

Closed-Reduction Techniques for Glenohumeral-, Patellofemoral-, and Interphalangeal-Joint Dislocations

Cynthia J. Wright, PhD, ATC*; Barbara A. Brandon, DO†; Edward J. Reisman, MD†

*Health Science Department, Whitworth University, Spokane, WA; †University of Washington School of Medicine, Spokane, WA

Joint dislocations account for a small but important portion of all athletic injuries, with most occurring at the glenohumeral, patellofemoral, and interphalangeal joints. Athletic trainers are responsible for managing acute joint-dislocation injuries, which may include performing closed-reduction techniques when appropriate. To achieve optimal patient outcomes, the clinician should be formally trained and skilled in performing various

techniques and familiar with the evidence supporting the selection of each technique. In this clinical review, we outline general reduction procedures and then summarize and synthesize the existing literature on common closed-reduction techniques for glenohumeral-, patellofemoral-, and interphalangeal-joint dislocations. When appropriate, the content has been adapted to be specific to the athletic trainer's scope of practice.

Key Points

- Multiple closed joint-reduction techniques have been reported in the literature for glenohumeral-, patellofemoral- and interphalangeal-joint dislocations.
- Joint-reduction procedures, success rates, and mean reduction times vary with different reduction techniques.
- Athletic trainers should be equipped to select the best closed joint-reduction technique for a patient's particular injury presentation and environment.

Joint dislocations account for a small (3.6%) but important portion of all athletic injuries¹ because of their potentially far-reaching effects on joint integrity, function, and overall patient outcomes.^{2,3} Certified athletic trainers (ATs) should be prepared to evaluate a joint dislocation; assess whether the patient is a candidate for an on-site reduction; and, if appropriate and permitted by their state statutes, rules, and regulations, perform a closed technique to reduce the dislocated joint.⁴

Historically, performing closed-reduction techniques has been controversial, with some prominent athletic training texts stating that closed reductions were outside the scope of practice of ATs and, thus, should be attempted only by physicians.⁵ The 2019 National Athletic Trainers' Association (NATA) position statement on the immediate management of appendicular joint dislocations⁴ clarified that joint reductions are within ATs' scope of practice and provided ATs with multiple relevant clinical and legal recommendations and guidelines. Especially important among the legal recommendations was that, whereas joint reductions may be part of the nationally recommended scope of practice, ATs should consult their state statutes, rules, and regulations. They should also verify if joint reductions are covered by their malpractice insurance.⁴

Only ATs with verifiable education, training, and competency should perform reduction techniques for joint dislocations.⁴ However, limited discipline-specific resources exist for ATs to pursue further education and training. Starting in 2020, the Commission on Accreditation of

Athletic Training Education standards include joint reductions in the curriculum⁶; however, the addition of this skill to entry-level education does not address updating currently certified clinicians. Therefore, the purpose of our clinical review was to summarize and synthesize the literature on common closed-reduction techniques for joint dislocations as a resource for current clinicians. When appropriate, clinical recommendations have been tailored to be specific to the scope of practice of ATs.

To set a manageable goal, we focused our clinical review on the 3 most commonly dislocated joints in athletes: the glenohumeral, patellofemoral, and interphalangeal joints.¹ The shoulder accounted for 55% of all joint dislocations in high school athletics, the wrist/hand/fingers for 17%, and the knee (both patellofemoral and tibiofemoral joints) for 16%.¹ These are not only the most frequently dislocated joints but also the joints most often deemed appropriate for on-the-field management.^{3,4} Relative to other dislocated joints, these 3 are considered lower risk (ie, lower probability of complications, poor patient outcomes, and legal action) and straightforward to reduce,⁶ so they provide a good starting point for ATs to develop reduction skills. We evaluated the evidence supporting the recommendations for each reduction technique using the Strength of Recommendation (SOR) Taxonomy, with ratings of A (consistent, good-quality, patient-oriented evidence), B (inconsistent or limited-quality patient-oriented evidence), and C (evidence based on consensus, usual practice, opinion, or disease-oriented evidence).⁷

RATIONALE FOR PROMPT REDUCTION VERSUS REFERRAL

Before we describe specific techniques, it is helpful to understand the rationale for and benefits of prompt reduction of a dislocated joint. One reasonable clinical question is “Why should an AT attempt an on-site reduction rather than transfer the patient for care to an emergency department or urgent care?” First, the successful relocation rate is higher with prompt reduction.⁸ Second, moderate evidence has shown improved patient comfort, joint integrity, and functional prognosis.³ Third, successful prompt reduction decreases both cost (potentially avoiding an emergency department visit) and psychological trauma to the patient.⁹ In summary, prompt reduction may be in the patient’s best interest.

However, in multiple situations, it may not be in the patient’s best interest to perform an on-site reduction. In these cases, the joint should be immobilized and the patient immediately referred (typically to an emergency department or urgent care center). Examples include situations in which an on-site reduction is contraindicated (eg, the patient displays signs of a fracture), the chance of a successful on-site reduction is low (eg, the patient is unable to follow directions because of pain), concomitant injury is present (eg, concurrent laceration, tendon rupture), or the clinician believes the probability of a poor patient outcome is high. Additionally, prerelation radiography is typically unavailable on-site in many athletic training settings but can provide important evidence in limiting the reduction risk to the patient and legal risk to the clinician. Both the AT and directing physician must be comfortable with the risk (and outline criteria in standing orders); otherwise, the AT should consider immobilizing the joint and referring the patient.

LEGAL ASSUMPTIONS

Our review was not intended to provide legal advice. It is based on 2 key assumptions. First, we assumed that reduction of a joint dislocation does not violate an AT’s state statutes, rules, and regulations. Second, we assumed that standing orders from the AT’s directing physician are in place and that the AT has demonstrated competency in performing reduction techniques for joint dislocations. Written standing orders are recommended.⁴

GENERAL REDUCTION PROCEDURES

Before we review specific reduction techniques for each joint dislocation, it is important to understand the general procedures for any reduction. These can be divided into 4 main steps: prerelation assessment, reduction, postreduction assessment, and postreduction care (Table 1). These steps are designed to ensure that ATs perform all recommended clinical actions before, during, and after a potential reduction of the joint dislocation and are based on expert recommendations.^{2,4,9}

The presence of neurovascular compromise alone does not preclude attempting a closed reduction; however, it influences the maximum number of attempts (ie, 1) and type of reduction technique (ie, gentle). Similarly, lack of access to imaging or pain management, or both, does not automatically preclude an attempt to reduce the joint

Table 1. General Joint-Reduction Procedure Checklist

Step 1: Prerelation Assessment
Verify joint dislocation is present.
Assess for signs an on-field closed reduction is contraindicated (eg, fracture).
Assess and document neurovascular integrity.
Consider preintervention imaging or pain management or both.
Obtain consent to perform reduction after discussing risks and benefits with the patient.
Step 2: Reduction
Select and perform appropriate reduction technique.
Step 3: Postreduction Reassessment
Assess and document neurovascular integrity.
Obtain postintervention imaging for all patients with first-time dislocations. Imaging for repeated dislocations depends on clinical findings and standing orders.
Step 4: Postreduction Care
Apply appropriate postreduction care, including joint immobilization in the appropriate position (eg, sling and swath for glenohumeral joint, full knee extension for patellofemoral joint).
Document all care provided.
Follow up with directing physician per standing orders.

dislocation (eg, if the patient can tolerate the procedure without pain management). If the AT deems either preintervention imaging or pain management to be necessary but lacks immediate access to it, he or she should immobilize the joint and refer the patient. A treatment algorithm based on current and previous recommendations^{4,9} is proposed in Figure 1.

Two differences between the recommendations for closed reduction by physicians and ATs must be noted. First, recommendations for physicians allow up to 2 closed-reduction attempts per injury before the reduction is considered to have failed, at which point referral to higher-level care is warranted (eg, reduction under general anesthesia, surgical reduction).^{2,3,9} The NATA’s position statement⁴ advised ATs to perform only 1 reduction attempt before referral. Second, physician recommendations contraindicate field-reduction attempts for any patient with a possible injury to an open growth plate, and caution is advised in any patient with open growth plates but no suspected growth-plate involvement. Guidance for ATs is slightly more conservative and contraindicates all on-site reductions in children (aged 6–12 years) because of the high risk of concurrent epiphyseal injury.⁴ Caution is recommended for any patient with open growth plates, and on-site reduction is contraindicated if injury to a growth plate is suspected.^{4,9} On-site differentiation between isolated dislocations and suspected fracture-dislocations or growth-plate injuries is difficult without imaging. The patient’s signs and symptoms may provide clues (Table 2). When in doubt about a possible fracture or growth-plate injury, the AT should refer the patient.

REDUCING GLENOHUMERAL-JOINT DISLOCATIONS

Indications, Contraindications, and Precautions

On-site reduction is potentially indicated for any anterior glenohumeral-joint dislocation. Anterior dislocations are by far the most common type (97% of all glenohumeral-joint dislocations).¹⁰ Reduction of posterior or inferior dislocations is contraindicated because these are associated with more complications and often cannot be reduced without

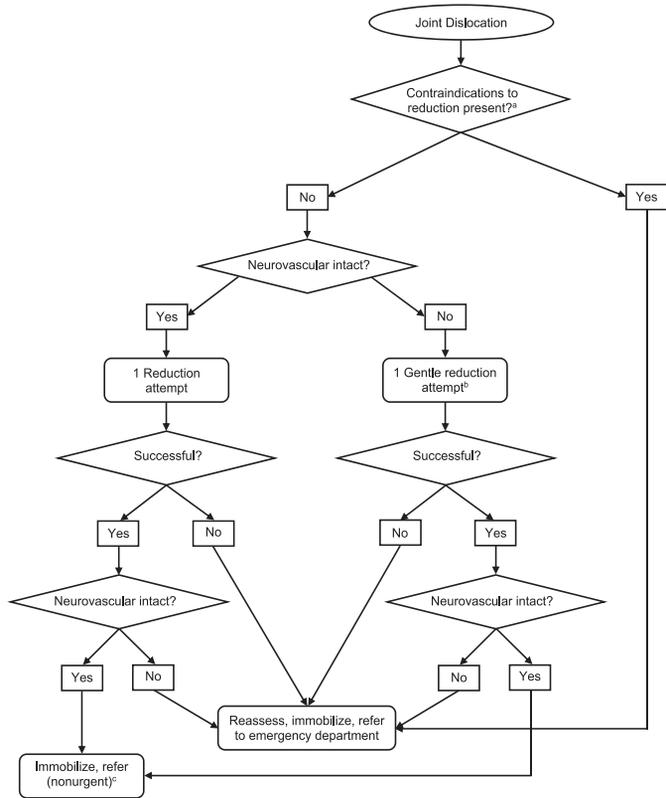


Figure 1. Proposed treatment algorithm for field reduction of a joint dislocation. ^a Common contraindications to reduction include an elderly patient, suspected open growth-plate injury, signs of fracture, a type of dislocation that is not appropriate for on-site reduction, and concomitant injury. ^b Although 1 attempt is permitted, referral should be considered if the estimated delay in care from emergency transport is short. ^c Imaging within 24 to 48 hours and physician referral within 1 week is recommended.

general anesthesia.⁶ An additional contraindication is a possible fracture of any associated bone (humerus, clavicle, or scapula; Table 2). Neurologic deficits caused by the dislocation occur in approximately 12% of patients, with the axillary nerve being affected most often.¹¹ If a neurologic deficit is present, on-site reduction is not necessarily contraindicated; however, as a precaution, only a single, gentle reduction technique should be performed.^{6,9} The presence of concomitant injury should be assessed. For example, a fractured ulna would also contraindicate the reduction of a glenohumeral-joint dislocation. One argument for using prereduction radiography is that fractures of the humeral neck may not present obvious signs or symptoms. Although associated injuries (eg, rotator cuff tear)¹² are more common, a humeral neck fracture may be displaced with reduction, leading to worse patient outcomes, such as avascular necrosis of the humeral head.¹³

Reduction Techniques for ATs

Many reduction techniques for glenohumeral-joint dislocations have been described in the literature.^{6,14,15} In their review, Dannenbaum et al¹⁴ prioritized techniques that are ideal for nonhospital reductions; therefore, we used their recommendations as a starting point for this article on the best reduction techniques for glenohumeral-joint dislocations by ATs. From this review, we selected 9 common

Table 2. On-site Differentiation Between an Isolated Joint Dislocation and a Fracture-Dislocation

Suspected Injury	Common Signs and Symptoms
Joint dislocation	Severe pain Visible joint displacement (may look like bony deformity) Palpable joint displacement Loss of joint motion or function
Joint dislocation with fracture	All of the above are possible Bony point tenderness Visible bony deformity Palpable bony deformity
Joint dislocation with growth-plate fracture	All of the above are possible Patient's age indicates open growth plates (especially children aged ≤ 12 y)

techniques based on their efficacy and applicability to typical AT environments: 3 techniques that are good options in most clinical situations, 4 techniques that are good options but have limitations, and 2 techniques to avoid. The 2 techniques to avoid were included because anecdotal evidence indicated that these techniques have been discussed and used by ATs in the past. The techniques are compared in Table 3, which lists the success rates, mean reduction times, need for an assistant or sedation, and summary recommendation.

Boss-Holzach-Matter Maneuver (Davos Technique)

Clinical Skill Performance. The Boss-Holzach-Matter maneuver is a self-reduction technique (Figure 2A). While seated, patients are instructed to apply anterior longitudinal traction to their own shoulder by grasping the wrist of the affected side with their contralateral hand, placing their hands over or around a raised knee, and then slowly leaning backward. Patients gradually increase traction by leaning farther back, relaxing their affected shoulder. If patients are apprehensive about falling backward, the clinician can provide a spotting hand near the upper back.

Advantages, Disadvantages, and Evidence. This technique has a high success rate (77%–86%)^{16,17} and the quickest relocation time (mean = 90 seconds)¹⁷ of all the reviewed techniques (Table 3). It is simple, requiring only oral instructions from the AT. It works best in young, healthy patients who are able to respond to directions, and it can be used for first-time or repeat dislocations.^{16,17} Anecdotally, the success rate has been reported as higher with repeat dislocations and lower with first-time dislocations because patient distress may impede the ability to respond to directions. More than half (57%) of failed reductions using this technique occurred in patients with conditions that reduced their ability to respond to directions (eg, dementia)¹⁶; therefore, one might reasonably expect higher success rates in a typical athletic population. Patients have been reported to experience significantly less pain than with the Spaso technique,¹⁷ and no short-term complications were seen in a randomized controlled trial of 30 patients.¹⁷ *SOR: B*

External-Rotation Maneuver

Clinical Skill Performance. The external-rotation maneuver is performed with the patient lying supine and the clinician standing on the affected side (Figure 2B). The

Table 3. Comparison of 9 Reduction Techniques for Glenohumeral-Joint Dislocations

Technique Name	Success Rate After 2 Attempts (Unless Otherwise Specified)	Mean Reduction Time	Assistant Needed?	Sedation Needed?	Summary Recommendation
Boss-Holzach-Matter maneuver (Davos technique)	77%–86% ^{16,17}	90 s (range, 5–600 s) ¹⁷	No	No	A good option for ATs in most patient-care scenarios
External-rotation maneuver	61% For first attempt ¹⁸	Anecdotal: 5–10 min ¹⁵	No	No	A good option for ATs in most patient-care scenarios
Spaso technique	67% Without sedation ¹⁷ 88% With sedation ¹⁹	1.8–4.8 min ^{17,20}	Yes or no	Yes or no	A good option for ATs in most patient-care scenarios
Traction-countertraction (Matsen technique)	73%–100% ^{20,21}	4.7–7.8 min ^{20,21}	Yes	Preferred	A good option for ATs but may not be appropriate for certain scenarios, depending on the patient presentation, clinician expertise, and available equipment
Scapular manipulation	79%–96% ^{18,22–24} 9% Lower success rate without sedation (79% without sedation versus 88% with sedation) ²⁴	2.4–6.1 min ^{23,25}	Yes or no	No	A good option for ATs but may not be appropriate for certain scenarios, depending on the patient presentation, clinician expertise, or available equipment
Stimson technique	28% For first attempt ²⁶ 96% With scapular manipulation ²³	8.8 min ²⁶ Anecdotal: 15–20 min ¹⁵	No	Preferred	A good option for ATs but may not be appropriate for certain scenarios, depending on the patient presentation, clinician expertise, and available equipment
Fast, Reliable, and Safe (FARES) method	88.7% Without sedation ²⁷	2.4 (standard deviation = 1.2) min ²⁷	No	No	A good option for ATs but may not be appropriate for certain scenarios, depending on the patient presentation, clinician expertise, or available equipment
Eskimo technique	74% ²⁸	Not reported	No	No	Should be avoided by ATs; better alternatives exist
Hippocratic method (heel-to-axilla method)	72.5% Without sedation ²⁷	5.4 (standard deviation = 1.9) min ²⁷	No	Preferred	Should be avoided by ATs; better alternatives exist

Abbreviation: AT, athletic trainer.

affected shoulder is positioned in adduction and internal rotation, with the elbow bent to 90°. The clinician applies light inferior longitudinal traction to the humerus with the hand placed near the elbow while externally rotating the shoulder with the other hand placed near the wrist. When resistance is met or patient discomfort is too high, the clinician pauses and waits for the muscles to adjust and relax and then continues external rotation. A “clunk” is typically felt with relocation. Care should be taken postreduction when internally rotating the shoulder while immobilizing it to avoid redislocation.

Advantages, Disadvantages, and Evidence. This technique has an acceptable first-attempt success rate (61%)¹⁸ and relatively long relocation time (anecdotally reported at 5–10 minutes¹⁵; Table 3). Evidence for the second-attempt success rate is lacking in the literature, which limits comparison with other techniques.¹⁸ It is less technical for the clinician to perform, requiring minimal clinician exertion. It is slow and gentle, with gravity assisting the external rotation, so it is typically considered acceptable for patients with neurovascular compromise. *SOR: B*

Spaso Technique

Clinical Skill Performance. The Spaso technique is performed with the patient lying supine and 1 or 2 clinicians standing near the affected shoulder (Figure 2C).

The 2-clinician technique is preferred. The primary clinician brings the affected shoulder to 90° of forward flexion; then he or she applies anterior longitudinal traction and an external-rotation force. If available, an assistant applies a stabilizing force to the patient’s clavicle to prevent the primary clinician from lifting the patient’s torso off a table.

Advantages, Disadvantages, and Evidence. This technique has an acceptable success rate (67%–88%)^{17,19} and relatively short relocation time (1.8–4.8 minutes^{17,20}; Table 3). As with most techniques, its success rate is higher when the patient is sedated,¹⁹ but it can be performed without sedation.¹⁷ Although it can be performed by a single clinician, an assistant is helpful. It is faster than the external-rotation maneuver, and no short-term complications occurred in a randomized controlled trial involving 30 patients.¹⁷ The technique is relatively simple but requires more clinician exertion (sustained traction forces against gravity) than some other techniques. *SOR: B*

Traction-Countertraction (Matsen Technique)

Clinical Skill Performance. The traction-countertraction technique is performed with the patient lying supine, preferably on a table (Figure 2D). Two clinicians are required. The first clinician positions the affected shoulder in 90° of shoulder abduction, 90° of elbow flexion, and



Figure 2. Recommended reduction techniques for glenohumeral-joint dislocations. A, Boss-Holzach-Matter maneuver (Davos technique). B, External-rotation maneuver. C, Spaso technique. D, Traction-countertraction (Matsen technique). E, Scapular-manipulation technique with 1 clinician. F, Scapular-manipulation technique with 2 clinicians. G, Stimson technique. H, Beginning, and I, end of the Fast, Reliable, and Safe (FARES) technique.

neutral rotation. Traction is applied along the line of the abducted humerus, typically using a strap or sheeting attached just distal to the bent elbow and secured around the clinician's torso. The second clinician secures a stabilizing strap or sheeting around the patient's torso (just inferior to the axilla) and his or her own torso and applies countertraction in the opposite direction. High levels of opposing traction forces should be maintained until visible or audible reduction of the dislocated joint occurs.

Advantages, Disadvantages, and Evidence. This technique has the highest published success rate (73%–100%)^{20,21} and a moderate-to-long relocation time (4.7–7.8 minutes^{20,21}; Table 3). Given its high success rate, physicians commonly use it for their second reduction attempt when the first attempt using a gentler technique fails.^{6,21} Given that the NATA has recommended a single reduction attempt for ATs,⁴ how that restriction will affect ATs' decision making regarding this highly effective but rough and painful technique is unknown. Disadvantages are that it is more painful than several other techniques,^{20,21} is physically demanding of multiple clinicians, and requires equipment (straps or sheeting). This technique is not gentle and thus should not be used for patients with neurovascular compromise or in significant distress.^{6,9} Additionally, secondary injury can occur from the force of the strap on the torso or arm; therefore, sheeting is preferred if available. The clinician should consult with the supervising physician about whether the benefits outweigh the risks of a single attempt at this technique in on-site settings. *SOR: B*

Scapular Manipulation

Clinical Skill Performance. The scapular-manipulation technique can be performed by 1 or 2 clinicians with the patient seated or prone (Figure 2E and F). Rather than the primary joint manipulation coming from repositioning the humerus on the scapula, the humerus is held steady while the clinician attempts to rotate the scapula. The primary clinician applies medial and superior pressure to the inferior angle of the scapula and downward pressure to the lateral aspect of the spine of the scapula. If a second clinician is available, he or she stabilizes the anterior shoulder, brings the affected shoulder to 90° of forward flexion, and applies light to moderate anterior longitudinal traction on the humerus. If the patient is prone, the affected shoulder is positioned so the arm hangs off the edge of a table in 90° of forward flexion, allowing gravity to provide traction.

Advantages, Disadvantages, and Evidence. This technique has one of the highest published success rates (79%–96%^{18,22–24}) and a moderate reduction time (2.4–6.1 minutes^{23,25}; Table 3). The technique is gentle, uses low forces, and has no known complications.^{6,22} It was less painful than the external-rotation maneuver¹⁸ and required no sedation in 90% of patients.²² However, a disadvantage is that reduction can be subtle and easy to miss. Therefore, clinician expertise is needed to perform it competently. The ability to perform it with the patient seated (assistant applies traction) or prone (gravity provides traction) gives the clinician 2 good options depending on the clinical situation. *SOR: B*

Stimson Technique

Clinical Skill Performance. The Stimson technique is performed with the patient lying prone on a table (Figure 2G). The patient is positioned so that the affected shoulder hangs off the side of the table in 90° of forward flexion. A 5- to 15-lb (2.25- to 6.75-kg) weight is attached to the wrist so that it does not cause neurovascular compromise (ie, the patient should not actively hold the weight). If any concern exists about the patient sliding off the side of the table, a stabilizing strap should be placed around his or her torso. After positioning the patient, the AT should monitor him or her and encourage muscle relaxation. Some researchers²³ have advocated for performing this technique concurrently with the prone scapular-manipulation technique (described earlier).

Advantages, Disadvantages, and Evidence. Evidence for the success rate of this technique is limited and variable. Amar et al²⁶ reported a 28% first-attempt success rate, whereas Kothari and Dronen,²³ who combined the Stimson and scapular-manipulation techniques, observed a 96% success rate. The time to reduction is relatively long: at least 8.8 minutes,²⁶ with anecdotal descriptions of 15 to 20 minutes (Table 3).¹⁵ This technique is commonly performed with the patient under sedation or analgesia because the long duration to reduction is quite painful. If pain management is unavailable, the AT should consider whether the patient might better tolerate another technique. The primary advantage is that it is easy to perform, requiring minimal clinician skill or exertion. Disadvantages include the relatively long time to reduction; prolonged prone positioning, which can be difficult for patients who are overweight, are elderly, or have difficulty breathing; and necessity of equipment (table, weight, strap to stabilize the patient). Lastly, if the table is not high enough, patients with long arms may be unable to achieve the necessary traction. *SOR: B*

Fast, Reliable, and Safe (FARES) Method

Clinical Skill Performance. The Fast, Reliable, and Safe (FARES) method is performed with the patient lying supine, the shoulder fully adducted, and the elbow straight (Figure 2H and I). The clinician applies longitudinal traction (grasping the wrist and hand) while performing small oscillating movements up and down and slowly abducts the shoulder. Reduction most commonly occurs at the end range of shoulder abduction (approximately 170°).

Advantages, Disadvantages, and Evidence. The FARES method has a high success rate (88.7% without sedation) and relatively quick time to reduction (mean = 2.4 minutes).²⁷ It was faster and less painful than 2 comparison techniques, and no complications were reported in initial research.²⁷ The primary disadvantage is the complicated nature of the technique, requiring a greater level of clinician expertise and familiarity with the technique to use it successfully. *SOR: B*

Eskimo Technique

Clinical Skill Performance. The Eskimo technique is performed with the patient side-lying on the unaffected side (Figure 3A). The clinician stands behind the patient, bringing the affected shoulder to 90° of abduction and



Figure 3. Reduction techniques for glenohumeral-joint dislocations that should be avoided. **A,** Eskimo technique. **B,** Hippocratic method (heel-to-axilla method).

applying longitudinal traction along the humerus. The traction force is strong and may lift the patient from the ground or table.

Advantages, Disadvantages, and Evidence. Use of this field-reduction technique is not recommended for ATs.⁶ It has a moderate success rate (74%),²⁸ and the reduction time has not been reported in the literature (Table 3). This technique may cause complications, such as stretching trauma to neurovascular structures.⁶ It requires intense physical exertion because the clinician performing the relocation must lift and hold the patient's body weight. Little evidence is available to support its use, and multiple sources^{6,14} have described it as a technique acceptable only for use in wilderness medicine or other extreme situations in which more effective and safe techniques are unfeasible and simply waiting for a referral is not an option. *SOR: C*

Hippocratic Method (Heel-to-Axilla Method)

Clinical Skill Performance. The Hippocratic method is performed with the patient lying supine, preferably on the ground (Figure 3B). The clinician stands on the affected side, bracing the patient to the ground by planting his or her foot in the patient's axilla and applying longitudinal traction on the affected limb at approximately 60° of forward flexion.

Advantages, Disadvantages, and Evidence. This field-reduction technique is not recommended for ATs. It has a moderate success rate (72.5% without sedation) and moderate reduction time (mean = 5.4 minutes; Table 3).²⁷ The Hippocratic method is the oldest documented reduction technique for glenohumeral-joint dislocation, harkening back to its namesake. A number of researchers^{6,14} have cited increased risks of humerus fracture and brachial plexus damage. Clinical use of this technique has been supplanted by safer and more effective alternatives. *SOR: B*

Clinical Bottom Line for Reducing Glenohumeral-Joint Dislocations

Multiple safe and effective reduction techniques for glenohumeral-joint dislocations have been reported in the literature,^{6,14,15} and many clinicians have anecdotally reported using modifications that have not been described in the literature. Given the individual nature of injuries, the technique that works the best in one scenario may not be the best choice in another. Evidence for each technique

ranges from moderate to weak (*SOR B* or *C*), with few randomized controlled trials and most research limited to reductions performed in a hospital setting. Researchers should investigate the safest and most effective on-site techniques. With their directing physicians, ATs should discuss preferences for specific joint-reduction techniques that are appropriate for their anticipated patient population and setting and include this information in standing orders.

REDUCING PATELLOFEMORAL-JOINT DISLOCATIONS

Indications, Contraindications, and Precautions

On-site reduction is potentially indicated for any lateral dislocation of the patellofemoral joint. Other dislocations (eg, medial, superior, or intra-articular) are less common, and on-site reduction of these injuries is not recommended^{2,3} because they often require operative reduction. Reduction is also contraindicated if any signs of patellar, tibial, or femoral fracture are present (Table 2) or if concomitant injuries that would interfere with the efficacy or safety of the reduction attempt (eg, knee dislocation, patellar tendon rupture) are present.

Reduction Technique

Clinical Skill Performance. Reduction of a patellofemoral-joint dislocation is performed with the patient lying supine or seated on a table, preferably with the torso inclined to promote slight hip flexion (Figure 4). The knee is typically fixed in a flexed position, with the patella visible lateral to the joint line. The clinician should gently extend the knee while applying medial pressure to the lateral border of the patella. If 2 clinicians are present (preferred technique), 1 clinician applies pressure to the patella while the other extends the knee. The clinician should expect hamstring-muscle guarding that resists knee extension and adopt appropriate body mechanics to overcome this force without clinician fatigue. Reduction should occur before the knee approaches full extension. If the dislocated joint does not easily reduce, the reduction attempt should be stopped because this is a sign of possible fracture.² Sedation is typically unnecessary, and reduction will greatly alleviate the patient's pain.

Advantages, Disadvantages, and Evidence. No original research evaluating the success rate or mean reduction time



Figure 4. Reduction technique for patellofemoral-joint dislocation with a single clinician. **A,** Starting position. **B,** Ending position.

of this technique is available, possibly because only 1 technique has been documented in the literature^{6,29} and, thus, comparative research is not needed. This is considered a relatively low-risk reduction because no complications arising from gentle attempts at reducing patellofemoral-joint dislocations have been reported.⁶ Anecdotally, the reduction time is typically quite short (1–2 minutes), and the success rate is very high (>90%). All evidence regarding this technique is based on expert opinion.^{6,29} *SOR: C*

Clinical Bottom Line for Reducing Patellofemoral-Joint Dislocations

Athletic trainers should gain proficiency in the reduction technique for patellofemoral-joint dislocations. Researchers should document its success rate and mean reduction time and compare patient-oriented outcomes between immediate and delayed reduction.

REDUCING INTERPHALANGEAL-JOINT DISLOCATIONS

Indications, Contraindications, and Precautions

On-site reduction is potentially indicated for dislocation of the proximal interphalangeal joint or distal interphalangeal joint. Given the increased potential for litigation associated with treating the first interphalangeal joint (thumb) compared with other interphalangeal joints, some would argue that on-site reduction of this joint should be avoided, but no consensus exists. On-site reduction of the metacarpophalangeal joint is also not typically recommended.³ Reduction is contraindicated if the clinician suspects a fracture (Table 2), which is commonly associated with this injury and may be missed in the absence of imaging. Additional concomitant injuries, such as a tendon rupture, may contraindicate on-site reduction. Rings should be removed before reduction; if rings interfere, an on-site reduction may not be possible. Any disruption that may interfere with fine-motor function could have lifelong consequences for the patient, and the clinician should consider referral to a hand specialist.^{6,30} For example, an inability to actively extend the proximal interphalangeal joint after reduction suggests a central slip

rupture, which may progress to a boutonnière deformity.^{31,32}

The AT should be knowledgeable about the most common types of finger dislocations and precautions for each type. Proximal interphalangeal joint dislocations are more frequent than distal interphalangeal joint dislocations. Dorsal dislocations, in which the distal segment is displaced dorsally, occur more often than volar or lateral dislocations and were reported to be the least complicated.^{2,3} Volar dislocations have a high incidence of soft tissue interposition that blocks reduction.^{31,33} Lateral dislocations typically display gross instability because of collateral ligament damage.³² Isolated distal interphalangeal joint dislocations are rare and usually associated with a fracture or skin lacerations (or both).^{30,34}

Exaggeration Method

Clinical Skill Performance. The exaggeration method is performed by first stabilizing the phalange proximal to the dislocated joint and then grasping the dislocated segment (Figure 5). The clinician applies slight longitudinal traction and force to exaggerate the dislocation (eg, a dorsal dislocation is hyperextended) and then applies force to the base of the dislocated segment in the direction opposite the dislocation (eg, a dorsal dislocation is pushed in a volar direction). If the attempt is successful, reduction should be visible.

Advantages, Disadvantages, and Evidence. The success rate and mean reduction time of this technique have not been evaluated in original research; evidence is based on expert opinion.^{6,31,32} Although often considered a “simple” reduction, success rates are not 100% and patients may require referral. *SOR: C*

Traction Method

Clinical Skill Performance. The traction method is performed by stabilizing the phalange proximal to the dislocated joint and then grasping the dislocated segment (Figure 5). The clinician applies axial traction to the dislocated segment while simultaneously pushing the bone in the direction opposite the dislocation (eg, for a dorsal dislocation, the clinician pushes from the dorsal side in a volar direction). Reduction should be visible if the attempt is successful.

Advantages, Disadvantages, and Evidence. The success rate and mean reduction time of this technique have not been evaluated in original research; evidence is based on expert opinion.^{6,30} Although often considered a “simple” reduction, success rates are not 100%, especially with volar dislocations, which may involve entrapment of the volar plate.^{31,33} *SOR: C*

Unique Aspects of Interphalangeal-Joint Postreduction Care

Despite their reputation as innocuous injuries, interphalangeal-joint dislocations can substantially affect fine-motor function. After an interphalangeal-joint reduction, the AT should assess full active range of motion, observe for normal joint mechanics, and stress test the collateral ligaments.^{31,32} A second dislocation of the affected joint that occurs during range-of-motion assessment is a

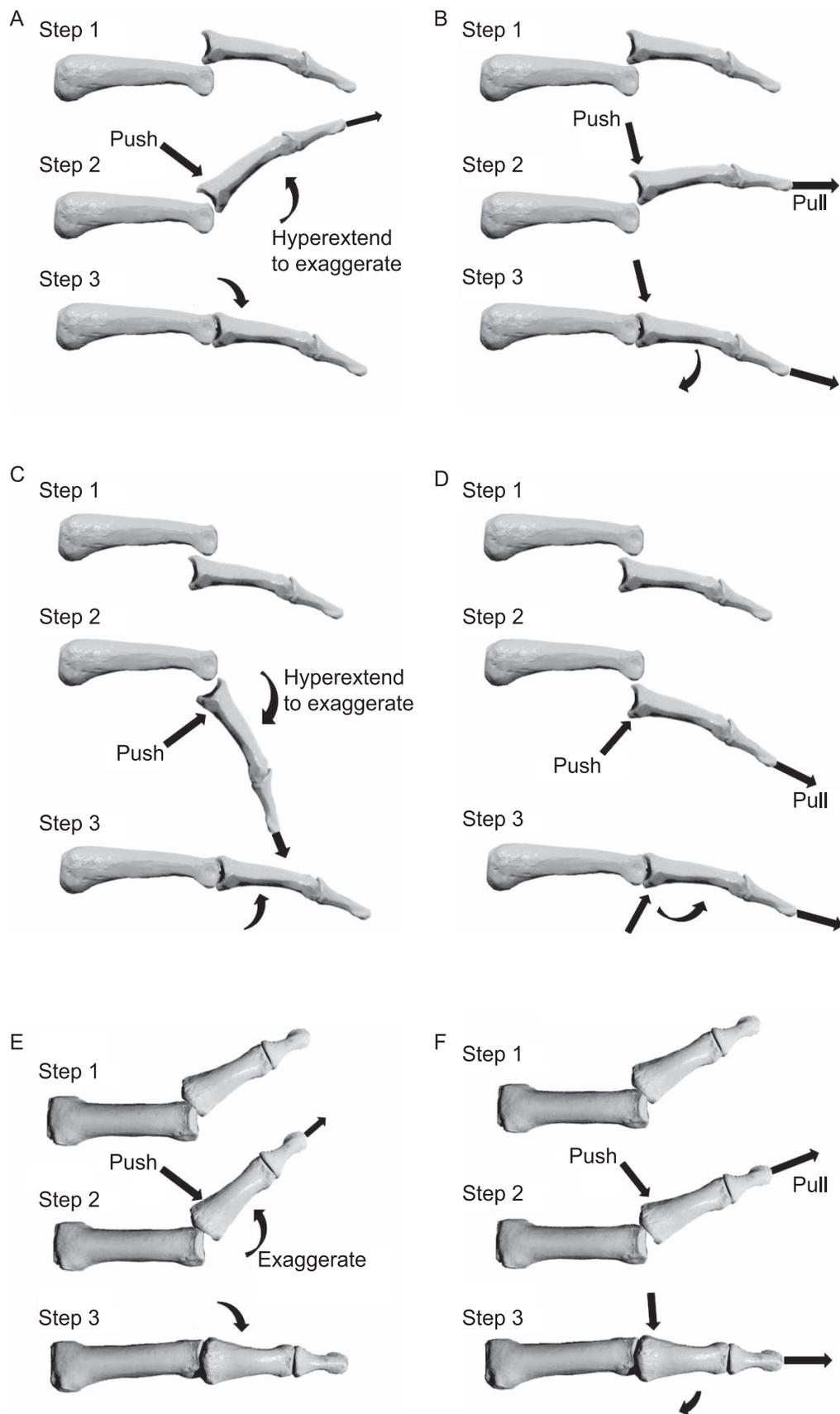


Figure 5. Reduction techniques for dorsal (lateral view), volar (lateral view), and lateral (superior view) dislocation of the interphalangeal joint. A, Exaggeration, and B, traction methods for dorsal dislocation. C, Exaggeration, and D, traction methods for volar dislocation. E, Exaggeration, and F, traction methods for lateral dislocation.

common sign of fracture. Do not attempt to rereduce it. Immobilize the joint and refer the patient. Imaging is highly recommended (typically within 24–48 hours) because of the potential for small fractures or changes in joint shape or congruence, which may have long-term implications for fine-motor function.^{6,32}

Clinical Bottom Line for Reducing Interphalangeal-Joint Dislocations

Two main reduction techniques for interphalangeal-joint dislocations have been described in the literature. Some experts have recommended the exaggeration method,^{31,32} whereas others have recommended the traction method³⁰ or have presented both methods as clinically appropriate options.⁶ No empirical research evidence is available to support one over the other, but anecdotally, the exaggeration method is preferred. Overall, the level of evidence is weak (SOR: C). Athletic trainers should use whichever technique aligns with their standing orders, the clinical scenario, and their own expertise.

CONCLUSIONS

Athletic trainers responsible for managing acute joint dislocations should be knowledgeable about and skilled in performing closed reductions of glenohumeral-, patellofemoral-, and interphalangeal-joint dislocations. If permitted by standing orders from the directing physician, ATs should perform reductions using appropriate general procedures and a treatment algorithm. Given that multiple acceptable techniques have been reported in the literature, clinicians should be familiar with the advantages and disadvantages of various techniques, selecting the technique that is likely to achieve a positive patient outcome in each scenario.

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Address correspondence to Cynthia J. Wright, PhD, ATC, Health Science Department, Whitworth University, 300 West Hawthorne Road, Spokane, WA 99251. Address e-mail to cwright@whitworth.edu.