One Solution to the Problem of the Prone Position for Surgical Procedures

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A device is described for facilitating the prone positioning of obese and poor-risk patients on the operating table.

SURGEONS and anesthesiologists have the obligation to protect the unconscious patient from injury in every way possible. One potential source of trauma in the operating room is the prone position on the operating table.

The "average" patient can be placed in a wide variety of positions[1,2] to assure ease of ventilation, avoidance of pressure injuries, and prevention of obstruction to venous return from the lower extremities. However, many surgical patients are not "average." Such conditions as obesity, low blood volume, impaired respiratory function, old injuries to neck and shoulders, and other pathologic states call for more than just the sandbags, cloth rolls, or rubber pads, employed for so long that their use requires no planning or thought.

It may be necessary to support 300 or more pounds as much as 12 inches off the operating table simply to free the abdomen for adequate ventilation. Without planning, the supporting structures may obstruct venous return via the femoral veins and/or the inferior vena cava, and force the return into the vertebral venous plexus, to complicate the operation and produce severe blood loss. Unless the elevation of the chest wall is equal to that of the pelvis, the patient's neck will be forced into extension, and when the head is turned to one side, the cervical ligaments will be dangerously stretched, leaving the patient with a painful neck.

The device illustrated (figs. 1A-D and 2) provides unrestricted ventilation and adequate venous return. It is easy to prepare, efficient, and inexpensive, costing less than $50 to build. It can be stored in a 20 x 12 x 8-inch box and can be assembled for use and installed in 5 minutes.

DESCRIPTION OF DEVICE

Two padded supports are set in a perforated bar which has been locked by set screws onto the "kidney rest" of a standard operating table. The kidney rest is then elevated by its crank mechanism to the height required to leave the patient's abdomen completely free of any pressure against the operating table.

When the patient is turned into the prone position, he is so oriented on the long axis of the table that his iliac crests overlie the kidney rest to which the perforated bar has been locked. The supports are set into the perforated bar so as to be under the superior edge of the iliac bones. In placing the patient on the supports, it is necessary to lift the pelvis enough to fit into the curved, padded face of the support in such a fashion that lateral pressure roughly approximates downward pressure. When the supports are properly applied, the iliac crest is in the center of the supporting curve.

After the supports are in position, the kidney rest is elevated, by cranking, as

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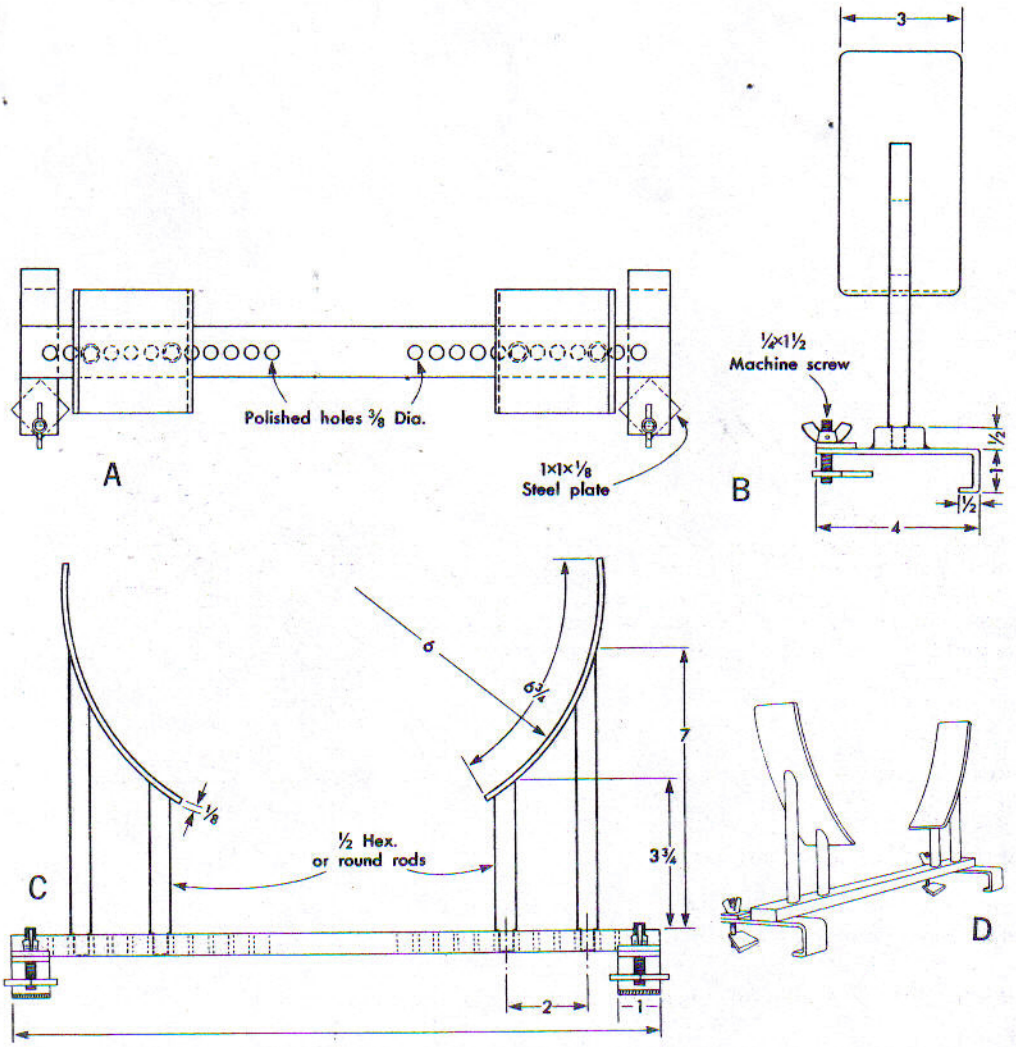

FIG. 1. A. The basis of the device is a perforated steel bar, 16 x 1¼ x ½ inch, which is clamped to the kidney rest bar. The bar has a row of perfectly drilled polished holes ⅜ inch in diameter and ½ inch center to center. B. The clamping device to hold the base bar onto the kidney rest is of ⅛-inch iron, is welded to each end of the base bar, and is adjustable to expedite placement and to accommodate differences in kidney rest sizes from one table to another. The threaded hole in the 1 x 1-inch piece of ⅛-inch iron is in one corner of the piece; this eccentric "nut" makes placement easy. C. The understructure of the supports are of ½-inch hexagonal or round steel rod. The lower ½ inch of each rod has been turned down to just under ⅜-inch diameter, to fit easily into the holes in the perforated bar. The weight of the support rests on the shoulder left by the turning. The rods for each support are 7 inches and 3¾ inches long. Two of these rods are set in two holes of the perforated bar so that they are 2 inches apart at the base (3 vacant holes between them), and the back of the support is welded to them in the midline of the support's curvature. The support face is of ⅛-inch iron. It is a curved surface 3 inches wide and 6¾ inches of the circumference of a circle with a 6-inch radius. It is so oriented that it curves forward 3 inches at the bottom in 5½ inches of fall from the top, forming the curved hypotenuse of a right triangle with 5½ and 3-inch sides. The lower edge of the support face just covers the top of the short rod. For very obese patients, supports with longer legs can be kept in reserve. D. The completed metal support without padding. The padding is 1½-inch sponge rubber, taped snugly, and with some compression to the support face. Over that is a pliable steer-hide cover about 1/16-inch thick, with grommets in the lateral edges for lacing to the metal form with leather boot laces. The upper end of the leather is folded over the support face and is included in the leather lacing, to prevent slippage of the padding on the curved support face. An additional 1½ inches of plastic sponge is taped to the steer-hide cover and is replaced after use.

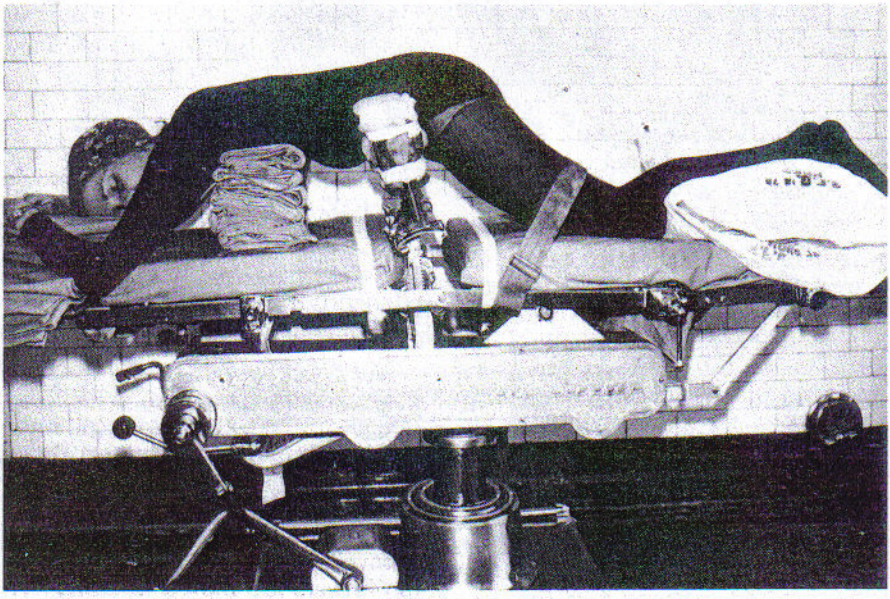

FIG. 2. Support in use. Note perfectly flat lumbar back.

much as is necessary to raise the abdominal wall off the table, and a pile of folded sheets as high as the pelvis elevation is placed under the chest between the xiphoid and the clavicles. This pattern of support frees the abdomen completely of all pressure against the table and lets the neck flex so that the head may be turned to either side of the normal turning point of the neck (fig. 2).

The supports, properly applied, do not interfere with venous return via the femoral veins or inferior vena cava. The following steps insure that there is no restriction to venous flow:

Step 1: The standard operating-table pads are separated, leaving the kidney-rest bar exposed. Each table pad, covered with a sheet, is taped firmly to the table edge; if the pad overlies the kidney rest when it is raised, the pressure on the abdomen blocks blood flow via the inferior vena cava.

Step 2: To prevent pressure on the femoral veins and inferior vena cava, the supports are so applied as not to be too close together.

Step 3: The venous pressure in a foot vein *can* be measured to determine whether there is obstruction by the support; if the venous pressure is found to be elevated, the patient must be repositioned to prevent blockage of venous return.

Step 4: The femoral artery is palpated after the patient is positioned to verify that arterial flow is not obstructed.

Step 5: To prevent injury to the lateral femoral cutaneous nerve, the iliac crest is positioned at the center of the support.

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Step 6: To prevent skin-metal contact during electrocautery, dry towels are placed between the patient and the metal kidney rest.

Step 7: To protect the genitalia of male patients from being caught between the table edge and kidney rest when the latter is lowered, a strap or other support is applied.

If the patient is positioned properly, the lumbar area of his back is nearly a flat plane. To flatten the lumbar curve completely, the table is flexed; the weight of the lowered legs raises the lumbar spine, using the support as a fulcrum. A body strap across the back of the thighs holds the patient on the supports and prevents caudad movement.

After the patient is in the proper position, and before body straps are applied, each side of the pelvis is lifted in turn, and the loose skin is pushed downward. If this step is not taken, the skin may be wrinkled, and the combination of wrinkle and pressure can produce a small area of skin necrosis.

For intraoperative x-rays of the lumbar spine, a 6-inch wide cassette holder is placed between the patient and the kidney rest bar just for the period of the x-ray exposure. For lateral x-rays, the pelvic supports must be of some nonmetallic material.

CLINICAL APPLICATIONS

The device described has been used in 106 surgical procedures, including lumbar laminectomy, bilateral posterior adrenal exploration, repair of heel tendons, skin grafts for decubitus, and stripping of posterior varicose veins. The position has been satisfactory in all cases for exposure, minimal bleeding, and adequate ventilation. Compliance was unchanged from that during supine positioning. Safety for the patient has been entirely adequate except for five occasions. In two cases, small areas of skin necrosis developed over the iliac crest pressure point. In three instances, the patients developed transient meralgia paraesthetica. One of these developed on the 3rd postoperative day.

These few minor injuries have resulted while learning how to use the hoists most efficiently. There were, however, no injuries to shoulders, arms, toes, breasts, or neck.

The positioning of the patient on the hoists is only part of the procedure. In addition, to protect the toes, a pillow is placed under the ankles. To protect the arms and shoulders, the arms are swung down beside the table and upward until they are parallel to the head and the hands and forearms are "above" the head. In positioning women, the breasts are moved laterally. The flexed neck and turned head requires that support be provided under the side of the head to some extent. Pressure on the eyes is carefully avoided.

Neurosurgeons who have performed lumbar laminectomies state that the hoists and careful positioning prevent distended back veins and offer the dryest possible field and easiest operating situation.

Patients with an unstable low back are lifted straight up from both sides and lowered onto the hoists, not put on the hoists by rolling from side to side.

REFERENCES

1. Smith RH, Gramling ZW, Volpitto PP: Problems related to the prone position for surgical operation. Anesthesiology 22:189-193, 1961

2. Smith RH: Hoist for the Georgia prone position. Anesthesiology 25:87-89, 1964

When you see a good man, think of emulating him; when you see a bad man, examine your own heart.

—*Confucius*