

STABILIZES:

- Fractures or Osteotomies Following Thoracotomy Procedure
- Costochondral Junction Fractures
- Traumatic Chest Wall Injuries
- Reconstructive Procedures of the Thorax



BioBridge®

RESORBABLE CHEST WALL STABILIZATION PLATE

ACUTE Innovations® is committed to providing surgeons and their patients with innovative solutions to challenging thoracic procedures.

ACUTE's BioBridge® Resorbable Chest Wall Stabilization Plate is the only resorbable plate specifically designed with the chest wall in mind. The plate's polylactide acid blend offers strength that exceeds typical chest wall loading and a resorption time that outlasts typical bone healing time.

Maintains strength through normal bone healing time

Fully resorbs within 18-24 months

18 holes to accommodate multiple suture patterns

Trim using any OR shears

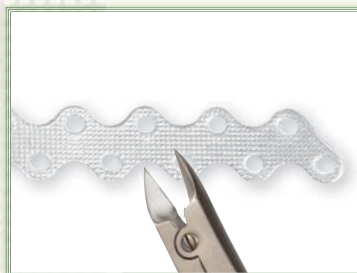
Sterile packed

Textured for easy handling and visibility

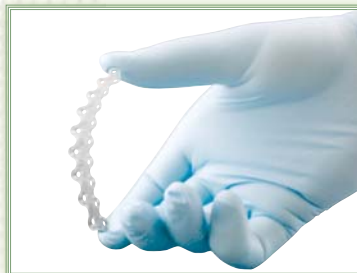
110mm long, 14mm wide



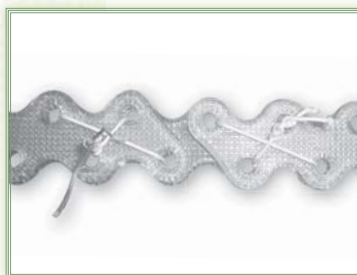
VERSATILE NON-PERMANENT SOLUTION



Trim easily for any application



Flexible to match the curvature of the chest wall



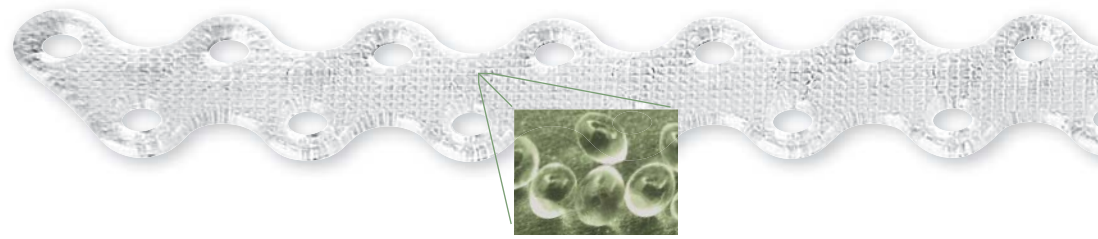
Stack plates to add length and rigidity

Figure A

GENERAL INDICATIONS

In the presence of appropriate additional immobilization or fixation, indicated for maintaining the alignment and fixation of bone fractures, osteotomies, arthrodeses or bone grafts, and maintenance of relative position of weak bony tissue (e.g., bone grafts, bone graft substitutes, or bone fragments from comminuted fractures), in trauma and reconstructive procedures of the thorax.

ADVANTAGES OF THE BIOBRIDGE TECHNOLOGY:



RESORBABLE

The BioBridge plate material is the optimal combination of strength and resorption time. The mixture of 70% L-lactide and 30% DL-lactide is fully metabolized within 18-24 months through hydrolysis.

The BioBridge plate maintains stability for 6 months, exceeding typical healing time while it slowly shifts load from the plate to the bone. Slower degradation time may also lessen risks associated with traditional metal implants.

REDUCE RISK OF:

- Interference if re-do surgeries are warranted
- Removals due to metal sensitivity
- Long term complications such as stress shielding or implant migration

SEMI-RIGID FIXATION

A modern misconception of resorbable plates is that they are unable to handle the strength of anatomical loading. The BioBridge plate was specifically designed to withstand the forces of the chest wall while allowing a semi-rigid fixation, thus promoting bone regeneration. Testing has shown that the strength of the BioBridge plate exceeds biological approximations of rib loading in coughing by over three times and in breathing by over nine times (fig. B).

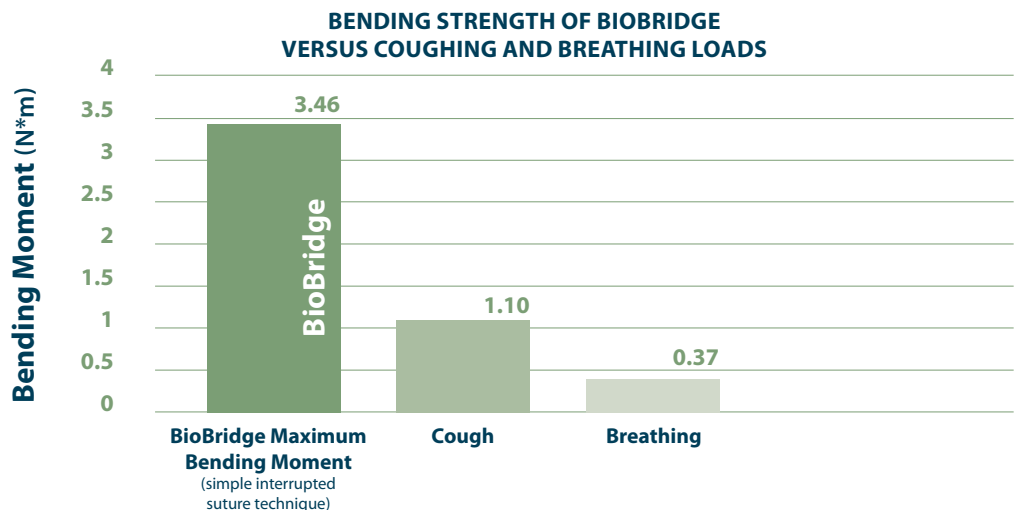


Figure B

A single BioBridge plate was installed using a simple interrupted suture technique on a fractured rib model then loaded until failure occurred. The coughing and breathing forces were extrapolated from Pai et al study in the Journal of Biomechanical Engineering.¹ Rib geometry and orientation as reported by Wilson^{2,3} were then used to translate the forces into bending moments.

PROCEDURES

THORACOTOMY

The BioBridge Resorbable Chest Wall Stabilization Plate is the ideal versatile, non-permanent solution for internal stabilization of an osteotomy or iatrogenic fracture during thoracotomy procedures.

A considerable amount of resources are spent treating Post Thoracotomy Pain Syndrome (PTPS) which affects approximately 50% of patients, of which about 30% may still experience pain 4-5 years post-op.⁴ An osteotomy or accidental fracture of the ribs during thoracotomy has been associated with post thoracotomy pain.⁵

INCREASE POSITIVE POST-OP OUTCOMES

Preliminary results from a pilot study at George Washington University showed that using the BioBridge Plate after thoracotomy significantly reduced pain scores and narcotic use.

Control: One compression suture bridging the osteotomy.

BioBridge Chest Wall Stabilization Plate: Two plates, cut then sandwiched over the osteotomy using a compression suture (fig. C).

10 patients were in each study group.

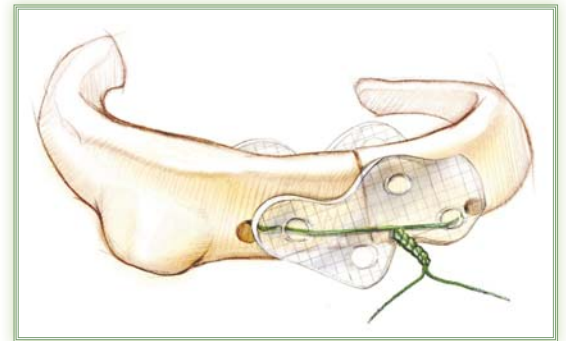


Figure C
Posterior Osteotomy Stabilization

Results

Mean Postoperative Likert Pain Score:

	Day 1	Day 14	Day 30
Control	7	4	2
BioBridge	5	2	1

$p < 0.05$

Mean Postoperative Narcotic Use:

Control	161 +/- 8 Pills
BioBridge	50 +/- 3 Pills

$p < 0.05$

Figure D

VERSATILE NON-PERMANENT SOLUTIONS FOR MULTIPLE THORACIC PROCEDURES

PECTUS REPAIR

The BioBridge plates can be used as a non-permanent strut during modified Ravitch procedures instead of using suture alone.

Multiple plates can be stacked (fig. A) and sutured together to add length and rigidity. The construct is placed on the posterior aspect of the sternum and is anchored to the anterior side of the ribs on both sides.

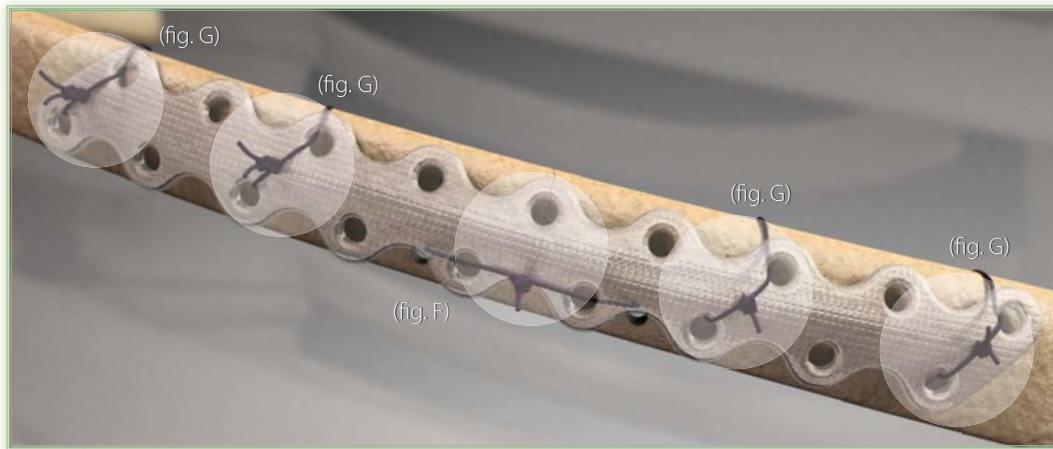
COSTOCHONDRAL JUNCTION REPAIR

Fractured cartilage caused by trauma or during thoracotomy are typically challenging to repair and require extended healing time. Immobilizing the fracture with stability and compression may help to reduce pain associated with movement, healing time and non-union formation (fig. E).



Figure E

PLATE INSTALLATION TECHNIQUE



RECOMMENDED CONSTRUCT:

Compression suture (fig. F) and four simple interrupted sutures (fig. G).



Figure F: Compression Suture

Compression Suture:

The most important feature of the compression suture (fig. F) is the placement of the rib holes. Notice how the holes on the ribs are off center from the holes on the plate. Use a suture retriever to aid when passing suture from the posterior aspect of the rib to the anterior side.



Figure G: Simple Interrupted Suture

Simple Interrupted Suture:

The simple interrupted suture (fig. G) passes through the superior plate hole and wraps superiorly over the rib, then passes through the inferior hole of the bone and plate.

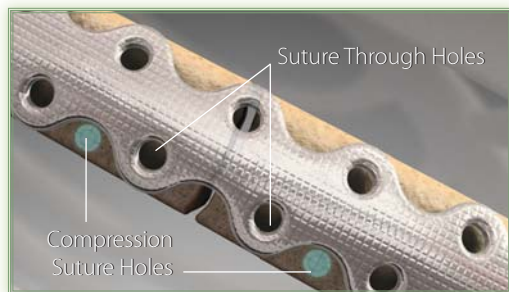


Figure H

The key to creating compression is drilling the rib holes off center from the plates holes (fig. H).

Note: A tight suture is key to ensuring a stable construct.

For more detailed information on the BioBridge installation technique, contact your local representative to request instructional videos.

PRE-OP LIST:

CONSIDERATIONS

Surgeon and OR staff should have an installation plan before surgery. Ensure the OR is equipped with all required and recommended instrumentation.

REQUIRED

- **Suture:** A braided polyester or nylon, USP 2, 3, 4 or 5 is recommended.

RECOMMENDED

- **2.7mm drill bit and small orthopedic power drill:** Drilling through the bone avoids the neurovascular bundle and improves stability
- **Maleable:** Place behind the rib while drilling
- **Hemostatic clamp:** Holds suture ends in place before tying
- **Bone or towel clamps:** To approximate the fracture and hold the plate in place while drilling and passing sutures.
- **Suture retriever:** Feeds suture posterioranteriorly through the plate and bone
- **OR shears with a sharp profile:** To resize the plate's length

NOTES

- When using a suture retriever, select a drill bit with 2.7mm diameter to accommodate the diameter of the retriever.
- Contact ACUTE Innovations to request a sterile packaged drill bit, or use the drill bit from the RibLoc® Rib Fracture Plating System tray.
- If a suture retriever is not available, or if the rib is soft enough, a cutting needle may be used to push the suture through the rib.

KEYS TO SUCCESS

- Create an installation plan before the surgery to ensure the proper instrumentation is prepared and available for the OR.
- Use a large (USP 2-5) non-absorbable suture to ensure the construct holds strength throughout typical bone healing time.
- To create compression, drill offset holes using the plate as a template (fig. H).
- Use a suture retriever to ease installation.
- Make sure all sutures are passed before tying them off.
- If any sutures loosen while tying the other sutures, re-tie them or add additional sutures for stability.



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Distributed by:

- (1) Pai, Shruti, Raymond M. Dunn, Russell Babbitt, Heather M. Strom, Janice F. Lalikos, George D. Pins, and Kristen L. Billiar. 2008. Characterization of Forces on the Sternal Midline Following Median Sternotomy in a Porcine Model. *Journal of Biomechanical Engineering* 130, no. 5: 051004.
- (2) Wilson, T. A., K. Rehder, S. Krayer, E. A. Hoffman, C. G. Whitney, and J. R. Rodarte. 1987. Geometry and respiratory displacement of human ribs. *Journal of Applied Physiology* 62, no. 5 (May 1): 1872-1877.
- (3) Wilson, Theodore A, Alexandre Legrand, Pierre-Alain Geveno, and André De Troyer. 2001. Respiratory effects of the external and internal intercostal muscles in humans. *The Journal of Physiology* 530, no. 2: 319-330.
- (4) Karmakar MK, Ho AM. Postthoracotomy pain syndrome. *Thorac Surg Clin.* 2004 Aug;14(3):345-52.
- (5) Alex G. Little, MD, Walter H. Merrill, MD. 2011. Complications in Cardiothoracic Surgery: Avoidance and Treatment.



Contact ACUTE Innovations about our other chest wall stabilization products.
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