CLAIMS

What is claimed is:

1. A suture clip applier for applying a suture around a tubular tissue adjacent to an open lumen, the suture clip applier comprising:

an elongated body comprising a tissue clinching mechanism at one end of the body, the tissue clinching mechanism comprising two arms that are movable between open and clinched positions;

a plurality of deformable suture clips mounted along a longitudinal length of the elongated body, wherein each suture clip is configured to be detachably positioned within an interior of the two arms and to be deformed between open and clinched positions in response to the two arms being moved between the open and clinched positions; and

a length of suture comprising a pre-formed adjustable fastening and a loop extending from the pre-formed adjustable fastening, the loop extending between the two arms.

2. The suture clip applier according to claim 1 further comprising:

a biasing element configured to longitudinally advance each deformable suture clip toward the tissue clinching mechanism.

3. The suture clip applier according to claim 2, wherein the biasing element comprises one or more springs.

4. The suture clip applier according to claim 1 wherein the two arms are hinged to the elongated body.

5. The suture clip applier according to claim 1,wherein the plurality of deformable suture clips include between 4-20 deformable suture clips mounted along the longitudinal length of the elongated body.

6. The suture clip applier according to claim 2, wherein the biasing element is configured to automatically advance each deformable suture clip toward the tissue clamping mechanism in response to a deformable suture clip being released from the clinching mechanism.

~~7. A method of using the clip applier according to claim 1 to apply a suture adjacent to an open lumen in a tubular tissue, the method comprising:~~

~~sequentially affixing a series of the deformable suture clips around the open lumen by actuating the tissue clinching mechanism to clinch each deformable suture clip onto the tubular tissue at a plurality of positions around the open lumen, the suture extending through the deformable suture clips affixed to the tubular tissue and forming a loop therethrough.~~

~~8. The method according to claim 7 further comprising:~~

~~using a cutting element to divide the tubular tissue and expose the open lumen prior to affixing the series of deformable suture clips.~~

~~9. The method according to claim 7 further comprising:~~

~~inserting the suture clip applier into a body cavity through a port incision.~~

~~10. The method according to claim 7 further comprising:~~

~~tightening the suture around the open lumen.~~

~~11.~~7. A surgical device for placing a suture around a bowel or other tubular tissue, the surgical device comprising:

a first arm and a second arm each having a longitudinal length with opposite proximal and distal end portions, at least one of said first arm and said second arm being movable between an open position and a clamped position,

wherein the surgical device includes a suturing mechanism comprising:

a first row of suture staples positioned along the longitudinal length in said first arm, and a second row of suture staples positioned along the longitudinal length in said second arm; and

a length of suture comprising first and second end regions coupled together by a pre-formed adjustable fastening, a first threaded region of the suture extending through the first row of suture staples, and a second threaded region of the suture extending through the second row of suture staples.

~~12.~~8. The surgical device according to claim 7~~11~~, wherein the length of suture is formed into a first bend between a first unthreaded region and a first threaded region, and a second bend between a second threaded region and a second unthreaded region, and

wherein when the suture is detached from the surgical device, the suture is biased to become unbent at the first and second bends such that the suture forms a loop extending from the pre-formed adjustable fastening.

~~13.~~9. The surgical device according to claim 8~~12~~, wherein the first threaded region and the first unthreaded region of the suture are detachably coupled to the first arm, the second threaded region and the second unthreaded region of the suture are detachably coupled to the second arm, and a first end portion and a second end portion of the suture and extend away from the first and second arms.

~~14.~~10. The surgical device according to claim 7~~11~~ further comprising:

a suturing mechanism having a pushing mechanism configured to push the suture staples out of the interior portion when the suturing mechanism is actuated.

~~15.~~11. The surgical device according to claim 7~~11~~, wherein the surgical device further comprises a cutting mechanism having a groove extending along the longitudinal length of the first or second arm, and the cutting element comprises a knife blade movably disposed in the groove and configured to move along said longitudinal length.

~~16.~~12. The surgical device according to claim 7~~11~~, wherein the surgical device further comprises a stapling mechanism having staples positioned along the longitudinal length of the first arm or the second arm, and an anvil positioned along the longitudinal length of the other of the first arm or the second arm.

~~17.~~13. The surgical device according to claim 12~~16~~, wherein the cutting mechanism is positioned along the longitudinal length between the suturing mechanism and the stapling mechanism.

~~18.~~14. The surgical device according to claim 13~~17~~, wherein the stapling mechanism, the suturing mechanism and the cutting mechanism are configured to be actuated simultaneously or substantially simultaneously.

19. A method of using the surgical system according to claim 11 to apply a suture around a tubular tissue, the method comprising:

clamping the tubular tissue between the first arm and the second arm;

actuating a cutting mechanism to divide the tubular tissue, thereby creating an open lumen; and

actuating a suturing mechanism to attach the first and second rows of suture staples to the tubular tissue adjacent to the open lumen, wherein the suture comprising the pre-formed adjustable fastening detaches from the surgical device and forms a loop around the tubular tissue, with a portion of the suture extending through the suture staples.

20. The method according to claim 19 further comprising:

tightening the suture around the tubular tissue by pulling one or more of the first and second end portions of the suture.

21. A method of using the surgical system according to claim 11 to intracorporeally resect a bowel specimen from a subject, the method comprising:

clamping the first arm and the second arm over a proximal margin of resection between the specimen and a healthy bowel portion;

actuating a cutting mechanism to divide the bowel at the proximal margin of resection,

actuating a stapling mechanism to close an interior lumen of the specimen by applying the staples to a proximal edge portion of the specimen;

actuating a suturing mechanism to attach the first and second rows of suture staples to an edge portion of the proximal bowel portion, wherein the suture comprising the pre-formed adjustable fastening detaches from the surgical device and forms a loop around the edge portion of the proximal bowel portion, a portion of the suture extending through the suture staples; and

clamping the first arm and the second arm over a distal margin of resection between the specimen and a healthy bowel portion;

actuating the cutting mechanism to divide the bowel at the distal margin of resection,

actuating the stapling mechanism to close an interior lumen of the specimen by applying the staples to a distal edge portion of the specimen; and

actuating the suturing mechanism to attach the first and second rows of suture staples to an edge portion of the distal bowel portion, wherein the suture comprising the pre-formed adjustable fastening detaches from the surgical device and forms a loop around the edge portion of the distal bowel portion, a portion of the suture extending through the suture staples.

22. The method according to claim 21, wherein actuating the cutting mechanism, actuating the stapling mechanism and actuating the suturing mechanism occur simultaneously, or substantially simultaneously, in response to a single actuation by a surgeon.

23. The method according to claim 21 further comprising:

extracting the specimen through the subject's rectum.

24. The method according to claim 23, wherein extracting the specimen through the subject's rectum comprises transanally inserting a grasping tool through the distal bowel portion, grasping the specimen with the grasping tool and extracting the specimen through the subject's rectum.

25. The method according to claim 21 further comprising:

intracorporeally forming an anastomosis between the proximal bowel portion and the distal bowel portion, wherein intracorporeally forming the anastomosis comprises transanally inserting a circular stapler and advancing the circular stapler through the distal bowel portion, the circular stapler comprising a stapling cartridge and an anvil component removably coupled thereto.

26. A transrectal extractor configured to expand a luminal circumference of a rectum, the transrectal extractor comprising:

a substantially cylindrical body comprising a deformable material extending along a longitudinal axis, the substantially cylindrical body having an exterior, an interior, and a top edge portion defining an opening into the interior;

an optional drawstring extending through the interior and coupled to the top edge portion;

an optional external sheath slidably coupled to and surrounding at least a portion of the exterior of the substantially cylindrical body; and

the substantially cylindrical body being configured to expand outward and increase a circumference of the opening, thereby expanding the luminal circumference of the rectum.

27. A method of using the transrectal extractor according to claim 26 to intracorporeally remove a specimen from a subject, the method comprising:

transanally inserting the transrectal extractor through a distal bowel portion; and

expanding the top edge portion around an opening in the distal bowel portion.

28. The method of claim 27 further comprising:

transanally inserting a grasping tool through the transrectal retractor;

grasping the specimen; and

transanally extracting the specimen through the interior of the transrectal retractor.

29. The method of claim 28 further comprising:

removing the transrectal extractor by pulling the drawstring which inverts the top edge portion, thereby pulling the substantially cylindrical body out of the rectum.

30. A method of intracorporeally resecting a specimen from a subject comprising:

(1) separating the specimen from a bowel wall by:

dividing the bowel wall at a proximal margin of resection,

closing a proximal interior lumen of the specimen by applying staples to a proximal edge portion of the specimen,

placing a suture around an edge portion of the proximal bowel portion;

dividing the bowel wall at a distal margin of resection,

closing a distal interior lumen of the specimen by applying staples to a distal edge portion of the specimen,

placing a suture around an edge portion of the distal bowel portion;

(2) extracting the specimen through the subject's rectum; and

(3) intracorporeally forming an anastomosis between the proximal bowel portion and the distal bowel portion.

31. The method of claim 30, wherein the method does not include making an abdominal wall incision, except for port incisions.

32. The method of claim 30 comprising using a surgical device to separate the specimen from the bowel wall, the surgical device comprising:

a first arm and a second arm each having a longitudinal length with opposite proximal and distal end portions, at least one of said first arm and said second arm being movable between an open position and a clamped position,

a cutting mechanism comprising a cutting element,

a suturing mechanism comprising a length of suture comprising first and second end regions coupled together by a pre-formed adjustable fastening, a first threaded region of the suture extending through a first row of suture staples positioned along the longitudinal length in said first arm, and a second threaded region of the suture extending through a second row of suture staples positioned along the longitudinal length in said second arm, and

optionally a stapling mechanism comprising staples positioned along the longitudinal length of the first arm or the second arm, and an anvil positioned along the longitudinal length of the other of the first arm or the second arm.

33. The method of claim 30 comprising using a transrectal extractor to extract the specimen, the transrectal extractor comprising:

a substantially cylindrical body comprising a deformable material extending along a longitudinal axis, the substantially cylindrical body having an exterior, an interior, and a top edge portion defining an opening into the interior;

an optional drawstring extending through the interior and coupled to the top edge portion;

an optional external sheath slidably coupled to and surrounding at least a portion of the exterior of the substantially cylindrical body; and

the substantially cylindrical body being configured to expand outward and increase a circumference of the opening, thereby expanding the luminal circumference of the rectum.