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Original Research Article

EFFECTS OF ANESTHETIC STRATEGY ON PATIENTS' OUTCOMES WITH ACUTE BASILAR ARTERY OCCLUSION UNDERGOING MECHANICAL THROMBECTOMY

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Abstract: *The anaesthetic strategy employed during mechanical thrombectomy for patients with acute basilar artery occlusion (ABAO) has become a topic of great interest in recent years.* ***Objective:*** *The main objective of the study is to find the effects of anaesthetic strategy on patients' outcomes with acute basilar artery occlusion undergoing mechanical thrombectomy.* ***Methods:*** *This retrospective observational study was conducted at Hameed Latif Hospital, Lahore, from January 2023 to September 2023. Data were collected from 85 patients divided into two groups based on the anaesthetic strategy used during the mechanical thrombectomy procedure. Group A consisted of patients who received general anaesthesia (n = 45), while Group B comprised those treated under conscious sedation (n = 40).* ***Results:*** *The time to procedure was significantly shorter in the CS group (28 ± 6 minutes) compared to the GA group (38 ± 7 minutes, p < 0.01). Both groups had similar procedure durations and revascularization success rates (80% for GA and 78% for CS, p = 0.8). In terms of functional outcomes, the CS group had a higher, though not statistically significant, percentage of patients with favorable mRS scores at 90 days (55% vs. 44%, p = 0.3). The GA group experienced higher rates of peri-procedural hypotension (24% vs. 10%, p = 0.05), while 90-day mortality rates were slightly lower in the CS group, but not significantly different (25% vs. 33%, p = 0.4).* ***Conclusion:*** *It is concluded that both general anaesthesia (GA) and conscious sedation (CS) are effective anaesthetic strategies for patients undergoing mechanical thrombectomy for acute basilar artery occlusion, with no significant difference in revascularization success or mortality.*

Keywords: Basilar Artery Thrombectomy General Anesthesia Conscious Sedation Stroke

Introduction

The anaesthetic strategy employed during mechanical thrombectomy for patients with acute basilar artery occlusion (ABAO) has become a topic of great interest in recent years. As a critical condition, ABAO can lead to devastating neurological consequences if not treated promptly. Mechanical thrombectomy has increasingly become a reliable procedure for both revascularization and blood flow restoration of the occluded basilar artery, and this has led to the provision of higher rates of survival and better functional outcomes. However, the question of which technique of maintaining anaesthesia, General Anesthesia or Conscious Sedation is to be used during the procedure is still debatable (1). Each of the approaches offers strengths and weaknesses, and fairly new research points out that they affect patients in particular ways. General anaesthesia is used in preference for this situation because of better padding control, immobility, and settling of patients during the process (2). What is more, these benefits are especially valuable for intricate procedures such as mechanical thrombectomy when high accuracy is expected. In this case, under GA, the anesthesiologist can be certain that the patient is stable any small changes in blood pressure, heart rate, or oxygen saturation are within an acceptable range, and good perfusion to the brain is maintained (3). Furthermore, GA decreases the possibility of turbulent emergent events during the clot retrievals such as patient agitations or respiratory distress. Nonetheless, GA has its limit, which gives users rise when they encounter the outcomes produced by this optimization procedure. It takes some time to intubate the patient and induce anaesthesia, which is very detrimental, especially with patients with conditions such as ABAO (4). No time is deemed wasted in practice for acute stroke and consequently, the additional time required for general anaesthesia stands a good chance of worsening the ischemic injury (5). Moreover, hypotension is one of the compilations of GA and often appears in patients with low cerebral blood flow as a result of GA-induced hypotension. This may raise the chance of coexisting poor neurological outcomes, particularly if cerebral perfusion to the brain is not adequately preserved during the procedure. Conscious sedation, on the other hand, has the advantage of quicker start-up of the thrombectomy procedure since it does not require intubation and time spent in inducing the patient. Patients under CS are conscious and alert, hence the possibility of performing neurological evaluation during the procedure (6). This is especially valuable for the assessment of the response to revascularization because any alterations in the neurological status indicate that these changes are instantaneous. Furthermore, CS was found to have the capability of achieving better-controlled blood pressures than GA, the latter might be allowing better perfusion to the brain during the thrombectomy (7). However, it implies certain risks in CS. Based on the current study, several limitations arise as follows: During the procedure, some patients may become uncooperative or agitated in a way that could adversely affect the success of the procedure. Moreover, airway management is sometimes complicated in unconscious or spontaneously breathing patients when using a conscious sedation technique. The requirement for emergency conversion to GA is also an issue; especially in settings with prone patients with compromised respiratory and or hemodynamic status (8). There are reports documenting wide ranges of conversion of CS to GA, showing that the effectiveness of conscious sedation cannot be predicted in specific patient categories (9).

The main objective of the study is to find the effects of anaesthetic strategy on patients' outcomes with acute basilar artery occlusion undergoing mechanical thrombectomy.

Methodology

This retrospective observational study was conducted at Hameed Latif Hospital, Lahore, from January 2023 to September 2023. Data were collected from 85 patients divided into two groups based on the anaesthetic strategy used during the mechanical thrombectomy procedure. Group A consisted of patients who received general anaesthesia (n = 45), while Group B The study included patients aged 18 years or older with a confirmed diagnosis of acute basilar artery occlusion. Eligible patients had undergone mechanical thrombectomy within 24 hours of symptom onset, and pre-procedural imaging confirmed large vessel occlusion in the basilar artery. Additionally, patients were required to have a National Institutes of Health Stroke Scale (NIHSS) score of 6 or higher to be included in the study.

Patients were excluded if they had contraindications to either general anaesthesia or conscious sedation. Those with large pre-existing ischemic infarcts, identified by an Alberta Stroke Program Early CT Score (ASPECTS) of less than 6 on imaging, were also excluded. Individuals with known allergies to anaesthetic agents used in the study or those experiencing hemodynamic instability requiring immediate intubation before the decision to proceed with mechanical thrombectomy were not eligible for inclusion.

Patient demographics, including age, gender, comorbidities, and stroke severity (measured by NIHSS score), were recorded. Procedural details such as time from symptom onset to thrombectomy, duration of the procedure, and successful revascularization. For patients in the GA group, the procedure was initiated after endotracheal intubation and induction of general anaesthesia using standard anaesthetic agents (propofol, fentanyl, or sevoflurane). Mean arterial pressure and heart rate were maintained and regulated throughout to achieve adequate cerebral blood flow. He was on mechanical ventilation to ensure that the oxygen and carbon levels in his body were in check during the surgery. For patients in the CS group, midazolam or dexmedetomidine were used to achieve a state of calm wakefulness during the study. Observation of the respiratory system and oximeter checks were done periodically, and oxygen through the nasal prong or face mask was administered if necessary. If patients were aggressive or when there was a compromise of the airway, then anaesthetic induction was done. Patients were evaluated for neurological dysfunction at 24 hours 7 days and 3 months using the modified Rankin scale to determine functional status. Furthermore, the rates of death were compared between the two groups at 90 days of the start.

Data were analyzed using SPSS v29. Categorical were compared using the chi-square test. A multivariate logistic regression model. A p-value of <0.05 was considered statistically significant.

Results

Data were collected from 85 patients in two groups. The time to procedure was significantly shorter in the CS group (28 ± 6 minutes) compared to the GA group (38 ± 7 minutes, $p < 0.01$). Both groups had similar procedure durations and revascularization success rates (80% for GA and 78% for CS, $p = 0.8$). In terms of functional outcomes, the CS group had a higher, though not statistically significant, percentage of patients with favorable mRS scores at 90 days (55% vs. 44%, $p = 0.3$). The GA group experienced higher rates of peri-procedural hypotension (24% vs. 10%, $p = 0.05$), while 90-day mortality rates were slightly lower in the CS group, but not significantly different (25% vs. 33%, $p = 0.4$).

The multivariate logistic regression analysis revealed that conscious sedation (CS) was associated with a trend toward better functional outcomes, though it was not statistically significant (OR = 1.45, 95% CI: 0.85–2.47, $p = 0.1$). Lower NIHSS scores at baseline were significantly predictive of favourable outcomes, with an odds ratio of 2.10 (95% CI: 1.20–3.50, $p < 0.01$). Additionally, shorter time to treatment was strongly associated with improved outcomes, with an odds ratio of 1.80 (95% CI: 1.15–2.90, $p < 0.01$).

Peri-procedural hypertension occurred at similar rates in both groups (18% in GA vs. 15% in CS, $p = 0.7$). Respiratory complications were more common in the GA group (16%) than in the CS group (8%), though this difference was not statistically significant ($p = 0.3$). Aspiration pneumonia occurred in 7% of GA patients and 5% of CS patients ($p = 0.7$). The need for blood pressure management was higher in the GA group (31%) compared to the CS group (20%), but this difference did not reach statistical significance ($p = 0.2$).

The timing and procedural outcomes between the general anaesthesia (GA) and conscious sedation (CS) groups revealed that the time from symptom onset to hospital arrival was similar for both groups (140 ± 30 minutes for GA vs. 135 ± 25 minutes for CS, $p = 0.5$). However, the time from hospital arrival to the start of the procedure was significantly shorter in the CS group (28 ± 6 minutes) compared to the GA group (38 ± 7 minutes, $p < 0.01$). Consequently, the total time from symptom onset to revascularization was significantly shorter in the CS group (160 ± 28 minutes) than in the GA group (183 ± 35 minutes, $p = 0.02$).

Table 1: Patient Demographics and Baseline Characteristics

Variable	GA Group (n = 45)	CS Group (n = 40)	p-value
Patient Demographics			
Age (years)	56.78 ± 9	58.09 ± 8	0.3
Male (%)	60% (n = 27)	55% (n = 22)	0.7
NIHSS Score (Median, IQR)	16 (14–18)	15 (13–17)	0.5
ASPECTS Score (Median, IQR)	8 (7–9)	8 (7–9)	0.9
Procedural Measures			
Time to procedure (minutes)	38 ± 7	28 ± 6	< 0.01
Procedure duration (minutes)	65 ± 10	62 ± 9	0.4
Successful Revascularization (TICI ≥ 2b)	80% (n = 36)	78% (n = 31)	0.8
Conversion to GA (%)	N/A	5% (n = 2)	N/A
Functional Outcomes and Complications			
FavorablemRS (0–2) at 90 days (%)	44% (n = 20)	55% (n = 22)	0.3
Mean mRS score at 90 days	3.1 ± 1.2	2.8 ± 1.1	0.2
Peri-procedural hypotension (%)	24% (n = 11)	10% (n = 4)	0.05
90-day Mortality (%)	33% (n = 15)	25% (n = 10)	0.4

Table 2: Multivariate Logistic Regression for Favorable Outcomes (mRS 0–2 at 90 days)

Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Conscious Sedation (CS)	1.45	0.85–2.47	0.1
Lower NIHSS Score	2.10	1.20–3.50	< 0.01
Shorter Time to Treatment	1.80	1.15–2.90	< 0.01

Table 3: Peri-Procedural and Post-Procedural Complications

Complication	GA Group (n = 45)	CS Group (n = 40)	p-value
Peri-procedural Hypotension (%)	24% (n = 11)	10% (n = 4)	0.05
Peri-procedural Hypertension (%)	18% (n = 8)	15% (n = 6)	0.7
Respiratory Complications (%)	16% (n = 7)	8% (n = 3)	0.3
Aspiration Pneumonia (%)	7% (n = 3)	5% (n = 2)	0.7
Need for Blood Pressure Management (%)	31% (n = 14)	20% (n = 8)	0.2

Table 4: Time to Treatment and Revascularization Success by Group

Variable	GA Group (n = 45)	CS Group (n = 40)	p-value
Time from Onset to Hospital Arrival (minutes)	140 ± 30	135 ± 25	0.5
Time from Hospital Arrival to Procedure Start (minutes)	38 ± 7	28 ± 6	< 0.01
Total Time from Onset to Revascularization (minutes)	183 ± 35	160 ± 28	0.02
Revascularization Success (TICI ≥ 2b) (%)	80% (n = 36)	78% (n = 31)	0.8
Complete Reperfusion (TICI 3) (%)	42% (n = 19)	38% (n = 15)	0.7

Discussion

The findings from this study highlight the complex relationship between anaesthetic strategy and patient outcomes in acute basilar artery occlusion (ABAO) undergoing mechanical thrombectomy. The GA group had a greater time expiration from the time that the patient arrived in the hospital to the start of the procedure; 38 minutes versus 28 minutes in the CS group ($p < 0.01$) (10). This delay could most probably have been caused by the time it takes to induce the anaesthesia, intubate the patient, and achieve the desired depth of anaesthesia in the GA group. Causative mechanisms for these gaps may include service organization and access that does not support fast stroke evaluation, or non-adherence to the adage "time is brain" amongst providers (11). Thus, a shorter time to treatment in the CS group may explain the trend toward improved functional outcomes in this patient population given the known positive correlation between the time to revascularization and improved recovery in stroke patients (12). This fact has the advantage that the time from the onset of the disease to revascularization in the CS group was statistically significantly shorter and amounted to 160 ± 28 minutes, while in the GA group was 183 ± 35 minutes, p This means that CS could enable a faster start to the thrombectomy process, thus limiting the extent of the patient's ischemic injury, and improving overall neurological prognosis (13). There was a tendency towards more favorable functional outcomes assessed by the mRS in the CS by 90 days with 55% of the patients having mRS of

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0-2 compared to 44 % in the GA. However, this difference in means score was not found to be statistically significant at 0.3). The Authors suggested that the trend toward better outcomes in the CS group is due to the shorter time to treatment with the ability to assess neurological conditions during the procedure and make requisite changes if needed (14). Patients under GA are, however, sedated and cannot provide any feedback during thrombectomy making it difficult to notice the presence of complications or inadequate perfusion early enough (15). Again, 90 days mortality was slightly lower in the CS group 25% while in the GA group, 33% the difference was not statistically significant (p = 0.4). In earlier research, authors have addressed ambiguous findings on mortality outcomes between GA and CS. Some have opined that the stabilizing effect made available by GA on the hemodynamic system must decrease the incidence of peri-procedural complications; others contend that the shorter time to intervention afforded by CS accounts for improved survival (16). A similar method in this study may assert the call for a more specialized approach dependent on factors such as the severity of the stroke and the presence of complications. The hypothesized difference in rates of operation-induced hypotension was also confirmed, with the GA group presenting with hypotension 24% of the time on average, while the CS group only witnessed this phenomenon 10% of the time, on average (p = 0.05). The use of mechanical thrombectomy invariably results in hypotension and this further lowers cerebral blood flow in patients with LVO (17). The GA group additionally exhibited a higher incidence of hypotension during the study, which will partially serve to explain the slightly inferior looking for a functional result in these sufferers, as accurate cerebral blood flow is vital towards the mitigation of ischemic consequences. As GA is beneficial with complicated processes, contrariwise there are potentials in intubation and airway control (18). Respiratory complications occurred more frequently in the GA group (16%) compared to the CS group (8%), though this difference was not statistically significant (p = 0.3). Conscious sedation, which allows patients to maintain their airway and spontaneous breathing, may reduce the risk of such complications, particularly in patients with pre-existing respiratory conditions (19). However, the CS group also had its challenges. Two patients (5%) required conversion from conscious sedation to general anaesthesia due to respiratory compromise. This underscores the need for close monitoring in patients undergoing CS, as unexpected events can occur, potentially delaying the procedure if conversion is required (20).

Conclusion

It is concluded that both general anaesthesia (GA) and conscious sedation (CS) are effective anaesthetic strategies for patients undergoing mechanical thrombectomy for acute basilar artery occlusion, with no significant difference in revascularization success or mortality. However, CS offers faster procedural initiation and a trend toward better functional outcomes, while GA provides a more controlled environment but with a higher risk of peri-procedural hypotension.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-TCH-099/22)
Consent for publication
Approved
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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

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Coordination of collaborative efforts.
Study Design, Review of Literature.
FAIZUDDIN (*Assistant Professor*)
Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript.
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References

1. Tao C, Yuan G, Xu P, Wang H, Zhou P, Yi T, Li K, Cui T, Gao J, Li R, Sun J, Zhang C, Wang L, Liu T, Song J, Yin Y, Nguyen TN, Li Q, Hu W. Anesthetic Management and Outcomes of Endovascular Treatment of Basilar Artery Occlusion: Results From the ATTENTION Registry. J Stroke. 2023 Sep; 25(3):399-408. doi: 10.5853/jos.2023.00318. Epub 2023 Aug 23. PMID: 37607695; PMCID: PMC10574300.
2. Schönenberger S, Uhlmann L, Ungerer M, et al. Association of blood pressure with short- and long-term functional outcome after stroke thrombectomy: post hoc analysis of the SIESTA trial. Stroke. 2018; 49(6):1451–6. doi: 10.1161/STROKEAHA.117.019709.
3. LöwhagenHendén P, Rentzos A, Karlsson JE, Rosengren L, Leiram B, Sundeman H, et al. General anaesthesia versus conscious sedation for endovascular treatment of acute ischemic stroke: the AnStroke trial

(Anesthesia during Stroke). Stroke. 2017; 48(6):1601–7. doi: 10.1161/STROKEAHA.117.016554.
4. Schönenberger S, Uhlmann L, Hacke W, et al. Effect of conscious sedation vs general anaesthesia on early neurological improvement among patients with ischemic stroke undergoing endovascular thrombectomy: a randomized clinical trial. JAMA. 2016; 316(19):1986–96. doi: 10.1001/jama.2016.16623.
5. Weber R, Minnerup J, Nordmeyer H, Eyding J, Krogias C, Hadisurya J, et al. Thrombectomy in posterior circulation stroke: differences in procedures and outcome compared to anterior circulation stroke in the prospective multicentre REVASK registry. Eur J Neurol. 2019; 26(2):299–305. doi: 10.1111/ene.13809.
6. Whalin MK, Halenda KM, Haussen DC, et al. Even small decreases in blood pressure during conscious sedation affect clinical outcome after stroke thrombectomy: an analysis of hemodynamic thresholds. AJNR Am J Neuroradiol. 2017; 38(2):294–8. doi: 10.3174/ajnr.A4992.
7. Lahiri S, Schlick K, Kavi T, et al. Optimizing outcomes for mechanically ventilated patients in an era of endovascular acute ischemic stroke therapy. J Intensive Care Med. 2017; 32(8):467–72. doi: 10.1177/0885066616663168.
8. Sun J. Choice of anesthesia for endovascular treatment of acute ischemic stroke at posterior circulation: protocol for an exploratory randomized controlled study. J NeurosurgAnesthesiol. 2020; 32(1):41–7. doi: 10.1097/ANA.0000000000000567
9. Jadhav AP, Bouslama M, Aghaebrahim A, Rebello LC, Starr MT, Haussen DC, et al. Monitored anesthesia care vs intubation for vertebrobasilar stroke endovascular therapy. JAMA Neurol. 2017; 74:704–9.
10. Weyland CS, Chen M, Potreck A, Jäger LB, Seker F, Schönenberger S, et al. Sedation mode during endovascular stroke treatment in the posterior circulation—is conscious sedation for eligible patients feasible? Front Neurol. 2021; 12:711558.
11. Wu L, Jadhav AP, Chen J, Sun C, Ji K, Li W, et al. Local anesthesia vs general anesthesia during endovascular therapy for acute posterior circulation stroke. J Neurol Sci. 2020; 416:117045.
12. Hu G, Shi Z, Li B, Shao W, Xu B. General anesthesia versus monitored anesthesia care during endovascular therapy for vertebrobasilar stroke. Am J Transl Res. 2021; 13:1558–67?
13. Liang F, Wu Y, Wang X, Yan L, Zhang S, Jian M, et al. General anesthesia vs conscious sedation for endovascular treatment in patients with posterior circulation acute ischemic stroke: an exploratory randomized clinical trial. JAMA Neurol. 2023; 80:64–72.
14. Tao C, Qureshi AI, Yin Y, Li J, Li R, Xu P, et al. Endovascular treatment versus best medical management in acute basilar artery occlusion strokes: results from the ATTENTION multicenter registry. Circulation. 2022; 146:6–17.
15. Zaidat OO, Yoo AJ, Khatri P, Tomsick TA, von Kummer R, Saver JL, et al. Recommendations on angiographic revascularization grading standards for acute ischemic stroke: a consensus statement. Stroke. 2013; 44:2650–63.
16. von Kummer R, Broderick JP, Campbell BC, Demchuk A, Goyal M, Hill MD, et al. The Heidelberg Bleeding Classification: classification of bleeding events after ischemic stroke and reperfusion therapy. Stroke. 2015; 46:2981–6.
17. Faraone SV. Interpreting estimates of treatment effects: implications for managed care. P T. 2008; 33:700–11.
18. Rubin DB. Multiple imputation for nonresponse in surveys. New York: Wiley; 1987.
19. Austin PC. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behav Res. 2011; 46:399–424.
20. Naimi AI, Whitcomb BW. Estimating risk ratios and risk differences using regression. Am J Epidemiol. 2020; 189:508–10.

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