



PATIENT INFORMATION FILE

“MECHANICAL” METATARSALGIA

Your surgeon has suggested that you undergo surgery for your foot-and-ankle problem.

The main lines of this treatment have been explained to you: the alternatives, how the operation will be conducted, the postoperative course, the expected results and also the possible complications. The present file is a supplementary document that your surgeon would like you to have, setting out the key issues concerning your particular pathology and enabling you to check over the important points about the future operation.

Your surgeon will be available to see you before the actual operation, to answer any further questions you may have.

File drawn up by the medico-legal commission of the French Foot and Ankle Surgery Association (AFCP)

This file is also available on-line at:

AFCP (<https://www.afcp.com.fr/infos-publiques/infos-patients/>)

SOFcot (<http://www.sofcot.fr/Infos-public-Patients>)

ORTHORISQ (<http://www.orthorisq.fr>)

Translation by Pr Mc Gill (Lyon University)

"Metatarsalgia" refers to all kinds of mechanical pain experienced under the forefoot at the metatarsals (the long forefoot bones, which form joints with the toe phalanges).

The causes of such pain vary greatly, and sometimes do not originate in the forefoot at all but, for example, in the ankle. Metatarsalgia may be isolated or associated with other pathologies of the forefoot, such as hallux valgus or claw-toe, or of the hindfoot and ankle, such as bone deformity, tendon retraction, pes cavus (high instep), etc..

ANATOMY

The forefoot skeleton includes 5 long parallel bones, the metatarsals, prolonged by phalanges, comprising the skeleton of the toes.

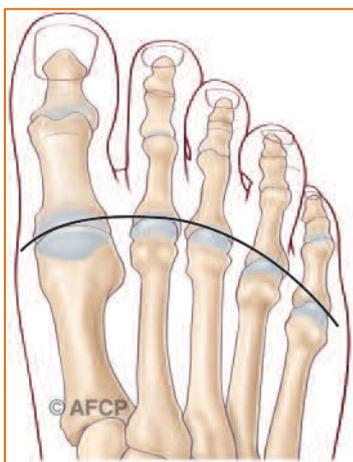
The metatarsals articulate with the back and neck of the foot, in relatively non-mobile joints.

Forward, they articulate with the toes, via the "metatarsophalangeal" joints, which in contrast are highly mobile.

The metatarsophalangeal joints are essential to walking:

- Joint sliding is made easy and painless by the cartilage covering the bone extremities.
- Stability is ensured by the fibrous "joint capsule". On either side, the capsule thickens toward the collateral ligaments, and on the plantar side is thickened by a fibrocartilage structure called the plantar plate, which increases pressure resistance in weight-bearing, and on which the metatarsal head is supported.
- Motion is governed by tendons which prolong the lower-leg muscles and attach to the various bone segments; the big toe has a special plantar tendon system, in which the "sesamoid" bones articulating with the plantar side of the first metatarsal head.
- Sensitivity depends on the sensory nerves, branching from the main nerves of the lower leg.

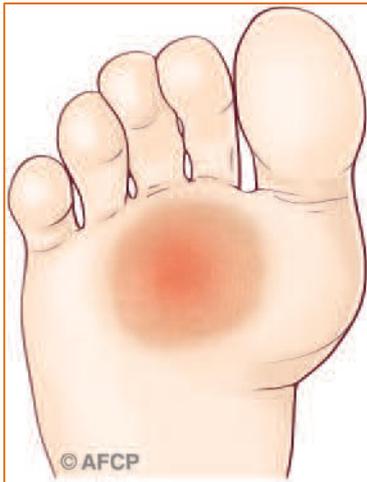
Normal metatarsal lengths are by no means arbitrary, successively decreasing from the 1st to the 5th toe in an arithmetic progression: i.e., the length of each is determined by the lengths of its neighbors. The angle they make with the ground likewise decreases from the 1st to the 5th toe, so that the plantar arch is higher inside the midfoot. This harmony between the axes, lengths and angles of the 5 metatarsals ensures harmonious distribution of force and stress in the whole forefoot.



This functional anatomy of the metatarsals and joints ensures good walking behavior in the propulsion phase, and equally ensures balance and posture. The function of the metatarsal bones and metatarsophalangeal joints is to transmit the forces coming from the ankle and hindfoot to the toes; this also involves elastic systems comprising the lower-leg muscles, a powerful membrane in the sole (the plantar fascia), and extensor and flexor tendons that move the toes.

THE PATHOLOGY (the problem)

Metatarsalgia results from excessive mechanical stress under the forefoot and metatarsal heads. Clinically, it manifests in the form of pain and corns, which are the skin's response to this excessive mechanical stress.



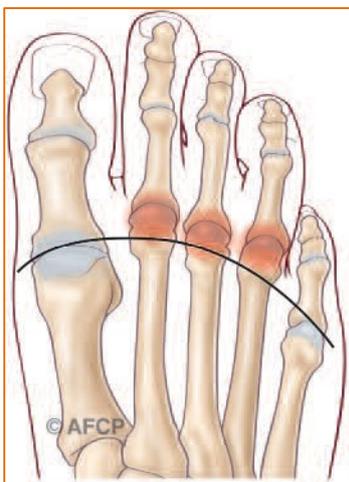
The pain may be diffuse, as in "round anterior foot", with extensive plantar callosity, or localized under a single joint, with just one little adjacent corn.

This excessive mechanical stress in the metatarsophalangeal joints deteriorates the forefoot plantar structures. This is especially the case for the 2nd metatarsal, which is often the longest. There is progressive distension leading to rupture of the plantar plate. Joint stability is no longer ensured, and the joints dislocate under the traction exerted by the tendons. The toe undergoes claw deformation, with subluxation then dislocation of the base of the phalanx with respect to the metatarsal head. The lesions may be supple at first, but become fixed; the callosities and corns thicken, and toe deformity soon makes footwear impossible.

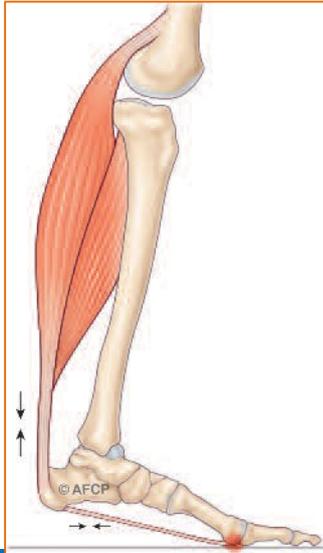
Under the big toe, the sesamoid bones (which play the same role as the patella in the knee) may show progressive degenerative lesions such as fracture, necrosis, etc.

As well as metatarsophalangeal joint lesions, lesions are found in the metatarsal bone segments, usually in the form of fatigue or stress fracture.

Metatarsalgia has many causes, but corresponds to failure in an anatomic structure transmitting mechanical stress from the lower leg to the toes and ground. This may be due to a local problem at the actual site of the pain (e.g., hallux valgus) or a remote problem (e.g., ankle stiffness, pes cavus, etc.). It is possible to give some examples, but nothing exhaustive can be said, as the underlying factors are so numerous.



- **The origin may, for example, be local.** This is the case when there is an underlying problem of metatarsal length or verticalization. This may be an acquired condition, due to metatarsal head necrosis, for example. The second metatarsal alone may be affected, if hallux valgus prevents the big toe from contributing to weight-bearing or if the big toe is too short; this is known as "2nd ray syndrome". The 1st metatarsal may also be affected, with damage to the sesamoid bones, which fragment and become necrotic (pes cavus...).



-Or the origin may be at a distance from the site of experienced pain.

This is the case in lower-leg or ankle bone and joint involvement: joint stiffness, equinus (i.e., ankle fixed in a downward position), or malalignment or congenital abnormality of the foot (pes cavus, etc.).

There may also be abnormalities of the tendons and muscles (retraction of the Achilles tendon or gastrocnemius muscles) or defective neural command (neuro-musculo-tendinous abnormality).

Other possibilities include sequelae of trauma, surgery, infection, neurologic conditions or rheumatoid arthritis or any congenital abnormality affecting the various bone and soft tissue organs transmitting mechanical stress to the ground.

CLINICAL PRESENTATION

Metatarsalgia presents as pain under the forefoot, in the plantar parts. The pain occurs with weight-bearing on standing, walking or jumping, at work, or in hard-soled shoes. The pain may be felt within or on top of the foot (fatigue fracture). It often restricts physical and sports activity, and may radiate up toward the ankle or lower leg, and usually disappears at rest and during the night.

Examination of plantar weight-bearing looks out for signs in the skin (callosities and corns) typical of mechanical overload, and seeks to rule out other types of forefoot pain, notably of neurologic origin, such as Morton's neuroma. The metatarsophalangeal joints are examined carefully to screen for plantar plate lesions.

Clinical examination is not restricted just to the forefoot: static and dynamic gait analysis assesses causal factors in the whole lower leg – bones, joints, muscles and tendons.

DIAGNOSIS

There are often 2 steps in diagnosis: confirming metatarsalgia, and then seeking its causes.

Several types of complementary examination may be called for. We begin with standard X-rays of the foot and ankle, looking for congenital abnormalities and problems of length, verticalization, joint dislocation, etc. This may be supplemented by CT, ultrasound or MRI scan to confirm lesions of the joints, tendons and plantar plates. If need be, a bone scan or electromyogram may be prescribed. In collaboration with a podiatrist, baropodometry on a force platform, to study gait, can be useful.

MEDICAL TREATMENTS

> THE PRINCIPLES OF MEDICAL TREATMENT

First-line treatment is medical, addressing causal factors. It seeks to limit pain on weight-bearing and correct the underlying causes.

We begin with footwear: wider and more supple shoes, with shock-absorption, and lower heels.

Insoles, produced by your chiropodist-podiatrist, give a better pressure distribution, and relieve pain. They can sometimes correct abnormal stance (pes cavus, weight-bearing abnormality, etc.). Chiropody treatment can temporarily remove painful callosities and corns.



It is essential to maintain foot joint suppleness by means of physiotherapy and daily self-rehabilitation stretching exercises, especially in tendon retraction (e.g., gastrocnemius retraction).

In some cases, injections may be prescribed.

In other cases, such as fatigue fracture, immobilization or non-weight-bearing may be necessary.

Medical follow-up is important for other general and chronic pathologies, such as diabetes, that may underlie metatarsalgia and its complications.

> RISKS AND COMPLICATIONS WITHOUT TREATMENT

Uncontrolled progression of metatarsalgia can lead to serious disability and loss of autonomy.

Pain increases, joint deformities become fixed, and callosities and corns thicken. Footwear becomes less and less tolerable.

Severe local complications can also develop, such as infected corns and fatigue fractures, and may require heavy surgery.

SURGICAL TREATMENT

> THE PRINCIPLES OF SURGICAL TREATMENT

Surgery is only required when pain persists despite medical treatment or if serious disability and/or complications develop.

The surgical treatment obviously relates to the underlying cause or causes.

Two types of surgery may be implemented; these are not "rivals", but depend on your deformity and on your surgeon's habits; they may even be associated in a single operation.

- **Conventional** or "open" surgery uses an incision a few centimeters long to operate on the tendons, bones or joints, under visual control.

- **Percutaneous** surgery uses incisions just a few millimeters long to operate on the tendons, bones or joints, using specific instruments, usually under radiological control.

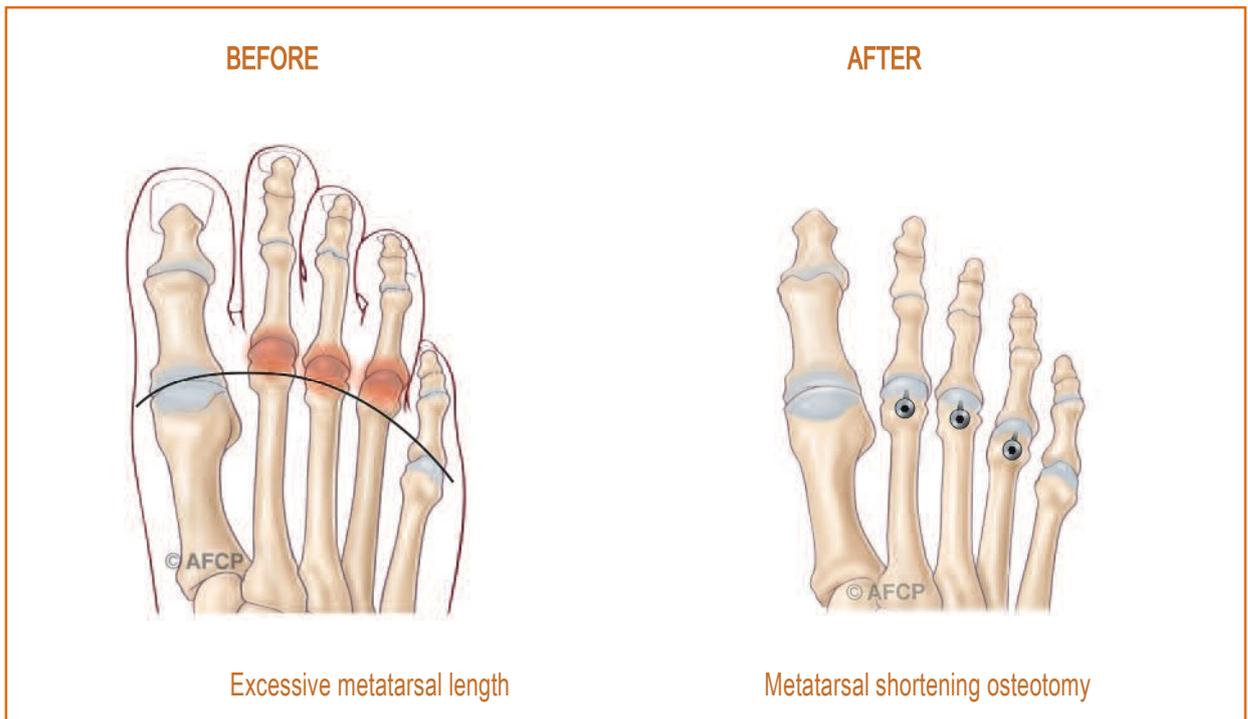
Both techniques include various procedures that may be isolated or associated, to treat the osteoarticular lesions involved in metatarsalgia and also the underlying causes.

For example:

- **Bone surgery** uses bone cuts (osteotomies) to correct metatarsal length or slope and restore harmonious weight-bearing.

This consists in reducing the excessive length of one or more metatarsals causing hyper-pressure metatarsalgia, by

distal shortening osteotomy: Weil osteotomy or percutaneous "distal metatarsal minimally invasive osteotomy" (DMMO). Metatarsal slope with respect to the ground can also be corrected by proximal osteotomy: e.g., Barouk-Rippstein-Toullec (BRT) osteotomy.



This bone surgery may require fixation material: screws, plates, pins, staples, metal or synthetic wires, in various absorbable materials or steel, titanium, carbon, etc.

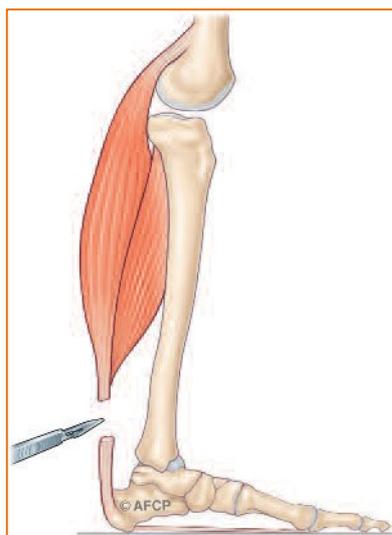
- Joint surgery:

Damaged or destroyed joints may require treatment. This may consist in "conservative" surgery to release the joint (arthrolysis) in subluxation. Conservative procedures can also apply to the capsule structures, with plantar plate suture and repair.

When the joint is too badly damaged, it can be blocked or resected, or a joint prosthesis (metal, plastic or polymer implant) may be used to replace it.

- Tendon and muscle procedures:

Lengthening, sectioning or tendon transfer procedures can be performed to correct toe deformities.



Surgery can also target the causes of metatarsalgia. For example, in case of calf muscle or tendon (gastrocnemius) retraction impairing dorsiflexion, these muscle groups can be lengthened to improve dorsiflexion, thereby reducing forefoot stress.

Surgery will usually combine bone, joint and/or tendon procedures, treating all of the structures involved in the metatarsalgia.

HOSPITAL ADMISSION

You will usually be admitted on an outpatient basis, for a single day. Depending on the scale of the operation, associated procedures and your individual characteristics (age, associated pathologies, heavy preoperative treatments already underway or



prescribed, excessive home-to-hospital distance, social isolation), you may also be admitted for a few days.

> ANESTHESIA

It is essential to have a preoperative consultation with an anesthetist. This doctor will explain to you the different possible types of anesthesia, adapted to the surgery you are to undergo and to your general health status.

During this consultation, the anesthetist will also check any medical treatments you are taking. New medications may be prescribed, before and/or after the operation; the most common are anticoagulants, antibiotics and/or anti-inflammatory drugs – and of course each has its own specific risks.

For the surgical operation, anesthesia may be “**locoregional**” (anesthetizing a segment of the leg from the tibia down to the toes), “**spinal**” (anesthetizing the pelvis and legs with an injection between two vertebrae), or “**general**”.

Blood transfusions are rarely needed in this kind of surgery, which does not involve any heavy bleeding.

> IN THE OPERATING ROOM

You will usually be positioned lying on your back, sometimes leaning slightly sideward to make the operative site more easily accessible. Sometimes, and especially for gastrocnemius lengthening, you may be positioned face down. Positioning may also be changed, for associated procedures. **When you come to the operating room, don't be too surprised if you are asked more than once (on arrival, then again when you are being positioned) for your name and which foot is to be operated on: this is the mandatory procedure for all patients, known as the “security check-list” and required by the French Health Authority.**

A tourniquet may be used, to temporarily interrupt blood flow into the area to be operated on. It may be applied on the thigh, the lower leg or the ankle, depending on the area to be operated on.

Radiology equipment is frequently used in the operating room, especially for percutaneous surgery.

> **SURGERY TIME** depends on the procedure or procedures, and ranges from 15 minutes to a few hours.

> **THE INCISIONS** depend on the procedure and technique, and range from a few millimeters to 10 cm (4 inches) or more. The number and locations of the incisions vary greatly: knee, lower leg, ankle and/or foot. Your surgeon will detail them for you, according to the surgery program to be implemented.

AFTER THE OPERATION

> RETURN TO WEIGHT-BEARING

- After surgery limited to the forefoot, weight-bearing is usually authorized immediately. It may, however, be postponed, depending on your operation and the surgeon's findings. Weight-bearing is helped by specific postoperative footwear.

Crutches can be useful during the first days, especially for more fragile and less autonomous patients.

- In case of surgery involving the hindfoot, ankle or lower leg, weight-bearing is usually postponed for a few weeks; you can nevertheless get about, using crutches or a frame.



> **POSTOPERATIVE EDEMA** (swelling of the foot and toes) is normal after foot surgery, and does not count as a complication. It is essential for it to be treated, not just to relieve pain but also to improve scar healing: a certain rest period, with the foot raised and wearing compression socks or stockings may be useful. The edema can last a long time (weeks or months), with no lasting harm, although you may need to adapt your footwear in the meantime.

> LOCAL CARE AT HOME

Dressing is meticulously performed during the operation, according to your surgeon's habits, and usually should not be changed later. In After percutaneous surgery, dressings are usually changed by the surgeon or team. However, if there is care to be performed at home, it is important to ensure that the scar remains hygienically clean so long as the sutures are still there and the wound is not fully healed. Clean hands are essential, and you must never touch the scar without first washing your hands. Make sure that there is somewhere at your home for the nurse to wash her hands, or a hydroalcoholic cleanser.

> IMMOBILIZATION

After purely forefoot surgery, strict immobilization is not usually necessary; in larger-scale ankle and lower leg procedures, however, a plaster cast or removable plastic boot may be fitted.

> MEDICAL TREATMENTS

- **Anticoagulation therapy** is sometimes prescribed, to limit the risk of blot clots in the veins (phlebitis); this depends on the scale of the operation and your personal autonomy and individual risk factors.
- **Postoperative pain** is variable, according to the scale of the operation: bone and soft-tissue surgery on all 5 toes is going to be heavier than a simple tendon procedure on a single toe. Even so, although strong pain-killers may be prescribed at first, you can as a rule return home with just simple analgesics.

WHAT YOU CAN EXPECT FROM THE OPERATION

Restoring the anatomy of your foot and ankle aims to enable pain-free walking in footwear. Obviously, some advanced lesions may not be able to be fully corrected, and some limited pain may persist.

POSTOPERATIVE CONSULTATIONS AND FOLLOW-UP

Your surgeon will carry out regular clinical, radiological and biological check-ups, and enter the results in your medical file.

The data in your file (rendered anonymous) may be used in medical studies or scientific communications or publications by your surgeon, in line with the French "Jardé" law of March 2012 (Decree 2016-1537). If so, your surgeon will ask for your specific consent, and this will be recorded in your file.

The first postoperative consultations are to check on scar healing and conditions around the surgical site. The later consultations are to check progress and functional recovery.

Osteotomies and arthrodeses require several months' radiological follow-up to monitor consolidation and guide the end of any immobilization and return to weight-bearing. Joint prostheses require careful monitoring, as these implants can have limited lifespans due to wear or bone fragility.

Follow-up usually lasts 3 months, the time for the bone to heal and for you to be able to use normal footwear.

THE RISKS

No surgery is ever without risk. Whatever the precautions, "zero risk" does not exist. When you decide to be operated on, you need to be aware of this, and to weigh the risks against the expected benefit: this is known as the "risk/benefit"



ratio".

However skilled your surgeon and the team, there is always, unfortunately, a risk of failure with any treatment. Failure here may mean recurrence of symptoms or even worsening, or other more severe risks. These risks may just be a matter of bad luck, but they can also be aggravated by your particular health issues, whether known to you or not, and whether local or general. It would not be possible to detail here every conceivable complication, but we have listed below the most frequent or the most serious risks that may arise with your pathology.

> CHRONIC PAIN AND COMPLEX REGIONAL PAIN SYNDROME

In any medical or surgical treatment for pain, some pain may unpredictably persist and other pains may worsen. These chronic, long-term phenomena may constitute a "complex regional pain syndrome" that may progress for several months, sometimes with trophic or joint sequelae.

> INFECTION

Despite all precautions in terms of disinfection and skin preparation, any surgical incision incurs a risk of microbial contamination leading to infection, early on or much later. Antibiotics are often needed, or surgical revision, with risk of pain or functional impact. Factors such as diabetes, smoking or immunodepressant treatments (corticosteroids, etc.) may increase the risk of infection.

> SCAR HEALING DISORDER

Despite all the care your surgeon takes to look after the surgical wound and all nursing care, there can be problems of scar healing, sometimes induced by general or local pathologies such as diabetes or circulation disorder. Wound healing may thus be delayed or defective, leaving a blemish or unhealed scar or skin necrosis. These scar issues can also lead to infection.

> MATERIAL DISASSEMBLY AND BREAKAGE

Your operation involves moving bone segments, which may require surgical material such as plates, screws, pins or wires. Like any material, these implants can incur complications, due to their fragility (breakage) or displacement under mechanical stress on the structures onto which they are implanted, which can lead to loss of correction.

This surgical material may thus require revision in case of displacement or complications.

Finally, well after the operation and the immediate postoperative period, when your pathology has been resolved, the material can sometimes be removed in a scheduled operation, depending on its location and whether it is causing local discomfort or impingement.

> THROMBOEMBOLIC COMPLICATIONS

Any surgery, and especially in the legs, can lead to a blood clot blocking the veins and causing phlebitis. The clot can even get into the circulation system of the lungs and cause an embolism that may have very serious or even fatal consequences.

Anticoagulants have their own risks, of hemorrhage and allergy, and are not prescribed automatically but rather on a case-by-case basis.

> MEDICATION COMPLICATIONS

Following surgery, you may be prescribed certain specific medications: most often, anticoagulants, antibiotics, painkillers, or anti-inflammatory drugs. These obviously all come with their own risks, that can be serious and sometimes unpredictable.

> ADJACENT COMPLICATIONS

As the surgical site is close to bones, tendons, blood vessels and nerves, the operation may directly or indirectly impact these elements: hemorrhage, hematoma, paresis, paralysis, loss of sensitivity, restriction of motion, joint stiffness, etc. Given the position of the scar, injury to a small nerve can lead to loss of sensitivity or to persistent pain. In some cases, revision surgery may be necessary: to drain a hematoma, decompress a nerve, release a tendon...

> SMOKING (NICOTINE INTOXICATION)



Nicotine intoxication is a major risk factor in foot and ankle surgery, notably causing healing problems, infections and thromboembolic complications and hindering bone healing. **Complete cessation of smoking is recommended for 6 weeks before and 6 weeks after surgery. If need be, do not hesitate to consult your family doctor about this.**

> DELAYED OR FAILED BONE HEALING

Surgical treatment of your pathology is based on bone healing, which is a biological phenomenon. However, it may fail or be delayed: an arthrodesis (blocking the joint) or osteotomy (bone cut) may fail to consolidate, and surgical revision may then be necessary.

> STIFFNESS:

Any joint surgery can induce temporary or definitive stiffness. This may require physiotherapy or even re-operation.

> RECURRENCE:

Recurrence is always possible, even despite initially good correction. It may be due to some individual predisposing factor (e.g., constitutional hyperlaxity) or to some overall abnormality of the foot (e.g., flat foot).

> POSTPONEMENT OF SURGERY:

Finally, your operation may need to be postponed, for your own safety, in case of:

- an illness just before admission;
- recent change to your usual treatment;
- a wound or infection near the intended operative site;
- forgetting or failing to respect the instructions given to you by the surgeon and anesthetist;
- unexpected unavailability of the material and equipment needed for the operation, or unforeseen incident in the operating room liable to interrupt surgery, including after anesthesia.

Frequently asked questions

"Is it possible to operate on both feet at once?"

This can sometimes be possible, depending on your surgeon's habits, the technique employed and the type of anesthesia used to operate on both feet in the same step. Ask your surgeon, who can explain and advise on what is the reasonable thing to do in your situation.

"If both my feet are operated on, will the pain be worse and the sick leave longer?"

Regarding pain, the treatment is usually the same, adapted to the operation. The sick leave period is also usually the same, barring the unexpected (such as delayed bone healing).

On average, it takes about 3 months to be able to return to "normal" footwear.

"How am I going to manage at home? When will I be able to drive again?"

Depending on the operation, you may or may not be able to place your foot on the ground, with or without crutches. If you have had forefoot surgery, you will be able to walk, using one or two special shoes prescribed by your surgeon, to protect your foot during bone healing and scar healing.

If you have had hindfoot or lower-leg surgery, a walking boot or rigid plaster or resin boot cast may be needed and complete weight-bearing may not be authorized; in that cases, crutches are indispensable.

During the immobilization period, driving is not possible, and in fact dangerous. Your surgeon will explain how you can start driving again, depending on how you progress.



"What should I do if my foot or ankle becomes painful again or swells up (edema)?"

Edema is frequent, and usually not pathological.

In a few cases, if it is accompanied by severe pain, it may be the sign of some problem with healing or with the bone (such as material displacement).

"What should I do in case of fever or a problem with the scar?"

If you develop fever, this might be a sign of infection.

If, when you change dressings, your scar is red, inflamed or suppurating, consult your surgeon as quickly as possible, for advice and adapted treatment - local or general (antibiotics).

"What should I do if I have pain in the calf or difficulty breathing?"

These signs may point to a blood clot in a vein (phlebitis) or a clot migrating to the lung (pulmonary embolism), which can have serious consequences.

The risk is greater if, because of the type of operation, you are not allowed to put your foot on the ground; in that case, your surgeon will have prescribed protective medicines (anticoagulants) for you – but even so, the risk remains and this kind of sign is an alarm.

Generally speaking, any new symptom means you should consult either your family doctor or your surgeon or, in case of emergency, the center in which you were operated on.

If you cannot reach them, do not hesitate to dial 15 for the emergency medical service, which will guide you.