How Accurately Do We Need to Reduce the Tibiofibular Syndesmosis to Get a Good Result?

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SUMMARY
Reduction and fixation of distal tibiofibular syndesmosis injuries associated with distal fibular and tibial malleolar fractures has been considered an important aspect of treatment in order to maximize the chances of a good result. Traditionally, reduction of the syndesmosis has been accomplished indirectly by reduction of the distal fibular and medial malleolar fracture fragments, and more directly by percutaneous manipulation of the tibia and fibula with fluoroscopic imaging. Adequacy of reduction has been judged by several criteria: postoperative radiographic assessment of the tibiofibular clear space, overlap on anteroposterior and mortise views, and assessment of the medial clear space and the talocrural angle with fibular length and rotation as well as assessment of the concentricity of the talar reduction beneath the plafond on orthogonal views.

Recently there have been many reports that the syndesmotic reduction achieved is not nearly as good as we had presumed, and a variety of more aggressive surgical approaches have been advocated, including direct operative exposure, reduction of the syndesmosis through anterior or posterior approaches, endoscopic-assisted reductions, and direct fixation of posterior tibial and fibular fractures associated with the syndesmotic ligaments. Computed tomography (CT) assessment of the reduction quality has also been advocated. These two articles provide important new information.

The article by Dikos et al. provides essential comparison values and ranges for the syndesmotic anatomy on CT scans of uninjured normal ankles, demonstrating a 2-mm side-to-side variability in the tibiofibular interval and a 6° variability in fibular rotation among sixty patients. Sagi et al. reported that the 44% syndesmotic malreduction rate with standard treatment was reduced to 15% with open exposure of the syndesmosis. Furthermore, patients with malreduction scored lower with regard to functional outcome at two years. The authors considered the presence of any difference between the appearances of the injured syndesmosis and contralateral syndesmosis to be a malreduction. The authors also suggested that we should always obtain a postoperative CT scan and return the patient to the operating room if a malreduction of the syndesmosis...
is identified. However, this is author opinion, and no direct comparison groups were reported to support this suggestion.

**DISCUSSION**

These articles suggest that syndesmotic reduction is important to outcome and can be reliably measured on CT scans comparing the injured and contralateral extremities. Sagi et al. found malreduction in 15% of the cases, despite having openly observed a supposedly perfect reduction, suggesting that what surgeons see with their own eyes may not be as accurate as they think. Alternatively, since Dikos et al. reported a 2-mm and 6° side-to-side variability in normal ankles, it may be that Sagi et al. used too-stringent a standard for the difference that constitutes a malreduction. Once again, there may be a tendency to overestimate our ability to objectively measure something—in this case, the CT images.

There are also suggestions that small malreductions tend to return to normal after syndesmotic soft-tissue healing and screw removal, and may do well clinically over the long term. It certainly seems prudent to be aware that malreductions of the syndesmosis are common and may cause clinical problems. Surgeons should monitor future data to help us determine how accurately we need to reduce the syndesmosis to obtain optimal clinical results, which techniques are most appropriate to assess the reduction, and which techniques and protocols are appropriate to obtain and maintain the reduction.

**SUMMARY**

The field of orthopaedic surgery relies extensively on imaging to aid diagnostic and therapeutic decision-making. The desire for reducing that volume of imaging stems from the potential risks from radiation to surgeons and patients and the wish to trim unnecessary health-care costs. Chaudhry et al. showed that distal radial, metacarpal, and ankle fractures are the most common injuries for which unnecessary post-splint radiographs are made. Other areas of orthopaedic care have dedicated investigative resources to understanding this issue.

Postoperative radiographs after uncomplicated total knee arthroplasty (TKA) have been examined. Moskal and Diduch reviewed the results of 646 consecutive TKAs; postoperative radiographs were obtained at only the initial postoperative office visit for 634 (98%) of these TKAs. No patient experienced any complication that was considered to be attributable to a delay in postoperative imaging. Eliminating postoperative radiographs saved US $450 per patient. For the 634 patients, this was a total saving of US $285,300 (Am J Knee Surg. 1998 Spring;11[2]:89-93).

Glaser and Lotke performed a similar review and noticed no alteration in management among 192 patients with postoperative radiographs performed before discharge after TKA, and only 36% of these images were considered an adequate baseline for
additional studies. The total cost of US $36,000 was for all 192 patients. They then prospectively looked at 550 patients who had undergone a first postoperative radiograph at six weeks and found no instances in which radiographs made before discharge were needed to change the conduct of postoperative management (J Arthroplasty. 2000 Jun;15[4]:475-8).

Molinari et al. studied the benefit of in-hospital postoperative radiographs after instrumented single-level degenerative spinal fusion in seventy-four patients. The conclusion was that anteroposterior and lateral radiographic imaging does not appear to provide additional clinically relevant information when intraoperative fluoroscopy was properly used. In addition, the fluoroscopic imaging demonstrated more consistent accuracy and a potential for significant savings at an average cost of US $600 for interpreted anteroposterior and lateral views (Spine J. 2012 Jul;12[7]:559-67).

The utility of postoperative radiographs after ankle fracture fixation has also been questioned. A chart review was performed for thirty patients who had undergone open reduction and internal fixation of ankle fracture types AO/OTA 44-A, B, or C. Fluoroscopic images were compared with standard postoperative radiographic images, and the authors found that fluoroscopic imaging was deemed acceptable for twenty-five of the thirty patients, and in no case did the postoperative radiograph result in any change in management (Injury. 1999 Dec;30[10]:699-701). Although this study lacked power, it provided an opportunity for alternative management and imaging in a trauma population. Postoperative radiographs of wrist, ankle, and foot injuries may be unlikely to provide useful clinical information due to obliquity of views and the presence of splints.

DISCUSSION
Elimination of unnecessary testing and imaging will lead to the preservation of limited and valuable health-care resources. More attention should be given to identifying the injuries for which this type of management controversy exists by way of optimally designed investigational studies. These data would allow for a directed approach at patient burden reduction including length of stay in the emergency department; health-care related costs; and minimal, yet present, radiation exposure.

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SUMMARY
The authors attempted to determine whether maintaining the screw in the dynamic locking hole (as opposed to removing all the screws at one end of the nail) improved the success of healing of femoral shaft fractures after dynamization. They also looked at whether the timing of dynamization (ten to twenty-four weeks versus less than twenty-four weeks) affected fracture healing. They studied thirty-nine fractures that failed to unite by at least ten weeks. Twenty-eight of the thirty-nine fractures united after dynamization alone. There was a higher rate of bone union if a screw had been maintained in the dynamic locking hole (fourteen of fifteen healed versus fourteen of twenty-four in the group in which all screws had been removed from one end of the nail, p = 0.028). Union occurred in twenty of twenty-three patients in whom dynamization had been performed early (at ten to twenty-four weeks) and in eight of sixteen patients in whom the treatment had been performed after twenty-four weeks. Interestingly, in the group in which the dynamization was done after twenty-four weeks, healing was obtained in four of four patients in whom the screw had been maintained in the dynamic locking hole but in only four of twelve in whom all the screws had been removed. There were two complications (shortening and rotational instability) in the group with all screws removed. The authors concluded that late dynamization was less favorable, and even more so if all screws were removed.

DISCUSSION
The authors support earlier dynamization. However, it is unclear in this paper if the reaming technique or the size of the nails used impacted the results. This article also does not discuss whether the delayed unions were hypertrophic or atrophic. Also, the

| Is There an Optimal Time to Consider Dynamizing Femoral Shaft Fractures? |
fractures in the group that underwent early dynamization may have actually gone on to heal if they had been left alone. Union rates for femoral shaft fractures treated with reamed nailing are in the range of 93% to 97%. If all the fractures that were dynamized had failed to unite without additional intervention, the rate of delayed union for this group would have been 18% (thirty-nine of 222 patients). This raises the question of whether or not many of these fractures would have gone on to heal, especially in the group that underwent early dynamization. This would make early dynamization appear overly successful. Finally, with the small number of retrospectively reviewed cases, it is difficult to conclude whether retaining a screw in the dynamic locking hole made a difference in healing. Prospective studies are needed to clarify the potential benefits related to healing.

Joint-Spanning External Fixation Is Good for Elbows Too


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**SUMMARY**

Open intra-articular distal humeral fractures are highly unstable injuries. When treated with splinting they may deform (apex posterior), with protrusion of the fractured bone through the traumatic wound. Sixteen patients with open distal humeral fractures were treated with elbow-spanning external fixation with irrigation and debridement. Staged external fixator removal with definitive internal fixation was performed after 7.1 days. The complication rate was high (twelve of sixteen patients), but no complications were directly attributed to external fixation. Joint-spanning external fixation may be useful in the staged management of open distal humeral fractures.

**DISCUSSION**

Temporary joint-spanning external fixation, as a bridge to definitive open reduction and internal fixation, has been proven to be safe and effective when an unstable fracture is surrounded by severely injured soft tissues or when the patient is physiologically unstable. The external fixator provides comfort, maintains fracture length, allows for soft-tissue monitoring, and provides fracture stability protective of the overlying soft tissues. Elbow-spanning external fixation is not commonly utilized for distal humeral fractures. However, what should happen to the patient with an open distal humeral fracture late at night being cared for by an inexperienced on-call surgeon, or to the patient unable to tolerate an acute reconstruction? Late-night fracture reconstructions are associated with increased rates of implant removal and complications, and may take a longer period of time to perform.

Post-debridement splints may not provide sufficient fracture stability. External fixation provides more rigid stabilization of the fracture, preventing bone protrusion, thereby protecting the soft tissues. Stability may also reduce infection risk by protecting overlying soft tissues. This option may be attractive to on-call surgeons who are inexperienced with distal fracture management.

The authors used a “semi-open” technique for humeral pin placement, potentially to protect the radial nerve. They utilized ulnar pins for increased stability. Although the authors preferred posterior pins, lateral pin placement may be easier for patients and caregivers; however, this type of placement requires transmuscular ulnar pins (see Fig. 1D in the original article, which shows the use of lateral pins). A high complication rate was noted in this series. It is likely that the complication rate was more related to the injury itself than to the treatment method (as indicated by the authors).

In summary, elbow-spanning external fixation instead of splinting improves distal humeral fracture stability and may result in fewer wound complications. Staged definitive fixation performed by rested and experienced surgical teams may be of benefit.
What is Zimmer PSI?

Zimmer PSI streamlines total and unicompartmental knee replacement surgery by ensuring accurate and reproducible jig fixation and resection cut-guide placement. Through a patient’s MR or CT image, the surgeon is able to pre-operatively plan the placement of the Zimmer knees based on the patient’s mechanical axis and other bony landmarks. PSI simplifies the knee surgery from start to finish without compromising a surgeon’s decision making, surgical technique or intraoperative flexibility.

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**Why would Zimmer PSI be important to me?**

In the surgeon’s hands, Zimmer PSI has the opportunity to offer surgical simplicity and surgical efficiency. By pre-operatively planning such parameters as resection depths, component rotation, femoral flexion and tibial posterior slope, a surgeon will potentially know the femoral and tibial knee implant sizes as well as the placement of these components as referenced to the patient’s mechanical-axis. For the femur, this eliminates the need to drill the femoral canal or to use an A/P Sizer to measure for femoral knee implant size. Tibial pre-operative planning allows similar knowledge going into the case.

The surgical simplicity and efficiency potentially allows parallel similarity for the hospital or surgery center. Less instrumentation would need to be washed, sterilized and/or otherwise prepared for surgery - possibly resulting in a cost savings.
What is the eLIBRA System?
The eLIBRA System is a dynamic soft-tissue knee balancing system that employs a disposable electronic force measurement to position the femoral knee implant in proper balance with the angle of the tibial cut and the force from the ligament tension. It is designed to improve postoperative stability by enhancing the repeatability of the soft-tissue balance.

What is the clinical relevance of the eLIBRA System?
Femoral malrotation, flexion instability, and improper patella tracking are three of the most common causes of revision of total knee procedures. It has been shown that the traditional anatomic femoral landmarks used to determine femoral rotation can create inaccurate flexion gap symmetry ten to fifty percent of the time.

The eLIBRA System offers a measurable, objective, and actionable approach to femoral rotation based upon patient-specific soft-tissue balance and allows for consideration of optimal patella tracking.

References:
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Is the Scaphoid Fractured or Not?

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SUMMARY

The authors produced a clinical prediction scale that they prospectively tested in a study of 223 patients. Patients were evaluated within seventy-two hours after injury and then again between two and six weeks after injury using clinical assessment and standard radiographs. Demographic data and the results of seven specific tests were recorded. Male sex, sports injury, anatomical snuffbox pain on ulnar deviation at the initial visit, and scaphoid tubercle tenderness at follow-up were independent predictors of fracture. All patients with no pain at the snuffbox with ulnar deviation at the first visit had no fracture; with the four factors positive, the risk of fracture was 91%.

DISCUSSION

This paper addresses one of the most common questions in my practice: is the scaphoid fractured or not? Or as my patients wonder, “Do I really have to wear a cast for this?” I have always relied on snuffbox tenderness with ulnar deviation plus radiographs. This article gives the practitioner some more information, which is great. I am not sure how limited the patient is by two weeks of cast immobilization in the face of a painful wrist, but it is good to have more diagnostic tools.

There were some weaknesses of the study: nonindependent provocative examinations, tests that were not specific to scaphoid pain, the assumption that negative radiographs affect the clinical diagnosis, and the use of a diverse group of emergency room physicians as the initial examiner (although, hopefully this scale will be used by them in the future). The authors have done other work that indicates that if the suspicion of fracture is high, supplementary studies consisting of magnetic resonance imaging, computed tomography, and bone scanning have more worth (J Hand Surg Am. 2008 Jul-Aug;33[6]:954-7 and J Bone Joint Surg Br. 2011 Jun;93[6]:713-9). This study will be an important tool in the diagnosis of scaphoid fractures and hopefully will cut costs by eliminating unnecessary supplementary tests.
Annotated Reviews of Fifty Significant Trauma Articles from the Past Year

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SUMMARY
The latest article in the popular The Journal of Bone and Joint Surgery Specialty Update series provides annotated reviews of fifty significant trauma articles published in the past year. Commentary on methods, results, and take-home points are provided for each article from the expert panel of authors. The general trend according to these articles is that locking plates are increasingly popular and seem to provide better radiographic results in a variety of applications; however, functional results are not much different compared with those of other treatment techniques. A variety of new problems and complications associated with locking plates are also reported. Plate fixation of clavicular shaft fractures is increasing in popularity, and results appear to be improved. Assessment and treatment of compartment syndrome and syndesmotic injuries are changing.

DISCUSSION
This review tool provides an excellent summary of the year in trauma publications, and it serves as a good update for all practicing orthopaedic surgeons who want to remain abreast of current trends. The authors reviewed clinical articles pertaining to all the major anatomic regions and general trauma topics, as well as a few significant basic-science publications.

Update from the European Federation of National Associations of Orthopaedics and Traumatology 2012 Congress

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The thirteenth annual scientific congress of the European Federation of National Associations of Orthopaedics and Traumatology (EFORT) took place from May 23 to 25, 2012, in Berlin, Germany. Herein, a short report has been compiled focusing on some of the most interesting studies presented.

SUMMARY
In the pelvic and acetabular session, the long-term opioid use and the potential risk factors for extended opioid intake for patients with acetabular fractures were investigated. Data for all patients with acetabular fractures were extracted from the Swedish National Hospital Discharge Register and the Swedish National Pharmacy Register. Each patient in the fracture cohort was matched with five individuals without acetabular fractures by age, sex, and residential area. The median follow-up time was fourteen months. There were 1017 patients with acetabular fractures who met the inclusion criteria. The proportion of patients who received opioids in the acetabular fracture cohort was 39%—seven times higher than that for the age and sex-matched non-fracture controls (n = 5077). The median daily morphine equivalent dose was 22 mg (interquartile range [IQR], 14 to 42 mg) within the first month after fracture. During follow-up, the frequency of patients taking moderate or high doses fell off. At six and twelve months after fracture, 41% (95% confidence interval [CI], 36 to 47) and 33% (95% CI, 28 to 39) of those patients were still treated with opioids, respectively. Multivariable Cox regression analysis (adjusted for age, sex, type of treatment, and mechanism of injury) revealed that younger patients (younger than seventy compared with older than seventy) were more likely to stop using opioids (hazard ratio, 2.0; 95% CI, 1.5 to 2.7). The authors concluded that a large number of patients still used opioid prescriptions several months after acetabular fracture and that elderly patients were more likely to use this type of analgesia.

In the geriatric trauma session, a study on postoperative mortality and risk factors leading to additional surgery in elderly patients with femoral neck fractures that required hemiarthroplasty was presented. To be included in this study, a patient had to have been included in the Swedish Hip Arthroplasty Register and to have received a modular unipolar or bipolar implant. The mean follow-up duration was eighteen months. The number of patients in the analysis was 23,509; 3.8% had reoperations, mostly due to dislocation or infection. Male sex, younger age, secondary arthroplasty, and an uncemented stem or bipolar head were factors...
leading to an increased risk of reoperation. An increased risk of reoperation due to dislocation was seen in younger patients, patients who had undergone a posterior approach, and those treated with a bipolar head. The risk of reoperation because of acetabular erosion was higher for younger age groups compared with patients older than eighty-five years, whereas the use of a bipolar head substantially decreased erosion risk. The one-year mortality rate was 23%. The method of implant fixation was not a significant risk factor for mortality. The authors concluded that bipolar implants lead to an increased risk of reoperation, in particular due to dislocation or infection, and that uncemented implants should not be used for patients with hip fractures.

Mitchell et al. evaluated the influence of consultant supervision and assistants on hip fracture surgery with respect to infection rate and mortality. Patients who had undergone surgery for which more than one surgeon was desirable (hemiarthroplasties and complex fixation) were eligible for inclusion. Patients who received cannulated screws or underwent dynamic hip screw fixation or nailing were excluded. The number of patients who met the inclusion criteria was 4086. The overall infection rate was 2.9% (120 of 4086); there was no significant difference in the infection rate when surgery was performed by a consultant compared with when it was performed by a trainee (p = 0.186). When a lone surgeon performed the procedure, the infection rate was significantly higher, regardless of the experience of the surgeon, compared with when a surgeon and an assistant performed the procedure (3.6% [sixty-three of 1742] compared with 2.4% [fifty-seven of 2344], p = 0.027). The overall in-hospital mortality was 18.7%. For cases complicated by infection, the mortality was 36% compared with 18% for those without an infective complication (p = 0.0001). The authors concluded that a lone surgeon performing hip fracture surgery raises infection rates, leading to increased mortality. They recommended not performing hip fracture surgery unless a skilled assistant is available.

Potestio et al. reported on the treatment of unstable distal radial fractures using nonbridging external fixation or bridging external fixation. Twenty-four patients were randomized to each treatment group. The patients completed the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire at one, three, and six months and one year after surgery. The ranges of motion of the wrist and forearm as well as radiographic parameters were also evaluated. At one and three months, the mean Patient-Rated Wrist Evaluation (PRWE) and DASH scores for the patients treated with nonbridging external fixation were significantly better than those for the patients treated with bridging external fixation. By six months and one year, there was no difference in the scores between the groups. The range of motion of the wrist differed significantly between the two groups at one, three, and six months after surgery; it was better for the group treated with nonbridging external fixation. There were no significant differences in radial inclination and radial length maintenance at one year.

In the basic-science section, Tan et al. investigated platelet-derived growth factor (PDGF) release in peripheral circulation following trauma and correlated its levels with the numbers of mesenchymal stem cells (MSCs) in iliac crest bone marrow aspirate and in peripheral blood. Twelve adult trauma patients with lower-extremity fractures were recruited prospectively. Peripheral blood was obtained on admission and at one, three, five, and seven days following admission. The serum was collected, and PDGF levels were measured with the enzyme-linked immunosorbent assay (ELISA) technique. Iliac crest bone marrow aspirate (20 mL) and peripheral blood (20 mL) were obtained on days zero to nine following admission. MSCs were enumerated with use of standard colony-forming unit fibroblasts (CFU-F) assay. A gradual increase in serum PDGF levels following fracture ($r^2 = 0.79$, $p = 0.005$, $n = 8$), which reached up to twice as high on day seven, was observed. In five of eight patients recruited for CFU-F study, an increase in iliac crest bone marrow CFU-F per milliliter of aspirate was observed, which reached an average of six times as high postfracture (ranging from day three to day nine). In three patients, for whom PDGF levels and CFU-F numbers were measured in parallel, a strong positive correlation was observed between CFU-F numbers per milliliter of bone marrow aspirate and circulating PDGF levels ($r^2 = 0.98$, $p < 0.01$). The authors concluded that the bone marrow MSC pool in humans is not static and may be stimulated following trauma. This is not a result of mobilization of MSCs into systemic circulation. Rather, MSC activation at remote sites, such as iliac crest bone marrow, can be due to systemic up-regulation of several cytokines and growth factors, including PDGF, in peripheral circulation. This finding may have important therapeutic implications in the future management of trauma patients, for whom stem cells may be important for stimulating bone and soft-tissue healing.

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A single-blinded, randomized (block randomization) controlled trial of no injection, bupivacaine intra-articular injection, or ropivacaine intra-articular injection for postoperative pain control for supracondylar humeral fractures was performed on 512 consecutive pediatric patients over a two-year time period. Patients who weighed <14 kg were excluded secondary to size. All patients received general anesthesia. No tourniquets were utilized. The elbow was aspirated of blood and injected with 4 mL (for patients aged four to seven years) or 5 mL (for patients aged eight to twelve years) of 0.20% ropivacaine or 0.25% bupivacaine via the transolecranon or posterolateral portal. Opioid and analgesic consumption prior to discharge and total (postoperative and post-discharge) consumption were significantly lower in the bupivacaine group versus the non-injection group. The ropivacaine and noninjection groups had similar opioid consumption and analgesic counts. Self-reported (Faces Pain Scale-Revised [FPS-R]) and parent-reported (parent Total Quality Pain Management [TQPM] Survey) pain scores for the bupivacaine group were significantly lower than those for the ropivacaine or the control group. The pain scores for the ropivacaine group were lower, but not significantly lower, than those for the control group. Bupivacaine was more effective than ropivacaine for controlling postoperative pain. No complications were noted.

Overall, this was a well-conducted study. Since the fracture line for most supracondylar humeral fractures is within the joint capsule, the authors surmised that the intra-articular injection bathes the fracture line and therefore lessens the pain. No signs of chondrolysis were seen, but this is a limited study on the elbow joint in an immature population. Many patients were excluded because their surgery was performed after hours or on the weekend when consent could not be obtained. Patients with more complex, problematic, or severe injuries may have required emergency surgery and thus been excluded. Exploring this population might have identified higher numbers of open fractures, compartment syndromes, and fractures requiring open approaches. Conclusions from this paper are therefore limited to the less severe supracondylar humeral fractures.

Future studies evaluating a group that has more severe injuries would be useful to determine if an intra-articular injection can help diminish pain with open approaches or camouflage impending compartment syndromes. Unfortunately, a limited percentage (59%) of the patients returned pain and analgesic logs from home. Pediatric patients who undergo closed reduction percutaneous pinning of supracondylar humeral fractures seem to benefit from bupivacaine intra-articular injections.