

A WOUND STAUNCHING MEANS AND A COOLING MEANS
INCLUDING WOOD FIBRE STRUCTURES

This invention is directed to a wood fibre structure means for wound staunching, or for cooling purposes.

5. It is needless to say that treatment by a doctor or other specialist is desirable when the flow of blood from a wound is substantial. A wounded person may succumb to a wound if there is delay in applying proper treatment.

- Serious injuries are frequent in factories and
10. at work sites as well as in traffic accidents. However, in the event of a major disaster such as a severe earthquake it is estimated that many persons will be killed or injured in cities due to collapse of buildings and their fixtures, furniture, glass, walls and the like. Telephone systems
15. for emergency calls and vehicular traffic would be paralysed. Injured people cannot expect to be treated by doctors at places where they are wounded. A main object of the emergency treatment at the time and place of the injury is to reduce loss of blood from a wound. Bandages, anti-
20. septic gauze, adhesive plaster and the like are used to cover wounds, but where there is a high flow of blood flow, these are of little use. A tourniquet or a piece of cloth cut in a triangular form must be used instead to stop the bleeding. However, if a tourniquet is applied
25. by an unskilled person, nerve and/or muscle may be seriously

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damaged. If the flow of blood is blocked by binding an arm, for example, for more than an hour, there may be damage to the periphery, and necrosis may occur. Therefore, where a person is wounded and there

5. is a substantial flow of blood, it is desired that he has an access to a staunching means which can readily be placed on the wound without any danger of inviting any one of the abovedescribed fatal effects.

The invention concerns further a cooling means

10. which can be placed on an injured part of the body of a person when he receives damage such as a sprain or blow for the purpose of suppressing swelling or extravasation before the damage becomes too difficult to be cured or causes aftereffects.

15. Sport is popular nowadays for the purpose of building a strong body, maintaining good health, preventing diseases or for recreation. People, young and old, play to cut down or gain weight, or to relieve mental stress. These amateurs are inferior to the professional

20. sportsmen in their health, strength and skill, so that they must be careful in selecting suitable sports. In addition, they should consult the doctor in advance, and be sure to warm up before playing. However, many people neglect the above and play in such a way that
25. they suffer sprains or blows.

Sports statistics in Japan show that sprains make

up 33.6% and blows 14.6% of all external injuries sustained in sports. On the other hand, grade school and junior high school children make up 21%, senior high school students 31%, and housewives 48%, of

5. all the players. Further, sprains and blows make up 20 to 30% of all injuries in each game.

- Younger people receive injuries because, in spite of the fact they they are still weak in their physique, they do not play games properly. As to those who are
10. in middle and old age, their bodies are injured because they neglect day-to-day excercises as well as warming up and do not play properly..

- Injuries come unexpected and usually there is no doctors and no adequate facilities for treatment.
15. To make it worse, sprains or blows are taken lightly despite being potentially serious injuries if untreated. As a result, it can take a long time to cure such an injury completely, or the damaged part may be deformed and after effects may ensue
20. causing inconveniences in daily life.

- When a part of the human body is sprained or receives a blow, it is a matter of principle in sports medicine to soak said part in iced water or to place an ice bag filled with ice on said part.
25. However, people seldom prepare ice water before playing and ice is not always available where such injury is sustained. Treatment which is carried out after

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the injured part has swollen is not very effective. And thus, a cooling means which can easily be stored or carried and which can be expeditiously applied to the injured part has long been wanted.

5. It is an object of the invention therefore to provide structures in the nature of dressings, which can be used as staunching means for blood flow or as cooling means for a blow, sprain or like injury.

The invention provides a wound staunching means

10. consisting of: a first layer in the form of a body consisting of wood fibres, one surface of said first layer having been treated by wetting, pressing and drying to form a skin; a layer of haemostatic agent placed to overlie said skin; and a second layer in the form of a body consisting of wood fibres placed to overlie the first layer with said skin and said haemostatic agent sandwiched between the two layers.

The invention also provides a cooling means consisting of:- a first layer in the form of a body consisting

20. of wood fibres, one surface of said first layer having been treated by wetting, pressing and drying to form a skin; a layer of freezing mixture (as hereinafter defined) placed to overlie said skin; and a second layer in the form of a body consisting of wood fibres placed to overlie the first layer with said skin and said freezing mixture sandwiched between the two layers.

The invention will be described further, by way of example, with reference to the accompanying drawings, wherein:-

Fig. 1 is a cross-sectional view of a staunch-
5. ing means according to the invention.

Fig. 2 is a view similar to that of Fig. 1, illustrating the coagulation of blood,

Fig. 3 is a cross-sectional view of a cooling means according to the invention,

10. Fig. 4 is a view similar to that of Fig. 3, illustrating how added water is absorbed and retained by the structure of the cooling means, and

Fig. 5 is a graphic diagram illustrating the change of temperature of the cooling means relative
15. to the lapse of time.

It may be useful to explain the features of wood fibres and their effect in stopping the flow of blood before fully describing a preferred embodiment of the invention.

20. Where a body or layer of wood pulp fibre is formed, the body or layer does not exhibit effective capillary action. Thus, liquid (blood in case of the present invention) absorbed by the body is retained only at or near where the body is in
25. contact with said liquid, and liquid is not dispersed or spread out to surrounding dry portions of the body. If the body keeps contact with liquid

further, only one part of the body will be saturated with said liquid.

When blood flows from a wound, as is generally known, fibrinogen in blood plasma turns to insoluble fibrin which tends to confine blood corpuscles, making blood viscous. The blood then turns to a clot which in turn changes to scab or crust which stops the flowing of blood.

Blood consists 55% blood plasma and 45% corpuscles. That which brings about coagulation of blood is fibrin in blood plasma and corpuscles. Serum has nothing to do with coagulation of blood. When a large quantity of blood flows from a wound, the amount of serum increases at a rate larger than the increase of fibrin, and this increase of serum hinders checking of bleeding. In other words, serum obstructs coagulation of blood. With this basic understanding, an embodiment of the invention will now be described, reference being made to the accompanying drawings.

There is shown in Fig. 1 in cross-section a wound staunching means according to the invention, the means comprising a first layer of wood fibres and a second layer of wood fibres which is formed with a skin layer continuous to the remaining

fibres in the interior, with a pulverised haemostatic agent placed in the middle where these two layers join.

In Figure 1, reference numeral 1 denotes a
5. first body or layer of pulp fibres, 2 a skin,
3 a layer of wood pulp fibres having the skin layer
2, 4 pulverised haemostatic agent, 8 an exterior
cover. The first pulp fibre layer 1 and the second
pulp fibre layer 3 having the skin 2 are put
10. together with a haemostatic agent 4 sandwiched
therebetween. An adhesive tape or cloth, not shown,
is placed on the lower cover 8 before the staunching
means is marketed.

Fig. 2 shows in cross-section the following
15. process: blood is locally absorbed, next saturated,
then makes contact with the haemostatic agent
placed in the middle of the staunching means, then
tends to coagulate, and further, serum in blood
permeates into the skin 2 and dispersed in said
20. skin 2, with coagulation synergistically accelera-
ted in the above process to form a clot which
then turns to a scab or crust. In this Fig. 2,
an area 5 enclosed by a dotted line shows the
part that is saturated with blood (the part will
25. be referred to as saturated part hereafter), area
5' a blood clot, and a shaded part 6 a scab, an

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area enclosed by a chain line a part wherein serum has dispersed. In use, the upper cover 8 of Fig. 1 makes contact with a wound.

- Referring again to Fig. 2, when the staunching means of Fig. 1 is applied to a wound, blood flowing through the cover 8 is locally absorbed by the first layer of wood fibres 1. In said layer 1 there will be no permeation or spreading out of blood to the unwetted part of the layer. Thus, if absorption of blood continues, saturated part 5 is formed locally and then blood makes contact with the haemostatic agent 4 located in the middle part of the staunching means. A suitable haemostatic agent to be used in the staunching means shown in Fig. 2 is the Japanese Pharmacopoeia tropine. The saturated part 5 also makes contact with the skin 2. The skin 2 shows positive capillary action since it has been treated as described before (wetting, pressing and drying), so that serum in the blood is spread out to unwetted portion as illustrated by the reference number 7 in Fig. 2. Because of this, the amount of serum which obstructs coagulation of blood decreases in the saturated part 5, which helps acceleration of coagulation and formation of the clot 5'.

The blood clot 5' formed to extend from the layer 1 to the skin 2 is deprived of the remaining serum, and the clot 5' shrinks gradually. Scab 6 is formed at periphery of clot 5', and the flow of blood is stopped when 5. the scab covers the wound.

The staunching means described so far has a simple structure. In use, it is placed on a wounded part, and its sides are fixed by means of adhesive tapes not shown. The flow of blood is halted without using a tourniquet 10. or the like.

An embodiment of cooling means according to the invention is shown in cross-section in Fig. 3 and comprises a first body or layer 11 of wood pulp fibres and a second body or layer of wood pulp fibres 13 having a 15. skin layer 12. Sandwiched between the layers 11 and 13, beneath layer 11 and on top of the skin 12 is a layer 14 of a compound or compounds which, when mixed with water cause a drop in temperature to occur (herein referred to as a "freezing mixture"). The layer 11 is 20. overlaid by a cover 17. The first layer 11 and the second layer 13 having the skin 12 is put together to sandwich the freezing mixture 14 therebetween. An adhesive tape or cloth, not shown, is placed on the cover 17.

Fig. 4 is a cross sectional view of the cooling 25. means of Fig. 3 to illustrate what happens when water is added. Water is added from above the cooling means as seen in Fig. 2. Thereafter,

the following were observed: water is retained by the first layer 11, then the part of said layer 11 retaining water is saturated with water.

(This part will be referred to as the saturated

5. part hereinafter). Water in the saturated part then makes contact with the freezing mixture which acts to exert a cooling effect after dissolution. Water then permeates into the skin spreading out laterally or horizontally as seen in the drawing;
10. making further contacts with freezing mixtures successively and consequently bringing about further cooling action by the dissolved agent. In Fig. 4, reference numeral 15 represents the part where water is added, area 16 enclosed by a chain line
15. a part where water has spread and caused dissolution of the freezing mixture. In use, water is added to the upper cover as seen in the drawings, and this upper cover makes contact with a part to be cooled.
20. Referring again to Fig. 4, water is absorbed by the layer 11 through the cover 17. Said layer 11 shows little capillary action by itself, so that absorbed water is retained locally at or near where it was added without spreading out. When
25. more water is added, this part will be saturated with water. However, the skin 12 of the layer 13

shows positive capillary action due to the treatment given to it, so that water reaching the skin layer spreads out laterally or horizontally.

- With the cooling means of Fig. 4 having an
5. area of 90 to 100 cm², for example, suitable amount of water, for example 20 to 30g, is poured on the cover 17 over the part 15. A part of the layer 11 becomes saturated with water locally. Water then makes contact with the freezing mixture 14
10. placed in the middle of the cooling means, and dissolves the mixture to bring about a cooling action. Water permeates the skin 12 laterally to make further contact with the freezing mixture 14 successively, causing more cooling action to
15. enhance the cooling effect of the cooling means.

The freezing mixture described above is a mixture which exhibits cooling effect when dissolved in water. Such mixture can be handled easily, and it is cheap. In the described embodiment, sodium

20. carbonate (Na₂CO₃) and ammonium chloride (NH₄Cl) were mixed at a rate of 1:1.5. The cooling effect of such mixture is shown in Fig. 5.

- In a graphic representation of Fig. 5, the abscissa shows the passage of time from a point
25. when water is added to the cooling means of the invention, the ordinate the temperature of the part of the cooling means in contact with a part of

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- human skin that was injured. When water was added, the temperature of part 15 of the cooling means was 0°C. When the part 15 is placed on the injured part, the part 15 is warmed by the said part of
5. which temperature would be slightly higher than the vital warmth. As time passes, the temperature of the part 15 goes up as illustrated in Fig. 5, showing 8°C after lapse of 30 minutes, 12.5°C when one hour lapsed. This would show that the injured
10. part is sufficiently cooled for one hour. As an injured person would be treated by a doctor within one hour from the time he was injured under normal circumstances, Fig. 5 shows that an emergency cooling treatment required under the principle of
15. the sports medicine is effectively carried out when the cooling means of the invention is used.

- However, if water in excess of 30g is added, more water permeates and is spread in the skin layer, bringing about more dissolution of the
20. freezing mixture. Although cooling effect is increased, time during which cooling is effective will be shortened accordingly.

- As will be understood from the foregoing, the structure according to the invention becomes
25. a cooling means by simply adding water to it. It can then be placed on the part of the body sprained or hit, and then can be fixed in position by an adhesive tape, not shown. It will then prevent

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- swelling of the body and extravasation. Its structure is simple, and it can be stored and/or carried handily. It can be applied easily. Because of these, the cooling means of the invention is suitable as
5. an emergency aid. In the foregoing, the invention has been described by reference to people playing sports, but the means of the invention can also be used in other cases. Where a patient's head must be cooled at a place where there is no ice,
 10. the means of the invention can be used instead of an ice bag. or, it may be used on the body of a pet or a racehorse.

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CLAIMS

1. A wound staunching means consisting of:-
a first layer in the form of a body consisting of wood fibres, one surface of said first layer
5. having been treated by wetting, pressing and drying to form a skin; a layer of a haemostatic agent placed to overlie said skin; and a second layer in the form of a body consisting of wood fibres placed to overlie the first layer with said skin
10. and said haemostatic agent sandwiched between the two layers.
 2. A wound staunching means substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.
 15. 3. A cooling means consisting of:- a first layer in the form of a body consisting of wood fibres, one surface of said first layer having been treated by wetting, pressing and drying to form a skin; a layer of a freezing mixture (as
20. hereinbefore defined) placed to overlie said skin; and a second layer in the form of a body consisting of wood fibres placed to overlie the first layer with said skin and said freezing mixture sandwiched between the two layers.
 25. 4. A cooling means substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.
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