

Fighting the robot.

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Introduction

At first blush it would seem that robot-assisted operations should be similar to laparoscopic surgery in its anesthetic requirements. Partly, that is true, for instance with robot-assisted nephrectomies. However, during the most common robot-assisted operations, in the lower abdomen and pelvic cavity (i.e. robot-assisted prostatectomy) circumstances can get quite severe, due to a complete lack of access during the case and positioning in extreme Trendelenburg. This talk will deal specifically with these types of operations.

Access

Because of the size and shape of the robot, the arms of the patient have to be alongside the patient. There is no room for an armboard. The Da Vinci robot has arms in the abdomen from all angles which basically turns the whole patient surface into the sterile field, including the area above the head. This mandates that the possibility to correct all likely and not so likely eventualities must be present before draping and the start of surgery. Any lack of preparedness may well come back to haunt you during the case.

Extreme Trendelenburg

A head down position of 45° or more is standard for these procedures and is maintained throughout the case, quite often for 4 or more hours. This means that 70% or more of the patient's weight pulls the patient cranially. If the head and shoulders are not immovably supported relative movement between them may result in great strain and brachial plexus lesions. The same goes for the leg supports. They are not designed to be used in extreme Trendelenburg and can cause thrombosis and necrosis of muscles. Furthermore, any cranial shift of the body, with the skin stuck in place, will put strain on the bloodvessels to the skin, leading to sores and ulcers.

Respiratory problems are similar to laparoscopic surgery, only more so.

Maintaining proper circulatory physiology can become difficult, not in the least because we really don't know what appropriate physiology is when you stand on your head. We also lack data on what is safe and for how long. Measuring invasive pressures is tricky as it is nearly impossible to calibrate the height of the pressure sensors.

It is clear that the elevated venous pressure in the head leads to visible edema of the head. If this extends to brain edema, whether that has deleterious effects and what a safe period might be is unknown. Several cases of permanent blindness have been reported. The precise mechanism of this has not been elucidated, nor do we know if and how it can be prevented.

Conclusion

Robot-assisted operations may be minimally invasive as counted by the number of holes in the abdomen. They are however major in regard to the stress imposed on the body. What is safe and what isn't is currently poorly defined.