Managing Anterior Shoulder Instability With Bracing: An Expanded Update

Bryan L. Reuss, MD; Warren G. Harding III, MD; Kevin D. Nowicki, MD

This article provides an updated report on functional bracing for anterior shoulder instability. A classification of shoulder braces is reintroduced into three separate types. Type A braces limit shoulder motion to a “safe zone,” whereas types B and C apply indirect and direct stabilizing forces to the joint, respectively. Thirteen of the most widely available braces were surveyed and the parameters of comfort, convenience, construction, cost, potential sport use, and special features were analyzed. Problem areas included poor fit and range of motion restriction. The system of classifying sports based on shoulder demands is reintroduced.

Shoulder instability is a common complaint among patients, with anterior shoulder instability representing 95% of cases. The shoulder allows more range of motion than any other joint in the body and is susceptible to injury. Static and dynamic restraints and a negative intra-articular pressure provide stability for the shoulder. Static restraints include the glenoid, labrum, glenohumeral ligaments, and joint capsule whereas the dynamic restraints are represented by the rotator cuff and scapular muscles. It has been shown that certain structures become more responsible for limiting anterior dislocation at different humeral positions. The inferior glenohumeral ligament provides the greatest restraint to dislocation. Because the inferior glenohumeral ligament is under the most stress at 90° of abduction with external rotation and extension, it is reasonable to assume that restricting this position would benefit a patient with instability.

An abundance of articles exist on the treatment of anterior shoulder instability including surgical indications, open versus arthroscopic technique, and rehabilitation issues. The role of functional bracing for anterior shoulder instability is rarely found in the literature.

This article discusses indications for functional bracing and reintroduces a system of classifying sports based on shoulder demands. In addition, 13 braces are listed with some insight provided into how they may work to counteract instability. In the 6 years since the original article was published, the authors are unaware of any articles published on shoulder bracing.

MANAGEMENT OF SHOULDER INSTABILITY

In general, anterior shoulder instability management has been controversial. The real issue for patients is not the initial shoulder dislocation, but the recurrent anterior instability following the sentinel event. This recurrent instability has been reported to be >90% in individuals aged <20 years and 40% in those aged 20-40 years. In addition to age, the patient’s activity level also predicted recurrent instability, with 82% of athletes suffering recurrent instability compared to only 30% of nonathletes. Recurrent instability approached 100% in those athletes choosing to return to collision sports.

The most likely pathologic reason for recurrent instability is the Bankart lesion, which is a capsulolabral detachment from the anterior glenoid rim and neck. A Bankart lesion has been reported to occur in up to 97% of anterior shoulder dislocations. Surgical repair of the Bankart lesion through an open or arthroscopic technique has shown excellent results in treating recurrent instability.

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the postoperative rehabilitation is restrictive and usually season-ending for the athlete. Injuries to athletes in mid-season or to an older patient participating infrequently in noncontact sports may be an indication for a more conservative approach. Some active patients are not medically cleared for or refuse surgical intervention. Functional bracing may be indicated for this patient population.

**Indications for Bracing**

Functional bracing may control pain, provide stability, and enhance the performance of the shoulder. A brace can protect a previous injury or surgical repair. It can also postpone or avoid the need for surgery. In addition, it is useful for placing specific limits on the patient’s range of motion. As mentioned previously, a brace may also offer an alternative for patients who, by virtue of age or concomitant illness, are poor candidates for surgery. Bracing provides the additional advantage of being cost-efficient. A brace is prescribed for use during activities that cause instability to be clinically evident.

**Brace Types**

The ideal brace stabilizes the shoulder, allowing full range of motion without impeding function. An inexpensive, comfortable, durable, and easy-to-use brace is also ideal.

Currently available braces reviewed in this article decrease anterior instability via three categories of action (Figure 1). Type A braces limit the shoulder to a “safe-zone.” Restriction of excessive abduction, extension, and external rotation may be indicated for patients with more severe instability. Type B braces apply an indirect stabilizing force to the shoulder whereas type C braces provide a direct force.

Problem areas can be predicted based on brace type. Type A braces can over-restrict motion whereas types B and C can hamper athletic function by interfering with respiration, scapulothoracic motion, or muscular excursion.

**Which Brace for Which Athlete?**

Overhead upper extremity activities were categorized based on skill, force, and range of motion requirements (Table 1). These are to be used as guidelines only as overlap exists between sport types. The

<table>
<thead>
<tr>
<th>Type</th>
<th>Functional Description</th>
<th>Athlete</th>
<th>Forces on Shoulder</th>
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<tbody>
<tr>
<td>I</td>
<td>Skilled overhead use, full ROM required</td>
<td>Thrower, swimmer, racket sports player, golfer</td>
<td>Overhead use, primarily acceleration and repetitive motion</td>
</tr>
<tr>
<td>II</td>
<td>Skilled overhead use (non-throwers), full ROM required</td>
<td>Wide receiver, basketball rebounder, volleyball blocker, gymnast</td>
<td>Overhead use, primarily deceleration</td>
</tr>
<tr>
<td>IIIA</td>
<td>High-impact forces, full ROM required</td>
<td>Linebacker, defensive lineman, soccer goalkeeper</td>
<td>Direct blow or strain placed on shoulder</td>
</tr>
<tr>
<td>IIIB</td>
<td>High-impact forces, full ROM not required</td>
<td>Hockey defense, offensive lineman, soccer striker, water sports</td>
<td>Direct blow or strain placed on shoulder</td>
</tr>
</tbody>
</table>

Abbreviation: ROM=range of motion.
<table>
<thead>
<tr>
<th>Name (Supplier/ Telephone/Cost)</th>
<th>Brace Type</th>
<th>Comfort, Cosmesis, Ease of Application</th>
<th>Construction/ Adjustment</th>
<th>Special Features</th>
<th>Potential Sport Use (Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acro Comfort (Otto Bock; 800-328-4050; $56)</td>
<td>B, C</td>
<td>Comfortable, cosmetically pleasing, requires no assistance to apply</td>
<td>Polyester; hook and loop fastener for direct humeral head force in AP or axial direction</td>
<td>Contains “Phase Change Materials” for temperature control, washable</td>
<td>I, II, IIIA, IIIIB</td>
</tr>
<tr>
<td>Cadlow Shoulder Stabilizer (DM Systems; 800-254-5438; $240)</td>
<td>A*</td>
<td>Comfortable, cosmetically pleasing, requires no assistance to apply, initial assembly is time consuming, requires McDavid compression shorts that hook into brace</td>
<td>Canvas straps with felt padding and adjustable bungee cords attached to arm strap; McDavid compression shorts attach to brace via hooks</td>
<td>Uses series of adjustable bungee cords to maintain shoulder in safe-zone (dynamically); allows increased ROM by using lower tension bungee cords, shorts prevent brace migration; washable</td>
<td>I, II, IIIA, IIIIB</td>
</tr>
<tr>
<td>Curtis Shoulder Cuff (EBI Medical Systems; 800-326-2579; $108)</td>
<td>A</td>
<td>Comfortable, requires no assistance to apply</td>
<td>Neoprene/hook and loop fastener with adjustable canvas straps</td>
<td>Static type A brace, washable</td>
<td>IIIB</td>
</tr>
<tr>
<td>Duke Wyre Shoulder Vest (CD Denison Orthopedics; 410-235-9645; $84.80)</td>
<td>A</td>
<td>Satisfactory, requires minimal assistance at first application</td>
<td>Canvas, leather with adjustable shoestrings to statically control abduction and extension but not external rotation</td>
<td>Static type A brace, dry clean only</td>
<td>IIIB</td>
</tr>
<tr>
<td>OmoTrain (Bauerfeind; 800-423-3405; $149.95)</td>
<td>B</td>
<td>Comfortable, cosmetically pleasing, requires no assistance to apply</td>
<td>Bi-elastic knitted support, elastic straps through plastic loops for adjustment</td>
<td>Allows full ROM with minimal ability to restrict motion/stabilize; washable</td>
<td>I, II, IIIA, IIIIB</td>
</tr>
<tr>
<td>Shoulder Controller (Professional’s Choice; 800-331-9421; $131.50)</td>
<td>C</td>
<td>Comfortable, cosmetically pleasing, requires no assistance to apply</td>
<td>Neoprene/spandex with elastic and hook and loop fastener to adjust direct, dynamic–anterior or posterior humeral head force</td>
<td>Allows full ROM, compression straps allow for pads/ice packs to be placed, washable</td>
<td>I, II, IIIA, IIIIB</td>
</tr>
<tr>
<td>Shoulder Stability Brace (Medco; 800-556-3326; cost NA as brace is still in premarket stage)</td>
<td>B, C</td>
<td>Comfortable, cosmetically pleasing, requires minimal assistance to apply</td>
<td>Neoprene with adjustable elastic hook and loop fastener</td>
<td>Can be used on either shoulder, both anterior and posterior direct humeral head compression along with type B support in abduction and extension; washable; limited instructions due to new/non-marketed product</td>
<td>I, II, IIIA, IIIIB</td>
</tr>
<tr>
<td>Shoulder Stabilizer (Breg; 800-321-0607; $285)</td>
<td>A</td>
<td>Comfortable, cosmetically pleasing, requires minimal assistance to apply</td>
<td>Neoprene/hook and loop fastener with adjustable canvas straps through plastic loops for static abduction and extension control</td>
<td>Static type A brace, washable</td>
<td>IIIB</td>
</tr>
<tr>
<td>SAWA/Shoulder Stabilizer (Donjoy; 800-336-6569; $134.10)</td>
<td>A, C*</td>
<td>Comfortable, cosmetically pleasing, requires no assistance to apply</td>
<td>Polyester/Lycra with adjustable hook and loop fastener for static type A restriction in extension, external rotation or abduction</td>
<td>Adjustable rigid control, axillary rigid control provides direct humeral head compression or AC compression for AC separations, can be used on either shoulder, washable</td>
<td>II, IIIA, IIIIB</td>
</tr>
</tbody>
</table>

Note: Prices may vary. Please contact manufacturer for accurate pricing. Abbreviation: ROM=range of motion.

*Dynamic.
†Secondary.
§Minimal.

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### TABLE 2B

<table>
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<tr>
<th>Name (Supplier/Telephone/Cost)</th>
<th>Brace Type</th>
<th>Comfort, Cosmesis, Ease of Application</th>
<th>Construction/Adjustment</th>
<th>Special Features</th>
<th>Potential Sport Use (Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder Subluxator Inhibitor (SS) (Boston Brace International; 800-262-2235; $390)</td>
<td>A</td>
<td>Satisfactory, requires minimal assistance to apply, requires initial assembly with Loctite tool for proper fit</td>
<td>Rigid polyethylene, elastic straps with buckle adjustment, custom fit</td>
<td>Allows full ROM or can be adjusted to limit abduction and extension, rigid polyethylene may be beneficial in contact sports</td>
<td>II, IIIA, IIIB</td>
</tr>
<tr>
<td>Simply Stable Shoulder Brace (Seattle Systems; 800-248-6463; $68.30)</td>
<td>A*</td>
<td>Comfortable, requires no assistance to apply, sternal plate can be compressive on large chested individuals</td>
<td>Neoprene/hook and loop fastener adjustable strap</td>
<td>Can be attached directly to shoulder pads instead of sternal plate harness, can be used on either shoulder, washable</td>
<td>II, IIIA, IIIIB</td>
</tr>
<tr>
<td>Sully (Saunders Group; 800-778-1864; $149.99)</td>
<td>A, B†</td>
<td>Comfortable, cosmetically pleasing, requires no assistance to apply</td>
<td>Neoprene with adjustable elastic hook and loop fastener</td>
<td>ROM can be restricted in abduction; allows full external rotation and extension, washable</td>
<td>I, II, IIIA, IIIB</td>
</tr>
<tr>
<td>Universal Shoulder Support (McDavid Sports/Medical; 800-237-0254; $31.40)</td>
<td>B, C‡</td>
<td>Comfortable, cosmetically pleasing, requires minimal assistance to apply</td>
<td>Neoprene with accessory hook and loop fastener to restrict either anterior or posterior instability through type B brace support</td>
<td>Pocket over shoulder can be used to insert pad for direct compression (minimal type C support, or ice pack, washable</td>
<td>I, II, IIIA, IIIIB</td>
</tr>
</tbody>
</table>

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athlete's age, arm dominance, skill, and position should be acknowledged as well. Considerations for the athlete's requirements should guide the selection of the most appropriate brace (Table 2).

**HOW DO BRACES COMPARE?**

The most familiar and commonly used braces on the market today were reviewed. Researching the field extensively, 13 braces were included in the survey. This was a subjective assessment without scientifically testing brace function. A male and a female athlete were used for brace application. The braces were analyzed for containment method, construction, comfort, cosmesis, convenience of application, and cost ("the six C’s"). The results of the review are summarized in Table 2.

Several areas of concern were noted. Some braces were difficult to apply and others sacrificed comfort for function. Some brace materials were moisture or heat intolerant (Neoprene braces) or not washable. A few of the braces had fitting issues, which become important when considering female athletes or people who are particularly large or small. Problems with inadequate control of shoulder motion leading to an ineffective brace were also encountered.

**CONCLUSION**

Although specific recommendations for brace use cannot be made through this study, guidelines for brace selection are

In young athletes, traumatic anterior shoulder instability is associated with a Bankart lesion 97% of the time.

In patients aged <24 years, 90% of those treated nonoperatively will have recurrent instability.

Athletes have a dislocation risk that is three times that of a nonathlete.

For the midseason athlete who is waiting for surgical treatment following the season or for the patient who is declining surgery, numerous options for bracing the shoulder are available.

Thirteen braces are reviewed and their features, which are pertinent to the athlete, are outlined.
Figure 2: Shoulder bracing algorithm.

REFERENCES