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SURGICAL ANASTOMOSIS APPARATUS AND METHOD

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Surgical Anastomosis Apparatus and Method

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This invention relates to surgical devices and, more particularly, to an apparatus for effecting and healing together of arteries, veins or other tubular body organs or parts, without the use of suture materials.

An object of the invention is to provide a simple, effective structure for such surgical purposes that eliminates the need for the use of suture materials and which may be left in place permanently without deleterious effect, being preferably of non-absorbable material having no tissue reaction or of material that is ultimately absorbable by the body tissues.

Another object of the invention is to provide a surgical device for effecting approximation and healing of severed body organs or parts coupled with the presentation of a maintenance of contact between intima and intima during the healing process and without requiring the use of suture materials.

Still another object of the invention is to provide a novel structure for effecting the foregoing that is simple in construction, simple to use, and that may be manufactured at comparatively low cost.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, the invention consists in the novel construction and arrangement of parts hereinafter to be described and thereby made to possess the characteristics of the invention, it being expressly understood, however, that changes may be made in the practice within the scope of the claims without destroying the inventive idea.

In the drawings, in which similar reference characters denote corresponding parts,

Fig. 1 is a perspective view of one of the three elements constituting the apparatus.

Fig. 2 is a perspective view of a second of the three elements.

Fig. 3 is a perspective view of the third of the three elements.

Fig. 4 is a longitudinal section of the apparatus device in assembly and illustrating its application in end to end anastomosis for effecting the approximation of intima to intima and healing of severed vein or artery parts.

Figs. 5 through 7 inclusive illustrate diagrammatically successive steps in the application of the device to secure the end to end anastomosis assembly shown in Fig. 4.

Figs. 8 through 10 inclusive are diagrammatic views of successive steps utilized in an end to side anastomosis, for example, in the renal vein-caval, short operation for effecting a joint between the vena cava and the portal vein and...
The device described is useful either in end to end anastomosis or in end to side anastomosis. One type of end to end anastomosis is illustrated in Figs. 4, 5 and 7 inclusive. Therein 20 and 21 denote, for example, the severed ends of tubular body organs such as artery parts A, A' which it is desired to remit. After dissection of the body tissue (not shown) surrounding the severed ends 21, 22, the artery portion A, for example, is drawn through the lumen of the proper size of anastomosis tube 10 from the flanged end (Fig. 5), for example, by appropriate surgical forceps or clamps F, so that the severed end 20 projects forwardly of the end 12 of the tube 10. The severed end 20 is then stretched and folded or drawn reversely over the blunt thinned end 12 of the tube 10 and onto the tube with the aid of the forceps F to expose the intima I of the artery section A as the outermost surface lying on the tube 10 and with the end 20 lying appropriately adjacent the flange 11. The clamping ring 16 is then pushed over this artery-bearing tube 10 until it is felt by a click or snap that the latter overlies the groove 18 which is the one nearest the annular flange 11. Temporary deformation of the tube 10 by reason of slot 13 permits such movement of ring 16 onto the tube 10. The internal diameter of clamping ring 16 is so admeasured that in such position it will retain the artery portion A firmly on the anastomosis tube 10 in the manner in which it has been mounted without causing additional trauma to the artery. Thereafter, the second clamping ring 17 is slid over the other artery portion A' (Fig. 7). The end 21 of this artery portion is then stretched as shown in Fig. 7 by forceps F to enlarge the lumen of vein portion A' sufficiently to facilitate the insertion of the lumen of the exposed intima I of the artery portion A lying on the tube 10 and already mounted on the latter as described. The extent of insertion is sufficient to bring the end 21 substantially into abutment with the clamping ring 16. Clamping ring 17 is then moved reversely on the artery portion A' towards end 21 until a click or snap indicates alignment with the groove 18 of the tube 10. At which time it functions to clamp the artery portion A' to the artery portion A with the intima I and I' of these two portions in direct contact.

It is seen that, with the anastomosis device of the invention, it is possible to approximate severed vein or artery portions for end to end reunion, to maintain the approximated ends in firm union with intima in contact with intima which is the most desirable condition for healing, and that the necessity for the use of suture materials of any kind is eliminated. Since the material of the device is non-tissue reactive, it may be left permanently in situ without deleterious effects to the patient. If of absorbable material, it ultimately is absorbed by surrounding body tissues. If non-absorbable, it has no deleterious effects because it is made of non-tissue reactive materials.

It is possible also to use the device for end to side anastomosis. For example, in a portal caval shunt operation, junction with a vena cava 20 of a portal vein 30 is required. This is illustrated in Figures 8-10 inclusive. Therein, the severed end 31 of the portal vein 30 is prepared and clamped by a ring 16, to an anastomosis tube 10, in the same way as the severed end 20 of artery portion A was attached to tube 10 with its intima I exposed (Fig. 9). A cruciate incision 34 is then made in the vena cava 29 (Fig. 8). The cut lips 34a of the cruciate incision are then drawn through the second clamping ring 17 as seen in Fig. 9 by the use of forceps F, and retracted to the opposite side of the ring 17a by these forceps to create an enlarged lumen that is sufficient to facilitate insertion of the prepared portal vein-bearing tube 10 so that the intima 1a on the latter is brought into contact with the intima 1a in the enlarged lumen. Forceps F, engaging the flange 11a of the tube 10a are used to facilitate the insertion, and forceps Fb are used to facilitate the holding of the vena cava 29 during such insertion. In addition, during insertion, the finger P is placed under the vena cava 25 below clamping ring 17a. When insertion into the stretched lumen 10a is completed, the clamping ring 17a is moved onto the portal vein-bearing tube 10a until the click or snap indicates its positioning over the groove (not shown) corresponding to groove 18. This functions to hold the intima 1a of the vena cava 29 to the intima 1a of the portal vein 30 and to maintain sufficient pressure without further traumatic injury during healing to accomplish the desired union. Being of non-tissue reactant material, the anastomosis tube 10a and clamping rings 16a, 17a, and relationship as described may remain in situ after healing is complete without deleterious effects.

End to side anastomosis thus is likewise possible with the device of my invention without alteration in its formal structure.

In the modification of Figs. 11, 12, 13 and 14, 16 donates an anastomosis tube similar to and constructed of the same material as the tube 10 of Fig. 1 except that the end 12a is solid rather than being slotted as in Fig. 1. The tube 16a is provided at one end with a flange 16c and at its opposite end with a rib 16d. For cooperation with the tube 16a there are provided two clamping members 16f and 16g of which 16f is of the same material as the anastomosis tube 10a while the member 16g is of any suitable elastic material permitting expansion of the ring to increase the diameter of its aperture. The member 16f is provided at its inner periphery with a series of small slots 16s. The internal diameters of both, clamping members 16f and 16g slightly exceed the external diameter of the portion 12a, but is slightly less than the external diameter of the rib 16c. The slots 16s function to permit temporary increase in the internal diameter of the ring 16d.

In utilizing the modification of Figs. 11 to 13, the clamping members 16f and 17a are applied to the tube 16a in the same manner as previously described, the only difference being that the clamping members are slightly extended during the operation of applying them rather than the tube being slightly reduced. When in place, the clamping members 16f and 17a serve the same purpose as the clamping members 16a and 17 of the embodiment of Figs. 1 to 3 inclusive. It is to be understood that the particular end to end and end to side anastomosis examples described are illustrative merely. The device is useful in any surgical procedure involving the junction of tubular body parts together or parts of tubular parts with other body parts and in the performance of artery or vein grafts and the union of the grafted-on artery or vein with other veins or arteries or the like.

While a specific embodiment of the invention has been described, variations in structural details within the scope of the claims are possible.
5 and are contemplated. There is no intention, therefore, of limitation to the exact details shown and described.

What is claimed is:

1. In a device of the character described, an anastomosis tube having a pair of annular spaced-apart peripheral grooves, a ring-like clamping member movable onto said tube and admeasured to be moved into and retained in one of said grooves, and a second ring-like clamping member movable onto said tube and admeasured to be moved into and retained in the other of said grooves.

2. In a device of the character described, an anastomosis tube having a slot to render its formable in a portion of its length and a pair of annular parallelly-extending peripheral grooves, a ring-like clamping member movable onto said tube and admeasured to snap into and be retained in one of said grooves, and a second ring-like clamping member movable onto said tube and admeasured to snap into and be retained in the other of said grooves.

3. In a device of the character described, an anastomosis tube of non-tissue reactive material adapted to have body parts mounted thereon and having a flanged end and a bluntly pointed opposite end, and having a slot extending from the bluntly pointed end toward the flanged end to provide resiliency, thereby enabling temporary reduction in tubular dimensions, and said tube having annular spaced-apart peripheral grooves, a clamping ring movable onto said tube from its bluntly pointed end and admeasured to snap into a first of said peripheral grooves and a second clamping ring movable onto said tube from its bluntly pointed end and admeasured to snap into a second of said peripheral grooves, the first of said clamping rings serving to retain a first tubular body part clamped to the outer surface of said tube and the second of said clamping rings serving to maintain a second body part approximated with and clamped to and over a portion of said first named body part carried on said tubular part.

4. A device of the character described, an anastomosis tube of non-tissue reactive material capable of remaining permanently in situ and adapted to have body parts mounted thereon, said tube having a flanged end and a bluntly pointed opposite end, and having a slot to provide resiliency for temporary deformation in application, said tube also having a pair of annular spaced-apart peripheral grooves, a clamping ring of material like that of said tube movable onto said tube from its bluntly pointed end and admeasured to snap into a first of said peripheral grooves, and a second clamping ring of similar material likewise movable onto said tube and admeasured to snap into a second of said peripheral grooves, the first of said rings serving to retain a first tubular body part on said tube with the intima thereof outermost, and the second of said clamping rings serving to clamp the intima of a second body part into contact with said first named intima.

5. In a device of the character described, an anastomosis tube of non-tissue reactive material capable of being left in situ, said tube having a flanged end and a bluntly pointed opposite end and having a slot to provide resiliency for temporary deformation in application, said tube also having a pair of annular spaced-apart peripheral grooves, said tube being adapted to have a tubular body part or organ pass through its lumen from the flanged end and to receive on its peripheral surface a reversely drawn projection of the tubular body part or organ having its intima lying outermost, a clamping ring of material like that of said tube movable onto the latter from the direction of its bluntly pointed end and admeasured to clamp said reversely folded portion to said tube in the first of said grooves without traumatic injury to the body part, and a second clamping ring of the same material as the first ring adapted to be moved onto said tube from the direction of its bluntly pointed end, said second clamping ring being admeasured to clamp in the second of said grooves intima of another body part or organ into contact with said first named intima without traumatic injury to either body part.

6. In a device of the character described, an anastomosis tube member having a flange at one end and a rib at the remaining end, and a ring-like clamping member movable onto said tube and adapted to snap over and be retained by said rib, one of said members being of variable effective diameter to facilitate assembly.

7. In a device of the character described, an anastomosis tube member having a flange at one end and a rib at the remaining end, and a ring-like clamping member movable onto said tube and adapted to snap over and be retained by said rib, one of said members being slotted or permit variation in its effective diameter to facilitate assembly.

8. In a device of the character described, an anastomosis tube member having a flange at one end and a rib at the remaining end, and a ring-like clamping member movable onto said tube and adapted to snap over and be retained by said rib, said tube member being slotted to permit variation in its effective diameter to facilitate assembly.

9. In a device of the character described, an anastomosis tube member having a flange at one end and a rib at the remaining end, and a ring-like clamping member movable onto said tube and adapted to snap over and be retained by said rib, said ring member being slotted to permit variation in its effective diameter to facilitate assembly.

10. In a device of the character described, an anastomosis tube member having a flange at one end and a rib at the remaining end, and a ring-like clamping member movable onto said tube and adapted to snap over and be retained by said rib, said tube member being of variable effective diameter to facilitate assembly.

11. In a device of the character described, an anastomosis tube member having different diameter portions and a ring-like clamping member movable onto said tube member and adapted to snap into and be retained in the smaller diameter portion of said tube member, one of said members being of variable effective diameter to facilitate assembly.

12. In a device of the character described, an anastomosis tube member having different diameter portions and a ring-like clamping member movable onto said tube member and adapted to snap into and be retained in the smaller diameter portion of said tube member, one of said members being slotted to permit variation in its effective diameter to facilitate assembly.

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No references cited.