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OSTEONECROSIS of the HIP

Osteonecrosis, also known as **avascular necrosis** or **aseptic necrosis**, is a disease of impaired osseous blood flow.

Neither the etiology nor the natural history has been definitively determined.

Many of the patients are young when they are diagnosed.

ETIOLOGY AND RISK FACTORS

TRAUMATIC CONDITIONS

a displaced fracture of the femoral neck or a hip dislocation are wellknown etiologies of ONH; they lead to a mechanical interruption of the circulation to the femoral head.

NONTRAUMATIC CONDITIONS

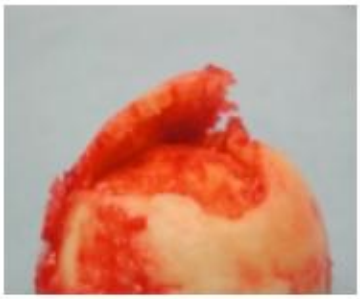
- **corticosteroid administration (** respiratory and rheumatoïd deseases, organ transplantation as well as Cushing disease) have a somewhat higher prevalence of osteonecrosis.
- **Excessive alcohol intake** has been identified as an etiologic factor.
- **many other pathologies** has been associated with Osteonecrosis : hemoglobinopathies, Dysbaric osteonecrosis, Gaucher desease, lupus, high-dose radiation, chemotherapy, hyperlipidemia...

PATHOPHYSIOLOGY

osteocyte death: The development of osteonecrosis is not due to one single precipitating event; it is a multifactorial process.
A unifying concept emphasizes the central role of vascular occlusion and ischemia leading to both marrow-cell and osteocyte death.
Vascular occlusion may occur through mechanical interruption from fractures or dislocations, intravascular occlusion from thrombi (Hypercoagulability) or lipid embols, or extravascular compression associated with intraosseous hypertension.

Associated factors may contribute to ONH :
- poor bone quality (osteoporosis or bone dystrophy)
- intraosseous lipid deposition and increase of lipidcell's volume in a rigid area leads to excessive compression and death of cells.

Cartilage stays alive for a long time even with necrotic bone underground as synovial liquid brings it nutritional elements. Then the cartilaginous matrix deteriorates and as the bone collapse, the cartilage cracks and detaches from subchondral bone layer giving the typical X-Ray image of " egg shell".



CLASSIFICATION AND STAGING

deep pain in the groin is the most common symptom. The findings on physical examination can be unremarkable; Radiographic studies are essential for a definitive diagnosis of the disease.
classification system of FICAT & ARLET is based on radiographic changes and the functional exploration of bone, which included intraosseous veinography and measurement of bone marrow pressure.

Stage I	Normal
Stage II	Sclerotic or cystic lesions
Stage III	Subchondral collapse
Stage IV	Osteoarthritis with decreased joint space with articular collapse

classification system of FICAT & ARLET

Steinberg et al. at the University of Pennsylvania included magnetic resonance imaging findings and the clear distinction into seven stages.

TREATMENTS

MEDICAL

It doesn't treat the desease. It is limited to analgesic tablets and non weight-baring with cruthes (this doesn't prevent compression by muscular tonus even in decubitus).

SURGICAL TREATMENT

Many operative treatments have been describe. The main operations performed nowdays are "core decompressions " and "arthroplasties.

1) CORE DECOMPRESSION

The goal of a core decompression is to decompress the femoral head and thereby reduce the intraosseous pressure in the femoral head, restore normal vascular flow.

First initiated by FICAT it consists in drilling a small canal through the femoral neck up to the top of the femoral head, inside the necrotic zone under fluoroscopic guidance in two planes..
It is a safe procedure..

2) CORE DECOMPRESSION + AUTOLOGOUS BONE GRAFTS

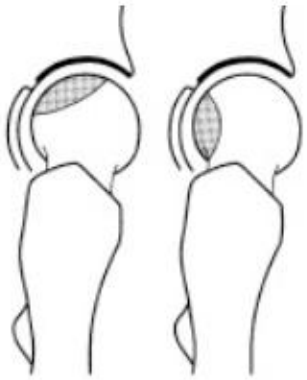
This technique may be completed with insertion of nonvascularized grafts to use it as a scaffold for cells and bone regrowth .

3) CORE DECOMPRESSION + AUTOLOGOUS BONE MARROW

core decompression is combined with autologous blood marrow to bring concentration of cells and growth factors that can enhance either the patient's osteogenic potential (bone morphogenetic protein) or the patient's angiogenic potential (fibroblast growth factor or vascular endothelial growth factor).

4) OSTEOTOMIES

Osteotomies are used to move the segment of necrotic bone away from the weight-bearing region. There are two general types of osteotomies: angular intertrochanteric (varus and valgus) and rotational transtrochanteric . they can be difficult to perform and they have a high potential for morbidity, including nonunion. Total hip replacements performed after an osteotomy are often technically more difficult than those done in patients with osteonecrosis of the femoral head who have never had an osteotomy because of deformities of the bone.
The angular osteotomies usually had the best results in young active patients who were not taking corticosteroids, had unilateral involvement with a good preoperative range of hip motion, and had a small lesion without femoral head



rotation of femoral head
BEFORE AFTER

X-Ray after osteotomy

5) ARTHROPLASTIES

femoral head resurfacing

Limited femoral resurfacing or hemiresurfacing arthroplasty is a viable option in young patients lesion with a femoral head necrosis without acetabular involvement.

Widely performed in the 70's (WAGNER, LUCK cup, etc), this procedure fell out of favor as a result of the advances in THA that increased longevity and durability and because of bad midterm and long term results.

pain relief following a femoral head resurfacing procedure is not as consistent as that following a THA and that patients will be reoperated with a total hip arthroplasty either for cup problem or for acetabular articular cartilage wear and pain.

Total Hip Arthroplasty

THA provides excellent pain relief and functional improvement;
Except for young patients with early-stage osteonecrosis, others may benefit of this reasonable treatment option.

CONCLUSION

A complete investigation is necessary to evaluate the etiology and stage of ONH. The ultimate goal of treating osteonecrosis of the hip is preservation of the femoral head as long as possible in young patients, and to propose arthroplasties to patients with advanced stage