

# Protocol

## Ultrasound Accelerated Fracture Healing Device

(10105)

<b>Medical Benefit</b>		<b>Effective Date:</b> 01/01/18	<b>Next Review Date:</b> 09/20
<b>Preauthorization</b>	Yes	<b>Review Dates:</b> 09/07, 09/08, 09/09, 05/10, 05/11, 01/12, 01/13, 01/14, 01/15, 01/16, 01/17, 09/17, 09/18, 09/19	

### **Preauthorization is required.**

*The following protocol contains medical necessity criteria that apply for this service. The criteria are also applicable to services provided in the local Medicare Advantage operating area for those members, unless separate Medicare Advantage criteria are indicated. If the criteria are not met, reimbursement will be denied and the patient cannot be billed. Please note that payment for covered services is subject to eligibility and the limitations noted in the patient's contract at the time the services are rendered.*

Populations	Interventions	Comparators	Outcomes
Individuals: • With fresh fractures (surgically managed and nonsurgically managed)	Interventions of interest are: • Low-intensity pulsed ultrasound as an adjunct to routine care	Comparators of interest are: • Routine care without low-intensity pulsed ultrasound	Relevant outcomes include: • Symptoms • Morbid events • Functional outcomes • Quality of life
Individuals: • With fracture nonunion or delayed union fractures	Interventions of interest are: • Low-intensity pulsed ultrasound as an adjunct to routine care including surgery, if appropriate	Comparators of interest are: • Routine care including surgery, if appropriate, without low-intensity pulsed ultrasound	Relevant outcomes include: • Symptoms • Morbid events • Functional outcomes • Quality of life
Individuals: • With stress fractures, osteotomy sites, or distraction osteogenesis	Interventions of interest are: • Low-intensity pulsed ultrasound as an adjunct to routine care	Comparators of interest are: • Routine care without low-intensity pulsed ultrasound	Relevant outcomes include: • Symptoms • Morbid events • Functional outcomes • Quality of life

### **DESCRIPTION**

Low-intensity pulsed ultrasound (LIPUS) has been investigated as a technique to accelerate healing of fresh fractures, surgically treated closed fractures, delayed unions, nonunions, stress fractures, osteotomy sites, and distraction osteogenesis. LIPUS is administered using a transducer applied to the skin surface overlying the fracture site.

### **SUMMARY OF EVIDENCE**

For individuals who have fresh fractures (surgically or nonsurgically managed) who receive LIPUS as an adjunct to routine care, the evidence includes randomized controlled trials (RCTs) and several meta-analyses. Relevant outcomes are symptoms, morbid events, functional outcomes, and quality of life. The evidence base has recently evolved with the publication of a large RCT and meta-analysis significantly shifting the weight of the evidence. Conclusions based on several earlier and small RCTs, rated at high-risk of bias, showed a potential benefit of

LIPUS; however, the large RCT published in 2016, rated at low-risk of bias, showed no benefit. A 2017 meta-analysis including only trials with low-risk of bias found no difference in days to full weight bearing, pain reduction, or days to radiographic healing. Similarly, the overall results of the meta-analysis found no significant difference in return to work, subsequent operations, or adverse events. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have fracture nonunion or delayed union fracture who receive LIPUS as an adjunct to routine care including surgery, if appropriate, the evidence includes only lower quality studies consisting of a small systematic review in scaphoid nonunions, a meta-analysis of nonunion in various locations, two low-quality RCTs, and one observational comparative study. Relevant outcomes are symptoms, morbid events, functional outcomes, and quality of life. Of the two RCTs, one did not include functional outcomes. The second RCT had a small sample size and did not describe the randomization procedure. The observational study reported similar healing rates with LIPUS and surgery, although the retrospective nature of the study, limits meaningful interpretation of these results. Additionally, the evidence base on the use of LIPUS in the management of fresh fractures has evolved as described above, and there is no demonstrated physiologic mechanism suggesting differential results of LIPUS in fracture nonunion or delayed union. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have stress fractures, osteotomy sites, or distraction osteogenesis who receive LIPUS as an adjunct to routine care, the evidence includes only lower quality studies consisting of small RCTs and one meta-analysis for distraction osteogenesis. Relevant outcomes are symptoms, morbid events, functional outcomes, and quality of life. Results do not generally include functional outcomes and results across various outcomes, primarily time to radiographic healing, are inconsistent. The meta-analysis of three trials using LIPUS for distraction osteogenesis reported no statistically significant differences in physiological or functional outcomes. Additionally, the evidence base on the use of LIPUS in the management of fresh fractures has evolved as described above and there is no demonstrated physiologic mechanism suggesting differential results of LIPUS in stress fractures, osteotomy sites, or distraction osteogenesis. The evidence is insufficient to determine the effects of the technology on health outcomes.

## POLICY

Low-intensity pulsed ultrasound may be considered **not medically necessary** as a treatment of fresh fractures (surgically managed or nonsurgically managed).

Low-intensity pulsed ultrasound may be considered **not medically necessary** as a treatment of fracture nonunion and delayed union fractures.

Low-intensity pulsed ultrasound may be considered **not medically necessary** as a treatment of stress fractures, osteotomy, and distraction osteogenesis.

## POLICY GUIDELINES

### FRESH (ACUTE) FRACTURES

There is no standard definition for a “fresh” fracture. A fracture is most commonly defined as fresh for seven days after the fracture occurs (Heckman et al, 1994; Kristiansen et al, 1997; Emami et al, 1999), but there is definitional variability. For example, one study defined fresh as less than five days after fracture (Lubbert et al, 2008), while another defined fresh as up to ten days postfracture (Mayr et al. [Does low intensity, pulsed ultrasound speed healing of scaphoid fractures?] [German]. *Handchir Mikrochir Plast Chir.* Mar 2000;32(2):115-122). Most fresh closed fractures heal without complications using standard fracture care (i.e., closed reduction and cast immobilization).

## Nonunion

There is no consensus on the definition of nonunions. One definition is a failure of progression of fracture-healing for at least three consecutive months (and at least six months postfracture) accompanied by clinical symptoms of delayed/nonunion (pain, difficulty weight bearing; Buza & Einhorn, 2016).

The definition of nonunion used in the U.S. Food and Drug Administration (FDA) labeling suggests that nonunion is considered established when the fracture site shows no visibly progressive signs of healing, without providing guidance on the timeframe of observation. The following patient selection criteria are consistent with those proposed for electrical stimulation as a treatment of nonunions (see the Electrical Bone Growth Stimulation of the Appendicular Skeleton Protocol):

- At least three months have passed since the date of the fracture, AND
- serial radiographs have confirmed that no progressive signs of healing have occurred, AND
- the fracture gap is one cm or less, AND
- the patient can be adequately immobilized and, based on age, is likely to comply with nonweight bearing.

## Delayed union

Delayed union is defined as a decelerating healing process as determined by serial radiographs, together with a lack of clinical and radiologic evidence of union, bony continuity, or bone reaction at the fracture site for no less than three months from the index injury or the most recent intervention.

## MEDICARE ADVANTAGE

For Medicare Advantage ultrasonic osteogenic stimulators are **medically necessary** for the treatment of non-union fractures prior to surgical intervention or after a failed surgical intervention. A nonunion fracture is demonstrated by:

- A minimum of two sets of radiographs, obtained prior to starting treatment with the osteogenic stimulator, separated by a minimum of 90 days. Each radiograph set must include multiple views of the fracture site accompanied with a written interpretation by a physician stating that there has been no clinically significant evidence of fracture healing between the two sets of radiographs.

It is **not medically necessary** to use ultrasonic osteogenic stimulators concurrently with other non-invasive osteogenic devices.

Ultrasonic osteogenic stimulators for fresh fractures and delayed unions, and fractures of the skull, vertebrae or related to a tumor are **not medically necessary**.

## BACKGROUND

### BONE FRACTURES

An estimated 7.9 million fractures occur annually in the United States. Most bone fractures heal spontaneously over several months following standard fracture care (closed reduction if necessary, followed by immobilization with casting or splinting). However, approximately 5% to 10% of all fractures have delayed healing, resulting in continued morbidity and increased utilization of health care services.<sup>1</sup> Factors contributing to a nonunion include which bone is fractured, fracture site, the degree of bone loss, time since injury, the extent of soft tissue injury, and patient factors (e.g., smoking, diabetes, systemic disease).<sup>1</sup>

## Fracture Nonunion

There is no standard definition of a fracture nonunion.<sup>2</sup> The Food and Drug Administration has defined nonunion as when “a minimum of nine months has elapsed since injury, and the fracture site shows no visibly progressive signs of healing for a minimum of three months.” Other definitions cite three to six months of time from the original injury, or simply when serial radiographs fail to show any further healing. These definitions do not reflect the underlying conditions in fractures that affect healing, such as the degree of soft tissue damage, alignment of the bone fragments, vascularity, and quality of the underlying bone stock.

## Delayed Union

Delayed union is generally considered a failure to heal between three and nine months post fracture, after which the fracture site would be considered a nonunion. The delayed union may also be defined as a decelerating bone healing process, as identified in serial radiographs. (In contrast, nonunion serial radiographs show no evidence of healing.) It is important to include both radiographic and clinical criteria to determine fracture healing status. Clinical criteria include the lack of ability to bear weight, fracture pain, and tenderness on palpation.

## Treatment

Low-intensity pulsed ultrasound (LIPUS) has been proposed to accelerate healing of fractures. LIPUS is believed to alter the molecular and cellular mechanisms involved in each stage of the healing process (inflammation, soft callus formation, hard callus formation, and bone remodeling). The mechanism of action at the cellular level is not precisely known, but it is theorized that LIPUS may stimulate the production or the activities of the following compounds that contribute to the bone healing process: cyclooxygenase-2, collagenase, integrin proteins, calcium, chondroblasts, mesenchymal cells, fibroblasts, and osteoblasts.

LIPUS treatment is self-administered, once daily for 20 minutes, until the fracture has healed, usually for five months.

## REGULATORY STATUS

In 1994, the Sonic Accelerated Fracture Healing System (SAFHS®; renamed Exogen 2000® and since 2006, Exogen 4000+; Bioventus) was approved by the U.S. Food and Drug Administration through the premarket approval process for treatment of fresh, closed, posteriorly displaced distal radius (Colles) fractures and fresh, closed, or grade I open tibial diaphysis fractures in skeletally mature individuals when these fractures are orthopedically managed by closed reduction and cast immobilization. In February 2000, the labeled indication was expanded to include the treatment of established nonunions, excluding skull and vertebra. Food and Drug Administration product code: LPQ.

## RELATED PROTOCOLS

Electrical Bone Growth Stimulation of the Appendicular Skeleton

Electrical Stimulation of the Spine as an Adjunct to Spinal Fusion Procedures

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Services that are the subject of a clinical trial do not meet our Technology Assessment Protocol criteria and are considered investigational. *For explanation of experimental and investigational, please refer to the Technology Assessment Protocol.*

It is expected that only appropriate and medically necessary services will be rendered. We reserve the right to conduct prepayment and postpayment reviews to assess the medical appropriateness of the above-referenced procedures. **Some of this protocol may not pertain to the patients you provide care to, as it may relate to products that are not available in your geographic area.**

## REFERENCES

We are not responsible for the continuing viability of web site addresses that may be listed in any references below.

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