Spondylolysis
To Brace or Not To Brace
AMSSM 2014
Disclosures

- Nothing to Disclose
To Brace?

• Goals of Treatment

• History/ Literature of Bracing

• Mechanics of Bracing

• Benefits to Brace. Earlier to return to sport?
Goals of Treatment

- Pain Relief / Clinical Healing
- Radiographic Healing?
- Reduce Recurrence
- Minimize long range complications - spinal stenosis?
- Return to sport. Same level?
- Time Loss from sport?
Acknowledgement.

Points of agreement?

• Rest/ activity modification/cessation of pain provoking activity.
  • Duration? 3-6 months? Less?

• Core Strengthening/ Hamstring Flexibility

• Most “Clinically” do well.

• Long term sequela - Minimal.
• “To date, there have not been any controlled trials assessing bracing as a treatment for spondylolysis or spondylolisthesis. However, there are studies that support bracing in the setting of acute pars fracture”.

• “…treatment with brace support is most often applicable to the skeletally immature athlete.”

• “bracing in the adult athlete is of limited utility and is typically reserved only for those recreational athletes who are highly symptomatic.”
Studies/ Reviews that cite Brace Treatment

- 1980’s Micheli
- 1980 AJSM
- 1985 Spine
- 1985 Orthotics and Prosthetics
Studies/ Reviews that cite Brace Treatment


• 2001:10 European Spine Journal. Sys, et al. Nonoperative treatment of active spondylolysis in elite athletes with normal X-ray findings:
Studies/ Reviews that cite Brace Treatment


- 2008:9(2) ISMJ Wicker. FIMS Statement. Spondylolysis and spondylolisthesis in sports.
Studies/ Reviews that cite Brace Treatment


• 2010:92(6) JBJS-B Tsirikos & Garrido. Spondylolysis and Spondylolisthesis in Children and Adolescents


Spondylolysis is a relatively common incidental radiographic finding that, most frequently, is asymptomatic. Isthmic spondylolysis with a lesion in the pars interarticularis may be a significant cause of pain in a given individual, particularly in adolescent athletes involved in sports with repetitive spinal motions. The pars lesion likely represents a stress fracture of the bone caused by the cumulative effect of repetitive stress imposed by physical activity. The lesion frequently presents as focal LBP and can often be identified on plain radiography. Advanced imaging with SPECT, CT, and MR imaging may be needed to ascertain the acuity of the lesion, assist in identifying a particular pars lesion as potentially symptomatic, and to exclude other spinal pathology that may be present. Conservative treatment is usually successful in controlling symptoms and restoring function; only a small percentage of patients require surgical intervention for pain or progressive spondylolisthesis. Based on current evidence, treatment requires activity restriction (i.e., temporary discontinuation of the aggravating sport or activity) and may require bracing to achieve treatment goals, although healing, pain relief or both may occur without brace application. A full understanding of spinal biomechanics and pathophysiology, the role of diagnostic imaging, and treatment options is needed to care for these patients.

PMID: 11092019
[PubMed - indexed for MEDLINE]
“BRACES DO NOT RESTRICT MOTION”
Articles Frequently Cited as evidence bracing DOES NOT inhibit motion.


Evidence to support NO BENEFIT?

- 1992 Orthopaedic Review, Miller
- x-ray study.
  - 7 patients with listhesis
  - 7 volunteers
- Average age - 37
Evidence to support NO BENEFIT?

  - “Tantalum indicators” were implanted at time of surgery - in the sacrum; and the most proximal vertebra fused.
  - Exam comparisons - supine and erect x-ray exams.
  - NO erect Active Motions performed!!
  - Results: decrease the overall load on the lumbar spine…but no stabilizing effect on the intervertebral mobility…. 

![Image](https://via.placeholder.com/150)
Is this “Evidence” Applicable to Athletic use of Brace?

• Can this postop study apply. Negate any possible brace effect in an active athlete?
  • Cohort differences?
    • Post op patients; Listhesis cases.
    • Mobility comparisons? Supine to Erect vs. Active motion of Sport
    • Age (the younger athlete, participating in sport, and due to greater flexibility, is more likely to extend spine SIGNIFICANTLY more than these postop adults. Thereby a brace will probably restrict at least some of the extreme extension of sport).
  • Authors comment: “In the current investigation the inter individual variation in mobility as demonstrated by RSA with and without lumbar support was considerable. This might imply that patient characteristics are more important than corset characteristics in spinal immobilization…”
Can These Studies Apply to the Active Athlete??
Braces CAN restrict Motion

UltraLign provided greater spinal restriction on ROM in all three trunk movements. ProLign LO offered less restriction on the lumbar movements compared to UltraLign LSO, but was still effective in the reduction of lumbar intervertebral segmental mobility compared to the no-brace trials.
Journal of Back and Musculoskeletal Rehabilitation
Zhang, et al 2006

Fig. 1. The setup of the reflective wands and marks on the trunk for the sagittal (A) and posterior (B) views.

Table 2
Segmental ROMs for the examined segments during trunk extension: means ± standard deviation

<table>
<thead>
<tr>
<th>Device</th>
<th>L5-S1</th>
<th>T12-L1</th>
<th>C7-T1</th>
<th>Lumbar angle</th>
<th>Thoracic angle</th>
<th>Hip extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Brace</td>
<td>6.7 ± 7.0</td>
<td>17.1 ± 6.2</td>
<td>39.7 ± 9.1</td>
<td>15.9 ± 8.6</td>
<td>37.9 ± 15.5</td>
<td>7.1 ± 4.2</td>
</tr>
<tr>
<td>ProLign</td>
<td>4.6 ± 10.6</td>
<td>14.2 ± 5.2</td>
<td>33.7 ± 9.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>19.2 ± 6.2</td>
<td>38.3 ± 11.6</td>
<td>4.5 ± 2.6&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>UltraLign</td>
<td>4.5 ± 11.6</td>
<td>9.2 ± 5.9&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>28.0 ± 11.4&lt;sup&gt;a&lt;/sup&gt;</td>
<td>13.2 ± 8.6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>31.9 ± 13.9</td>
<td>3.6 ± 2.8&lt;sup&gt;a,b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Braces

- Most Studies of Spine Movement by Braces are intended to assess effect on fracture management at levels higher than L5-S1.

- These studies HAVE NOT been designed to assess restriction of spine movement during active athletic movement.

  - Mechanical restriction

  - “Reminder” restriction


Studies/ Reviews Questioning Brace Effectiveness for Bone Healing


Studies/ Reviews Questioning Brace Effectiveness for Bone Healing

• Publication liberties???


• In this 2009 meta-analysis, the authors cite a 2006 publication by Sairyo. In the text the authors state “the use of a corset was discontinued in later studies by the same group…”

• BUT, Sairyo’s publication on the use of MRI states, “The conservative treatment involved asking the patient to stop any sporting activity and to wear a thoracolumbosacral-type trunk brace”

• THERE IS NO MENTION of “..corset was discontinued..” in Sairyo’s article as was stated by Klein in the 2009 article.
Multiple Variables Affect Outcomes

Significant factors which affect union following conservative treatment of pars defects of the lumbar spine in 134 children.

- Local factors
  - Stage of defect
  - Vertebral level
  - Stage of Contralateral defect
  - Location of defect (L5) - Near Pedicle vs. Isthmus

- Lumbosacral factors
  - Lumbar lordosis angle (L5 early stage)
  - Lumbar inclination angle (early and progressive stage)
- Systemic factors
  - Chronological age (L4 progressive stage)
Is the benefit of bracing Earlier Return to Sport?


• 73 athletes used Boston Brace 6.9 +/- 3.1 months
  • 85% compliance with brace.

• Return to sport in 4-6 weeks.
  • ? lose less muscle mass.
Summary

- Rest/ Activity Modification is Cornerstone of Treatment.

- No Randomized Clinical Trials

- Old and Recent Literature suggest bracing.

- Studies suggesting brace does not restrict MAY NOT apply to sport use.
  - Mechanical AND “Reminder” Effect.
Summary

- Bracing MAY allow earlier return to sport without compromising outcomes - clinical or radiographic.
  - Timing may significantly influence an athlete’s sport progression.
- The Act of Intervening “engages” patient and parents in a treatment plan.
- Compliance with Brace vs. Compliance with Rest?
- No physical risks/ Modest expense.