Distal radius fractures can no longer be thought of in isolation. Increasing recognition is being given to the associated soft-tissue injuries that include: median nerve compression, radioulnar ligament injury, fibrocartilage disc substance tear, volar extrinsic ligament injury, dorsal extrinsic ligament injury, and intrinsic ligament injuries. Diagnosis, classification, and management of the associated soft-tissue injuries can be accomplished with a combination of endoscopic and arthroscopic techniques that balance well with current methods of distal radius fixation. The use of these less invasive but stable techniques facilitates an early rehabilitation program with the long-term goal of improved function.

The management of distal radius fractures has evolved substantially over the past several decades. More surgeons are now agreeing on the importance of stable internal fixation, and increased recognition is being given to the assessment and management of associated soft-tissue injuries. It is these injuries that often account for unsatisfactory results in the long term.\textsuperscript{1,2} Most classifications used for distal radius fractures hint at but do not directly address the pattern of associated soft-tissue injuries. The Frykman, Melone, Mayo, Universal, and AO classification systems are all ultimately based on the pattern of the fracture lines. The Jupiter and Fernandez\textsuperscript{3} classification is based on the mechanism of injury and thus at least indirectly suggests which soft-tissue injuries may be present. A method of documenting the associated soft-tissue injuries that tie them to existing classifications for radius fractures would be of particular benefit in judging outcome reporting from different centers during comparative literature assessment (Table 1). Overlooking the associated soft-tissue injuries in the past may be owing to less rigorous assessments of outcome or because prolonged immobilization in casts or external fixators failed to show
the soft-tissue deficiencies during the initial aftercare. Current trends in radius fracture management include earlier and more aggressive motion protocols. In this setting, soft-tissue injuries become more apparent. The following potential injuries should be assessed as part of the evaluation and management of a distal radius fracture: (1) median nerve compression; (2) radioulnar ligament injury; (3) fibrocartilage disc substance tear; (4) volar extrinsic ligament injury; (5) dorsal extrinsic ligament injury; and (6) intrinsic ligament injury.

The rates of associated soft-tissue injury identified at the time of fracture surgery continue to be quantified.2,4 Furthermore, definitive classifications for each of these injury patterns have not been agreed on universally, although the biomechanics of each injury and its consequences have been defined.3,6

Surgical Considerations

Quantitative motor and sensory testing are used to judge the involvement of the median nerve. The other 5 soft-tissue injuries are diagnosed and graded through combined physical stress testing and arthroscopic examinations.

Median Nerve Compression

Median nerve compression in distal radius fractures can occur in the acute, subacute, or late setting with a reported incidence of up to 8%.7 The incidence, however, may be even higher in more severe, high-energy, intra-articular injuries. In vivo carpal canal pressure studies show an acute increase in pressure within the canal before fracture reduction and for over 12 hours after reduction.8 Historically, treatment of median nerve compression with associated distal radius fractures has been controversial. Axelrod and McMurtry9 noted common complaints of median nerve compression symptoms after open reduction and internal fixation with either a dorsal or volar approach in patients with high-energy trauma and associated soft-tissue wrist injuries. Subsequent prophylactic carpal tunnel release was recommended.

Three different injury scenarios may exist with the median nerve. First, the nerve may suffer a ballistic contusion injury at the moment of impact and show diminished function thereafter. In this clinical situation, the nerve will not be aided by decompression and is expected to recover spontaneously. The second scenario is that of no apparent initial injury, but as swelling develops over hours to days the nerve becomes critically compressed. Surgical release of the transverse carpal ligament will decompress the median nerve. The third scenario is that of initial concussive injury that shows diminished function on physical examination from the outset that then masks the evolving compartment syndrome in the carpal canal. This scenario is the most dangerous and is sometimes missed, resulting in a permanent deficit. Considering the earlier-mentioned pitfalls, minimally invasive surgical decompression of the median nerve is indicated in situations in which the physical examination reveals lost nerve function to a degree that suggests permanent nerve damage may result. Determining when this threshold has been reached is difficult. Serial examinations with monofilaments are performed to quantify sensibility. The inability to perceive the 4.31-g monofilament is suggestive of significant median nerve dysfunction.

After surgery, the degree of swelling may increase the pressure on the median nerve above preoperative levels. In cases involving high-energy injuries and complicated reconstructions, it is often wise to decompress the median nerve, even when the preoperative

| TABLE 1
| Soft-Tissue Addendum Classification |
|-----------------|----------------------------------|
| Nerve           | Posttraumatic nerve compression  |
|                 | requiring urgent surgical        |
|                 | decompression and serving as the |
|                 | prime determinant of surgical    |
|                 | timing                           |
| Intrinsic       | Intrinsic ligament rupture with  |
|                 | instability requiring open or    |
|                 | arthroscopic repair with pinning |
| Extrinsic       | Extrinsic ligament rupture with  |
|                 | instability requiring open or    |
|                 | arthroscopic repair with pinning |
| Radioulnar      | Radioulnar ligament rupture with |
|                 | instability requiring open or    |
|                 | arthroscopic repair with pinning |

NOTE. Each letter would be added after the designation given for the classification of the radius fracture itself. Stratification thus allows research outcomes to more fairly reflect the magnitude of injury and give meaning to comparison between patients treated in different series by different investigators (ie, if the Fernandez classification were chosen as the base classification, a fracture with combined mechanisms and a high degree of comminution with a concomitant perilunate dislocation and radioulnar dissociation would be coded as a Fernandez type 5,I,R).
physical examination showed limited abnormalities. The endoscopic technique may be safely used and is, in fact, simpler after acute trauma than in elective cases when abundant synovitis can obscure visualization of the transverse carpal ligament fibers. Open decompression is also a viable alternative.

**Radioulnar Ligament Injury**

Perhaps one of the most poorly understood wrist ligaments is the radioulnar ligament. Previous studies have reached seemingly opposing conclusions over the importance of the dorsal and volar bundles for distal radioulnar joint stability in pronation and supination. A recent biomechanical study found that the dorsal and volar bundles of the radioulnar ligament function in concert such that each cannot be considered independently. When associated with a distal radius fracture, injuries to this ligament complex occur in 3 patterns. The ulnar styloid may fracture at its base and be carried radially with the ligament because it displaces according to movement of the sigmoid notch (most frequent). If unstable, reduction and tension band wiring around 2 K-wires (0.035 in) is an effective means of restoring stability (Fig 1). Second, the ligament may rupture in midsubstance (usually near the ulnar insertion) and show no relevant fracture fragments on radiograph. This pattern is seen on radiograph as a disruption of the radioulnar relationship. Third, the margin of the sigmoid notch may suffer a small fracture from the remainder of the radius and travel with the distal ulna (least frequent). Treatment requires restoration of the radioulnar relationship, which may include fixation of a small fracture fragment that carries the attached ligament, or direct reinsertion of the ligament to bone. If the ligament fixation is considered stable, no supplemental pinning is necessary. If unstable, pinning the radius to the ulna with 2 K-wires (0.0625 in) for 4 weeks is recommended.

**Fibrocartilage Disc Substance Tear**

Of all the soft-tissue injuries associated with distal radius fractures, tearing of the fibrocartilage disc is both the most frequently encountered and the least clinically significant. An incidence of 43% to 78% has been reported in distal radius fractures. An opportunity for early repair is lost when any of the other 4 associated ligament injuries are missed. With fibrocartilage disc tears, the treatment is debridement of the torn fibrocartilage flap, which may be performed with equal success at a later date. The injury described in this section is a Palmer type IA fibrocartilage tear (Fig 2). True Palmer type IB and ID lesions are actually radioulnar ligament injuries. Palmer type IC lesions are volar extrinsic ligament injuries.

**Volar Extrinsic Ligament Injury**

True volar extrinsic ligament injuries in association with distal radius fractures are exceedingly rare. The pattern of injury that may be more frequently encountered is a shearing pattern of fracture dislocation of the radiocarpal joint, as described by Jupiter and Fernandez. A pure fracture dislocation of the joint may appear to have taken place, however, there is usually a small volar fragment that carries the origin of one or more volar extrinsic ligaments (radioscaphocapitate, long radiolunate, short radiolunate). Direct reduction and stabilization of the small bony fragment and the associated volar ligaments re-establishes stability. Pinning across the radiocarpal joint for 4 weeks may still be a necessary adjunct to avoid subluxation or failure of fixation at the small fragment site. The same may be true for volar extrinsic ligament injuries without the associated fragment.

**Dorsal Extrinsic Ligament Injury**

The dorsal extrinsic ligaments have not received the attention of the volar extrinsics until recently. The dorsal radiocarpal ligament and dorsal intercarpal ligament may frequently be injured in association with distal radius fractures. Too often this injury is only recognized later as a shift into volar flexion of the proximal row, represented by the lunate. There may be no apparent damage to the lunotriquetral interosseous ligament or other critical wrist ligaments. When this pattern of injury is recognized, 4 weeks of radiocarpal pin stabilization may eliminate patterns of carpal shift. The dorsal extrinsic ligaments are allowed to adhere back to their anatomic site of attachment on the dorsum of the proximal carpal row, primarily the lunate distal pole and triquetrum.

**Intrinsic Ligament Injury**

Increased attention has now been given to recognizing intrinsic (scapholunate interosseous and lunotriquetral interosseous) ligament injuries and their association with distal radius fractures. The reported incidence ranges from 32% to 54%, whereas the
best treatment continues to be discussed. There is controversy over open versus arthroscopic fixation, the pattern of pin placement, and the length and type of immobilization required. The length of immobilization required to protect ligament healing may delay the intention to otherwise mobilize the wrist joint based on the fracture pattern itself.

Fracture Stabilization

The method of bone reduction and stabilization is intimately related to the status of the soft tissues. This is true both with respect to events at the time of surgery and in relation to subsequent rehabilitation efforts. Volar, fixed-angle, platform plates can neutralize the forces of displacement across the fracture site and are independent of the fracture direction or pattern. Early reports with a volar, fixed-angle device have shown less osteopenia, no loss of reduction, and greater wrist range of motion at final follow-up evaluation as compared with a similar group of patients treated with external fixation. A biomechanical study by Osada et al has shown that volar, platform-
plate systems with rigid fixed angles are significantly stronger than dorsal plate devices. Composite stability in axial compression was superior with volar platform plating when compared with dorsal plating systems. There are a number of critical concepts to understand regarding the relationship between radius fixation strategy and the soft tissues that have been discussed in detail elsewhere.  

The Role of Arthroscopy

The primary role of arthroscopy is in evaluation and stress testing of associated soft-tissue injuries followed in most cases by arthroscopic-based repairs. However, arthroscopy also has a valuable role in the treatment of the fracture itself (Fig 3). After initial plate placement, radiocarpal arthroscopy aids in the confirmation of subchondral peg/screw placement and articular reduction. The complicated and concave shapes of the lunate and scaphoid fossas of the distal radius are difficult to fully appreciate on a 2-dimensional radiograph, especially when using an image intensifier. Edwards et al reported up to 33% of simple intra-articular fractures that were treated with closed reduction and pinning under fluoroscopy to have an articular gap of greater than 1 mm with adjunct wrist arthroscopy.

Establish a Stable Foundation

A comprehensive approach to management of bone and soft-tissue injuries includes open reduction of the radius fracture through a volar approach, the performance of a carpal tunnel release when indicated, and arthroscopic evaluation and repair. Early carpal tunnel release (performed through the smallest incision possible considering safety) protects the median nerve from any subsequent pressure increase in the carpal canal that can occur with fracture manipulation or associated wrist procedures. Access to the volar radius is completed between the flexor carpi radialis and the flexor pollicis longus and through pronator quadratus. This approach creates a minimal disturbance of normal tissue architecture (especially the critical dorsal extensor fibro-osseous network) and provides excellent soft-tissue coverage over the plate at the conclusion of the surgery. All surgical steps that may need to be performed including bone grafting can be performed from the standard or extended flexor carpi radialis approach. The plate must be placed precisely at the exact proximal-to-distal location so that the fixed-angle support will be immediately under the subchondral plate. The final 10° of volar tilt usually requires a lift maneuver (Fig 4) executed by a fixed-angle plate.

FIGURE 2. (A) Fibrocartilage tear—traumatic I-A—in association with an unstable distal radius fracture. (B) A stable rim is created through debridement and shrinkage with the thermoablation probe.
to restore the joint surface orientation.\textsuperscript{16,18} It is this same maneuver that places tension into the dorsal extensor apparatus and indirectly reduces the small-commminated dorsal cortical fragments while preserving their vascularity. The anatomic specificity of reduction that can be maintained over the long term by this technique is unsurpassed. Lag screws have the ability to pull in any dorsal fragments that may be drifting away from the main volar base of stability.

\textit{Midcarpal Arthroscopy}

Arthroscopy of the recently traumatized wrist is more difficult than elective wrist arthroscopy especially in the presence of a comminuted intra-articular distal radius fracture. The details of an arthroscopic set-up that allow complex reconstructions to be performed are reviewed elsewhere.\textsuperscript{14,18} The primary goal of midcarpal arthroscopy is stress testing of the lunotriquetral interosseous

\textbf{FIGURE 3.} Volar platform plating during arthroscopy.

\textbf{FIGURE 4.} The lift maneuver when using a volar platform plating system. The distal fixed-angled screws or pegs are positioned in the subchondral bone with the plate raised off to the volar and ulnar side of the radius. The plate is then brought back to the volar cortex of the radius, correcting volar tilt and radial inclination.
ligament and the scapholunate interosseous ligament in 4 directions of distraction, diastasis, translation, and rotation (Fig 5). A grading scheme for severity that directly correlates with treatment has been proposed based on this pattern of stress testing (Table 2). Arthroscopic fixation includes 1-cm incisions in the midaxial lines to gain access to the scaphoid or triquetrum with prepositioning of 2 or 3 K-wires (0.045 in). Direct reduction is performed through the mini-open incision or arthroscopically by using a sharp-tipped probe to manipulate the proximal carpal row. The lunate is reduced and the K-wires advanced to the appropriate position (Fig 6). The wires may be bent, cut, and crimped beneath the skin for later removal.

FIGURE 5. Arthroscopic intrinsic wrist ligament testing for the scapholunate interosseous ligament and lunotriquetral interosseous ligament. (A) Diastasis stress test at the volar margin of the lunate and triquetrum. (B) Distraction ballottement test for the L-T joint. (C) Volar translation test at the L-T joint. (D) Flexion and rotation test at the L-T joint. DC, dorsal capsule; L, lunate; T, trapezium.
weeks after surgery. If the injured ligament is not reduced to the edge of the involved carpal bone on the radiocarpal view, a suture anchor placed through a mini–open incision may be needed to secure the ligament edge for optimal healing.

**Radiocarpal Arthroscopy**

Radiocarpal arthroscopy completes the assessment of the soft tissues and intra-articular fracture (Fig 7). Direct probing to test the integrity of the volar extrinsics and the fibrocartilage disc is straightforward. Volar extrinsic ligament ruptures with bone fragments require direct open fixation of the fragments. Midsubstance damage should have loose tissue edges arthroscopically debrided and, if sufficiently unstable, the radiocarpal relationship percutaneously pinned for 4 weeks. Tears of the midsubstance of the fibrocartilage disc are debrided back to a stable peripheral rim with either the motorized shaver or any one of several commercially available thermal ablation probes. Evaluation of the dorsal extrinsic attachment to the distal pole of the lunate requires more skill. The fibers of the dorsal capsule blend with the fibers of the dorsal radiocarpal ligament as it passes over the distal and dorsal pole of the lunate. When seen from the radiocarpal joint, this normal structure forms a distinct arch with a firm attachment. Disruption of this attachment allows passage of a probe into the midcarpal joint over the dorsal pole of the lunate. Excessive dynamic (and sometimes static) flexion of the lunate can be shown by stress testing with a sharp-tipped probe. If proximal row instability is confirmed, pinning across the radiocarpal joint with a single K-wire for 4 weeks will allow the dorsal extrinsic ligaments to adhere to their anatomic points of attachment on the dorsal lunate and triquetrum.

The most difficult assessment is that of the radioulnar ligament. This requires careful coordination between the primary and assistant surgeons. While viewing from the 3–4 portal and with a probe in the 6R portal, the volar and dorsal radioulnar ligament bundles are palpated while the distal radioulnar joint is stressed in translation. Final grading is based on the amplitude of translation and the tension developed in the ligaments at the maximum end point of stress. No objective criteria have yet been established to support a reproducible grading scheme (Table 3). Preoperative examination of the uninjured contralateral distal radioulnar joint is essential for setting baseline expectations regarding laxity. The pattern of damage most frequently seen (in the absence of an ulnar styloid fracture) is rupture of the ligament from the ulnar attachment. Reinsertion to the base of the fovea requires a small open approach ulnarly to prepare the fovea and create drill channels through bone. Arthroscopically placed repair sutures may then be passed into the fovea and out to the ulnar cortex. The radioulnar ligament repair may require unloading accomplished by dual 0.062-in K-wire pinning between the radius and ulna for 4 weeks. Dressings include gentle compressive gauze and below-elbow splinting with the wrist extended at least 25°.

**TABLE 2**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Diastasis</th>
<th>Average of 3 stress shift tests: distraction, translation, rotation</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Volar opening of 2.3 mm, no dorsal opening</td>
<td>Less than 10% shift</td>
<td>Partial tear does not require pin stabilization</td>
</tr>
<tr>
<td>II</td>
<td>2.3 mm or greater, both dorsally and volarly</td>
<td>Shifts between 10%-25%; A, radiocarpal view ligament reduced to normal bed; B, radiocarpal ligament free edge not reduced</td>
<td>A, Arthroscopic repair with early mobilization; B, limited, open, direct anchor repair of ligament edge</td>
</tr>
<tr>
<td>III</td>
<td>2.5 mm or greater diastasis</td>
<td>Shifts &gt;25%; A, same; B, same</td>
<td>A, Arthroscopic repair, no early mobilization owing to damaged secondary stabilizing ligaments; B, limited, open, direct anchor repair of ligament edge</td>
</tr>
</tbody>
</table>
**Alternate Procedures**

The 2 main alternatives to managing the fracture itself have particular relevance and a significant direct impact on the management of the associated soft tissues.

**External Fixation**

The majority of current external fixators use longitudinal distraction as the primary method of reduction and stabilization for the radius fracture. The term ligamentotaxis has been used to suggest that by pulling with the fixator, a reduction of the fracture fragments will occur. Most radius fractures collapse in compression dorsally and fail in tension at the volar cortex. Dorsal comminution is the rule rather than the exception. When traction is applied, it is the stout, longitudinally oriented volar ligaments and cortex that are pulled distally, not the dorsal cortex. Ligamentotaxis also fails to elevate depressed articular fragments. Follow-up studies have indicated a direct negative relationship between external fixation traction forces and duration of fixator placement with induced capsular stiffness, loss of motion, and pain.

**FIGURE 6.** (A) Prepositioning of L-T and S-L pins for Mayfield III soft-tissue injury associated with an intra-articular and unstable distal radius fracture. (B) After arthroscopic reduction of the scaphoid and lunate, the pins are advanced and the S-L and L-T joints are stabilized. (C) The carpal pins have a wide distribution for rotational control to the S-L and L-T. Note the immediate subchondral placement of fixed-angled supports when using volar platform plate systems.
scores.24,25 In addition, rehabilitation efforts are greatly impaired with the fixator in place. Significant extrinsic extensor tightness and osteopenia subsequently develop between the 2 sets of fixator pins. Radial neuralgia is also frequent with a risk for progression to a regional pain syndrome.

**Dorsal Plating**

The overwhelming tendency of radius fractures to collapse preferentially in a dorsal direction naturally led surgeons to try to support the compressed fragments from the dorsum. However, a number of specific problems have been identified. The dorsal cortex is usually highly comminuted. If the fragments are to lie under the plate, they must be stripped of their soft-tissue attachments and thus their blood supply. Most of them are too small to individually control, especially after they have lost their soft-tissue envelope. The small, comminuted dorsal fracture fragments maintain their blood supply and are controlled

![Figure 7](image)

**FIGURE 7.** (A) Arthroscopic preparation of an intra-articular distal radius fracture using a shaver and curettage. (B) Postreduction of the articular fracture lines as seen through the 4-5 arthroscopic portal.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Assistant</th>
<th>Arthroscopist</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Translation increase in amplitude v contralateral but with good endpoint</td>
<td>Tension palpable with arthroscopy probe</td>
<td>No formal stabilization required</td>
</tr>
<tr>
<td>II</td>
<td>Translation &lt;25% AP dimension of sigmoid notch</td>
<td>Tension lost in one or both bundles of RUL; A, no discernable free tissue edge of ligament; B, ruptured ligament margin palpable by probe</td>
<td>A, Pinning RU relationship for 4 weeks; B, arthroscopic repair</td>
</tr>
<tr>
<td>III</td>
<td>No endpoint, translation &gt;25% AP dimension of sigmoid notch</td>
<td>Absent tension in both bundles</td>
<td>Arthroscopic-assisted limited open repair directly to bone at ulnar fovea</td>
</tr>
</tbody>
</table>

Abbreviations: AP, anterior-posterior; RU, radioulnar ligament.
indirectly by the dorsal soft-tissue sleeve of the fibroseptated extensor apparatus. These fibroseptae and associated soft-tissue sleeves form the floor to each of the extensor compartments. Cross-sectional examination of the radius reveals unique concave longitudinal channels in the dorsal cortex of the distal metaphysis. When a plate is placed on the dorsal surface, the extensor tendons are displaced from their natural environment. The transposition of retinacular flaps to cover the plate is not capable of restoring normal anatomy. Early reports on dorsal plating found adherence, tenosynovitis, and rupture rates in up to 50% of cases. Although dorsal plating certainly offered advantages over external fixation, it introduced a number of specific problems that are inherent to the regional anatomy and biomechanics and are unlikely to be overcome by design modifications.

**Complications**

Complications fall into the categories of poor decision making and surgical technical errors. The relevant issues here are nerve injury, stiffness, instability, and arthritis. One of the most serious complications in wrist trauma comes from mismanagement of major nerves, primarily median. Experience with arthroscopy of acutely traumatized wrists is needed to avoid iatrogenic damage through extravasation. Cutaneous nerve damage is most closely related to superficial radial nerve irritation by buried K-wires used to stabilize the intrinsic ligaments. Bending and crimping the wires shields the small nerve branches from the cut end of the wire. Induction of postsurgical stiffness results from overly aggressive soft-tissue stripping during open procedures, excessive traction when using external fixators, or failure to institute and progress a well-tailored rehabilitation program. Mismanagement of ligament disruptions is also a likely error resulting in residual instability. This is avoidable with a comprehensive strategy for assessment and grading of all possible injuries followed by the appropriate management. The use of the arthroscope will minimize the development of posttraumatic arthritis by ensuring the most accurate reduction possible.

**Rehabilitation**

Therapy is started at least than 1 week after surgery for elbow and hand range of motion. The inclusion of forearm rotation and wrist motion will depend on the pattern of associated injury and method of treatment. In most cases, wrist motion is initiated during the first 2 weeks, though an orthoplast splint is used between therapy sessions. If intrinsic ligament pinning is performed, a gentle dart-thrower’s motion is allowed from the outset until pins are removed at 8 weeks. With volar or dorsal extrinsic ligament pinning, no wrist motion is allowed for 4 weeks, followed by a more gradual advancement. Forearm pins are removed at 4 weeks. At 6 weeks postoperative, a more aggressive attempt is made to restore full forearm range of motion. Protective splinting is gradually discontinued after 6 weeks. Static progressive splinting is added for major motion losses between 8 to 12 weeks. At around 3 months after surgery, an aggressive strengthening program is initiated.

**Conclusion**

Consideration must be given to recognizing and treating the associated soft-tissue injuries that often accompany radius fractures because this component of the overall injury pattern is often responsible for poor outcomes when overlooked. The current climate of early aggressive rehabilitation and greater expectations from the patients to return to near-normal function places pressure on surgeons to find reliable methods of meeting these needs with low complication rates. The incidence of soft-tissue injury associated with distal radius fractures is not truly known and continues to evolve. Further research will likely reveal that at least 1 of these 6 anatomic structures is compromised in a far greater number of cases than is currently appreciated. In addition to facilitating evaluation and manipulation of the articular surface of the distal radius, arthroscopy of the traumatized wrist plays a critical role in the assessment and repair of soft-tissue injuries. The correlation between evolving techniques in the management of the soft tissues and the more modern fixation strategies for the radius fracture itself should be documented through improved classification systems to assist in future treatment planning. Surgeons can influence the outcome for any pattern of injury by accurate restoration of the anatomy with minimal disruption of the surrounding soft tissues.
REFERENCES