DESCRIPTION



159159

FLUSHING DEVICE AND CATHETER SET



G00002

Technical Field

[0001]

The present invention relates to a flushing device for flushing a catheter that is to be inserted into the body, and a catheter set that combines the catheter with the flushing device.

Background Art

[0002]

Treatments of inserting a microcatheter into a blood vessel and conducting a surgical operation in the blood vessel are employed in the field of medicine.

As such a microcatheter, a structure that includes a catheter tube, a catheter hub connected to one end of the catheter tube, and a guidewire inserted in and passed through the catheter tube is frequently used. In this microcatheter, a torque device is connected to a proximal end of the guidewire, the guidewire is passed through a lumen of the catheter tube, and the catheter tube is inserted into the blood vessel from outside the body. Having done so, the guidewire is manipulated using the torque device, and the catheter tube is manipulated using the hub. As a result, a tip of the catheter tube can selectively be inserted into a thin blood vessel and led to a desired position.

[0003]

Also, an opening that links to the lumen of the catheter tube is formed at one end of the hub away from the catheter tube. By inserting a luer or the like into this opening, a medical fluid or the like can be infused into the catheter tube.

Here, before inserting the catheter into the blood vessel, it is necessary to flush the catheter, that is, to fill the lumen of the catheter tube with normal saline or the like. This is conventionally done in the following way. The guidewire is removed from the catheter tube, and the inside of the catheter tube is filled with a flushing liquid (e.g. normal saline). The guidewire is soaked with normal saline or the like too, and then reinserted into the catheter tube.

[0004]

On the other hand, a structure in which a circuit for injecting a flushing liquid from one end of the torque device and making it flow to the other end is provided and the other end of the torque device is connectable to the catheter hub, has been developed as catheter assemblies disclosed in patent documents 1 and 2.

These catheters allow for easy flushing, with there being no need to remove the guidewire from the catheter tube.

Patent document 1: Examined Japanese Patent Application Publication No. H04-2074

Patent document 2: Unexamined Japanese Patent Application Publication No. 2001-137351

Disclosure of the Invention

Problems the Invention is going to Solve

[0005]

However, in the above case of flushing the catheter by injecting the flushing liquid from the end of the torque device, it is necessary to provide, in the torque device, the circuit for causing the flushing liquid to flow. That is, a general torque device cannot be used.

In view of the above problem, the present invention aims to enable flushing of a catheter to be performed without removing a guidewire from a catheter tube, even when a general torque device is used in the catheter.

Means of Solving the Problems

[0006]

The stated aim can be achieved by a flushing device used in a state of being attached to a catheter that includes: a catheter tube; a hub connected to the catheter tube and having an opening that links to an inside of the catheter tube, and a guidewire inserted in the catheter tube, the flushing device including: a main tube portion through which the guidewire is passable; and a side tube portion connected to the main tube portion so that an inside of the side tube portion links to an inside of the main tube portion, wherein one end of the main tube portion is shaped to fit into the opening of the hub, and one end of the side tube portion away from the main tube portion is shaped to enable a nozzle for ejecting a flushing liquid, to be inserted into the side tube

portion.

[0007]

In the above flushing device, it is preferable that a tube wall of the main tube portion has a slit extending from the end to an other end of the main tube portion.

Here, a valve element made of a more flexible material than the main tube portion may be attached to a part of the main tube portion facing the slit.

In the above flushing device, it is preferable that the other end of the main tube portion is closed by a cover, and the cover has an opening to enable the guidewire to pass through the main tube portion.

[0008]

Here, a valve element made of a more flexible material than the cover may be attached to a part of the cover facing the opening of the cover.

It is preferable that the cover is thicker than the tube wall of the main tube portion.

Effects of the Invention

[0009]

According to the above structure, the main tube portion through which the guidewire is passable has one end shaped to fit into the opening of the hub. Therefore, in a state where the guidewire is inserted in the catheter tube and the hub, the flushing device can be attached to the catheter by engaging the main tube portion with the guidewire so as to surround the guidewire, and fitting the end of the main tube

portion into the opening of the hub.

Also, the side tube portion has one end shaped to allow a nozzle for ejecting a flushing liquid to be inserted into the side tube portion. Therefore, the flushing liquid can be injected into the side tube portion, by inserting the nozzle for ejecting the flushing liquid through this end.

[0010]

Also, since the side tube portion is connected to the main tube portion so as to create a passageway therebetween, the flushing liquid injected into the side tube portion flows into the main tube portion.

Accordingly, by attaching the flushing device of the present invention to the catheter without removing the guidewire from the catheter tube and the hub, inserting the nozzle through the end of the side tube portion, and injecting the flushing liquid into the side tube portion, the injected flushing liquid flows into the catheter tube via the main tube portion and the opening of the hub, as a result of which the catheter is flushed.

[0011]

After the flushing, by removing the flushing device from the guidewire and attaching a general torque device to the guidewire, a loss of operability of the torque device, which is caused by the presence of the flushing device, can be avoided.

In the above flushing device, by forming a slit on the tube wall of the main tube portion from one end to the other, the main tube portion can be engaged with or removed from

the guidewire on a side thereof, through the use of this slit. This eases the attachment and removal of the flushing device. Hence the flushing device can easily be attached to or detached from the catheter between the torque device and the hub, with there being no need to remove the torque device from the guidewire.

[0012]

In such a case, if the valve element made of a more flexible material than the main tube portion is attached to a part of the main tube portion facing the slit, the leakage of the flushing liquid from the slit at the time of flushing can be suppressed.

In the above flushing device, if the other end of the main tube portion is closed with the cover and the opening which allows the guidewire to pass through the main tube portion is formed in the cover, the leakage of the flushing liquid from the other end at the time of flushing can be suppressed. Here, if the valve element made of a more flexible material than the cover is formed in a part of the cover facing the opening, the leakage of the flushing liquid from this opening at the time of flushing can be suppressed.

[0013]

Furthermore, by making the cover thicker than the tube wall of the main tube portion, the leakage of the flushing liquid from the opening of the cover at the time of flushing can be suppressed.

Brief Description of the Drawings

[0014]

FIG. 1 shows a structure of a catheter and a flushing device attached to the catheter, according to an embodiment of the present invention.

FIG. 2 is a perspective view of the flushing device.

FIG. 3 is a relevant part sectional view showing a situation where flushing is performed using the flushing device.

FIG. 4 is an enlarged sectional view of one end of a flushing device according to a modification of the present invention.

Description of Reference Numerals

[0015]

1	.....	catheter
10	.....	catheter tube
12	.....	tip of the catheter tube
20	.....	hub
23	.....	end of the hub
24	.....	opening
30	.....	guidewire
40	.....	torque device
50	.....	syringe
52	.....	nozzle
100	.....	flushing device
110	.....	main tube portion
111	.....	end of the main tube portion
112	.....	end of the main tube portion

113 ..... slit

114 ..... cover

114a ..... opening

115 ..... valve element

120 ..... side tube portion

121 ..... end of the side tube portion

122 ..... opening

Best Mode for Carrying out the Invention

[0016]

The following describes a catheter and a flushing device according to an embodiment of the present invention, with reference to the drawings.

(Catheter)

FIG. 1 shows a structure of a catheter and a flushing device that is to be attached to the catheter.

A catheter 1 is roughly composed of a catheter tube 10 made of a flexible tube, a hub 20 attached to a proximal end of the catheter tube 10, a guidewire 30 inserted in and passed through the catheter tube 10, and a torque device 40 attached to a proximal end of the guidewire 30. This catheter 1 and a flushing device 100 attached to the catheter 1 constitute a catheter set.

[0017]

The catheter tube 10 is used by being inserted into a body lumen such as a blood vessel, and is a flexible tube element.

The proximal end of the catheter tube 10 is liquid-tightly connected to one end of the hub 20.

The catheter tube 10 is made of a flexible resin material (polyolefin, polyester, fluorine resin) or elastomer. The catheter tube 10 may have a reinforcement layer formed using a linear object or a mesh.

[0018]

The hub 20 is a tube element through which the guidewire 30 is to be passed. The proximal end of the catheter tube 10 is connected to an end 21 of the hub 20. Also, a long thin cap 22 for covering the proximal end of the catheter tube 10 is formed on the end 21 of the hub 20.

Meanwhile, an opening 24 through which a luer of a syringe or the like is to be inserted is formed at an end 23 of the hub 20. This opening 24 links to the inside of the catheter tube 10.

[0019]

Such a hub 20 functions as an insertion port when inserting the guidewire 30 into the catheter tube 10, an inlet when injecting a fluid such as a medical fluid into the catheter tube 10, and an operation unit when an operator manipulates the catheter tube 10.

An inner wall of the opening 24 is tapered such that an internal diameter of the hub 20 in this area gradually increases toward the torque device 40. This allows the luer to be inserted in and connected to the hub 20 easily and reliably, and the guidewire 30 to be inserted easily.

Also, a plurality of handles 25 are projected from sides

of the hub 20. The operator can hold the hub 20 and operate the catheter tube 10, by grasping these handles 25.

[0020]

The guidewire 30 can be formed using a Ni-Ti alloy wire, a stainless wire, a piano wire, or the like. Alternatively, the guidewire 30 may be any of these wires a circumference of which is covered with a resin or an elastomer. A distal end 31 of the guidewire 30 is bent.

The torque device 40 is composed of an operation unit 41 that is held and manipulated by the operator, and a chuck head unit 42 that is provided on a hub end of the operation unit 41 and holds the proximal end of the guidewire 30. A chuck claw 43 and a screw cap 44 for tightening the chuck claw 43 are provided in the chuck head unit 42.

[0021]

A female screw that mates with a male screw 41a provided at the hub end of the operation unit 41 is formed on an internal surface of the screw cap 44. By tightening this screw cap 44, the screw cap 44 presses the chuck claw 43 to thereby hold the guidewire 30.

A syringe 50, as a fluid injection device, is filled with a flushing liquid (e.g. normal saline). The flushing liquid can be ejected from a nozzle 52 by operating a plunger 51.

[0022]

(Structure of the Flushing Device 100)

FIG. 2 is a perspective view of the flushing device 100.

The flushing device 100 includes a main tube portion

110 which the guidewire 30 can pass through, and a side tube portion 120 connected to the main tube portion 110 so as to create a passageway therebetween. The side tube portion 120 is connected to a middle part of the main tube portion 110 (i.e. between an end 111 and an 112 of the main tube portion 110). An angle between the main tube portion 110 and the side tube portion 120 is such that the side tube portion 120 is inclined toward the end 112 of the main tube portion 110 rather than perpendicular to the main body portion 110, to allow the fluid entering from the side tube portion 120 into the main tube portion 110 to flow toward the end 111.

[0023]

The end 111 of the main tube portion 110 is shaped to fit into the opening 24. By fitting the end 111 into the opening 24, the main tube portion 110 is liquid-tightly connected to the hub 20 and this connection state is maintained.

Meanwhile, the end 112 of the main tube portion 110 is closed to reduce a gap with the guidewire 30. In detail, a cover 114 for tube blockage is provided at the end 112 of the main tube portion 110, with an opening 114a, which allows the guidewire 30 to pass through the main tube portion 110, being provided at a center of the cover 114.

[0024]

The side tube portion 120 has an opening 122 into which the nozzle 52 of the syringe 50 can be inserted, at its end 121 that is away from the main tube portion 110.

An inner wall of the opening 122 is tapered such that an internal diameter of the side tube portion 120 in this

area gradually increases toward the end 121. This enables the nozzle 52 to be inserted into and connected with the side tube portion 120 easily and reliably.

The flushing device 100 is made of an acrylic resin, a polyamide resin, a polyamide elastomer, polyethylene, polypropylene, polycarbonate, or polyacetal. The flushing device 100 can be formed by injection molding any of these materials.

[0025]

A slit 113 is formed on a tubular wall of the main tube portion 110 from the end 111 to the end 112. This slit 113 is used for inserting the guidewire 30 from its side. The slit 113 is linked with the aforementioned opening 114a, with it being possible to insert the guidewire 30 into the opening 114a.

(Flushing Operation)

An operation of attaching the flushing device 100 to the catheter 1 and flushing the catheter 1 is described below.

[0026]

The following describes an example of attaching the flushing device 100 to the catheter 1 in a state where the guidewire 30 is inserted in and passed through the catheter tube 10 and the torque device 40 is connected to the proximal end of the guidewire 30.

The attachment of the flushing device 100 is performed as follows. A part of the main tube portion 110 where the slit 113 is formed is pressed against the side of the guidewire

30. In this state, the guidewire 30 is inserted into the main tube portion 110, and further the end 111 of the main tube portion 110 is fit into the opening 24. In this way, the flushing device 100 is attached to the catheter 1.

[0027]

As described above, the slit 113 is formed in the main tube portion 110 of the flushing device 100. Accordingly, the flushing device 100 can easily be attached to the guidewire 30 between the hub 20 and the torque device 40, in a state where the guidewire 30 is inserted in and passed through the catheter tube 10 and the torque device 40 is fixed to the guidewire 30.

FIG. 3 is a sectional view showing a situation where the flushing device 100 is attached to the catheter 1 and flushing is performed.

[0028]

As shown in FIG. 3, the nozzle 52 is inserted into the opening 122 of the side tube portion 120, to connect the syringe 50 to the side tube portion 120. The plunger 51 is manipulated to inject the flushing liquid in the syringe 50 into the side tube portion 120.

The flushing liquid injected into the side tube portion 120 flows into the main tube portion 110 and, streaming down the surface of the guidewire 30, enters into the catheter tube 10 via the inside of the hub 20. In this way, not only the lumen of the catheter tube 10 but also the surface of the guidewire 30 are flushed.

[0029]

After the flushing ends, the syringe 50 is detached from the side tube portion 120, and the flushing device 100 is detached from the catheter 1. This is a reverse operation of the aforementioned attachment.

Since the slit 113 is formed in the main tube portion 110, the main tube portion 110 can easily be detached from the guidewire 30.

[0030]

Note here that, though it is possible to operate the torque device 40 without removing the flushing device 100 from the catheter 1, the operability of the torque device 40 is compromised by the presence of the flushing device 100. If the flushing device 100 is removed from the catheter 1 after flushing as described above, on the other hand, the operability of the torque device 40 can be ensured.

(Insertion of the Catheter into the Blood Vessel)

After the flushing, the catheter 1 is inserted into the blood vessel. When doing so, the catheter tube 10 is inserted into a guiding catheter or a contrast catheter according to need, and then inserted into the blood vessel. Following this, the torque device 40 is manipulated to lead the tip 12 of the catheter tube 10 to a desired position.

[0031]

Once the tip 12 of the catheter tube 10 has reached the desired position, the guidewire 30 is removed from the catheter tube 10.

After this, an injection instrument such as a syringe

is connected to the opening 24 of the hub 20, and a contrast medium or a medical fluid is injected. As a result, the contrast medium or the medical fluid flows through the hub 20 and the catheter tube 10, and is introduced into the blood vessel from the tip 12 of the catheter tube 10.

[0032]

After the above operation ends, the catheter tube 10 is withdrawn from the blood vessel together with the guiding catheter (or the contrast catheter).

(Details about the Slit 113 and the Cover 114)

If the slit 113 is wider, the flushing device 100 can more easily be attached to and removed from the guidewire 30, but the flushing liquid tends to leak from the slit 113 at the time of flushing. Accordingly, it is generally preferable to set the width of the slit 113 to be substantially equal to a diameter of the guidewire 30. For example, when the diameter of the guidewire 30 is 0.46 mm, the width of the slit 113 is preferably in a range of 0.3 mm to 0.6 mm. It should be noted here that the appropriate range of the width of the slit 113 differs depending on the material of the flushing device 100. If the material of the flushing device 100 has high elasticity, the flushing device 100 can easily be attached to and removed from the guidewire 30 even when the width of the slit 113 is considerably small.

[0033]

Also, the tube wall of the main tube portion 110 in the vicinity of the slit 113 may be made thicker. This increases

the dimension of the slit 113 in the tube wall thickness direction, with it being possible to further suppress the leakage of the flushing liquid.

Also, the thickness of the cover 114 is preferably greater than the tube wall of the main tube portion 110, and the size of the opening 114a is preferably substantially equal to the diameter of the guidewire 30. In this way, the leakage of the flushing liquid from the opening 114a when the flushing device 100 is attached to the guidewire 30 (when the guidewire 30 is inserted in the opening 114a) can be prevented.

[0034]

(Modifications)

Although the catheter 1 and the flushing device 100 to be attached to the catheter 1 have been described in the above embodiment, the present invention should not be limited to the above. Example modifications are given below.

(1) The whole flushing device 100 need not be formed from the same material. For instance, the flushing device 100 in the vicinity of the slit 113 or in the vicinity of the slit 113 and the opening 114a may exclusively be formed using a flexible material.

[0035]

As one example, the flushing device 100 is basically formed using the aforementioned resin such as an acrylic resin, a polyamide resin, a polyamide elastomer, polyethylene, polypropylene, polycarbonate, or polyacetal, but part of the flushing device 100 facing the slit 113 or the opening 114a is provided with a valve element that is made of a flexible

material (elastomer material).

FIG. 4 is an enlarged sectional view of the end 112 of the flushing device 100 to which this modification relates. In the flushing device 100 of FIG. 4, the cover 114 has a greater thickness, a cavity is formed in part of the cover 114 facing the opening 114a, and a valve element 115 made of an elastomer material is fit into this cavity. As an alternative, this valve element may be joined to part of the cover 114 facing the opening 114a. Likewise, part of the main tube portion 110 facing the slit 113 may be provided with a valve element by means of fitting or joint.

[0036]

Such a valve element attached to the part corresponding to the slit 113 or the opening 114a serves to block the slit 113 or the opening 114a without obstructing the insertion of the guidewire 30 through the slit 113 or into the opening 114a. Hence the leakage of the flushing liquid from the slit 113 or the opening 114a can be prevented.

(2) The above embodiment describes the case where the side tube portion 120 is connected to the middle part of the main tube portion 110 in the flushing device 100, but the side tube portion 120 may be connected to the end 112 of the main tube portion 110.

[0037]

(3) In the flushing device 100, the slit 113 may be omitted from the main tube portion 110. In such a case, the flushing device 100 is attached to the catheter 1 in the following manner. In a state where the torque device 40 is not attached

to the guidewire 30, the main tube portion 110 is engaged with the guidewire 30 from the proximal end of the guidewire 30, and the end 111 of the main tube portion 110 is fit into the opening 24. Having attached the flushing device 100 in this way, the nozzle 52 is inserted into the opening 122 to connect the syringe 50 to the side tube portion 120, and flushing is performed.

[0038]

After the flushing ends, the flushing device 100 is removed from the proximal end of the guidewire 30, and the torque device 40 is attached to the proximal end of the guidewire 30.

(4) Instead of forming the slit 113 in the main tube portion 110 of the flushing device 100, a thin tube wall part may be provided in the main tube portion 110 from the end 112 to the end 111.

[0039]

In such a case, the flushing device 100 and the torque device 40 are attached to the guidewire 30 beforehand. In this state, the nozzle 52 is inserted into the opening 122 to connect the syringe 50 to the side tube portion 120, and flushing is performed.

After the flushing ends, the thin tube wall part of the flushing device 100 is torn to remove the flushing device 100 from the guidewire 30.

Industrial Applicability

[0040]

The flushing device according to the present invention can be used for flushing a catheter that includes a catheter tube, a hub connected to the catheter tube, and a guidewire inserted in and passing through the catheter tube. The flushing device according to the present invention is especially suitable for flushing a medical-use microcatheter that is to be inserted into a blood vessel and the like.

CLAIMS

1. A flushing device used in a state of being attached to a catheter that includes: a catheter tube; a hub connected to the catheter tube and having an opening that links to an inside of the catheter tube, and a guidewire inserted in the catheter tube, the flushing device comprising:

a main tube portion through which the guidewire is passable; and

a side tube portion connected to the main tube portion so that an inside of the side tube portion links to an inside of the main tube portion,

wherein one end of the main tube portion is shaped to fit into the opening of the hub, and

one end of the side tube portion away from the main tube portion is shaped to enable a nozzle for ejecting a flushing liquid, to be inserted into the side tube portion.

2. The flushing device of Claim 1,

wherein a tube wall of the main tube portion has a slit extending from the end to an other end of the main tube portion.

3. The flushing device of Claim 2,

wherein a valve element made of a more flexible material than the main tube portion is attached to a part of the main tube portion facing the slit.

4. The flushing device of any of Claims 1 to 3,

wherein the other end of the main tube portion is closed by a cover, and

the cover has an opening to enable the guidewire to pass through the main tube portion.

5. The flushing device of Claim 4,

wherein a valve element made of a more flexible material than the cover is attached to a part of the cover facing the opening of the cover.

6. The flushing device of Claim 4,

wherein the cover is thicker than the tube wall of the main tube portion.

7. A catheter set comprising:

a catheter tube;

a hub connected to the catheter tube and having an opening that links to an inside of the catheter tube; and

the flushing device of Claim 1.

8. A catheter set comprising:

a catheter tube;

a hub connected to the catheter tube and having an opening that links to an inside of the catheter tube;

a guidewire inserted in the catheter tube; and

the flushing device of Claim 1.

9. A catheter set comprising:

a catheter tube;

a hub connected to the catheter tube and having an opening that links to an inside of the catheter tube;

a guidewire inserted in the catheter tube;

a torque device for operating the guidewire; and

the flushing device of Claim 1.