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IMPLANT DEPLOYMENT DEVICE

Abstract

An implant deployment device comprising, a body part comprising a space formed internally in an elongated shape in one direction, a needle having a hollow shape in which a first end engages with a first end of the body part and a second end is formed with a longitudinal slit of a predetermined length, a pushrod movably accommodated in the internal space of the body part in a forward direction, a slider engaging the push rod and comprising a snagging jaw and a receiving groove; and a camrod pivoting between a first position in which the snagging jaw restricts rearward movement of the slider, and a second position in which the snagging jaw is unjammed and inserted into the receiving groove to permit rearward movement of the slider a predetermined distance.

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Background/Summary

BACKGROUND OF THE DISCLOSURE

Technical Field

[0001] The present invention relates to an implant deployment device, and more particularly to an implant deployment device for deploying an implant for suturing a tear in the knee cartilage (or meniscus) in the event of a tear.

Background Art

[0002] Arthroscopic surgery is becoming more common for the repair of soft tissue tears. When the knee cartilage (or meniscus) tears, when the meniscus tears, the lesion is treated by making a microincision at the site of the tear, or by placing an implant with a suture at the site of the tear and securing it with sutures after the lesion is identified with arthroscopy.

[0003] Sutures are fixedly attached to the implant to close the lesion. A deployment device in the form of a cannula is used to deploy the implant into the lesion.

[0004] The implant deployment device further comprises a cutter for cutting the suture to minimize the length of the suture after closing the lesion with a suture fixedly connected to the implant deployed in the lesion.

[0005] In one example, the implants may be configured as a pair. It is important that the implant deployment device is capable of reliably deploying the implant with minimal incision when an operator (a surgeon) uses the implant deployment device to deploy the implant to the lesion site.

SUMMARY OF THE DISCLOSURE

[0006] The objective of this invention is to provide an implant deployment device that can deploy an implant stably at the tear site without performing an incisional surgery.

[0007] An implant deployment device is provided. The implant deployment device comprising: a body part comprising a space formed internally in an elongated shape in one direction; a needle having a hollow shape in which a first end engages with a first end of the body part and a second end is formed with a longitudinal slit of a predetermined length; a pushrod movably accommodated in the internal space of the body part in a forward direction, which is a direction of the needle, and a rearward direction, which is an opposite direction of the needle, and having a unidirectionally elongate shape, a part of which is accommodated in a hollow portion of the needle and a remaining part of which is accommodated in the internal of the body part; a slider engaging the push rod and comprising a snagging jaw and a receiving groove; and a camrod pivoting between a first position in which the snagging jaw restricts rearward movement of the slider, and a second position in which the snagging jaw is unjammed and inserted into the receiving groove to permit rearward movement of the slider a predetermined distance, wherein a first implant is disposed at the other end of the needle and is pressed by the pushrod as the pushrod moves forward to deploy into an affected area, a second implant disposed rearward of the first implant at the other end of the needle, a lower portion of the second implant is supported by the pushrod and an upper portion of the second implant is accommodated in a slit in the needle.

[0008] In one embodiment, the implant deployment device further comprises elastically pressurizing means to elastically pressurize the slider to move rearwardly.

[0009] Further, the implant deployment device further comprises a push handle that includes a

handle exposed to outside of the body part, penetrates through the body part and engages with the slider to move with the push part, and the push part can be moved by a forward or backward movement of the push handle.
[0010] Further, the implant deployment device further comprises a rotary lever, a portion of which is exposed to outside of the body part and a portion of which penetrates through the body part to engage the camrod so as to rotate the camrod, and the camrod can be rotated to a first position or a second position by rotation of the rotary lever.
[0011] Further, the implant deployment device can further comprise a length adjustment member engaging the needle at a first end of the body part and movably installed longitudinally of the body part,
[0012] Further, the needle can be forwardly movable by the length adjustment member.
[0013] Preferably, the body part and the length adjustment member are formed with a restraining means that permit forward movement of the length adjustment member and restrict rearward movement of the length adjustment member.
[0014] In one embodiment, the restraining means comprises: a first tooth in the shape of a right triangular tooth formed on the body part; and a second tooth in the shape of a right triangularly tooth formed on the length adjustment member and engaging the first tooth, wherein the second tooth can be elastically deformed to allow movement of the length adjustment member when the length adjustment member is moved in a direction of the needle, and wherein movement in the opposite direction can be prevented by the second tooth engaging the first tooth.
[0015] In one embodiment, a upper surface of a needle-side end of the push rod is a plane, a lower surface of the second implant is a plane, and the lower surface of the second implant can be supported on the upper surface of the needle-side end of the push rod.
[0016] According to the implant deployment device of the present invention, the tear can be reliably closed in a minimally invasive manner without incision.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0017] FIG. **1** is a perspective view of the implant deployment device according to an embodiment of this invention.
[0018] FIG. **2** shows a sectional view of the implant deployment device depicted in FIG. **1**.
[0019] FIG. **3** is a diagram for explaining the forward movement of the push part.
[0020] FIG. **4** is a diagram to explain the backward movement of the push part as the camrod rotates to the second position.
[0021] FIG. **5** is a diagram for explaining the deployment of the first implant as the push part moves forward.
[0022] FIG. **6** and FIG. **7** are diagrams for explaining the downward movement of the second implant as the push part moves backward with the camrod rotated to the second position.
[0023] FIG. **8** is a diagram showing the forward movement of the length adjustment member.
DETAILED DESCRIPTION OF THE DISCLOSURE
[0024] Hereinafter, specific details for implementing this invention are provided by a detailed description of preferred embodiments, referring to the attached drawings.
[0025] Reference numerals are assigned to the components in each drawing, and identical components may have the same numerals, even if they are shown in different drawings.
[0026] FIG. **1** is a perspective view of the implant deployment device according to an embodiment of this invention, FIG. **2** shows a sectional view of the implant deployment device depicted in FIG. **1**, FIG. **3** is a diagram for explaining the forward movement of the push part, FIG. **4** is a diagram to explain the backward movement of the push part as the camrod rotates to the second position, FIG.

5 is a diagram for explaining the deployment of the first implant as the push part moves forward, FIGS. **6** and **7** are diagrams for explaining the downward movement of the second implant as the push part moves backward with the camrod rotated to the second position, and FIG. **8** is a diagram showing the forward movement of the length adjustment member.

[0027] An implant deployment device according to this embodiment includes a body part **10**, a needle **20**, a push part **30**, a push handle **40**, an elastic pressurization means **50**, a camrod **60**, a rotary lever **70**, a first implant **80**, and a second implant **90**.

[0028] The body part **10** includes a space formed inside in a unidirectionally elongated shape as shown in FIG. **1**, and the space accommodates a configuration of the slider **31** of the push part **30**, the elastomeric pressurization means **50**, the camrod **60**, and the like.

[0029] The body part **10** includes a length adjustment member **100** and a restraining means **110**.

[0030] The length adjustment member **100** is provided at one end of the body part **10** and is movable to the front of the body part **10**. (Movement to the rear is restricted by the restraining means **110** described later.

[0031] The length adjustment member **100** is coupled to a needle **20**, which is coupled to the body part **10** via the length adjustment member **100**.

[0032] In FIG. **8**, the length adjustment member (**100**) moved forward, and as the length adjustment member **100** moves forward, the needle **20** moves with it, allowing the needle **20** to penetrate deeper into the skin.

[0033] The restraining means **110** can be configured as a ratchet mechanism that allows the length-adjusting member **100** to move forward but restricts its backward movement.

[0034] The restraining means **110** includes a first tooth **111** and a second tooth **112**.

[0035] The first tooth **111** is in the configuration of a right triangular tooth formed on the body part **10**, and the second tooth **112** is on the configuration of a right triangular tooth formed in the length adjustment member **100**, and is engageable with the first tooth **111**.

[0036] When the length adjustment member **100** moves forward, the second tooth **112** rides over the first tooth **111** as the length adjustment member **100** or a portion of the body part **10** that abuts the length adjustment member **100** elastically deforms, causing the length adjustment member **100** to move. The rearward movement of the length adjustment member **100** is blocked because the second tooth **112** is caught by the first tooth **111**.

[0037] The needle **20** is unidirectionally elongated, with one end engaging the first end of the body part **10** and the other end penetrating into the skin to deploy the first implant **80** and the second implant **90**, and a longitudinal slit **21** formed at a predetermined length is formed at the other end penetrating into the skin.

[0038] The push part **30** includes a push rod **31** and a slider **32**.

[0039] The pushrod **31** is partially accommodated in the needle **20** and partially accommodated in the interior of the body part **10** in a unidirectionally elongate configuration, movably accommodated forward, which is the direction of the needle **20**, and rearward, which is the opposite direction of the needles **20**. In FIG. **2**, the left side is the front and the right side is the rear.

[0040] The upper surface of the other end of the push rod **31** is planar, as shown in FIGS. **3** and **4**.

[0041] The slider **32** engages the push rod **31** and is accommodated in a space formed in the interior of the body part **10** to move forward or backward, and includes a snagging jaw **321** and a receiving groove **322**.

[0042] The push handle **40** comprises a handle exposed to the outside of the body part **10**, and penetrates through the body part **10** to engage the slider **32**, wherein a handle projection **41** of the push handle **40** is inserted into a handle groove **33** of the slider **32**, so that the two configurations are joined.

[0043] The elastically pressurizing means **50** may utilize a coil spring, as shown, in a configuration that elastically pressurizes the slider **32** to move rearwardly.

[0044] The camrod **60** pivots between a first position and a second position, the first position being

a position in which the camrod **60** is engaged with the snagging jaw **321** as shown in FIG. **3**, restricting the rearward movement of the slider **32**, and the second position being a position rotated 90 degrees from the first position as shown in FIG. **4**, in which the camrod **60** is disengaged with the snagging jaw **321** and inserted into the receiving groove **322**, allowing the slider **32** to move rearwardly a predetermined distance.

[0045] The rotary lever **70** is configured to engage the camrod **60** in such a way that when the operator rotates the rotary lever **70**, the camrod **60** rotates with it, and like the push handle **40**, a portion of the rotary lever **70** is exposed to the outside of the body part **10** and a portion penetrates through the body part **10** to engage the camrod **60**.

[0046] The first implant **80** is disposed at the other end of the needle **20** and is pressurized by the pushrod **31** as the pushrod **31** moves forward to deploy into the annulus.

[0047] The second implant **90** is disposed at the other end of the needle **20** and is positioned posteriorly relative to the first implant **80**. The lower surface of the second implant **90** has a planar shape and is supported on the upper surface of the push rod **31**, and the upper surface is received in the slit **21** of the needle **20**.

[0048] Hereinafter, a method of deploying the first implant **80** and the second implant **90** using the aforementioned configurations will be described to illustrate the function, action, and effect of each configuration.

[0049] First, in the state shown in FIG. **1**, the other end of the needle **20** is inserted into the skin near the torn tissue. Once the needle **20** is inserted, the first implant **80** and the second implant **90** are also inserted. Although not shown, the first implant **80** and the second implant **90** are secured with sutures.

[0050] When the push handle **40** is pushed forward with the needle **20** inserted, the elastomeric pressurization means **50** is elastically compressed and the slider **32** coupled to the push handle **40** moves forward, causing the push rod **31** coupled to the slider **32** to move with the slider **32** to press the first implant **80** forward. The first implant **80**, pressurized by the push rod **32**, moves forward (in the affected area's direction) and is implanted at the operator's desired location. FIG. **5** shows the first implant **80** disengaged from the needle **20**.

[0051] Once the first implant **80** is implanted, the operator rotates the rotary lever **70** to rotate the camrod **60** to the second position, When the force applied to the push handle **40** is removed, the push rod **31** and the slider **32** are moved rearwardly by the elastomeric pressurization means **50**, such that the push rod **31** and the slider **32** are moved further rearwardly as the camrod **60** is inserted into the receiving groove **322** than when the camrod **60** is hung in the receiving groove **322** (see FIG. **2**). (See FIG. **4**).

[0052] As the push rod **31** and slider **32** move rearward as shown in FIG. **4**, the second implant **90** moves from the state shown in FIG. **6** to the state shown in FIG. **7**, where the second implant **90** is lowered. The second implant **90** is supported by the push rod **31** and when the push rod **31** is moved to the rear, the second implant **90** is moved by gravity to the state shown in FIG. **7**.

[0053] With the second implant **90** moved downwardly as shown in FIG. **7**, pushing the push handle **40** forward causes the push rod **31** and slider **32** to move forward, pushing the second implant **90** forward causes the second implant **90** to move and be implanted in the desired location by the operator, and this is accomplished by the same mechanism as implanting the first implant **80**.

[0054] On the other hand, if the location where the first implant **80** or the second implant **90** is to be implanted is deeper in the skin, moving the length adjustment member **100** forward as shown in FIG. **8** will cause the needle **20** to move forward as well, allowing the first implant **80** or the second implant **90** to be implanted deeper in the skin than in the condition shown in FIG. **1**.

[0055] Once the first implant **80** and second implant **90** are implanted, the sutures can be manipulated appropriately to connect the torn tissue.

[0056] The foregoing description is merely an exemplary description of the technical ideas of the

present invention, and various modifications, changes, and substitutions will be apparent to one of ordinary skill in the art to which the present invention belongs without departing from the essential features of the invention. Accordingly, the embodiments disclosed herein and the accompanying drawings are intended to illustrate and not to limit the technical ideas of the invention, and the scope of the technical ideas of the invention is not limited by these embodiments and accompanying drawings.

Claims

1. An implant deployment device comprising: a body part comprising a space formed internally in an elongated shape in one direction; a needle having a hollow shape in which a first end engages with a first end of the body part and a second end is formed with a longitudinal slit of a predetermined length; a pushrod being movably accommodated in the internal space of the body part in a forward direction, which is a direction of the needle, and a rearward direction, which is an opposite direction of the needle, a part of which is accommodated in a hollow portion of the needle, a remaining part of which is accommodated in the internal of the body part, and having a unidirectionally elongate shape; a slider engaging the push rod and comprising a snagging jaw and a receiving groove; and a camrod pivoting between a first position in which the snagging jaw restricts rearward movement of the slider, and a second position in which the snagging jaw is unjammed and inserted into the receiving groove to permit rearward movement of the slider a predetermined distance; wherein a first implant is disposed at the other end of the needle and is pressed by the pushrod as the pushrod moves forward to deploy into an affected area, a second implant disposed rearward of the first implant at the other end of the needle, a lower portion of the second implant is supported by the pushrod and an upper portion of the second implant is accommodated in a slit in the needle.
2. The implant deployment device of claim 1, wherein the implant deployment device further comprises elastically pressurizing means to elastically pressurize the slider to move rearwardly.
3. The implant deployment device of claim 1, wherein the implant deployment device further comprises a push handle that includes a handle exposed to outside of the body part, penetrates through the body part and engages with the slider to move with the push part, and wherein the push part is moved by a forward or backward movement of the push handle.
4. The implant deployment device of claim 1, wherein the implant deployment device further comprises a rotary lever, a portion of which is exposed to outside of the body part and a portion of which penetrates through the body part to engage the camrod so as to rotate the camrod, and wherein the camrod is rotated to a first position or a second position by rotation of the rotary lever.
5. The implant deployment device of claim 3, wherein the implant deployment device further comprises a rotary lever, a portion of which is exposed to outside of the body part and a portion of which penetrates through the body part to engage the camrod so as to rotate the camrod, and wherein the camrod is rotated to a first position or a second position by rotation of the rotary lever.
6. The implant deployment device of claim 1, wherein the implant deployment device further comprises a length adjustment member engaging the needle at a first end of the body part and movably installed longitudinally of the body part, and wherein the needle is forwardly movable by the length adjustment member.
7. The implant deployment device of claim 3, wherein the implant deployment device further comprises a length adjustment member engaging the needle at a first end of the body part and movably installed longitudinally of the body part, and wherein the needle is forwardly movable by the length adjustment member.
8. The implant deployment device of claim 6, wherein the body part and the length adjustment member are formed with a restraining means that permit forward movement of the length adjustment member and restrict rearward movement of the length adjustment member.

9. The implant deployment device of claim 7, wherein the body part and the length adjustment member are formed with a restraining means that permit forward movement of the length adjustment member and restrict rearward movement of the length adjustment member.

10. The implant deployment device of claim 8, wherein the restraining means comprises: a first tooth in the shape of a right triangular tooth formed on the body part; and a second tooth in the shape of a right triangularly tooth formed on the length adjustment member and engaging the first tooth, wherein the second tooth is elastically deformed to allow movement of the length adjustment member when the length adjustment member is moved in a direction of the needle, and wherein movement in the opposite direction is prevented by the second tooth engaging the first tooth.

11. The device of claim 9, wherein the restraining means comprises: a first tooth in the shape of a right triangular tooth formed on the body part; and a second tooth in the shape of a right triangularly tooth formed on the length adjustment member and engaging the first tooth, wherein the second tooth is elastically deformed to allow movement of the length adjustment member when the length adjustment member is moved in a direction of the needle, and wherein movement in the opposite direction is prevented by the second tooth engaging the first tooth.

12. The device of claim 1, wherein a upper surface of a needle-side end of the push rod is a plane, a lower surface of the second implant is a plane, and the lower surface of the second implant is supported on the upper surface of the needle-side end of the push rod.