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Ultrasound-Guided Axillary Brachial Plexus Block as a Definitive Anesthetic Strategy in a Patient with Anticipated Difficult Airway Following Post-Burn Cervical Flap Reconstruction: A Case Report

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A B S T R A C T

Introduction: Airway management in patients with post-burn cervical flap reconstruction is challenging because hypertrophic scars, restricted neck mobility and limited mouth opening compromise both ventilation and laryngoscopy. Ultrasound-guided regional anesthesia is increasingly proposed as an alternative that preserves spontaneous ventilation and avoids airway instrumentation entirely. **Case presentation:** A 47-year-old woman scheduled for bilateral hand contracture release presented with extensive post-burn cervical flap reconstruction performed 15 years earlier, persistent neck contractures, facial scarring, Mallampati class III, limited inter-incisor distance and markedly reduced cervical extension. Routine laboratory and chest radiographic findings were within normal limits. An ultrasound-guided axillary brachial plexus block was selected as the sole anesthetic technique, using 20 mL of 2% lidocaine delivered in-plane around the median, ulnar, radial and musculocutaneous nerves. A complete sensorimotor block was achieved within 15 minutes. The procedure proceeded uneventfully without conversion to general anesthesia, and the patient remained hemodynamically stable with effective postoperative analgesia and no neurological deficit. **Conclusion:** Ultrasound-guided axillary brachial plexus block can serve as a safe and effective definitive anesthetic strategy for distal upper-limb surgery in post-burn cervical flap patients with anticipated difficult airway, supporting the principle that distance from the airway is itself a deliberate anesthetic plan.

1. Introduction

Burn injury is a major cause of acquired structural deformity worldwide, with the cervical region being particularly vulnerable to functional loss because of the inherent mobility of this anatomic zone and the relatively thin subcutaneous fat that is unable to dissipate thermal energy.[1] When deep dermal or full-thickness burns involve the anterior neck, healing occurs through hypertrophic scarring and contracture, with subsequent disorganized collagen deposition, persistent myofibroblast activity and reduction in skin compliance.[2] Reconstructive flap procedures—locoregional, fasciocutaneous or free—restore some functional capacity but leave behind a fibrotic envelope around the cervicofacial soft tissues that profoundly alters the anatomy relevant to airway management.[3]

Limited neck extension, reduced mouth opening, distortion of submandibular compliance, and obliteration of the anatomical landmarks needed for direct laryngoscopy combine to produce a markedly difficult airway in many of these patients.[4] The 2022 Practice Guidelines of the American Society of Anesthesiologists and the Difficult Airway Society 2015 algorithm both highlight the importance of advance planning, awake techniques where feasible, and a willingness to abandon airway instrumentation when a regional alternative exists.[3,4] Awake fiberoptic intubation has long been considered the gold standard in this scenario, but it requires patient cooperation, equipment availability and operator experience that are not uniformly accessible.[5] Even in expert hands, awake fiberoptic intubation remains an instrumented airway in tissue that may bleed, swell or react unpredictably to topical anesthesia.

Regional anesthesia offers a fundamentally different solution: by anesthetizing the surgical territory rather than the airway, it removes the airway from the equation altogether.[6] In acute and reconstructive burn surgery, Sheckter and colleagues have argued that regional techniques reduce opioid requirements, attenuate the systemic stress response, and improve perioperative respiratory profiles.[6] Among the brachial plexus approaches, the axillary block presents particularly attractive features for the cervical flap patient: it is performed at the axilla—a region remote from the burn field and unaltered by the cervical reconstructive scar; it does not require neck movement; and unlike the interscalene or supraclavicular approaches it carries no meaningful risk of phrenic nerve blockade or pneumothorax.[7-8]

Ultrasound guidance has, over the past two decades, transformed the safety and reliability of axillary brachial plexus block. Direct visualization of the axillary artery and the surrounding nerves, in-plane needle tracking and real-time monitoring of local anesthetic spread allow for a tailored circumferential perineural deposit while minimizing vascular puncture, intraneural injection and inadvertent systemic toxicity.[9,10] Systematic comparisons between the supraclavicular, infraclavicular and axillary approaches under ultrasound guidance show comparable efficacy for below-elbow surgery, with the axillary block carrying the lowest profile of respiratory complications.[11,12]

Despite this background, published descriptions of an exclusively ultrasound-guided axillary block as the sole anesthetic technique in adult patients with prior cervical flap reconstruction and an anticipated difficult airway remain scarce. Most case reports of difficult airway in burn populations focus on awake intubation, supraglottic airway placement, or pediatric anatomic variations.[13,14] The present case fills this gap by providing a structured, technique-oriented account of axillary block use in a 47-year-old woman with extensive cervicofacial scarring after flap reconstruction, undergoing bilateral hand contracture release.

The novelty of this case report is therefore twofold: it demonstrates that ultrasound-guided axillary brachial plexus block can serve as the definitive—not merely supplementary—anesthetic technique in a difficult-airway post-burn cervical flap patient, and it articulates a deliberate strategic principle that distance from a hostile airway is itself a safety-yielding anesthetic plan. The aim of this study is to describe the perioperative reasoning, technique and outcome that supported this strategy, and to derive practical learning points for anesthesiologists facing a similar clinical scenario.

2. Case Presentation

This case report has been prepared in accordance with the CARE guidelines for case reports. Written informed consent was obtained from the patient for the use of clinical data, images and publication of the report. Table 1 summarizes the patient's demographic and clinical characteristics relevant to the perioperative decision. Laboratory findings and preoperative investigations are detailed in Table 2, while the anesthetic and intraoperative timeline is presented in Table 3. A comparison with published cases of regional anesthesia in post-burn cervical contracture is presented in Table 4 within the Discussion.

History and examination

A 47-year-old woman, body weight 56 kg and height 158 cm (body mass index 22.4 kg/m^2), was scheduled for elective surgical release of bilateral post-burn hand contractures with split-thickness skin grafting. Her past medical history was dominated by a flame burn injury sustained 15 years earlier, with full-thickness involvement of the anterior cervical region, perioral and chest wall areas in addition to the dorsal aspect of both hands and the bilateral upper limbs. She had subsequently undergone multiple reconstructive procedures, including local fasciocutaneous flap rotation for the cervical region, contracture release of the lower face and chest, and staged hand contracture procedures.

On the morning of admission the patient described long-standing functional impairment of both hands with inability to extend the metacarpophalangeal and proximal interphalangeal joints, contracture-related skin maceration, and chronic pain on attempted gripping. She was independent in basic activities of daily living but required assistance for fine motor tasks. She denied dyspnea, orthopnea or stridor, slept comfortably in a single pillow, and tolerated routine speech and oral intake without choking. She had no history of cardiac disease, diabetes mellitus, hypertension, asthma, smoking or recreational drug use. Previous anesthetic exposures (during the original flap reconstruction and subsequent debridement procedures) had been uneventful according to family report, though formal records were unavailable.

On preoperative airway assessment, the patient demonstrated marked limitations consistent with chronic cicatricial change. The Mallampati score was class III, with the soft palate and the base of the uvula only barely visible. Inter-incisor distance was reduced to approximately 2.5 cm. The thyromental distance was estimated at 5 cm. Cervical extension was substantially restricted because of fibrotic anchoring of the chin to the chest wall, with neck extension of less than 30° from the neutral position. There was extensive perioral and submandibular scar with reduced compliance on palpation. The lower lip showed eversion and the corners of the mouth were tethered. Microstomia was present but mild. Despite these limitations the patient was not in respiratory distress at rest, with respiratory rate 18 breaths/min and SpO_2 99% on room air.

Cardiovascular examination demonstrated regular rate and rhythm, blood pressure 120/72 mmHg, heart rate 78 beats/min, no murmurs, capillary refill <2 seconds. Pulmonary auscultation was clear bilaterally. The abdomen was soft and unremarkable. Peripheral neurological examination of both upper limbs revealed intact gross sensation in the median, ulnar and radial nerve distributions, with the contracture-related restriction of motor function described above. Bilateral palmar surfaces showed hypertrophic scarring with band-like webs across the second to fifth digits.

Photographic documentation of the dorsal surface of the right upper limb and contracture pattern is presented in Figure 1, panel A. A plain anteroposterior radiograph of the right hand (Figure 1, panel B) showed no underlying osseous deformity but visualized the fixed flexion posture of the metacarpophalangeal joints. The cervicofacial reconstructive appearance is illustrated in Figure 2: the anterior view (panel A) demonstrates the rotational scar contour and tethered lip commissures, while the lateral view (panel B) shows fixed cervical flexion with obliteration of the submandibular triangle.

Laboratory and radiologic investigations

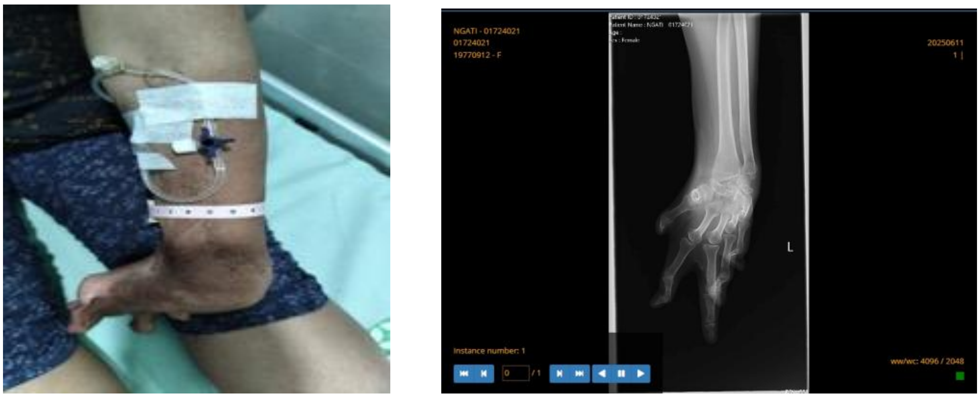
Routine preoperative investigations were unremarkable. Hemoglobin was 12.6 g/dL, hematocrit 38%, platelet count 268 × 10^9/L, and white cell count 7.4 × 10^9/L with a normal differential. Serum sodium was 138 mmol/L, potassium 4.1 mmol/L, urea 22 mg/dL and creatinine 0.7 mg/dL. Random blood glucose was 95 mg/dL. Hepatic enzymes were within normal range, with aspartate aminotransferase 24 U/L and alanine aminotransferase 22 U/L. Coagulation studies showed prothrombin time 11.8 seconds (INR 1.04) and activated partial thromboplastin time 30.4 seconds. Electrocardiography demonstrated sinus rhythm at 76 beats/min with no axis deviation, normal PR interval, and no repolarization abnormalities. The chest radiograph (Figure 3) demonstrated clear lung fields, a normal cardiothoracic ratio, and no evidence of fibrothorax or pleural change.

Laboratory and preoperative investigations are summarized in Table 2 with reference ranges and clinical interpretation, none of which contraindicated either general or regional anesthesia.

Table 1. Demographic, clinical and airway-assessment characteristics of the patient.

Parameter	Finding
Age/gender	47 years/female
Body weight/height/BMI	56 kg/158 cm/22.4 kg/m^2
ASA physical status	II (post-burn cicatricial change)
Burn history	Flame burn 15 years prior; full-thickness anterior cervical, perioral, chest, bilateral upper limbs
Reconstructive history	Cervical fasciocutaneous flap rotation; staged contracture release; multiple skin grafts
Planned surgery	Bilateral hand contracture release with split-thickness skin graft
Mallampati class	III
Inter-incisor distance	≈ 2.5 cm (reduced)
Thyromental distance	≈ 5 cm
Cervical extension	< 30° from neutral (markedly restricted)
Submandibular compliance	Reduced; tethered scarring
Predicted Cormack–Lehane	Grade III–IV
Resting respiratory status	RR 18/min, SpO_2 99% on room air
Cardiovascular status	BP 120/72 mmHg; HR 78/min; no murmurs
Comorbidities	Nil cardiac, pulmonary, endocrine or coagulation
Anesthetic plan	Ultrasound-guided axillary brachial plexus block, bilateral, sole technique

Footnote: BMI, body mass index; ASA, American Society of Anesthesiologists; BP, blood pressure; HR, heart rate; RR, respiratory rate.



(A) **(B)**

Figure 1. (A) Clinical appearance of the right hand demonstrating fixed flexion contractures of the metacarpophalangeal and interphalangeal joints; (B) plain radiograph of the right hand showing the fixed-flexion bony posture without primary osseous deformity.

(A) **(B)**

Figure 2. Cervicofacial appearance after burn injury and flap reconstruction. (A) Anterior view: rotational flap contour, perioral scar tethering, and microstomia. (B) Lateral view: fixed cervical flexion with obliteration of the submandibular triangle.

Table 2. Laboratory and preoperative investigations with reference ranges and clinical interpretation.

Investigation	Result	Reference range	Interpretation
Hemoglobin	12.6 g/dL	12.0–16.0 g/dL	Normal
Hematocrit	38%	36–48%	Normal
White cell count	7.4 × 10^9/L	4.0–11.0 × 10^9/L	Normal
Platelet count	268 × 10^9/L	150–450 × 10^9/L	Normal
Prothrombin time	11.8 s (INR 1.04)	11–13.5 s (INR 0.9–1.1)	Normal
aPTT	30.4 s	25–35 s	Normal
Sodium	138 mmol/L	135–145 mmol/L	Normal
Potassium	4.1 mmol/L	3.5–5.0 mmol/L	Normal
Urea / creatinine	22 mg/dL / 0.7 mg/dL	10–50 / 0.6–1.1 mg/dL	Normal
Random blood glucose	95 mg/dL	70–140 mg/dL	Normal
AST / ALT	24 / 22 U/L	< 40 / < 40 U/L	Normal
Electrocardiography	Sinus 76/min	—	Normal
Chest radiograph	Clear lungs, normal CTR	—	Normal

Footnote: aPTT, activated partial thromboplastin time; AST, aspartate aminotransferase; ALT, alanine aminotransferase; CTR, cardiothoracic ratio; INR, international normalized ratio.

Figure 3. Posteroanterior chest radiograph on admission showing clear lung fields, normal cardiothoracic ratio and no evidence of fibrothorax or pleural change.

Anesthetic plan and multidisciplinary decision

Preoperative multidisciplinary discussion involved the operating anesthesiologist, the senior anesthetic consultant, the operating plastic surgeon and the anesthetic nursing team. The combination of a Mallampati III airway, restricted cervical extension, a fixed-flexion neck due to cervical flap scar tissue, and limited inter-incisor distance prompted a Cormack–Lehane prediction of grade III–IV laryngoscopy. Mask ventilation was anticipated to be very difficult because of microstomia and reduced submandibular compliance. The clinical team estimated that the probability of failed direct laryngoscopy and subsequent difficult mask ventilation was substantial, yet the surgical site (distal upper extremities) was fully amenable to a peripheral nerve block strategy. After full discussion of risks and alternatives—including awake fiberoptic intubation, supraglottic airway insertion, and inhalational induction with maintenance of spontaneous ventilation—the consensus plan was an ultrasound-guided axillary brachial plexus block as the sole anesthetic technique with appropriate rescue plans on standby. Written informed consent was obtained, with explicit discussion of conversion options should the block prove inadequate.

Anesthetic procedure and block performance

On arrival in the operating theatre standard anesthetic monitoring was instituted, including five-lead electrocardiography, non-invasive blood pressure measurement at five-minute intervals, pulse oximetry and capnography via nasal cannula. A peripheral 18-gauge intravenous cannula was placed in the dorsum of the left foot to ensure secure intravenous access without compromising the operative field. Lactated Ringer's solution was infused at a maintenance rate of 80 mL/h. Baseline vital signs were blood pressure 124/76 mmHg, heart rate 80 beats/min, respiratory rate 16 breaths/min, SpO_2 99% on room air, and temperature 36.6°C. The patient was positioned supine with the right arm abducted to 90° and externally rotated, the elbow flexed and forearm supinated.

After surgical-site skin antisepsis with chlorhexidine 2% and the establishment of a sterile field, a high-frequency linear ultrasound transducer (10–15 MHz) was placed transversely in the proximal axilla. The pulsatile axillary artery was identified, with the median nerve seen anterolaterally, the ulnar nerve medially, the radial nerve posteromedially, and the musculocutaneous nerve embedded in the coracobrachialis muscle (Figure 4). A 22-gauge, 50 mm short-bevel block needle (Pajunk SonoPlex) was introduced in-plane from the lateral side of the probe under continuous real-time visualization. After negative aspiration, 5 mL of 2% lidocaine was deposited around the median nerve, followed by 5 mL adjacent to the ulnar nerve, 5 mL around the radial nerve and a final 5 mL around the musculocutaneous nerve, achieving circumferential donut-like spread at each target. A total volume of 20 mL of 2% lidocaine (400 mg total dose, 7.1 mg/kg) was used. No fascicular swelling, paresthesia or vascular puncture was encountered. The patient tolerated the procedure well, reporting only mild needling sensation.

Sensorimotor onset was assessed at 5-minute intervals using pin-prick and modified Bromage scoring of the affected limb. Complete sensory anesthesia in all four nerve distributions was achieved at 12 minutes, and complete motor block at 15 minutes. The same procedure was then repeated for the contralateral (left) limb under fresh sterile technique, using a further 20 mL of 2% lidocaine. Total local anesthetic dose for the case was 40 mL (800 mg) of 2% lidocaine, delivered with at least 30 minutes between sides to allow individual onset assessment and to keep peak plasma concentrations within accepted safety limits. No premedication or sedation was administered. The intraoperative timeline of anesthetic events is summarized in Table 3.

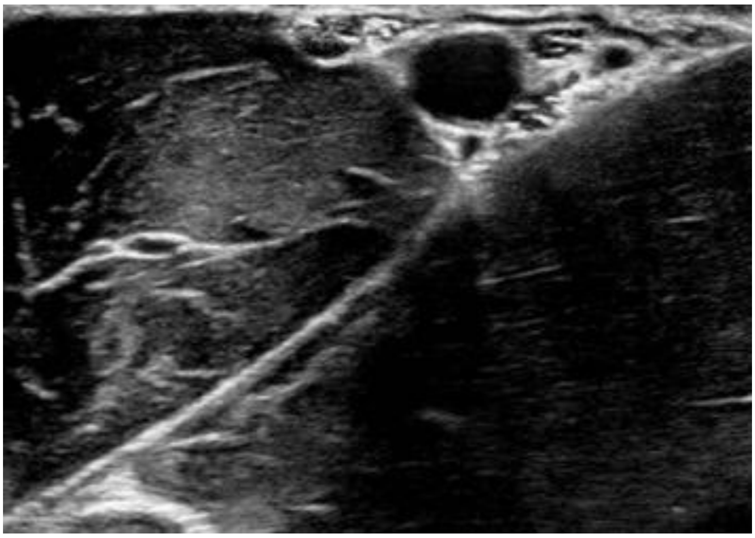


Figure 4. Sonographic image during ultrasound-guided axillary brachial plexus block, demonstrating the axillary artery (anechoic round structure) flanked by the median, ulnar and radial nerves; the musculocutaneous nerve is visible within the coracobrachialis muscle.

Table 3. Intraoperative anesthetic and surgical timeline (timestamps relative to OR arrival).

Time (min from arrival)	Event	Detail
0	Arrival in OR	Standard ASA monitoring; IV cannulation; 18-G dorsal foot vein
+5	Patient positioning	Supine, right arm abducted 90°, externally rotated
+8	Antisepsis & probe placement	Chlorhexidine 2%; high-frequency linear US transducer (10–15 MHz)
+10	Right axillary block	22-G short-bevel needle in-plane; 5 mL lidocaine 2% per nerve × 4 (median, ulnar, radial, musculocutaneous)
+25	Block assessment (right)	Complete sensory + motor block at 12–15 min
+45	Left axillary block	Repeat technique on contralateral side; 20 mL lidocaine 2%
+60	Block assessment (left)	Complete sensorimotor block confirmed
+78	Surgical incision	Bilateral hand contracture release with Z-plasty + STSG
+78 to +173	Intraoperative	Hemodynamics stable; SpO_2 99–100% RA; no sedation; EBL 80 mL
+173	Surgery complete	Transfer to PACU; no airway intervention required
+265	Block recovery onset	Motor recovery starting; oral acetaminophen 1 g
+413	Discharge to ward	Hemodynamically stable; pain NRS 3/10

Footnote: OR, operating room; PACU, post-anesthesia care unit; STSG, split-thickness skin graft; NRS, numerical rating scale; G, gauge; MAC, monitored anesthesia care.

Intraoperative course

Surgery commenced 18 minutes after completion of the second block. The operating plastic surgeon performed bilateral release of the metacarpophalangeal and proximal interphalangeal joint contractures, with Z-plasty fashioning and split-thickness skin grafting from the right thigh. Surgical duration was 95 minutes. Throughout the procedure, the patient remained alert and comfortable, conversing with the anesthetic team. Hemodynamics were stable, with mean arterial pressure between 78 and 92 mmHg, heart rate 70–88 beats/min, SpO_2 99–100% on room air and end-tidal CO_2 sampled via nasal cannula 32–36 mmHg. No additional intravenous opioid or sedative was required. Estimated intraoperative blood loss was 80 mL, replaced with maintenance crystalloid only.

There were no episodes of bradycardia, arrhythmia, hypotension, desaturation, perioral numbness, tinnitus, metallic taste or other prodromes of local anesthetic systemic toxicity. The patient was transferred to the post-anesthesia care unit at the end of the procedure without the need for airway support, supplemental oxygen or rescue analgesia.

Postoperative course and follow-up

In the recovery area, the patient remained hemodynamically stable. Numerical Rating Scale pain scores were 0/10 at the surgical sites for the first 90 minutes. The block recovery profile was consistent with lidocaine pharmacokinetics, with motor recovery beginning at approximately 2 hours and pin-prick recovery shortly thereafter. As block density waned, oral acetaminophen 1 g was administered, followed by ketorolac 30 mg intravenously at 4 hours; the patient declined opioid analgesia. Hand sensation, motor function and capillary refill were monitored hourly for the first 6 hours, with no neurological deficit. She was transferred to the surgical ward in stable condition.

On postoperative day one the patient ambulated independently, tolerated a normal diet and reported pain scores no higher than 3/10. The surgical wounds were clean and the grafts were viable. She was discharged on the second postoperative day on a regimen of oral acetaminophen and non-steroidal anti-inflammatory medication, with outpatient follow-up for graft surveillance at one and two weeks. Telephone follow-up at six weeks confirmed satisfactory functional improvement and absence of any neurological sequelae.

3. Discussion

This case demonstrates that an ultrasound-guided axillary brachial plexus block, deployed as the sole anesthetic technique with bilateral single-shot lidocaine deposition, can deliver safe and effective surgical anesthesia for the release of distal upper-limb contractures in an adult patient with cicatricial cervical flap reconstruction and an anticipated difficult airway. The strategic principle illustrated here is summarized by the deliberate choice to keep distance from the hostile airway: by anesthetizing the operative limb at the axillary level, the airway never needed to be instrumented, sedated or topicalized, eliminating an entire class of perioperative risk.[15,16]

The patient's airway features—Mallampati class III with reduced inter-incisor distance, restricted cervical extension, and tethered submandibular soft tissues—form a recognizable post-burn pattern that predicts both difficult laryngoscopy and difficult mask ventilation. Prakash and Mullick observed that cervical scar contractures impose fixed flexion of the cervical spine, reduce the distance between mandible and sternum, and obliterate the submandibular space necessary to displace the tongue during direct laryngoscopy.[1] Mishra and colleagues described an anatomically similar patient in whom multiple intubation attempts were required despite preoperative video laryngoscopy and fiberoptic equipment availability.[2] Mathur and colleagues highlighted the additional pitfall of distorted nasal anatomy, which can preclude the otherwise reliable awake nasal fiberoptic technique.[17,18]

The 2022 ASA Practice Guidelines[3] and the DAS 2015 algorithm[4] both recognize that when a difficult airway is anticipated, the anesthetic plan must include a clearly articulated default option that does not require successful airway instrumentation. In adult upper-extremity surgery, regional anesthesia satisfies this criterion in a way that few other strategies do: the airway is not merely managed differently, it is rendered irrelevant to the conduct of the operation. The literature on regional anesthesia in burn populations remains relatively limited but consistently positive, with Sheckter and colleagues describing reduced opioid use, faster post-operative recovery, attenuation of the catabolic stress response and improved hemodynamic profiles when peripheral nerve blocks are integrated into burn care pathways.[6]

The axillary approach to the brachial plexus, originally described by Hirschel in 1911 and refined progressively by transarterial, neurostimulator and ultrasound-based variants, has emerged as a particularly attractive technique for surgery at or distal to the elbow. Anatomically, the axillary sheath surrounds the median, ulnar, radial and musculocutaneous nerves at relatively superficial depths (typically 1–3 cm) and is unaltered by cervical or shoulder pathology. Compared to the interscalene approach, the axillary block carries no risk of phrenic nerve blockade, recurrent laryngeal nerve effect, or vertebral artery injection.[7] Compared with the supraclavicular approach, the risk of pneumothorax is essentially eliminated and there is no requirement to cross the cupula of the lung with the needle tip.[11]

In our patient the considerations against interscalene or supraclavicular blocks were not theoretical. A patient with restricted cervical mobility and chronic fibrosis of the soft tissues anterior to the lung apex would have had distorted ultrasound landmarks at the supraclavicular fossa, an elevated risk of pneumothorax due to scar-related thinning, and the additional potential of phrenic nerve blockade in a patient already exhibiting some baseline restriction of inspiratory mechanics from anterior cervical scar tension. The axillary level, by contrast, lay outside the entire cicatricial field and required no neck movement during transducer manipulation. The supine, abducted-arm position was easily tolerated.

Ultrasound guidance contributed several layers of safety. Direct visualization of the axillary artery oriented the operator within the axillary sheath and identified the four target nerves; in-plane needle tracking allowed continuous monitoring of the needle tip; hydro-localization with small aliquots of saline confirmed extra-fascicular needle position prior to local anesthetic deposition; and circumferential doughnut spread of local anesthetic around each nerve confirmed satisfactory perineural distribution.[9,10] The 2016 ASRA evidence-based assessment formalized these advantages into a structured grading of evidence and concluded that ultrasound guidance improves block onset and quality, reduces vascular puncture, and may modestly reduce the incidence of local anesthetic systemic toxicity.[9]

The choice of 2% lidocaine deserves particular comment. Lidocaine's rapid onset, predictable two-hour surgical block and well-characterized safety profile make it ideally suited to a single-shot brachial plexus anesthetic for a procedure of moderate duration.[19,20] The combined dose of 800 mg in our patient (40 mL across both axillae) was administered with at least 30 minutes between sides, providing time for assessment of block adequacy and minimizing the peak plasma concentration. With a weight of 56 kg, the 7.1 mg/kg per-side dose remained at the upper boundary of accepted safety thresholds, and the staggered approach kept the cumulative systemic exposure below the conventional 1000 mg/24-hour safety ceiling cited in pharmacology references.[21] Use of longer-acting agents such as levobupivacaine 0.25–0.5% or ropivacaine 0.5%, alone or in combination with lidocaine, would have offered prolonged postoperative analgesia and might have been reasonable choices in a different surgical timetable.[21,22]

Black and colleagues' recent review of local anesthetic systemic toxicity emphasizes vigilance for early signs—perioral numbness, tinnitus, metallic taste, agitation—particularly in the first 30 minutes after deposition.[23] None of these were observed in our patient. Standard precautions included incremental injection with intermittent aspiration, ECG monitoring throughout, immediate availability of intralipid 20% and resuscitation drugs, and a documented step-down plan in the event of LAST. The Auroy registry's landmark French complication data continue to inform our institutional standards, with the modern iteration of this dataset showing serious complications of regional anesthesia at well below 5 per 10,000 blocks.[22]

From the perspective of the patient experience, the avoidance of general anesthesia conferred several quantitative and qualitative advantages. There was no exposure to volatile anesthetic agents, no muscle relaxant residual, no postoperative nausea and vomiting and no sore throat from instrumentation. The ambulatory recovery profile was rapid, allowing early mobilization, oral intake and discharge planning. These benefits, well documented in the ambulatory and outpatient regional anesthesia literature,[24] are particularly meaningful in a patient with cicatricial neck and chest disease who would otherwise have faced a prolonged recovery period if airway instrumentation had been required.

Equally important was the absence of intra-operative sedation. Patients with reduced respiratory reserve due to restrictive thoracic involvement, as may occur after circumferential burn injury, are at greater risk of sedation-related airway compromise. Avoidance of sedation removed the principal mechanism by which a regional-anesthesia patient would still have required active airway management, namely loss of cooperation or obtundation. The patient remained fully conversant throughout the case, able to report any symptoms suggestive of LAST, sympathetic tachyarrhythmia, or block-related complaint.

Our outcome compares favorably with the limited published experience in this specific population, summarized in Table 4. Subramanyam reported successful regional nerve blocks supplemented by general anesthesia in a post-burn chest contracture patient with microstomia, but airway instrumentation was still required.[15] Pramono and Dewi described regional anesthesia successfully integrated into pediatric difficult airway management for neck contracture release.[13] Silwal and colleagues highlighted awake direct laryngoscopy for tracheal intubation in a resource-limited setting—an approach effective in expert hands but demanding in patient cooperation and equipment availability.[16] Kumar and colleagues described pre-shaped supraglottic airway devices as an alternative to endotracheal intubation in post-burn neck contracture.[17] Each of these strategies retains some degree of airway instrumentation; the present case shows that, when the surgical site is accessible to a peripheral block, complete avoidance of the airway is feasible and may be the safest option.

Several practical implications emerge from this synthesis. First, preoperative multidisciplinary discussion is essential; surgeons and anesthesiologists must agree on the operative window for which the regional technique will be sufficient and the precise rescue plan if it is not. Second, ultrasound competency is non-negotiable in this setting; blind or paresthesia-based techniques offer materially less safety in patients whose only fallback is a difficult airway. Third, the operating team must rehearse and have immediate access to all elements of the difficult-airway cart, including a video laryngoscope, fiberoptic bronchoscope, supraglottic airway devices in multiple sizes, and surgical airway equipment, irrespective of the regional plan.[25]

Table 4. Comparison of the present case with previously reported cases of regional anesthesia or alternative airway management in post-burn cervical contracture.

Author/Year	Patient profile	Anesthetic technique	Airway instrumented?	Outcome
Subramanyam, 2015[15]	Post-burn chest contracture with microstomia (adult)	Regional nerve blocks + GA	Yes — supplemental intubation	Successful but airway needed
Pramono & Dewi, 2022[5]	Pediatric post-burn neck contracture	Combined regional + GA with SAD	Yes — supraglottic airway	Successful, partial regional contribution
Silwal et al, 2023[16]	Adult post-burn contracture (resource-limited setting)	Awake tracheal intubation via DL	Yes — endotracheal intubation	Successful but airway-dependent
Kumar et al, 2022[17]	Post-burn neck contracture series	Pre-shaped SAD (no ETT)	Yes — supraglottic airway	Successful airway alternative to ETT
Mishra et al, 2022[2]	Post-burn contracture neck (adult)	Awake fiberoptic intubation	Yes — endotracheal	Successful with multiple attempts
Present case (2026)	Adult post-burn cervical flap; Mallampati III; bilateral hand contracture release	Bilateral US-guided axillary block, 2% lidocaine 20 mL/side	No — no airway instrumentation	Successful; no GA; rapid recovery; no complication

Footnote: GA, general anesthesia; SAD, supraglottic airway device; ETT, endotracheal tube; DL, direct laryngoscopy; US, ultrasound.

There are limitations to the generalizability of this case. The operation was a relatively short, distal upper-limb procedure amenable to a single-shot block; longer procedures or surgery extending proximal to the mid-humerus may exceed the predictable window of axillary block anesthesia and demand either a continuous catheter, supraclavicular approach, or multimodal supplementation. Patient cooperation was high; anxious or claustrophobic patients may not tolerate awake regional anesthesia in this setting and may require a small dose of sedation, which immediately reintroduces airway risk. Finally, our patient had no respiratory restriction at rest and no significant cardiopulmonary comorbidity; in patients with substantial restrictive lung disease from thoracic contracture, even a regional plan may need adjuncts such as supplemental oxygen, gentle positioning and continuous capnography to ensure ventilation adequacy.

Despite these limitations, the underlying lesson generalizes. The anesthesiologist confronting a post-burn cervical flap patient should consider, early and seriously, whether the operative anatomy is such that the airway can be removed from the equation altogether. Where this is possible, ultrasound-guided peripheral nerve blockade represents a decisive change in risk profile and a corresponding improvement in patient experience.

Several learning points crystallize from this case. The cervical flap patient should be approached with the assumption that airway instrumentation will be both difficult and hazardous, and the operating team should determine whether the surgical territory permits a regional alternative before defaulting to general anesthesia. The axillary block is anatomically distant from the burn field and free from the principal risks of more proximal approaches, making it an excellent first-line regional choice for distal upper-limb surgery in this population. Ultrasound guidance is integral to the safety of the technique, particularly given the absence of an instrumentable airway as backup. Finally, the choice of local anesthetic should reflect the duration and intensity of surgery, the cumulative dose ceiling for the patient's weight, and the postoperative analgesia plan.

Beyond the immediate clinical implications, this case raises broader considerations for the evolving role of regional anesthesia in burn and reconstructive surgery. As ultrasound technology becomes more widely available—including portable and handheld units suitable for resource-limited environments—the technical barriers to deploying blocks such as the axillary brachial plexus approach are progressively lowered. Continuous catheter techniques, in particular, can be combined with patient-controlled local anesthetic infusion to provide several days of analgesia after extensive contracture release procedures, reducing opioid burden and accelerating rehabilitation. A continuous infraclavicular or axillary catheter could plausibly have been chosen in this patient if longer postoperative analgesia had been desired, although the staged single-shot strategy proved adequate for the relatively short operative interval and was simpler to manage in our setting.

Quality-improvement opportunities also emerge. A structured preoperative checklist for the post-burn cervical flap patient could capture key airway features, the operative territory, and the regional-anesthesia feasibility assessment in a single decision aid, supporting earlier and more consistent identification of patients in whom regional anesthesia would be appropriate. Institutional registries that track outcomes across burn-reconstructive cases—including airway-related complications, block-related events, postoperative pain trajectories and discharge timelines—would build the evidence base required to formalize recommendations. A multinational case series of regional anesthesia in post-burn cervical flap patients would be a natural next step and would help differentiate scenarios in which complete airway avoidance is feasible from those in which a hybrid plan is needed.

Equally important is the human dimension. Patients with extensive post-burn deformity often endure repeated hospitalisations and anesthetic exposures across years or decades. The cumulative burden of general anesthetics, with their attendant airway risk, postoperative nausea, sedation, and disorientation, deserves explicit recognition in shared decision-making. The patient in our case had previously undergone multiple general anesthetics during her reconstructive trajectory and expressed clear preference for a non-airway-instrumented technique after the procedure, citing improved comfort, faster recovery and absence of postoperative sore throat. This experiential dimension, while subjective, is an important component of the overall value proposition of the regional approach and reinforces the case for considering it earlier and more deliberately in similar patients.

4. Conclusion

Ultrasound-guided axillary brachial plexus block can serve as a safe, effective and definitive anesthetic strategy for adult patients with anticipated difficult airway following post-burn cervical flap reconstruction undergoing distal upper-limb surgery. In our 47-year-old patient with bilateral hand contractures, Mallampati III airway, restricted cervical extension and extensive cicatricial cervicofacial scarring, bilateral single-shot blocks with 20 mL of 2% lidocaine on each side delivered complete sensorimotor anesthesia, supported a stable hemodynamic and respiratory profile throughout a 95-minute procedure, and avoided airway instrumentation entirely. The patient experienced effective postoperative analgesia, recovered without complication and was discharged on the second postoperative day. The central principle—that distance from a hostile airway is itself an anesthetic plan—deserves wider recognition in the management of post-burn cervical flap patients. We recommend that anesthesiologists evaluating such patients consider, early in their preoperative deliberation, whether the operative anatomy is amenable to a peripheral regional technique, and that they invest in the ultrasound competency necessary to deploy that technique safely. Future prospective work, including registry data and structured outcome reporting, would help to consolidate the place of regional anesthesia as a primary—not rescue—strategy in this challenging population.

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