

HEMOSTATIC DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a hemostatic device which is attached to a patient's limb at a site on the limb where bleeding is to be stopped and which, by the inflation of a balloon, applies pressure to the site so as to stop bleeding.

2. Description of the Related Art

10 When a procedure involving a percutaneous insertion of an instrument such as a catheter into a blood vessel is carried out for medical treatment, examination or diagnosis, bleeding at a puncture site must be stopped following subsequent withdrawal and removal of the catheter. Hemostatic devices which are attached by being wrapped around the portion of an arm or leg where the puncture site is located and compress the puncture site where bleeding is to be stopped are already known in
15 the prior art (e.g., U.S. Patent No. 7498477).

 In this hemostatic device, a band wrapped around a puncture site of an arm or a leg is secured by securing means thereby maintaining pressure of a balloon pressing the puncture site. However, in order to prevent occurrence of excessive load in adjacent nerves or the ulna artery, it has been recommended that the band be wrapped
20 to be about 15 mm loose in the step of wrapping the band in the state before the balloon is inflated.

 "About 15 mm loose" means that, compared to the state that the band is wrapped around an arm and a leg in the manner that the entire circumference thereof is in contact with the arm or leg, the band is wrapped such that the length in the
25 circumferential direction thereof is lengthened by about 15 mm.

However, since there is no standard for the loose state, if the band is tightly wrapped, pain or numbness occurs at the site around which the band is wrapped. If the band is too loose, pressure by the balloon becomes insufficient so that stopping bleeding is failed.

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SUMMARY OF THE INVENTION

One object of the present invention is to provide a hemostatic device, in which by providing a space maintaining member in advance and wrapping a band around the limb, pressing force to a puncture site by inflation of a balloon to stop bleeding can be set to a proper degree of force in a simple manner with reproducibility.

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These objects are achieved by the present invention as set forth in (1) to (5) below.

(1) A hemostatic device comprising: a flexible band adapted to be wrapped around a limb of a patient at a site on the limb where bleeding is to be stopped; securing means for securing the band in a wrapped state to the limb; a curved plate, which is made of harder material than the band, and at least a portion of which is curved toward an inner side of the band; a balloon, which is provided in an inner side of the curved plate, and which inflates when a fluid is introduced therein, wherein the balloon is inclined toward one end side of the longitudinal direction of the curved plate being held in the band; and a space maintaining member for setting pressing force by inflation of the balloon, wherein the space maintaining member is detachably provided to the hemostatic device.

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(2) The hemostatic device according to (1), wherein the space maintaining member is a round bar having a cross-section diameter of 10 to 15 mm.

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(3) The hemostatic device according to (1), wherein the space maintaining

member is a clip.

(4) The hemostatic device according to (3), wherein the clip comprises means for setting a length of the clip.

(5) The hemostatic device according to any one of (1) to (4), wherein the space maintaining member is connected to the band.

According to the present invention, it is possible to provide a hemostatic device, in which by providing a space maintaining member in advance and wrapping a band around the limb, pressing force to a puncture site by inflation of a balloon to stop bleeding can be set to a proper degree of force in a simple manner with reproducibility.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a bottom view of an embodiment of a hemostatic device including a space maintaining member, showing a side of the device that serves as an inside surface when the device is attached to a wrist of a patient;

FIG. 2 is a sectional view showing the hemostatic device including the space maintaining member as shown in FIG. 1 during use to stop bleeding;

FIG. 3 is a sectional view showing an example 1 of the hemostatic device including the space maintaining member;

FIG. 4 is a sectional view showing an example 2 of the hemostatic device including the space maintaining member;

FIG. 5 is a sectional view showing an example 3 of the hemostatic device including the space maintaining member; and

FIG. 6 is a sectional view showing an example 4 of the hemostatic device including the space maintaining member.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, based on embodiments for carrying out the hemostatic device including the space maintaining member, the embodiments will be described in detail with reference to drawings. The embodiments below are exemplary products or methods for realizing the technical idea of the present invention. The technical idea of the present invention is not limited to a hemostatic device and can be applied to generals of medical instruments. Types of configuration materials and configuration conditions, etc., are not limited to those described below. Various modifications to the technical idea of the present invention, which are within the technical scope defined in the claims, may be added.

FIG. 1 is a bottom view of an embodiment of a hemostatic device including a space maintaining member, showing a side of the device that serves as an inside surface when the device is attached to a wrist of a patient. FIG. 2 is a sectional view showing the hemostatic device including the space maintaining member as shown in FIG. 1 during use to stop bleeding.

The hemostatic device 1 shown in FIG. 1 is used to stop bleeding at a puncture site 510 (where bleeding to be stopped) following the removal of an instrument such as a catheter which was inserted percutaneously into an artery through a puncture formed somewhere on a limb, such as at a wrist 500 (limb), for a medical purpose such as treatment, examination or diagnosis. This hemostatic device 1 has a band 2 which is adapted to be wrapped around the wrist 500 and has a width of about 40mm, a surface fastener 3 made of an air-permeable member as means for securing the band 2 in a wrapped state to the wrist 500, a curved plate 4, a balloon 5, a secondary balloon 6, a marker 7 and a space maintaining member 9.

The band 2 is a flexible belt-like member. As shown in FIG. 2, the band 2 is

attached to the wrist 500 by being wrapped one full turn around an outside of the wrist 500 and having portions of the band 2 near both ends thereof mutually overlap. The overlapping portions of the band 2 are then secured (or joined), by means of the surface fastener 3 (which will be described later) such as a velcro-type hook and loop fastener (e.g., the product commonly known in Japan as Magic Tape®).

The material making up the band 2 is not subject to any particular limitation, as far as the puncture site 510 can be seen therethrough. Illustrative examples include polyvinyl chloride, polyolefins such as polyethylene, polypropylene, polybutadiene and ethylene-vinyl acetate copolymers (EVA), polyesters such as polyethylene terephthalate (PET) and polybutylene terephthalate (PBT), polyvinylidene chloride, silicones, polyurethanes various thermoplastic elastomers such as polyamide elastomers, polyurethane elastomers and polyester elastomers, and any combinations of the above in the form of, for example, resin blends, polymer alloys or laminates.

Incidentally, it is preferable for the band 2 in the present embodiment to be substantially transparent (visible-light transparent) so that the puncture site 510 is reliably visible from an outside and a marker 7 (which will be described later) can be easily and properly positioned at the puncture site 510.

The band 2 may have near the center thereof a curved plate holder 21 for holding the subsequently described curved plate 4. In the embodiment shown in FIG. 1, the curved plate holder 21 is composed in part of a separate strip-like member joined to the outside (or inside) surface of the band 2 by a suitable method such as welding (e.g., heat welding, high-frequency welding, ultrasonic welding) or adhesion (such as with an adhesive or solvent) so as to form a double layer construction. The curved plate 4 is inserted into a gap in the double layer and thereby held.

The means that may be employed to secure the band 2 in a wrapped state to

the wrist 500 are not limited only to surface fasteners 3. Other suitable means include snaps, buttons, clips, and members such as buckles through which the ends of the band 2 are passed.

5 The curved plate 4 is inserted into the gap in the double layer construction of the curved plate holder 21 on the band 2, and is thereby held on the band 2.

The curved plate 4 is shaped so that at least a portion thereof is curved toward an inner side of the band 2. This curved plate 4 is constructed of a material more rigid than the band 2 and maintains a substantially fixed shape.

10 It is preferable for the curved plate 4 to be provided with an air hole (not shown) at a position which does not overlap with a balloon 5 (which will be later) such that the air hole of the curved plate 4 communicates with an air hole (not shown) of the band 2.

In this embodiment, the curved plate 4 has a shape that is elongated in the lengthwise direction of the band 2. As shown in FIG. 2, the curved plate 4 has a center portion 41 in the lengthwise direction thereof which is substantially uncurved and thus shaped as a flat plate. The curved plate 4 also has, on either side of this center portion 41, curved portions 42 which curve toward the inner side of the band 2 and along the lengthwise direction of the band 2 (circumferential direction of the wrist 500). The curved portions 42 have a radius of curvature R2 which is smaller than the radius of curvature R1 of the center portion 41 (in the illustrated arrangement, R1 is substantially 180°).

25 The material making up the curved plate 4 is not subject to any particular limitation, as far as the puncture site 510 can be seen therethrough. Examples of materials of which the curved plate 4 may be made include acrylic resins, polyvinyl chloride (particularly rigid polyvinyl chloride), polyolefins such as polyethylene,

polypropylene and polybutadiene, polystyrene, poly(4-methyl-1-pentene), polycarbonates, ABS resins, polymethyl methacrylate (PMMA), polyacetals, polyarylates, polyacrylonitriles, polyvinylidene fluorides, ionomers, acrylonitrile-butadiene-styrene copolymers, polyesters such as polyethylene terephthalate (PET) and polybutylene terephthalate (PBT), butadiene-styrene copolymers, aromatic and aliphatic polyamides, and fluorocarbon resins such as polytetrafluoroethylene.

Incidentally, it is preferable for the curved plate 4 in the present embodiment to be substantially transparent (visible-light transparent) so that the puncture site 510 is reliably visible from the outside and the marker 7 (which will be described later) can be easily and properly positioned at the puncture site 510.

Incidentally, the curved plate 4 may have no uncurved portion such as center portion 41, and may thus be curved over its entire length.

The band 2 has connected to the inner side thereof a balloon 5 made of a flexible material. The balloon 5 inflates when a fluid (a gas such as air, or a liquid) is introduced therein, thus applying pressure to the puncture site 510 on the wrist 500.

The balloon 5 is positioned near one end of the curved plate 4 in the lengthwise direction thereof. That is, in the arrangement shown in FIG. 1, the balloon 5 is in a position that overlaps with substantially the right half of the curved plate 4.

The material making up the balloon 5 is not subject to any particular limitation provided it is a material that allows the puncture site 510 to be seen. For example, a material similar to that making up the band 2 may be used. To facilitate joining of the balloon 5 with the band 2 by welding, and thus make the hemostatic device 1 easier to manufacture, it is preferable for the balloon 5 to be made of a material which is of the same nature or type as that making up the band 2.

Incidentally, it is preferable for the balloon 5 in the present embodiment to be substantially transparent (visible-light transparent) so that the puncture site 510 is reliably visible from the outside and the marker 7 (which will be described later) can be easily and properly positioned at the puncture site 510.

5 The balloon 5 may have a construction in which the edges of sheets made of the above-described material are sealed together by a suitable process such as welding or adhesion to form a sort of pouch. In the arrangement shown in FIG. 1, the balloon 5 is substantially square in the uninflated state.

10 The balloon 5 is connected to the band 2 by a flexible connector 11. In the present embodiment, the balloon 5 is connected to the band 2 by a connector 11 only on the side of one end of the curved plate 4; that is, only on the right side in FIG. 1. The connector 11 has a relatively short length, thereby keeping the balloon 5 tethered in a position deviated to one end of the curved plate 4. The connector 11 is preferably made of the same material as the balloon 5.

15 As shown in FIG. 1, the hemostatic device 1 of the present embodiment has a marker 7 provided on the inside surface of the balloon 5; that is, the surface which comes into contact with the puncture site 510. Providing such a marker 7 on the balloon 5 facilitates proper positioning of the balloon 5 at the puncture site 510, which in turn helps prevent blood leakage and hematoma formation due to poor positioning
20 of the balloon 5.

As shown in FIG. 1, it is preferable for the marker 7 to be provided at the center of the balloon 5. Because this enables the center of the balloon 5 to be properly positioned at the puncture site 510, when the balloon 5 has been inflated, the compressive force applied by the balloon 5 acts reliably upon the puncture site 510.

25 The marker 7 is not limited to any particular shape. Examples of suitable

shapes include circular, triangular and square shapes. In FIG. 1, the marker 7 has an annular shape.

Incidentally, it is possible to place the marker 7 on an outside surface of the balloon 5; that is, on the side opposite the surface of the balloon 5 that comes into
5 direct contact with the puncture site 510 (back side in the plane of FIG. 1).

Alternatively, instead of being placed on the balloon 5, the marker 7 may be placed on the band 2, on the curved plate 4, or on a secondary balloon 6 (which will be described later). In such cases, it is advantageous for the marker 7 to be placed in such a way that it can be positioned over the center of the balloon 5.

10 As shown in FIG. 1, the balloon 5 has connected thereto an inflator 8 for introducing a fluid into the balloon 5. The inflator 8 is composed of a flexible tube 81 which is connected at a proximal end thereof to the balloon 5 and which has a lumen that communicates with the interior of the balloon 5, a bulb 82 which is provided at the distal end of the tube 81, and a tubular connector 83 which is joined to the bulb 82.

15 Inflation of the balloon 5 is carried out by inserting the protruding tip of a syringe (not shown) into the connector 83 and pushing a plunger on the syringe so as to introduce fluid within the syringe through the inflator 8 into the balloon 5. Once fluid has been injected into the balloon 5 and the protruding tip of the syringe is withdrawn from the connector 83, a check valve within the connector 83 closes, preventing the
20 fluid from leaking out and thus maintaining the balloon 5 in an inflated state.

As shown in FIG. 2, a secondary balloon 6 composed of a flexible material may be provided between the curved plate 4 and the above-described balloon 5 in such a way that all or part of the secondary balloon 6 overlaps with the balloon 5. This secondary balloon 6 functions as a pressing member for pressing against the balloon 5.

25 Under the pressure of the fluid with which it is filled, the secondary balloon 6

applies to the balloon 5 a pressing force (arrow f in FIG. 2) which is directed toward substantially a center 520 of the wrist 500. Under the influence of this pressing force f from the secondary balloon 6, the balloon 5 in turn applies to the puncture site 510 a compressive force (arrow F in FIG. 2) that acts in an oblique or inclined direction (toward the center 520 of the wrist 500) rather than vertically downward (that is, in a vertical direction with respect to the surface of the wrist 500). This arrangement provides a better hemostatic effect and is thus able to more reliably stop bleeding than when compression is applied to the puncture site 510 in a vertically downward direction.

The material making up the secondary balloon 6 is not subject to any particular limitation, as far as the puncture site 510 can be seen therethrough. For example, materials similar to the above-described materials making up the band 2 may be used. It is preferable for the secondary balloon 6 to be substantially transparent (visible-light transparent) so that the puncture site 510 is reliably visible from the outside and the marker 7 can be easily and properly positioned at the puncture site 510.

In the present embodiment of the invention, the secondary balloon 6 has a smaller width in the lengthwise direction of the band 2 than the balloon 5. Hence, the secondary balloon 6 is smaller in size than the balloon 5 and thus applies pressure locally to the balloon 5. This enables the direction of the pressing force F applied by the balloon 5 to the puncture site 510 to be more reliably inclined.

In this embodiment, as mentioned above, the curved plate 4 has, on the side on which the balloon 5 is positioned (the right side in FIG. 2), a curved portion 42 with a radius of curvature smaller than that of the center portion 41 of the curved plate 4. The secondary balloon 6 contacts, through the band 2, the curved portion 42 of the curved plate 4 or a portion to the right side thereof in FIG. 2. In this way, the

direction of the force incurred by the secondary balloon 6 from the curved plate 4, i.e., the normal direction of the curved plate 4 where it contacts the secondary balloon 6 through the band 2, is inclined toward the center 520 of the wrist 500. As a result, the directions of pressing force f and pressing force F can be more reliably inclined.

5 In this embodiment, a portion of the balloon 5 and a portion of the secondary balloon 6 are joined together by a suitable method such as welding or adhesion. At the resulting junction, a communication portion (an opening) 12 is formed as a means for communicating between the interior of the balloon 5 and the interior of the secondary balloon 6. When a fluid is injected into the balloon 5 in the manner
10 described above, some of the injected fluid flows through the communication portion 12 into the secondary balloon 6, so that the secondary balloon 6 inflates as the balloon 5 inflates. In this way, both balloons can be inflated in a single operation, providing excellent ease of use and efficiency.

In the present embodiment, the secondary balloon 6 is connected to the band 2
15 via a connector 13 on the same side as the connector 11 for the balloon 5 (i.e., the right side in FIG. 2). Accordingly, the secondary balloon 6 more easily and reliably assumes a tilted orientation. This more readily allows the pressing force f applied to the balloon 5 to act in an oblique direction (that is, in a direction which causes the balloon 5 to face substantially the center 520 of the wrist 500), thus enabling a better
20 hemostatic effect to be achieved.

Incidentally, in this invention, the pressing member which presses against the balloon 5 is not limited to a secondary balloon 6. Other types of pressing members that may be used for this purpose include pads made of a spongy substance, an elastomeric material, an assemblage of fibers such as cotton, or combinations thereof.

25 As shown in FIG. 1, a space maintaining member 9 is connected to the band 2

via a flexible connector 91. Alternatively, instead of being connected to the band 2 with using the connector 91, the space maintaining member 9 may be fixed to a positioning portion of the space maintaining member 9 on the band 2 by a clip, etc.

A method of using the hemostatic device 1 including the space maintaining member will be described below.

[1] Before mounting the hemostatic device 1 including the space maintaining member on the wrist 500, the balloon 5 and the secondary balloon 6 are placed in an uninflated state. In case of the wrist 500, the puncture site 510 into an artery is generally placed on a position inclined toward the thumb of the inner side of the wrist 500 (where the tendons are located). In general, an introducer sheath is indwelled at the puncture site 510. The band 2 is wrapped around the wrist 500 in the state that the introducer sheath is indwelled, following the wrist 500 by using the space maintaining member 9 without applying tensile force. The balloon 5 (band 2) is positioned so that the marker 7 provided on the balloon 5 lies over the puncture site 510. Portions near both ends of the band 2 are secured (joined) by overlapping a male side of a surface fastener 31 and a female side of a surface fastener 32.

[2] Once the hemostatic device 1 including the space maintaining member has been attached to the wrist 500, the space maintaining member 9 is detached, a syringe (not shown) is connected to the connector 83 on the inflator 8 and a fluid is introduced into the balloon 5 and the secondary balloon 6 as described above for a predetermined amount in accordance with a medical case, thereby inflating the balloon 5 and the secondary balloon 6.

In the embodiment, before inflating the balloon 5, the band 2 is wrapped around the wrist 500 by using the space maintaining member 9. As such, when the space maintaining member 9 is detached, the degree of looseness of the band 2

maintains constant each turn. Accordingly, pressing force to the puncture site 510 by inflation of the balloon 5 when a predetermined amount of fluid is introduced maintains almost constant each turn.

When the space maintaining member 9 has been detached, looseness of the band 2 is preferably 10 to 25 mm. If the looseness is below 10 mm, pressing force to the puncture site 510 by the inflation of the balloon 5 becomes excessively strong. If the looseness exceeds 25 mm, pressing force to the puncture site 510 by the inflation of the balloon 5 becomes insufficient so that the puncture site 510 may be out of the balloon 5 or the band 2 may be taken off from the wrist 500.

[3] When the balloon 5 and the secondary balloon 6 are inflated, the syringe is allowed to be released from the connector 83. And, the introducer sheath is taken out from the puncture site 510. The balloon 5 and the secondary balloon 6 maintain in the inflated state, and the pressed state by predetermined pressing force to the puncture site 510 maintains (refer to FIG. 2). In this state, the balloon 5 applies pressure locally to the puncture site 510 (and its environs). Due to the inflation of the balloon 5 and the secondary balloon 6, the curved plate 4 is spaced from the surface of the wrist 500, so that it becomes difficult for the curved plate 4 to keep in contact with the wrist 500. As a result, pressing force is intensively applied to the puncture site 510 (and its environs). Before inflating the balloon 5 after detachment of the space maintaining member 9, the band 2 is wrapped and secured around the wrist 500 with a predetermined length of looseness. As such, the pressing force is set to a predetermined proper degree of force. Accordingly, the pressing force to the puncture site 510 by the balloon 5 does not cause excessive load to adjacent nerves or the ulna artery.

[4] After the introducer sheath is taken out from the puncture site 510, if

bleeding is stopped, the syringe is connected again to the connector 83 so as to discharge fluid in the balloon 5. Next, the hemostatic device including the space maintaining member is detached from the wrist 500 to finish bleeding stopping.

Bleeding stopping time from start of bleeding stopping to finish of bleeding stopping could be as short as two or three hours or as long as ten or more hours, according to the size of a catheter used. However, if the band 2 including the space maintaining member is used, excessive pressure or insufficient pressure to the puncture site 510 can be prevented.

Examples

(Example 1)

FIG. 3 is a sectional view showing an example 1 of the hemostatic device 1 including the space maintaining member.

In Example 1, by using a round bar 10 made of plastic with a diameter of $\phi 10\text{mm}$ as the space maintaining member 9, the method of using the hemostatic device including the space maintaining member of paragraphs [1] to [4] above was performed.

The round bar 10 having a diameter of $\phi 10\text{ mm}$ is attached, and the band 2 is wrapped, following the circumference of the wrist 500 without applying tensile force. Next, when the round bar 10 is detached, the band 2 has an about 15 mm length of looseness.

The space maintaining member 9 is not limited to a cylindrical round bar and may be of any shapes that can be put into between the wrist 500 and the hemostatic device 1, such as a square bar including a cuboid and a cube, a sphere, and a triangle bar including a frustum of a cone with gentle slope.

(Example 2)

FIG. 4 is a sectional view showing an example 2 of the hemostatic device 1

including the space maintaining member.

In Example 2, by using a clip 20 having a stopper (not illustrated) to make the clip with a length of 8 mm as the space maintaining member 9, the method of using the hemostatic device 1 including the space maintaining member of paragraphs [1] to [4] above was performed. The stopper may have a structure enabling the length of the clip to be adjustable step by step.

In the state that the band 2 is overlapped to have an overlap length of 8 mm and clipped by the clip 20, the band 2 is wrapped, following the circumference of the wrist 500 without applying tensile force. Next, when the clip 20 is detached, the band has an about 16 mm length of looseness.

Even if time to stop bleeding using the hemostatic device 1 including the space maintaining member exceeds ten hours, if either the space maintaining member 10 of Example 1 or the space maintaining member 11 of Example 2 is used, pain or numbness due to excessive pressure to the puncture site 510, or delay in time to stop bleeding due to insufficient pressure do not occur.

In the present example, the hemostatic device having one space maintaining member 1 has been described. However, a plurality of space maintaining members may be provided. As a result, degree of pressure can be adjusted step by step.

(Example 3)

FIG. 5 is a sectional view showing an example 3 of the hemostatic device 1 including the space maintaining member.

In Example 3, by using cylindrical round bars 10a, 10b, and 10c made of plastic and each having a diameter of $\phi 8$ mm as the space maintaining member 9, the method of using the hemostatic device 1 including the space maintaining member of paragraphs [1] to [4] above was performed.

The round bars 10a, 10b, and 10c each having a diameter of $\phi 8$ mm are attached with equal intervals as illustrated. The band 2 is wrapped around the circumference of the wrist 500 without applying tensile force. Next, when the round bars 10a, 10b, and 10c are detached, if the interval among 10a, 10b, and 10c is 8 mm, the round bar band 2 has an about 15 mm length of looseness.

In the method of using the hemostatic device 1 including the space maintaining member of paragraph [2] above, the three round bars 10a, 10b, and 10c are not detached at the same time. For example, the round bar 10a is detached, and the balloon 5 is inflated. After elapse of certain time from start of stopping bleeding, the round bar 10b is detached. Likewise, after elapse of certain time, the round bar 10c is detached. According to this sequence, degree of pressure can be adjusted step by step.

A diameter, the number, and disposition of a round bar used as the space maintaining member 9 are not limited. Diameters of the round bars 10a, 10b, and 10c may be different.

The space maintaining member 9 is not limited to a cylindrical round bar and may be of any shapes that can be put into between the wrist 500 and the hemostatic device 1, such as a square bar including a cuboid and a cube, a sphere, a triangle bar including a frustum of a cone with a gentle slope, and others.

(Example 4)

FIG. 6 is a sectional view showing an example 4 of the hemostatic device including the space maintaining member.

In Example 4, by using three clips 20a, 20b, and 20c each having a stopper (not illustrated) to make the clip with a length of 2.5 mm, the method of using the hemostatic device 1 including the space maintaining member of paragraphs [1] to [4]

above was performed. The stopper may have a structure enabling the length of the clip to be adjustable step by step.

In the state that the band 2 is overlapped to have an overlap length of 2.5 mm and clipped by using the clips 20a, 20b, and 20c, the band 2 is wrapped, following the
5 circumstance of the wrist 500 without applying tensile force. Next, when the clips 20a, 20b, and 20c are detached, the band has an about 15 to 16 mm length of looseness.

In the method of using the hemostatic device 1 including the space
maintaining member of paragraph [2] above, the three clips 20a, 20b, and 20c are not
10 detached at the same time. For example, the clip 20a is detached, and the balloon 5 is inflated. After elapse of certain time from start of stopping bleeding, the clip 20b is detached. Likewise, after elapse of certain time, the clip 20c is detached. According to this sequence, degree of pressure can be adjusted step by step.

Length, the number, and disposition of a clip used as the space maintaining
15 member 9 are not limited. Lengths of the clips 20a, 20b, and 20c may be different.

The hemostatic device including the space maintaining member has been described based on the illustrated embodiments. However, it is not limited to the embodiments. Each of the parts configuring the hemostatic device including the space maintaining member may be substituted by any other configuration part that can
20 achieve the same function as that of the configuration part of the present invention. Further, any configuration elements may be added.

The hemostatic device including the space maintaining member is not limited to use on the wrist alone, and can be employed as a hemostatic device including a space maintaining member for attachment and use on any portion of a patient's arm or
25 leg (referred to collectively in this specification as "limbs").

The illustrated embodiments of the invention have been described above, although many modifications and variations may be made thereto in light of the above teachings. It is therefore to be understood that the invention may be practiced otherwise than as specifically described without departing from the scope of the
5 appended claims.

By providing a space maintaining member in advance, wrapping a band around the limb, and detaching the space maintaining member so as for the band to have a predetermined length of looseness, the hemostatic device including the space maintaining member enables pressing force to a puncture site by inflation of a balloon
10 to stop bleeding to be set to a proper degree of force in a simple manner with reproducibility. Thus, the industrial applicability of the present invention is significant.

WHAT IS CLAIMED IS:

1. A hemostatic device comprising:

a flexible band adapted to be wrapped around a limb of a patient at a site on the limb where bleeding is to be stopped;

5 securing means for securing the band in a wrapped state to the limb;

a curved plate, which is made of harder material than the band, and at least a portion of which is curved toward an inner side of the band;

10 a balloon, which is provided in an inner side of the curved plate, and which inflates when a fluid is introduced therein, wherein the balloon is inclined toward one end side of the longitudinal direction of the curved plate being held in the band; and

a space maintaining member for setting pressing force by inflation of the balloon, wherein the space maintaining member is detachably provided to the hemostatic device.

15 2. The hemostatic device according to claim 1, wherein the space maintaining member is a bar.

3. The hemostatic device according to claim 1, wherein the space maintaining member is a clip.

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4. The hemostatic device according to claim 3, wherein the clip comprises means for setting a length of the clip.

25 5. The hemostatic device according to claim 1, wherein the space maintaining member is connected to the band.

6. The hemostatic device according to claim 1, wherein a degree of wrapping the band around the site where bleeding is to be stopped is set by attachment and detachment of the space maintaining member.

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7. The hemostatic device according to claim 1, wherein the state of pressure to the site where bleeding is to be stopped by the inflating balloon is set by attachment and detachment of the space maintaining member.

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8. The hemostatic device according to claim 1, wherein the space maintaining member is provided between the band and the limb.