HIGH VALGUS TIBIAL OSTÉOTOMY (HTVO)

INDICATION
The body weight applies on the knee through the femoro-tibial mechanical axis of the limb; it passes across the center of the knee. In case of VARUS deformation, the mechanical axis is deviated medially increasing load compression forces on the medial compartment of the knee, and thus a cartilage lesion leading to medial arthrosis.

HTVO consists in realignement of the varus osteoarthritic knee to better distribute forces.
HTVO is indicated on the patient who is 40 to 60 years of age, who still is active, who does not have sensitive joint, who has knee pain, and who clearly is too young and active for either uni or total knee arthroplasty.

HTVO may also be an effective method as a common adjunct to articular cartilage regeneration, meniscal transplantation and chronic ligament insufficiency.

SURGICAL TECHNIQUE

High tibial valgus osteotomy realign the varus knee to better distribute forces; There are two major techniques:

- **Closing wedge osteotomy** that has been the standard procedure for more than 30 years. This needs removal of a lateral wedge of the tibia associated to a peroneal osteotomy.

- **Opening wedge osteotomy** in recent years with the development of strong fixation plates. There is only a bonecut that allow to open the tibia like a book; the gap is then filled with autologous (iliac crest) or allograft or synthetic (Hydroxyapatite) blocks. This technique preserves the proximal tibial anatomy and bone stock allowing easy conversion to total knee arthroplasty, is more precise in correcting the mechanical axis, and avoids lesion of the proximal tibia-fibular joint and peroneal nerve.

HTVO technique of opening wedge:

Patient is positioned supine, and the involved limb and ipsilateral iliac crest are prepared and draped. The procedure carried out under tourniquet. Concurrent arthroscopy is performed as necessary to evaluate the menisci and the status of the articular cartilage.

A vertical incision is made over the pes anserinus insertion halfway between the medial
border of the patellar ligament and the posterior margin of the tibia. The sartorial fascia is incised exposing the hamstring. Under fluoroscopic control, a guide wire is drilled across the proximal tibia from medial to lateral. The guide is positioned at the level of the superior aspect of the tibial tubercle and oriented obliquely to end approximately 1 cm below the joint line at the lateral tibial cortex. The osteotomy is then performed with an oscillating saw below the guide pin to prevent superior migration and an intra-articular fracture. The osteotomy is deepened with flexible and rigid ostotomies under fluoroscopic guidance. Once the osteotomy has been nearly completed, the medial opening is created progressively using 2 screwed ostotomies. An alignment guide is used to ensure that the weight-bearing axis is passing through the converted point (62.5% from medial to lateral).

The plate is fixed proximally with 6.5-mm cancellous screws and distally with 4.5-mm cortical screws. Either iliac crest or allogenic bone grafting or synthetic bloc is inserted through the opening wedge to prevent delayed or nonunion and fixation failure.

The ideal amount of correction remains a matter of controversy. Overcorrection is recommended by almost all surgeons; valgus correction of \( \geq 8^\circ \) for proximal tibial osteotomy is recommended.
CHECK-UP BEFORE SURGERY

In order to detect vital risk for anesthesiology, and to assess a potential risk of post-operative complication in a short or long term follow-up, a medical questionnaire checking list is needed before the operation, to be planed by the surgeon and his team.

- Risk factors influencing complications are:

  **Factors increasing risk of infection**
  - Obesity: is associated with a higher risk of infection. Individuals with a body-mass index (BMI) >35 had a 2.1 times greater risk of infection compared with those with a lower BMI
  - Patients with osteonecrosis and rheumatoid arthritis had a 2.2 times greater risk of infection compared with those with osteoarthritis.
  - Diabetes
  - Previous infection of the joint
  - Arthritis
  - Tooth infection: a visit to dentist & panoramic dental X-Ray, and treatment of dental problems are necessary to eliminate a potential risk of infection.

- **Factors increasing risks for medical complications**
  - American Society of Anesthesiology (ASA) scores > 3 is at risk.
  - Previous algo neuro dystrophy may be a recurrent risk.
  - Previous deep vein thrombosis is a predisposing factor to recurrent episode

POSTOPERATIVE CONSIDERATIONS

You will stay 2 to 5 days in the surgical department of orthopaedics.

Internal fixation allows the patient to start immediately rehabilitation exercises and permits a rapid recovery of ROM. Internal fixation is secure enough to avoid any type of bracing.

The knee is mobilised the day after operation, under physiotherapist supervision. Straight leg raising exercises and passive/active mobilisation are encouraged, and the splint is removed at day 2 when active extension of the leg is obtained. Weight bearing is forbidden during the first 3 weeks, and then authorized under control after X-Ray showing bone healing starting. You will be able to walk without crutches at the end of the 3rd month.

RESULTATS ET COMPLICATIONS

RESULTS

Overcorrection to 3° to 10° of varus produces the best success rates at 10 years following the osteotomy, but these results tend to deteriorate overtime. Progressive osteoarthritis seems to be the reason for the deterioration of functional outcomes.

Factors associated with an increasing risk of revision of the osteotomy are:
- An older age at the time of the surgery
- Obesity (more than 1.32 times the ideal weight)
- Less constitutional preoperative tibial varus (<5°)
- Advanced femorotibial osteoarthritis of the medial compartment with >50% reduction in the joint space
- Severe limitation of motion before surgery
COMPLICATIONS

Even with a carefully act performed by perfectly trained team, any complications may happen the same as in every surgical act. These are exceptional; the list below is not exhaustive.

- **Infection** is one of the most dreaded complications. The efficacy of prophylactic measures and risk factors play an important role.
  - **Prophylactic measures:** laminar flow, body suits, drains, surgical time (length), the use of preoperative antibiotics.
  - **Detection and treatment of risk factors:** obesity, diabetes, prep treatment of dental or urinary infection.

- **Skin necrosis** should well controlled with adapted local healthcare. Its prevention is realised with a central skin incision. If not controlled, the risk is to transmit an infection to the prosthetic joint. A reoperation is necessary.

- **Neuro-algodystrophy**: rare (1 to 3%) but impossible to plan (except in case of previous episode) and difficult to treat.

- **un syndrome des loges**: may happen in closed wedge osteotomy technique as the muscle and lateral aponeurosis of the leg are opened.

- **Delay or non union**: rare in this metaphyseal bone area. It may break the plate and needs an other operation.

- **Tibial plateau fracture** when opening the osteotomy. It may delay the bone healing.

- **Partial palsy in case of traumatism of the motor branch of the extensor hallucis longus during lateral approach in closing HTVO.

- **Femoro-cutaneous nerve palsy** when harvesting graft on iliac crest.

- **Pain at iliac crest harvesting zone**

- **Hematoma at iliac crest harvesting zone**

- **Pain on osteosynthesis material some months later**: removal is possible at 6 months.

- **Phlebitis**: preventive measure (early mobilisation, anti-thrombotic socks, low weight Molecular Heparin anti-embolic prophylaxis for 6 weeks) and systematic echodoppler control at 7th day allow the risk to be minimize; in case it happens, an anticoagulation treatment is started and rehabilitation is slowed.

**LONG TERM FOLLOW-UP**

Long term results of HTVO in terms of knee function, radiographic alignment, and progression of osteoarthritis are show generally excellent and good results in 97% of the cases after 2 years, in 85% after 5 years, and only in 60% after 8-10 years.

In order to prevent this deterioration in time it is recommended not overweight to avoid coming of arthrosis disease in lateral compartment, and to delay the Total Knee Arthroplasty indication.