

COMPLICATIONS OF DIGITAL SURGERY

Robert P. Taylor, DPM, FACFAS

Complications following digital surgery can occur despite appropriate evaluation, surgical technique, and postoperative management. A working knowledge of those complications can facilitate early diagnosis and potentially avoid or lessen the severity of the complication. Complications of digital surgery include infection, failure of the procedure with continued or increased pain and deformity, painful or unsightly scar formation, nerve damage, delayed or non-healing wound or bone, dysvascular episodes, and even Charcot arthropathy. In this article, we will discuss infections, mal or non-unions, failure of the procedure, or reoccurrence of the deformity, and Charcot arthropathy.

INFECTION

Infection is a well documented complication following any bone or tissue surgery. Factors that may affect the infection rate include the use of a prophylactic antibiotic, sterile technique, and the physiologic condition of the patient. Anatomic dissection also can aid in the decrease of infections rates by avoiding unnecessary tissue destruction. Infection following digital surgery can be difficult to differentiate from a significant amount of erythema and edema. Evaluating the subjective and objective symptoms of the patient are necessary in aiding in the diagnosis. Most often the intensity of the clinical presentation aids the clinician in differentiating between an infection and an intense postoperative inflammatory response. This is true with the exception of the immunocompromised patient who may have an infection in the presence of a "subclinical" appearance.

Once the clinician has deciphered that they are possibly dealing with an infection several issues now have to be addressed. One issue would be whether or not to remove any fixation that has been used for stabilization. The orthopedic, podiatric, and infectious diseases communities have varying views on this issue. Some argue that any and all fixation should be removed immediately in the face of a postoperative infection, while others state this must be decided case by case, and the ramifications of the removal of the fixation must be weighed against the potential morbidity of leaving the fixation in. The author agrees with the later point of view

and would offer guidelines for aiding in the decision as to whether or not to remove the fixation. One such guideline would be to determine if the fixation is loose or not. If the pin easily pistons in the digit, it should be removed as it may serve as a nidus for infection, and allow the spread of the infection into the digit. The other issue to consider is the severity of the potential deformity should the fixation be removed. One may argue that removing a pin from a single digital correction and having the arthrodesis fail or a reoccurrence of the deformity is far less a problem and easier to address than osteomyelitis. The author would tend to agree with this point of view in that if it is a borderline call, to err on removal of the fixation would be recommended, versus leaving it in and potentiating the spread of the infection.

Another issue to consider is whether the patient can be treated as an outpatient with oral antibiotics, or needs to be admitted to the hospital for IV antibiotics. This decision is again based on the symptoms of the patient and your clinical findings. If the patient shows any signs of systemic involvement including fever, chills, nausea, vomiting, significant lymphadenopathy or ascending cellulites, then intravenous antibiotics should be instituted. Should the clinician feel the infection is superficial and can be managed on an outpatient basis, appropriate antibiotics should be chosen, and the patient should be reevaluated shortly after the start of the antibiotics to evaluate the efficacy of the treatment regimen. The vast majority of infections will be gram positive organisms. All too often the patient is placed on ciprofloxacin alone which does not have good gram positive coverage. Also, should there be an abscess present, no amount of antibiotic, oral or intravenous will be effective. The clinician must not be intimidated by releasing a portion of the sutures if an abscess is suspected. Abscesses must be incised and drained in order to treat the infection appropriately.

MALUNION & NONUNIONS

Malunions and nonunions can and do occur in the face of appropriate surgical technique. If the surgeon is experiencing an increased rate of nonunions a critical evaluation of their surgical technique must be done. While mal or nonunions can produce a "functional

arthrodesis” which is often asymptomatic, there are times when they are symptomatic and can lead to a reoccurrence of the deformity (Figure 1). One technical change that can augment bone healing is the use of hand instrumentation for denuding the cartilage at the arthrodesis site. This reduces the thermal necrosis of the power instrumentation. It also allows for an anatomic bone to bone apposition and positioning. Maintaining a natural anatomic contour can also decrease the amount of bone resection and shortening which can lead to a flail or floating digit.

The length of time that the pin fixation remains intact also can affect the fusion rate. Many surgeons have varied the length of time the wires remain in the digit. Six weeks remains to be a consistent optimum for allowing a fusion to occur.

Smoking is a well documented inhibiting factor to bone healing whether from a fracture or osteotomy. This issue should be discussed with the patient preoperatively with the best case scenario being a cessation of the use of tobacco products.

REOCCURRENCE AND FAILURE

While failure or reoccurrence of a digital deformity can occur as a result of a nonunion as previously discussed, other common causes include failure to identify the etiology or deforming force and not choosing and

performing the best procedure for the deformity. An example would be performing an arthroplasty on a patient who suffers from digital deformities secondary to a neuromuscular disease in which an arthrodesis procedure would be indicated. Not performing stepwise intraoperative evaluations can lead to an incomplete release of a deforming force in the digit. No two digital deformities are exactly the same even on the same foot. The surgeon’s digital surgery armamentarium should include multiple procedures and the preoperative evaluation should include the severity of the deformity and the etiology. Not performing an appropriate evaluation and correlating it with the appropriate procedure will cause the surgeon to experience a higher rate of failure and reoccurrence.

SCAR FORMATION AND SWELLING

Scar formation and swelling are normal encounters in the healing process. When the scar formation or swelling is protracted or significant enough to cause discomfort, treatment with injectable or oral anti-inflammatory agents may be necessary. Other treatment modalities include bracing, splinting and compression.

Identifying patients that may be prone to hypertrophic scar formation is the most effective way to prevent such complications. If the patient is prone to hypertrophic scar formation or keloids, then the choice of



Figure 1. This is a 1 year postoperative radiograph of an attempted arthrodesis procedure. Fortunately the patient’s symptoms resolved despite the nonunion.



Figure 2. This is a radiograph of a patient who developed digital Charcot arthropathy. Despite ruling out osteomyelitis with a bone biopsy, the patient ultimately had to undergo a digital amputation because of large nonhealing ulcerations which ultimately caused bone exposure.

suture material is crucial. A minimally reactive suture non absorbable suture that needs to be removed can aid in decreasing scar formation. Minimizing the amount of tissue damage done through appropriate incision placement, anatomic dissection, and layered closure can also decrease excessive scar formation and swelling.

CHARCOT ARTHROPATHY

Digital surgery on diabetic patients is routinely done to prevent ulcerations as well after the ulcerative process has begun. The Charcot process can be stimulated by the digital surgery. The clinical and radiographic appearance of the Charcot arthropathy digit can mimic that of the changes consistent with osteomyelitis (Figure 2). The patient must be educated on the process of Charcot arthropathy. The process should be monitored with the hope that the disease enters a quiescent phase and

consolidates. Even if the bone destruction is purely a result of Charcot arthropathy, the unfortunate end may result in the amputation of the toe as the increased girth of the toe predisposes the digit to chronic non-healing ulcerations. A bone biopsy is still the gold standard to diagnose osteomyelitis versus other bone destructive procedures.

Digital surgery is a complicated process that requires a detailed preoperative, intraoperative, and post-operative evaluation and care. Complications following digital surgery are numerous and meticulous attention to detail throughout all phases of the patients postoperative care can help minimize their occurrence. Despite meticulous detail, some of these complications will occur, and a quick appreciation and early treatment of these complications can aid in decreasing the morbidity associated with them.