INTERLOCKED SURGICAL DRAPE AND METHOD

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References Cited
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ABSTRACT

An interlocked drape comprising a sheet of flexible material having a pair of side edges extending longitudinally along the sheet, and a pair of laterally extending end edges connecting the side edges. The sheet has a plurality of longitudinally extending folds reducing the width of the sheet, a first lateral fold of the longitudinally folded sheet generally in the longitudinal mid-region of the sheet, and a lateral accordion fold of the laterally folded sheet, whereby the sheet is interlocked to prevent premature unfolding during manipulation of the drape.

16 Claims, 17 Drawing Figures
INTERLOCKED SURGICAL DRAPE AND METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention
The present invention relates to surgical drapes.

2. Description of the Prior Art
A various assortment of drapes have been used during surgical procedures for many years, and more recently disposable drapes have attained widespread use. Some of these drapes, such as laparotomy drapes, have a relatively large size and bulk. Although most drapes are folded in some manner, it is particularly important that larger drapes be folded into a convenient configuration to facilitate packaging, handling, and subsequent placement of the drape on a patient.

In the past, large drapes have usually been folded in a manner similar to that shown in FIG. 5 of Endres U.S. Pat. No. 3,695,260, and FIGS. 7, 8, and 11 of Keoughan, Jr., et al., U.S. Pat. No. 3,343,534. Such drapes are first longitudinally fan-folded from opposite sides of the drape, and then each of the opposite ends of the longitudinally folded drape are laterally fan-folded into separate stacks of folds, as shown in these patents. Although drapes folded in this manner have a reduced bulk, as is desired, difficulties have been encountered with such drapes in the operating room. If a nurse, or other user, grasps and lifts the drape by one of the laterally stacked fan folds, the other stack of lateral fan folds may unfold and fall toward the floor. Thus, the unfolded portion of the drape may touch a contaminated object, such as the floor, and contaminate the previously sterile drape. In such a case, the contaminated drape should be discarded, and another sterile drape should be used in its place.

Accordingly, the prior art drapes have resulted in waste, and, at the very least, require extreme care by the user to prevent premature unfolding. For example, the nurse must grasp such a drape with both hands to hold both lateral stacks of folds, or grasp and hold both stacks of folds with one hand in the center of the drape. In either case, both procedures require undue caution, and resulting inconvenience, by the operating room personnel.

Other patents disclosing folded drape configurations are Rowland, Jr. et al., U.S. Pat. No. 3,537,446 and Krebs No. 3,667,458.

SUMMARY OF THE INVENTION

The principal feature of the present invention is the provision of a folded surgical drape which permits manipulation and placement of the drape without premature unfolding of a substantial portion of the drape.

The drape of the present invention comprises a sheet of flexible material having a pair of side edges extending longitudinally along the sheet, and a pair of laterally extending end edges connecting the side edges. The sheet has a plurality of longitudinally extending folds reducing the width of the sheet, a first lateral fold of the longitudinally folded sheet generally in the longitudinal mid-region of the sheet, and a lateral accordion fold of the laterally folded sheet.

Thus, a feature of the invention is that the lateral accordion fold of the sheet interlocks the drape to prevent premature unfolding of a substantial portion of the drape during manipulation of the drape.

Another feature of the invention is that in a preferred embodiment of the drape the sheet includes a pair of end sections folded over the top of the sheet, providing convenient flaps for unfolding and placement of the drape on the patient.

Further features will become more fully apparent in the following description of the embodiments of this invention and from the appended claims.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a drape which may be folded into the interlocked drape of the present invention;

FIGS. 2-6 are perspective and end views illustrating longitudinal folding steps of the drape of FIG. 1;

FIG. 7 is a perspective view of a longitudinally folded drape of FIG. 1;

FIGS. 8-10 are perspective views illustrating steps in the lateral folding of the drape of FIG. 7;

FIG. 11 is a perspective view of one embodiment of the interlocked drape of the present invention;

FIG. 12 is a perspective view of the drape of FIG. 11, showing the drape being grasped and lifted by one hand of the user;

FIGS. 13 and 14 are perspective views illustrating a preferred method of folding the interlocked drape of FIG. 11; and

FIGS. 15-17 are perspective views showing alternative embodiments of the interlocked drape of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1, there is shown a surgical drape designated generally 20 comprising sheet 22 of flexible material having a pair of side edges 24a and 24b, a pair of end edges 26a and 26b connecting the side edges 24a and b, a top surface 28 facing away from the patient after placement of the drape, and a lower surface 30 contacting the patient after placement of the drape. The drape 20, which is shown as having a rectangular shape, will normally have longer side edges 24a and b than its end edges 26a and b, and the side edges 24a and b will be extended along the drape, while the end edges 26a and b will be described as extending laterally across the drape. However, it will be understood that this terminology is utilized for convenience in describing the invention, and the terms "longitudinal" and "lateral" will be used irrespective of whether the side edges 24a and b are shorter or longer than the end edges 26a and b. The drape 20 may be either disposable or non-disposable, and the sheet 22 may be made of any suitable material, such as a nonwoven fabric, which is frequently utilized for surgical drapes.

As will be described below, the drape 20 is first folded longitudinally in a normal fashion, and then the longitudinally folded drape is folded laterally to provide the interlocked drape of the present invention. Longitudinal and lateral lines shown on the sheet 22 of FIG. 1 indicate where fold lines are impressed in the sheet when folded in accordance with a preferred embodiment of the invention. The letters a', b', c', d', e', f', and g' designate longitudinal panels defined by the longitudinal fold lines, while the letters a, b, c, d, e, f, and g designate lateral sections in the sheet defined by the lateral fold lines.
For a relatively large drape, such as a laparotomy sheet, the drape may be first longitudinally folded inwardly to reduce the overall width of the drape, such as by a fan or accordion fold in the accustomed fashion, as illustrated in FIGS. 2-6. Panels $a'$ and $g'$ may be folded onto the top surface 28 of the sheet 22, as shown in FIG. 2, providing the drape configuration illustrated in FIG. 3. Next, the folded drape of FIG. 3 is further fan-folded as shown in FIGS. 4 and 5 to result in the configuration of the longitudinally folded drape illustrated in FIGS. 6 and 7. Thus, the longitudinally folded drape has a central panel $d'$ and a folded stack of panels folded over the top of panel $d'$ adjacent each of its sides. One stack of panels contains the panels $a'$, $b'$, and $c'$, while the other stack contains the panels $e'$, $f'$, and $g'$. Although for convenience the drape has been described as having a longitudinal fan fold, it is contemplated that the drape may be longitudinally folded in any suitable manner.

The relationship of the previously mentioned lateral sections $a$, $b$, and $g$ to the longitudinally folded drape is illustrated in FIG. 7. After the drape has been laterally folded according to a preferred embodiment of the present invention, as described below, the lateral fold lines define a plurality of contiguous intermediate sections $b$, $c$, $d$, $e$, $f$, and $g$ of approximately equal length, and a pair of end sections $a$ and $g$ extending from opposite ends of the contiguous sections. The end sections $a$ and $g$ preferably having a length approximately equal to one-half the length of the contiguous sections $b, . . . , f$.

As illustrated in FIG. 8, the longitudinally folded drape may first be laterally folded along a line between sections $d$ and $e$, positioning section $e$ on top of section $d$, and may then be reverse folded along a line between sections $e$ and $f$, locating section $f$ on top of section $e$. Next, as shown in FIG. 9, the drape is folded along a line between sections $c$ and $d$ to position section $c$ on top of section $d$, and then the drape is reversed folded along a line between sections $b$ and $c$ to position section $b$ on top of section $c$. Finally, the end sections $a$ and $g$ are folded over the top of the intermediate section $b$, as shown in FIG. 10, to provide the interlocked drape shown in FIG. 11.

The interlocked drape of FIG. 11 has a central section $d$, and two end portions extending from opposite ends of section $d$, with one end portion including sections $a$, $b$, and $c$, and the other end portion containing sections $e$, $f$, and $g$. Both end portions are fan-folded and interleave to interlock the drape, as shown. Thus, when the drape is grasped and lifted by one hand, as shown in FIG. 12, pressure exerted by the hand on the interleaved intermediate sections retain the sections in their folded configuration, and, at the most, only one of the relatively small end sections may be free to unfold. Accordingly, the folded interlocked drape of the present invention may be handled with confidence and ease without the possibility that a substantial portion of the drape may be prematurely unfolded.

As may be seen from FIGS. 7-11, the drape of the preferred embodiment has an odd number of intermediate contiguous sections which may be calculated in number by the formula $(2i+1)$, where $i=1, 2, 3, . . . , n$. The longitudinal center of the drape is located at approximately the center of the most-central intermediate section, such that the fold lines between the most-central section and the adjoining sections are offset from the longitudinal center of the drape by a distance approximately equal to one-half of the length of the intermediate sections.

A simplified manner of folding the longitudinally folded drape of FIG. 7 into the interlocked drape of FIG. 11 is illustrated in FIGS. 13 and 14. As shown in FIG. 13, the drape of FIG. 7 has a first lateral fold 32 between sections $d$ and $e$, such that the end edge 26b is positioned adjacent the longitudinal center of the end-most contiguous section $b$. As previously noted, the first lateral fold 32 is offset from the longitudinal center line of the drape by a distance approximately equal to one-half the length of the intermediate sections. Next, the laterally folded drape of FIG. 13 is fan or accordion folded as illustrated in FIG. 14 to provide the interlocked drape shown in FIG. 11.

The end sections $a$ and $g$ of the interlocked drape of FIG. 11 provide convenient grasping flaps for unfolding the drape during placement of the drape on a patient. Thus, the end sections $a$ and $g$ are first unfolded and then pulled in opposite directions to laterally unfold the drape. A similar embodiment of the drape is illustrated in FIG. 15, in which one of the end sections $g$ has been omitted, such that the end edge 126b of the drape is located at the end of contiguous section $f$. The drape of this embodiment may be laterally unfolded by grasping and pulling the end section $a$ and the contiguous section $f$ adjacent the end edge 126b.

Another embodiment of the drape of the present invention is illustrated in FIG. 16, in which the drape 220 has $(2i+3)$ contiguous sections of approximately equal length, where $i=1, 2, 3, . . . , n$. In this embodiment, the first fold 232 is also offset from the longitudinal center of the drape by a distance approximately equal to one-half the length of a contiguous section. The two end-most contiguous sections adjacent end edge 126b are overlapped along a fold line 234, while the end-most section adjacent the opposite end of the drape is positioned under these two sections with the end edge 226a terminating adjacent the fold line 234. The drape 220 may be unfolded for placement by grasping and pulling the section adjacent end edge 226a sufficiently to expose the section adjacent the end edge 226a, after which the section adjacent 226a may be grasped and pulled in the opposite direction.

Another embodiment of the drape of the present invention is illustrated in FIG. 17, in which the accordion folded sheet defines $(2i+2)$ contiguous sections of approximately equal length, where $i=1, 2, 3, . . . , n$. The first lateral fold 332 of the drape 320 is positioned adjacent the longitudinal center of the sheet 322, such that the two opposite end-most contiguous sections are co-extensive, with one of these sections underlying the other. The drape 320 is unfolded for placement by grasping the two opposite end-most sections adjacent end edges 326a and $b$, and by pulling these sections in opposite directions.

It will be apparent that all the embodiments of the drape of the present invention may be folded in the simplified manner described in connection with FIGS. 13 and 14. Thus, a longitudinally folded drape is folded along a first lateral fold line generally in the mid-region of the drape, and the laterally folded drape is then fan or accordion folded to interlock the drape together.

The foregoing detailed description is given for clearness of understanding only, and no unnecessary limita-
tions should be understood therefrom, as modifications will be obvious to those skilled in the art.

We claim:

1. A method of folding a surgical drape comprising the steps of:
   folding the drape longitudinally to reduce the width of the drape;
   folding the longitudinally folded drape along a first lateral fold line generally in the mid-region of the drape to define a pair of contiguous end portions extending from the first fold line having free ends; and
   fan folding both contiguous end portions together a sufficient number of times to interleave both of the end portions, interlock the drape, and prevent premature unfolding of a substantial portion of the drape during manipulation of the drape.

2. An interlocked surgical drape comprising, a sheet of flexible material including a pair of side edges extending longitudinally along the sheet, a pair of laterally extending end edges connecting said side edges, a plurality of longitudinally extending folds reducing the width of said sheet, a first lateral fold of the longitudinally folded sheet generally in the longitudinal mid-region of the sheet, said first fold defining a pair of contiguous end portions extending from the first fold and having free ends, and a lateral accordion fold extending through both of the contiguous end portions to interleave said end portions with ends of the end portions being exposed at an outer surface of the laterally folded sheet, whereby said sheet is interlocked to prevent premature unfolding of a substantial portion of the drape during manipulation of the drape and the sheet may be readily unfolded during placement by grasping the ends of the end portions.

3. The drape of claim 2 wherein said sheet has a rectangular shape, and said longitudinal folds comprises a fan fold of said sheet generally parallel to said side edges.

4. The drape of claim 2 wherein the accordion folded sheet defines a plurality of contiguous sections of approximately equal length, and at least one end section extending from said contiguous sections.

5. The drape of claim 4 wherein said drape has a pair of end sections, extending from opposite ends of said contiguous sections.

6. The drape of claim 5 wherein said end sections are folded over the top of said contiguous sections, providing flaps for unfolding the drape.

7. The drape of claim 5 wherein said end sections have a length approximately equal to one-half the length of said contiguous sections.

8. The drape of claim 4 wherein said first lateral fold is offset from the longitudinal center of the sheet by a distance approximately equal to one-half the length of a contiguous section.

9. The drape of claim 4 wherein said accordion folded sheet defines (2*i+1) contiguous sections, where

i=1,2,3, ..., n.

10. The drape of claim 9 wherein said first lateral fold is located at a longitudinal end of the most central contiguous section.

11. The drape of claim 9 wherein an end edge of the longitudinally folded sheet is positioned adjacent the longitudinal center of an end-most contiguous section after said first lateral fold.

12. The drape of claim 2 wherein the accordion folded sheet defines a plurality of contiguous sections of approximately equal length, and said first lateral fold is positioned adjacent the longitudinal center of said sheet.

13. The drape of claim 12 wherein said accordion folded sheet has (2*i+2) contiguous sections, where

i=1,2,3, ..., n.

14. The drape of claim 2 wherein the accordion folded sheet defines (2*i+3) contiguous sections of approximately equal length, where i=1,2,3, ..., n, with the first lateral fold being offset from the longitudinal center of the sheet by a distance approximately equal to one-half the length of a section.

15. An interlocked surgical drape comprising, a sheet of flexible material including, a pair of side edges, a pair of end edges connecting said side edges, a plurality of longitudinally extending folds reducing the width of the sheet, a first lateral fold of the longitudinally folded sheet, said first fold defining a pair of end portions extending from the first fold, and a lateral accordion fold of the laterally folded end portions, with the accordion fold defining a plurality of interleaved intermediate contiguous sections of approximately equal length, and defining a pair of end sections extending from opposite ends of and folded over the top of all of said intermediate sections, with the length of said end sections being approximately equal to one-half the length of the intermediate sections, and with the first lateral fold being offset from the longitudinal center of the sheet a distance approximately equal to one-half the length of the intermediate sections, whereby said sheet is interlocked and interlocked to prevent premature unfolding of a substantial portion of the drape during manipulation of the drape.

16. An interlocked surgical drape comprising, a sheet of flexible material including, a pair of side edges extending longitudinally along the sheet, a pair of laterally extending end edges connecting said side edges, a plurality of longitudinally extending folds reducing the width of said sheet, a central section of the longitudinally folded sheet and a pair of end portions extending from opposite ends of said central section and having free ends, both of said end portions being fan-folded a sufficient number of times to interleave both end portions with each other and interlock the drape, preventing premature unfolding of a substantial portion of the drape during placement of the drape.

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