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Case Series

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Anaesthetic Management of Carotid Endarterectomy: A Five-Patient Case Series

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ABSTRACT

Background: Anaesthetic technique for carotid endarterectomy (CEA) remains debated. This single-centre case series describes pragmatic selection between general anaesthesia (GA) and ultrasound-guided locoregional anaesthesia (LRA) with the associated monitoring strategies and immediate peri-operative experience.

Methods: Retrospective review of five consecutive CEAs (2023–2024). Four strategies were used: GA with endotracheal tube (ETT) alone (n=1), GA+superficial cervical plexus block (SCPB) (n=2), awake SCPB+deep cervical plexus block (DCPB) (n=1), and awake SCPB+carotid sheath block (CSB) (n=1). All regional techniques were ultrasound-guided (linear 5–15 MHz probe, 23G, in-plane). Monitoring comprised continuous clinical neurological assessment in awake cases and multimodal neuromonitoring (EEG/SSEP/TCD/cerebral oximetry with stump-pressure assessment) under GA. Haemodynamic targets focused on normotension to balance cerebral perfusion against myocardial ischaemia risk. (Detailed demographics, presenting concerns, and indications were not recorded in the source slides, so analysis is technique-focused.)

Results: GA (with or without SCPB) showed intra-operative haemodynamic instability, whereas awake LRA techniques did not. Continuous neurological assessment was feasible only in awake cases; GA cases relied on multimodal monitors. Recovery was faster with awake techniques. Immediate postoperative neurological status was stable across all approaches. Patient comfort was documented as “comfortable” for awake techniques and not recorded for GA groups.

Conclusion: In this five-patient series, ultrasound-guided cervical plexus variants and CSB enabled awake CEA with steadier haemodynamics, real-time neurological testing, and rapid recovery, while GA—optionally with SCPB—provided airway control with greater reliance on neuromonitoring and slower emergence. Technique selection can be individualised within a protocol emphasising tight blood-pressure control and appropriate monitoring; acceptable early outcomes were observed across strategies.

Key-words: Carotid endarterectomy, Carotid sheath block, Cervical plexus block, General anaesthesia, Locoregional anaesthesia, Neuromonitoring, Ultrasound-guided regional anaesthesia

INTRODUCTION

Carotid endarterectomy (CEA) remains a cornerstone for stroke prevention in appropriately selected patients with carotid stenosis.

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Contemporary guidelines emphasize that either locoregional anaesthesia (LA) or general anaesthesia (GA) is acceptable, with the choice tailored to patient factors, local expertise, and monitoring strategy [1]. Large trials and meta-analyses—including the GALA randomized trial and subsequent Cochrane and guideline updates—have not demonstrated a decisive difference in 30-day major outcomes between GA and LA, though each approach carries distinct practical advantages and trade-offs [2,3]. This case series describes five consecutive CEAs performed at a single centre using GA, cervical plexus blocks (CPB), and carotid sheath block (CSB) in

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varying combinations, with ultrasound guidance for all regional techniques. We outline technique selection and practical considerations and highlighting pragmatic choices across GA and regional approaches and the monitoring framework used.

Carotid endarterectomy (CEA) remains a cornerstone for stroke prevention in appropriately selected patients with carotid stenosis. Contemporary guidelines emphasize that either locoregional anaesthesia (LA) or general anaesthesia (GA) is acceptable, with the choice tailored to patient factors, local expertise, and monitoring strategy [1]. Large trials and meta-analyses—including the GALA randomized trial and subsequent Cochrane and guideline updates—have not demonstrated a decisive difference in 30-day major outcomes between GA and LA, though each approach carries distinct practical advantages and trade-offs [2,3]. This case series describes five consecutive CEAs performed at a single centre using GA, cervical plexus blocks (CPB), and carotid sheath block (CSB) in varying combinations, with ultrasound guidance for all regional techniques. We outline technique selection and practical considerations and highlighting pragmatic choices across GA and regional approaches and the monitoring framework used.

CASE PRESENTATION

Series overview- This was a retrospective, single-centre series of five CEAs (2023–2024). Four distinct anaesthetic strategies were used: GA with endotracheal tube (ETT) alone (n=1); GA with ETT plus superficial cervical plexus block (SCPB) for adjunct analgesia (n=2); awake SCPB with deep cervical plexus block (DCPB) (n=1); and awake SCPB with carotid sheath block (CSB) (n=1). All regional techniques were ultrasound-guided using an Esaote machine with a 5–15 MHz linear probe, 23-G needle, in-plane approach. Intra-operative goals were maintenance of blood pressure within normal limits and balancing cerebral perfusion with myocardial ischaemia risk. Neuromonitoring included continuous clinical assessment in awake cases, and EEG, SSEP, transcranial Doppler, cerebral oximetry, and stump-pressure monitoring under GA. Post-operatively, patients were monitored for respiratory distress, hypertension, cerebral ischaemia, and iatrogenic cranial nerve injury.

Individual case summaries

The series comprised five CEA cases illustrating four anaesthetic strategies.

Case 1 underwent general anaesthesia with endotracheal intubation (ETT) without regional adjuncts, managed to protocolised physiological targets with multimodal neuromonitoring.

Cases 2 and 3 also had GA with ETT, each supplemented by an ultrasound-guided superficial cervical plexus block administered pre-incision for analgesia, with standard GA neuromonitoring throughout.

Case 4 proceeded awake under combined ultrasound-guided superficial and deep cervical plexus blocks, allowing continuous intraoperative neurological assessment.

Case 5 likewise proceeded awake with an SCPB complemented by an ultrasound-guided carotid sheath block via a medial needle approach, with ongoing clinical neurological monitoring intraoperatively (Table 1).

Table 1: Summary of anaesthetic techniques and monitoring used across five CEAs

Cases	Anaesthetic approach	Airway	Regional block(s)	Patient state	Ultrasound & needle	Intra-op monitoring (examples)
1	GA	ETT	-	Asleep	Linear 5-15 MHz; 23G; in-plane	EEG/SSEP/TCD/cerebral oximetry; stump pressure
2	GA	ETT	SCPB	Asleep	As above	As above
3	GA	ETT	SCPB	Asleep	As above	As above
4	LRA	-	SCPB + DCPB	Awake	As above	Continuous clinical neuro-assessment
5	LRA	-	SCPB + CSB	Awake	As above	Continuous clinical neuro-assessment

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Across the five cases, haemodynamic instability was noted under GA (with or without SCPB) but not during awake plexus/sheath techniques; intra-operative neurological assessment was continuous only in awake cases, recovery was faster with awake techniques, and immediate postoperative neurological status was stable across all approaches (Table 2).

Tables 2: Comparative intra-/peri-operative features by anaesthetic strategy (technique-level from slides)

Evaluated for	GA (ETT)	GA (ETT) + superficial cervical plexus block	Superficial + Deep cervical plexus block (awake)	Superficial cervical plexus block + carotid sheath block (awake)
Haemodynamic instability	Present	Present	Absent	Absent
Intra-op neurological status	Stump-pressure monitoring	Stump-pressure monitoring	Assessing consciousness continuously	Assessing consciousness continuously
Recovery characteristics	Delayed	Delayed	Fast	Fast
Post-op neurological status	Stable	Stable	Stable	Stable
Patient comfort	Not recorded	Not recorded	Comfortable	Comfortable

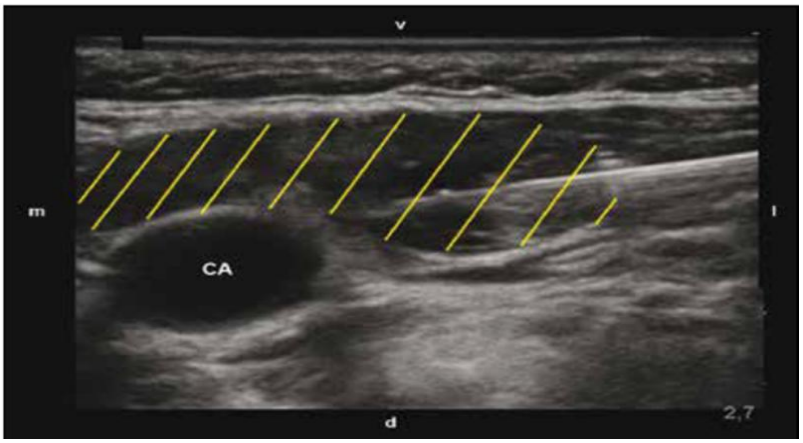

Fig. 1: In-plane lateral-to-medial needle approach with anticipated spread along the carotid sheath around the common carotid artery (CA); orientation markers: v=superficial, d=deep, m=medial, l=lateral.

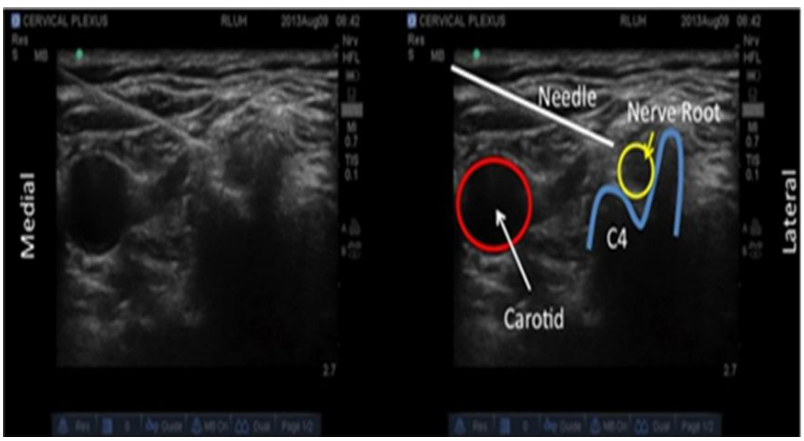

Fig. 2: Needle advanced from medial to lateral toward the C4 nerve root (yellow), with the carotid artery (red) medial/anterior to the target and the C4 transverse process as a posterior landmark.

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DISCUSSION

Choice of anaesthetic technique for CEA

Large trials and modern guidelines demonstrate broadly equivalent hard outcomes between GA and LRA for CEA. The GALA trial (n=3,526) reported no difference in 30-day stroke/MI/death, and pooled analyses have corroborated the non-inferiority of LRA compared to GA [1]. At a systems level, centres that routinely use LRA may achieve lower in-hospital stroke or death, suggesting experience and workflow matter. Our series reflects this equipoise and the tendency toward pragmatic, patient- and surgeon-specific selection: two cases received GA with adjunct SCPB for analgesia and haemodynamic comfort, while two proceeded awake under combined cervical plexus or carotid sheath techniques with direct neurological assessment. In contexts where haemodynamic lability, pulmonary risk, or need for continuous neurological testing weigh heavily, LRA is attractive; conversely, GA offers airway control and tightly titratable physiology, particularly in complex reconstructions or when patient preference favours unconsciousness.

Contemporary regional techniques

Ultrasound guidance has refined cervical plexus blocks—superficial, deep, or "intermediate"—by improving deposition accuracy and reducing local anaesthetic volume. Educational reviews emphasise sonoanatomy, spread patterns, and safety, while observational data suggest intermediate CPB may provide reliable anaesthesia with fewer risks than traditional deep CPB [4-6]. In addition, the carotid sheath block (CSB)—targeting the carotid sheath and contiguous neural structures—has emerged as a pragmatic adjunct to SCPB for awake CEA, potentially reducing supplemental infiltration and improving intra-operative comfort [7]. Early series and case reports indicate feasibility and stability with ultrasound-guided CSB, aligning with our Case 5 approach [7,8].

Neuromonitoring strategy under GA and LRA

When GA is chosen, multimodal neuromonitoring—EEG, SSEP, transcranial Doppler, near-infrared cerebral oximetry, and stump-pressure assessment—supports timely shunting decisions and optimisation of cerebral perfusion during cross-clamp. Narrative syntheses from 2022–2024 detail strengths and limitations of each modality and endorse a tailored, multimodal strategy rather than reliance on a single monitor [9,10]. Awake CEA under LRA leverages continuous clinical neurological examination, a long-standing advantage that can simplify shunt decision-making and may reduce ancillary monitoring burden. Our series' monitoring framework mirrors these contemporary principles.

Haemodynamic management

Regardless of technique, maintaining stable systemic arterial pressure with attention to individual cerebral autoregulatory thresholds remains central. Guidelines stress avoidance of hypotension during clamp and early post-operative hypertension that risks cerebral hyperperfusion syndrome [1,3]. In observational comparisons, LRA cohorts have shown less vasopressor exposure and haemodynamic variability, although confounding persists [11]. The series protocol here—normotension and balanced cerebral/perfusion–myocardial ischaemia goals—accords with guideline-directed care.

This series-level comparison highlights the practical trade-offs between GA and awake regional techniques [12]. Awake SCPB-based approaches (with DCPB or carotid sheath block) were associated with steadier haemodynamics, real-time neurological assessment, and quicker recovery, while GA facilitated stump-pressure–guided monitoring at the expense of delayed emergence and more haemodynamic fluctuation [13]. Importantly, early postoperative neurological status remained stable across techniques, underscoring that protocolised monitoring and blood-pressure targets can support safe outcomes regardless of approach.

CONCLUSIONS

In this single-centre series of five CEAs, both GA-based and ultrasound-guided regional strategies were successfully deployed within a unified monitoring and haemodynamic protocol. Technique selection can be individualised without sacrificing guideline-concordant care: awake LRA affords continuous neurological assessment and may attenuate haemodynamic swings, while GA provides airway security and precise physiological control when indicated. Accruing experience with ultrasound-guided cervical plexus variants and carotid sheath blocks expands the armamentarium for awake CEA. These observations are

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consistent with modern evidence showing no clear superiority of GA or LRA for major peri-operative outcomes, and they reinforce that centred, protocol-driven execution—rather than one "best" technique—likely determines safety and success. Future work at the institutional level could clarify which patient subsets derive the greatest benefit from a given strategy.

CONTRIBUTION OF AUTHORS

Research concept- Ramyashree MH, Timmareddy Kataraki
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Data analysis and interpretation- Ramyashree MH, Timmareddy Kataraki
Literature search- Ramyashree MH, Timmareddy Kataraki
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Critical review- Arun N
Article editing- Ramyashree MH, Timmareddy Kataraki
Final approval- Arun N

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