



The Spider Limb Positioner in subscapular system free flaps

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ABSTRACT

Background: The subscapular system is a versatile vascular network that can provide multiple flaps for reconstruction of the head and neck. A significant drawback of using the subscapular system is that patient positioning can preclude the use of simultaneous two-team ablative and reconstructive surgery. Herein, we describe a novel use of an upper extremity limb positioner (Spider Limb Positioner) used primarily in orthopedic surgery to facilitate concurrent two-team technique in head and neck surgery.

Methods: Using a bean bag and the Spider Limb Positioner for the upper extremity, a semidecubitus position was used for subscapular donor site dissection. Ablative and reconstructive teams worked concurrently in all cases.

Results: This technique was utilized 78 times on 73 patients, with chimeric flaps used in 38% of cases. The average operative time was 466 min. Only one patient required repositioning intraoperatively due to a change in the subscapular donor site side. There were no nerve compression injuries or positioning related complications.

Conclusion: Scapular and parascapular free flaps are useful tools for reconstruction of the head and neck. In a two-team approach, the use of a semidecubitus position in conjunction with the Spider Limb Positioner facilitates exposure for the reconstructive team without compromising access for the ablative team.

Introduction

The subscapular system is a versatile vascular network for head and neck reconstruction. From this site, several single or multiple (chimeric) free tissue transplants can be harvested: the latissimus dorsi muscle or musculocutaneous free flaps, the serratus anterior muscle free flap, the parascapular fasciocutaneous free flap, the lateral scapula bone free flap, and the scapular tip bone free flap. In 1984 dos Santos first described the vascularization and dissection of the scapular region for free flap surgery. In this publication, a prone or lateral decubitus position was advocated [1]. These positions preclude the use of simultaneous two-team ablative and reconstructive surgery and sometimes necessitate intraoperative re-positioning when the donor site is used for reconstruction after head and neck oncologic surgery. This increases operative time, flap ischemia time, and the risk of contamination of the sterile surgical field and has impaired widespread acceptance of the scapular system for head and neck reconstruction. Since it was initially described, however, others have described subscapular system dissection via a modified supine approach, utilizing a surgical assistant to position the upper extremity during dissection [2–6].

In order to improve the ease of scapular system flap harvest, our institution uses a semidecubitus position with slightly less rotation to the dorsal decubitus position described by Paek et al. [7] This position, which involves utilizing a bean bag to position the pelvis and thorax with approximately 30 degrees of rotation, allows for simultaneous ablative surgery and subscapular system dissection [4]. To provide adequate visualization of the area, however, the thorax must be internally rotated while abducting and elevating the shoulder. This shoulder and arm position requires the use of either a paid assistant or trainee (e.g. medical student or resident), whose education may be subsequently compromised by the task of holding the upper extremity, as this precludes good visualization of the procedure. Additionally, the physical presence of an assistant to hold the upper extremity congests the operating room space. Eskander et al. recently published an alternative technique to avoid these pitfalls by utilizing a Mayo stand [8]. They describe successful two-team concurrent surgery of the subscapular system by using a 30 degree semilateral position with the use of a Mayo stand to position and secure the arm. As an alternative, our group has adopted the use of an upper extremity limb positioner (Spider Limb Positioner, Smith and Nephew, Andover, MA, USA) used

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Table 1
Spider arm set-up and positioning.

Positioning
1. The patient placed supine on bean bag.
2. The patient is minimally rolled to the contralateral side to expose the scapular tip and desired skin paddle.
3. The bean bag is inflated to maintain position.
4. The Spider arm is attached to bed such that first joint is at the level of the shoulder.
5. The hand is placed on the handle bar with the brace on the ulnar aspect of the hand.
6. The thumb is positioned under the handle bar in a natural position and the arm and hand are secured to the brace with the provided Velcro wrap and ***insert name of cling here)
7. At the time of harvest the brace is inserted into the sterile draped arm of the spider arm
8. The arm is positioned with extension at the shoulder with the thumb pointed medially in a natural position as the scapular tip is winged to facilitate harvest.
9. The arm is adjusted during the harvest and closure to facilitate ease of operating and simultaneous two team surgery while ensuring that the arm is always in a natural position.

Table 2
Demographic data for scapular free flap series using Spider Limb Repositioning System.

Characteristic	Number
Age, year (range)	60.2 (16–82)
Sex, N	
Male	50
Female	23
BMI, mean (range)	25.9 (14–48)
Operative Time, mean, min (range)	466 (153–900)
Ischemia Time, mean, min (range)	95.1 (45–225)
Donor Site, N	
Latissimus	53
Scapula	46
Parascapular	7
Serratus	3
Number of flaps, N	
1 Flap	48
2 Flaps	27
3 Flaps	3
Defect Site	
Midface	22
Oral Cavity	29
Neck	8
Scalp	7
Parotid	3
Pharynx	4
Need for Repositioning	1*
Nerve Injury from Spider Limb Positioner	0

* Patient repositioned in order to harvest contralateral scapular flap due to intraoperative flap loss.

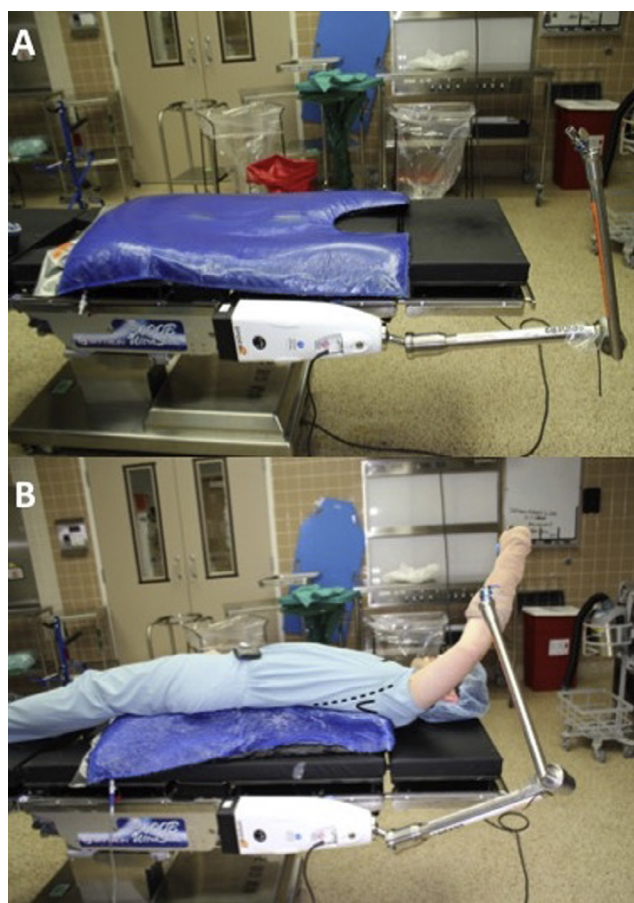


Fig. 1. Ideal patient positioning for two team approach. (A) The bean bag is inflated to give a semidecubitus position and the Spider Limb Positioner is used to fixate the upper extremity. (B) The patient is positioned so the scapular tip (solid curve) is lifted off the table for ease of dissection. The latissimus muscle edge is marked with dashed line.

primarily in orthopedic surgery in order to improve surgical visibility, decongest the operating room space, and decrease the number of personnel required to perform the harvest of free flaps from the subscapular system. The purpose of this study was to report the novel use of the Spider Limb Positioner to facilitate two-team surgery using subscapular system flaps in head and neck reconstruction.

Materials and methods

The Spider Limb Positioner was used 78 times on 73 patients (Table 1). Prior to the patient entering the operating room, a bean bag is placed on the operating table beneath the bed sheet. The beans are pushed to the ipsilateral side as the harvest site (Fig. 1A). The patient is then brought into the operating room and placed on the table in the standard supine position. After induction of anesthesia, the patient’s shoulders and thorax are rotated towards the contralateral side, which allows palpation the tip of the scapula within the prepped surgical field. The bean bag is then placed on suction to fixate the patient in a semidecubitus position (Fig. 1B). The anterior border of the latissimus, the soft tissue triangle, and the scapula are marked.

The Spider Limb Positioner is a second generation battery powered arm with three articulating joints, used frequently for upper extremity and shoulder orthopedic procedures [9]. In positioning patients for surgery, the ipsilateral upper extremity is affixed to the Spider Limb Positioner and prepped and draped into the field (Table 2). To minimize the potential risk for compression and nerve injury, the wrist is not placed into the brace until the reconstructive team is ready to harvest. Once the limb positioner is fixed to the patient, the arm is positioned with 90 degrees of flexion at the glenohumeral joint to bring the hand position directly anterior to the shoulder. With the addition of a small amount of medial rotation of the humerus, the scapula is pulled away from the thorax facilitating dissection of the area. This medial rotation is one significant benefit compared to other techniques, as it makes the dissection between the thorax and scapula significantly easier. The hand is positioned prone with the thumb directed medially for a comfortable and neutral position. Adjustments can be made to this position by using a foot pedal to lock and unlock the device throughout the case.

Results

We used the Spider Limb Positioner 78 times on 73 patients (Table 1). There were five patients who required additional operations

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