

■ INGENUITY  
■ FOR  
■ HEALTH

SURGICAL STAPLERS

INGENIOUS

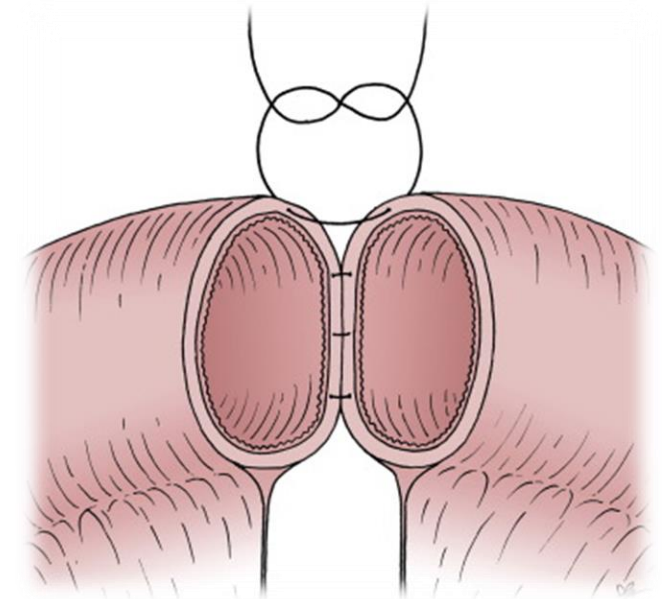
1. ANASTOMOSIS
2. STAPLERS
3. LINEAR STAPLERS
4. CIRCULAR STAPLERS
5. PPH STAPLERS

# ANASTOMOSIS

- Anastomosis is a surgical connection between two structures or the surgical establishment of a communication, shunt, fistula, between two conduits or cavities which normally are separate
- To short-circuit the intervening portion
- To effect a repair after its removal.

## EXAMPLES OF SURGICAL ANASTOMOSES ARE:

- Vascular anastomosis ( Arterial fistula for dialysis).
- **Colostomy (an opening created between the bowel and the skin of the abdominal wall).**
- **Intestinal anastomosis (two ends of intestine are sewn together).**
- Graft anastomosis ( Between a blood vessel and a graft)

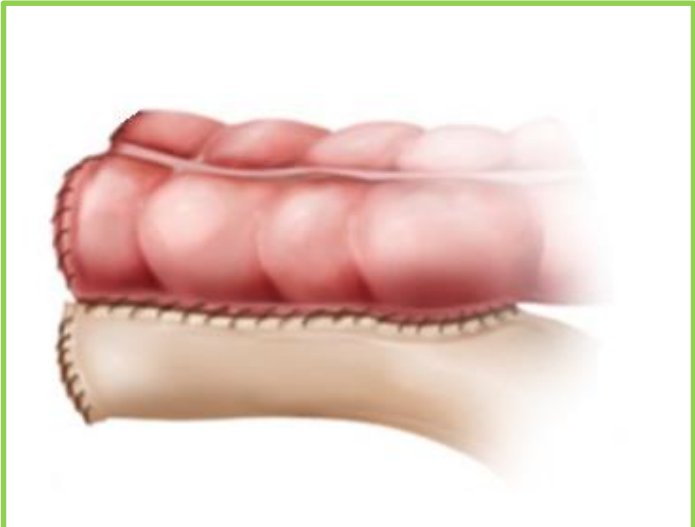




END TO END



END TO SIDE



SIDE TO SIDE

**Should promote  
early recovery of  
function**

**Zero leak rates**



**No vascular  
compromise at the  
incised or divided  
margins of a viscus**

**Technique should  
be preferably be  
quick to perform**

**Should not  
narrow the lumen  
of a viscus**

## JOINING TWO ENDS OF SIMILAR TYPE :

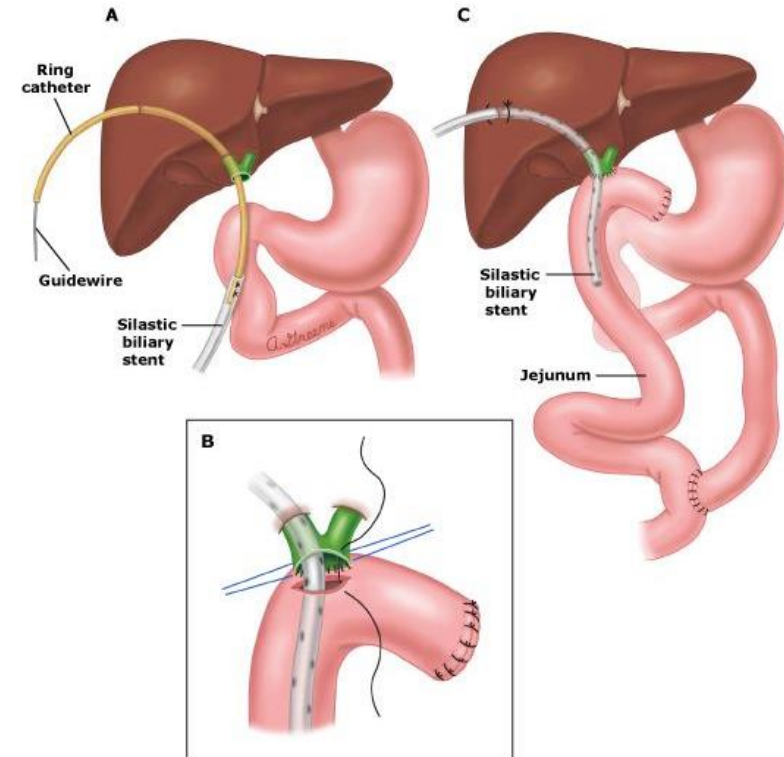
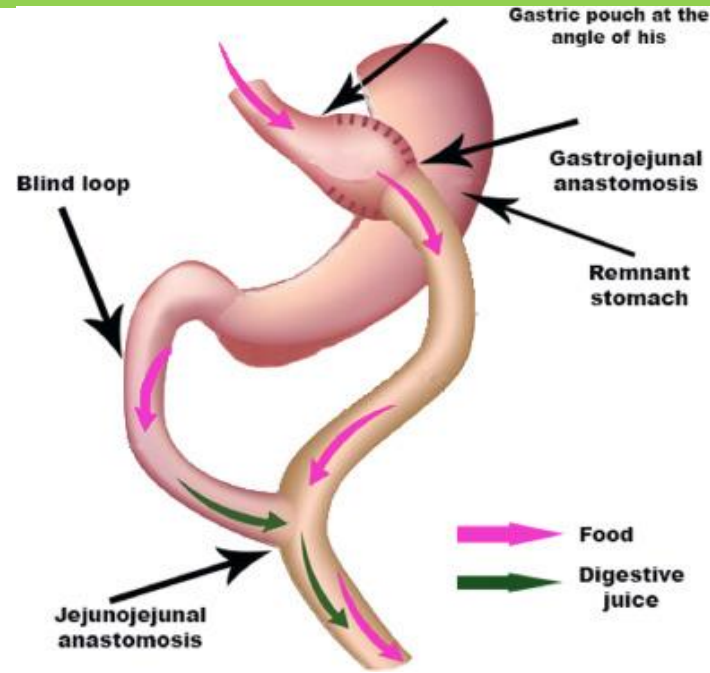
- Jeuno-jejunal
- Ileo-ileal
- Colo-colic.

## JOINING TWO ENDS OF DIFFERENT TYPE :

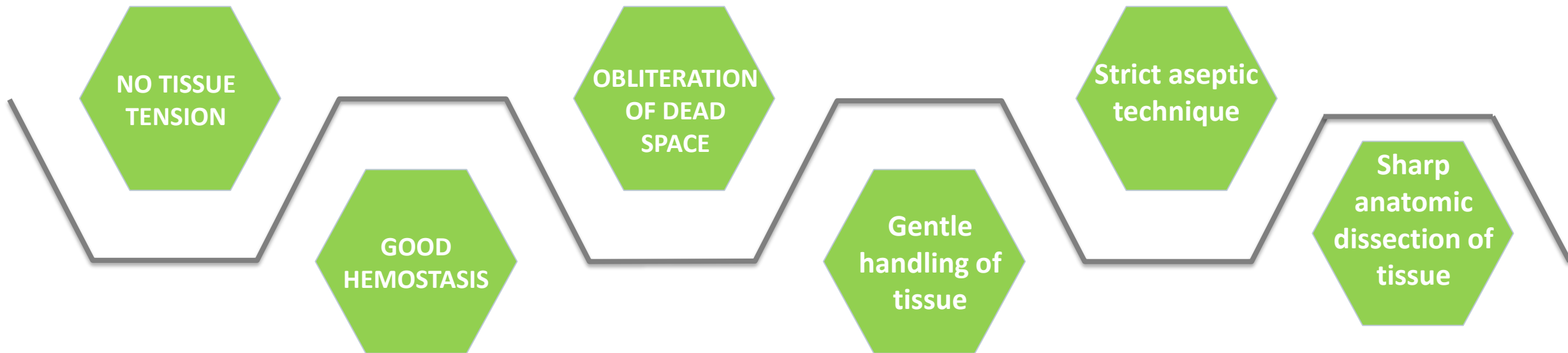
- Gastro-jejunostomy
- Oesophago-jejunostomy

## JOINING GUT WITH ANOTHER TUBULAR STRUCTURE :

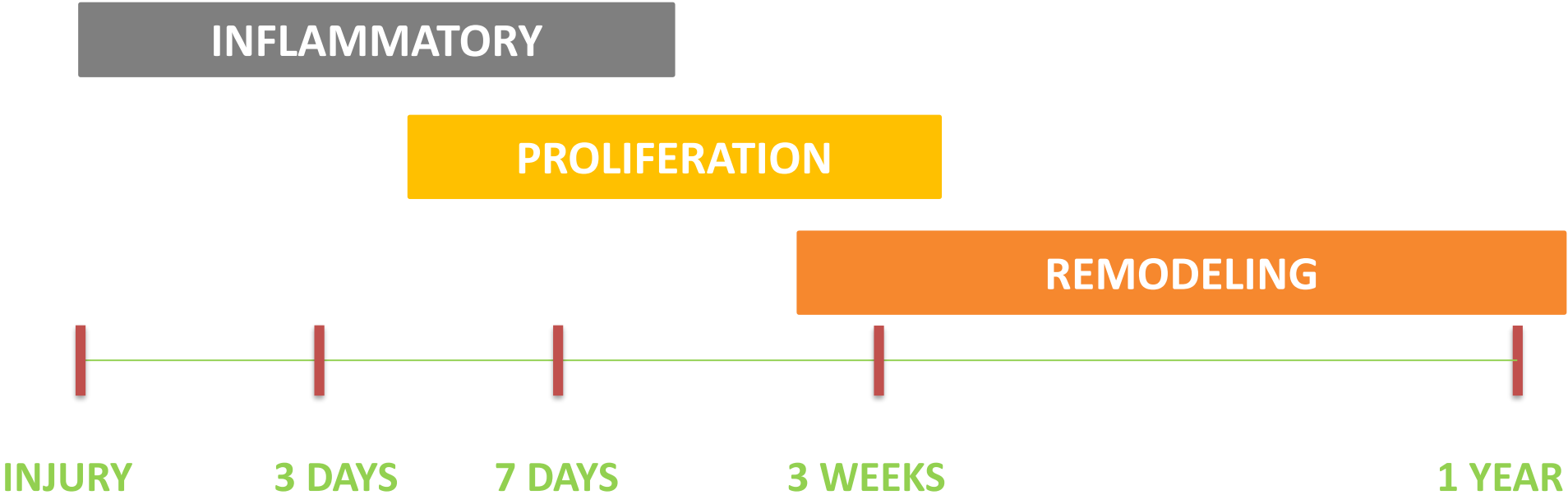
- Hepatico-jejunostomy
- Choledocho-jejunostomy
- Pancreatico-jejunostomy



The principles for gently treating tissue were established more than 100 years ago by **Dr. William Halsted**.







**STAPLERS**

It is a technical equipment used to mechanically connect hollow organs, divide soft tissue or vascular structure

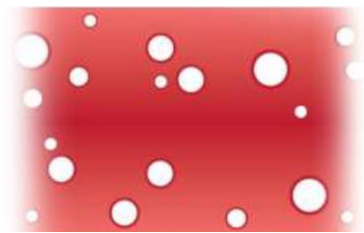
### ADVANTAGES :

- Saves time
- Helpful in difficult sites like rectum and high esophagus where anastomosis is difficult
- Multiple anastomosis are required ( Whipple's, radical cystectomy)

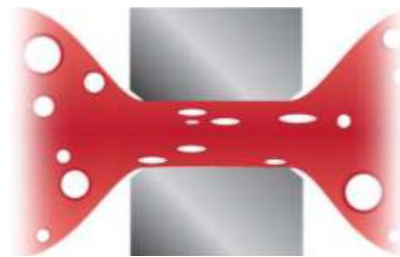
Made of titanium but have some amount of nickel.

Different staple cartridges designed for different tissue thickness :

- Allow adequate hemostasis
- Avoid significant ischemia
- Avoid tissue destruction



Living Tissue before compression



Living Tissue compressed to adequate thickness for stapling



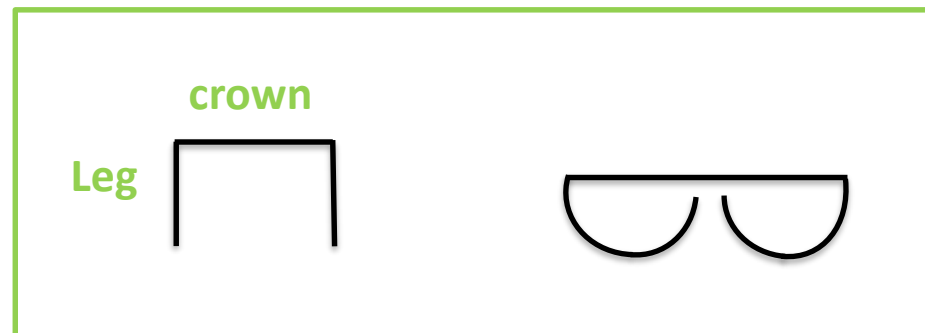
Energy is stored in the staple as compression is maintained

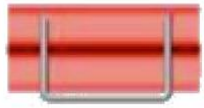


Three staggered rows of staples



Two staggered rows of staples





**BAD**



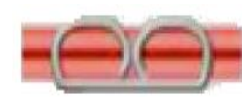
**VERY BAD**

Staple legs lie on top of tissue



**ACCEPTABLE**

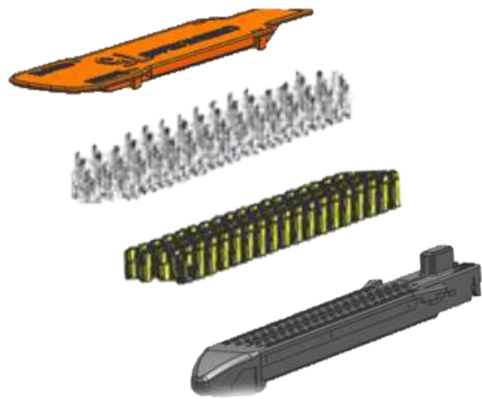
The tissues have been pierced 3 times. The leg are bent over and pierce the tissue. This staple line will hold



**GOOD**

Tissue will tear before staple comes open

**Appropriate staple formation is a combination of the instrument and cartridge interaction with living tissue**



Staple Retainer

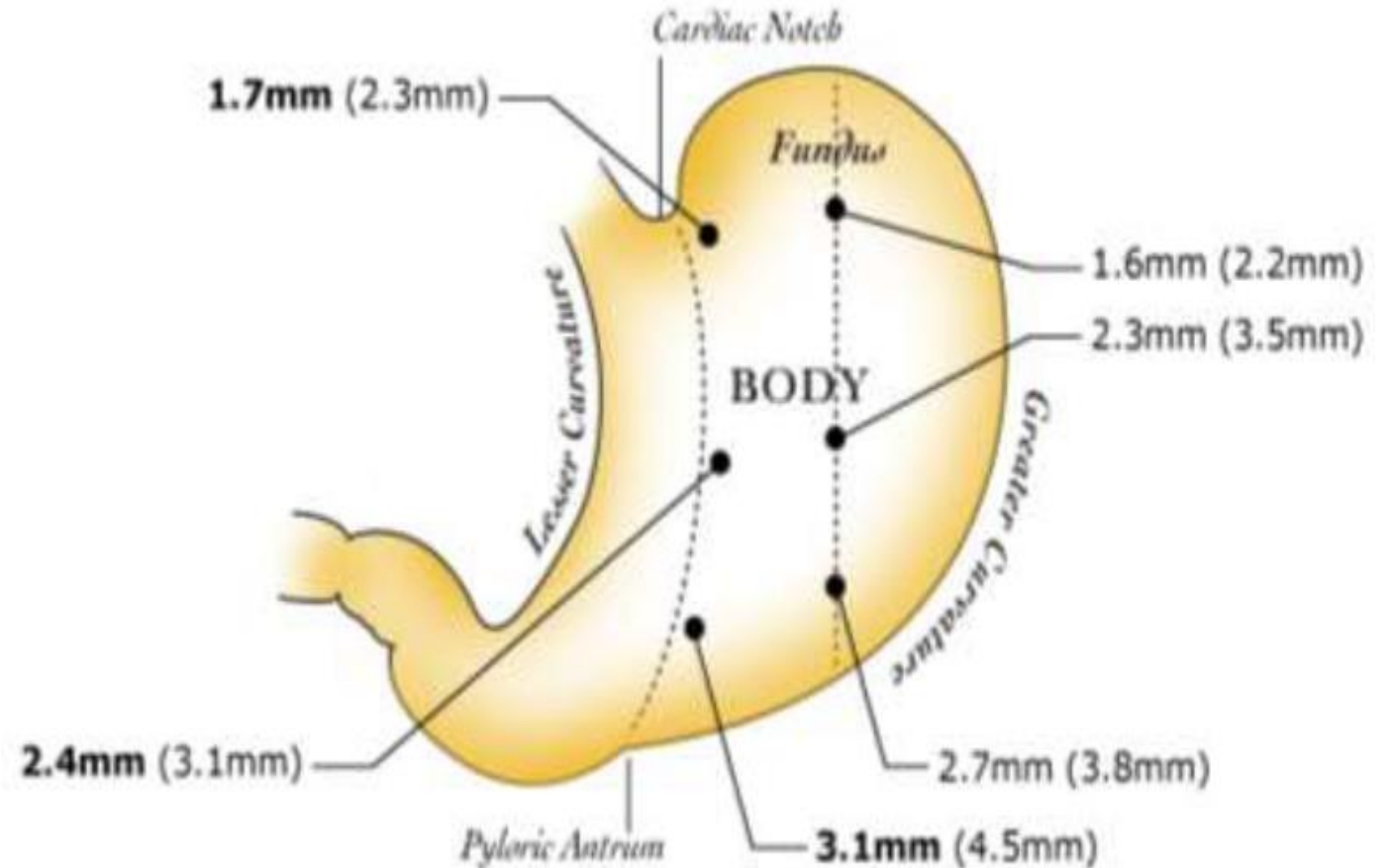
Staples

Staple Drivers

Cartridge Body



- Tissue thickness varies widely throughout the body from organ to organ.
- Even within each organ, tissue thickness ranges greatly.







ABILITY TO ACCESS THE  
TARGET SITE (Trocars &  
articulating area)



COMPLETE STAPLER LINE &  
CUT (No need for  
additional movement)



ABSENCE OF IMMEDIATE  
STAPLE LINE LEAKAGE &  
BLEEDING



EASY HANDLING & SOFT  
MECHANISM

1880

Dr. Henroz-  
everted bowel  
anastomosis in  
dogs

1921

Hungarian  
Surgeon developed  
light and easy-to-  
use version of  
stapler

1908

Professor Humer Hult with Victor  
Fischer :

- Tissue Compression
- B-shaped configuration of closed staples
- Placement of staples in double staggered rows
- Use of fine wire as the staple material

1934

Dr. H. Friedrich :  
First stapling  
instrument to  
feature a  
replaceable,  
preloaded staple  
cartridge

1967

Dr. Mark Ravitch introduces key functional innovations :

- Staple lines
- Reusable stapler

And the first stapler with a double row of staples

1980

Minimally invasive procedures. Surgeons request laparoscopic adaptation of Transecting Linear Cutter device

1950

Establishment of the Scientific Institute for Experimental Surgical Apparatus and Instruments in Moscow, USSR

1950

Ethicon, Inc introduces the first completely disposable, single use mechanical stapler

1989

Titanium replaces stainless steel as the key component for staples

### SUTURE /HAND-SEWN

- Standard surgical material for more than 150 years.
- Low cost
- Ease of use
- Strength

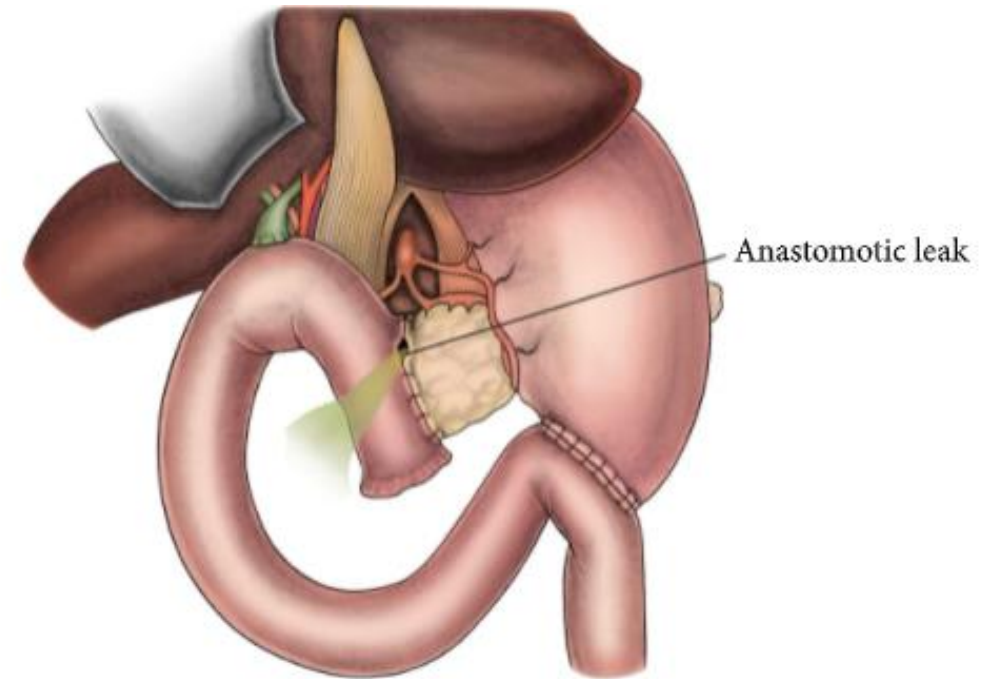


### STAPLING DEVICE

- Close abdominal wounds
- Join internal organs to restore to normal function
- Maintain hemostasis
- Reduce tissue trauma
- Reduce contamination
- Prevent postoperative morbidity and infections

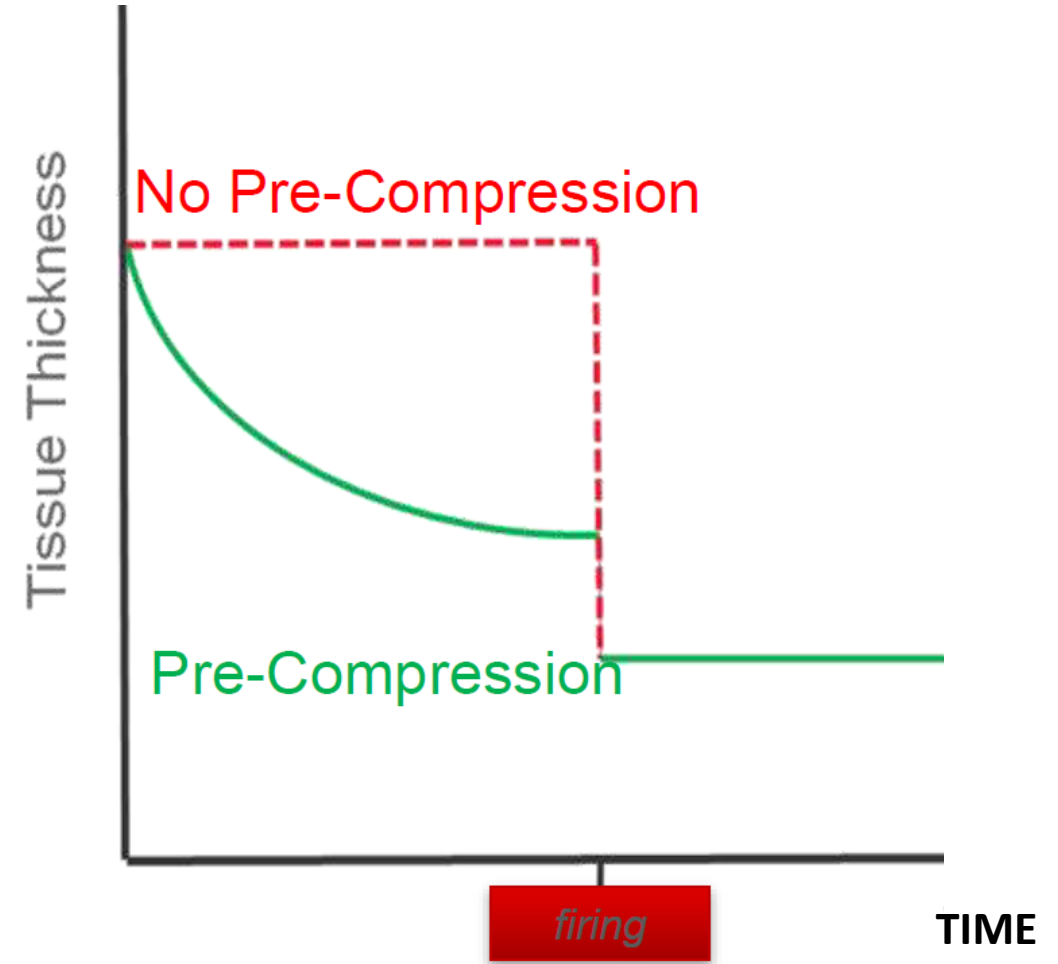


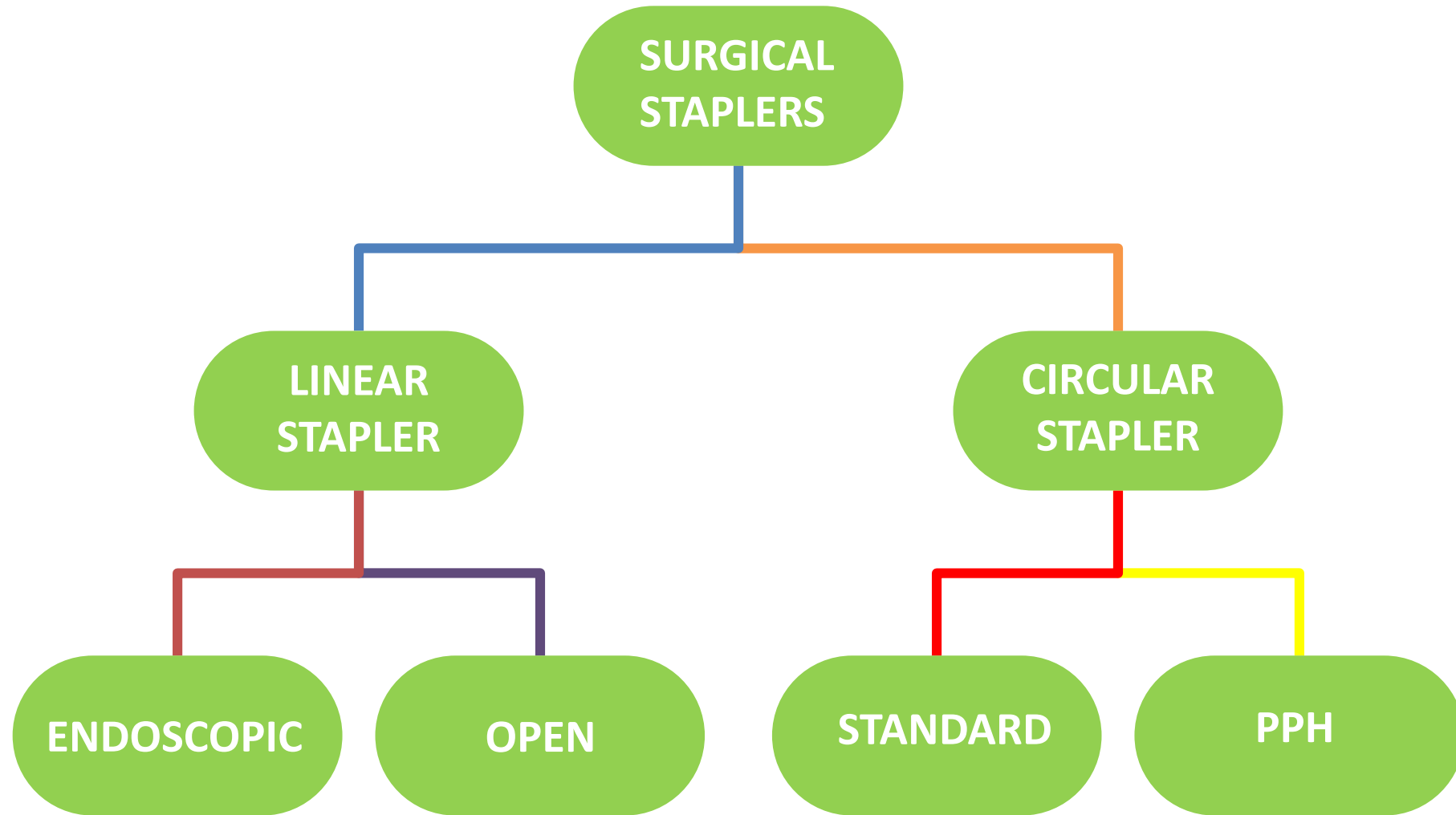
- Anastomosis leaks reported may or may not involve the staple lines, dependent upon the method of surgery used.
- Anastomosis leaks
  - Major / manifested leaks
  - Minor leaks
- Etiology of staple line leaks :
  - Mechanical / tissue causes – seen in first 2 days following surgery (More commonly seen)
  - Ischemic causes – ischemic leaks happens 5 to 7 days post operatively.



- Pre-compression is necessary for good staple formation
- Holding compression before firing :
  - Prepares the tissue to be fired upon
  - Reduces stress on the tissue prior to firing
  - Minimizes tissue flow
  - Optimize staple formation

**1 to 5 seconds pre-compression is needed for our staplers**

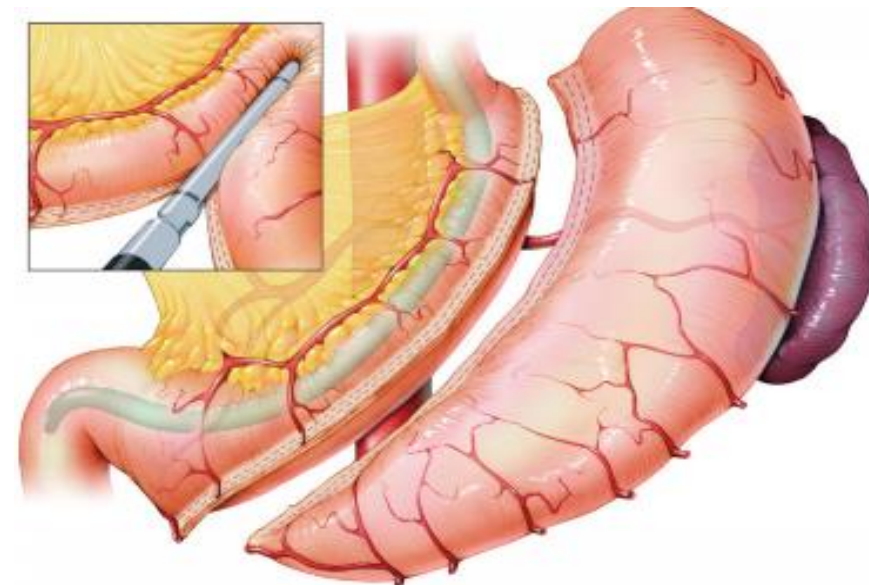
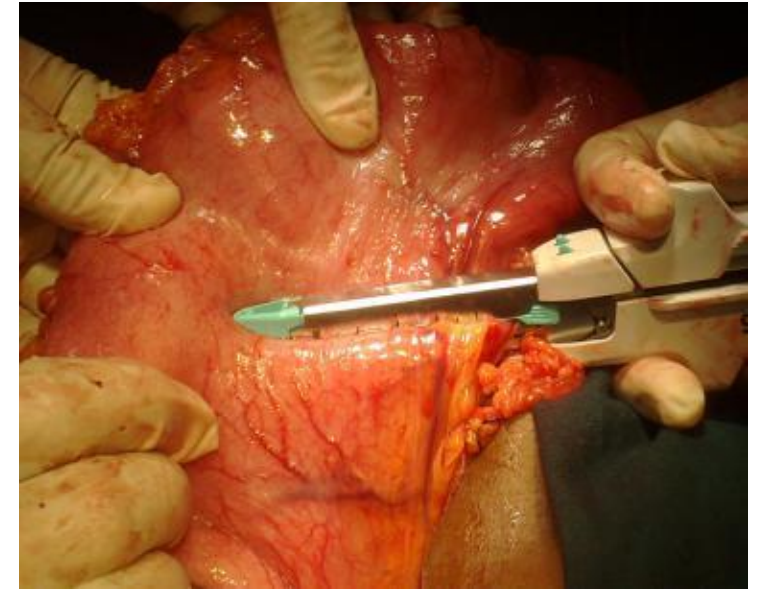




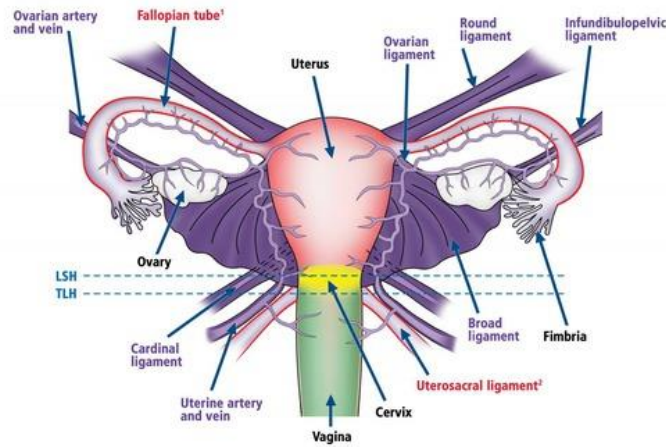
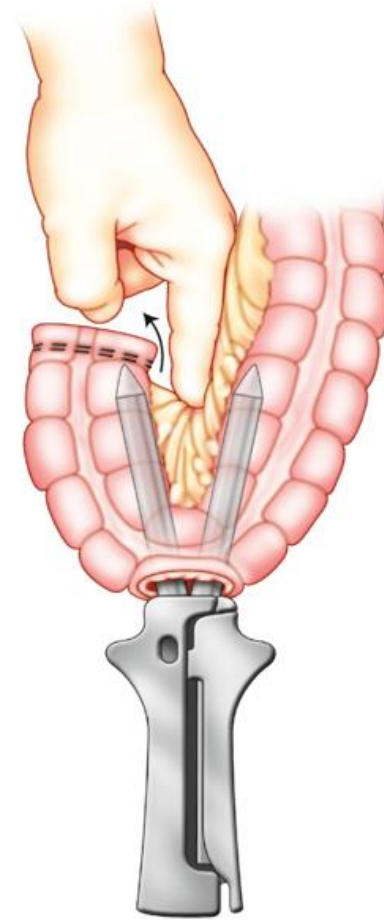


# LINEAR STAPLERS

- Close internal organs prior to transection
- Close the common opening or enterotomy after the creation of an anastomosis
- Make **SIDE TO SIDE** or functional **end to end** anastomosis
- Resection of solid organs such as liver or pancreas
- 2 Types of Linear staplers : **ENDO** & **OPEN**

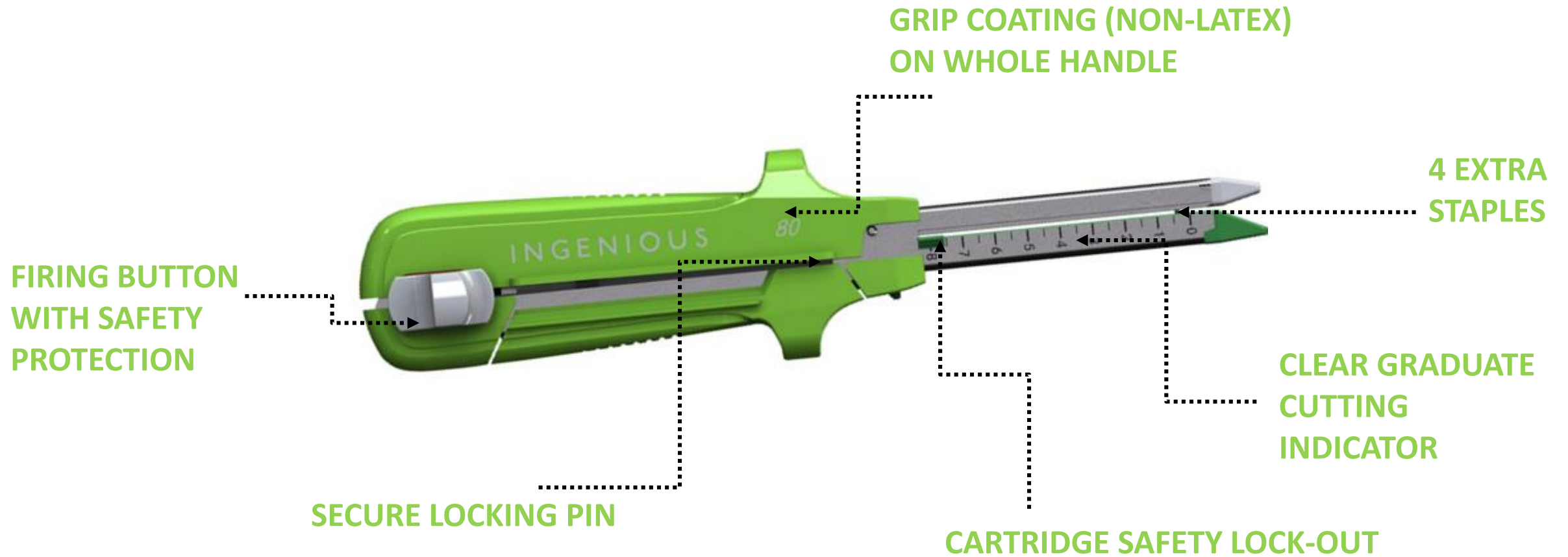


- **GASTRO-INTESTINAL** : Gastrectomy, Gastric bypass , Bowel resections and anastomosis of the stomach and intestine.
- **GENERAL SURGERY**: Liver resection, splenectomy, Whipple surgery.
- **GYNECOLOGY** : Tubal Broad ligament
- **UROLOGIC** : Ileal bladder

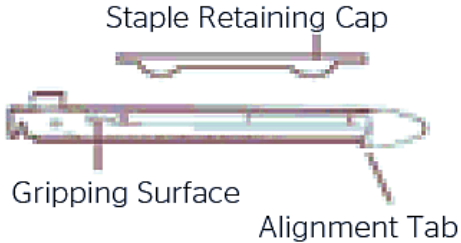
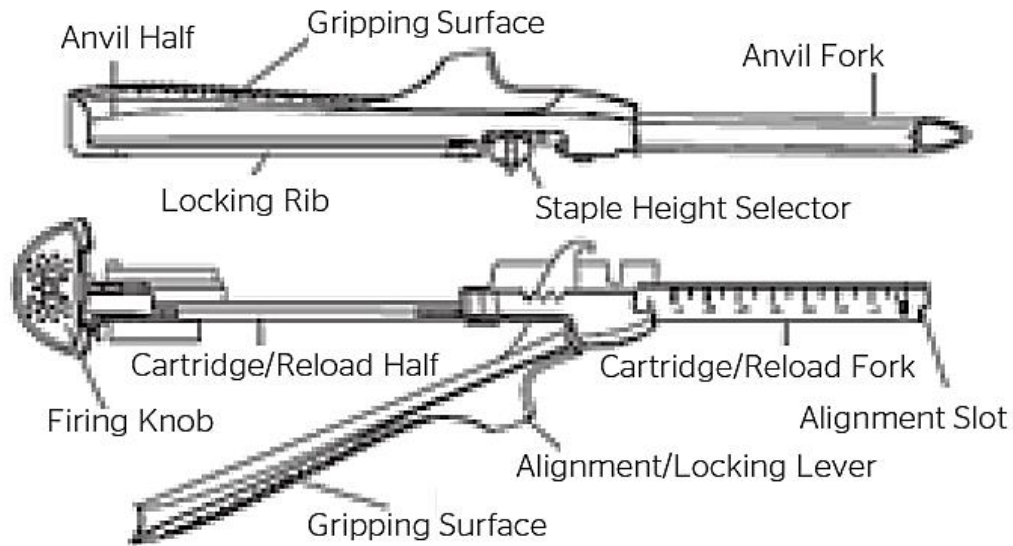


**OPEN LINEAR STAPLERS**

### 3. LINEAR STAPLERS – OPEN LINEAR STAPLER



# 3. LINEAR STAPLERS – OPEN LINEAR STAPLER COMPONENTS

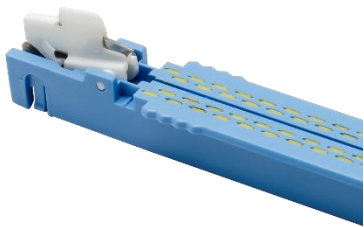


### 3. LINEAR STAPLERS – OPEN LINEAR STAPLER

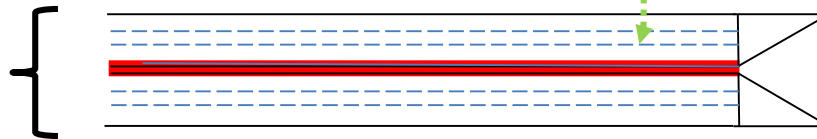


| SPECIFICATIONS           |   |
|--------------------------|---|
| Description              | 60 mm Linear cutter with <b>BLUE</b> reload |
| Max firing               | 11  |
| Staple rows              | 4   |
| Tissue thickness         | <b>Medium</b>                               |
| Nr. Of staples           | 60  |
| Cutting length           | 56 mm                                       |
| Staple height            | 3.8 mm                                      |
| Order Nr. ( for cutter)  | <b>900-200-00</b>                           |
| Order Nr. ( for reloads) | <b>900-200-06</b>                           |

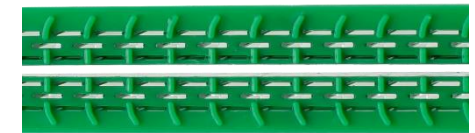
| SPECIFICATIONS           |  |
|--------------------------|--|
| Description              | 60 mm Linear cutter with <b>GREEN</b> reload |
| Max Firing               | 11   |
| Staple rows              | 4  |
| Tissue thickness         | <b>Thick</b>                                 |
| Nr. of staples           | 60   |
| Cutting length           | 56 mm  |
| Staple height            | 4.5 mm                                       |
| Order Nr. ( for cutter)  | <b>900-200-01</b>                            |
| Order Nr. ( for reloads) | <b>900-200-07</b>                            |



4 Rows of staples



15 staples per row

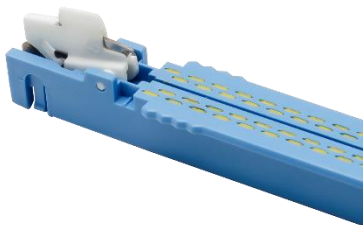


### 3. LINEAR STAPLERS – OPEN LINEAR STAPLER

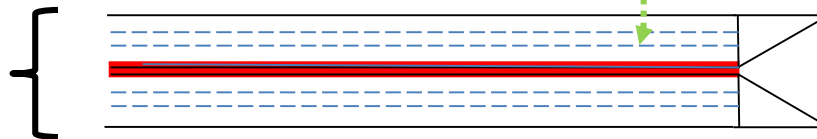


| SPECIFICATIONS          |                                      |
|-------------------------|--------------------------------------|
| Description             | 80 mm Linear cutter with BLUE reload |
| Max Firing              | 11                                   |
| Staple rows             | 4                                    |
| Tissue thickness        | Medium                               |
| # of staples            | 80                                   |
| Cutting length          | 76 mm                                |
| Staple height           | 3.8 mm                               |
| Order No ( for cutter)  | 900-200-02                           |
| Order No ( for reloads) | 900-200-08                           |

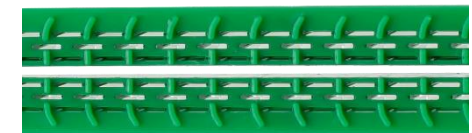
| SPECIFICATIONS          |                                       |
|-------------------------|---------------------------------------|
| Description             | 80 mm Linear cutter with GREEN reload |
| Max Firing              | 11                                    |
| Staple rows             | 4                                     |
| Tissue thickness        | Thick                                 |
| # of staples            | 80                                    |
| Cutting length          | 76 mm                                 |
| Staple height           | 4.5 mm                                |
| Order No ( for cutter)  | 900-200-03                            |
| Order No ( for reloads) | 900-200-09                            |



4 Rows of staples



20 staples per row



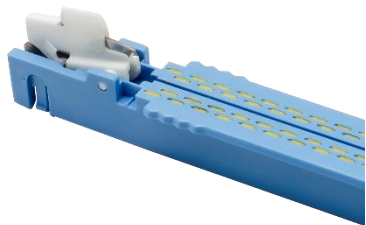


### 3. LINEAR STAPLERS – OPEN LINEAR STAPLER

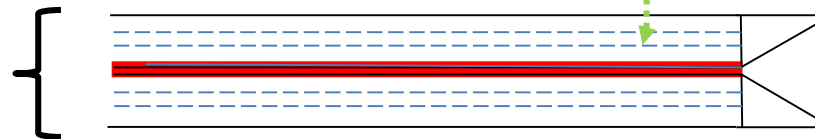


| SPECIFICATIONS          |  |
|-------------------------|--|
| Description             | 100 mm Linear cutter with <b>BLUE</b> reload |
| Max Firing              | 11   |
| Staple rows             | 4  |
| Tissue thickness        | <b>Medium</b>                                |
| # of staples            | 100  |
| Cutting length          | 96 mm  |
| Staple height           | 3.8 mm                                       |
| Order No ( for cutter)  | <b>900-200-04</b>                            |
| Order No ( for reloads) | <b>900-200-10</b>                            |

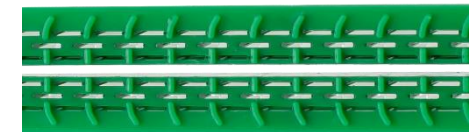
| SPECIFICATIONS          |   |
|-------------------------|---|
| Description             | 100 mm Linear cutter with <b>GREEN</b> reload |
| Max Firing              | 11  |
| Staple rows             | 4   |
| Tissue thickness        | <b>Thick</b>                                  |
| # of staples            | 100   |
| Cutting length          | 96 mm   |
| Staple height           | 4.5 mm  |
| Order No ( for cutter)  | <b>900-200-05</b>                             |
| Order No ( for reloads) | <b>900-200-11</b>                             |

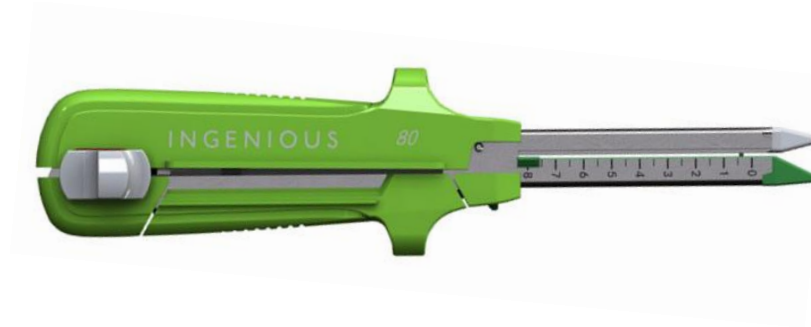


4 Rows of staples



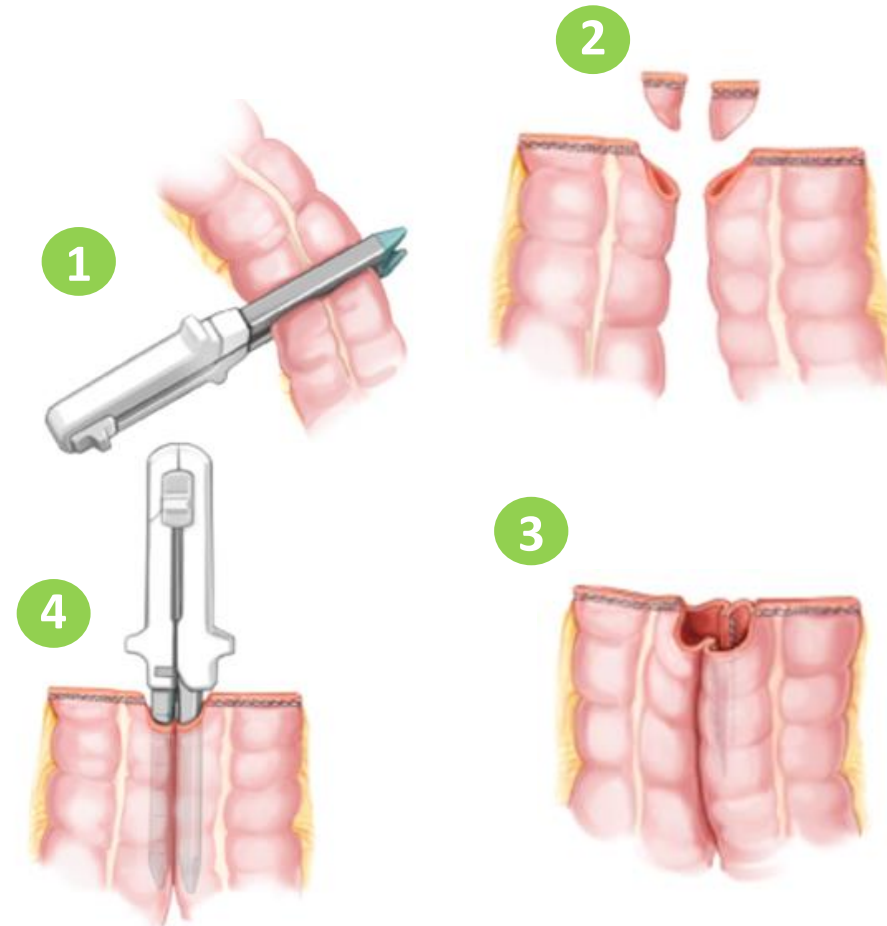
25 staples per row





- End to end anastomosis is technically a side bi side approach (Colorectal anastomosis)

- 1 Dividing the proximal colon with a linear stapler. The distal colon is also divided with a linear stapler.
- 2 Cutting the antimesenteric stapled corners from both the proximal and distal colon.
- 3 Inserting the linear stapler into both lumens.
- 4 Inserting the linear stapler into both lumens.



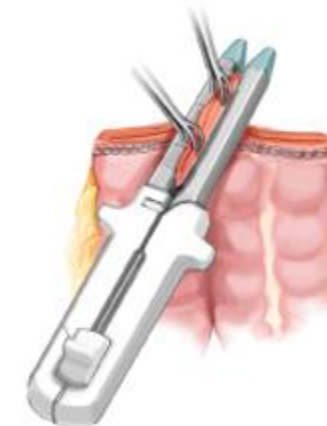
**5** The stapled anastomosis between the proximal and distal colon, with the joined lumens open. Allis clamps securing the lumen in preparation for closure.



**6** A linear stapler placed distal to the Allis clamps and closing the lumen.



**7** The stapled functional end-to-end anastomosis.



**IN LINEAR STAPLERS, THE STAPLING LINE IS ALWAYS LARGER THAN THE CUTTING LINE TO ACHIEVE END TO END ANASTOMOSIS.**

1

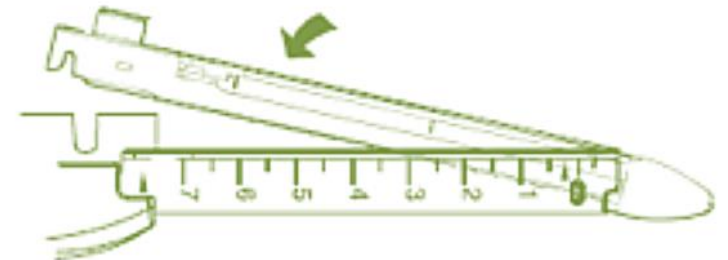
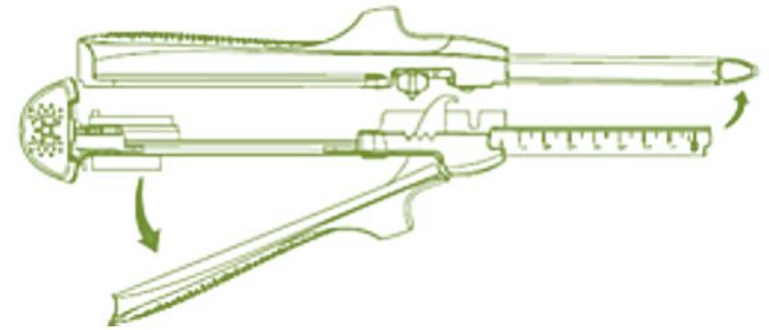
- Remove the instrument from the package by using sterile technique.
- To avoid damage, do not flip the cartridge/Reload into the sterile field.

2

If instrument is not separated into halves, separate instrument by completely disengaging the Alignment/Locking Lever.

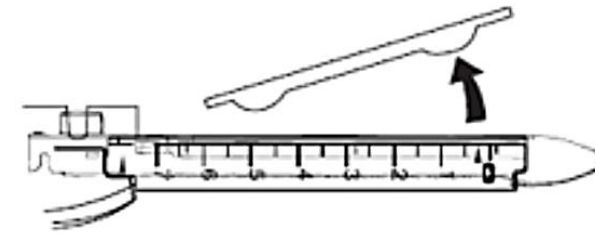
3

- Load the instrument by inserting the selectable Cartridge.
- Reload by placing the alignment tabs into the alignment slots and pivoting the selectable Cartridge/Reload onto the Cartridge/Reload Fork.
- Snap the Cartridge/Reload into position.



4

- Remove Staple Retaining Cap by grasping the edge of the Staple.
- Retaining Cap and lift straight up from the Cartridge/Reload.
- Discard the Staple Retaining Cap.



5

Place the instrument across the tissue for transection or into the lumen to form an anastomosis.



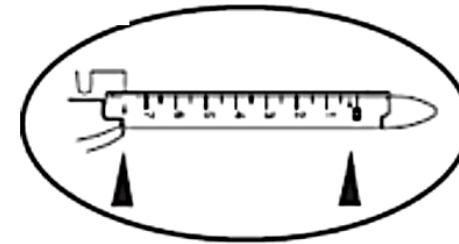
6

- With the Alignment/Locking Lever in the completely opened position join the instrument halves together by aligning from either the front, center, or back of the instrument.
- To adjust tissue on the forks before firing, move the alignment.



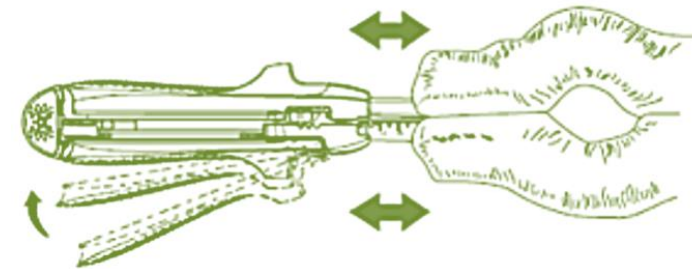
7

- Locking Lever to the intermediate position.
- This allows maneuvering of the tissue while the instrument halves are joined



8

- Ensure that the tissue lies flat between the forks.
- Any “bunching” of tissue along the reload or scale may result in an incomplete staple line.
- Tissue to be transected must be located between the arrows marked on the instrument jaw.
- Any tissue located outside of the arrows is out of the stapling range.



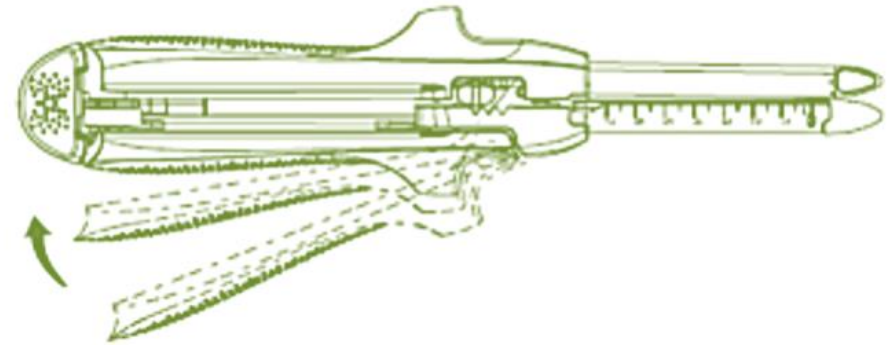
9

- When positioning the device on the application site, ensure that no obstructions such as clips, stents, guide wires, and etc., are within the instrument anvils.
- Firing over an obstruction may result in incomplete cutting action and/or improperly formed staples.

10

- Ensure that the Cartridge/Reload Fork and the Anvil Fork are aligned.
- Close the Alignment/Locking Lever completely when the tissue is properly in place.

**Note: When firing across thick tissue, holding the jaws in place for 15 seconds after closing and prior to firing may result in better compression and staple formation.**

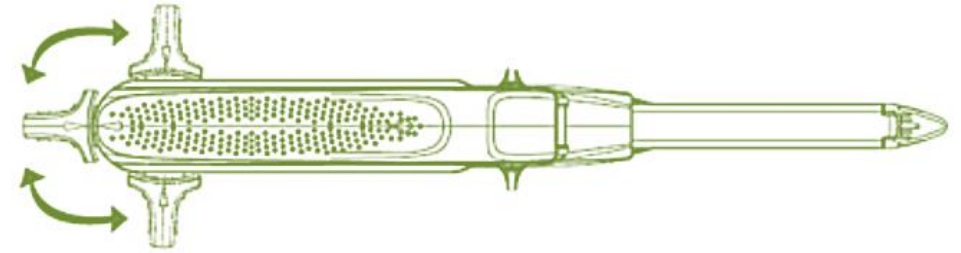




11

With the instrument closed, the Firing Knob is rotated to either side of instrument.

**Note:** In its pre-firing position, the Firing Knob cannot be rotated from its pre-firing position unless the alignment/Locking Lever is engaged.

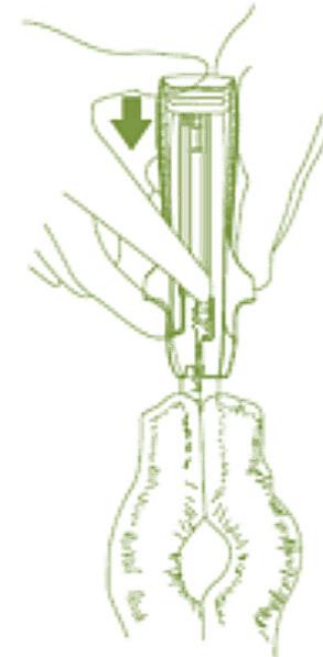


12

- To fire the linear cutter, place the thumb on the firing knob and two fingers on the shoulders of the linear cutter.
- Fire the instrument by pushing the firing knob completely forward.

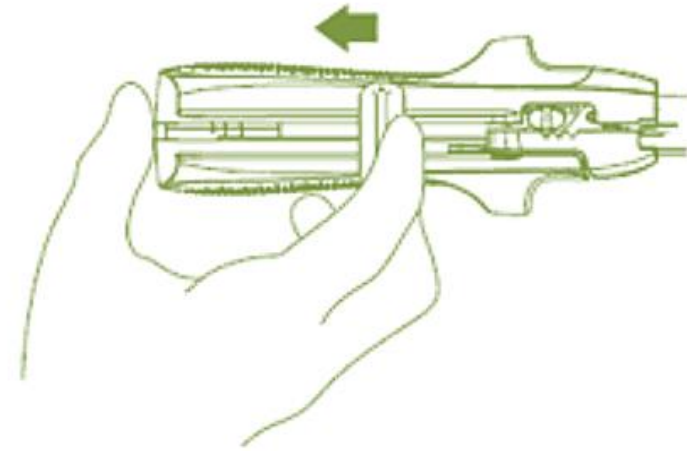
**Note:** it is possible to utilize the thumb or palm of hand to fire the instrument.

**Note:** crossing of staple lines may shorten the life of the instrument.



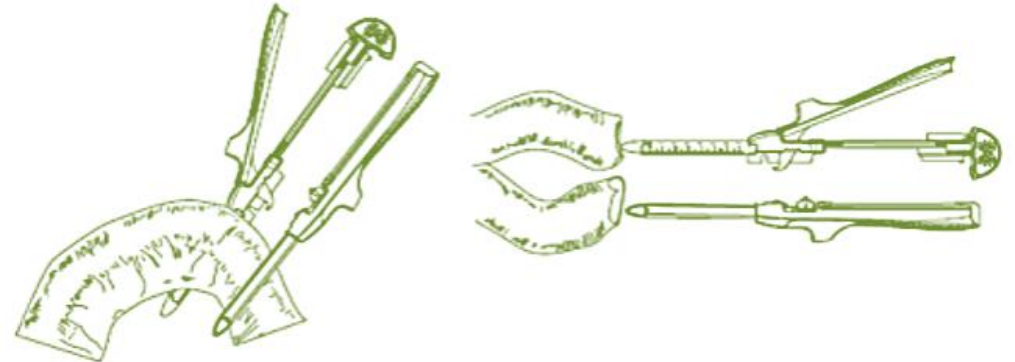
13

Completely return the Firing Knob to the original pre-firing, “RETURN KNOB HERE” position.



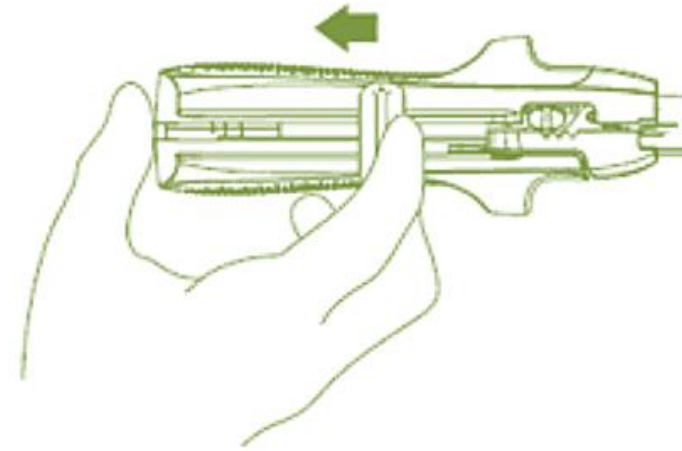
14

Separate the instrument halves by opening the Alignment/Locking Lever and remove the instrument from the patient.



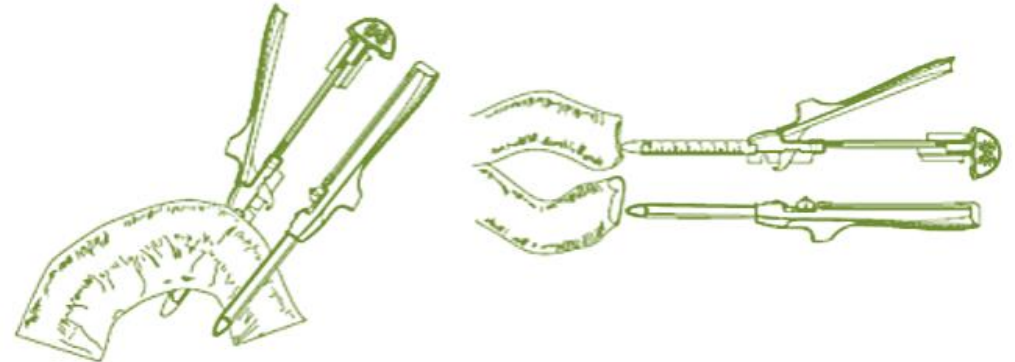
16

Completely return the Firing Knob to the original pre-firing, “RETURN KNOB HERE” position.



17

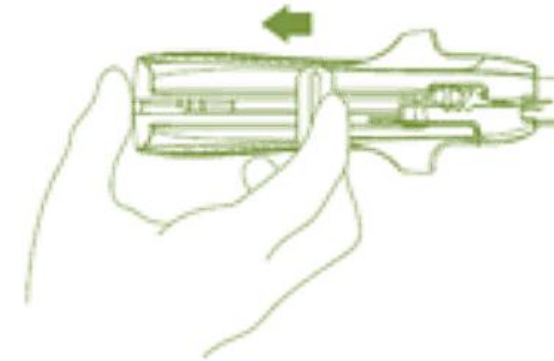
- Separate the instrument halves by opening the alignment/Locking
- Lever and remove the instrument from the patient.



18

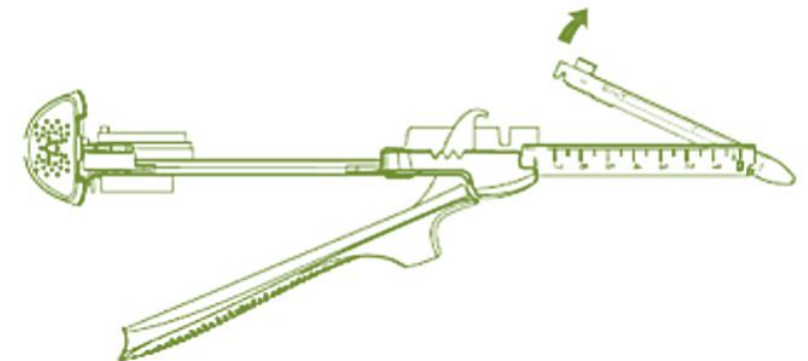
If Firing Knob is not in “RETURN KNOB HERE” position, return the Firing Knob to the original pre firing, “RETURN KNOB HERE” position.

**Note: The Cartridge cannot be inserted unless the firing Knob is in its original position.**

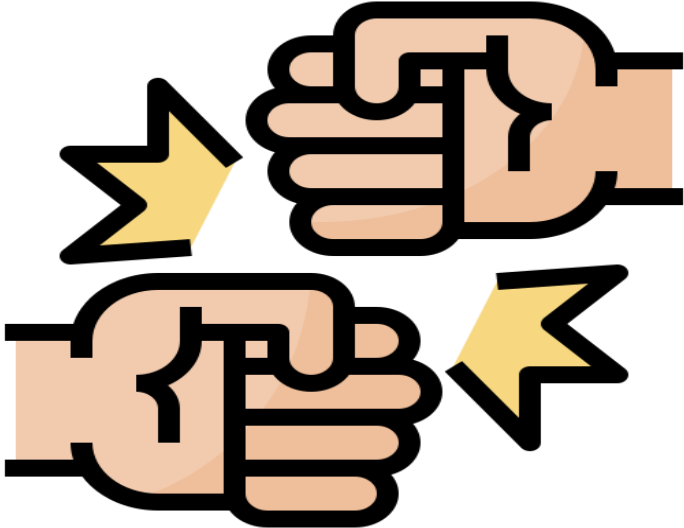


19

- Separate the instrument halves by pulling open the alignment/ Locking Lever.
- Pull upward on the gripping surface and unsnap the used cartridge from the Cartridge fork. Discard the used cartridge.



INGENIOUS



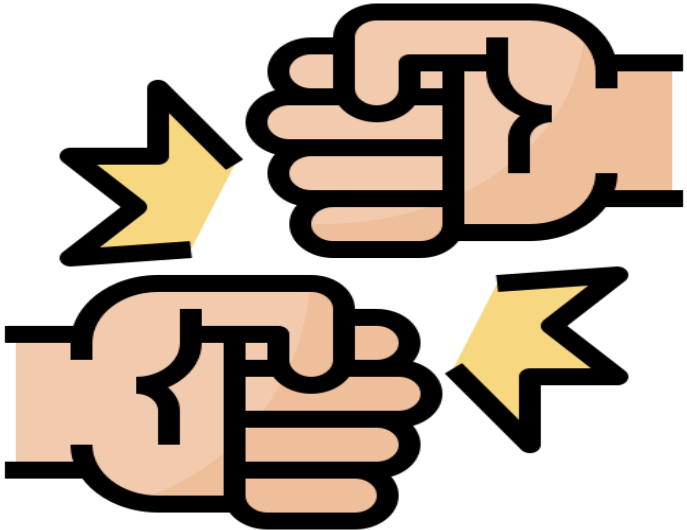
Medtronic

### 3. LINEAR STAPLERS – COMPARAISON /MEDTRONIC



| COLOR RELOAD | STAPLE HEIGHT (before closure) | Approx. STAPLE HEIGHT (closed) | CUTTING LENGTH | Nr. OF FIRING | STAPLE Nr. | HANDLE/ RELOAD PACKING | STAPLE ROWS |
|--------------|--------------------------------|--------------------------------|----------------|---------------|------------|------------------------|-------------|
| BLUE         | 3.8 mm                         | 1.7 mm                         | 56 mm          | 11            | 60         | 1/6 Pcs/box            | 4           |
|              |                                |                                | 76 mm          |               | 80         |                        |             |
| GREEN        | 4.5 mm                         | 2.2 mm                         | 96 mm          | 11            | 100        | 1/6 Pcs/box            | 4           |
|              |                                |                                | 56 mm          |               | 60         |                        |             |
|              |                                |                                | 76 mm          |               | 80         |                        |             |
| BLUE         | 3.8 mm                         | 1.5 mm                         | 96 mm          | 8             | 104        | 3/6*** Pcs/box         | 4           |
|              |                                |                                | 66 mm          |               | 64         |                        |             |
|              |                                |                                | 86 mm          |               | 84         |                        |             |
| GREEN        | 4.8 mm                         | 2 mm                           | 106 mm         | 8             | 104        | 3/6*** Pcs/box         | 4           |
|              |                                |                                | 66 mm          |               | 64         |                        |             |
|              |                                |                                | 86 mm          |               | 84         |                        |             |

INGENIOUS



Ethicon  
Endo-Surgery

PART OF THE *Johnson & Johnson* FAMILY OF COMPANIES

### 3. LINEAR STAPLERS – COMPARAISON /ETHICON



| COLOR RELOAD | STAPLE HEIGHT (before closure) | Approx. STAPLE HEIGHT (closed) | CUTTING LENGTH | Nr. OF FIRING | STAPLE Nr. | HANDLE/ RELOAD PACKING | STAPLE ROWS |
|--------------|--------------------------------|--------------------------------|----------------|---------------|------------|------------------------|-------------|
| BLUE         | 3.8 mm                         | 1.7 mm                         | 56 mm          | 11            | 60         | 1/6 Pcs/box            | 4           |
|              |                                |                                | 76 mm          |               | 80         |                        |             |
| GREEN        | 4.5 mm                         | 2.2 mm                         | 96 mm          | 11            | 100        | 1/6 Pcs/box            | 4           |
|              |                                |                                | 56 mm          |               | 60         |                        |             |
|              |                                |                                | 76 mm          |               | 80         |                        |             |
| BLUE         | 4.4 mm                         | 1 mm                           | 98 mm          | 8             | 56         | 3/6*** Pcs/box         | 4           |
|              |                                |                                | 56 mm          |               | 76         |                        |             |
|              |                                |                                | 76 mm          |               | 100        |                        |             |
| GREEN        | 4.8 mm                         | 2.5 mm                         | 98 mm          | 8             | 56         | 3/6*** Pcs/box         | 4           |
|              |                                |                                | 53 mm          |               | 76         |                        |             |
|              |                                |                                | 73 mm          |               | 100        |                        |             |



### 3. LINEAR STAPLERS – TAKE HOME MESSAGE

**REDUCED POST OPERATIVE BLEEDING**

DOUBLE ROWS STAPLERS ON EACH SIDE OF RELOAD

**SAFETY MECHANISM**

BUILT IN SAFETY LOCK-OUT MECHANISM

**TISSUE RETAINING PIN**

PREVENTION OF TISSUE SLIPPAGE AT DISTAL END

**ENSURED STAPLE FORMATION**

DUE TO ONE STEP FORMING ANVIL

**SMOOTH CUTTING MECHANISM**

HIGH COMPRESSION FORCE

**4 EXTRA SATPLERS**

ENSURING DEPENDABLE HAEMOSATIS

**WIDE SELECTION OF CARTIDGES**

DEPENDING ON CUTTING LENGTH

**SAFETY PROTECTION**

WITH FIRIN BUTTON

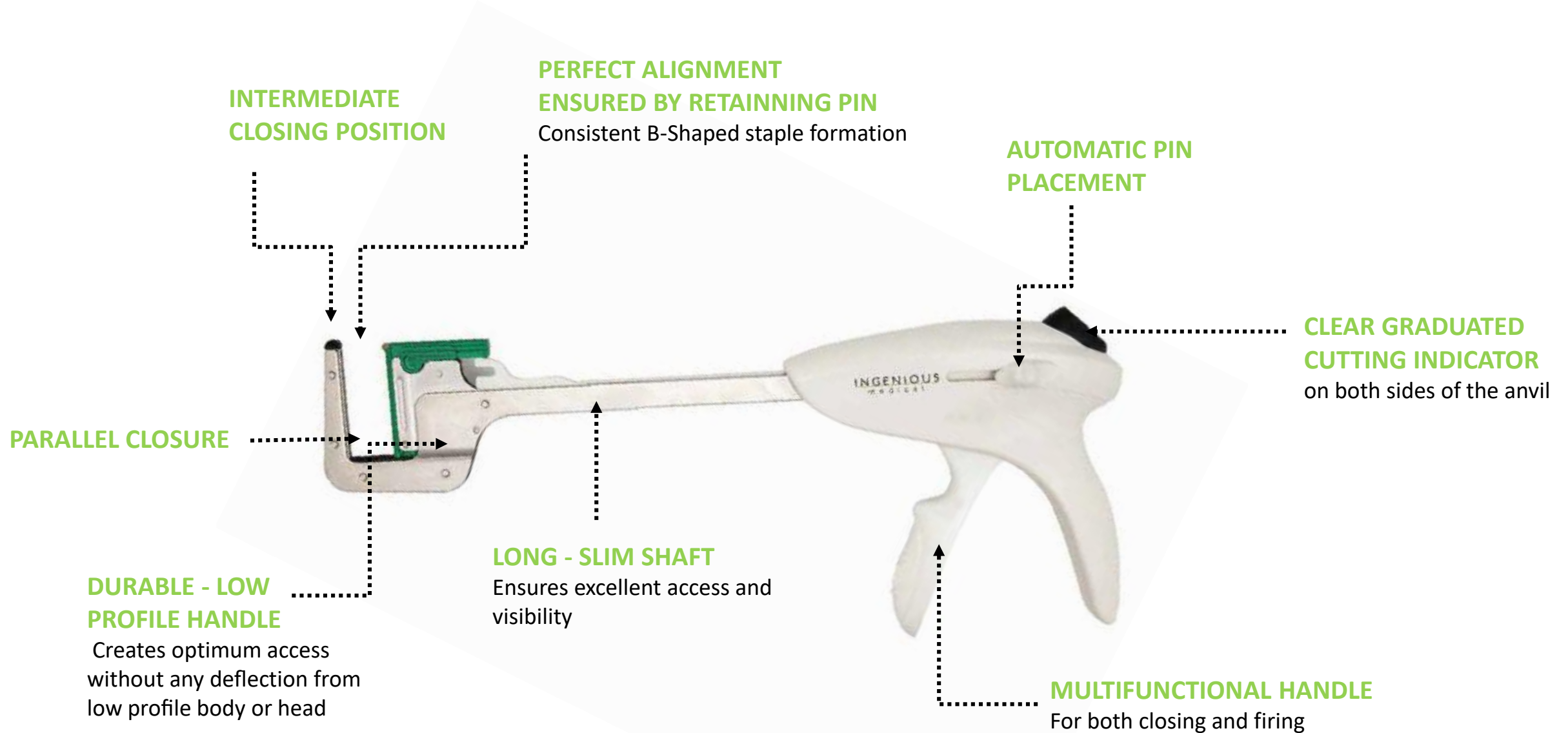
**DIFFERENT RANGE OF TISSUES**

VASCULAR >> EXTRA THICK



**LINEAR STAPLER**

**TA - SHAPE**



**AVAILABLE IN GREEN AND BLUE RELOADS:**

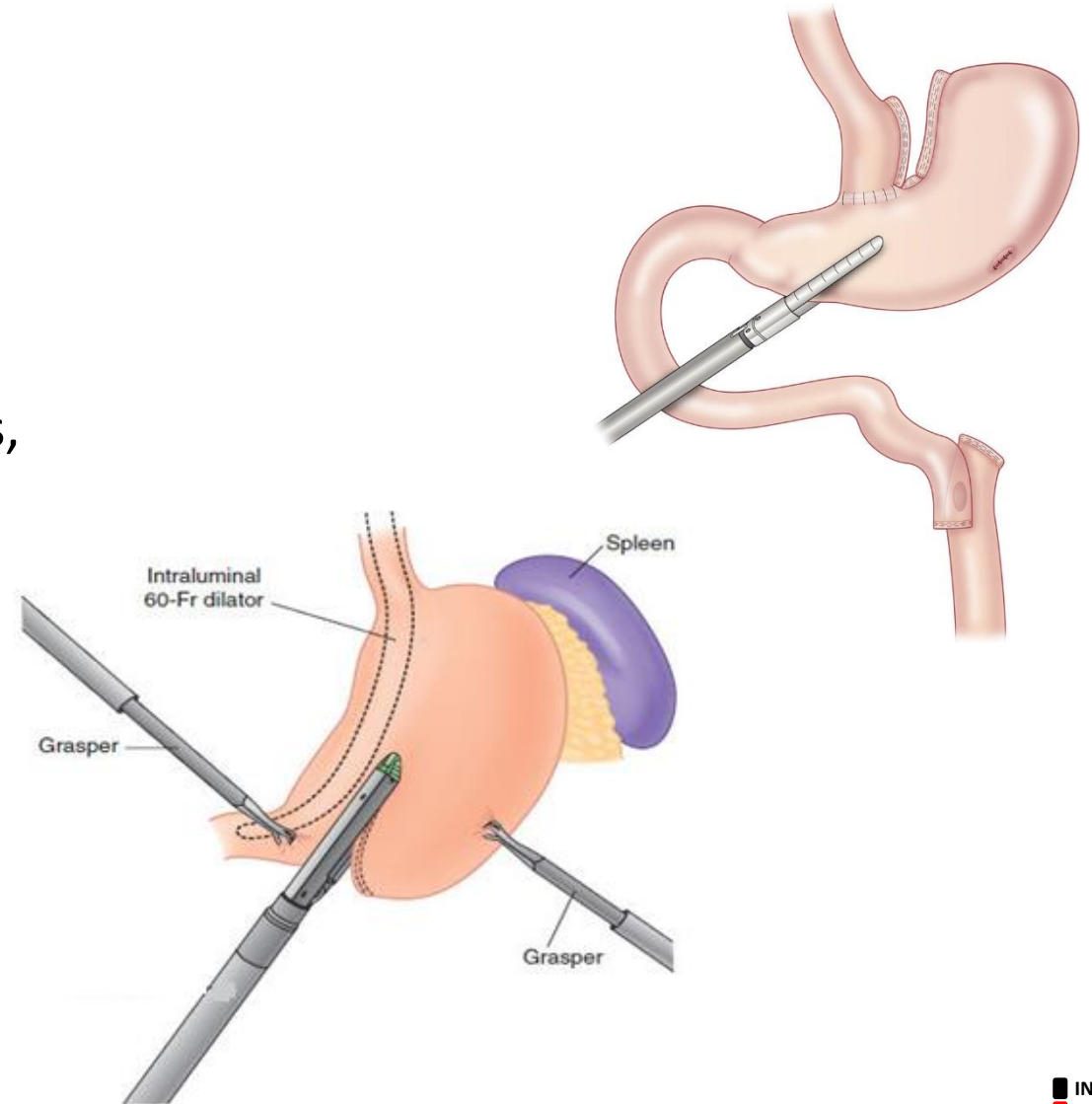
- **BLUE** FOR NORMAL TISSUE
- **GREEN** FOR THICK TISSUE

**AVAILABLE IN 4 SIZES :**

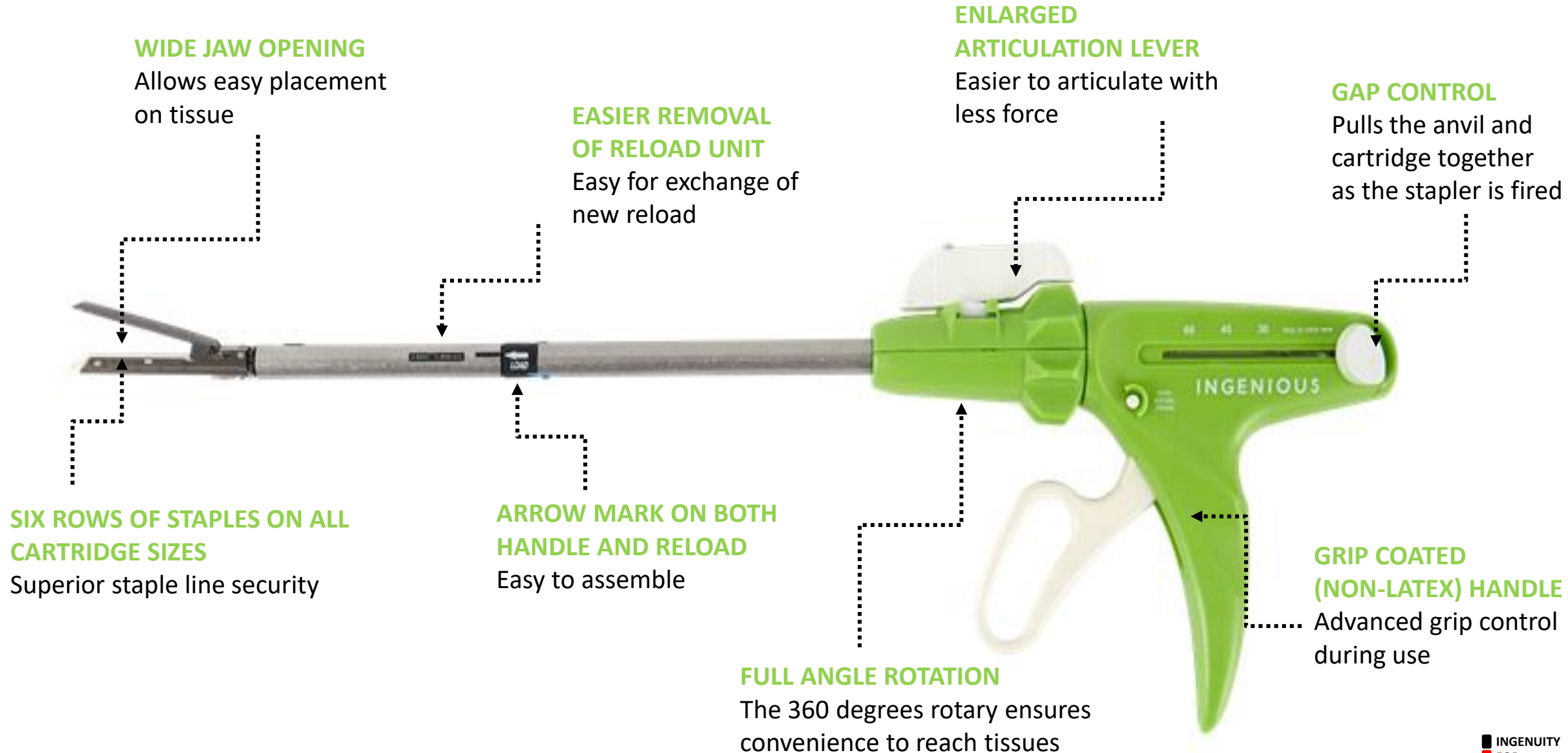
| DESCRIPTION     | COLOR | STAPLE LENGTH BEFORE CLOSURE | SIZE OF CLOSED STAPLE | STAPLE NO | PACK QTY                                     |
|-----------------|-------|------------------------------|-----------------------|-----------|--|
| Stapler size 30 | BLUE  | 3.8 mm                       | 1.5 mm                | 11        | 1 pc/box for handle<br>6 pcs/box for reloads |
|                 | GREEN | 4.5 mm                       | 2.0 mm                |           |  |
| Stapler size 45 | BLUE  | 3.8 mm                       | 1.5 mm                | 15        | 1 pc/box for handle<br>6 pcs/box for reloads |
|                 | GREEN | 4.5 mm                       | 2.0 mm                |           |  |
| Stapler size 60 | BLUE  | 3.8 mm                       | 1.5 mm                | 21        | 1 pc/box for handle<br>6 pcs/box for reloads |
|                 | GREEN | 4.5 mm                       | 2.0 mm                |           |  |
| Stapler size 90 | BLUE  | 3.8 mm                       | 1.5 mm                | 33        | 1 pc/box for handle<br>6 pcs/box for reloads |
|                 | GREEN | 4.5 mm                       | 2.0 mm                |           |  |

# ENDOSCOPIC LINEAR STAPLERS

- **BARIATRIC SURGERY** :Gastric sleeve, Gastrectomy, Bowel resections and anastomosis.
- **GENERAL SURGERY** : Bowel resections ,anastomosis, liver resection, splenectomy, Whipple surgery.



### 3. LINEAR STAPLERS - ENDOSCOPIC



| Order No.  | Description             | Rod Length  | Pack Qty |
|------------|-------------------------|-------------|----------|
| 900-100-00 | Endo Cutter Size Small  | 75 ± 10 mm  | 1 pc/box |
| 900-100-01 | Endo Cutter Size Medium | 155 ± 10 mm | 1 pc/box |
| 900-100-02 | Endo Cutter Size Large  | 255 ± 10 mm | 1 pc/box |





### 3. LINEAR STAPLERS – ENDOSCOPIC HANDLES

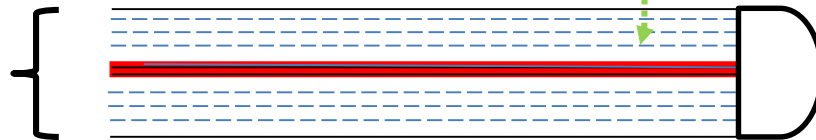


| SPECIFICATIONS           |                                      |
|--------------------------|--------------------------------------|
| Description              | 45 mm Linear cutter with AQUA reload |
| Staple rows              | 6                                    |
| Tissue thickness         | Vascular /Medium                     |
| Nr. Of staples           | 66 (6 X 11)                          |
| Suture (Staple) length   | 45 mm                                |
| Cutting length           | 44 mm                                |
| Staple height            | 1.9 – 3 mm                           |
| Order Nr. ( for reloads) | 900-100-10                           |

| SPECIFICATIONS           |                                      |
|--------------------------|--------------------------------------|
| Description              | 60 mm Linear cutter with AQUA reload |
| Staple rows              | 6                                    |
| Tissue thickness         | Vascular /Medium                     |
| Nr. of staples           | 90 (6 X 15)                          |
| Suture (Staple) length   | 61 mm                                |
| Cutting length           | 60 mm                                |
| Staple height            | 1.9 – 3 mm                           |
| Order Nr. ( for reloads) | 900-100-11                           |

**PULSE TECHNOLOGY**

6 Rows of staples



15 staples per row



### 3. LINEAR STAPLERS – ENDOSCOPIC RELOADS

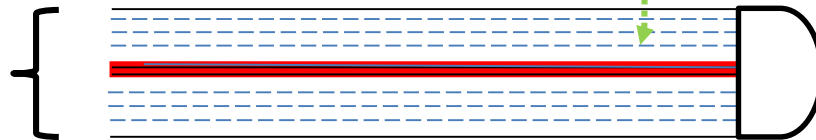


| SPECIFICATIONS           |   |
|--------------------------|---|
| Description              | 45 mm Linear cutter with <b>ORANGE</b> reload |
| Staple rows              | 6   |
| Tissue thickness         | <b>Medium / Thick</b>                         |
| Nr. Of staples           | 66 (6 X 11)                                   |
| Suture (Staple) length   | 45 mm   |
| Cutting length           | 44 mm   |
| Staple height            | 2.9 – 4.1 mm                                  |
| Order Nr. ( for reloads) | <b>900-100-12</b>                             |

| SPECIFICATIONS           |   |
|--------------------------|---|
| Description              | 60 mm Linear cutter with <b>ORANGE</b> reload |
| Staple rows              | 6   |
| Tissue thickness         | <b>Medium / Thick</b>                         |
| Nr. of staples           | 90 (6 X 15)                                   |
| Suture (Staple) length   | 61 mm   |
| Cutting length           | 60 mm   |
| Staple height            | 2.9 – 4.1 mm                                  |
| Order Nr. ( for reloads) | <b>900-100-13</b>                             |

**PULSE TECHNOLOGY**

6 Rows of staples



15 staples per row



### 3. LINEAR STAPLERS – ENDOSCOPIC RELOADS

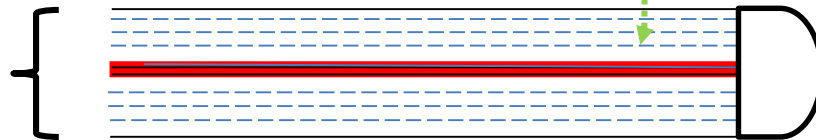


| SPECIFICATIONS           |  |
|--------------------------|--|
| Description              | 60 mm Linear cutter with <b>BROWN</b> reload |
| Staple rows              | 6  |
| Tissue thickness         | <b>Extra / Thick</b>                         |
| Nr. Of staples           | 66 (6 X 11)                                  |
| Suture (Staple) length   | 45 mm  |
| Cutting length           | 44 mm  |
| Staple height            | 4 - 5.2 mm                                   |
| Order Nr. ( for reloads) | <b>900-100-14</b>                            |

| SPECIFICATIONS           |  |
|--------------------------|--|
| Description              | 60 mm Linear cutter with <b>BROWN</b> reload |
| Staple rows              | 6  |
| Tissue thickness         | <b>Extra / Thick</b>                         |
| Nr. of staples           | 90 (6 X 15)                                  |
| Suture (Staple) length   | 61 mm  |
| Cutting length           | 60 mm  |
| Staple height            | 4 - 5.2 mm                                   |
| Order Nr. ( for reloads) | <b>900-100-15</b>                            |

**PULSE TECHNOLOGY**

6 Rows of staples



15 staples per row



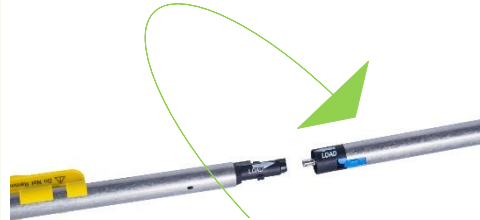
# 3. LINEAR STAPLERS – STEPS – RELOADING ENDOSCOPIC LINEAR STAPLER

1



REMOVE FROM  
PACKING

2



INSERT RELOAD

3



REMOVE PLASTIC  
WEDGE

4



CYCLE THE  
INSTRUMENT

**1** Close the tip of the stapling device and pass it through a trocar.

**2** Ensure the anvil of the reloading unit has fully entered the abdominal cavity before pulling back on the return lever and open the jaws.

**3** A stapler should be placed from the periphery to the central area.

**4** The position of both the cartilage and the anvil of the stapler should be visually confirmed before twisting the tissue.



5

Using the 360 degree rotational wheel positioning the tissue to be stapled between the jaws of the reloading unit.

6

Articulating reloading unit allow for further maneuverability when the articulating lever is turned from the left to the right.

7

Only tissue positioned within the cut mark line will be transected.

8

Additional reloading units may be required for tissue exceeding the length of the cut mark line.



9

Close the jaws of the reloading unit across the tissue to be transected by pulling the firing handle.



10

The jaws of the device may be repositioned on the tissue prior to firing by fully pulling up on the return lever allowing jaws to reopen.



11

Allows 1 -2 s for tissue compression

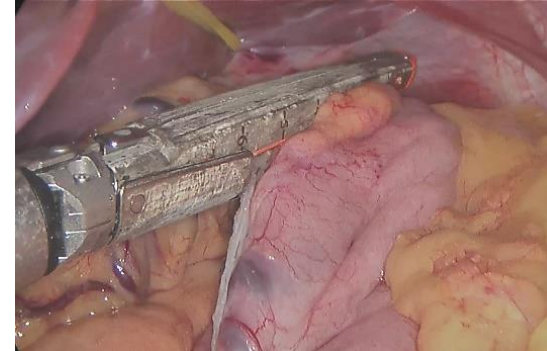
12

Press the push button before firing.



**13**

Fire the device by pushing the firing handle. The number of squeezing to fully fire the device depend on the length of the reloading unit.



**14**

Once the device is fired, pull back on the return lever to open the jaws of the reloading unit and gently remove the device from the inspected tissue.



**15**

Inspect the staple line for hemostasis.

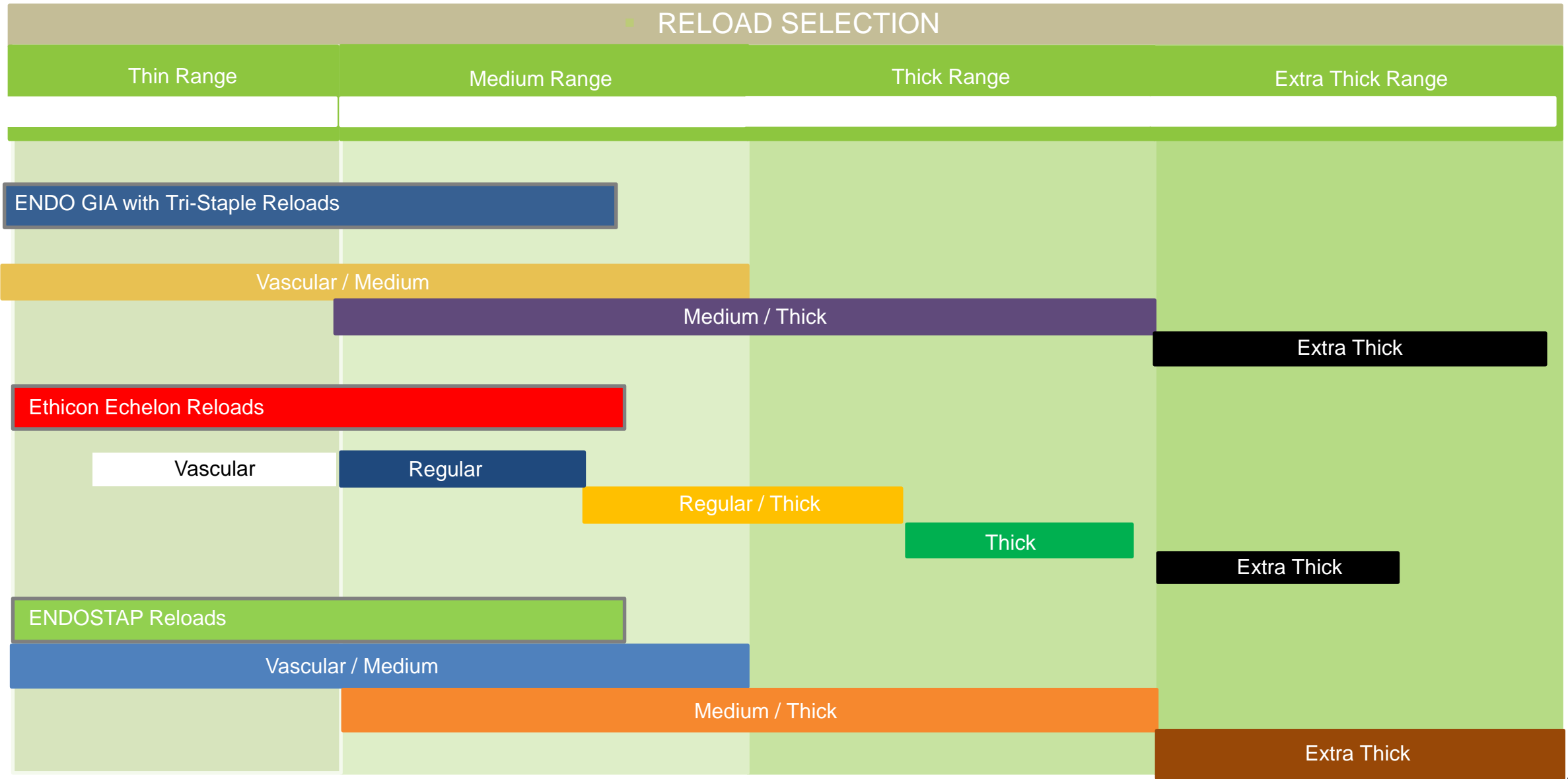
**16**

Close the jaws to remove stapler from the abdominal cavity and unload the cartilage.





# 3. LINEAR STAPLERS – COMPARAISON /ETHICON /MEDTRONIC



Three different experiments PERFORMED on two commercial Endoscopic Linear Staplers from different companies, to test different critical parameters that affect the performance of staplers such :

- A. Compression Force
- B. Leakage Rate At Staple Line
- C. Cutting Line

**Endoscopic Linear Cutter Staplers: A Comparative Study**

Najim Moudamad, Ali Khatami, Mahamed Hisham, Hassan Wabli, Ali Cherry  
 Dept. of Electrical Engineering  
 Lebanese International University  
 Beirut, Lebanon  
 nmoudamad@liu.edu.lb

**Abstract**—currently, obesity has become an epidemic issue spreading globally and a major cause of the burden regarding disabilities and chronic diseases. Weight loss techniques are increasing day after day, and surgeons are the most preferred option by many people to address this problem. Recently, gastric sleeve surgery is considered an effective and safe method to lose weight. It is the newest surgery that got a very high evaluation from doctors and its complications and great results caught surgeons' attention. The use of endoscopic staplers in the case of our research project. The development of a comparative study to compare two staplers from Covidien and Intuitive Surgical companies study will be used as a guide for the two products and a step towards the design of the present stapler. The aim of this research is to measure each product in terms of force, cutting, probability. These tests were conducted in order to evaluate the mechanism of the stapler. **Keywords**—laparoscopy, gas leakage rate, force, comparative study.

**I. INTRODUCTION**

Obesity rates are growing nearly million obese persons among 1 billion. Associated with different degenerative diseases, obesity is a global health problem affecting all ages and all different weight loss methods are recommended. These methods include diet and surgical and medical treatments. None is out of laparoscopic strategies, the modifications and sometimes gastric bypass surgery. Laparoscopic bariatric surgery is a system for long-term weight loss that is more effective than non-surgical treatments.

Laparoscopic vertical gastric bypass is the most appropriate weight loss. It is characterized by an incision, suitable for patients with some weight. This surgery is done laparoscopically in six incisions in the abdomen and uses a video camera (laparoscope) to make incisions placed through incisions. It is needed to accomplish this surgery in 1-2 hours, which is considered a short stay in a plan for patients with lower risk surgery can lead sometimes to complications like leaks, thrombosis, stricture, infections[1].

According to study done by "Obesity consensus" website, the risk of leakage is measured to be about 2.8% in a systematic analysis of 4888 patients. Staple line reliability and security is a main consideration in bariatric surgery. Leaking staple lines are linked with significant morbidity and, in some cases, death. The characteristic tissue thickness of the stomach demands that the staplers should carefully consider the specific location of the planned staple line, as this will affect the choice of staple size. Human tissues are due to the presence of solid and liquid components. The rate and intra-cellular fluids affect the tissue, so that distension occurs as a result of creating forces application. When exposed to an applied distension, a reduction in the amount of force required to maintain the applied displacement occurs. The successive compression will yield an elastic tissue shear or tensile stress that result in tearing of tissues. The phenomena of tissue creep, stress relaxation, and shear stress are related to one common factor which is time. Optimum stapling time would consist of allowing adequate time for tissue compression and creep while not producing excessive tensile stress. Taking this into consideration, our test is to evaluate the leaks occurrence or possibilities when utilizing the Covidien and the Intuitive model. This test will be proposed to experience the leaks after applying the stapling line, and also evaluate what would happen by simulating the effect of time [10, 11]. The test model proposed needs:

- Two balloons of same thickness
- Water
- The two end-staplers with airlocks to create a pouch.
- A beaker
- A timer

The test first starts with creating a pouch with each balloon one with Covidien and other with Intuitive. Leak testing is accomplished then by infusing water into each pouch. Each balloon will be placed on a beaker with a timer

**B. Integrity Of The Cutting Line**

When dealing with the gastric sleeve, the cutting line integrity is very important. The goal behind the gastric sleeve is to decrease the size of the stomach, but still maintain a shape that is close to the regular stomach. Another factor affecting the cutting line is the level of the endo-stapler whose movement will cause a disarticulation in the line. The slippage of the tissue may affect also the cutting line. Furthermore, the fact that the stomach is not a flat organ but almost a curved organ makes the cutting process more crucial and sensitive to be applied. The stability of the cutting line can be tested by almost imitating the real scenario that occurs during the surgery [4]. For that we will need:

- Pieces of parchment.
- The Covidien model and the Intuitive model.
- Feed retracts (just the knife) just to observe the cut.

**C. Leakage Rate**

According to study done by "Obesity consensus" website, the risk of leakage is measured to be about 2.8% in a systematic analysis of 4888 patients. Staple line reliability and security is a main consideration in bariatric surgery. Leaking staple lines are linked with significant morbidity and, in some cases, death. The characteristic tissue thickness of the stomach demands that the staplers should carefully consider the specific location of the planned staple line, as this will affect the choice of staple size. Human tissues are due to the presence of solid and liquid components. The rate and intra-cellular fluids affect the tissue, so that distension occurs as a result of creating forces application. When exposed to an applied distension, a reduction in the amount of force required to maintain the applied displacement occurs. The successive compression will yield an elastic tissue shear or tensile stress that result in tearing of tissues. The phenomena of tissue creep, stress relaxation, and shear stress are related to one common factor which is time. Optimum stapling time would consist of allowing adequate time for tissue compression and creep while not producing excessive tensile stress. Taking this into consideration, our test is to evaluate the leaks occurrence or possibilities when utilizing the Covidien and the Intuitive model. This test will be proposed to experience the leaks after applying the stapling line, and also evaluate what would happen by simulating the effect of time [10, 11]. The test model proposed needs:

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- A beaker
- A timer

The test first starts with creating a pouch with each balloon one with Covidien and other with Intuitive. Leak testing is accomplished then by infusing water into each pouch. Each balloon will be placed on a beaker with a timer

**IV. TESTING AND RESULTS**

**A. Test 1 and its results**

The setup of the circuit to measure the grasping force illustrated in figure 4. The test is repeated three times:

- Straight stapling
- Half articulation stapling
- Full articulation stapling

Results are shown in figure 5.



**Figure 4: Application of the test.**



**Figure 5: Grasping force in Newtons for Covidien and Intuitive models in the weight sensor.**

The results of this test show that the grasping force applied by the Intuitive endostapler highly exceeds that of the Covidien endostapler.

**B. Test 2 and its results**


This test is very simple. All what we did is to fix the already fired reload (knife) to a piece of parchment. The

## COMPRESSION FORCE

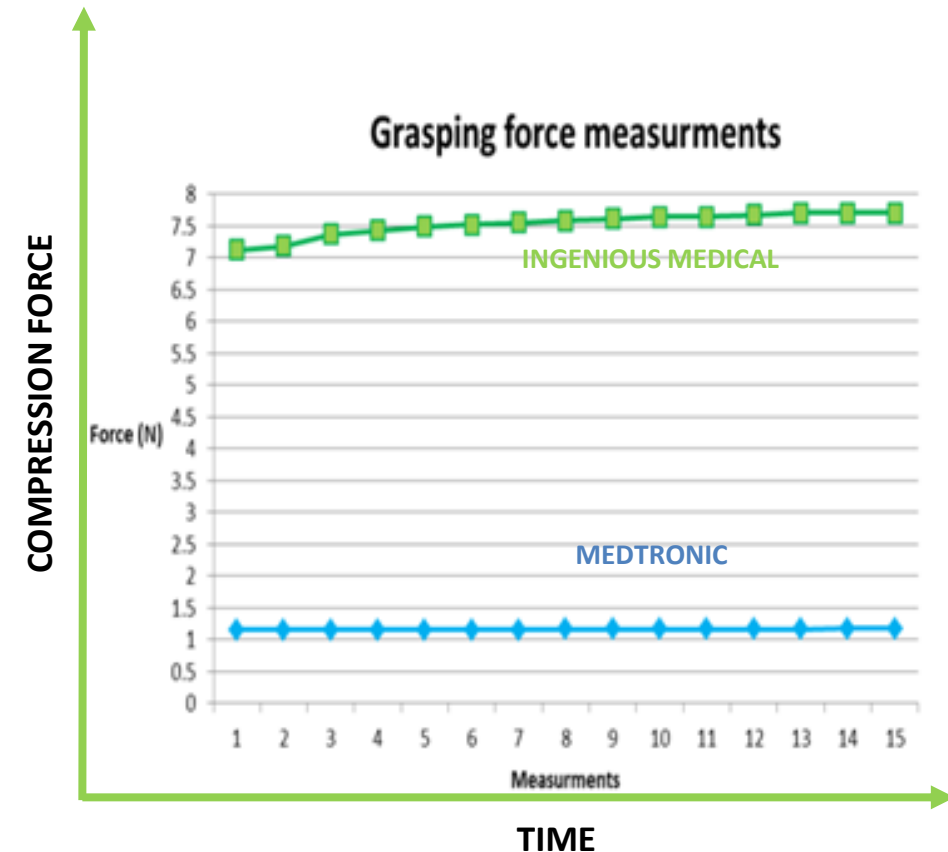
AFTER INSERTION OF 30 MM (3 CM)

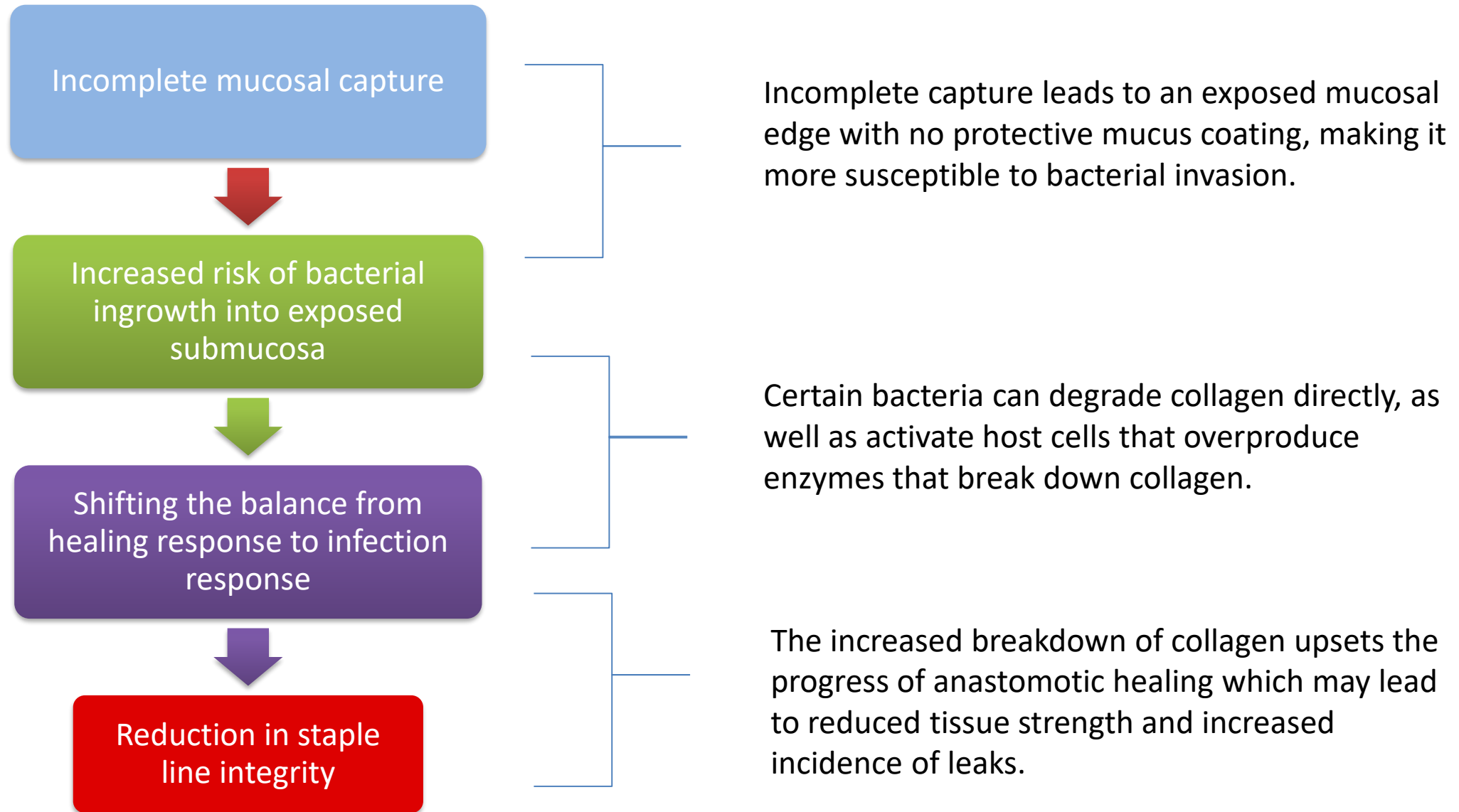
☹️ **MEDTRONIC GRASPING FORCE = 1 – 1.2 N**

😊 **INGENIOUS MEDICAL GRASPING FORCE = 7 – 7.8 N**

 With INGENIOUS Endoscopic Staplers, surgeon perform less force/power to hold the grasped tissue during firing process

 With INGENIOUS Endoscopic Staplers, risk of grasped tissue slippage is eliminated







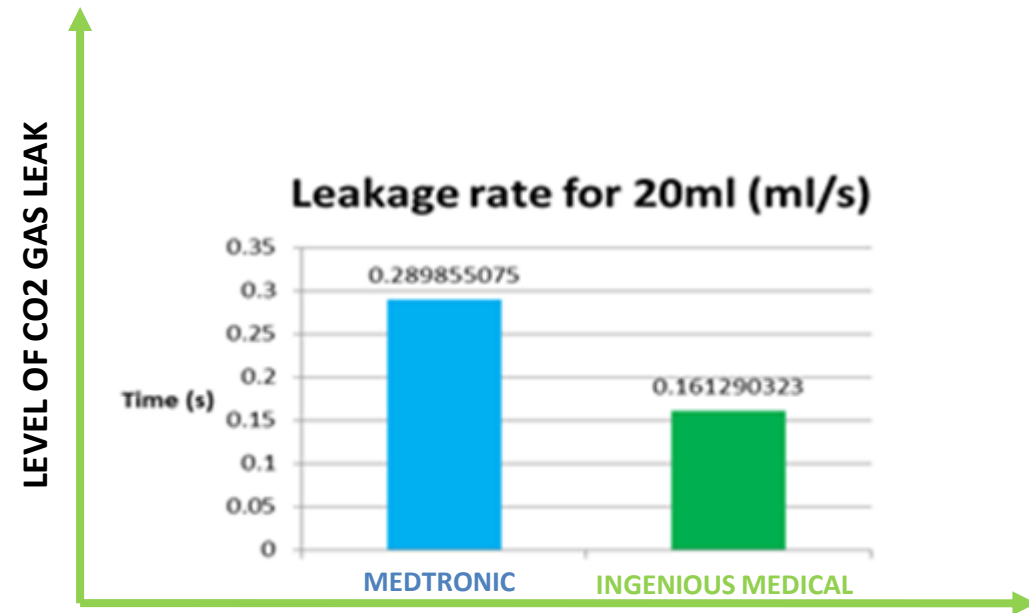
#### LEAKAGE RATE AT STAPLE LINE

##### AFTER STAPLING PROCESS OF LIQUID BALLOON

- ☹️ **MEDTRONIC LEAK RATE = 0.29 ~ 0.3 (ml/sec)**
- 😊 **INGENIOUS MEDICAL LEAK RATE = 0.16 – 0.16 (ml/sec)**

 With INGENIOUS Endoscopic Staplers, surgeons face less leakage rate at staple line

 With INGENIOUS Endoscopic Staplers, risk of post operative complications are eliminated





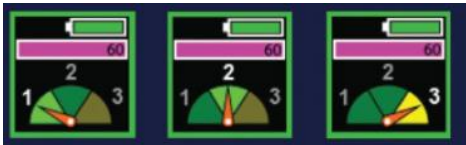
## IS SIGNIA REALLY BETTER THAN ENDOSTAP?



Smart stapler !!

- Automated speed fire across tissue type
- Continuous firing process

Visual Real time feedback on clamping force!!



Alarm display in case reload is not correctly connected to the shaft



Surgeon lose control on firing

- Automated speed fire across tissue type
- Staplers will overlap especially with low grasping force on tissue \*\*refer to technical study discussed above\*\*

- Since automatic firing is performed >> in all cases surgeon will not take in control if the clamping force is not convenient
- Values indicate as: 1, 2 and 3 >> no precise values are displayed

With ENDOSTAP security fire button is not released in case reload not properly connected

#### IS SIGNIA REALLY BETTER THAN ENDOSTAP?



- ✗ NO improved grasping force
- ✗ NO precise clamping value
- ✗ ONLY 3 speeds of firing
- ✗ High cost

- ✓ Real one Handed Control
- ✓ Chargeable



## IS ECHELON FLEX POWERED PLUS WITH GST RELOAD REALLY BETTER THAN ENDOSTAP?



With GST reloads >> better control on tissue movement

Smart stapler !!

- Slows the motor in thick tissue
- Continuous firing process



Grasping force = 2.1 N < than 7.8 N for ENDOSTAP



- Since automatic firing is performed >> in all cases surgeon will not take in control if the clamping force is not convenient



## IS ECHELON FLEX POWERED PLUS WITH GST RELOAD REALLY BETTER THAN ENDOSTAP?



- ✗ NO Universal Handle (2 handles)
- ✗ Single height tissue stapling formation
- ✗ Low clamping force (even with GST tech.)
- ✗ High cost
- ✗ NONE Chargeable



Real one Handed Control

# 3. LINEAR STAPLERS – TAKE HOME MESSAGE - ENDOSTAP

**GREAT CLAMPING FORCE**  
WITH GRASPING FORCE UP TO 7.8 N

**WIDE JAW APERTURE**  
WIDE PROXIMAL TO DISTAL JAW  
APERTURE – 25 MM

**CONTROLLED TENSION**  
PRECISE STAPLING FORCE

**NO DELAY FOR TISSUE  
COMPRESSION**  
1 – 2 SECONDS COMPRESSION TIME

**DIFFERENT RANGE OF TISSUES**  
VASCULAR >> EXTRA THICK

**REDUCED STAPLER LINE Oozing**  
UNIQUE STAPLE FORMATION

**UNIVERSALITY**  
ALL RELOADS ARE COMPATIBLE  
WITH ENDOTAP HANDLES

**COMPROMISED CARTRIDGE  
SELECTION**  
3 CARTRIDGES COVERING ALL  
TISSUES

**ARTICULATION FUNCTION**  
2 STEP ARTICULATION UP TO 45°  
LEFT & RIGHT SIDES

**SUSTAINABILITY**  
NO TISSUE MOVEMENT DURING  
FIRING PROCESS



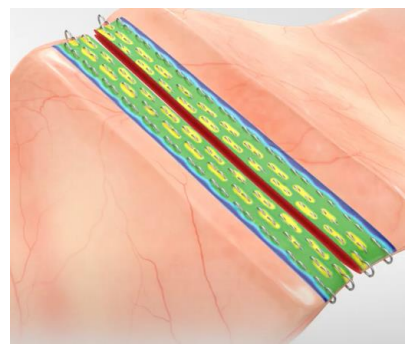
**PULSE TECHNOLOGY**



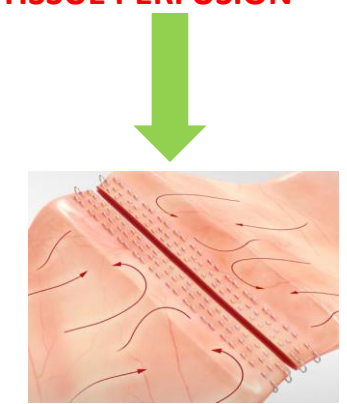
**DYNAMIC STAPLER LINE FOR  
ULTRA ANASTOMOSIS**



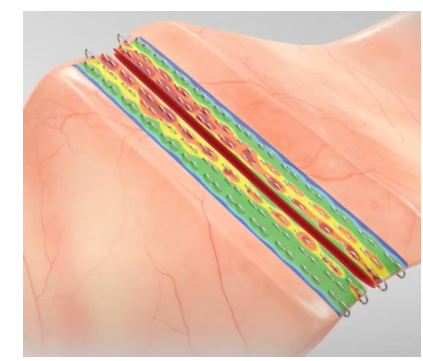
# 3. LINEAR STAPLERS – TAKE HOME MESSAGE – ENDOSTAP THE ONE AND ONLY INGENIOUS



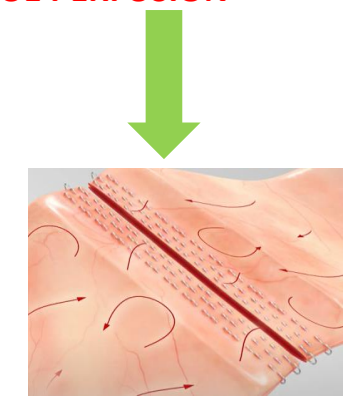
**NO VARIABLE COMPRESSION**  
**ONE CLOSED STAPLE HEIGHT**  
**NO TISSUE PERFUSION**



**NOT PREFERRED BY SURGEONS**  
 BECAUSE OF SLOW HEALING  
 PROCESS



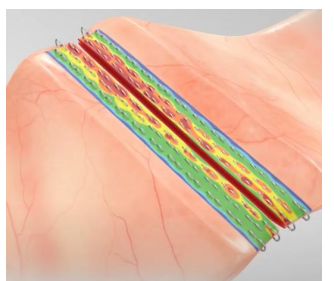
**VARIABLE COMPRESSION**  
**VARIABLE CLOSED STAPLE HEIGHT**  
**TISSUE PERFUSION**



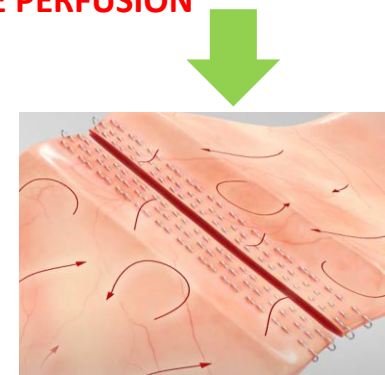
**WILL RESULT OOZING AT STAPLE  
 LINE**  
**NOT PREFERRED BY SURGEONS**

**HIGHLY PREFERRED BY SURGEONS**  
 BECAUSE OF FAST & SAFE HEALING  
 PROCESS

**WILL RESULT IN CLEAR / CLEAN  
 STAPLING LINE (LESS OOZING)**  
**HIGHLY PREFERRED BY SURGEONS**



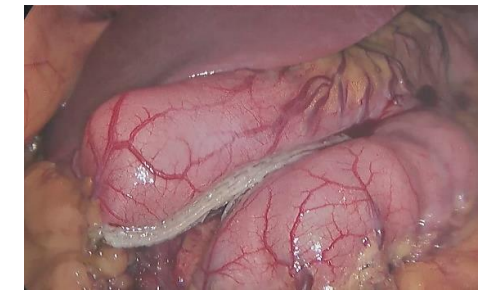
**VARIABLE COMPRESSION**  
**VARIABLE CLOSED STAPLE HEIGHT**  
**TISSUE PERFUSION**



**HIGHLY PREFERRED BY SURGEONS**  
 BECAUSE OF FAST & SAFE HEALING  
 PROCESS

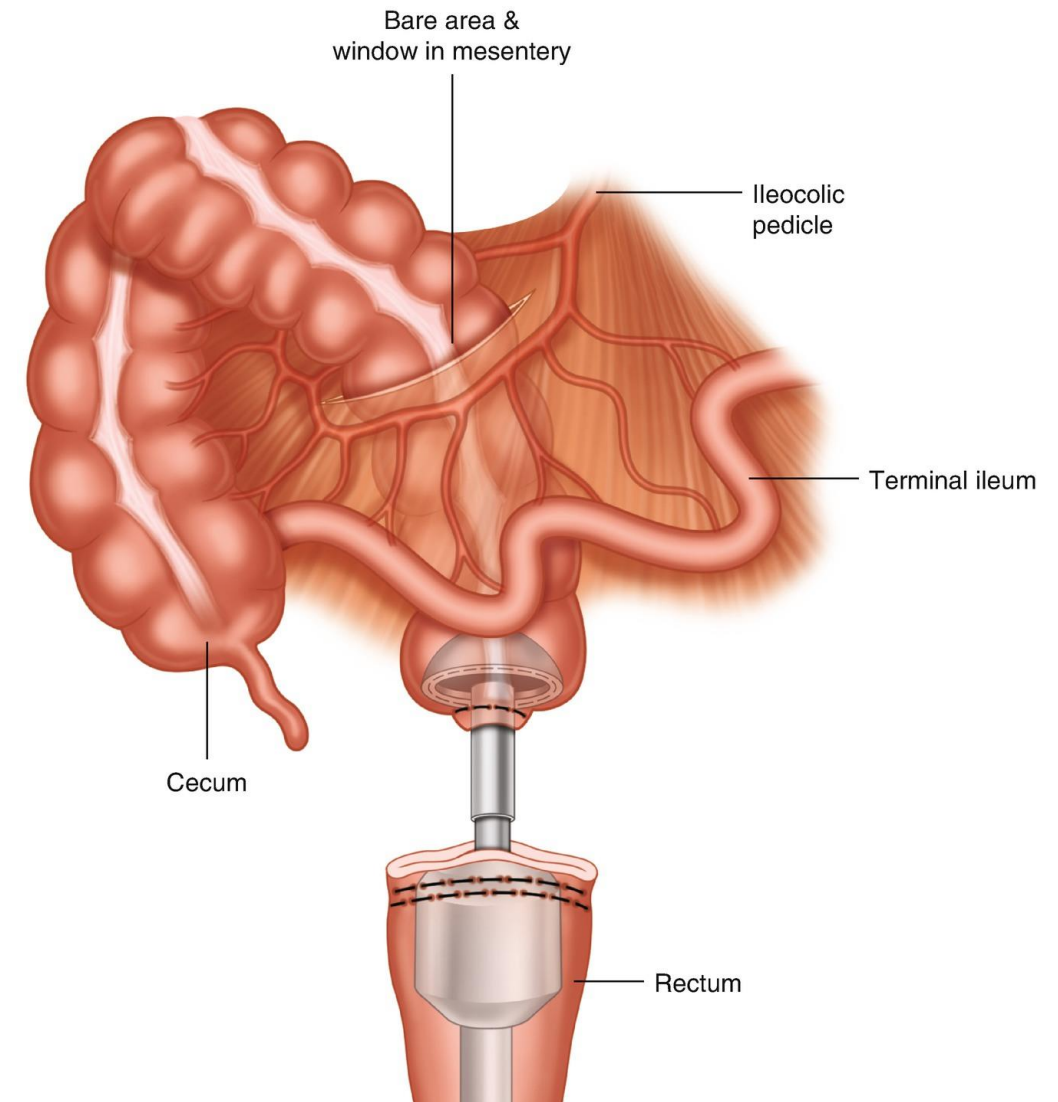


**HIGHLY PREFERRED BY SURGEONS**  
 BECAUSE OF LESS / ELIMINATED  
 OOZING BASED ON PULSE TECH.

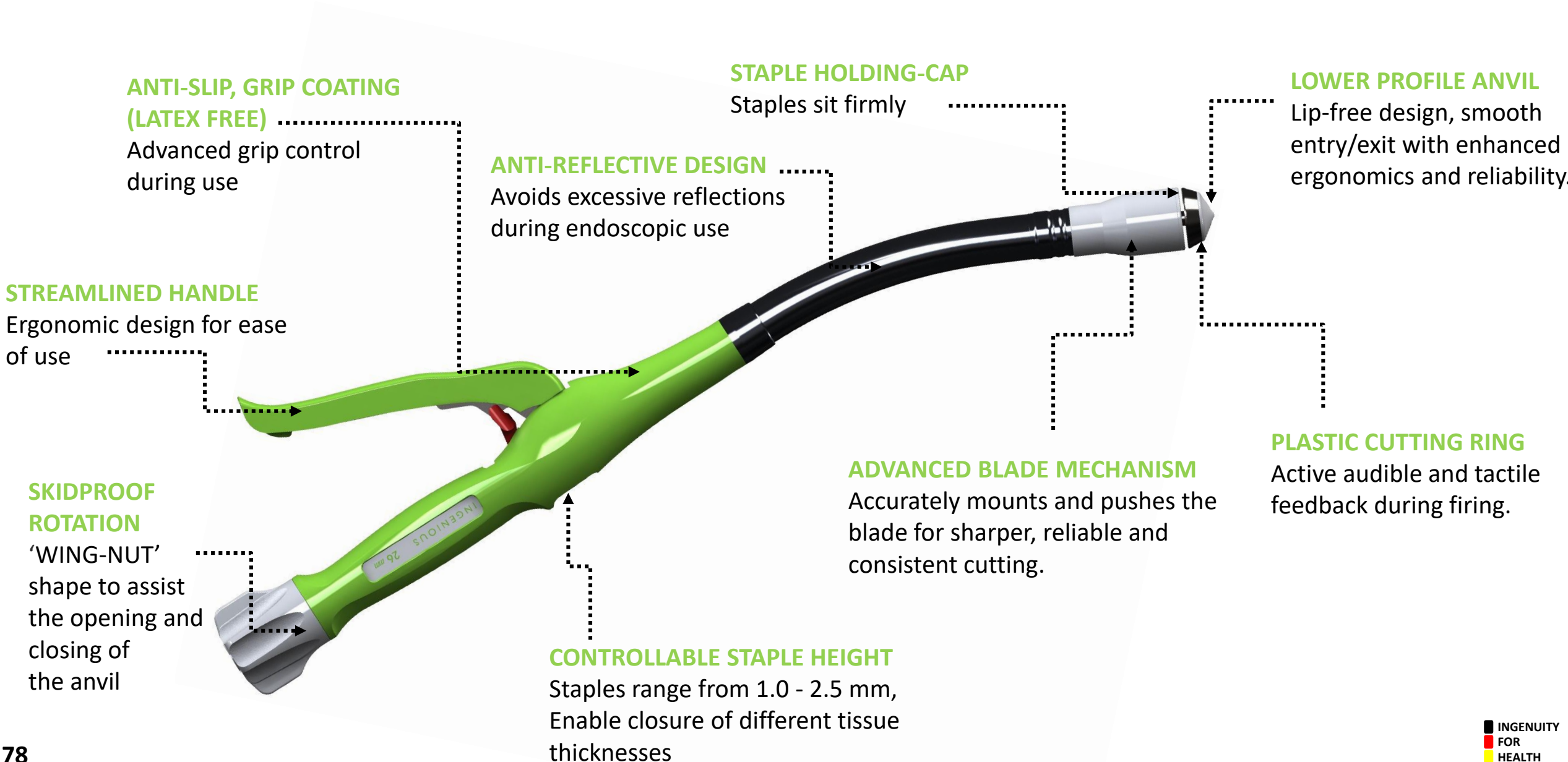


# CIRCULAR STAPLERS

- Suitable for end-to-end, end-to-side and side-to-side anastomosis in the alimentary canal operation (e.g. intestine , Stomach...)
- **Anastomosis** is a surgical connection between two structures.
  - End to end anastomosis (e.g. colorectal anastomosis in Low anterior resection)
  - End to side anastomosis (e.g. Ile colostomy after right hemicolectomy)
  - Side to side anastomosis (e.g. side to side gastrojejunostomy after gastrectomy)



# 4. CIRCULAR STAPLERS



**ANTI-SLIP, GRIP COATING (LATEX FREE)**

Advanced grip control during use

**STAPLE HOLDING-CAP**

Staples sit firmly

**ANTI-REFLECTIVE DESIGN**

Avoids excessive reflections during endoscopic use

**LOWER PROFILE ANVIL**

Lip-free design, smooth entry/exit with enhanced ergonomics and reliability.

**STREAMLINED HANDLE**

Ergonomic design for ease of use

**SKIDPROOF ROTATION**

'WING-NUT' shape to assist the opening and closing of the anvil

**ADVANCED BLADE MECHANISM**

Accurately mounts and pushes the blade for sharper, reliable and consistent cutting.

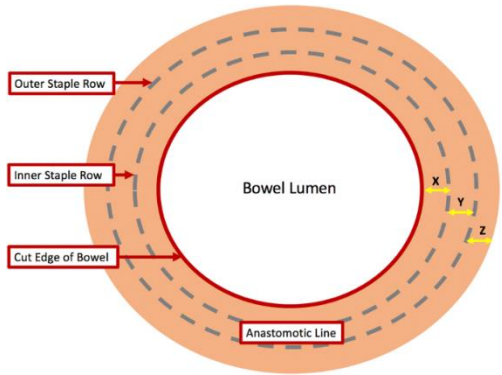
**CONTROLLABLE STAPLE HEIGHT**

Staples range from 1.0 - 2.5 mm, Enable closure of different tissue thicknesses

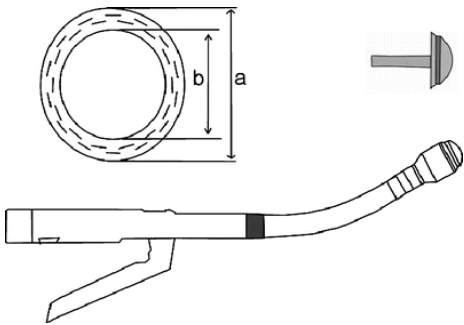
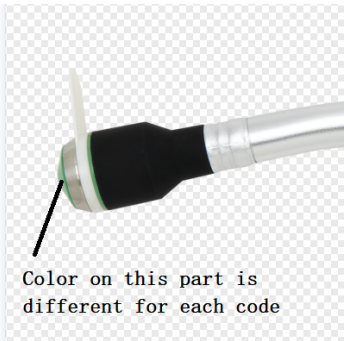
**PLASTIC CUTTING RING**

Active audible and tactile feedback during firing.

# 4. CIRCULAR STAPLERS



| DESCRIPTION     | ORDER Nr.  | Nr. OF STAPLES | COLOR  | ADJUSTABLE CLOSED STAPLE HEIGHT | LUMEN   | PACK QTY |
|-----------------|------------|----------------|--------|---------------------------------|---------|----------|
| Stapler size 20 | 900-400-00 | 16             | ORANGE | 1.0 mm – 2.5 mm                 | 12.2 mm | 1 pc/box |
| Stapler size 24 | 900-400-01 | 18             | YELLOW | 1.0 mm – 2.5 mm                 | 15.3 mm | 1 pc/box |
| Stapler size 26 | 900-400-02 | 22             | WHITE  | 1.0 mm – 2.5 mm                 | 17.4 mm | 1 pc/box |
| Stapler size 29 | 900-400-03 | 24             | BLUE   | 1.0 mm – 2.5 mm                 | 20.6 mm | 1 pc/box |
| Stapler size 32 | 900-400-04 | 26             | GREEN  | 1.0 mm – 2.5 mm                 | 23.2 mm | 1 pc/box |



**Longer shafts (46 cm) are available with intraluminal circular staplers**

## 4. CIRCULAR STAPLERS – STEPS OF PROCEDURE

1

Open the device by turning the adjusting knob counterclockwise until the anvil shaft is fully exposed.

2

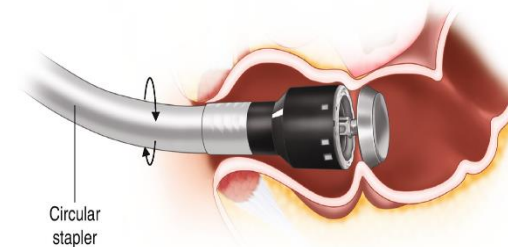
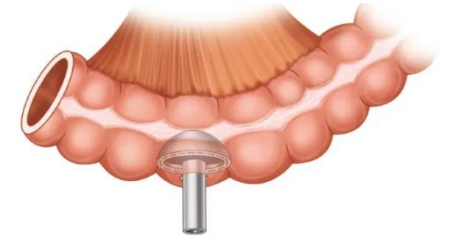
With the anvil removed, retract the device trocar until it is no longer exposed.

3

Insert the anvil into the lumen using either the open lumen purse string technique or the closed lumen stapling technique, ensuring that the tissue is located at the suture tying area.

4

With the anvil removed and the device trocar retracted until it is no longer exposed, insert the device. So it fits snugly against the distal transection site





## 4. CIRCULAR STAPLERS – STEPS OF PROCEDURE

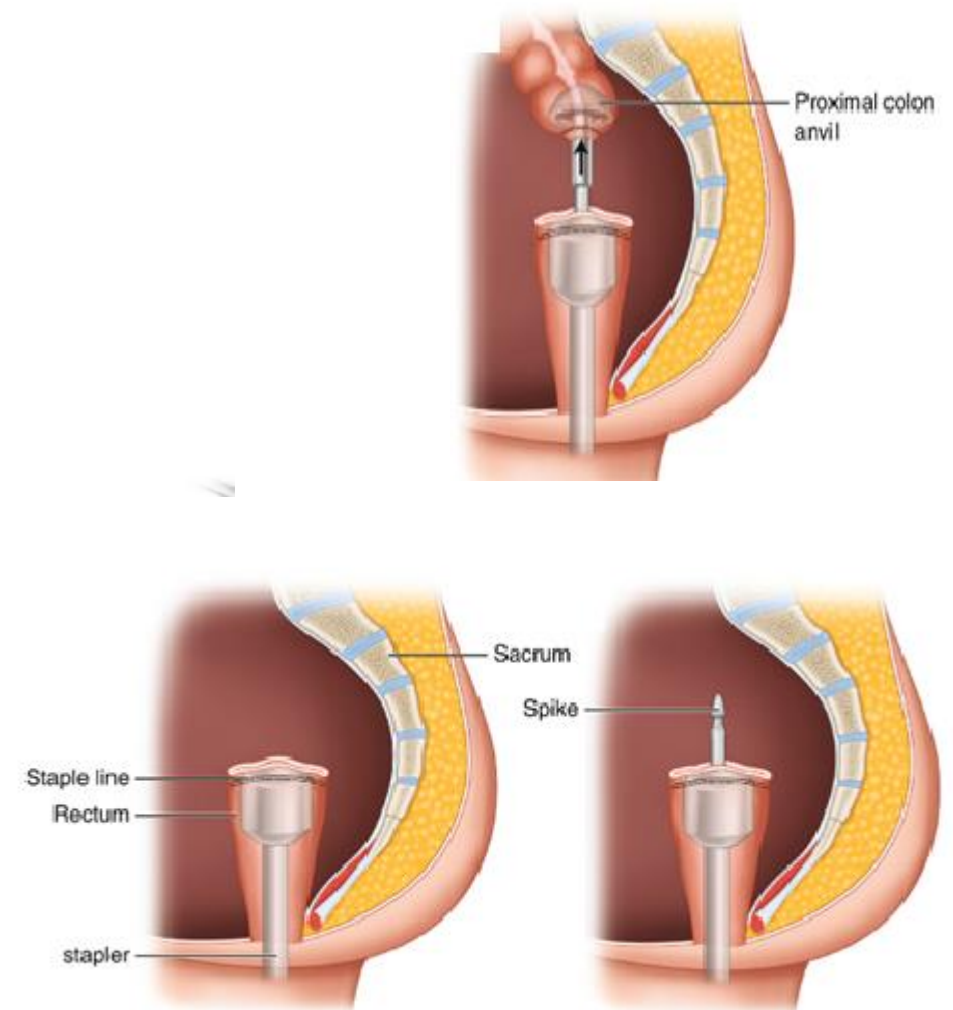
**5** Fully extend the device trocar and pierce the distal transection site with the trocar by rotating the adjusting knob counter clock wise.

**6** During device insertion ensure the Safety remains in the locked position to prevent premature staple deployment.

**7** Attach the anvil to the extended trocar  
**Caution: Do not clamp across or grip the locking springs when attempting to reattach the anvil.**

**8** Close the device by adjusting knob clockwise

**9** As the devices closes, it is important to ensure that the tissue remains in the proper orientation and no extraneous tissue is included.



10

As the tissue is compressed, you will feel resistance in the adjusting knob.

11

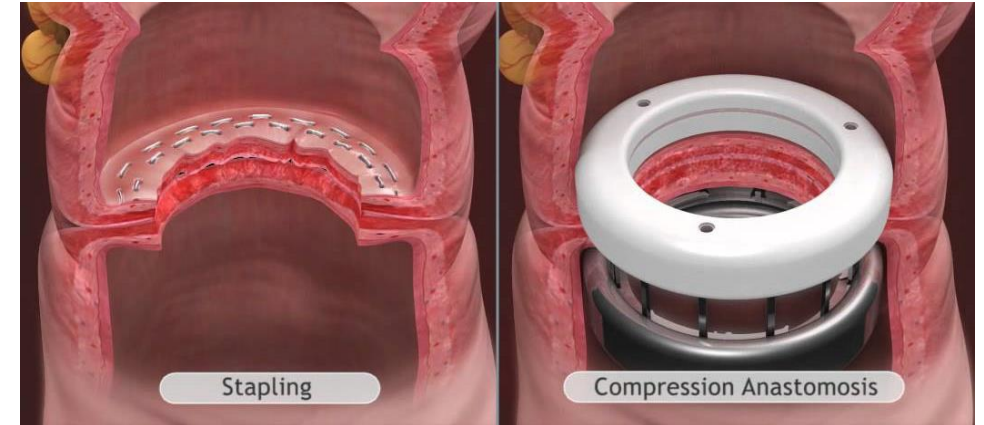
Continue to turn the adjusting knob slowly until appropriate tissue resistance is felt.

12

Tissue thickness may vary even within a single GI tract, that's why circular stapler are designed to provide flexibility for use with different tissue thicknesses.

13

Rapid compression may not allow sufficient time for fluid egress from the tissue and generate resistance before the appropriate compression is achieved.



14

Wait 15 seconds to allow for adequate tissue compression and adjust if needed to maintain appropriate tissue resistance.

15

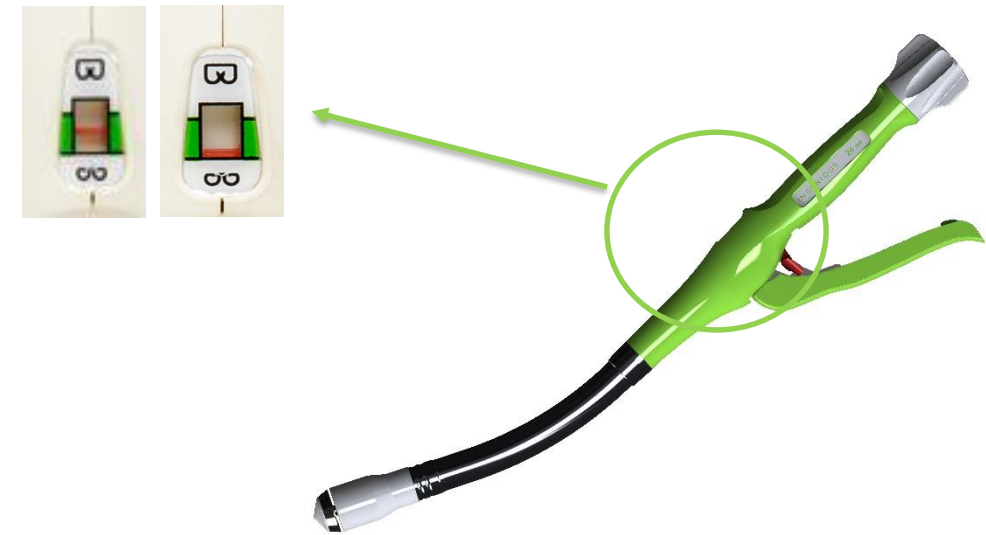
Once the device is fully closed, check the tissue compression scale to confirm that the orange staple height indicator is within the green range.

16

If the indicator is not in the green range when fully compressed, the tissue thickness exceeds the indicated range of the stapler.

17

**Caution:** If excessive force is required to close the device, this may indicate there is too much tissue or thickened tissue in the device. Attempting to fire the device in this condition may result in malformed staples, incomplete cutting line, bleeding, and leakage from the staple line and /or difficulty removing the device.



## 4. CIRCULAR STAPLERS – STEPS OF PROCEDURE

14

To fire the instrument draw back the red safety back toward the adjustment knob until it seats into the body of the instrument.

**Caution :** The safety should not be released if the instrument is not in the safe firing range.

14

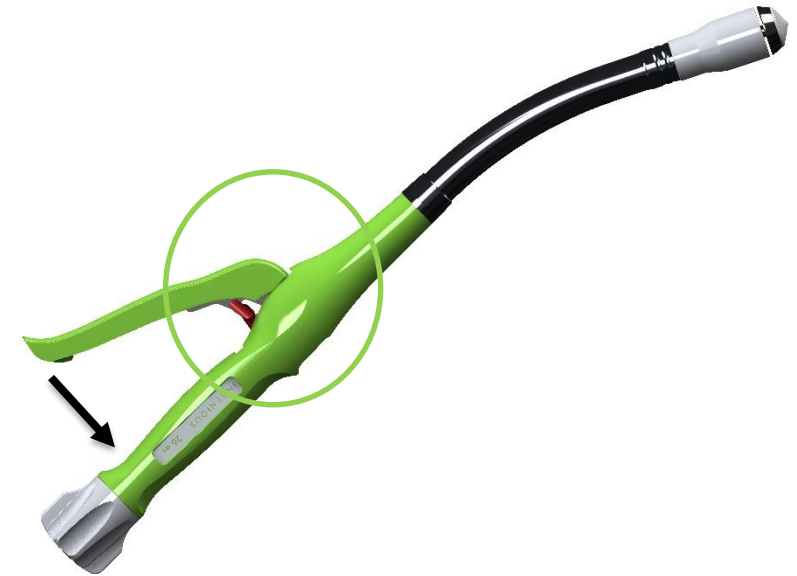
Caution : Once the safety has been released. DO NOT turn the adjusting knob to ensure the instrument remains in the safe firing range.

14

Squeeze the firing trigger with firm, steady pressure.

14

Fire the instrument in one continuous stroke until the firing trigger touched the device body.



14

You should notice both tactile and audible feedback during firing sequence.

14

**Caution :** The firing stroke must be completed. Do not potentially fire the instrument. Incomplete firing can result in malformed staples, incomplete cut line, bleeding, and leakage from the staple line and/or difficulty removing the device.

14

To safely remove the device from the newly formed anastomosis, return the red safety to the locked position to prevent unintended knife exposure and damage to the anastomosis and turn the adjusting knob counter clockwise for 2 complete revolution 360 degrees \* 2

## 4. CIRCULAR STAPLERS – STEPS OF PROCEDURE

14

Ensure the tissue has been released by rotating the head of the device 90 degrees in both directions, taking care to stabilize the head of the device to minimize movement of the distal tip.

14

Remove the device by gently pulling out while simultaneously rotating. If you rotate the device and it does not freely release from the anastomosis, or if the device does not withdraw easily then turn the adjusting knob one additional complete revolution 360 degree and remove again.

14

Remove the anvil, washer and donuts from within the circular knife.

14

Examine the integrity of the donuts, which should be intact and include all tissue layers.

14

Inspect the anastomosis for leakage.



# 4. CIRCULAR STAPLERS – TAKE HOME MESSAGE

**MINIMAL STRESS**  
ON TISSUE DURING COMPRESSION  
AND CLAMPING

**BETTER PERFUSION**  
ALLOWED INTO THE STAPLE LINE

**CONSISTENT PERFORMANCE**  
OVER VARIABLE TISSUE THICKNESS

**REDUCED POTENTIAL LEAK**  
DUE TO DISTRIBUTED COMPRESSION

**PRECISED COMPRESSION**  
DUE TO STABILIZED GRASPING AND  
TISSUE MOVEMENT

**GREAT SURFACE CONTACT**  
DUE TO CIRCULAR GRIPPING FORCE

**CONTROLLABLE STAPLE HEIGHT**  
RANGE FROM 1.0 - 2.5 MM,  
ENABLE CLOSURE OF DIFFERENT  
TISSUE THICKNESSES

**ANTI-REFLECTIVE DESIGN**  
AVOIDS EXCESSIVE REFLECTIONS  
DURING ENDOSCOPIC USE

**SKIDPROOF ROTATION**  
WING-NUT' SHAPE TO ASSIST  
THE OPENING AND CLOSING OF  
THE ANVIL

**VARIETY OF SIZES TO COVER  
ALL PROCEDURES**



**LONGER SHAFTS (46 CM) ARE  
AVAILABLE WITH INTRALUMINAL  
CIRCULAR STAPLERS**



**PPH STAPLER**

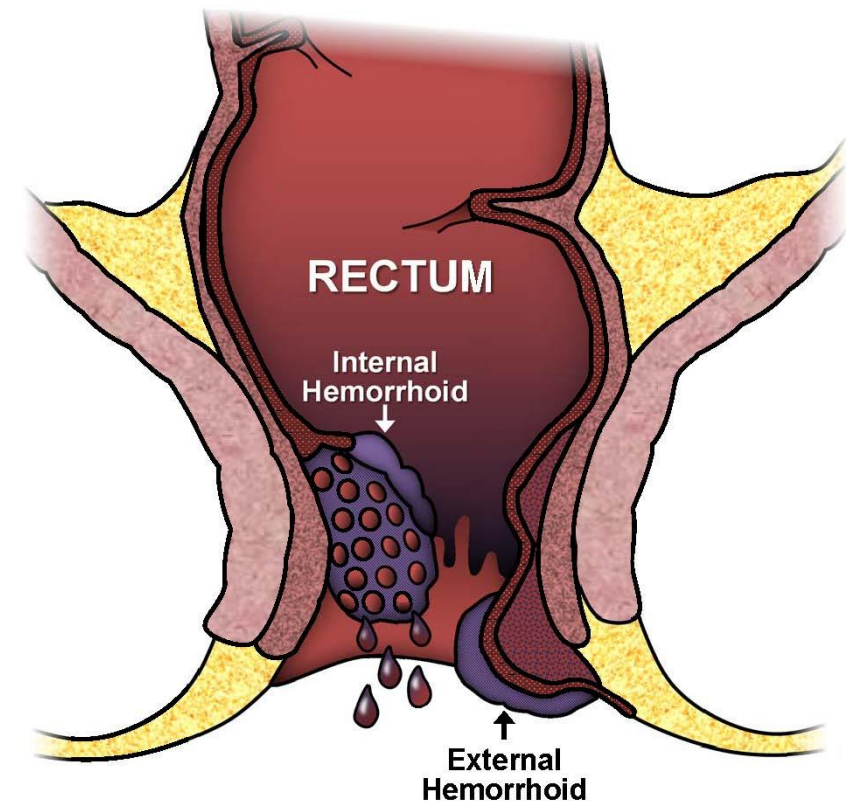


### WHAT ARE HEMORRHOIDS?

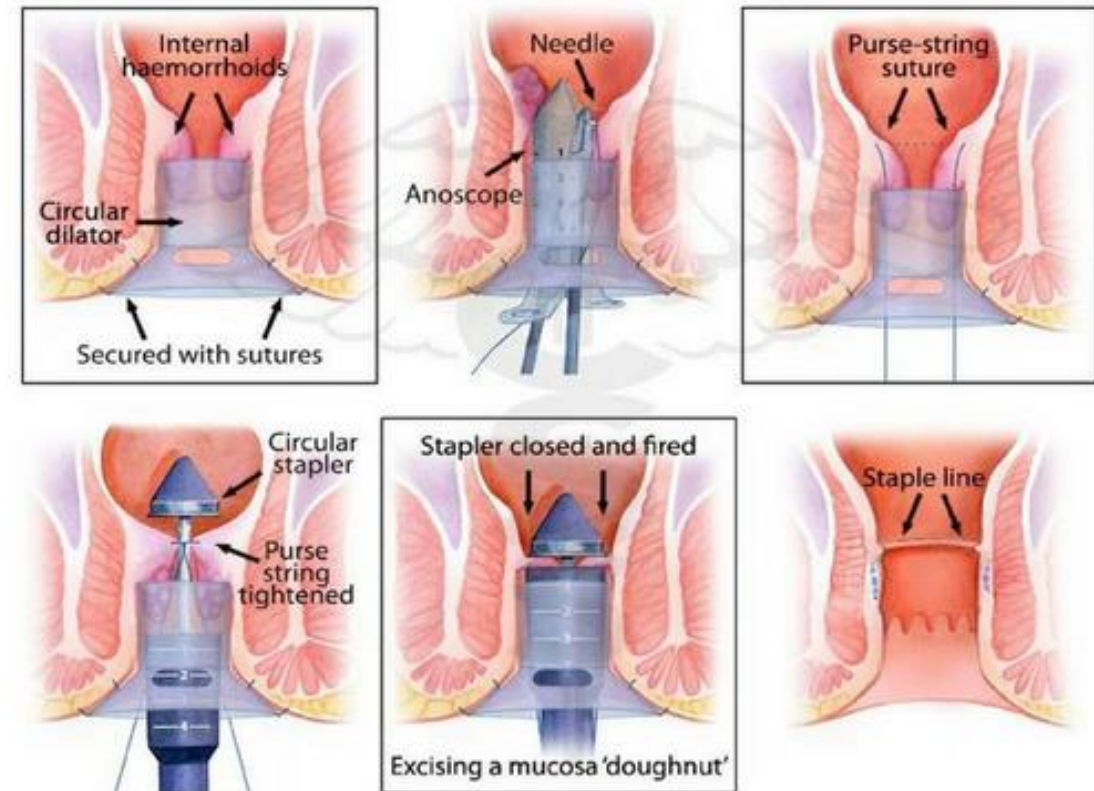
- Hemorrhoids are merely swollen veins.
- The affected tissue may, at times, extend outside the body; this is called prolapse and it's a sign of an advanced stage of hemorrhoids.

### ▪ HEMORRHOID SYMPTOMS :

- Itching
- Pain
- Swelling
- Cracking
- Bleeding or sensitive lumps.



- Circular Stapler is designed for the Procedure for Prolapse and Hemorrhoids (PPH)
- PPH is a technique that reduces the prolapse (enlargement) of hemorrhoidal tissue.
- With the PPH procedure, patients experience less pain and recover faster than patients who undergo conventional hemorrhoidectomy procedures
- PPH is a minimally invasive surgical approach and has several advantages compared to conventional hemorrhoidectomy procedures :
  - Less pain
  - A quicker recovery period
  - Less overall complications
  - Need for less postoperative pain medication





| DESCRIPTION  | ORDER Nr.  | LENGTH | OUTER DIAMETER OF CIRCULAR KNIFE | STAPLE HEIGHT | STAPLE WIDTH | PACK QTY |
|--|------------|--------|----------------------------------|---------------|--------------|----------|
| Circular stapler for rectal prolapse & hemorrhoids | 900-500-00 | 395 mm | 34 mm                            | 4.6 mm        | 3.8 mm       | 1 pc/box |



Hook

ANORECTAL DILATOR

ANORECTAL TRANSFIXATION TOOL

ANORECTAL INTRODUCER



## AUTO- RELEASE

RED AUTO RELEASE SAFETY RELEASE  
FUNCION

## LARGER HOUSING

ACCOMMODATE GREATER VOLUME  
OF TISSUE

## TENSION FREE REMOVAL

LOW PROFILE ANVIL DESIGN FOR  
EASE OF INSERTION & REMOVAL

## ADJUSTABLE

ACCOMMODATES VARIOUS TISSUE  
THICKNESSES

## SAFE

FIXED ANVIL MITIGATES ACCIDENTAL  
DETACHMENT

## RELIABLE

TISSUE COMPRESSION CONTROLLED



- The use of stapling does not guarantee the successful outcome of a surgical procedure
- Effective and safe use of mechanical stapling devices depends upon good basic surgical technique, including clean, atraumatic dissection, careful hemostasis, attention to tissue condition and blood supply, and creation of tension-free anastomoses.
- If you wouldn't sew it, don't staple it



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HEALTH



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THANK YOU

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