Prone Position

Richard Davis, Gregory Sund

Introduction:

In the prone position, the patient is most vulnerable to injury. Great care must be taken by both the anesthesia team and the surgical team to position the patient safely and to make sure the patient remains in position. As with all patient positions, the patient can shift under the drapes as the surgery progresses, into a position that causes harm, while the team remains unaware.

Injury to the eyes including blindness is a feared complication of this position. Pressure on one or both of the globes is one possible cause. Elevated pressure in the ophthalmic vessels is another; it is wise to keep the head elevated and to avoid having the upper body below the level of the heart for a long time. Avoiding hypotension and anemia may also decrease the risk.

Loss of the airway is extremely difficult to address when the patient is face-down and an operation is underway. The best way to prevent this problem is to make sure the tube is very secure and that it is not dislodged during surgery.

Nerve injury from positioning must be avoided. Pay special attention to the ulnar nerve at the elbow and the peroneal nerve passing over the fibular head. The brachial plexus is also worth special attention: make sure the neck, shoulders and upper arms are in a position that looks comfortable and natural. Patients in prone position can be placed with their arms either at their sides or with shoulders abducted and forearms "overhead." In either case, this area can shift during surgery and apply pressure, leading to a palsy of the brachial plexus.

Pressure from being in one position for a prolonged time can cause injury as well. The toes, knees, genitalia, breasts, and especially the face can be affected. The best way to avoid this kind of injury is to methodically examine all these areas once the patient is in position and make sure there is no excessive pressure or awkward positioning.

Putting a patient in prone position proceeds in the following steps:

- Prepare the equipment: padding for the face and body.
- Induce anesthesia in a separate location (trolley / gurney next to the operating table.)
- Roll the patient into the prone position on the operating table.
- Assure proper positioning of all the devices under the patient and verify that ventilation is adequate.
- Perform a final examination of all sensitive pressure areas.

Steps:

1. Padding for the face and body are prepared. For the face, use either a specially cut foam piece, or a piece of cloth shaped into a ring, large enough to support the patient's face without pressing on the eyes, nose, and lips. For the body, use large rolled sheets or foam pads that will support the chest, the pelvis, and the legs.

A cut piece of foam such as this one is preferred. The upper, transverse cutout avoids any pressure on the eyes. The lower, vertical part of the cutout avoids pressure on the nose or mouth. The slit to either side of the mouth portion allows an endotracheal tube to pass freely. If such a foam device is not available, a "ring" of rolled up cloth can be fashioned to apply pressure to only the outside of the face.

Prone Position

Richard Davis, Gregory Sund

An "armored" endotracheal tube is preferred: This tube has embedded metal rings and is more resistant to kinking or obstruction.

Rolls are placed on the operating table in the area where the patient's chest, hips, and lower legs will go. The foam device for the face is at the top of the table, covered in plastic and a sheet.

2. After induction of anesthesia, the tube is secured very well and the eyelids are taped shut.

The endotracheal tube is taped both above and below the mouth.

3. A team composed of enough people to safely log-roll the patient is assembled. One person must clearly be in charge, usually the anesthetist, who will control the airway as the patient is moved.

The patient on the trolley, next to the prepared operating room table. Be sure you have enough help to safely lift the patient. If the trolley's wheels don't lock, be sure that the staff leans against it, to prevent the patient from sliding into the space between the two beds.

Prone Position

Richard Davis, Gregory Sund

Prior to rotating the patient, the anesthetist places the foam device over the face and then holds it in place as the patient is rotated into position. It is also acceptable to have the foam device in place and carefully guide the patient's face into it as they are rotated, as shown in other photos here.

4. The patient is carefully turned, with the team making sure all parts move simultaneously, into prone position. The arms are at the patient's sides. Make sure the shoulder does not flex and the fingers are not bent during the move.

With the anesthetist controlling the head and commanding the team, the patient is rotated with everyone supporting part of the body to make sure it all moves together.

As the patient continues to be rotated, the team on the operating table side (left in this photo) receive and gently guide the patient into the face-down position.

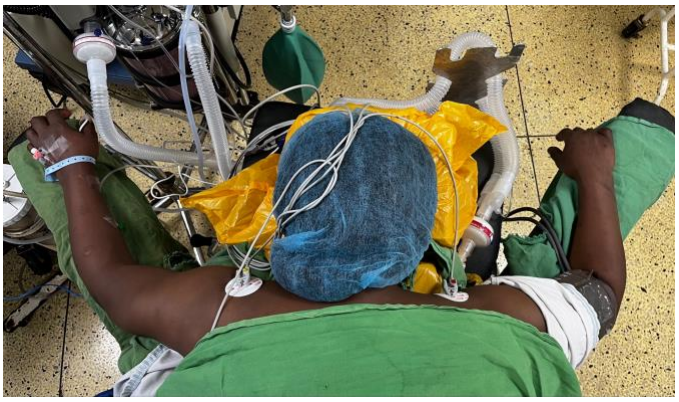
The patient reaches the prone position.

5. Once the patient is face-down, move the arms into position either at the patient's side or above the head. For arms at the side, be sure they are loosely held and look to be in a comfortable position.

Prone Position

Richard Davis, Gregory Sund

The arms at the patient's side, held in place with plastic arm holders that allow the arms to rest at the patient's side. An alternative is to fold the arms in a sheet that is tucked under the mattress. This technique usually hides the fingers, so make sure that they are not being pinched or bent in an awkward position.



Arms in "up over head" position, shoulders are not abducted beyond 90 degrees and shoulders are not hyperextended. Two possible armboard configurations are shown. Either is acceptable, as long as the pressure on the forearm is even and the ulnar groove in the elbow is not under pressure.

6. Check the position of the chest roll, making sure that it supports the upper chest. It must not press on the neck or the breasts, and it must not force the shoulders into an awkward position.

The roll supporting the chest (yellow plastic) with the arms abducted. The roll must be centered over the sternum, pressing neither on the neck nor the breasts.

The chest roll with the arms at the patient's side. It does not force the shoulders or upper arms too far posteriorly, they appear to lie in a comfortable and natural position.

7. Position the roll that is under the hips. It must lie under the anterior superior iliac spine. Make sure that the foley catheter and the genitalia are not pulled, squeezed or pinched, by the roll or by anything else.

Prone Position

Richard Davis, Gregory Sund

The hip roll under the anterior superior iliac spine. Lift up the thigh and check on the genitalia and foley catheter.

The roll under the legs is adjusted so that the weight of the foot does not rest on the toes.

The foley catheter is not under tension. By spreading the thighs from posteriorly, you can check on the genitalia and be sure they are not pulled, squeezed or pinched.

8. Adjust the roll under the legs. The knees should rest on the padding of the bed and the roll should support the shins in such a way that the toes are just barely resting on the padding of the bed.

9. Check very carefully on the position of the face. Make sure that the tape on the eyelids is still in place. There must be no pressure on the eyes, nose, or lips. Gently check on the entire face by pushing the padding supporting it downwards gently away from the face. Try to assess where the pressure on the face will be. Most of it should be at the periphery of the face, on the forehead and lateral cheekbones.

The face in position supported by the foam block. The endotracheal tube passes through the cut in the foam.

Prone Position

Richard Davis, Gregory Sund

Gently examine all of the face by pushing down on the foam and assessing the pressure points on the face.

Pitfalls

- Blindness after surgery in the prone position is a devastating complication. Prevent pressure on the globes and have the anesthetist frequently recheck them. There is some evidence that avoiding intraoperative hypotension and anemia reduces the risk, and that prolonged time with the head below the heart (Trendelenburg's position) increases the risk.
- Injury to the face from pressure on sensitive structures such as the eyes, nose, or mouth. Carefully check the face after the patient's position is finalized. The anesthetist should recheck the face every hour as the surgery progresses.
- Vascular compression and lower limb ischemia from malpositioning of the pelvic roll, or if pressure is applied to the femoral artery at the groin by a poorly folded sheet or some other object in that area.

Mottling of the right foot was noted after the patient was placed in prone position. Careful repositioning of the pelvic roll and hips led to resolution of the mottling.

- Brachial plexus injury: if the arms are to be abducted, make sure they are not past 90 degrees. If the patient is tilted upwards or downwards (standard or reverse Trendelenburg's position) during surgery, the shoulders can shift. This may occur under the surgical drape and be undetected by the team.
- Migration of the endotracheal tube after positioning the patient: auscultate the chest after finishing positioning to make sure the endotracheal tube is still located properly. This is also something the anesthetist keeps a careful eye on as the surgery progresses.
- Pressure injury resulting in bruising and ecchymosis from excess pressure on the knees, forehead and over the pelvis, especially if the patient is frail or the operation is prolonged. Be very careful that all supporting structures are soft.
- Nerve injury due to pressure, especially in the common places where nerves are vulnerable: the ulnar nerve in its groove at the elbow or the peroneal nerve as it passes over the fibular head.
- Patient fall: patients are in danger of injury due to falls at any time that their position is changed. As this maneuver involves a transfer between two places, there is particular danger that the

patient will fall in between the table and the transport gurney. Make sure you have enough help. The team that is on the side of the gurney should lean into it, pressing it against the operating table during the transfer.

Richard Davis MD FACS FCS(ECSA)
AIC Kijabe Hospital
Kenya

Gregory Sund, MD
AIC Kijabe Hospital
Kenya

May 2022