Nerve Injuries Following TRAM Flap Surgery

Robert B. Dybec

The purpose of this study was to determine whether nerve injuries related to patient positioning could be prevented in patients undergoing transverse rectus abdominis myocutaneous (TRAM) flap breast reconstruction surgery. Gel pads were used on the arms, and the patient's arms were secured along the full length of the armboard. Ninety-one patients have undergone TRAM without any nerve injury. We conclude that use of pads and full length boards had reduced the risk of intraoperative positional nerve injury.

Within a 4-month period, two patients developed nerve injuries following transverse rectus abdominis myocutaneous (TRAM) flap reconstruction surgery. One woman presented with a left sided brachial plexus nerve palsy, the other developed a bilateral median nerve palsy.

The close proximity in time between the two patients and the seriousness of the injuries triggered the formation of a collaborative team consisting of:

- Nurse Manager for Plastic and Reconstructive Surgery,
- Operating Room Nursing Staff,
- Department of Anesthesia,
- Attending Plastic Surgeons, and
- OR Materials Manager.

Presented with an opportunity to improve patient care, our team investigated how these two TRAM flap patients may have acquired these perioperative complications. We then developed a plan to prevent or reduce the risk of future positioning-related complications in the operating room.

Literature Review

A preliminary literature search revealed no data that were specific to nerve injuries in patients undergoing TRAM flap surgery. A correlation between brachial plexus injuries in axillary dissection surgery, as well as with overzealous retraction of the axilla during mastectomy surgery where lymph nodes are dissected has been suggested (Kwaan & Rappaport, 1970; Petrick, 1995). Godfrey (1994) presents a case report involving a bilateral brachial plexus nerve injury in a patient having bilateral mastectomies with immediate bilateral TRAM flap reconstruction. The case report describes a 40-year-old patient having no axillary lymph node dissection, whose arms were adequately secured to the armboards, and never at an angle greater than 90 degrees.

Godfrey's conclusion was that pedicled TRAM flap surgery with no axillary retraction or hyperabduction of the arms was not free of risk from neural injury, and that more studies were needed to specifically define risk-related maneuvers for those and other anesthetized patients.

Assessment

After a careful review of these two cases by the collaborative team, it was determined that the most probable intraoperative reasons for the nerve complications were as follows:

1. The brachial plexus palsy, which was most likely due to a hyperabduction of the arm during surgery. The brachial plexus is susceptible to injury by other means, including:
   - the use of shoulder braces;
   - dorsal extension and lateral flexion of the head to the opposite side; and
   - placing the dependent shoulder and arm under the patient while lying in a lateral position.

   These were ruled out as potential causes in the first patient. Of greatest interest is that the brachial plexus palsy occurred on the opposite side of the mastectomy/TRAM flap surgery. It could only be traced to a possible hyperabduction of the arm greater than 90 degrees.

2. For the woman who had bilateral nerve palsy, it was considered to be caused by the 1 1/2-inch anesthesia straps around the patients' forearms. During the procedure the patient is placed in a sitting position to verify contour of the new breast mound. After this sitting position is achieved, with the patients' arms extended out on arm boards at a 90-degree angle, gravity naturally pulls the arms down. The straps may have exerted undue pressure on the volar surface of the forearms, an area where branches of the median nerve are superficial.

Having identified the apparent etiology of the nerve injuries, we devised a plan to resolve the problem.

Planning

Based on the presumed causes of the complications, the collaborative team determined a need to:

- prevent any unnecessary pres-
Figures 1A and 1B
Arm being wrapped in Action® Dry Polymer Pad.

- securing the patient's arms the full length of the arm board. This would provide the necessary support for the entire arm after the patient is put in the sitting position. It was decided to use a roll of flannel material that was strong and provided support without the risk of being too tight, as seen with an elastic bandage or a conforming bandage roll (see Figure 2).

Process
In a 3-year period (January 1994 - January 1997), 91 patients having TRAM flap breast reconstruction surgery were tracked and observed for postoperative nerve complications, yielding the following results:
- mastectomies with immediate reconstruction = 70,
- TRAM flap reconstructions only = 19, and
- Deep Inferior Epigastric Perforator (DIEP) Flaps = 2.

Findings and Discussion
Of the 91 patients who were followed since the new guidelines for positioning and padding were instituted, not one has presented with any postoperative nerve complications. A zero percent complication rate was observed during the study period.

The results of this study indicate that nerve injuries to the upper extremities in patients undergoing TRAM flap surgery, can be minimized through the use of proper positioning techniques and the use of Action® dry polymer pads. Data will continue to be collected on these patients.

Quality Improvement Functions
This study touched upon several areas of quality improvement relating to the care of patients. The initial assessment of the patients identified a potential problem in the environment of care. Through education, appropriate actions were taken to improve overall performance in the specific patient group. The research utilized information management, and a continuity of care to reveal the
effectiveness of the measures taken. The result was a safe, caring, efficient, and effective surgical nursing environment.

Recommendations

Although this study was specific to TRAM flap patients, it should be noted that this technique for positioning and padding the arms has and continues to be used effectively for other surgical procedures as well. These include but are not limited to: breast reduction surgery, breast augmentation surgery, open heart surgery, mastectomy with tissue expander, and abdominoplasty.

Conclusion

Perioperative nurses are responsible to ensure a safe environment for their patients. The surgical team of surgeon, anesthesiologist, and nurse working collaboratively can prevent nerve injuries in patients having TRAM flap surgery by: (a) identifying patients at a greater than normal risk for nerve injuries, (b) possessing knowledge of risk factors and anatomical nerve pathways, (c) following proper positioning guidelines, and (d) incorporating the use of gel pads (Action® pads) and positioning assist and support devices.

References


Readings


