Magnetic Esophageal Ring to Treat Gastroesophageal Reflux Disease

Description

A laparoscopically implanted ring composed of interlinked titanium beads with magnetic cores has been developed for the treatment of gastroesophageal reflux disease (GERD). The device is placed around the esophagus at the level of the gastroesophageal junction and is being evaluated in patients who have GERD symptoms despite maximum medical therapy.

Background

GERD is defined as reflux of stomach acid into the esophagus that causes symptoms and/or mucosal injury. GERD is a common medical disorder, with estimates of 10% to 20% prevalence in developed countries. The severity of GERD is widely variable. Many patients have mild, intermittent symptoms that do not require treatment or only require episodic use of medications. Other patients have chronic, severe GERD that can lead to complications such as Barrett’s esophagus and esophageal cancer. For patients with severe disease, chronic treatment with acid blockers is one option. For some patients, medications are not adequate to control symptoms, and other patients prefer to avoid the use of indefinite, possibly lifelong medications. Surgical treatments are available for these patients, primarily a Nissen fundoplication performed either laparoscopically or by open surgery. A number of less invasive procedures are also being evaluated as an intermediate option between medical therapy and surgery (see policy 2.01.38 on endoscopic procedures).

The LINX™ Reflux Management System (Torax Medical) is composed of a small flexible band of 10 to 18 interlinked titanium beads with magnetic cores. Using standard laparoscopic techniques, the band is placed around the esophagus at the level of the gastroesophageal junction. The magnetic attraction between the beads is intended to augment the lower esophageal sphincter to prevent gastric reflux into the esophagus, without compressing the esophageal wall. It is proposed that swallowing food or liquids creates sufficient pressure to overcome the magnetic bond between the beads, allowing the beads to separate and temporarily increase the size of the ring. The target population is patients who have GERD symptoms despite maximum medical therapy (e.g., proton pump inhibitors) but who do not want to risk the adverse effects of a surgical procedure like Nissen fundoplication. Adverse events of the LINX™ Reflux Management System may include dysphagia or odynophagia. The device can be removed by a laparoscopic procedure if severe adverse events occur or if magnetic resonance imaging (MRI) is needed for another condition.
Regulatory Status

The LINX™ Reflux Management System was approved by the U.S. Food and Drug Administration (FDA) in 2012. The LINX™ device is indicated for patients diagnosed with GERD, as defined by abnormal pH testing, and who continue to have chronic GERD symptoms despite maximum therapy for the treatment of reflux. FDA has required 5-year follow-up of 100 patients from the investigational device exemption (IDE) pivotal study to evaluate safety and efficacy of the device. FDA product code: LEI.

Related Policies

2.01.38 Transesophageal Endoscopic Therapies for Gastroesophageal Reflux Disease

Policy

*This policy statement applies to clinical review performed for pre-service (Prior Approval, Precertification, Advanced Benefit Determination, etc.) and/or post-service claims.

An implantable magnetic esophageal ring to treat gastroesophageal reflux disease (GERD) is not medically necessary.

Rationale

Randomized, controlled trials are necessary to establish the efficacy of treatments for gastroesophageal reflux disease (GERD). GERD has a variable natural history, with exacerbations and remissions, and as a result, a control group is required to differentiate improvements in symptoms from the natural history of the disorder. A placebo control is optimal due to the subjective nature of the patient-reported outcome measures, which are prone to bias if the patient is not blinded to treatment assignment. Random assignment is important because of the multiple potential confounders of GERD outcomes, such as diet, smoking and obesity. Randomization minimizes the chance that these confounders will be distributed unevenly among treatment groups.

Single-arm series are of limited usefulness for determining treatment efficacy. Improvements in symptoms in single-arm studies may be due to the variable natural history of GERD, and/or bias from the placebo and other non-specific effects. Single-arm series can demonstrate the feasibility and potential benefit of this procedure and can be used to determine rates of adverse events. It is also important to determine comparative efficacy of treatments for GERD, because there are numerous medical and surgical treatments that are effective. Single-arm series are inadequate for determining comparative effectiveness of different treatment options; controlled trials with active comparators are required for this.
Literature Review

Food and Drug Administration-Regulated Trials

Data submitted to the U.S. Food and Drug Administration (FDA) for the LINX® Reflux Management System included 2 single-arm FDA-regulated investigational device exemption (IDE) trials with a total of 144 subjects and follow-up data between 2 and 4 years. (1) The feasibility IDE study enrolled 44 subjects at 4 clinical sites (2 U.S. and 2 Europe) and has published data out to 4 years. (2, 3) The pivotal IDE study included 100 subjects from 14 clinical sites (13 U.S. and 1 Europe) who had documented symptoms of gastroesophageal reflux disease for longer than 6 months (regurgitation or heartburn that responds to acid neutralization or suppression), required daily proton pump inhibitor (PPI) or other anti-reflux drug therapy, had symptomatic improvement on PPI therapy, and had a total distal ambulatory esophageal pH less than 4 for 4.5% or more of the time when off GERD medications. The primary safety endpoint measured the rate of related device and procedure serious adverse events (SAEs). Efficacy endpoints were assessed off PPI therapy and measured esophageal acid exposure, total GERD-Health Related Quality of Life (HRQL) scores, and PPI usage. Subjects served as their own controls.

Results of the pivotal trial were published in 2013. (4) In this study, the primary efficacy endpoint of pH normalization or greater than 50% reduction in acid exposure time when off PPI was met by 64% of the subjects. The mean total acid exposure time was reduced from 11.6% at baseline to 5.1% at 12 months (56% reduction). The secondary efficacy endpoints met the study success criteria. Ninety-two percent of subjects had at least a 50% improvement in GERD-HRQL symptom score (the mean GERD-HRQL total score decreased from 28.4 at baseline to 5.9 and 5.5 at 12 and 24 months, respectively), and 93% had reduced PPI use (79% and 83% of subjects were free from daily dependence at 12 and 24 months, respectively, compared with 0% at baseline). Dysphagia was observed in 68% of patients postoperatively, in 11% at 1 year, and in 4% at 3 years. Nineteen patients underwent esophageal dilation for dysphagia. Six patients (6%) experienced a serious adverse event (SAE) including severe dysphagia and vomiting. The device was removed in 4 of these 6 patients with a SAE and in 2 additional patients for persistent reflux and chest pain.

Nonrandomized Controlled Trials

Two retrospective comparative studies have been identified on magnetic sphincter augmentation (MSA) with the LINX® device compared with laparoscopic Nissen fundoplication (LNF). Louie et al compared outcomes from 34 patients who had MSA with 32 patients who underwent LNF. (5) Similar improvements were found for the 2 groups on the GERD-HRQL scale. The DeMeester score and pH normalized in both groups, but these were lower (p=.001) in the fundoplication group. MSA allowed belching in 67% of patients compared with none in the fundoplication group. Sheu et al compared outcomes from 12 MSA patients with a contemporaneous case-matched cohort of patients who underwent LNF. (6) Over half of the MSA patients were self-referred, compared with none of the patients who underwent LNF. Both procedures were effective for reflux. Severe dysphagia requiring endoscopic dilation was more frequent after MSA (50% of cases), while there was a trend for a reduction in bloating, flatulence, and diarrhea in this small retrospective study.
Observational Studies

In 2014, Lipham et al reported on adverse events for the first 1048 implanted patients (82 institutions). (7) Of these, 144 were implanted as part of premarket clinical trials (described above), 332 had been enrolled in a postmarket registry, and 572 were implanted outside of a postmarket registry. The 3 sources that were used to identify adverse events were the published clinical literature along with the device’s Summary of Safety Effectiveness Data, the FDA database for device-related complications (MAUDE database), and information provided by the manufacturer. Event rates were 0.1% intra-/perioperative complications, 1.3% hospital readmissions, 5.6% endoscopic dilations, and 3.4% reoperations for device removal. The primary reason for device removal was dysphagia. Erosion of the device occurred in 1 patient (0.1%). The median device implantation was 274 days. This study is limited by the short follow-up and the voluntary reporting of adverse events outside of the registry.

Ongoing and Unpublished Clinical Trials


- NCT01940185 is a prospective, multicenter, single-arm postapproval study to monitor the safety and efficacy of the LINX® implant procedure and device with follow-up through 5 years. The study has an estimated enrollment of 200 patients, with completion expected in 2019.
- NCT01624506 is a registry to track and monitor patients treated with either the LINX® device or fundoplication in clinical practice. It began in 2010, and has an estimated enrollment of 800 patients, with completion anticipated in 2016.

Practice Guidelines and Position Statements

In 2013, the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) published a Technology and Value Assessment guideline on the safety and effectiveness of the LINX Reflux Management System. (8) SAGES Technology and Value Assessment Committee stated that safety analyses of the LINX system suggests the procedure is associated with few serious adverse events and no reported mortality, and that currently available data demonstrates a reasonable assurance as to the efficacy of the LINX Reflux Management System. The committee concluded that direct comparative studies between the LINX procedure and Nissen fundoplication will be needed, although based on the available evidence the LINX device should be an option available to patients and providers for the management of medically refractory GERD.

A 2013 report on emerging technology from the American Society for Gastrointestinal Endoscopy concluded that long-term data about the safety and efficacy of the LINX device are needed. (9) The document indicates that the LINX band is currently being deployed laparoscopically; however, a natural orifice transluminal endoscopic surgery approach could be explored.

U.S. Preventive Services Task Force Recommendations

Use of magnetic esophageal rings is not a preventive service.
Summary

A laparoscopically implanted ring composed of interlinked titanium beads with magnetic cores has been developed for the treatment of gastroesophageal reflux disease (GERD). The device is placed around the esophagus at the level of the gastroesophageal junction and is being evaluated in patients who have GERD symptoms despite maximum medical therapy. Current evidence on magnetic sphincter augmentation (MSA) consists of 2 retrospective comparative cohort studies along with several case series, including 2 uncontrolled and unblinded manufacturer-sponsored studies that were submitted to the Food and Drug Administration (FDA) for device approval. The single-arm series are of limited usefulness for determining treatment efficacy and provide no information on the comparative efficacy of this procedure with other GERD treatments. The comparative trials are retrospective and nonrandomized, and may be affected by selection bias. In addition, the subjective outcome measures used in these trials, such as the Gastroesophageal Reflux Disease-Health Related Quality of Life (GERD-HRQL) scores, may be biased due to placebo effects in these nonblinded trials. The objective measure of esophageal pH shows modest improvement compared with baseline, but this is a physiologic measure with uncertain clinical significance. Dysphagia was common in treated patients, although serious adverse events were less common, and the smaller feasibility study did not identify any serious safety concerns at up to 4 years of follow-up. FDA has required 5 years of follow-up on the 100 subjects in the pivotal study. Randomized comparisons of MSA with Nissen fundoplication are also needed to evaluate the relative risk-benefit of these 2 procedures. The evidence at this time is insufficient to permit conclusions concerning the effect of this device on net health outcome. It is considered not medically necessary.

Medicare National Coverage

No national coverage decisions were identified for the LINX® Reflux Management System.

References


This policy was approved by the FEP Pharmacy and Medical Policy Committee on December 5, 2014 and is effective January 15, 2015.

Signature on File
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