SURGICAL SUTURE EXTRACTOR

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References Cited
UNited States Patents
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720,706 7/1902 Lamb ......................... 30/241

ABSTRACT
An instrument for severing and removing sutures constructed of telescoping parts slidable one within the other and disposable in whole or in part. The device grips the suture either before or immediately after the thread or stitch is cut so that the suture can be removed in a single motion of the surgeon's hand.

9 Claims, 11 Drawing Figures
SURGICAL SUTURE EXTRACTOR
CROSS REFERENCES TO RELATED APPLICATIONS


SUMMARY OF THE INVENTION

The instrument is not of the tweezer type as disclosed in the first three of the above patents and also in Beaver U.S. Pat. No. 3,541,684 granted Nov. 24, 1970. The present instrument is made up of two slender, elongated members one of which is hollow, and which receive the second member in internal sliding relation therewith. Although both members are advantageously cylindrical in shape, one or both of them may be polygonal in cross section. Also, although the inner member may be made hollow, it may, if desired, be made solid.

The outer member is at least partially tapered or conical at its outer or working end and formed with a projection extending angularly with respect to its axis. This angular projection also includes a part which serves as a backup member for a knife which is mounted at the end of the inner sliding member and the cutting edge of which is sloped to approximately the same degree as the angularity of the projection referred to so that the edge of the knife and the surface of the backup member are approximately parallel.

The device may be made of several different materials such as plastic, glass or metal, or combinations thereof. Although the knife supported by the inner sliding member is usually made of metal such as steel it may be of the same material as the inner member, or both the inner and outer members. In one form of the invention the knife is made integral with the inner sliding member and this form is particularly adapted for the one-piece construction.

The instrument is held by the hand of the surgeon and the sliding movement of the inner member to effect the movement of the knife is produced by the surgeon's hand, for example, the thumb, which engages the inner member through a suitable opening in the outer member.

BRIEF DESCRIPTION OF THE VIEWS OF THE DRAWING

FIG. 1 is a perspective view showing the device in combination with the operator's hand which is shown in phantom.

FIG. 2 is a view showing the instrument in central longitudinal partial section.

FIG. 3 is a longitudinal section taken on line 3—3 of FIG. 2.

FIG. 4 is a view drawn to an enlarged scale of the upper portion of the device as shown in FIG. 2 with the knife in a different position.

FIG. 5 is a top or plan view of the device as seen from the upper end of FIG. 3 but drawn to the same scale as FIG. 4.

FIG. 6 is a view similar to the upper end portion of FIG. 2 showing a modification.

FIG. 7 is a view similar to FIG. 3 taken on line 7—7 of FIG. 6.

FIG. 8 is a top or plan view similar to FIG. 5 looking from the upper end of FIG. 6.

FIG. 9 is a view similar to FIG. 6 of a further modification.

FIG. 10 is similar to FIG. 9 with the knife in a different position and

FIG. 11 is a view similar to FIG. 6 showing a still further modification.

DETAILED DESCRIPTION

The instrument of the invention is shown in the hand of the user in FIG. 1 the hand being shown in phantom. The device comprises an outer tubular member 15 which is shown as being cylindrical and slender considering the purpose for which it is to be used. This member has a short tapered or conical portion 16 which terminates in an angular projection 17, the lateral dimension of which is no longer than the diameter of member 15.

Mounted in slidable relation within member 15 there is an inner member 18 which desirably has a corrugated portion 19 to be engaged by the thumb of the user through a short opening 20 in outer member 15. The remaining details of construction will be described below.

Now referring to FIGS. 2—5 the tapered portion 16 has two opposite equally sloping walls 21 and 22, the upper edges of which 23 and 24 terminate short of the apex 25 of the outer member so as to leave a lateral opening for the passage of a suture 26 to be cut and removed. Apex 25 is at the outer end of the angular projection 17 as shown more clearly in FIG. 3. Thus angular projection 17 is integral at its right end as shown in FIGS. 3 and 5 with the sidewall of outer member 15, and the opposite sides of projection 17 are approximately parallel.

Mounted on a flat surface 27 provided on inner slidable member 18 at its outer end there is a cutting blade 28 which is mounted at one side of and parallel with the axis of the device and has a cutting edge approximately parallel with angular projection 17. As shown by the section lining in FIGS. 2—4 the instrument illustrated is made of synthetic plastic, and the steel cutting blade or knife 28 is held in place by means of a stud 29, the end of which is softened and formed into a head by heat treatment.

The inner surface 30 of angular projection 17 is flat and forms a backup surface 30 to support the suture while it is being severed by knife 28. On the right-hand portion of angular projection 17 there is a flat surface 31 which is in alignment with surface 27 on inner member 18. After the operator inserts the angular projection 17 beneath a suture 26 he pushes inner member 18 forward and the edge of knife 28 is thus moved against the suture and severs it by a shearing action with the intersection 32 between surfaces 30 and 31, which intersection forms a backup cutting edge. As shown in FIG. 3 the angularity of the edge of blade 28 differs slightly from that of the edge 24 which forms the lower edge of the lateral suture opening 33.

In order to grip suture 26 so as to remove it a compressible member 34 is formed on the inner end of the inner sliding member 18. As illustrated this is a hollow member so that as knife 28 is pushed forward and cuts the suture 26 member 34 is deformed as it presses
3,802,074

3 against the suture as indicated in FIG. 4. Thus the left-hand part of suture 26 is gripped before it is severed from the suture section 35 shown at the right.

When the inner slideable member 18 is cylindrical and therefore easily rotatable with respect to the outer member 15 it is important to maintain the knife or blade 28 parallel with surface 31 on angular projection 17 and with the backup and shearing intersection 32. This may be accomplished by providing a narrow elongated and shallow recess 36 in the surface of inner member 18, and an elongated rib 37 on the inner surface of outer member 15 and which projects into recess 36.

The modification shown in FIGS. 6, 7 and 8 is similar in construction to that previously described in connection with FIGS. 2-5 and similar reference numerals have been used in these figures where the parts are alike. There are two differences. One of these is that blade or knife member 28a of FIGS. 6 and 7 is bonded on its inner surface to the surface 27 on inner member 18, instead of being secured thereto by the stud 29. The second difference is the provision of an arcuate reaction member 38 (FIG. 8) which has a flat interior surface 39 to engage the outer surface of knife 28a and maintain it in its proper working position with respect to the surface 31 of the backup member provided by angular projection 17.

In the constructions previously described and shown in FIGS. 1-8 the suture is first gripped and then cut or severed whereas in the constructions of FIGS. 9-11, the opposite is the case. The suture is first cut and then gripped. Referring to FIGS. 9 and 10 the construction is similar to that described above in connection with FIGS. 6 and 7. That is to say the knife 28a is bonded to surface 27 of the inner sliding member 18 and a reaction member 38 having a flat inner surface 39 presses the knife against the surface 31 on angular projection 17. The difference from the previous figures is that the compressible member 34 which holds the suture against surface 30 while it is being cut is omitted. Instead of gripping the suture 26 by such a compressible member, knife 28a first severs the suture and then the outer surface 40 of the outer end of inner sliding member 18 engages the suture and presses it against surface 30. In FIG. 9 the parts are shown prior to severing the suture and in FIG. 10 they are shown after suture has been severed.

It will be understood of course that instead of bonding the knife 28a in position, it may be held in place in any other suitable way, as for example by a stud 29 as previously illustrated and described.

In the modification shown in FIG. 11 the knife blade 28b is made integral with the inner slideable member 18, instead of being bonded or otherwise held in position. Also the flat longitudinal surface 31 of the previous figures has been omitted and the inner surface 30 of angular projection 17 is employed as a backup member so that when knife 28b is advanced to cut the suture it merely forces the outer surface of the suture against surface 30 while the point of the knife is penetrating the suture to this surface. As shown in FIG. 11 a compressible member 34a comprising a piece of plastic sponge, rubber or the like is mounted at the outer end of inner sliding member 18 and engages the inner surface of the suture while knife 28b is producing the severing action. The suture therefore is gripped either just prior to or during the severing process and such gripping will be maintained until the suture has been removed.

Although all forms of the invention are constructed to be advantageous from the standpoint of disposability the form of FIG. 11 is particularly advantageous from this standpoint because its cutting knife is made in one piece with the inner sliding member.

Also the edge of the knife can move beyond the suture after severing, as in previous forms.

I claim:

1. An instrument for removing sutures comprising:
   a. a slender elongated outer tubular member to be grasped by the hand, and having at its outer open end an angular projection overlying said outer end for supporting the suture during cutting and removal thereof;
   b. said projection including a back-up member;
   c. a single-piece inner, elongated member fitted to slide axially within said outer member;
   d. said inner member carrying a knife at its outer end to cooperate with said back-up member in severing the suture;
   e. said outer member having an opening for exposing a portion of said inner member and said inner member having a gripping surface aligned with the opening for contact by a finger of the hand, including the thumb, to produce axial sliding of the inner member relative to the outer member; and
   f. said outer tubular member having a flat, hollow, diametrically opposed, tapered outer end terminating in said angular projection.

2. An instrument for removing sutures according to claim 1 in which the backup member has a cutting edge, and the knife on the inner member cooperates in shear with said cutting edge in severing the suture.

3. An instrument for removing sutures according to claim 1 wherein,
   a. said inner member has a reduced portion at its outer end, one side thereof being parallel with the adjacent inner surface of said hollow tapered portion and the opposite side thereof is parallel with the axis of said instrument and supports said cutting knife;
   b. a surface of said backup member is parallel to the axis of the instrument, and in order to maintain said knife in cooperation with said surface, a reaction member is provided on the inner surface of said outer member for cooperation with said axially parallel surface of said inner member.

4. An instrument according to claim 1 wherein said outer end is at an acute angle to said backup member and said knife has a cutting edge at some angle different than said outer end.

5. An instrument for removing sutures according to claim 1 wherein,
   a. said inner member is wholly contained within said outer member with the gripping surface recessed in the opening of the outer member.

6. An instrument for removing sutures comprising:
   a. a slender elongated outer tubular member to be grasped by the hand, and having at its outer open end an angular projection overlying said outer end for supporting the suture during cutting and removal thereof;
   b. said projection including a backup member;
   c. a single piece inner elongated member fitted to slide axially within said outer member;
3,802,074

d. said inner member carrying a knife at its outer end to cooperate with said backup member in severing the suture;

e. a deformable member arranged on the outer end of said inner member alongside of said knife, said

deformable member when in the undeformed condition extending beyond the knife edge and forcing the suture against said backup member to grip the suture during and after the severing thereof to enable removal of the suture; and

f. said outer member having an opening for exposing a portion of said inner member and said inner member having a gripping surface aligned with the opening for contact by any finger of the hand, including the thumb, to produce axial sliding of the inner member relative to the outer member.

7. An instrument for removing sutures according to claim 6 wherein said deformable member is integral with said inner member.

8. An instrument for removing sutures according to claim 7 in which said knife is integral with said inner member.

9. An instrument for removing sutures comprising:

   a. a slender elongated outer tubular member to be grasped by the hand, and having at its outer open end an angular projection overlying said outer end for supporting the suture during cutting and removal thereof;

   b. said projection including a backup member;

   c. a single piece inner elongated member fitted to slide axially within said outer member;

   d. said inner member carrying a knife at its outer end to cooperate with said backup member in severing the suture;

   e. said outer member having an opening for exposing a portion of said inner member and said inner member having a gripping surface aligned with the opening for contact by any finger of the hand, including the thumb, to produce axial sliding of the inner member relative to the outer member; and

   f. said outer member defining a flat tubular, diametrically opposed tapered outer end with planar surfaces on opposite sides of the knife tapering toward said outer end.

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