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Guest Editorial

Just an ankle fracture?

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The unstable closed ankle fracture is one of the first fractures that surgeons in training are allowed to operate upon and one that many residents feel comfortable doing as they progress. I have heard trainees reviewing the day's operative schedule and commenting, *"It's just an ankle fracture."* This suggests a simple surgical exercise with limited educational value compared to more complex fracture patterns that demand pre-operative planning, extensive exposures, and complicated reduction sequences and fixation constructs.

Conversely, as a supervising and teaching physician, I believe that bi- and especially trimalleolar ankle fractures represent an outstanding opportunity for surgeons to articulate and reflect upon the proven strategies of efficient, successful osteosynthesis, in part, because they are less technically demanding than "big" cases. In these ankle cases, the learner tends to be relaxed and more receptive to questions from the attending surgeon, who can probe the learner's operative plan, asking the "Why" questions and not just the "Whats?"

Core principles that span from case preparation through reduction sequence to patient aftercare are more clearly demonstrated in managing elementary fracture patterns. This intraoperative interaction between surgeons drives residents to reflect on what was learned during this routine case and, ultimately, the ability to apply the lessons learned in this safe environment to the more complex cases that they will manage over their careers. In the following paragraphs, I will sample just some of the many areas where critical thinking about an ankle fracture can be directly probed and assessed, and most importantly, applied to other fractures.

PREPARATION AND DIAGNOSIS

Developing a routine for knowing what is "normal" for the patient and planning a surgical path that ends with a reduced fracture supported by a stable bone/implant montage is universal for all osteosyntheses and well modeled in ankle fractures. How thoroughly and systematically did the trainee prepare? Was the radiographic workup and assessment adequate? Although post-reduction plain films and CT scans give finer detail for templating, it is the injury films that best suggest the deforming force that the final construct must resist as well as predict the location and severity of the soft-tissue injury. With syndesmotic disruption, significant fibular comminution or segmentation, contralateral "normal side" pre-operative radiographs are certainly helpful, if not critical. Did these factors receive the attention that they deserve?

How should the operating field be organized? Where best to position the C-arm to be able to provide necessary imaging? Where are the scrub tech and instrumentation? Which OR table

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is optimum? How to position the extremity and ankle for operating and cross-table imaging? *Attention to details in "routine" cases opens the door for efficiency and success on the most complex interventions*.

SURGICAL APPROACHES AND INJURY ASSESSMENT

Similar to the forearm, bicondylar tibial plateau and some acetabular fractures, a two-incision approach is usually needed. Many trainees choose to approach, explore, reduce, and fix the lateral malleolus first and only then open and fix medially. Why is this? I have been told that it is faster or more efficient, but it is all one injury. With the lateral column stabilized, I find it difficult and unsatisfying to adequately explore the tibiotalar joint through a medial incision without stressing the lateral repair.

Working through one fracture plane to access another avoids further stripping and dramatically improves the power of achieving reductions. It is best achieved in bicondylar and two-column acetabular fractures but sampled here in a lower ankle fracture. In contrast to exploring, reducing, and fixing the lateral malleolus first, exploring an unstable ankle fracture through an anteromedial approach allows for robust exposure as well as the option to sublux the joint to the original injury position without skin tenting given the relaxing incision just made. There would appear to be a clear advantage to exposing, appreciating, diagnosing, and debriding chondral injuries before any stabilization. Perhaps equally clear to the experienced fracture surgeon, anatomically reducing and fixing the medial malleolus is prone to malalignment if fibular length has not already been established. Therefore, a surgical sequence of medial approach, joint assessment, and debridement followed by lateral ± posterior malleolus open reduction and internal fixation and then a return to medial malleolar reduction and fixation appears preferred. The advantages of pre-operative planning and the appreciation of surgical-step sequence modifications to improve exposure and/or facilitate reductions are applicable to more complex articular fractures and are easily modeled during dual incision ankle repairs.

REDUCTION AND FIXATION

There are several factors to consider in determining the optimum lateral approach. The presence of a tubercle of Chaput or posterior malleolus may require modifications to address. The level and geometry of the lateral malleolus fracture should also influence the thoughtful surgeon's strategy. The typical spiral fracture extending proximally from the joint line offers the opportunity to work *in the most biologically friendly fashion inside the fracture*. This allows not only visualization and debridement of the lateral malleolar fracture but also with fracture distraction and posterior joint subluxation – basically recreating injury deformity – visualization and full access to both surfaces of the posterior malleolar fracture plane is possible. This allows for a complete and thorough debridement of joint detritus and all organizing hematoma that might prevent anatomic reduction of the posterior malleolus.

If the surgeon trainee has carefully planned the sequence of surgical steps to their osteosynthesis, they should appreciate that when working through the fibular fracture and directly seeing the posterior tibial fracture plane is the ideal time to direct and drill the glide hole(s) for a lag screw(s) to be placed from the anteromedial incision through the distal tibia, as one can directly visualize and direct where the drill tip exits into the fracture plane (but does not violate the displaced posterior malleolus). The posterior malleolus maintains its ligamentous attachments to the displaced lateral malleolus. Therefore, by restoring fibular length and directly anatomically reducing the lateral malleolus; the posterior malleolus is indirectly – but anatomically – reduced. In patients with osteoporosis, fibular comminution, and/or those who are delayed in presentation, correcting shortening and anatomic reduction of lateral malleolus can be challenging. Residents should be able to describe and demonstrate strategies to achieve this critical step. Applying targeted force to regain length without damaging or devitalizing the fracture zone is inherent to all successful metaphyseal fracture reductions.

Lag screw fixation of the lateral malleolus is carried out with one or two appropriately sized implants. Fluoroscopy is employed to assess the mortise and posterior malleolus reduction before plate fixation to allow unobstructed lateral imaging. A prong of a pointed clamp can be positioned behind the peroneal tendons to compress the posterior malleolar fracture. The previously placed anterior glide hole(s) can be revisited now to drill the posterior fragment, measure, and insert fully threaded optimally placed lag screw(s) to securely compress this fractured posterior column of the ankle. At this point, the fibular plate is applied. The specific geometry of the fracture, the possible need to buttress as well as neutralize, the status of the syndesmosis, the screw density desired, and other variables should go into selecting plate orientation, length, and type. *We should be certain our young surgeons can consider these factors and can describe their reasoning.*

Finally, the focus returns to the medial malleolar fracture, which by this point, is usually indirectly almost anatomically positioned. Although technically simple to perform, numerous decision points exist that can be explored: Why use two screws, what type, size, and length? Is there a benefit for cannulation? Lag by design or by technique for fracture compression? Countersink? How best to create a balanced construct? Each issue is relevant for success and is

foundational for most all future metaphyseal fractures these surgeons will treat.

FINAL ASSESSMENT, CLOSURE, AND POST-OPERATIVE MANAGEMENT

What are the specific markers of an effective versus deficient surgical construct that we look for with stressing the ankle and final imaging? "It looks pretty good" is not a measurable endpoint. Multiplanar imaging should specifically assess articular reduction and alignment, screw length, density, implant impingement, and overall construct balance. These are each objective and independent variables to support a subjective summation. Well-executed osteosyntheses can be sabotaged by poorly considered and coordinated wound closure and post-operative management. Are the post-operative orders and recommendations realistic for this specific patient and their support network?

SUMMARY

Although unstable ankle fractures are common and less technically challenging than many other articular fractures, successful optimal outcomes follow the same principles and demand the same planning and thoughtful intraoperative decision making that complex reconstructions do. Attending surgeons and learners should appreciate that trimalleolar fracture repair is an excellent and recurring opportunity to reflect on and improve treatment strategies that will lead to more successful and efficient treatments for the entire spectrum of operative fracture repair. One is not just fixing an ankle fracture.

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