Open Wegde Tibial Osteotomy: New Approach and Advantages of the Technique

Mehdi Abakka *, Yahya Baidriss, Hamza El Ouagari, Jalal Mekkaoui, Monsef Bouffetal, Rida-Allah Bassir , Mohamed Kharmaze, Moulay Omar Lamrani , Mohamed Saleh Berrada
Department of Orthopedic and Traumatological Surgery, Ibn Sina Hospital, Rabat, Morocco

Abstract:
The tibial valgus osteotomy is a so-called conservative" surgical technique used in the treatment of knee osteoarthritis in the early stages of evolution, as opposed to non-conservative techniques such as knee prostheses. Internal knee osteoarthritis is promoted by an anomaly of the axis of the lower limb (genu varum). When there is an axis defect, the stresses are poorly distributed and the weight of the body is applied more on the internal side, accelerating the wear of the cartilage. When this is not too significant, we can propose to slow down its evolution by modifying the axis of the knee by an osteotomy. This is the tibial valgus osteotomy. This osteotomy can be performed in 2 different ways either by “opening” the internal part of the tibia (it is the tibial varus osteotomy by internal addition) or by “closing” its external part (external subtraction osteotomy). The choice of one or the other of these 2 operating techniques is up to each surgeon.

Keywords: osteotomy, tibial, arthrosis, open, wedge

Introduction
Medial femorotibial osteoarthritis, and at a lower frequency osteonecrosis of the internal condyle, are pathologies for which tibial valgus osteotomy is the reference conservative intervention, performed regularly in France in patients under 60 years (Bonnevialle et al., 2002; Lavalle et al., 2004; Puddu et al., 2007). Recent publications mainly of original Anglo-Saxon recommend for these same pathologies, the arthroplasty, in particular unicompartamental arthroplasty, emphasizing the rapidity of the postoperative course, the good quality recovery, and on a survival curve that allows to offer them, even to patients under the age of 60 (Goutallier, Julieron & Hernigou, 1992; Hernigou, Ovadia, & Goutallier, 1992; Brouwer et al., 2006).

The place of the osteotomy was perfectly defined by Daniel Goutallier et al. (1986): “the treatment of internal femorotibial osteoarthritis by a tibial valgus osteotomy is based on a mechanical concept. But this concept does not justify that if the osteotomy does not lead to long-term deterioration of the external femorotibial compartment, improves or at least stabilizes internal osteoarthritis and finally opposes the recurrence of the deformation”.

This work is licensed under a Creative Commons Attribution 4.0 International License. The license permits unrestricted use, distribution, and reproduction in any medium, on the condition that users give exact credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if they made any changes.
Preparation of the Intervention

The diagnosis of internal osteoarthritis is confirmed by clinical examination and x-rays (Koshino, Murase & Saito, 2003). The X-ray found osteoarthritis of the internal compartment and quantified its stage of severity. It is used to calculate the axis of the limb in order to assess the importance of the correction to be made. An MRI can complete the assessment.

We perform osteotomies with tailor-made cutting guides specifically created in 3-dimensional printing to correct your deformation, for this we will prescribe a scanner equipped with a specific image acquisition protocol to be carried out before the intervention.

The risk of a post-operative infection occurring is exceptional but never zero, it increases in the event of immunosuppression (diabetes, overweight, smoking, liver failure, blood disease, etc.). In order not to increase this risk, certain precautions must be taken, both by you and by the surgical team.

Smoking cessation must be complete and effective 1 month before the intervention and, if not definitively acquired, extended at least 6 months after the intervention.

In the event of symptoms of an active infection, you must inform your surgeon and your doctors so that appropriate antibiotic therapy may be prescribed and the intervention may be postponed. If you are diabetic, the glycated hemoglobin should be close to normal, it is a good marker of the balance of your diabetes (your general practitioner and the diabetologist are the best guarantors of your follow-up).
The day before and the morning of the procedure, you must take a shower with a product based on surgical soap or disinfectant (betadine/hibiscrub). Eventually, the surgical site will be depilated with a depilatory cream or a clipper (shaving is not recommended). You must avoid any wounds or skin excoriations next to the knee to be operated on.

**Surgical Act**

The operation is performed under general, spinal or loco-regional anesthesia.

In the case of internal addition osteotomy, the scar is vertical on the inside of the leg below the knee (Miller et al., 2005). After surgical dissection, we place the tailor-made cutting guide specifically created in 3-dimensional printing on your tibia to correct your deformity, then the osteotomy is performed with a saw with an oblique cut line in the tibia (Noyes et al., 2006). Depending on the importance of the axis correction to be corrected, a bone substitute or a bone graft can be inserted at the internal part of the tibial opening then the tibia is fixed by a screwed plate. If it is a bone autograft, the bone is taken from the pelvis on the iliac crest. This removal requires the creation of a scar on the pelvis, generally on the same side as the osteotomy (Spahn, Kirschbaum & Kahl, 2006).

At the time of the intervention, the anesthesiologist will administer a so-called “prophylactic” antibiotic therapy. Do not forget at the time of the visit to the anesthesiologist to inform him of your possible allergies to antibiotics and of any other types of allergy.

---

**Figure 5. Incision Situation on the Knee**

**Figure 6. Cement Added to Fill the Void**

**Figure 7. Osteosynthesis Plate Placed in the Tibia**
cutting guide specifically created in 3-dimensional printing to correct your deformation. The tibial osteotomy is then performed with a saw with a horizontal or oblique cut line. A bone wedge is removed from the external part of the tibia then the tibia is fixed by a screw plate or staples (Bové, 2002; Esenkaya & Elmali, 2006). There is no bone graft taken for this procedure, however this technique of osteotomy by external closure requires the concomitant performance of a fibula osteotomy which is performed during the same operation before having corrected the tibial deformity (Hoell, 2005).

**Post-Operative Follow-Up**

To avoid a hematoma, a drain will be left in place in the scar. After the operation, your surgeon will authorize your discharge from the hospital with the necessary care orders (dressing, analgesics, anticoagulants, physiotherapy) and a work stoppage. A certified nurse must apply sterile dressings.

The knee can be immobilized or not in a splint for the duration of bone consolidation, at the surgeon's choice. Getting up is authorized the same day of the intervention or the next day. Your surgeon, depending on the type of osteotomy and its strength, will decide the amount of support allowed during walking. The resumption of full support is often delayed by 2 months.
Rehabilitation begins the same day of the intervention or the next day and aims to maintain your joint amplitudes and your muscular trophicity. Anticoagulant treatment will be prescribed for 6 weeks. The consolidation of the osteotomy will be monitored in consultation.

Driving is possible as soon as full support is resumed. The resumption of sports will generally be possible after 6 months.

![Figure 12. Physiological presentation of the applied knee forces](image)

**Complications**

There are specific but rare or even exceptional complications such as knee stiffness due to rehabilitation default.

A fracture of the bone hinge during the opening maneuver of the osteotomy which may require the additional placement of a bone staple or a small osteosynthesis plate (Kessler, Jacob & Romero, 2002).

Deep infection is a very rare complication. It may require a new intervention and the prescription of prolonged antibiotic treatment.

Smoking is prohibited, as it significantly increases the rate of infection or skin complications. Its cessation must be obtained one month before the operation and, if not definitive, at least extended for six months following the operation. Failure to consolidate the osteotomy beyond 6 months (non-union) (non-monitored smoking cessation, infection, etc.) may require a new operation.

In the event of a bone graft taken from the pelvis, pain or hematoma may occur postoperatively but resolve well with medical treatment. In case of osteotomy by external subtraction, there is a risk of lesion of the common fibular nerve and its branches of divisions.

A neuro-musculo-vascular compartment syndrome is also exceptional but serious and must be diagnosed and treated surgically in an emergency at the risk of permanent sequelae paralysis.

There are non-specific complications such as deep vein thrombosis called phlebitis, hematoma that exceptionally requires surgical puncture or drainage, algodystrophy, etc.

There are risks associated with anesthesia, which were notified to you by your surgeon but re-explained precisely during the anesthesia consultation prior to the operation.

**Conclusion**

Tibial valgus osteotomy is a surgical procedure performed in the treatment of monocompartmental medial osteoarthritis of the knee at the beginning or moderately advanced stage. Recovery after surgery requires several weeks (consolidation of the osteotomy). The resumption of sports must be gradual and carried out under medical supervision, respecting the deadlines given by your surgeon.

**References**


