Microsurgical Suturing Technique

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Problem Identification and Needs Assessment

Identification of targeted learners
PGY1-PGY5 residents in orthopaedic surgery.

Identification of need or problem for targeted learners
The basics of the microsurgical technique is grounded on basic surgical instrument knot tying principles. The assumption is that if the resident can perform basic microsurgical techniques such as suture passing and knot tying, then this will aid the resident in macro suturing and knot tying techniques.

Current educational approach to address need or problem
The current educational approach is for residents to learn basic microsurgical suturing skills during their on call activities, generally at night or on weekends as hand and upper extremity trauma demands dictate. Additional opportunities exist in some programs to attend a microsurgical skills course or “rat lab.” Otherwise, exposure of these skills are offered only in hand surgery fellowship training.

Ideal educational approach to address need or problem
The ideal approach is for residents to have the opportunity in a safe and non-pressured environment to gain expertise in basic microsurgical knot tying skills.

Goals and Objectives

Specific educational goals
- Familiarize with the different microsurgical forceps, scissors and needle drivers
- Learn the proper wear or usage of magnification devices
- Learn proper posture for performing seated microsurgical technique
- Pass microsurgical needles and suture through a low resistance material under binocular 2.5x or 3.5x magnification
- Tie knots using standard microsurgical technique

Specific cognitive, affective, psychomotor task objectives
Using binocular 2.5x or 3.5x loop magnification or standard operating room microscope:

1) The learner will pass and handle microsurgical instruments appropriately
2) The learner will pass 10-0 nylon suture on a BV-75 needle through a low resistance material, simulating nerve or blood vessel.
3) The learner will tie standard microsurgical knots without tearing the low resistance material, bending the needle or separating the needle from the suture
Syllabus Development

Assumptions
1) Basic understanding of microsurgical instruments
2) Basic understanding of microsurgical suture
3) Basic understanding of magnification devices available
4) Basic understanding of knot tying

Suggested readings

Description of laboratory module
The laboratory module will involve passing and tying microsurgical knots on a sheet of thin rubber. The set up will involve placing a 1mm thick training substance. Using a scalpel, small cuts are made in the training material. Then using available magnification, the small cuts are repaired by placing multiple interrupted 10-0 nylon sutures using a BV 75 needle. The learner will use either 2.5x or 3.5x loop magnification when an operating room microscope is not available. While performing the training module, the learner will be expected to exercise proper sitting posture, proper hand positions and standard use of microsurgical instrumentation in order to affect closure of the cut. This module will also require the learner to cut the suture once the tie is placed.

Common errors and prevention strategies
An error common to microsurgery is bending the needle, pulling the needle from the suture, breaking the suture or simply pulling the suture through prior to tying a knot. Proper holding and passing of the needle will be stressed as well as fatigue management in order to prevent these errors

Demonstrate expert performance
A video of proper technique of suture passage, knot tying and suture cutting will be provided for demonstration

Recommendations for motor skills practice
Motor skills practice will involve the placement of multiple sutures and knots as described above.

Supplies and station setup
- Loop magnification or operating room microscope
- Ecoflex training material
- 10-0 nylon on a BV-75 needle
- Microsurgical forceps
- Microsurgical needle holder
- Straight microsurgical scissors

Suggested duration for completion of module
Two, 2-hour sessions.

Estimated budget
- Disposable materials= 6 packets of 10-0 nylon suture @ $20 each= $120.
- Durable materials=3 microsurgical instruments @ $200 each= $600
- Training material consisting of Ecoflex 00-30 Supersoft (BASF Corporation, Florham Park, NJ) (60 mL of Part A + Part B = $3.76) + Slacker Tactile Mutator (30 mL = $1.54) + Silc Pig silicone pigment – Flesh Tone (0.1 mL = $0.61) Total cost associated with a 20 inch x 14 inch x 0.1 inch sheet = $5.91
- Magnifying loops or operating room microscope= supplied by learner or hospital
Learner Evaluation and Feedback

Methods of performance assessment

Performance assessment will include three benchmarks:

1) Needle integrity—any new bend in the needle will be considered failure
2) Suture and needle integrity—dislodging the needle from the suture will disqualify the attempt at proficiency
3) Completion of an acceptable microsurgical suture placement:
   a. Equal spacing of suture from edges of cut
   b. 4 throws of suture to tie the knot in a square fashion
   c. Cutting of the suture with 1mm tails

Suggested proficiency benchmarks

Tie 10 microsurgical knots without a needle bend or break with the knot parameters given above

Methods for learner debriefing and feedback

Essentially, this module can be self-assessed as the learner will know when and if the needle was damaged and if the knot had the appropriate number of square throws.

Periodic Curriculum Review, Evaluation, Validation, and Refinement

Continuous Program Update and Improvement

Initially, will assess module for the practicality of requiring 10 consecutive “proper” microsurgical knot ties for passage of the module.

If this proves too hard, then will limit the number of required knot ties to 5.

If the exercise proves too easy, will add knot tying exercises from different approaches.