

A quiet crack at second base can steal months of growth from a 12-year-old ankle. In clinic, that moment often shows up as a swollen, tender joint with a normal looking X-ray. The child limps, the parent worries about a sprain, and the real problem hides in cartilage you cannot see on plain films. That is the challenge and the responsibility of a foot and ankle growth plate surgeon, to protect a maturing skeleton without trading away future motion or alignment.



What a Growth Plate Really Is

Growth plates, or physes, are bands of cartilage at the ends of long bones. They let a child’s bones lengthen and shape themselves through adolescence. In the foot and ankle, the distal tibia and fibula, the calcaneus, the metatarsals, and the phalanges all have growth plates, each with its own timeline for closure. The distal tibial physis typically closes between 12 and 15 in girls, 14 and 17 in boys, starting medially and moving laterally. The distal fibula lags behind, which partly explains transitional fracture patterns like Tillaux and triplane injuries in older adolescents.

Cartilage does not show up well on X-ray. That single fact drives many of the misdiagnoses we see. A child with genuine physeal injury can carry a normal radiograph, especially in Salter Harris type I patterns. Experience and a careful exam often matter more than the first set of films.

Where Foot and Ankle Growth Plate Injuries Happen

Not all physes carry equal risk. The distal tibial and fibular physes are the most commonly injured in the ankle. In the foot, the base of the fifth metatarsal apophysis and the calcaneal apophysis are frequent sources of pain in active kids. The apophysis is a traction growth plate where tendons attach, different from the joint-forming physis of the tibia or fibula. That difference matters because traction apophysitis, like Sever’s disease at the heel, is an overuse problem managed without surgery, while intra-articular physeal fractures, like a Tillaux fracture, can threaten joint congruity and require an operative plan.

The bones around the ankle participate in weight transfer and rotational stability. If a fracture crosses a physis into the joint or heals crooked, the child pays for it later with altered gait, uneven wear, and sometimes early arthritis. A foot and ankle joint preservation surgeon looks at an ankle fracture and sees not only a broken bone, but the next five years of growth.

How These Injuries Happen

Mechanisms separate clean sprains from growth plate damage. Younger kids often twist an ankle and avulse cartilage at the physis rather than tearing the ligament. The ligament is stronger than the growth plate until mid adolescence. Older teens who are near skeletal maturity begin to show adult patterns, including high ankle sprains and true ligament injuries.

Several reliable patterns show up again and again. A distal fibular Salter Harris I injury often follows a simple inversion with lateral ankle pain and soft tissue swelling. A Tillaux fracture occurs when external rotation of the foot peels off the anterolateral tibial epiphysis as the central and medial physis close. Triplane fractures combine a coronal epiphyseal fracture with a transverse physeal line and a sagittal metaphyseal fragment, a three-plane problem that looks deceptive on plain films. Direct falls or axial loading can injure the calcaneal apophysis in younger athletes or produce metaphyseal fractures in the metatarsals.

The Art of the Exam

A foot and ankle pain doctor will spend time finding the pain with a finger, not a general sweep. Point tenderness directly over the physis, pain with growth plate shear, and minimal laxity on ligament tests favor a Salter Harris I injury over a classic sprain. Medial ankle tenderness in a child with an eversion injury always raises suspicion for a distal tibial physeal fracture. Gentle stress, not aggressive maneuvers, protects an unstable physis during evaluation.



Neurovascular status gets documented every time. Swelling that is disproportionate to a simple inversion sprain hints at a more significant injury, sometimes even compartment syndrome in high energy trauma. In my experience as a foot and ankle injury surgeon, a careful first exam prevents unnecessary sedation later. If tenderness is focal and weight bearing is painful, I treat the child as having a fracture until proven otherwise.

Imaging That Tries Not to Miss the Real Problem

X-rays are the start, not the finish. We obtain anteroposterior, lateral, and mortise views for the ankle, and targeted views for the foot based on pain location. Oblique films help at the midfoot. Stress views are used sparingly in children.

When the clinical suspicion is high and X-rays are clean, MRI offers a look at the cartilage and bone marrow. It is particularly useful in distal tibial physeal injuries that are occult on radiographs, and in evaluating suspected physeal bars during follow up. CT has a narrower but important role, mainly to define fragment displacement in Tillaux and triplane fractures where a 2 mm gap often separates nonoperative from operative care. Ultrasound is not a primary tool for fracture diagnosis in this region, but a foot and ankle ultrasound guided surgeon may use it for nerve blocks or to evaluate tendon involvement around the injury.

When Nonoperative Care Is Enough

Most nondisplaced Salter Harris I and II ankle injuries respond well to immobilization. A short leg cast or walking boot protects the physis, with weight bearing modified according to pain. Typical immobilization runs 3 to 4 weeks for distal fibular injuries and 4 to 6 weeks for distal tibial injuries, with earlier return to function in less severe cases. Patients with metatarsal physeal injuries often resume sports by 6 to 8 weeks if they regain strength and motion.

Nonoperative care only succeeds with the right follow up. We recheck alignment, pain, and growth at set intervals. It is normal to see some stiffness and proprioceptive loss during early recovery, which respond to guided home exercises and later formal physical therapy.

When Surgery Becomes the Safer Path

The decision to operate rests on joint congruity, displacement, and the risk of premature physeal closure. For intra-articular distal tibial fractures, even a 2 mm step-off can accelerate cartilage wear. In adolescents with Tillaux fractures, CT-confirmed displacement greater than 2 mm calls for reduction and screw fixation. Triplane fractures often need percutaneous or open reduction to restore the joint surface and the metaphyseal block. Markedly displaced Salter Harris II fractures of the distal tibia are reduced closed under anesthesia when possible. If they do not hold or the periosteum is trapped, open reduction becomes necessary.

The primary goals are simple to say and tricky to execute. Restore the joint surface. Respect the physis. Stabilize the construct enough for early safe motion. A foot and ankle operative specialist plans incisions that avoid crossing the growth plate and chooses implants that spare the physis whenever possible. Screws can be placed parallel to the growth plate through the epiphysis in Tillaux injuries, or across the metaphysis in Salter Harris II patterns. When crossing a physis cannot be avoided in an older adolescent near closure, the risk is discussed and minimized.

Here are the core surgical strategies a family might hear about in a preoperative visit:

- Closed reduction with percutaneous pinning to restore alignment through small incisions when fragments are mobile and can be guided without opening the joint.
- Arthroscopically assisted reduction to confirm the joint surface is smooth while limiting soft tissue dissection.
- Open reduction and internal fixation with screws or low-profile plates for fractures that cannot be reduced closed or that involve soft tissue interposition.
- Physeal bar resection with interposition graft when a partial growth arrest forms and there is enough growth remaining to justify trying to restore it.
- Guided growth or corrective osteotomy for established angular deformity or limb length discrepancy, sometimes staged with epiphysiodesis on the opposite side.

A foot and ankle internal fixation surgeon will match technique to injury pattern and age, not personal preference. That tailoring is the difference between routine and durable.

Ankle Replacement or Ankle Fusion Which to Choose?



Inside the Operating Room

Families often ask what the surgery really looks like. In truth, for many adolescent ankle physeal injuries, it is a precise, brief procedure with image guidance. After anesthesia, reduction is achieved through gentle manipulation. Fluoroscopy verifies alignment in multiple planes. In Tillaux fractures, a small anterolateral incision lets the surgeon place a guidewire and a single cannulated screw across the epiphyseal fragment, parallel to the physis. For triplane fractures, the sequence of reduction matters, first the metaphyseal fragment, then the epiphysis, frequently with two or three screws. Operative time is often under an hour for straightforward cases, and the child goes home the same day with a splint or cast. That is typical work for a foot and ankle outpatient surgeon.

Complex patterns sometimes require more. A foot and ankle osteotomy surgeon may perform a corrective cut months after the initial injury if malalignment develops. External fixation is uncommon but valuable when soft tissues are compromised. Arthroscopy can help confirm articular reduction, but it is not mandatory for every case. An experienced foot and ankle surgical team keeps the plan flexible and the incisions small, working as a minimally scarring surgeon whenever safety allows.

What Complications We Guard Against

Two complications drive the long-term strategy. First, premature physeal closure, a growth arrest that can appear in 5 to 30 percent of distal tibial physeal fractures depending on displacement, energy of injury, and quality of reduction. Second, articular incongruity, which does not remodel well and accelerates cartilage wear. Early detection of a physeal bar through serial X-rays and MRI lets a foot and ankle corrective osteotomy specialist or foot and ankle joint stabilization surgeon intervene while growth remains.

Nerve irritation from hardware, infection, and stiffness are the more common short-term risks, and they are generally manageable when recognized early. A foot and ankle complication management surgeon monitors wounds, adjusts immobilization, and steps in quickly if pain [foot and ankle surgeon near me](#) escalates or sensation changes. Hardware removal is sometimes offered a year down the road if screws become symptomatic, a simple outpatient procedure performed by a foot and ankle hardware removal surgeon.

Follow Up That Does Not Rush Growth

The calendar for follow up is built around the biology of healing and the physics of growth. After nonoperative care or fixation, we see the child at two weeks to check the skin and pain control, then again at four to six weeks to evaluate early healing. If the fracture crossed the physis or if there was significant displacement, growth monitoring continues every three to six months for one to two years. That sounds long until you consider that a small bar can take months to reveal itself radiographically.

Parents notice that my notes include alignment measurements in degrees and a comparison to the opposite side. The intention is to catch asymmetry when it is millimeters, not centimeters. A foot and ankle surgical evaluation doctor uses these data points to decide when to continue observation, when to order MRI, and when to discuss guided growth.

Rehabilitation and a Thoughtful Return to Sport

When the bone heals, the real work begins. Immobilization weakens muscles, dulls balance responses, and compresses joint capsule range. Physical therapy targets proprioception and strength first. Single-leg stance on an unstable surface, resisted inversion and eversion with bands, and gentle joint mobilization rebuild ankle control. Running often returns by 8 to 12 weeks after stable fractures, later if the joint surface or alignment required open procedures. Cutting, pivoting, and contact drills are loaded in stages to avoid re-injury.

Protective bracing during the first season back can help in older adolescents. Children who had a distal tibial intra-articular fracture typically need more time and supervision than those with distal fibular Salter Harris I injuries. A foot and ankle post operative care surgeon coordinates with the therapist and the family, making small adjustments that keep recovery safe but moving.

When To Seek Immediate Care

Parents are often unsure whether to wait or to drive in. The following red flags are reliable, and they justify prompt assessment by a foot and ankle clinic surgeon:

- Inability to take four steps without significant pain after an ankle or foot twist.
- Point tenderness directly over a bone end or growth plate rather than along a ligament.
- Visible deformity, progressive swelling, or bruising that tracks around the foot and up the ankle within hours.
- Numbness, tingling, or skin color changes in the toes.
- Severe pain at night or pain that escalates after initial rest and elevation.

Case Snapshots From Practice

A 13-year-old midfielder plants to cut and feels a pop. The ankle swells laterally. X-rays show a subtle irregularity at the anterolateral tibia. CT confirms a 2.5 mm Tillaux fragment. We reduce percutaneously and place one screw parallel to the physis through a 2 cm incision. She is non weight bearing in a splint for two weeks, then casted another four. At three months she is jogging, at five months she plays a half game with an ankle brace. At one year, she is pain free, and the physis has completed closure without a bar.

A 9-year-old tumbles off a scooter and rolls an ankle. Tender at the distal fibular physis, laxity tests are quiet. X-rays are normal. We treat it like a Salter Harris I injury with a boot and partial weight bearing for two weeks, then gradual return. The family appreciates the conservative approach, and the child is back to recess at four weeks.

A 15-year-old sprinter arrives with chronic heel pain after a growth spurt. Exam localizes to the calcaneal apophysis without focal bony tenderness or deformity. This is Sever's disease, not a fracture. We apply activity modification, heel cups, and a brief home program. Avoiding unnecessary imaging and surgery is still part of the job for a foot and ankle pediatric surgery specialist.

Deformity After Injury, and What We Can Do About It

Despite meticulous care, some children develop angular deformity or a limb length discrepancy from a partial physal arrest. When the bar is small and growth potential remains, a foot and ankle growth plate surgeon can resect the bar and place a fat graft to prevent re-bridging. Success depends on timing and how much of the physis is involved. If the bar is larger or the child is closer to maturity, guided growth with a small plate across the opposite side of the joint can slow growth there and let the other side catch up. In established deformity with mechanical symptoms, a foot and ankle alignment correction surgeon may plan a distal tibial osteotomy to reorient the joint line. These are not decisions made in a single visit. They require a foot and ankle surgical planning specialist who follows growth trends over months.

Evidence, Thresholds, and Trade Offs

Families often ask why 2 mm seems to be the magic number for intra-articular displacement. Decades of outcome data show that small step-offs in weight bearing joints increase contact pressures and cartilage stress. In the adolescent ankle, remodeling potential at the joint surface is limited. The 2 mm threshold is a practical line where the balance of risk tips toward a small surgery that restores anatomy. For metaphyseal fractures away from the joint, acceptable angulation tolerates a bit more because remodeling can correct mild deformity if enough growth remains. A foot and ankle evidence based surgeon frames it this way: we operate not because we can, but because the future ankle is worth protecting now.

Common Questions From Families

Will this affect final height or leg length? Rarely, and mostly with distal tibial injuries that develop a significant bar. We monitor for it. If there is a projection of a centimeter or more at maturity, options exist to balance it.

Are screws permanent? Often they can stay if asymptomatic. If they irritate tendons or the skin, a foot and ankle hardware removal surgeon can take them out after the bone is solid, usually around a year.

How soon can my child return to sport? It depends on the fracture type and treatment. Many nondisplaced injuries return by 8 to 10 weeks. Intra-articular fractures that required open reduction often need 12 to 16 weeks before running and longer before pivoting sports. Progression is criteria based, not purely time based.

Is a second opinion reasonable? Yes. A foot and ankle surgical second opinion can confirm the plan, especially for intra-articular injuries, suspected growth arrest, or proposed corrective osteotomy. Good surgeons welcome thoughtful questions.

Choosing the Right Specialist

The label matters less than the experience behind it. Look for a foot and ankle growth plate surgeon who treats children regularly and can explain why a specific plan fits your child’s age, fracture pattern, and goals. Ask how often the surgeon fixes Tillaux and triplane fractures. Ask about their thresholds for surgery and how they follow growth. A foot and ankle surgical consultant who can describe both nonoperative and operative paths, and who partners with a physical therapist

and a pediatric anesthesiologist, gives your child a broader safety net. In complex cases, a foot and ankle multidisciplinary surgeon can coordinate care with pediatricians, radiologists, and rehab specialists.

Modern techniques help, but judgment still carries the day. Fluoroscopy, arthroscopy, and low-profile implants are tools. The craft is knowing when to use them and when to let biology do the work. A foot and ankle advanced surgery specialist should be just as comfortable recommending a boot as a screw, and just as quick to schedule a follow up as an operation.

The Stakes Are Long Term, The Steps Are Simple

Protect the growth plate. Restore the joint. Watch growth like a hawk. Those are the principles I share with families on day one and repeat at each visit. They guide the small decisions, like boot versus cast, and the big ones, like percutaneous screw versus open reduction. When followed closely by a foot and ankle medical surgeon with pediatric experience, most children return to school, sport, and growth without a limp and without a late curveball from a silent bar.

If your child has a painful, swollen ankle after a twist and the X-ray seems too clean, trust the symptom, not the film. Ask for a tailored assessment from a foot and ankle surgical provider who sees both the bruise today and the growth still ahead. With the right eyes and a steady plan, the next season can still be theirs.