

Concise Review

Shoulder Arthroscopy Positioning: Lateral Decubitus Versus Beach Chair

Christina M. Peruto, M.D., Michael G. Ciccotti, M.D., and Steven B. Cohen, M.D.

Abstract: Since the introduction of the beach chair position for shoulder arthroscopy, orthopaedic surgeons have debated whether the beach chair or lateral decubitus is superior. Most surgeons use the same patient position to perform all of their arthroscopic shoulder procedures, regardless of the pathology. Each position has its advantages and disadvantages. The evidence regarding the efficiency, efficacy, and risks of the lateral decubitus and the beach chair positions for shoulder arthroscopy does not show one position to be superior. This review presents a comparison of these positions with regard to setup, surgical visualization, access, and patient risk. **Key Words:** Arthroscopy positioning—Beach chair position—Complications of shoulder arthroscopy—Lateral decubitus position—Nerve injury with shoulder arthroscopy—Shoulder arthroscopy.

Shoulder arthroscopy can be performed with the patient in either the lateral decubitus or the beach chair position. The main topics of controversy include the ease, efficiency, and economics of setup; the visualization of and access to the surgical site; and the risks to the patient. Historically, a surgeon's preference for patient positioning has been based largely on training. The purpose of this review is to provide a comprehensive comparison of these positions to enable surgeons to make an educated decision about patient positioning for shoulder arthroscopy.

POSITIONING

Lateral Decubitus

To achieve the lateral decubitus position (Fig 1) for shoulder arthroscopy, the patient is placed laterally on a standard operating table with the operative shoulder exposed vertically. A beanbag and/or other stabilizing device, such as straps or braces, are used for support. The head is maintained in neutral position with a foam pad, and the eyes and downside ear are protected. An axillary roll is placed for optimal ventilation and protection of neurovascular structures. Pressure points are padded on both legs. The nonoperative arm is placed on an arm board. The operative arm is placed into a foam traction sleeve that is connected to a traction device. Weight is applied to the traction device, and the amount of abduction and forward flexion of the shoulder is adjusted based on surgeon preference. Gross and Fitzgibbons modified the lateral decubitus position by tilting the table by 20° to 30°, which tilts the patient posteriorly, to position the glenoid parallel to the floor.¹⁻⁵ This modification has become standard for the lateral decubitus position in shoulder arthroscopy.

From the Rothman Institute and Department of Orthopedic Surgery, Thomas Jefferson University, Philadelphia, Pennsylvania, U.S.A.

The authors report no conflict of interest.

Received August 18, 2008; accepted October 5, 2008.

Address correspondence and reprint requests to Steven B. Cohen, M.D., Director of Sports Medicine Research, Rothman Institute Orthopedics, Department of Orthopedic Surgery, Thomas Jefferson University, 925 Chestnut St, Philadelphia, PA 19107, U.S.A. E-mail: steven.cohen@rothmaninstitute.com

© 2009 by the Arthroscopy Association of North America

0749-8063/09/2508-8472\$36.00/0

doi:10.1016/j.arthro.2008.10.003



FIGURE 1. Lateral decubitus position of the right shoulder (right side up, view from behind with head to the left) with use of a commercial traction device.

Beach Chair

To put the patient into the beach chair position (Fig 2), the patient is placed on the operating table, a standard or “beach chair” table, in the supine position. The head, neck, and torso are supported in a neutral position by special straps and attachments. The patient is placed into 10° to 15° of Trendelenberg; flexed at the hips to 45° to 60°; and the patient’s knees are flexed to 30°. Pressure points are padded, and the eyes and various aspects of the head are protected. The nonoperative arm is tucked, placed on an arm board, or placed in a sling. If a “beach chair” operating table is used, a portion of the back of the table can be removed for access to the posterior shoulder. In addition, an optional sterile arm positioning device as seen in Fig 2 (SPIDER Limb Positioner; Tenet Medical Engineering, Calgary, Alberta, Canada) may be attached to the operative arm.²⁻⁵

Ease of Setup

Proponents of the lateral decubitus and the beach chair positions each claim that the position they defend is the easiest and fastest to employ, including the number of steps, amount of equipment, and assistance required to set up and perform the arthroscopy.^{2-4,6,7} Regardless of which position a surgeon prefers, both require assistance, and both positions may require adjustments to be made during surgery that can add to surgical time. For the lateral decubitus position, assistance is required to turn and secure the patient after they have been anesthetized. Assistance is required for the addition of the traction and any adjustments that

are made to the traction. In the lateral decubitus position, a scrubbed assistant may be required to hold the humerus in internal or external rotation during the surgery. Achieving the proper beach chair position takes time to secure the head, neck, and torso. To prevent harm to the patient, repositioning during the case may be necessary and may require assistance. In addition, a scrubbed assistant is needed to position the arm if a mechanical arm holder is not used in the beach chair position. Despite the use of a mechanical arm holder, an assistant may still be required to pull traction on the arm in the beach chair position. To date, there is no objective, empirical evidence to support either group’s claims of speed of setup or need for assistance.

Conversion

Ease of conversion to an open procedure without the need for repositioning and redraping is a point made by proponents of the beach chair position.^{2-4,6} Some go as far as saying that the ease of conversion to



FIGURE 2. Beach chair position of right shoulder (view from the front) shown with the use of a commercial mechanical arm positioner.

an open procedure can affect surgical decision making.⁴ Supporters of the lateral decubitus position argue that the rare need for conversion from an arthroscopic to an open procedure makes this argument less important.⁷ However, when the need for conversion from an arthroscopic to an open procedure arises, the beach chair position allows for greater flexibility, and no repositioning or redraping is necessary.

Anesthesia

Positioning during shoulder arthroscopy may affect the type of anesthesia used. Surgeons who prefer the beach chair position cite the ability to use general or regional anesthesia as an advantage.^{2,4} Regional anesthesia is possible for the patient in the beach chair but it is poorly tolerated in patients in the lateral decubitus position. The lack of muscle paralysis of patients under regional anesthesia allows for patient head control²; however, it can allow for an undesirable effect if the patient shifts his or her body during the surgery. Finally, the airway access provided by the beach chair position^{7,8} enables rapid conversion to general anesthesia if necessary.

Cost of Setup

The equipment used in the setup of each position varies based on surgeon preference. A cost comparison of this equipment is listed in [Table 1](#). Supporters of the lateral decubitus position argue that costly equipment is a disadvantage of the beach chair position. Many surgeons now use beach chair attachments for the operating table. They secure the head and torso, and then a portion can be removed to expose the posterior shoulder. However, in their original paper describing the beach chair position, Skyhar et al.⁶ used a standard operating table. In addition, Terry and Altchek⁴ have also described the use of a standard operating table for the beach chair position. Based on this, one may argue that the cost of the beach chair

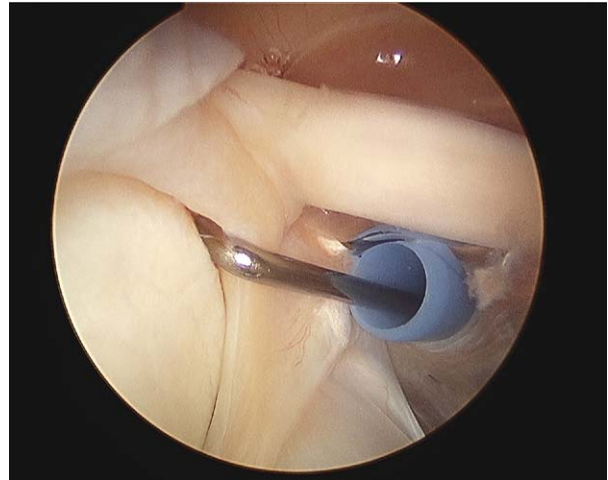


FIGURE 3. Beach chair position. View of the superior labrum/biceps anchor from the posterior portal in the right shoulder.

attachments is not a reason to refute operating in the beach chair position. The expensive, specialized arm positioners that can be used to assist in stabilizing the arm for a beach chair procedure add to the ease of the procedure, but they are not an absolute necessity to perform the surgery.

Orientation, Visualization, and Accessibility

Orientation, visualization, accessibility, and mobility of the shoulder anatomy are all topics of debate when comparing beach chair to lateral decubitus. Proponents of the beach chair position report that the upright, anatomic position makes orientation and teaching easier ([Fig 3](#)).^{4,6} Those who favor the lateral decubitus position counter that argument by saying that positioning the glenoid parallel to the floor creates a standard reference point and turning the camera 90° aids in the conceptualization of the anatomy in the natural sitting position. Furthermore, conceptualization of anatomy has been argued to be a function of surgeon experience rather than the actual position of the patient.^{3,7}

Surgeons that favor the beach chair position report no difficulty visualizing and working in all portions of the glenohumeral joint and subacromial space while using all of the various portals ([Fig 4](#)).^{4,6} The ease of stabilizing the scapula makes an examination under anesthesia easier in the beach chair position than in the lateral decubitus position.⁴ However, the most accurate method of examination under anesthesia is in the supine position before positioning the patient. The beach chair position is also said to enable better pal-

TABLE 1. Cost Comparison for Setup of Beach Chair Versus Lateral Decubitus Positions

Beach chair position	
Beach chair	\$4,000-\$8,500
Mechanical arm holder	\$8,000-\$12,000
Lateral decubitus position	
Bean bag	\$600
Side braces	\$1,000
Traction bar	\$2,000-\$4,500

Note. Costs are approximate and based on a survey of various manufacturers' published retail prices.



FIGURE 4. Beach chair position. View of posterior superior aspect of the rotator cuff in the subacromial space from the posterior portal in the right shoulder.

pation of external anatomy to guide portal placement.⁶ It has been argued that beach chair is the best position for anterior stabilization, releases, and rotator cuff repairs.⁴ Access to the anterior shoulder is said to be easier without the arm hanging in the operative field, and the anterior portal allows for insertion of anchors into the glenoid neck below the 4 o'clock position.^{4,6} Lateral translation of the humerus while in the beach chair position gives excellent access to the anterior inferior capsule and axillary region.⁴ Proponents of the beach chair position feel that the superior mobility

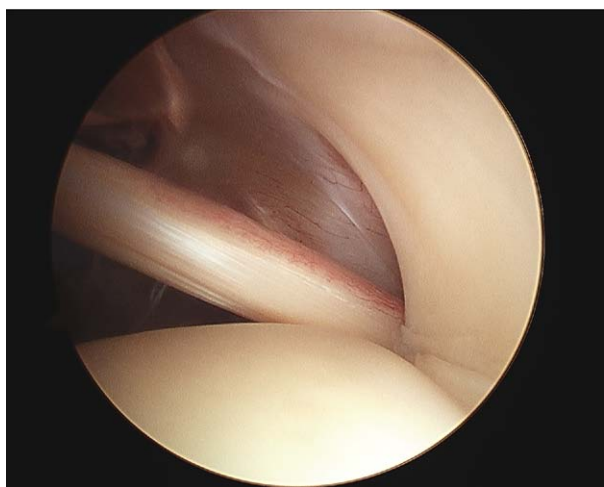


FIGURE 5. Beach chair position. View of the undersurface of the supraspinatus and biceps tendon in the glenohumeral joint from the posterior portal in the right shoulder.

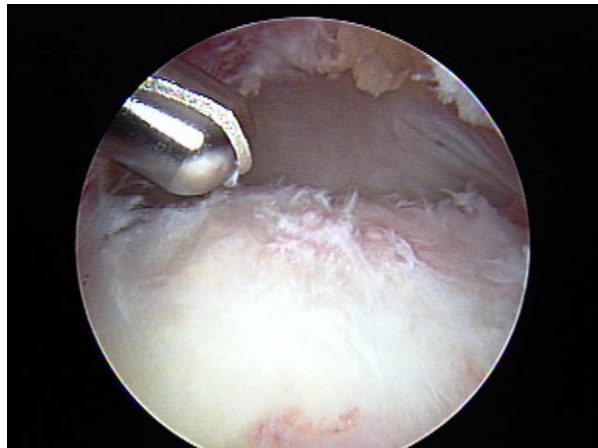


FIGURE 6. Lateral decubitus position. View of posterior superior aspect of the rotator cuff in the subacromial space from the posterior portal in the left shoulder.

of the arm in that position gives them a better dynamic view of the cuff and enables them to pick up subtle pathology, such as subluxation and both internal and subacromial impingement (Fig 5).^{2,4,6,7} Finally, it can be argued that the capsular anatomy is not stretched, which is important for capsular reattachment, assessment of ligamentous laxity, and reapproximation of tissues under minimal tension.⁶

Conversely, those who favor the lateral decubitus position feel that it allows for better visualization and workspace, both in and around the shoulder (Fig 6).^{2,3,7} They also state that in the beach chair position, the table and the head act as mechanical blocks limiting workspace for the posterior and superior portals. The beach chair position has also been criticized for causing decreased visibility because of fogging of the camera and the collection of bubbles in the subacromial space.^{6,7} In the lateral decubitus position, traction is said to accentuate labral tears and improve access to the labrum, subacromial space, inferior capsule, and underside of the rotator cuff (Fig 7).^{2,7} For example, visualization of the posteroinferior glenoid has been reported to be insufficient using an anterosuperior portal in the beach chair position unless sufficient abduction and traction are applied to the arm. Although Costouros et al.⁹ have recently reported the use of a transrotator cuff portal to successfully perform posterior capsulorrhaphy in the beach chair position, arthroscopic posterior Bankart repair and capsulorrhaphy have historically been more easily performed in the lateral decubitus position.⁹

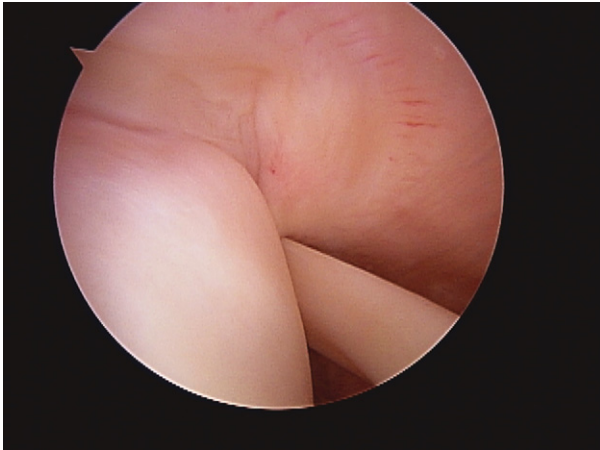


FIGURE 7. Lateral decubitus position. View of the undersurface of the supraspinatus and biceps tendon in the glenohumeral joint from the posterior portal in the left shoulder.

Risks

There are neurovascular and cardiovascular risks associated with the lateral decubitus and the beach chair positions. The traction used in lateral decubitus can cause damage to peripheral nerves and the brachial plexus; paresthesias and palsies have a reported 10% to 30% incidence.^{2,6} Soft tissue injuries and compression of digital nerves have been seen at the site of traction,⁴ and compression of the peroneal nerve can also occur in the lateral decubitus position. Traction has been shown to cause decreased limb perfusion, especially with the use of both vertical and longitudinal traction.^{2,10} In addition, a cadaveric study

has shown an increased risk of neurovascular injury when establishing an anteroinferior portal in the lateral decubitus position, with the musculocutaneous and axillary nerves being at greatest risk.¹¹ Neurovascular injuries are extremely rare in both positions; however, they are less common in the beach chair position. Compression and rotation of the head in the beach chair position have been associated with 3 superficial nerve palsies and 1 hypoglossal nerve palsy.^{12,13}

Sudden, profound hypotensive and bradycardic events have been reported in more than 20% of patients undergoing shoulder arthroscopy in the beach chair position.^{4,14} Brain and spinal cord ischemia, transient visual loss, and ophthalmoplegia caused by hypotension have been documented in patients who have undergone shoulder surgery in the upright position.^{8,15} Patients with abdominal obesity are at greater risk of hypotension in the upright position because compression of the vena cava decreases venous return.⁵ In the beach chair position, hyperextension and rotation or tilt of the head can decrease vertebral artery blood flow causing infarcts of the posterior cerebral circulation.¹⁵ In addition, an ischemic event caused by air embolus is of greater theoretical risk to patients in the upright position.^{7,15}

There are ways to minimize the risk of each of the aforementioned complications. Klein et al.¹⁶ studied the strain on the brachial plexus in the lateral decubitus position and found that 45° of forward flexion combined with either 90° or 0° of abduction maximized visibility and minimized strain.¹⁶ Today, although a variety of arm positions are used, no more than 15 to 20 pounds of traction are applied in order

TABLE 2. *Lateral Decubitus v Beach Chair: Advantages and Disadvantages*

	Lateral Decubitus	Beach Chair
Advantages	<ol style="list-style-type: none"> 1. Traction increases space in joint and subacromial space 2. Traction accentuates labral tears 3. Operating room table/patient's head not in the way of posterior and superior shoulder 4. Cautery bubbles move laterally out of view 5. No increased risk of hypotension/bradycardia; better cerebral perfusion 	<ol style="list-style-type: none"> 1. Upright, anatomic position 2. Ease of exam under anesthesia 3. Arm not hanging in the way of anterior portal 4. No need to reposition or redrape to convert to open procedure 5. Can use regional anesthesia 6. Mobility of operative arm
Disadvantages	<ol style="list-style-type: none"> 1. Nonanatomic orientation 2. Must reach around arm for anterior portal 3. Must reposition and redrape to convert to open procedure 4. Patients do not tolerate regional anesthesia 5. Traction can cause neurovascular and soft tissue injury 6. Increased risk of injury to axillary and musculocutaneous nerves when placing anteroinferior portal 	<ol style="list-style-type: none"> 1. Potential mechanical blocks to use of scope in posterior or superior portals 2. Increased risk of hypotension/bradycardia causing cardiovascular complications 3. Cautery bubbles obscure view in subacromial space 4. Fluid can fog camera 5. Theoretically increased risk of air embolus 6. Expensive equipment if using beach chair attachment with or without mechanical arm holder

to minimize strain on the brachial plexus. It is also recommended that internal rotation of the humerus is increased along with forward flexion to decrease brachial plexus strain.³ For the beach chair position, studies have shown that the administration of metoprolol can decrease the incidence of hypotensive and bradycardic events.¹⁴ Furthermore, many of the ischemic events that have been reported for the beach chair position are thought to be related to errors in interpretation of blood pressure values.^{8,15} Because hypotensive anesthesia is used to minimize bleeding, it is imperative that the blood pressure is measured appropriately. Placing the blood pressure cuff at the level of the heart rather than the calf and aggressively treating perioperative blood pressure values lower than 80% of preoperative resting values are ways to avoid cardiovascular complications of shoulder surgery in the beach chair position.⁸

CONCLUSIONS

Overall, the evidence regarding the efficiency, efficacy, and risks of the lateral decubitus and the beach chair position for shoulder arthroscopy does not show 1 position to be superior to the other (Table 2). However, there is a significant difference in the cost of equipment for the beach chair position if the surgeon chooses to use the beach chair attachments and/or a mechanical arm positioner. The complications associated with each position are rare and, for the most part, avoidable, and they should be considered when choosing a patient position. The lateral decubitus position puts neurovascular structures at greater risk, especially when using an anteroinferior portal. The risk of cardiovascular complications is greater for patients in the beach chair position, and hypertension and obesity further increase those risks. There is no objective, empirical evidence to support claims that either position is easier to set up or provides better surgical access. Therefore, after considering the costs and risks, there is no argument that can be made against a surgeon choosing a position based on their experience and comfort. Surgeons should choose the position that they are most comfortable with in order to perform the anticipated arthroscopic shoulder procedures.

REFERENCES

1. Gross RM, Fitzgibbons TC. Shoulder arthroscopy: A modified approach. *Arthroscopy* 1985;1:156-159.
2. Phillips BB. Arthroscopy of the upper extremity. In: Canale ST, Beaty JH, eds. *Campbell's operative orthopaedics*. Ed 11. Philadelphia: CV Mosby Elsevier, 2008;2923-2926.
3. Tibone JE. Diagnostic shoulder arthroscopy in the lateral decubitus position. In: Tibone JE, Savoie FH 3rd, Shaffer BS, eds. *Shoulder arthroscopy*. New York: Springer-Verlag, 2003; 3-8.
4. Terry MA, Altchek DW. Diagnostic shoulder arthroscopy technique: Beach chair position. In: Tibone JE, Savoie FH 3rd, Shaffer BS, eds. *Shoulder arthroscopy*. New York: Springer-Verlag, 2003;9-15.
5. Bonner KF. Patient positioning, portal placement, normal arthroscopic anatomy, and diagnostic arthroscopy. In: Cole BJ, Sekiya JK, eds. *Surgical techniques of the shoulder, elbow, and knee in sports medicine*. Philadelphia: WB Saunders Elsevier, 2008;3-5.
6. Skyhar MJ, Altchek DW, Warren RF, Wickiewicz TL, O'Brien SJ. Shoulder arthroscopy with the patient in the beach-chair position. *Arthroscopy* 1988;4:256-259.
7. Warren RF, Morgan C. Shoulder positioning: Beach chair vs. lateral decubitus: Point/counterpoint. *Arthroscopy Association of North America Newsletter*. 2008;March;4-5.
8. Papadonikolakis A, Wiesler ER, Olympio MA, Poehling GG. Avoiding catastrophic complications of stroke and death related to shoulder surgery in the sitting position. *Arthroscopy* 2008;24:481-482.
9. Costouros JG, Clavert P, Warner JJP. Trans-cuff portal for arthroscopic posterior capsulorrhaphy. *Arthroscopy* 2006;22: 1138.e1-1138.e5.
10. Hennrikus WL, Mapes RC, Bratton MW, Lapoint JM. Lateral traction during shoulder arthroscopy: Its effect on tissue perfusion measured by pulse oximetry. *Am J Sports Med* 1995; 23:444-446.
11. Gelber PE, Reina F, Caceres E, Monllau JC. A comparison of risk between the lateral decubitus and the beach-chair position when establishing an anteroinferior shoulder portal: A cadaveric study. *Arthroscopy* 2007;23:522-528.
12. Mullins RC, Drez D Jr, Cooper J. Hypoglossal nerve palsy after arthroscopy of the shoulder and open operation with the patient in the beach-chair position. A case report. *J Bone Joint Surg Am* 1992;74:137-139.
13. Park TS, Kim YS. Neuropraxia of the cutaneous nerve of the cervical plexus after shoulder arthroscopy. *Arthroscopy* 2005; 21:631.e1-631.e3.
14. Liguori GA, Kahn RL, Gordon J, Gordon MA, Urban MK. The use of metoprolol and glycopyrrolate to prevent hypotensive/bradycardic events during shoulder arthroscopy in the sitting position under interscalene block. *Anesth Analg* 1998; 87:1320-1325.
15. Pohl A, Cullen DJ. Cerebral ischemia during shoulder surgery in the upright position: A case series. *J Clinical Anesth* 2005; 17:463-469.
16. Klein AH, France JC, Mutschler TA, Fu FH. Measurement of brachial plexus strain in arthroscopy of the shoulder. *Arthroscopy* 1987;3:35-64.