INTRODUCTION

Shoulder arthroscopy is a team event. It is important that all those involved be aware of the unique requirements, including equipment, anesthesia, patient positioning, and surgical technique to ensure that the case is performed with maximum efficiency and patient safety. In our operating room, each team member is expected to be familiar with all the aspects of the procedure and not just his or her primary task. This chapter is intended for use not only by the surgeon and assistant, but also by the entire operating room staff, including the nurses, anesthesiologists, and scrub technicians. If the surgeon is new to a hospital or surgery center, we suggest that an “in-service” be held with the entire team before undertaking the first shoulder arthroscopy case to ensure that each team member is aware of the steps of the procedure and the specific requirements peculiar to the case. We also suggest that this chapter be copied and distributed as a handout for all team members in preparation for the meeting and as a reference for future cases. In addition, the companion video is an ideal training tool for the operating room staff.

OPERATING ROOM ENVIRONMENT

Any standard operating room at least 30 × 30 feet is sufficient for shoulder arthroscopy. If there are exterior windows in the room, they should be covered with blackout blinds to darken the room to ensure optimal video viewing. Ideally, there would be a source of supplemental lighting that is reflected off the ceiling to indirectly illuminate the surgical field. The walls of the room should be finished with nonglare materials to diminish the reflection on the video monitors.

OPERATING ROOM LAYOUT

The operating room table is situated in the center of the room but angled so that the anesthesiologist is positioned approximately 45 degrees toward the anterior side of the laterally positioned patient. This gives the surgical team unobstructed access to both the anterior and the posterior shoulder (Fig. 2-1).

The video and shaver equipment stack is situated on either a movable video cart or ceiling-mounted boom positioned on the anterior side of the table facing the surgeon (Fig. 2-2). The basic equipment on the video stack includes a 26-inch HD video monitor, an HD camera box, a light source, a shaver console, a digital documentation/DVD burner, and a photo printer.

Along with a main back table for equipment, two additional Mayo stands are utilized. One Mayo stand is positioned just behind the surgeon and assistant on the posterior side of the table. This tray holds basic instruments: graspers, a hemostat, switching sticks, probe, a marking pen, and a kidney basin. The kidney basin is kept on this stand to keep all sharp instruments, such as the scalpel and spinal needle (Fig. 2-3). When the surgeon finishes using any sharp tool, it is placed back in the basin. Using the “sharps basin” in this manner minimizes the risk of injury to the scrub tech or surgeon that might otherwise occur when sharp instruments are handed back and forth in a dimly lit operative suite.

The second Mayo stand is positioned on the front side of the OR table where it can be accessed at the level of the patient’s chest. It is covered by a sterile towel and carefully moved to this position by the scrub technician after draping of the patient. In this location, the surgeon and assistant can reach some of the most frequently used tools for the operative procedure, obviating the need to wait for the scrub tech to pass them. This tray initially holds the arthroscope, its light cord, the mechanical shaver, the suction tubing, and the radio-frequency device (Fig. 2-4).
**FIGURE 2-1.** The operating table is positioned in the center of the room, prepared with the positioning aids: Vacupak beanbag, head support, leg compression stockings, axillary roll, and pillows. The arthroscopy tower is positioned across from the surgeon’s side of the table.

**FIGURE 2-2.** The arthroscopy “tower”: The video and power equipment stack holds all of the recording, monitoring, and documenting equipment along with the shaver power source.

**FIGURE 2-3.** The first Mayo stand is prepared with basic instruments and is positioned behind the surgeon on the operative side of the table.

**FIGURE 2-4.** The second Mayo stand holds instruments at the front side of the patient: the arthroscope, shaver, and radio-frequency device.
Arthroscopic Fluid Irrigation and Pump System

The arthroscopic pump system is placed next to the video cart. There should be adequate space between them to minimize the risk of fluids splashing onto the electrical equipment in the video cart. The pump apparatus is held on a stand within easy view of the surgeon, usually toward the foot of the table. We have used various gravity and arthroscopic pump systems for shoulder arthroscopy and have found a good pump to be an invaluable asset. The preferred pump for our purposes is the Linvatec 87k model (Largo, FL) (Fig. 2-5). This pump system can accommodate a number of different options for inflow, outflow, and fluid pressure monitoring, quickly and automatically controlling conditions within the operative site to help ensure optimum visibility and distension. The pump will automatically monitor and maintain the selected values for pressure and flow rate, independently of one another, alarming or even shutting down if pressures increase significantly at the tip of the arthroscope. This is an important safety factor when compared with other systems designed to sense pressure from a cannula located away from the pump inflow line. In these other systems, the tubing can be kinked or the cannula blocked by synovium, causing it to sense an inaccurately low-pressure reading, and possibly pump a dangerous amount of fluid into the body.

An outflow cannula is connected to the outflow tube included with the tubing set. This drainage line passes back through a pinch valve at the pump box when the tubing cassette is loaded. This arrangement is advantageous because it eliminates the need for suction and hence negative pressure when draining the joint. When one uses a burr during subacromial surgery, the bone debris can be evacuated using the outflow cannula connected to the drain tube with only minimal suction through the burr motor. Because there is no negative suction pressure, the outflow is gentle, maintaining a little positive back pressure, thereby minimizing bone bleeding and lessening flow turbulence. In addition, there is no fear of the outflow being plugged by debris as often occurs when suctioning exclusively through the burr.

The remote control for the pump is positioned in easy reach of the surgeon on the front Mayo stand. The fluid flow and pressure are adjusted frequently during the case to maintain optimal visual clarity while using only the minimum pressure necessary to control bleeding. The 3-L irrigation bags are hung near the arthroscopic pump.

Shoulder Traction Equipment

Supporting the shoulder in the proper position for shoulder arthroscopy requires a special system designed for safety and efficacy. It must apply gentle, balanced support of the arm with just the required amount of traction, be simple to adjust for both arthroscopy and bursoscopy positions, and be easy to install and remove from the OR table. We prefer the 3-Point Shoulder Distraction System (Arthrex, Naples, FL), placed on the nonoperative side of the table and set such that it will provide approximately 70 degrees of abduction and 10 degrees forward flexion while in the glenohumeral position (weight on the white cable), and approximately 15 degrees of abduction and 5 degrees of forward flexion in the bursoscopy position (weight on the yellow cable). We do not use the red distraction cable routinely, but it can be helpful in providing some lateral traction and rotational control in certain cases. Variable degrees of abduction can be achieved by moving the traveling pulley along the upper boom arm.

There are several arm suspension sleeves currently available. We prefer either a S.T.a.R. Sleeve (Shoulder Traction and Rotation, Arthrex, Naples, FL) or the Gelzone Suspension Sleeve (Ventura, CA). The Gelzone can be applied unsterile before draping, allowing the arm to be placed in suspension without having to be manually held while the circulating nurse preps (Fig. 2-6). It can later be draped with a sterile towel and sterile 6-inch Coban overwrap. The Gelzone can be applied unsterile and will provide approximately 70 degrees of abduction and 10 degrees forward flexion while in the glenohumeral position (weight on the yellow cable). We do not use the red distraction cable routinely, but it can be helpful in providing some lateral traction and rotational control in certain cases. Variable degrees of abduction can be achieved by moving the traveling pulley along the upper boom arm.

Floor Suction Drainage Mats

Despite using specialized shoulder arthroscopy drapes with fluid collection pouches, there will always be an amount of water that spills onto the floor. It can be helpful to have a suction system to collect the fluid from the floor to maintain safe and comfortable footing for the surgical team and facilitate room cleanup between cases. The product we prefer is the fluid collection suction floor mats called Aqua Vac (Arthro Plastics, Chagrin Falls, OH). Two mats are employed, one at the head end of the table and one along the posterior side. They are connected with a Y tube to a suction system located at the head of the table with the tubes positioned away from the area where the operating team stands.

Patient Positioning Aids

Because the patient will be maintained in a lateral decubitus position for arthroscopy, several unique positioning aids should be available (Fig. 2-1). A 3-foot-long Vacupak “beanbag” size 32 (Olympic Medical, Seattle, WA) is placed on the table with the base of the U-shaped end at the level of the patient’s scapula. A 1-L plastic bag of IV solution
wrapped in a cotton towel constitutes a useful "axillary roll." A foam head-and-neck support with a section cut out for the patient’s ear should be available for use by the anesthesiologist once the patient is turned on his side. Additionally, four soft pillows are employed under and between the patient’s legs to prevent strain on the hips and knees and avoid excess pressure on the bony prominences. Foam padding is helpful to protect the dependent peroneal nerve, the ankles, and the elbow and wrist of the contralateral arm.

Once the room setup is complete and the instruments and arthroscopic equipment are ready, the patient may be brought into the operating room.

**PATIENT PREPARATION IN THE OPERATING ROOM BEFORE ANESTHESIA**

The patient is positioned on the operating table with the “U” portion of the beanbag at the level of the axilla. A single cotton sheet covers the beanbag for comfort and is also useful when lifting the patient while turning to the lateral position. The patient’s head rests on a comfortable pillow until he is asleep, at which time a foam head-and-neck cradle is substituted for better and less obtrusive support. The head and neck should be positioned in a neutral, not tilted, fashion to prevent cervical or brachial plexus strain. Warm blankets help keep patients comfortable and relaxed. Two arm boards are attached to the table to afford comfortable support of the upper extremities. The OR lighting should be subtle and the surgical spotlights must never be directed into the patient’s eyes. Cardiac monitor leads are attached to the chest well away from the surgical site but never on the dependent thorax where they will create pressure points when the patient is positioned on his side. When the team is all set and the surgical equipment is prepared, general endotrachial anesthesia is induced.

**PATIENT POSITIONING AND SURGICAL PREPARATION AFTER ANESTHESIA**

As soon as the patient is asleep and the endotrachial tube is secured, the team prepares to turn the patient to the lateral decubitus position. Four team members are required to turn the patient safely: the anesthesiologist for the head, the surgeon and assistant for the anterior and posterior trunk, and a nurse for the legs. The arm board is removed from the posterior side of the table and the one on the front is repositioned to the maximum upper limit of the Clark rail and angled upward 30 degrees to accommodate the dependent arm position after the turn.

The anesthesiologist directs the turn. He supports the head, detaches the anesthesia circuit from the endotrachial tube, and directs the others to lift the patient on his count. The patient is elevated from the table using the draw sheet and moved a few inches toward the posterior side of the table before gently turning him to the lateral position with the surgical shoulder uppermost. The axillary roll is positioned in the “U” of the beanbag to support the thorax and prevent pressure on the dependent shoulder and axilla (Fig. 2-7). The anesthesia tubing is reconnected, the breath sounds are carefully evaluated, and the positioning aids are installed. Place the foam padding below the dependent ankle, elbow, and peroneal nerve, and install the pillows between the thighs and legs. Flex the knees and hips to a comfortable balanced position, and mold the beanbag around the torso to maintain...
Operating Room Setup for Shoulder Arthroscopy

Chapter 2

Examination for Motion and Stability

With the patient in the lateral position, test the shoulder for range of motion and ligamentous stability. If there is any question of instability, perform the examination with video recording to document the status of the ligaments on the permanent video record. If the operating room is not equipped with an overhead camera, use the arthroscopic camera without the arthroscope for the recording.

Patient Sterile Preparation

The Arthrex 3-point shoulder traction unit is attached to the Clark rail of the operating table on the side which the patient will be facing, contralateral to the surgical side (Fig. 2-8). The arm is then placed in the Gelzone and suspended in approximately 10 pounds of traction on the white cable. The surgical site is then initially isolated using the plastic U-drape around the shoulder and the rectangular drape to connect the legs of the U-drape. The exposed arm, shoulder, and hemithorax are then prepped without having to hold the arm up. If the chosen prep solution remains wet or contains flammable alcohol, any excess needs to be removed and allowed to completely dry.

The surgeon and the scrub tech then apply the surgical arthroscopy drapes. The specialized drapes must seal on the skin to protect the patient and anesthesiologist from

FIGURE 2-7. The axillary roll is placed below the dependent thorax to reduce pressure on the axillary structures.

FIGURE 2-8. A boom for suspending the shoulder in the lateral position will provide balanced glenohumeral support in several variable degrees of abduction and flexion. The Arthrex 3-point shoulder distraction system (points 1, 2, 3) is attached to the table on the side opposite the surgeon. The angle of abduction can be adjusted by moving the traction pulley (arrow) up or down along the boom.
contamination with surgical fluids. Fluid is collected in pouches anterior and posterior on the drape and drained by gravity into a large container or bucket adjacent to the head of the table, where it can be monitored and emptied as needed by the circulating nurse (Fig. 2-9). The arm is draped with a thick sterile towel wrapped lengthwise, and then overwrapped with a 6-inch self-adherent Coban wrap. Another towel can be folded into a pouch and wrapped into the Coban along the upper arm. This “bandana” serves as an additional place to keep basic instruments (switching sticks, graspers) close at hand. Appropriate bony landmarks are then outlined on the shoulder with a sterile marker.

Prior to incision, a surgical “timeout” is called: the correct patient, procedure, and surgical site are confirmed. Surgeon initials on the extremity are confirmed as correct and visible. Prophylactic antibiotics are confirmed as being given, and the procedure begins.