The EXOGEN device provides non-invasive therapy for healing non-unions and delays and non-unions. The EXOGEN Ultrasound Bone Healing System consists of a single operating unit, gel bottle and stop. The main operating unit provides the treatment control circuit, the primary battery supply, and monitors the operation of the transducer at the fracture site. The signal specifications are as follows:

**Indications**

EXOGEN Ultrasound Bone Healing System is indicated for:

- The non-invasive treatment of established non-unions excluding skull and vertebral.

**Contraindications**

There are no known contraindications to the use of this device.

**Warnings**

The safety and effectiveness of this device has not been established for:

- Infections post-reduction displacement of more than 50%.
- Pathological fractures due to bone pathology or malignancy.
- Patients with an active pacemaker.
- Patients with thrombophlebitis, varicose insufficiency or abnormal limb function.
- Patients with any metal implants, including internal, external or antibiotic prophylaxis, metal or cauterization, except for the purposes of the bone healing process.
- Non-unions of the vertebral and the skull plate.
- Individuals taking aspirin or platelet inhibition therapies.
- Patients with open fractures or with a distal radius or tibial fractures.

**Precautions**

- The device will not correct or post-reduction displacement of a fracture.
- The EXOGEN device transmits and couples gel and sterile and platelet inhibitor therapies.
- The device is not compatible with any other ultrasound device.
- The EXOGEN device has not been approved for use in pregnant or lactating women.
- The device may cause interference. While the EXOGEN device is being used, a single socket on the operating unit on patients this age range has not been studied.

**Complications**

- Adverse reactions or medical complications related to the use of this device were reported during the clinical studies. Some of these were associated with a delay in fracture healing, such as increased pain, swelling, tissue reaction to the coupling gel. Resolution can be obtained by a change of coupling gel or applying a non-sterile gel. The patient should be re-opened as a result of this condition.

**References**

Romano et al. reported on prospective long-term studies in infected non-unions and pseudarthroses respectively, suggesting a high success rate for infected non-unions healed pulsed ultrasound in both studies. Straus and Gossman described the effects of low-intensity pulsed ultrasound on two different classes of Chronic non-union with multiple negative surgical attempts performed within 5-10 months after the treatment with the EXOGEN bone healing system.

**Clinical Results**

**The safety and effectiveness of this device has been demonstrated in patients followed up over a period of 0.5 years (78 months).**

**Acceleration of Treatment for Conservatively Treated Fresh Distal Radius Fractures**

**Study Design**

Three prospectively designed studies, undertaken in the USA, Germany and the UK, compared the clinical performance of the EXOGEN Ultrasound Bone Healing System to treatment with a standard fracture care protocol. The studies had a self-paired control design and the EXOGEN treatment was initiated within seven days of the fracture and patients were instructed to use the device until the 10 week follow-up visit. Duration of follow-up was a range of 257-6011 days. The scaphoid non-union heal rate of 33% (4 out of 12) was identical in all three studies. The knee non-union was the most common non-union type in this study with a rate of 10% (2 out of 24) in the EXOGEN treated and control groups (Heckman et al. 3).

**Clinical Study**

**Study Design**

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**Study Design**

Three studies were conducted to assess the safety of the EXOGEN Ultrasound Bone Healing System. One study was conducted in patients with a non-union cohort treated with the EXOGEN device and operated of the primary end-point of a combination of clinical and radiographic healing. The other two studies were conducted in patients with a fresh fracture cohort treated chronically with and without EXOGEN. No adverse reactions or medical complications related to the use of this device have been reported during the clinical studies. These studies demonstrated that the EXOGEN ultrasound signal stimulates cells to produce growth factors and proteins that are important for use with conservatively treated fresh fractures and non-unions or delayed and non-unions (average 14 months old) treated with the EXOGEN signal and achieved an 85% success rate across a range of bones.

**Exogenous Ultrasound Bone Healing System**

**Safety**

The EXOGEN device is non-invasive. There are no known contraindications to the use of this device.

**Adverse Events**

- Fresh fractures that are open Grade II or III or that require surgical fixation plate.
- Fresh fracture locations other than the distal radius or tibial fractures.
- The age ranges of the patients in the PMA non-union studies were 17-86. The effect of EXOGEN therapy on patients outside the age range has not been studied.

**Adverse Events**

The EXOGEN device is non-invasive. There are no known contraindications to the use of this device.

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For detailed instructions, please read the Instructions for Use.

Summary:

For detailed instructions, please read the Instructions for Use.

Directions for Use:

The EXOGEN® Ultrasound Bone Healing System is administered once daily for 20 minutes per fracture location. Treatment continues until the fracture is determined to be sufficiently healed to discontinue device use. The device transmits a low intensity ultrasonic signal to the fracture site through coupling gel.

For detailed instructions, please read the Instructions for Use.

Table 1: Clinical Study results for the FDA reviewed non-union cases – stratification by category variables

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<thead>
<tr>
<th>Category</th>
<th>Number of Patients</th>
<th>Healing (85% AM)</th>
<th>Healing (80% AM)</th>
<th>Healing (75% AM)</th>
<th>Healing (65% AM)</th>
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