ABSTRACT

A device and technique are disclosed for enabling a tracheotomy to be performed by those lacking medical training or skills, and under emergency conditions. An indexing frame with chinrest is secured to the patient's neck, and rotation of a knob on the frame causes three hollow air tubes to penetrate the windpipe. The frame is thereafter removed, leaving the tubes in place for attachment of oxygen hoses.

11 Claims, 6 Drawing Figures
TRACHEOTOMY METHOD AND MEANS

BACKGROUND OF THE INVENTION

Due to the physiological interrelationship of the upper respirators and gastro-nomic systems in humans, it is normal for breathing to be momentarily interrupted by the action of swallowing food. Based upon this interrelationship, many cases of choking have been known to result when abnormal effects from eating suddenly develop, such as food lodging in the throat. The human trachea functions as the primary airway for communicating both incoming and exhaled breath between the lungs and the outside atmosphere. When a person's airway becomes obstructed so that he cannot breathe, it is necessary to clear the airway or otherwise re-establish a path for inhalation and exhalation within a very brief period. Such emergencies are known, by emergency rescue squads and city fire department workers, to occur many times a year wherein death results in a matter of minutes.

One remedy for obstructed breathing in the foregoing type of situation is removal of the blockage. However, where this is not possible, an alternative remedy is formation of an artificial airway or breathing passage around the obstruction. This procedure, known as a tracheotomy, is a surgical operation requiring the professional skills of a surgeon. Surgical operations are normally done in the environs of a hospital where medical skills, equipment, and trained personnel are available. Such operations entail careful preliminary studies, preparation, and closely controlled conditions of lighting, cleanliness, proper implements, and thoroughly disciplined teamwork.

All of the foregoing necessities associated with normal surgical practice are lacking in most situations involving sudden, severe and unexpected choking such as in an average home or restaurant. When a bolus of food lodges in the trachea, haste is absolutely essential if the victim is to survive. If obstruction is complete, only about five minutes are available for re-establishment of breathing. In most cases, of course, the human body is able to self-correct the minor abnormalities, and the diner merely coughs up the obstructing bolus. Occasionally, however, the bolus is firmly lodged and the person is unable to disgorge it. Although this severe case can happen to any person of any age, its occurrence is more likely in the case of the elderly or in one whose reflexes are diminished by alcohol or drugs.

Where the foregoing crisis occurs, there is no time to transport the victim to a hospital or to obtain professional medical help. The chances of an experienced surgeon happening upon the scene are virtually nonexistent, and even if one is present, the handicaps presented by lack of suitable instruments remain.

SUMMARY OF THE INVENTION

The invention consists of a device 10 seen in FIG. 1 which is adapted to fit the neck of any person and to enable any other person to perform a tracheotomy without any previous medical training or skills. The device consists essentially of frame 12 supported under the patient's chin by support 24, and containing movable plate 52 in which hollow cutting pins 56, 58 and 60 are secured. With frame 12 properly placed over the patient's neck, rotation of knob 48 causes translational movement of plate 52 whereby pins 56, 58 and 60 puncture the neck and penetrate the trachea. Thereafter, plate 52 is manually held in place while frame 12 and the other elements supported thereon are removed, permitting attachment of oxygen lines to the stated hollow pins.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a front elevational view of the novel device, FIG. 2 is a side elevational view of the structure from FIG. 1.

FIG. 3 is a fragmentary view, partly in cross section, taken generally along line 3—3 in FIG. 1.

FIG. 4 is an isolated view, partly in cross section, taken generally along line 4—4 of FIG. 1.

FIG. 5 is an isolated fragmentary view of a detail from the structure shown in FIG. 3, and FIG. 6 is a view corresponding to FIG. 5 and essentially of the same structural detail shown therein.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, the novel device is generally designated by reference numeral 10 and may be seen to include a hollow box-like chassis or frame 12 of generally rectangular shape having side portions 14 and 16, between which top portion 18 and lower portion 20 both extend laterally. Integraly formed with or otherwise secured to lower portion 20 of frame 12 is a rounded projection 22 which may be of bulbous form or is otherwise adapted to fit within the sternum notch at the forward base of the human neck between the collar bones (not shown) and below the Adam's apple. Projection 22 comprises a reference means for proper location of device 10 on a human patient so that the later incisions will be correctly placed.

Mounted on frame 12 and vertically movable relative thereto is another reference means in the form of chin support 24 having curved or cup-shaped bracket 25 adapted to fit under the wearer's chin. Due to dimensional differences between people with particular regard to variations in sizes or lengths of necks, adjustable connection means are provided between bracket 24 and projection 22 for accommodating such variations. The stated means illustratively include a pair of hollow tubes 26 and 28 integrally formed with or otherwise affixed on frame 12 at top portion 18 thereof. Tubes 26 and 28 are sized and positioned so as to receive in telescoping relationship therewith a corresponding number of rods or shafts 30 and 32 affixed on support 24 and extending downwardly therefrom. Shafts 30 and 32 are slidably movable within tubes 26 and 28, respectively, and are releasable secured in any desired position of adjustment by holding screws 34 and 36 which are threadable secured in lateral extending holes formed in each of tubes 26 and 28, respectively, as shown in FIG. 1, for example. Knurled knobs 38 and 40 are provided on the mentioned holding screws to permit their manual rotation when securing support 24 in a desired position of adjustment relative to frame 12 or when releasing the same from such position.

Substantially equidistant between upper and lower portions 18 and 20 of frame 12, a lateral support member or rib 42 extends between side portions 14 and 16 as shown in FIG. 1. Midway between these side portions a cylindrical collar or bushing 44 is formed in member 42 and adapted to receive and support a rotat-
3,791,386

3 able shaft 46 concentrically through the bushing. Shaft 46 is provided at one end thereof with a knurled knob 48 to permit its rotation by application of manual force to the knob. At its other end opposite from knob 48, shaft 46 is provided with a small projecting stem 50 of less diameter than the shaft. A plate or rigid sheet 52 is affixed to shaft 46 in a manner which will permit separation of these two items upon application of relatively slight force in a direction tending to pull the same apart. Illustratively, stem 50 may have a small dent or annular groove formed at the distal end of the stem adapted to make an interference fit with a hole formed near the center of plate 52, as suggested by item 54 in FIG. 4, for example.

Affixed firmly on plate 52 are a number of hollow tubular pins or air passage elements which may comprise more than one but not less, and in the illustrative case of FIGS. 1 through 3 are suggested by three pins 56, 58 and 60. Each of these items is essentially the same in form and function, hence only one need be described in detail. Referring to FIG. 5, it may be seen that tube 56 has a radially extending flange 62 formed thereon adapted to seat against a surface of plate 52. Concentrically within tube 56 and in firmly fitting relationship therewith is an elongate stopper or plug 64 adapted to completely fill the tube and block all passage there-through. Plug 64 may illustratively be made from a moldable semi-rigid plastic material or the like. A flange 66 integrally formed at one end of elongate plug 64 bears against flange 62 on tube 56. Both the tube and the plug are diagonally cut at a uniform angle relative to the longitudinal axis thereof to produce a planar surface 68 oriented to result in a sharp cutting edge 70 along one side of the distal end of tube 56 as seen in FIG. 5. Each of the remaining tubes 58 and 60 have similar plugs positioned therewith which function in the same manner to be described for plug 64.

Shaft 46 is operative related to plate 52 and to frame 12 whereby rotation of the shaft by manual force applied to knob 48 results in translational movement of plate 52, together with elements attached thereto, from the initial position shown in FIG. 2 toward the right to the final position shown in FIG. 3. The mentioned linear or translational movement of plate 52 is achieved by a spiral groove 72 formed on the cylindrical surface of shaft 46 and operatively engaged by a projecting pin 74 secured within bushing 44 and extending radially inwardly toward the center longitudinal axis of rotation of the shaft as shown by FIGS. 2 and 4. Since pin 74 is stationary, rotation of shaft 46 results in application of force by pin 74 against the sidewalls of groove 72 in a manner which cam's the shaft toward the right in FIG. 2. To prevent rotational displacement of plate 52 during rotation of shaft 46 to which the plate is secured at stem 50, a downwardly depending flange 76 is integrally formed or otherwise affixed to upper portion 18 of frame 12 and engages a groove 78 in the upper edge of plate 52 as seen particularly from FIG. 1. The foregoing interrelationship between items 76 and 78 guides and maintains plate 52 on a straight path as it traverses the distance between the two limits of its lateral movement represented by the views shown in FIGS. 2 and 3.

**OPERATION**

In operation, device 10 is initially placed on the patient after it is determined that restoration of breathing by normal means is not possible, and emergency measures are absolutely essential to save the patient's life. The proper placement is achieved by positioning projection 22 within the patient's sternum notch, and sliding upper support 24 into position with bracket 25 under the patient's chin, thus assuring that the head is not bent over the chest in a manner which would further obstruct breathing. When the desired position of adjustment between frame 12 and support 24 is achieved, knobs 38 and 40 are rotated so that screws 34 and 36 bear tightly against shafts 30 and 32, respectively, to hold the device in the stated position.

Thereafter, knob 48 is quickly rotated manually one-half a revolution so that pin 74, which is initially at one extreme end of groove 72 as seen in FIG. 2, is positioned at the other extreme end of the groove as seen in FIG. 3. The stated rotation of knob 48 and shaft 46 to which the knob is secured results in translational movement of plate 52 by application of force to the plate through stem 50. Plate 52 moves an amount sufficient for hollow pins 56, 58 and 60 to reach and to penetrate the patient's trachea. Thereafter, slight pressure is applied to plate 52 to hold the same in position against the patient's neck, and force is simultaneously applied to pull frame 12, with the remaining elements mounted thereon, away from plate 52 and from the patient. Immediately thereafter, stoppers within each of the pins 56, 58 and 60 corresponding with stopper 64 seen in FIG. 5, are removed to permit entrance of air into the trachea through the hollow pins. Also, when an external oxygen source is available, a hose connection from such source may be made with one or more of the pins 56, 58 or 60 such as suggested by hose connection 80 seen in FIG. 6. It will be understood that plugs 64 functions not only to maintain the inside of pins 56, 58, and 60 in a sterile condition when the device 10 is not in use, but also to prevent a particle of flesh or tissue from being severed when cylindrical pins such as 56 initially pierce the skin. Planar surface 68 and edge 70 seen in FIG. 5 result in a single elongate, usually slightly curved, incision from which no loose particles may normally be expected to result, such as wood tend to block the air passages within the pins or further complicate breathing by aggravating the trachea or the lungs of the patient.

1. In a device for performing a tracheotomy: frame means for placement on the outside of a patient's neck, hollow air passage means for penetrating into said patient's trachea to form a passage for breath into and out of said patient's lungs, translational support means for mounting said hollow air passage means in said frame means, manual force transmitting means connected to said translational support means for moving said translational support means and said hollow air passage means translationally relative to said frame means; and reference means on the frame for engaging a patient's sternum notch for correctly positioning said frame means so that said translational movement moves said air passage means toward a penetration site communicating with the said patient's trachea.

2. The structure set forth in claim 1 above wherein the reference means on said frame means further com-
prises adjustable means for engaging a patient’s chin for correctly positioning said frame means so that said translational movement moves said air passage means toward a penetration situs communicating with the said patient’s trachea.

3. The structure set forth in claim 1 above, wherein: said hollow air passage means comprises at least one elongate pin with a diagonal blade edge formed on the distal end thereof which enters said patient’s neck.

4. The structure set forth in claim 3 above, wherein: said translational support means comprises a rigid plate in which said elongate pin is affixed.

5. In a device for performing a tracheotomy: frame means for placement on the outside of a patient’s neck; hollow air passage means for penetrating into said patient’s trachea to form a passage for breath into and out of said patient’s lungs, comprising at least one elongate pin with a diagonal blade edge formed on the distal end thereof which enters said patient’s neck; translational support means for mounting said hollow air passage means in said frame means, said translational support means comprising a rigid plate in which said elongate pin is affixed;

manual force transmitting means connected to said translational support means for moving said translational support means and said hollow air passage means translationally relative to said frame means, said manual force transmitting means including: a rotatable cylindrical shaft connected to said plate at one end of said shaft, and a spiral groove formed in the cylindrical surface of said shaft; and a stationary pin mounted in said frame means for engagement within said spiral groove so that rotation of said shaft causes reaction force applied by said pin to move said shaft translationally during said rotation.

6. A surgical device for performing a tracheotomy, including: a chassis; a chin support on said chassis adapted to receive a patient’s chin; a projection on said chassis adapted to engage the sternum notch of said patient; air conduit means including at least one tubular element adapted to extend into said patient’s trachea, and force transmitting means connected between said air conduit means and said chassis for translationally moving said conduit means along their length relative to said chassis from a position retracted relative to the chassis to a position extended from the chassis coinciding with penetration into said patient’s trachea.

7. An apparatus for performing a tracheotomy comprising: an indexing frame; a chin rest at one end of the frame; a tubular piercing member having a sharpened tip; means for temporarily connecting the piercing member to the indexing frame for translation in a direction transverse to the chin rest; and means on the frame for pressing the piercing member in the direction of its sharpened tip.

8. An apparatus as defined in claim 7 further comprising means for adjusting the relative spacing between the indexing frame and the chin rest.

9. An apparatus as defined in claim 7 further comprising means for engaging the sternum notch of the patient mounted on the opposite end of the indexing frame from the chin rest.

10. An apparatus as defined in claim 9 further comprising at least one additional tubular piercing member having a sharpened tip, at least one of the tubular piercing members being displaced laterally from a line between the center of the chin rest and the center of the means for engaging the sternum notch.

11. An apparatus as defined in claim 7 wherein the means for temporarily connecting comprises a plate temporarily connectable to the means for pressing; and further comprising at least one additional tubular piercing member having a sharpened tip mounted on the plate, at least one of the piercing members being located laterally of the center line of the apparatus.

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