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SURGICAL STAPLERS WITH TISSUE PROTECTION AND RELATED METHODS

RELATED APPLICATIONS

This application claims the benefit of and priority to U.S. Provisional Application Ser. No. 61/472,894 filed Apr. 7, 2011, the contents of which are hereby incorporated by reference as if recited in full herein.

FIELD OF THE INVENTION

This invention relates to surgical staplers that may be particularly useful for gastrointestinal surgeries.

BACKGROUND OF THE INVENTION

Gastroesophageal reflux disease (GERD) can occur in children. Unfortunately, some of these children have such severe GERD that it cannot be managed with medication. These children may benefit from anti-reflux surgery. Neurologically impaired (NI) children may have a severe form of GERD with emetic reflux. The standard anti-reflux surgery, Nissen Fundoplication (NF), is less effective in NI children and NI treatment can lead to other complications and a relatively high failure rate. An alternative anti-reflux surgery, gastroplasty with restricted antrum to control emesis (GRACE), has been developed in an animal model. This surgery can be more effective than NI in controlling reflux emesis.

Known surgical staplers are used to deploy at least two parallel rows of staples from a proximal end of the jaws of the staplers to the distal end. A knife blade can divide the tissue between two adjacent rows to provide a stapled division of tissue. However, conventional staplers are not suitably configured to safely and/or optimally perform the GRACE procedure.

SUMMARY OF EMBODIMENTS OF THE INVENTION

Embodiments of the present invention are directed to surgical staplers that can be used to perform a GRACE procedure.

Embodiments of the present invention are directed to surgical staplers with a proximal tissue protection segment.

Some embodiments are directed to surgical staplers that include: (a) a stapler head having opposed first and second elongate jaws with opposing proximal and distal end portions; (b) a staple cartridge held in at least one of the first and second jaws, the stapler cartridge configured to concurrently deliver a plurality of parallel rows of staples; and (c) a tissue protection segment held in a proximal portion of at least one of the first and second jaws. The jaws are configured to close against target tissue and, at stapler firing, staples are delivered to a subset of tissue held inside the jaws so that tissue held by the tissue protection segment adjacent the proximal end portion of the stapler is not stapled.

The staples in the cartridge can be held longitudinally spaced apart from the tissue protection segment (closer to the distal end portion of the respective jaw).

The tissue protection segment can be formed by or held in the stapler cartridge.

The tissue protection segment can be defined by at least one inner surface of the first and/or second jaw of the stapler head.

The jaws can have a straight configuration. At least one of the jaws can have an arched leading edge portion.

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The tissue protection segment can be configured as an interior facing recess configured to inhibit tissue crushing for tissue held thereat when the jaws close.

The tissue protection segment can include at least one resilient member configured to translate transversely outward in a direction substantially orthogonal to a longitudinally extending centerline of a shaft of the stapler when the jaws close against tissue to thereby inhibit tissue crushing for tissue held thereat when the jaws close.

The tissue protection segment can have a length that is between about 10-30 mm.

The active stapling portion of the stapler cartridge can have a length that is between about 30-80 mm.

The stapler may optionally also include a cutting member configured to extend and retract from one of the first or second jaws. The cutting member can be configured to cut only tissue proximate the stapled tissue held against the staple cartridge.

The cutting member can be configured to pivotably translate upward or downward to be aligned with an axially extending centerline of the stapler head to cut tissue between two adjacent stapled rows of tissue.

The tissue protection segment can include a scalloped interior-facing surface.

In some embodiments, when the jaws close against target tissue held by the tissue protection segment adjacent the proximal end portion of the stapler, the tissue thereat is held snugly without introducing undue compressive injury.

In some embodiments, the stapler head can be configured to releasably interchangeably hold a first stapler cartridge that includes the tissue protection segment and a second stapler cartridge that is devoid of the tissue protection segment.

The stapler may optionally include a circuit configured to direct the stapler to operate in a tissue protection mode or in a full length stapling mode. The circuit can be in communication with a staple drive mechanism that delivers the staples from the staple cartridge. In the tissue protection mode, the stapler cartridge delivers staples only from a distal to medial portion of the stapler head. In the full length stapling mode, the staple cartridge delivers staples from the proximal portion of the stapler head as well as the distal and medial portions.

Other embodiments are directed to gastrointestinal treatments. The treatments can include: (a) providing a stapler with a staple head having first and second opposed jaws, with at least one of the jaws having a tissue protection segment proximate a staple cartridge; (b) inserting the stapler into a patient in an inferior to superior direction so that one jaw resides over one outer wall of the stomach and the other jaw resides under an opposing outer wall of the stomach; (c) closing the jaws against the stomach whereby an inferior portion of the stomach is held in the tissue protection portion of the stapler head and a more superior portion of the stomach is held against the stapler cartridge, wherein tissue held against the tissue protection segment is protected from undue (compressive) injury; then (d) applying a plurality of parallel rows of staples to only the more superior portion of the stomach and not to tissue held in the tissue protection segment of the stapler jaws; and (e) cutting between two adjacent rows of stapled tissue to divide the stomach tissue.

The applying and cutting steps can be carried out to form a first opening through the stomach with a stapled perimeter of tissue.

The method can also include applying staples to additional tissue above the first opening in a length sufficient to reach a junction of a natural esophagus at an upper portion of the stomach; and cutting the additional stapled tissue to form a neo-esophagus. The method may also include using a lower portion of the stapled tissue of the first opening to form part of