BY DAN ALLEN, FOuNDING PARTNER OF DAN ALLEN SURGICAL

PATIENT POSITIONING FOR ROBOTIC SURGERY

An insider's perspective

I have been involved in patient positioning since the early1980s. The invention of new surgical techniques often creates obsolescence of existing standard-of-care positioning technology. In doing so, invention encourages the development of innovative alternatives. This was true during the explosive growth of laparoscopy and continues to be true today with the widespread adoption of the da Vinci robot surgical technique. To that end I will restrict this discussion of patient positioning to the need for safe and effective positioning accessories customized for exclusive use with the robot.

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I am reminded of experiences that I had last year when I attended an OR managers' congress. I was demonstrating the new TrenGuard Trendelenburg Patient Restraint and was approached by a number of OR managers seeking out patient positioning accessories that were designed specifically to meet the needs of their robotics programs. One individual made clear her frustration that the positioning devices they used for traditional MIS and open procedures were not able to meet the physical space restrictions or the unique patient safety requirements for robotics cases.

A manager from New York described incidents where robot arms clashed with stirrups and arm restraints. Another OR director complained that the beanbag restraints used for MIS inevitably shift a few inches on the table and were not safe to use with the robot. Yet another manager complained that it was "absolutely inconceivable that after spending millions of dollars for our robots that we find it necessary to literally use tape to secure our patients to the table."

These and other comments fueled my curiosity. I started an informal research project to determine the reason why certain contemporary positioning devices could not meet the unique requirements necessary for robotic procedures. My research included interviewing a number of anesthesiologists, robotic surgeons and robotic program nurse managers with regards to each of the issues that were voiced during that congress.

I have observed a number of robotic procedures performed by GYN and urology surgeons. I remain amazed at the technology, versatility and precision of the robot, but I became painfully aware that there is a vacuum in the development of criteria for positioning standards for robotic surgery. This void is clearly responsible for the draconian methods being employed currently to restrain patients while in extreme Trendelenburg postures for robotics procedures.

Below, I'll discuss pros and cons of some of the most important patient positioning accessories for robotic surgery.

EXTREME TRENDELENBURG DURING ROBOTIC SURGERY

Keeping the patient anchored is key to patient safety.

While basic positioning principles apply to traditional laparoscopy, there are certain technology features of modern articulating tables and the robot device that create additional complications. This is of particular concern in extreme Trendelenburg positioning. Unlike a surgeon who

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makes subtle changes after noticing that a patient has slipped a little on the table, the robot is not programmed to compensate for changes in patient location on the OR table. Concerns are being voiced that when a patient slides "just a little bit," the arms of the robot will assume the primary role for restraining the patient. Patient risks include the potential of necrosis or bruising at the site of the major ports, as well as increased and potentially prolonged post-op pain.

CURRENT METHODS USED FOR EXTREME TRENDELENBURG POSITION FOR ROBOTIC PROCEDURES

The most common Trendelenburg positioning techniques in use for robotic assisted surgery involve using friction, shear or lots of foam and tape to secure the patient on the table. It is because there were no apparent alternatives these techniques were developed by early adopters and passed along to others as robotic surgery gained favor. The methods were developed based on theory, conjecture and a strong sense of urgency that they must protect their patients from harm. In all cases, the techniques being used came from a frustration of the medical device industry's inability to develop a new standard of care in a timely manner. Most of the available commercial and home-made Trendelenburg restraint techniques being used are described below.

The designs of the first two devices below do not permit the patient to slide, as both utilize skeletal structures to anchor the patient in place on the table. When utilizing skeletal structures to anchor patients on the table, the patient cannot slide.

Trendelenburg patient restraint utilizing the concavities of the skeleton: An anatomical pad, attached to the table, is located under the notch of the neck to anchor the patient in position. Use of the skeletal concavities was described in the literature as being a safe and effective method of anchoring the patient in ultra-extreme postures.

Shoulder braces anchoring the patient's skeleton on the table: Regardless of the degree of Trendelenburg, the use of a two-piece shoulder brace is contraindicated in nearly all the literature. There is an extreme risk of BPN due to the forces of gravity and patient weight forcing, or funneling, the patient's mass between the braces. That funneling dynamic is considered causal to BPN.

Anecdotal and published evidence indicates that, for the most part, the remaining device concepts tend to stop until something restrains the patient. The first two techniques take on the look of craft projects in that they typically consist mainly of egg crate foam and tape binding the patient to the table.

- **THE BANDITO POSITION:** This technique features tape and foam criss-crossing the patient's chest. The procedure is common even though respiration is often sub optimal.
- **THE MICHELIN MAN POSITION:** This is similar to the Bandito position with the exception of the application of the tape across the chest.
- **BEAN BAG RESTRAINTS:** These devices are attached to the rail using belts for security. The device holds a vacuum to maintain its configuration. It is not unusual for this device to slowly slip on the table until the straps become taut.
- **FRICTION / CONFORMING PAD:** This disposable positioner is strapped to the rail and is said to slip the least of the Trendelenburg systems that use straps to secure it onto the table rails.
- **TABLE PAD OVERLAYS USING FRICTION AND SHEAR FOR RESTRAINT**: Patients are positioned on the fingers of large sections of Egg crate foam that has been taped to the table top.
- **FULL LENGTH Gel PADS** are sometimes taped to the table top and the patient is placed on the pad in a "Skin to Skin" configuration in an attempt to utilize friction and skin shear to hold the patient on the table.

I suggest that the following standards be adopted for devices developed for positioning patients for robotic surgical procedures:

- Utilize only those Trendelenburg patients restraints that can safely anchor the patient into place. Arm restraints should be designed to avoid clashing with the control arms. Patient arms should be cradled and secured without undue compression.

- Lithotomy positioners without fins will clash less with robotic arms.
- Hands that extend beyond the end of the table should be protected with either a disposable mitt or another hand protection device.

Current accessories considered to be standard of care accessories were not designed to meet the needs of both the patient and the physical presence of the robot.

Developing standards for patient positing for robotic surgical procedures is an important goal that needs to be reached. The entire OR staff must be made aware that they need to question common theory on positioning patients who are being subjected to ever more extreme postures. The one certainty is that the classic positioning methods and current published AORN standards of care for patient positioning in extreme postures were not designed for, nor do they meet, the needs of the extreme surgical postures, the unique environment and the special requirements of the robot.

While published basic positioning principles apply to traditional laparoscopy and open procedures, there are certain technology features of modern articulating tables and the robot device itself that create additional and unique complications in the patient positioning process.

It is extremely important that robotics teams consider, understand and practice the necessary steps required to reduce previously unrecognized patient injury risks that present during robotic assisted procedures. ORT