VI./2.: Avascular femoral head necrosis

This chapter deals with one of the common causes of hip pain in adults. After reading this chapter reader will be able to recognize this disease, and will be able to evaluate this disorder from a differential diagnostic point of view. We will also present the possibilities of modern diagnostics and treatment.

VI./2.1.: Definition

Avascular femoral head necrosis (AVFN) is an ischemic necrosis caused by impaired circulation usually occurring at the point (triangle) of greatest weight bearing. In the end the cartilage surface of the femoral head crumbles over that necrotic zone causing severe pain and difficulty in weight-bearing. Femoral head necrosis may lead to secondary osteoarthritis (secondary coxarthrosis). 20-40% of the cases are bilateral.

Synonyms: idiopathic femoral head necrosis, aseptic femoral head necrosis

VI./2.2.: Clinical symptoms

The affected hip joint is painful, and the pain may radiate to the groin, the trochanteric region and the knee. Pain may be undulating in the beginning. Pain may characteristically the provoked by internal rotation, and may be tested for in this way. Limited range of motion and preventive limping is also characteristic. The extremity may become shorter.

VI./2.3.: Incidence

Incidence of this disease is 1:1000. It primarily affects the male population of ages between 40-60. They call it the coronary syndrome of the hip.

VI./2.3.1.: Etiopathogenesis

In several cases it is impossible to find the reason for the femoral head necrosis, this is why we use the term „idiopathic”, which basically refers to the fact that the reason for the disease is not yet known to our knowledge.

There are general pathologies that are often associated with femoral head necrosis. These are Gaucher’s disease, caisson disease or sickle cell anemia. It may also be linked to metabolic or storage diseases (hypercholesterinaemia, hyperglycemia, hyperuricemia). It may also occur associated to systematic inflammation or autoimmune diseases (i.e. SLE).

It may develop following trauma, i.e. medial hip fracture, if the fracture wasn’t reduced and fixed surgically in time.

May develop as a complication of taking certain medications. Long-term steroid intake, cytostatic therapy or radio-therapy may also lead to necrosis of the femoral head.

Patients who had undergone kidney transplantation are characteristic examples, in their cases the etiology of femoral head necrosis maybe multifactorial.

Femoral head necrosis is frequently linked to chronic alcohol abuse in our region.

VI./2.3.2.: Stages

As femoral head necrosis develops over a long period of time and outcome is predictable
and hard to influence it is traditionally classified as preclinical, early clinical, florid or end stage. Clinical symptoms become more severe over time. Radiological stages are of outmost significance, so we will discuss staging there.

VI./2.4.: Radiological investigation of femoral head necrosis

VI./2.4.1.: Radiographic signs

As femoral head necrosis may be bilateral the first diagnostic step is an A-P radiograph of both hips, which may be complimented with “frog leg”-views. On these images we may evaluate the contour of the femoral head, bone structure and we may examine the triangular sclerotic region of the weight bearing zone. Crumbling of the joint surface and potential secondary signs of arthrosis are easy to spot. All of the above is only possible in the late stages of the disease. We barely see anything on traditional radiographs in the early stages of the disease.

VI./2.4.2.: MRI

When clinical suspicion arises yet conventional radiographs barely the show anything MRI is the diagnostic tool of choice. MRI can detect the impaired circulation, the edema and degeneration of the femoral head at an early stage. The reactive synovitis in the joint is easy to spot, and the contralateral hip may also be evaluated. As bilateral cases are frequent we may see florid femoral head necrosis on one side and edema on the other. This may have therapeutic consequences.

VI./2.4.3.: Classification according to Ficat

Stage 0.: No radiological signs, uncertain MRI findings (i.e. mild bone marrow edema) due to increased intraosseal pressure.

Stage I.: Triangular region shows up on the MRI but x-rays are negative.

Stage II.: Traditional radiographs reveal wedge shaped necrotic region with sclerotic edges. Subchondral fractures they show up as sickle-shaped lines under an intact joint surface.

Stage III.: The joint surface crumbles.

Stage IV.: The joint gap narrows, osteophytes appear, and the acetabulum may also show signs of arthritis.

![Figure 1.: MRI of femoral head necrosis Ficat stage I.](image1.png)  ![Figure 2.: Histological investigation of femoral head necrosis Ficat stage I shown on figure 1.](image2.png)
VI./2.5.: Treatment

Treatment must be adapted to clinical and radiological symptoms, and must depend on whether the disease is in the early, florid or end stage.

VI./2.5.1.: Possibilities of conservative treatment

Treating femoral head necrosis conservatively is not a simple task because it is a process that progresses on its own. We may however achieve transient results in the early stages by prohibiting weight-bearing, giving NSAIDs, exercising hips, swimming and bicycle riding. Basically we must minimalize weight-bearing and eliminate the underlying causes, and improve circulation of the hip. Circulation of the femoral head may also be improved with medication (i.e. ASS, pentoxiphylline) or physical therapy (i.e. pulsating magnetic field).

VI./2.5.2.: Joint sparing surgical procedures

In the short period before the joint surface collapses and secondary arthrosis develops there are a couple of procedures that may result in varying success.

VI./2.5.2.1.

In early stages the necrotic parts of the femoral head may be drilled from the lateral cortex under image intensifier, to refresh the necrotic region and helping the formation of new vessels. This procedure is called core decompression in the literature.
**VI./2.5.2.2.**

An alternative procedure which is more difficult to perform is to expose the necrotic region and implant a vascularized muscle-bone flap, which may help revascularization.

**VI./2.5.2.3.**

In more advanced stages of the disease when there are irreversible changes in the subchondral bone we may perform an osteotomy that takes the necrotic region out of the weight bearing zone. This procedure is barely performed world-wide as total hip arthroplasty (THA) has become routine.

**VI./2.5.3.: Total hip arthroplasty (THA)**

In the great majority of cases this is the procedure to follow because implantation of the hip prosthesis presents a definitive solution to the patients problem, the hip joint can immediately loaded by full weight-bearing, pain is relieved and young active patients may return to work, family etc. Because THA has many well known complications, patients must be informed in detail and underlying diseases must be treated appropriately.

![Video 1: Surgical image of cemented THA](image)

**Literature**

*Obligatory literature:*

Miklós Szendrői: Orthopedics. Chapter 28.2.3

*Recommended literature:*


[http://www.eorthopod.com](http://www.eorthopod.com)
