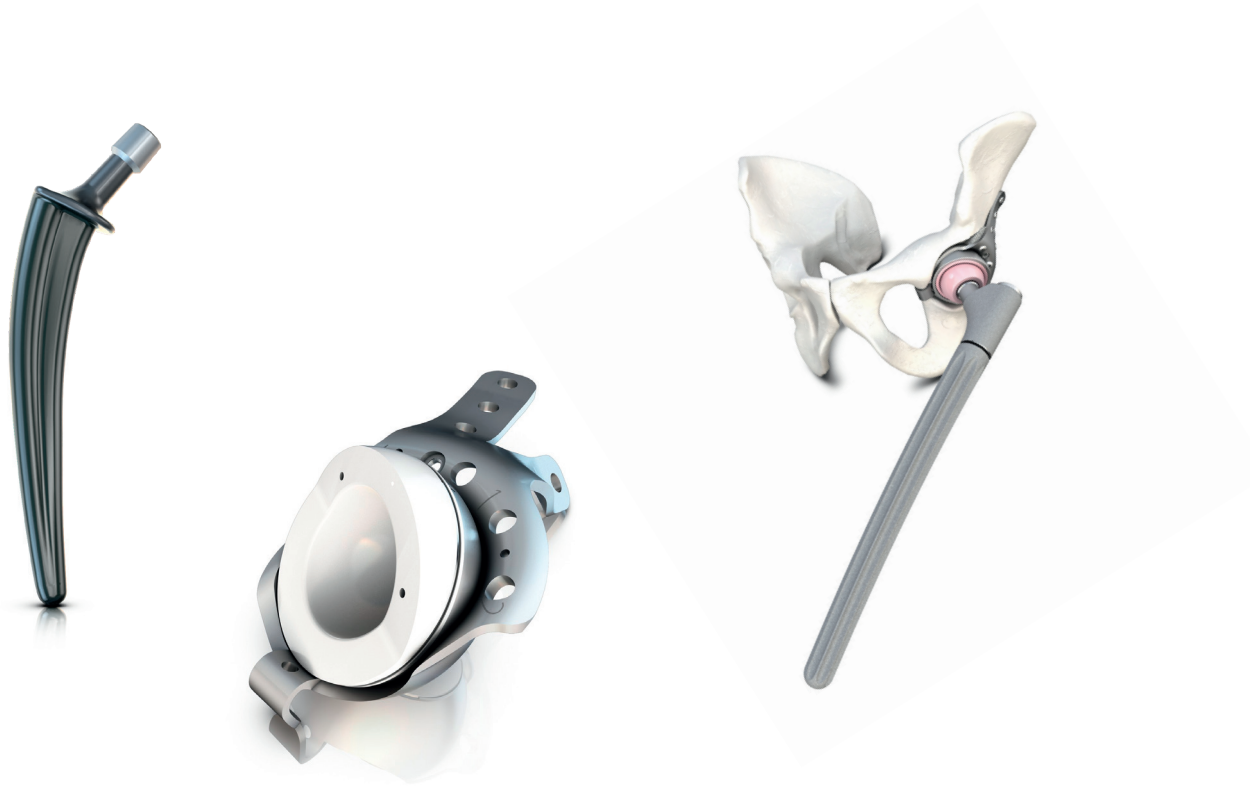
- I What components constitute a total hip?
- I How long does an artificial hip currently last?
- I What is meant by "cemented" and "cementless" in total hip arthroplasty?
- I How is a total hip arthroplasty performed?

Surgical intervention should be considered where conservative therapies have failed. The following section includes a few observations about this situation.

What components constitute a total hip?

The artificial hip consists of an acetabular component fixed in the pelvis and a stem that transfers motion to the femur, the thigh bone. As a modular system, these two main components are joined together using the natural tension of the pelvic muscles. The artificial femoral head, which may be metal or ceramic, is mounted on the femoral stem and articulates within the cup liner of the new acetabular component, which is metal. The cup liners usually made of UHMWPE (ultra-high-molecular-weight polyethylene) or increasingly of highly cross-linked polyethylene (HXLPE) and ceramic. The polyethylene (PE) used in arthroplasty is a specially hardened plastic that shows very little wear or plastic deformation when interacting with the other articular surfaces.

Where larger bony defects are present in an initial operation or following several previous interventions, both the acetabular component and the stem component must be made individually. In a revision procedure to replace an implant, other acetabular component designs are available, such as rings or cups with a screw fixation system. The stem length and method of fixation can also be varied. (Fig. 2)



*Fig. 2: Schematic diagram of implants
(examples: AEON-System (left), MRS-TITAN Comfort (middle) and MRP-TITAN (right), PETER BREHM GmbH)*

How long does an artificial hip currently last?

The longevity of a total hip depends on the following factors:

- | Patient's age at the time of the first operation
- | Duration and intensity of weight bearing
- | Anatomy of the joint (deformity)
- | Cause of joint degeneration
- | Metabolic diseases of bone
- | Quality of implantation
- | Particulate wear with the release of particles from the implant

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For these reasons it is not possible to predict exactly how long hip arthroplasties will last. Data from international patient registers confirm very good long-term function of hip implants. About three-quarters of all hip implants currently have a longevity of 15-20 years; at least half of all hip implants last 25 years^{1,2,3}.

What is meant by "cemented" and "cementless" in total hip arthroplasty?

In a cemented total hip, a biologically compatible epoxy cement creates a resilient interface between the implant and the bone that permits early weight bearing after surgery.

In a cementless total hip, the interface between the implant and the bone is created solely by the shape of the implant (design, surface). The surgeon dissects the bone to optimize the implant bed for a perfect fit to the shape of the implant, ensuring implant longevity. However, the bone must grow into the surface of the implant after the operation. To facilitate this, the attending physician will often recommend several weeks of partial weight bearing in the operated leg.

The decision as to which type of implant is most suitable for you as the patient depends on many factors such as age, fitness, bone quality, anatomy, etc. and is determined on an individual basis in consultation between you and the attending physician.

How is a total hip arthroplasty performed?

The natural hip joint is usually opened with an anterior, lateral, or posterior skin incision. Care should be taken to minimize soft-tissue trauma. Once the joint has been opened, the worn out femoral head and part of the femoral neck are removed. Then both the acetabulum and the femur are contoured with special instruments to ensure a perfect fit with the implants. Depending on the specific implant design used, the implant is cemented in place or impacted without cement. After the metal components, the stem and cup, have been implanted along with the cup liner, the new joint is reduced and tested for stability against dislocation. The joint must not dislocate when moved through its range of motion. Then the surgical wound is closed in layers, taking care to protect the hip extensors. When the operation has been completed, the proper position of the implant is verified by fluoroscopy.

3. Before surgery

The decision in favor of an artificial joint is not always an easy one to make; in spite of all advancements, it still brings with it certain changes in life. The following questions and answers may help to make the decision making process easier.

- | Am I ready for a total hip arthroplasty?
- | I am overweight. Should I lose weight before undergoing total hip arthroplasty?
- | Does smoking influence the course of the implant surgery?
- | I have an allergy. What do I need to know about implant surgery?
- | What kind of anesthesia is suitable for me?
- | When is a blood transfusion required?
- | How great is the risk of getting hepatitis or even HIV from implant surgery?
- | What does a person with diabetes need to know about hip surgery?
- | How does osteoporosis affect the longevity of the artificial hip?

1 Siegmund-Schultze N. Haltbarkeit von Hüftendoprothesen: Drei Viertel der künstlichen Hüftgelenke halten 15 bis 20 Jahre. Dtsch Arztebl 2019; 116(15):A-739 / B-609 / C-598 (German)

2 Erfolgsstory: Hüft- und Knieprothesen halten länger als gedacht. Deutsche Gesellschaft für Endoprothetik e.V. <https://www.ae-germany.com/die-ae/presse/ae-pressemeldungen>, März 2019 (German)

3 Evans JT, Evans JP, Walker RW, et al. How long does a hip replacement last? A systematic review and meta-analysis of case series and national registry reports with more than 15 years of follow-up. Lancet 2019; 393: 647–54

Am I ready for a total hip arthroplasty?

Answer the following questions for yourself: If you end up with more positive answers, then you will benefit from implantation of an artificial hip joint.

- I Does your hip pain significantly restrict you in your daily activities?
- I Does your hip pain fail to improve significantly even when you take pain medication?
- I Do you have hip pain not only during the day but also at night?
- I Do you suffer from the side effects of pain medication taken regularly, such as nausea, stomach pain, and loss of appetite?
- I Are alternate conservative treatments no longer successful to any relevant extent?

Positive answers and the presence of the following disorders should make you consider surgery:

- I Osteoarthritis of the hip
- I Rheumatic inflammation of the hip
- I Osteonecrosis of the femoral head

The decision as to whether an implant is indicated and which type is most suitable for you as the patient depends on many factors and is determined on an individual basis in consultation between you and the attending physician.

I am overweight. Should I lose weight before undergoing total hip arthroplasty?

Weight loss is not absolutely required although it is very beneficial for your general physical well being and the longevity of the implant. Excessive weight increases the risk of impaired wound healing or thrombosis. High body weight also increases the mechanical load on the implant. This can have a negative effect on the longevity of the implant.

The degree to which you are overweight can be calculated using the body mass index (BMI) according to the following formula: body weight in kilograms (kg) divided by the square of your height in meters (m). Values between about 18.5 and 25 kg/m² represent normal weight. Values between about 25 and 30 kg/m² are overweight. If the values are higher, then we refer to obesity. In such cases, dietary consulting and weight loss are recommended.

$$\text{BMI} = \frac{\text{weight (Kg)}}{\text{height x height (m)}}$$

Does smoking influence the course of the implant surgery?

Smoking negatively influences vascular perfusion and significantly slows wound healing. This can lead to dangerous wound infections. In the interest of an optimal surgical result, it would be advisable to quit smoking.

I have an allergy. What do I need to know about implant surgery?

In the initial consultation with the surgeon, you should mention all allergies you know of. Allergies to chrome or nickel lead to reddening or itching when the metal comes into contact with the skin. This can be caused by such things as costume jewelry or metal buttons. Special implants are available to the surgeon to minimize the risk of allergy. This means a suitable type of implant can be selected for you provided that your allergy and allergic predisposition are known. However, it should be noted that the significance of metal allergies in total joint arthroplasty is not yet fully understood.

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What kind of anesthesia is suitable for me?

As a matter of course, the operation is performed under general anesthesia (injection of an intravenous anesthetic followed by an inhalation anesthetic administered with a mask) or under regional anesthesia (injection of anesthetic at the spinal cord; patient remains conscious). Which form of anesthesia is best for you is determined in a consultation with the anesthesiologist. Both types of anesthesia have proven effective in arthroplasty.

When is a blood transfusion required?

A blood transfusion is performed when there is a deficiency of red blood cells (erythrocytes). These cells transport vital oxygen (O₂). If the quantity of red blood cells decreases (anemia), the risk of cell death from lack of oxygen increases. This can lead to deficient organ function. The heart, brain, kidneys, and liver are particularly vulnerable. The body's tolerance of an oxygen deficit depends among other things on preexisting underlying disorders and the patient's age. In general, the chance that a transfusion will be needed during initial implantation of an artificial joint is very slight. However, a blood transfusion may be required in exceptional cases.

How great is the risk of getting hepatitis or even HIV from implant surgery?

Implant surgery itself cannot cause hepatitis (liver inflammation due to hepatitis viruses) or HIV infection. One possible transmission path is contact with donor blood such as from a transfusion of donor blood or injection of clotting factors. The processing of blood products is subject to a very strict procedure that includes careful testing of donors and blood products for viruses. A minimal risk remains nonetheless.

What does a person with diabetes need to know about hip surgery?

An operation represents a change in the rhythm of life and stress for the body which are associated with altered metabolism. These two factors usually lead to a slight temporary imbalance in the blood glucose level. Therefore, you should adapt your insulin dose to your altered situation in consultation with your attending physician. If you are taking tablets to reduce blood glucose, ask your physician prior to surgery whether and to what extent your body will tolerate a transient increase in your blood glucose level. Diabetes medication must also be proportionately reduced or suspended prior to surgery.

Consult your attending physician before making any changes in your medication.

How does osteoporosis affect the longevity of the artificial hip?

Osteoporosis means the amount of calcium salts in bone tissue is reduced, resulting in decreased stability. This increases the risk of fracture regardless of whether the patient has undergone surgery. Using a suitable surgical technique makes it possible to achieve secure fixation of the implant even in osteoporotic bone. There has not been any evidence of earlier implant loosening. However, take care to avoid falls and sports that put stress on the joints as fractures in the surrounding bone can occur.

4. Possible risks and complications in hip operations

- | What is a hip implant infection?
- | What is "aseptic" hip implant loosening?
- | Is there a risk of a leg-length difference after implantation of an artificial hip?
- | What does the term "heterotopic ossification" mean?
- | When does a hip implant have to be replaced?
- | What is bursitis in the operated hip?
- | What does the term "Girdlestone resection arthroplasty" mean?

What is a hip implant infection?

Another complication is an implant infection (bacterial infection). A distinction is made between early infections (within three weeks postoperatively) and late infections. These can even occur years later and often have an insidious onset. Pain, swelling, reddening of the skin, and prolonged secretions from acute wounds suggest an infection. Treatment requires lavage of the surgical wound, antibiotic therapy, or in the case of a persistent clinical course removal or replacement of the hip implant.

Therefore, you should inform the physician prior to surgery about any inflammation in the mouth, throat, nose, or ears and about any infection in the gastrointestinal tract. Fingernail and toenail injuries can also provide small entry portals for pathogens and require appropriate treatment prior to surgery and after the implant has been placed. Any loosening of hip implants within the first three years invariably suggests the presence of an infection.

What is "aseptic" hip implant loosening?

Despite correct surgery, implant loosening can occur in isolated cases. The term "aseptic" means that no bacteria are involved in the loosening process of the implant that has been placed. In the case of a cemented implant, the cement mantle around the implant is usually broken and the metal no longer adheres securely to the bone. In cementless implants, there is no longer sufficient contact between the bony trabeculae (tiny bridge-like structures within the bone) and the metal. The implant shifts with every motion instead of being securely seated in the bone. A common reason for aseptic implant loosening is increased particulate wear, which can occur with increased loading. The abraded particles set in motion an inflammatory cascade that in turn leads to loosening of the implant.

Is there a risk of a leg-length difference after implantation of an artificial hip?

Modern improved planning modalities together with the preoperative radiographs (x-ray images) make it possible to select the implant that will fit perfectly. However, the preoperative leg length may have to change in the interest of achieving optimal muscle tension and a perfect fit between the individual anatomy and the prefabricated implant. Differences of less than 1 cm are usually to be expected only where pathology of the opposite hip is also present and is not immediately compensated for.

What does the term "heterotopic ossification" mean?

Heterotopic ossification refers to the formation of bone tissue in places where muscles or tendons normally course. In extreme cases, these growths must be surgically removed after completion of the bone remodeling process as they can greatly limit the range of motion. Proven methods of prophylaxis against ossification include the brief use of medications or a single session of radiation therapy.

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When does a hip implant have to be replaced?

Painfully loosened implants and implants with bacterial infections should generally be replaced. A further reason may be persistent thigh pain after placement of a cementless hip implant.

What is bursitis in the operated hip?

At the level of the hip between the femur and the tendons of the thigh, there is a small fluid-filled sac known as a bursa. Irritation (inflammation) can cause pain. Consult your attending physician regarding possible treatment options.

What does the term "Girdlestone resection arthroplasty" mean?

The term "Girdlestone resection arthroplasty" describes the status after removal of a total hip. Today, it usually represents a temporary solution in the setting of a two-stage procedure to manage an infection. However, a "Girdlestone resection arthroplasty" can represent a definitive treatment in patients with very poor general health or disastrous bony defects. Muscular strength in the operated thigh is reduced after a Girdlestone procedure. Canes can compensate for this.

5. After surgery

- I How will I manage in daily life after implant surgery?
- I How do I protect myself against deep venous thrombosis after implant surgery?
- I How do I protect myself against dislocation of the joint after hip implant surgery?
- I What does thigh pain mean after implantation of a total hip?
- I How long will I be hospitalized?
- I What is an implant identification card?

How will I manage in daily life after implant surgery?

After hip implant surgery, physical therapy will help you learn how to get out of bed by yourself, walk with canes, and climb stairs. The therapist will also show you which motions you must absolutely avoid in order to prevent dislocation.

A special hospital bed is rarely required. It helps to put a chair in the shower or use a tub bench placed across the top of the bathtub for the first few weeks.

How do I protect myself against deep venous thrombosis after implant surgery?

Thrombosis is a vascular disorder in which blood clots develop within a blood vessel. To begin with, you should consult your family physician or the surgeon about your personal risk of developing thrombosis: Have you ever been diagnosed with thrombosis before? Are any risk factors present that may favor the development of thrombosis? Are you taking any medications that influence blood coagulation? Things such as compression stockings, leg muscle exercises, and special venous cuffs help to minimize the risk after surgery. Without full weight bearing, anticoagulant therapy in the form of injections or tablets must be continued postoperatively according to the attending physician's instructions.

Drink plenty of liquids unless the physician tells you something to the contrary due to a heart or kidney disorder. Some hospitals have a special department to determine the proper procedure for coagulation disorders.

How do I protect myself against dislocation of the joint after hip implant surgery?

Risky activities for a newly implanted artificial hip include sitting down on a low chair or toilet seat, putting on your shoes in a squatting position, turning over in bed onto the non-operated side, and crossing your legs. You should take special care to avoid these activities during the first six weeks postoperatively. Aids such as devices for putting on shoes, seat cushions, and elevated toilet seats are available to help protect you against this problem. In the first few days after surgery, physical therapy will include instruction in how to correctly get out of bed and what to do when sitting down.

What does thigh pain mean after implantation of a total hip?

With a cementless femoral stem, pain that varies with weight bearing can occur but does not necessarily indicate a problem or complication. Other disorders such as osteoarthritis of the knee, back problems, a fracture, or even a vascular disorder can also cause thigh pain. However, whenever thigh pain suddenly occurs with an implant that has not previously caused any symptoms, prompt diagnostic evaluation is essential to verify or rule out implant loosening.

How long will I be hospitalized?

The duration of hospitalization depends on the type of surgery, possible comorbidities (associated diseases), and the course of recuperation. Currently the average stay is seven to ten days, although it may well be shorter or longer. A longer hospital stay is required especially in the case of revision procedures to replace an implant.

What is an implant identification card?

An identification card is issued with every operation in which the patient receives an artificial implant. This implant identification card (Fig. 3) includes personal data as well as the date of surgery, the operated extremity, and the implant used. You can show this card at airport security checks with metal detectors. You should bring the identification card to every visit to a physician as it contains important information for the doctor.



Fig. 3: Example of an implant identification card (PETER BREHM GmbH)

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6. Living with an artificial hip

- I Can I go back to work after hip implant surgery?
- I Can I still participate in sports after hip implant surgery?
- I Is sexual activity restricted after hip implant surgery?
- I Will I be completely free of pain after hip implant surgery?
- I Can I influence the longevity of the implant positively?

Can I go back to work after hip implant surgery?

The rule is that implanting an artificial hip should improve the quality of life and therefore allow the patient to return to daily activity after surgery.

In the first twelve weeks after surgery you should avoid shock stresses, squatting or kneeling, compressive stresses, lifting or carrying heavy loads, and great exertion or rigorous physical work. Instead you should continue the familiar physical therapy exercise program after leaving the hospital. Then you can regain the ability to perform sedentary work and light physical tasks. The degree of weight bearing that is possible after implantation cannot usually be assessed before six weeks postoperatively.

You should no longer do any work on uneven terrain; physically demanding activities such as road work; or work that involves regularly standing on and climbing ladders, scaffolding, or roofs. Also avoid regularly working in a stooped or kneeling position or working in confined spaces with low ceilings. Driving a car or truck is possible in principle, although whether your joints and muscles will tolerate putting in a full eight hours of work is a question that must be decided on a case by case basis.

Can I still participate in sports after hip implant surgery?

The scientific evidence regarding sports participation after hip implant surgery remains inconclusive. The crucial factor is your ability to participate in sports and your experience in the sport in question prior to surgery. The sports themselves are divided into low-impact and high-impact sports.

The higher the load (high-impact) on the artificial joint, the greater the risk of implant loosening or implant fracture. Moderate, low-impact sports have a particularly beneficial effect. These include walking, bicycling, and swimming. So-called power and contact sports (squash, tennis, and ball games) can lead to significantly higher mechanical stresses acting on the artificial joint due to the abrupt acceleration and braking maneuvers they involve. This in turn can accelerate wear and tear, which is why these sports are generally not recommended. Jogging, skiing, martial arts, and most competitive sports can also shorten the life of the implant if practiced more intensively than at an amateur level.

As a result these sports, too, are viewed very critically. However, your attending physician will instruct you about specific options on an individual basis. Please avoid any sports that involve an increased risk of falling. The development of new implant designs and material matches in the articular surfaces has generally increased patients' ability to participate even in sports that involve greater peak stresses.

Is sexual activity restricted after hip implant surgery?

Intimate contact is also possible once the surgical wound has healed. Avoid any hip motions that increase the risk of dislocation or cause pain, such as extreme flexion or rotation.

Will I be completely free of pain after hip implant surgery?

The artificial implant replaces the worn out parts of the hip joint, thus significantly reducing symptoms. The extent of the areas to be replaced depends on the degree of damage present. However, the implants also alter the natural anatomy and mechanics of the joint. For this reason it is not possible to guarantee that all symptoms will completely disappear in every case.

Can I influence the longevity of the implant positively?

The implant is subject to natural wear and tear which can make it necessary to replace the implant as the years go by. Your personal behavior can decisively influence the longevity of the implant. Avoid falls! Lifestyle and dietary habits influence bone metabolism and the mechanical load on the implant. Avoid sports with an increased risk of falling and sports that place excessive stresses on the joint. Talk to your physician about your personal risk.

Text: With the kind support of Kathi Thiele, MD, Charité Berlin, Germany

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



! NOTE

The information about the products and/or procedures described in this brochure is of a general nature and does not represent the advice or recommendation of a physician. The information provided here does not in any way represent an opinion on the diagnosis or treatment of any specific medical case. The respective patient must be examined individually and advised accordingly. This brochure can neither completely nor partially substitute these measures.

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