

The corner pocket and beyond: a narrative review of the supraclavicular block and its variants

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Abstract

The supraclavicular brachial plexus block remains a reliable and time-efficient technique for surgical anaesthesia and postoperative analgesia for upper limb procedures. Ultrasound guidance has improved visualisation of the plexus, subclavian vessels, first rib and pleura, but clinically important risks persist, including pneumothorax, vascular puncture, local anaesthetic systemic toxicity, nerve injury and hemidiaphragmatic paresis. Contemporary practice has moved beyond the traditional cluster injection toward more anatomy-directed strategies. Corner pocket and intertruncal approaches aim to improve coverage of the inferior trunk and the ulnar nerve, while selective trunk and superior trunk blocks allow more tailored sensory profiles for whole-limb or shoulder-focused indications. Continuous supraclavicular catheter techniques, including proximal longitudinal oblique approaches, may expand the role of supraclavicular blockade in shoulder analgesia while reducing, but not abolishing, diaphragmatic involvement compared with interscalene techniques. This narrative review summarises the relevant anatomy, historical evolution, named variants, clinical efficacy, complications, local anaesthetic strategies, adjuvants, and catheter techniques related to the

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supraclavicular brachial plexus block. It also proposes a practical decision-making framework to guide technique selection based on surgical site, need for ulnar coverage, anticipated duration of analgesia, pulmonary reserve, coagulation status, and patient-specific risk. Meticulous ultrasound technique, appropriate volume selection, as well as readiness to manage complications remain central to safe and effective practice.

Keywords: brachial plexus block, nerve block, peripheral nerves, postoperative pain, ultrasonography

Introduction

The supraclavicular brachial plexus block (SCB), long referred to as the “spinal of the upper limb”, remains a reliable and time-efficient approach for regional surgical analgesia for upper limb procedures due to the compact arrangement of the brachial plexus as trunks and divisions in the supraclavicular fossa.^{1,2} Ultrasound guidance has transformed its clinical use by allowing direct visualisation of the plexus, subclavian vessels, first rib and pleura, thereby reducing but not eliminating complications such as pneumothorax, vascular puncture, local anaesthetic (LA) systemic toxicity, and nerve injury.²⁻⁶ Importantly, SCB should not be considered reliably phrenic-sparing, and hemidiaphragmatic paresis (HDP) remains a key consideration in patients with limited pulmonary reserve.⁷⁻⁹

Contemporary SCB practice has moved beyond a single “cluster” injection concept to variants with more anatomy-directed approaches. Corner pocket and intertruncal techniques aim to improve inferior trunk and ulnar nerve cover, while selective trunk and superior trunk blocks reflect increasing interest in customised block profiles.¹⁰⁻¹⁵ Continuous supraclavicular catheter techniques, including proximal longitudinal oblique SCB, may extend the role of supraclavicular approaches in shoulder analgesia while potentially reducing diaphragmatic involvement compared with interscalene catheters.^{16,17}

This narrative review summarises the relevant anatomy, historical development, named variants, clinical efficacy, complications, LA strategies, adjuvants, and catheter techniques related to SCB. It also provides a practical comparison of major variants and a decision-making framework to guide technique selection based on surgical site, pulmonary reserve, need for ulnar coverage, duration of analgesia and patient-specific risk.

Methods

This review used an evidence prioritised approach: (i) adult perioperative upper-limb surgery focus; (ii) preference for English language randomised controlled trials (RCTs), systematic reviews or meta-analyses, large observational cohorts or registries, and anatomy or sonoanatomy technique papers; (iii) inclusion of seminal pre-ultrasound landmark techniques for historical context and risk framing. Literature searches were conducted up to March 2026 using targeted combinations of terms associated with SCB, named variants, complications, catheter techniques, and adjuvants.

Anatomy relevant to the supraclavicular brachial plexus block

At the supraclavicular fossa, the brachial plexus is most commonly visualised as a cluster posterolateral to the subclavian artery, resting on the first rib with the pleura lying deep, an arrangement that explains both the efficacy of the SCB and its characteristic complication profile, including dorsal pneumothorax, vascular puncture, and

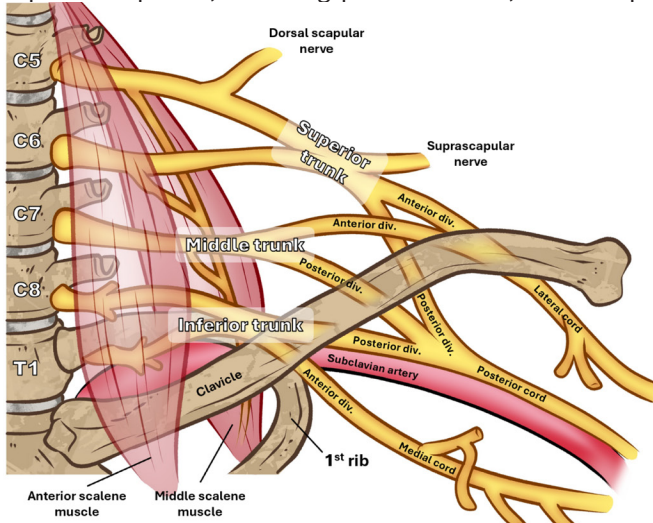


Fig. 1. Anatomy of the brachial plexus above and below the clavicle showing the ventral rami, trunks, divisions, cords and terminal branches of the brachial plexus in relation to the cervical spine, first rib, and clavicle. The compact arrangement of the plexus at the supraclavicular fossa explains the reliability of the supraclavicular brachial plexus block, while its proximity to the first rib, pleura, and subclavian vessels underpins the importance of ultrasound-guided needle-tip visualisation.

potential spread towards the cervical sympathetic chain and phrenic nerve.¹⁸ The anatomical relationship of the brachial plexus to the cervical spine, first rib, clavicle, and adjacent vascular structures is illustrated in Figure 1.

Modern microsoneanatomy work reveals that, rather than a simple single sheath, the supraclavicular brachial plexus is organised with epineurium around each trunk and a surrounding paraneural sheath that can channel LA spread. This framing underpins the distinction between an extrafascial injection (outside the paraneural sheath), intracluster injections (within the sheath or cluster to accelerate onset), and intertruncal injections (within adipose tissue planes between trunks to avoid violating trunk epineurium).¹¹

The use of high-definition ultrasound to identify individual components of the supraclavicular brachial plexus has become increasingly important because SCB variants aim to target these specific elements, *e.g.*, the inferior trunk to guarantee ulnar coverage or the superior trunk for shoulder analgesia. High-definition sequential ultrasound imaging has refined understanding of the brachial plexus above the clavicle by demonstrating that its individual elements are able to be systematically identified rather than treated as a single compact cluster. Karmakar *et al.* showed that a systematic scan, described as the sequential ultrasound imaging technique (SUIT) using the C7 transverse process as a key landmark, could identify the C5–T1 ventral rami, the three trunks, the suprascapular nerve, and the formation of the inferior trunk in healthy volunteers, providing an anatomical basis for superior trunk, selective trunk, and inferior trunk-directed approaches.¹⁹ Songthamwat *et al.* subsequently demonstrated that SUIT is reproducible, with moderate overall inter-rater agreement and particularly consistent visualisation of the C5–C6 ventral rami and superior trunk; however, the T1 ventral ramus and inferior trunk were less frequently and less reliably visualised.²⁰ These findings support the move beyond “cluster blocking” towards element-level targeting, while also highlighting why selective inferior trunk coverage remains technically challenging.

Techniques and named variants

Landmark and “subclavian perivascular” family

The classical SCB approach historically depended on surface landmarks and eliciting paraesthesia in the era of “no paraesthesia, no anaesthesia”. Early and mid-20th century descriptions culminated in the subclavian perivascular concept, which aimed to use the vascular anatomy as a consistent landmark for block performance.²¹

In a large prospective series of 1,001 consecutive subclavian perivascular blocks performed with a nerve stimulator and 35–40 ml LA, block success was high (98.8%), and no clinically evident pneumothorax was reported, illustrating both the potential performance of non-ultrasound methods and their reliance on higher volumes and indirect endpoints.²² Despite these successes, landmark or perivascular approaches have become less favoured in current practice largely due to the advent of ultrasound-guidance, which facilitates simultaneous visualisation of the pleura, first rib, artery, and plexus, whilst allowing active needle trajectory control and smaller incremental injections.²

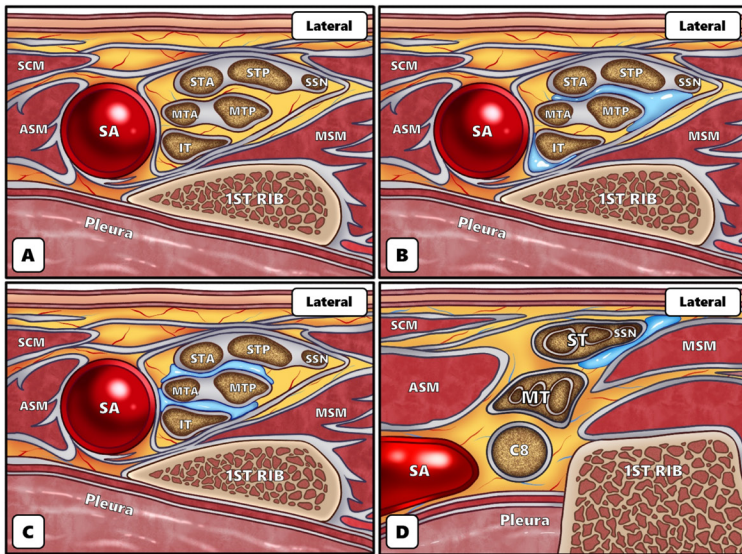


Fig. 2. Schematic illustrations of transverse ultrasound sonoanatomy and selected supraclavicular brachial plexus block approaches. (A) Baseline supraclavicular anatomy showing the brachial plexus as a compact neural cluster posterolateral to the subclavian artery and superficial to the first rib and pleura. (B) Classical ultrasound-guided supraclavicular brachial plexus block using a double-injection technique. The first injection is directed to the corner pocket, located between the subclavian artery, first rib, and inferior aspect of the neural cluster, followed by a second injection into the centre of the neural cluster. (C) Intertruncal approach with local anaesthetic deposition between the middle and inferior trunks, followed by a second injection between the superior and middle trunks. (D) Superior trunk block, showing local anaesthetic deposition around the superior trunk. SA, subclavian artery; ASM, anterior scalene muscle; MSM, middle scalene muscle; SCM, sternocleidomastoid muscle; STA, superior trunk anterior division; STP, superior trunk posterior division; SSN, suprascapular nerve; MTA, middle trunk anterior division; MTP, middle trunk posterior division; IT, inferior trunk

Classical ultrasound-guided supraclavicular block (“cluster” technique)

In the classical approach to the ultrasound-guided SCB, the brachial plexus is targeted where it appears as a compact cluster of hypoechoic trunks and divisions posterolateral to the subclavian artery at the level of the first rib. Contemporary descriptions commonly use an in-plane lateral-to-medial trajectory, directing the needle first toward the “corner pocket” between the subclavian artery and the brachial plexus, followed by a second injection into the centre of the main neural cluster (Fig. 2). In the double-injection technique described by Techasuk *et al.*, 16 ml was deposited within the main neural cluster and 16 ml at the corner pocket, while a more recent classical approach used 15 ml at the corner pocket and 10 ml centrally within the neural cluster.^{23,24}

This approach remains clinically robust. In a large multi-operator series of 510 ultrasound-guided SCBs performed by 47 operators among different training levels, successful surgical anaesthesia was achieved in 94.6% of patients after a single attempt, 2.8% required supplementation of one peripheral nerve territory, and 2.6% required unplanned general anaesthesia, with no clinically symptomatic pneumothorax reported.² However, the classical “cluster” approach is not purely anatomical targeting of individual plexus elements. Its effectiveness depends on adequate spread within and around the compact neural cluster, which explains both its reliability and its limitations, particularly ulnar sparing when inferior trunk coverage is incomplete. This has provided the rationale for the following variant approaches. The major supraclavicular and related trunk-level variants, including their injection strategies, clinical rationale, trade-offs, and evidence signals, are summarised in Table 1.

Corner pocket approach

The “corner pocket” target is the inferolateral region adjacent to the subclavian artery and above the first rib, chosen to improve spread toward the inferior trunk or divisions and reduce ulnar sparing (Fig. 2).¹⁰ In practice, the corner pocket’s safety trade-off is that the target is anatomically closer to the pleura, thus the technique requires rigorous tip visualisation and confirmation that the needle does not drop below the first rib line.

Intertruncal approach

The intertruncal approach proposes purposeful injection into the two adipose planes between the upper-middle and middle-lower trunks with the goal of avoiding intraneural or intracluster injection by respecting trunk epineurium and keeping the needle endpoint farther from pleura than the corner pocket endpoint, theoretically reducing pneumothorax risk (Fig. 2).¹¹ Clinical trials show a nuanced picture. In an RCT designed around ulnar nerve blockade, intertruncal injection produced higher rates of complete ulnar sensory and motor block at 15 minutes and shorter

Table 1. Comparison of supraclavicular block variants

Technique	Typical injection strategy	Rationale	Trade-offs and cautions	Evidence signals
Classical ultrasound-guided (“cluster”) approach	Spread around plexus cluster; often includes a corner pocket and central component.	General elbow-to-hand surgery; fast dense block.	HDP risk; Horner’s syndrome; proximity to pleura.	High success in large series; RCTs show ~95% success rates. ²
Corner pocket (inferior trunk) approach	Deposit at subclavian artery-first rib “corner”.	Reduce ulnar sparing.	Proximity to pleura.	RCT: may still have ulnar sparing depending on implementation. ¹⁰
Intertruncal (between trunks) approach	Deposit between lower-middle and upper-middle trunks.	Maintain pleural distance; avoid trunk epineurium; improve ulnar block onset.	Longer imaging and performance time; may increase HDP.	RCT: improved early ulnar block vs corner pocket; not non-inferior vs mixed classical technique; HDP higher in 1 RCT. ¹¹
Selective trunk block (SeTB)	Smaller volumes targeted to trunks.	Whole upper limb anaesthesia.	HDP risk; complexity depends on element identification.	Cohort success 93%, but HDP 82%. ¹²
Superior trunk block (STB)	Inject around the superior trunk (C5-C6).	Shoulder or proximal humerus surgery; reduced HDP risk vs interscalene.	May not provide distal arm or hand anaesthesia.	RCT: lower HDP vs interscalene with similar analgesia. ¹³
Continuous PLO-SCB catheter	Low-volume bolus and continuous infusion via PLO path.	Major shoulder surgery where HDP risk precludes interscalene catheter.	Requires catheter skillset and monitoring; HDP not eliminated.	RCT: non-inferior analgesia; lower early and late HDP. ¹⁷

HDP: hemidiaphragmatic paresis; RCT: randomised controlled trials; PLO-SCB: proximal longitudinal oblique supraclavicular block

ulnar sensory onset versus a comparator corner pocket strategy.¹⁰ A second RCT similarly found higher proportions of complete ulnar and “all four terminal nerve” blockade at 15 minutes with intertruncal injection, but at the cost of longer block performance time and greater patient discomfort scores.²⁵ Notably, the comparator corner pocket strategy produced longer ulnar sensory duration.

However, a larger non-inferiority RCT comparing intertruncal double injections (15 ml between middle-inferior trunks and 10 ml between superior-middle trunks) against a “classical” mixed technique (15 ml corner pocket and 10 ml intracluster central) did not confirm non-inferiority for complete sensory blockade at 20 minutes and found worse musculocutaneous blockade, longer performance time, and higher HDP incidence in the intertruncal group.²⁴

Selective trunk block and superior trunk block

The selective trunk block (SeTB) targets individual trunks with comparatively small volumes per trunk to attempt predictable coverage of the whole upper extremity, except typically T2 territory, while providing a conceptual framework for “whole-limb” anaesthesia without very proximal root injections.¹² In a single-centre cohort study, SeTB with 25 ml of LA (7, 8, and 10 ml to the superior, middle, and inferior trunks, respectively) for upper-extremity surgery resulted in a 93% block success rate with relatively rapid sensorimotor blockade dynamics.¹² However, ipsilateral HDP was present in 82%, a reminder that “selective trunk” does not necessarily mean “phrenic sparing” when injections occur sufficiently proximal or within contiguous fascial planes.

The superior trunk block (STB) specifically targets C5–C6 components after they merge into the superior trunk but before major branch points and was developed as a diaphragm-sparing alternative to conventional interscalene block for shoulder or proximal humerus surgery (Fig. 2).²⁶ In a humerus surgery RCT, STB using 15 ml 0.5% bupivacaine markedly reduced diaphragmatic paresis compared with interscalene block while providing similar analgesia.¹³ This is consistent with earlier randomised evidence in arthroscopic shoulder surgery, where STB provided non-inferior surgical anaesthesia or analgesia compared with interscalene block while substantially preserving diaphragmatic function.^{27,28} A recent systematic review and meta-analysis similarly supports STB as an effective phrenic-sparing alternative to interscalene block for shoulder arthroscopy, although ongoing work is still needed to define optimal LA volume, spread patterns, and patient selection.²⁹ Overall, SeTB and STB should therefore be viewed as related but distinct trunk-level strategies: SeTB aims for comprehensive upper limb coverage, whereas STB prioritises shoulder analgesia with a lower risk of phrenic nerve involvement.

Intercostobrachial nerve block (T2)

Adjunct intercostobrachial nerve block is useful when the expected limitation of SCB is T2-mediated cutaneous sparing rather than incomplete brachial plexus anaesthesia. Because the intercostobrachial nerve is not part of the brachial plexus, SCB does not reliably cover the axilla or medial upper arm, making supplementation relevant for upper arm surgery, arteriovenous access procedures, and medial arm tourniquet discomfort.³⁰ In a randomised observer-blinded trial of SCB for upper arm arteriovenous access surgery, proximal and distal ultrasound-guided intercostobrachial nerve blocks produced similar surgical anaesthesia rates of 93.3%, although the proximal approach more consistently covered both the medial upper arm and axilla.³¹ Targeted intercostobrachial blockade may therefore be preferable to increasing SCB volume when the anticipated sensory gap is limited to T2 or medial upper arm coverage.

Evidence synthesis across outcomes and complications

Effectiveness outcomes

Across modern ultrasound-guided practice, SCB commonly achieves high surgical anaesthesia success rates with performance times that are generally competitive with other approaches and that are sensitive to the number of injection sites and required needle passes.² In an RCT directly comparing ultrasound-guided supraclavicular, infraclavicular and axillary blocks for elbow-to-hand surgery, success rates were similar (95%–97.5%) and total anaesthesia-related time was similar (23–26 min).³² SCB produced a substantially higher Horner's syndrome rate (37.5%), a pattern consistent with more cephalad spread potential near cervical sympathetic structures.

Ulnar-nerve sparing and time-to-readiness are key discriminators among SCB variants. Two RCTs found that intertruncal approaches improved early ulnar sensory or motor completeness compared with corner pocket approaches at 15 minutes, with faster ulnar onset but longer performance time and greater patient discomfort.¹⁰ When compared with a “classical” mixed strategy incorporating corner pocket plus intracluster injection, intertruncal injection did not meet the non-inferiority criterion for complete sensory block at 20 minutes and showed longer performance time.²⁴ These comparative findings are reflected in Table 1.

Analgesia, opioid-sparing, and patient-centred outcomes

Peripheral nerve blocks for upper limb surgery are associated with prolonged postoperative analgesia and avoids the complications of general anaesthesia, including postoperative nausea and vomiting and sore throat, which has contributed to their adoption in ambulatory pathways.²

For shoulder surgery where the interscalene block has been the traditional gold standard, continuous supraclavicular approaches have emerged as a safer and viable option for prolonged postoperative analgesia. In open rotator cuff repair, continuous SCB produced comparable 24-hour pain scores to continuous interscalene while reducing the incidence of HDP at early and 24-hour time points.¹⁶

In a more recent double-blind RCT in arthroscopic shoulder surgery, a novel continuous proximal longitudinal oblique supraclavicular block (PLO-SCB) technique with an initial 5 ml 0.75% ropivacaine bolus followed by patient-controlled 0.15% ropivacaine infusion achieved similar pain scores compared to continuous interscalene block while dramatically reducing early HDP (0% vs 73.7% at 30 minutes).¹⁷

Procedure time and learning curve

Comparative studies of ultrasound guidance versus peripheral nerve stimulation (PNS) for SCB generally favour ultrasound for procedure efficiency and block dynamics, although the degree of benefit varies according to operator experience, definitions of onset and study setting. In one randomised trial, ultrasound guidance significantly reduced procedure time compared with PNS guidance, from 21.7 to 11.6 minutes, and was associated with shorter sensory and motor onset times, with no complications observed in either group.³³ However, procedure time is also influenced by the chosen ultrasound-guided variant: techniques that require deliberate identification of individual trunks or intertruncal planes may increase imaging and performance time compared with classical cluster or corner pocket approaches, particularly during the learning phase.²⁵

Beyond technical performance, ultrasound-guided SCB is also highly relevant as a training model because its compact sonoanatomy, consistent vascular landmark, and close pleural relationship require deliberate probe handling and continuous needle-tip visualisation. In a prospective cohort of trainees with no prior experience in ultrasound-guided regional anaesthesia, structured theoretical and simulation-based training before supervised clinical practice resulted in a 96% overall block success rate and a very low observed complication incidence.³⁴ This is consistent with contemporary regional anaesthesia education literature, which supports simulation as a bridge between didactic teaching and supervised clinical practice, allowing trainees to rehearse sonoanatomy recognition, probe-needle

coordination, safe injection behaviour, and complication management before patient exposure.³⁵

Complications: comparative synthesis

Pneumothorax

Historically, pneumothorax rates for landmark-based supraclavicular approaches were reported in the range of 0.6%–6.1%, contributing to the technique's decline before the ultrasound era.² In a large ultrasound-guided supraclavicular series, no clinically symptomatic pneumothorax occurred, while in a larger prospective observational study of 6,366 ultrasound-guided periclavicular blocks, clinically symptomatic pneumothorax occurred in 4 cases (0.06%).^{2,3}

Despite low incidence, pneumothorax is a high-impact event and can present late; case reports and safety analyses recommend explicit counselling, clear post-discharge instructions, and systematic training in needle visualisation and discrimination of rib and pleura.³⁶

Vascular puncture, haematoma, and local anaesthetic systemic toxicity

Vascular puncture remains an important minor-to-moderate complication of SCB. Ultrasound guidance reduces this risk by allowing identification of the subclavian artery, vein, and nearby vascular variants, but it does not eliminate vascular puncture entirely, as demonstrated in a case series by Perlas *et al.* where unintended vascular puncture occurred in 0.4%.²

While the SCB is generally considered lower risk than neuraxial techniques in patients on antithrombotics, the 2025 American Society of Regional Anesthesia and Pain Medicine (ASRA) guidelines highlight that major vascular structures near the plexus mean haematoma risk must still be carefully assessed, especially in patients on anticoagulation or dual antiplatelet therapy.³⁷ Similarly, the 2022 European Society of Anaesthesiology and Intensive Care (ESAIC) guidelines stress that compressible sites such as the supraclavicular region still warrant caution, particularly in those with impaired coagulation, with timing of anticoagulant cessation and resumption adjusted to minimise bleeding risk.³⁸

Local anaesthetic systemic toxicity (LAST) after SCB is rare but remains a high-consequence event because relatively large doses of LA are often deposited close to major vascular structures. Large registry data suggest that ultrasound guidance reduces the risk of LAST after peripheral nerve blockade, but case reports continue to describe both early and delayed toxicity after SCB, including

late-onset cardiovascular toxicity.^{4,39} Therefore, SCB should be performed with dose calculation, fractionated injection, frequent aspiration, visualisation of LA spread, appropriate monitoring, and immediate access to a LAST rescue protocol.

Nerve injury

Severe or permanent nerve injury after SCB is rare, and postoperative neurological symptoms are difficult to attribute solely to the block because surgical, positioning, tourniquet-related, and patient factors may contribute. Nevertheless, case reports of prolonged neurological recovery after ultrasound-guided SCB highlight that serious nerve injury, although uncommon, remains possible.⁴⁰ Mechanistic and advisory literature implicates direct needle trauma, intrafascicular injection, and high injection pressure as modifiable risks; therefore, contemporary practice favours a multimodal safety strategy incorporating continuous needle-tip visualisation, avoidance of intentional intraneural injection, incremental low-pressure injection with aspiration, cessation of injection with pain or paraesthesia, and injection-pressure monitoring where available.⁵

Phrenic nerve palsy and hemidiaphragmatic paresis

The SCB is not reliably phrenic-sparing. Although ultrasound guidance can significantly reduce HDP compared with nerve stimulation, as shown by Renes *et al.* with 0% versus 53% HDP using 20 ml ropivacaine, later studies show that diaphragmatic involvement remains technique- and volume-dependent.⁷ Tedore *et al.* found HDP across volumes from 5 to 40 ml and concluded that no clinically reliable volume threshold avoids HDP, while Petrar *et al.* reported complete HDP in 34% after SCB, compared with 3% after infraclavicular block using 30 ml ropivacaine.^{8,9}

Variant approaches may also modulate risk: in a 2025 RCT, intertruncal injection produced higher HDP than a classical corner pocket combined with intracluster technique (47.3% vs 25.9%) and required longer performance time.²⁴ Thus, while HDP after SCB is often tolerated in patients with normal respiratory reserve, infraclavicular or costoclavicular approaches, and diaphragm-sparing shoulder blocks such as STB or PLO-SCB catheter techniques, should be preferred when preservation of diaphragmatic function is critical.¹⁷

The practical implications of these complication profiles for block choice are summarised in Table 1, while specific safety measures are outlined in Table 2.

Table 2. Evidence-supported recommendations for supraclavicular block

Tip	Why it matters	Evidence or Rationale
Always identify first rib as a “hard backstop” and distinguish it from pleura before needling.	Prevents inadvertent pleural puncture when targeting inferior spread.	Pneumothorax remains possible and may present late; ultrasound reduces but does not eliminate risk. ³
Use incremental injection with continuous tip visibility and stop if injection is painful or high-pressure.	Reduces risk of intrafascicular injection and nerve injury.	Practice advisories link injury to intraneural injection and high pressure; multimodal monitoring recommended. ⁵
Treat SCB as “not phrenic-sparing” in preoperative planning; tailor volume and approach to pulmonary reserve.	HDP can be clinically meaningful in COPD or limited respiratory reserve; volume-HDP relationship exists.	HDP variability across trials; dose-response evidence; comparative phrenic sparing with PLO-SCB, STB, or costoclavicular. ⁹
If ulnar sparing would be costly (hand surgery), consider inferior-coverage strategies (corner pocket or intertruncal), but anticipate longer imaging time for intertruncal.	Ulnar sparing is a common failure mode at supraclavicular level.	RCTs show improved early ulnar block with intertruncal vs corner pocket in some settings; performance time trade-off. ¹⁰
For upper arm tourniquet or axillary cutaneous pain, plan adjunct blocks (e.g., intercostobrachial nerve).	SCB may not reliably cover T2/intercostobrachial nerve territory.	RCT evidence in arteriovenous access surgery context; longstanding anatomical rationale. ³¹
Maintain LAST readiness whenever using potentially toxic doses; use cognitive aids and lipid rescue protocols.	LAST is rare but life-threatening and time-critical	Updated LAST checklist and practice advisory emphasise preparedness and early lipid use. ⁴⁷
In anticoagulated patients, follow deep plexus or deep peripheral block guidance and prefer compressible sites or approaches when risk is high.	Haematoma near supraclavicular or infraclavicular plexus can be high-consequence.	Evidence-based anticoagulation guidance from major societies is readily available; peripheral blocks vary in bleeding risk. ^{37,38}

SCB: supraclavicular brachial plexus block; COPD: chronic obstructive pulmonary disease; HDP: hemidiaphragmatic paresis; PLO-SCB: proximal longitudinal oblique supraclavicular block; STB: superior trunk block; RCT: randomised controlled trials; LAST: local anaesthetic systemic toxicity

Horner's syndrome and other spread-related effects

Horner's syndrome after SCB reflects accidental spread of LA to the cervical sympathetic chain or stellate ganglion. It is usually transient and benign, but its presence suggests cephalad or medial spread beyond the intended supraclavicular target.⁴¹ The incidence appears higher with more proximal blocks and larger-volume injections, whereas more distal approaches reduce exposure of cervical sympathetic structures. In an RCT comparing approaches for upper limb anaesthesia, SCB was associated with a higher rate of Horner's syndrome than infraclavicular or axillary block.³² Clinically, Horner's syndrome should be recognised, explained to patients, and differentiated from more serious complications such as recurrent laryngeal nerve involvement, phrenic nerve blockade, or neuraxial spread.

Local anaesthetic choice, volume, and adjuvants

Local anaesthetics and volumes

Contemporary single-shot, ultrasound-guided SCB commonly uses long-acting LA such as ropivacaine, bupivacaine, or levobupivacaine, sometimes combined with lidocaine to accelerate onset, with total volumes often in the 20–30 ml range.²⁴ This reflects a practical compromise between reliable spread through the compact supraclavicular plexus and minimising unwanted proximal, medial, or phrenic nerve spread.

Dose-finding studies show that the minimum effective volume is highly technique- and endpoint-dependent. Duggan *et al.* reported a minimum effective volume in 50% of patients (MEV50) of 23 ml and a minimum effective volume in 95% of patients (MEV95) of 42 ml for ultrasound-guided SCB, suggesting that very low-volume techniques may be less reproducible when strict surgical anaesthesia endpoints are applied.⁴² These data caution against treating “minimum volume” as a fixed property of the block; it is determined by drug, concentration, injection strategy, operator skill, and the definition of successful surgical anaesthesia.

Adjuvants: dexamethasone and dexmedetomidine

For SCB specifically, a network meta-analysis of 100 RCTs found that dexamethasone (perineural or intravenous [IV]) provided the greatest prolongation of sensory and analgesic duration compared with LA alone, while IV dexmedetomidine did not prolong block or analgesic duration.⁴³ Differences between IV and perineural dexamethasone were not clinically important within that analysis.

A later dose-response model-based network meta-analysis across peripheral nerve blocks supports similar maximum effect between IV and perineural dexamethasone, with higher IV doses required to obtain comparable prolongation.⁴⁴ Furthermore, recent trial evidence suggests that combining IV dexamethasone with IV dexmedetomidine does not significantly extend analgesia beyond IV dexamethasone alone after SCB.⁴⁵

Perineural dexmedetomidine prolongs block and analgesia in brachial plexus blocks but exhibits dose-dependent side effects (*e.g.*, bradycardia, sedation) among broader evidence syntheses, so dosing strategy and route should be considered in conjunction with patient comorbidity and monitoring environment.⁴⁶ Practical recommendations regarding volume selection, injection safety, LAST preparedness, as well as patient-specific risk mitigation are summarised in Table 2.

Continuous catheter techniques

Continuous supraclavicular catheters can be placed with conventional supraclavicular windows or with modified approaches designed to keep the catheter path away from the operative shoulder field. PLO-SCB is a catheter-focused variant: in the shoulder RCT, a low-volume bolus plus continuous infusion achieved non-inferior analgesia with much lower early HDP versus interscalene catheter analgesia, supporting this as a compromise between shoulder analgesia and respiratory preservation.¹⁷ Continuous catheter options, including conventional SCB and PLO-SCB, are incorporated into the decision-making pathway shown in Figure 3.

Conclusion

The SCB remains a versatile and efficient technique for upper limb surgery, especially for elbow-to-hand procedures. Ultrasound guidance has improved its safety profile, but complications such as pneumothorax, vascular puncture, LAST, nerve injury, and HDP remain relevant, particularly in patients with limited pulmonary reserve or altered coagulation. The shift from a simple “cluster” approach to corner pocket, intertruncal, superior trunk, and catheter-based techniques reflects a broader move toward patient-specific regional anaesthesia. Classical SCB remains suitable for many distal upper limb procedures, while infraclavicular, costoclavicular, STB, or PLO-SCB approaches may be preferred when diaphragmatic preservation or shoulder analgesia is prioritised. Until stronger comparative evidence is available, optimal practice depends on careful patient selection, meticulous ultrasound-guided technique, and preparedness to manage complications.

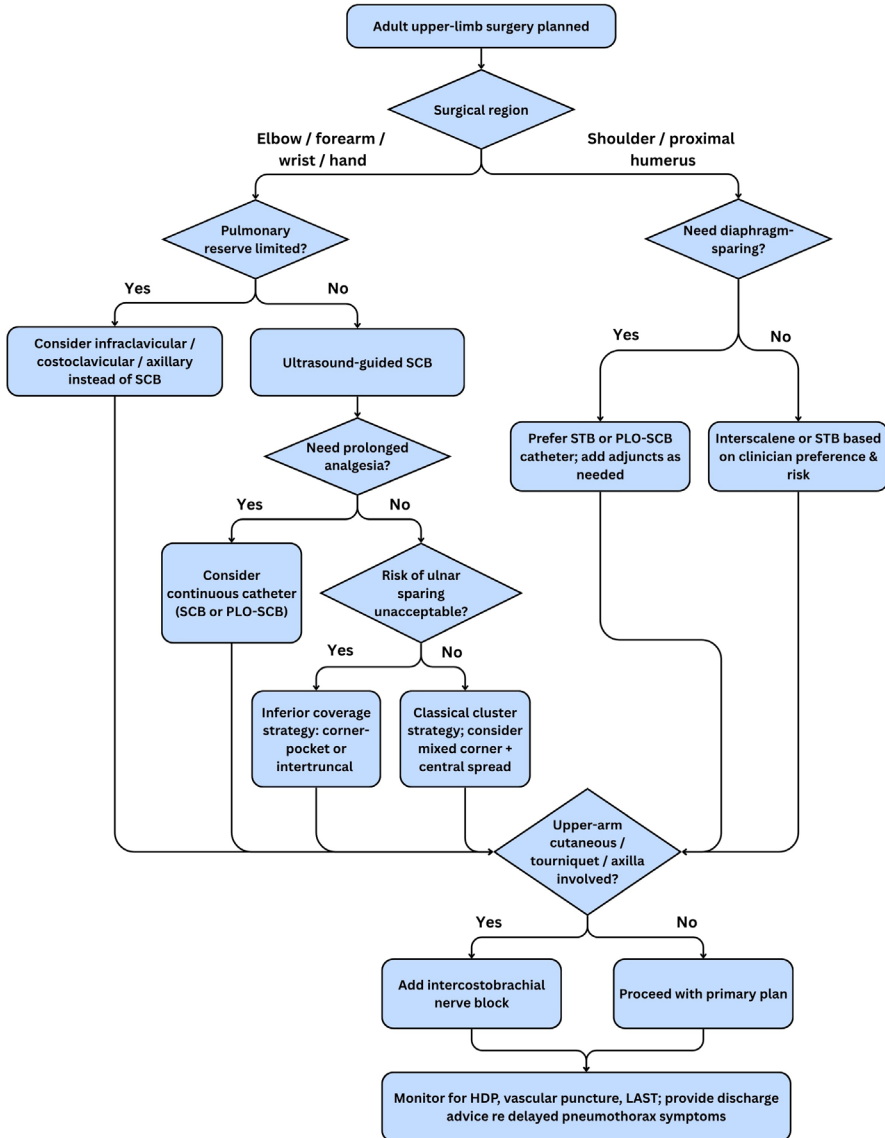


Fig. 3. Decision-making algorithm for selecting supraclavicular brachial plexus block and related approaches for adult upper-limb surgery. The algorithm summarises practical considerations for selecting supraclavicular brachial plexus block and related approaches. SCB, supraclavicular brachial plexus block; STB, superior trunk block; PLO-SCB, proximal longitudinal oblique supraclavicular block; HDP, hemidiaphragmatic paresis; LAST, local anaesthetic systemic toxicity.

Declarations

Ethics approval and consent to participate

Not applicable. This narrative review did not involve human participants, human materials, or individual patient data, and therefore did not require ethics committee or institutional review board approval.

Competing interests

Dr. Shahridan Mohd Fathil is an editor of the Malaysian Journal of Anaesthesiology. The authors declare no other financial or non-financial competing interests.

Funding

No funding was received for the preparation of this manuscript.

Acknowledgements

The authors would like to acknowledge Ms. Khalida Liyana Khalid for her assistance with the illustrations for this manuscript.

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