



Module 1: Basic Principles of Arthroscopy

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Problem Identification and Needs Assessment

Identification of targeted learners

Targeted learners will include PGY 1 Orthopaedic Surgery residents with potential inclusion of PGY 2 residents.

Identification of need or problem for targeted learners

Arthroscopy is one of the most common orthopaedic procedures. In order to perform arthroscopy safely and efficiently, surgeons must become familiar with basic arthroscopy tools and equipment. Learners must also understand relevant periarticular anatomy and the associated portals for safe access to joints.

Current educational approach to address need or problem

Our current approach is to bring the resident into the operating room environment, demonstrate the use of the arthroscope, and then allow the trainee to utilize the instruments in a patient. A cadaveric lab may have been performed beforehand, but typically residents have very limited training about the surgical equipment to be used. Risk of patient injury is higher and risk of equipment damage is higher with this see one, do one, teach one approach. Relevant neurovascular and portal anatomy is generally taught with lectures and cadaver dissections, followed by making portals on patients. A stepwise progressive approach is likely to be both safer and more efficient.

Ideal educational approach to address need or problem

The ideal educational approach would be structured and progressive, allowing the resident

to acquire basic cognitive information, followed by training and practice setting up arthroscopy equipment, leading to practice with a model or arthroscopy simulator (to an acceptable level of proficiency), before implementation of these skills on patients.

Goals and Objectives

Specific educational goals

- The learner will become familiar with the basic set up and function of the arthroscopy "tower", including the angled arthroscope (30 and 70 degree lens), light source, shaver and pump, tissue ablation / coagulation tools (radiofrequency devices), foot pedals, and control boxes.
- The learner will become familiar with basic hand tools that are used during arthroscopy, including probes, graspers, baskets, scissors, and motorized shavers.
- The learner will become familiar with operating room set-up and draping techniques for the most common arthroscopic procedures.
- The learner will understand the relationships between surface anatomy, superficial and deep neurovascular anatomy, and basic arthroscopy portals.

Specific cognitive, affective, psychomotor task objectives

- The learner will demonstrate ability to set up and connect the various elements of the arthroscopy tower.
- The learner will demonstrate familiarity and application of various hand instruments used during basic arthroscopic procedures.

- The learner will demonstrate creation of safe portals and will articulate the associated risks to local anatomic structures.

Syllabus Development

Assumptions

It is assumed that the learner will have little or no prior knowledge or experience with arthroscopic tools or equipment set up. The learner may have had some prior video game experience, but no prior arthroscopic motor skills practice. The learner should have had some prior education pertaining to anatomy relevant to arthroscopic portals during medical school.

Suggested readings

- AANA Advanced Arthroscopy: The Shoulder: Expert Consult: Online, Print and DVD, 1e Richard L Angelo, James Esch, Richard K. N. Ryu 2010. Saunders, Philadelphia, PA
- AANA Advanced Arthroscopy: The Knee: Expert Consult: Online, Print and DVD, 1e [Hardcover] Robert E. Hunter (Author), Nicholas A. Sgaglione (Author) 2010. Saunders, Philadelphia, PA
- Shoulder arthroscopy: principles and practice. Rao AG, Yokota A, McFarland EG. Phys Med Rehabil Clin N Am. 2004 Aug;15(3):vi, 627-42.
- Primer of Arthroscopy: Text with DVD, 1e [Paperback] Mark D. Miller MD (Author), A. Bobby Chhabra MD (Author), Marc Safran MD (Author) 2010. Saunders
- Arthroscopic Techniques of the Shoulder: A Visual Guide (Visual Arthroscopy) Tal David MD (Author), James Andrews MD (Author). 2009 Slack Incorporated. Thorofare, NJ
- Arthroscopic Techniques of the Knee: A Visual Guide (Visual Arthroscopy) Thomas Gill MD (Author) 2009 Slack Incorporated. Thorofare, NJ

Description of laboratory module

The first sub-module will be an introduction to arthroscopy equipment, the arthroscopy tower, and hand tools. This information will be delivered by a video demonstration. The learner will

demonstrate proficiency in setting up the equipment. The second sub-module will begin with a video demonstration of common arthroscopic portals and the relevant neurovascular anatomy. The learner will demonstrate creation of the common portals and knowledge of the associated structures at risk.

Description of techniques and procedures

Sub-Module 1(A): Tower and Hand Instruments: There will be a video demonstration of arthroscope optics (0, 30 and 70 degree scopes), with discussion of the importance of preservation of the tip of the scope and avoidance of chips and shaver damage. The video will also demonstrate the various elements of the arthroscopic set up and the methods for connection of light source and cables. There will be a brief demonstration of fluid management alternatives (gravity versus pump system). The video will show various basic hand tools used for probing and simple resection / manipulation.

Sub-Module 1(B): Room Set-up: The video will demonstrate positioning alternatives for knee arthroscopy (including leg holder and lateral post), as well as positioning for shoulder arthroscopy (lateral decubitus and beach chair). Basic draping techniques will be demonstrated.

Sub-Module 2: Portals: This video will demonstrate the relationships of the bony anatomy to the peri-articular and neurovascular structures at risk. The video will also demonstrate placement of safe portals for knee and shoulder arthroscopy.

Common errors and prevention strategies

- Damage to the tip of the arthroscope, breakage of equipment due to excessive force / leverage, dropping equipment
- Damage to tissues from excessive force with hand tools or shavers, thermal injury from excessive use of a radiofrequency device with shavers
- Draping errors that make it difficult to reach portals or allow fluid leakage where drape not secured well to patient
- Direct neurovascular injury (for example, too far medial to the coracoid or far postero-lateral in the knee)

Demonstrate expert performance

Videos with demonstration of arthroscope properties and optics, room set-up, fluid management, draping and trouble-shooting of equipment. Separate knee and shoulder videos for demonstration of portal anatomy and introduction of cannulas or instruments through portals.

Recommendations for motor skills practice

The first motor skills element would involve demonstration that the learner is able to set up the arthroscopic equipment and can make all the connections and activate the control boxes in the arthroscopic tower. This element can be tutored (and perhaps performance monitored by) experienced operating room personnel who are familiar with the arthroscopic instruments.

The second motor skills element would involve physical manipulation of the common hand instruments used for basic arthroscopy skills, with manipulation under direct visual control (i.e. not using an arthroscopic image or triangulation). The learner could use the *FAST* workstation for this exercise, and can rehearse some basic use of the hand tools on either paper or plastic models. Practice should be performed using both hands, under direct visual control.

The third motor skills element will involve placement of appropriate markings for skin portals for knee and shoulder arthroscopy using a simulation model or a human volunteer (without creating a skin incision). Alternatively, portals could be created in either an arthroscopic joint model or a cadaver joint, with placement of the arthroscope.

Supplies and station setup

- Arthroscope and tower, light source, fluid pump, tubing (this equipment is readily available in every operating room).
- Knee and shoulder models for drawing out anatomy and creation of portals.
- An additional option is the *FAST* workstation, for hand instrument familiarization under direct visual control.

- Other platforms utilizing similar equipment to simulate arthroscopic camera/light source setup and handling can be used for these exercises.

Suggested duration for completion of module

Background reading and video review should be accomplished in 2 hours. The learner should be able to complete each motor skills sub-module in 30 to 60 minutes. Total time to completion: 4-6 hours.

Estimated budget

- High quality videos will be available online for implementation of this module. Additional expenditure would be associated with on-site customized video production.
- Each training program should have suitable arthroscopic towers and equipment in their operating rooms for completion of Sub-module 1.
- Additional costs will be associated with utilization of the *FAST* workstation and with use of knee and shoulder arthroscopy simulation models. It would be most cost-effective to utilize volunteers for drawing sample arthroscopy portals. If models are used, it may be possible to use ink that can be wiped away, so that multiple learners can demonstrate proper portal positions.

Learner Evaluation and Feedback

Methods of performance assessment

The mentor will use a check list to record observations while the learner demonstrates equipment set up and arthroscopy tower connections.

The mentor will use a checklist to record observations while the learner marks the appropriate positions for basic arthroscopy portals of the knee and shoulder.

Suggested proficiency benchmarks

The learner must be able to demonstrate ability to connect the arthroscope, camera, light source and

monitor and successfully turn on the system with a picture. The learner must successfully connect the shaver handpiece by demonstration of instrument actuation (either with the handpiece or with a foot pedal). The learner must demonstrate an understanding of light cord rotation to change the field of view with a 30° arthroscope.

The learner will demonstrate proper portal position, within 5 mm of ideal position (as defined by the mentor). The passing rate will be 80% (in other words, 8/10 portals are in the proper position).

Methods for learner debriefing and feedback

Learners will provide curriculum feedback using a web-based, anonymous tool assessing module didactic content, expert video quality and usefulness of skills training.

Periodic Curriculum Review, Evaluation, Validation, and Refinement

Curriculum faculty will annually review learner comments and assess potential improvements in the didactic and manual skills portion of the module. Educational validation will occur when the learner is observed and graded in the clinical setting, noting the specific steps of arthroscopic equipment set up and portal placement.