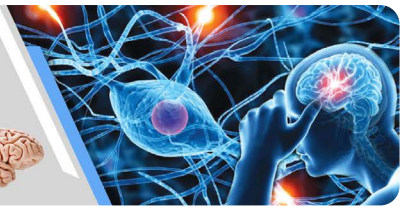
fortune Journals

Research Article

JOURNAL OF PSYCHIATRY AND PSYCHIATRIC DISORDERS

ISSN: 2572-519X



A Systematic Review on Efficacy of Etomidate as an Anaesthetic Agent in Modified Electroconvulsive Therapy

Lakshmi Anand[ORCID ID1], NithinP[2], Vikram Seggam[3], Monica Dolli[4], Jitendra Mugali[5], Fakirappa B Ganiger[6], Suhasini Hubli[7*]

Abstract

Background: Electroconvulsive therapy (ECT) is a well-established treatment for various psychiatric disorders. Introduction of general anaesthesia added comfort and safety. Etomidate has shown promise in ECT due to its favourable pharmacological profile. Despite its advantages, the efficacy of etomidate in ECT remains understudied. This systematic review aims to examine etomidate's effectiveness in ECT focusing on outcome parameters.

Method: This systematic review was conducted according to PRISMA guidelines searching PubMed, Google Scholar, and Cochrane literatures from 1965 to 2024 using keywords "Etomidate," "Electroconvulsive therapy," "Seizure duration," "Anaesthetic agents," "Side effects," "Recovery," "Depression," "Schizophrenia," and "Catatonia." MeSH terms “AND” and “OR. Out of the 5439 articles, 37 studies met the inclusion criteria.

Result: This systematic review of 37 studies compared etomidate with other anaesthetic agents in modified ECT. Etomidate prolonged seizure duration and reduced side effects and when compared to propofol and thiopental it demonstrated superior efficacy in major depressive disorder and schizophrenia with an increase in mean heart rate, blood pressure and sometimes causing a temporary adrenocortical suppression. Propofol exhibited better hemodynamic control whereas at discharge, similar clinical efficacy profiles were observed between etomidate and propofol

Discussion: Etomidate prolongs seizure duration and has reduced side effects compared to other anaesthetic agents. Etomidate's superiority in major depressive disorder and schizophrenia suggests its potential as a better anaesthetic agent. While etomidate increases heart rate and blood pressure, dexmedetomidine's adjunctive use may mitigate hemodynamic stress. Limitations include variability in study designs, populations, and differences in ECT protocols.

Keywords: ECT; Etomidate; Efficacy; Anaesthetic Agents; Side Effects; Schizophrenia.

Introduction

Etomidate is an anaesthetic agent primarily used for inducing general anaesthesia and sedation. In 1965, Janssen Pharmaceuticals designed a compound to combat fungal infections, which also revealed its surprising ability to induce deep sleep and emerged as a safer alternative to traditional barbiturates.Etomidate is administered as a purified R(+) enantiomer formulation which is hydrophobic in nature and requires specialized

Affiliation:

[1,3,5,6] Department of Psychiatry, Gadag institute of Medical Science, Gadag

[2]Department of Psychiatry, Jawaharlal Nehru Medical College, Belgavi.

[4]Department of Psychiatry, Shridevi Medical College, Tumakur.

[7]Department of Anaesthesiology, Gadag institute of Medical Science, Gadag.

***Corresponding author:**

Dr Suhasini Hubli, Department of Anaesthesiology, Gadag Institute of Medical sciences, Gadag

Citation: Lakshmi, Nithin P, Vikram S, Monic Dolli, Jitendra Mugali, Fakirappa B Ganiger, Suhasini Hubli. A Systematic Review on Efficacy of Etomidate as an Anaesthetic Agent in Modified Electroconvulsive Therapy. Journal of Psychaity and Psychaitric Disorders. 8 (2024): 275--286.

Received: October 18, 2024
Accepted: October 28, 2024
Published: November 07, 2024

Lakshmi A, et al., J Psychiatry Psychiatric Disord 2024
DOI:10.26502/jppd.2572-519X0228

formulations to enhance its solubility. It isprepared as a 0.2% solution in propylene glycol, lipid emulsion, or in cyclodextrins. Clinical trials have established intravenous bolus doses of 0.2-0.4 mg/kg for short-term hypnosis and continuous infusions of 30-100 µg/kg/min for maintenance of general anaesthesia and can also be administered via oral, trans mucosal and rectal routes [1].

Electroconvulsive therapy (ECT) is a treatment in psychiatry, with a history spanning over many decades. It has proven to be safe, well-tolerated and highly effective treatment for various conditions including mood disorders, schizophrenia, catatonia, Parkinson's disease, delirium, neuroleptic malignant syndrome, autism as well as agitation in patients with dementia. There are no absolute contraindications but caution is advised for patients with increased intracranial pressure, recent cardiovascular events [2]. The introduction of general anaesthesia and muscle relaxation in ECT has been added to patient acceptance and when it comes to selecting an anaesthetic agent, the main criteria are a swift induction and recovery, minimal impact on seizure quality and having no adverse effects on hemodynamics or patient safety [4]. Advances have minimized side effects making modified ECT a viable option for vulnerable populations, including geriatric, adolescent and even pregnant patients. Common adverse effects include headache, nausea and myalgias, transient amnesia while cardiovascular complications can also be seen [2]. As described by Addersley and Hamilton in 1953,an adequate seizure duration is when there is a seizure for at least 25 seconds characterized by generalized tonic-clonic motor activity. In cases where motor activity was ambiguous, an alternative criterion of 30 seconds of abnormal left frontal electroencephalogram (EEG) activity, as previously established by Warmflash et al. in 1986 would be considered. General anaesthesia is now a standard component of ECT and its absence can lead to increased risks of musculoskeletal injuries and post-traumatic stress disorder [4,5]. Various anaesthetic agents, such as propofol, methohexital, ketamine and etomidate are commonly employed for ECTeach with its unique benefits and drawbacks. Despite this, the efficacy of a suitable anaesthetic agent for ECT remains a topic of discussion with no consensus yet reached [4].

A retrospective analysis comparing various anaesthetic agents in depression revealed etomidate's advantages. Although propofol resulted in shorter seizure durations, it required significantly higher stimulus charges and led to a higher rate of failed seizures. Etomidate demonstrateda more stable treatment profile with no significant increase in stimulus charge requirements [6]. A study comparing the effects of etomidate and S-ketamine on ECT in patients with major depression revealed etomidate demonstrating a consistent safety profile and effective seizure management. Although S-ketamine showed a lower initial seizure threshold etomidate's advantages included a lower risk of cardiovascular side effects. Etomidate did not significantly impact the clinical global impression scores, number of ECT sessions or incidence of adverse events [7]. A comparative study on schizophrenia revealed that etomidate demonstrated longer seizure durations both in EEG- and EMG-registered measurements compared to propofol. Propofol reduced seizure duration to a greater extent, whereas etomidate showed comparable efficacy in electrophysiological parameters correlated with clinical outcomes. Etomidate's hemodynamic effects were more evident, with a greater increase in mean arterial pressure (MAP) compared to propofol but with no impact on the number of necessary restimulations or postictal suppression [8] Etomidate also demonstrated comparable efficacy to propofol in managing seizure activity duringECT in patients with schizophrenia as it induced longer seizure durationsas measured by EEG and EMG without significant differences in minimum seizure eliciting stimulation energy or restimulation frequency. It also maintained seizure durations above the minimal thresholdensuring effective treatment [9]. An RCT investigated the efficacy of ECT in treating unipolar (UP) and bipolar (BP) depressive illnesses. With the four anaesthetic agents methohexital, thiopental, etomidate and propofolshowed equivalent remission and response rates as well as similar numbers of ECT sessions, for both UP and BP depression groups [10]. In a comparative study of patients undergoing ECT etomidate demonstrated a similar seizure duration profile to thiopental. Etomidate achieved this without requiring a lower electrical dose unlike thiopental, whereas propofol resulted in shorter seizure durations. Etomidate's balanced performance makes it a suitable choice for ECT offering a reliable and effective treatment option [11]. A study comparing the effects of propofol, thiopental and etomidate; etomidate demonstrated a comparable safety and efficacy profile to propofol and thiopental with no significant differences in cardiovascular effects, seizure variables, cognitive functions, or treatment response [12]. A retrospective analysis highlighted etomidate's superiority in ECT for affective and psychotic disorders. Notably, etomidate maintained consistent electroencephalographic seizure durations throughout treatment and was associated with fewer side effects during and after ECT making it a safer choice [13]. Etomidate emerges as a superior alternative to traditional induction agents for ECT with shorter ECT courses, lower seizure thresholds, and reduced electrical charges. Hence our study aims to review the efficacy of etomidate by looking into various parameters as the literatures are sparce conveying the same. By opting for etomidate, clinicians can potentially reduce the length and cost of inpatient stays, improving overall patient outcomes [14].

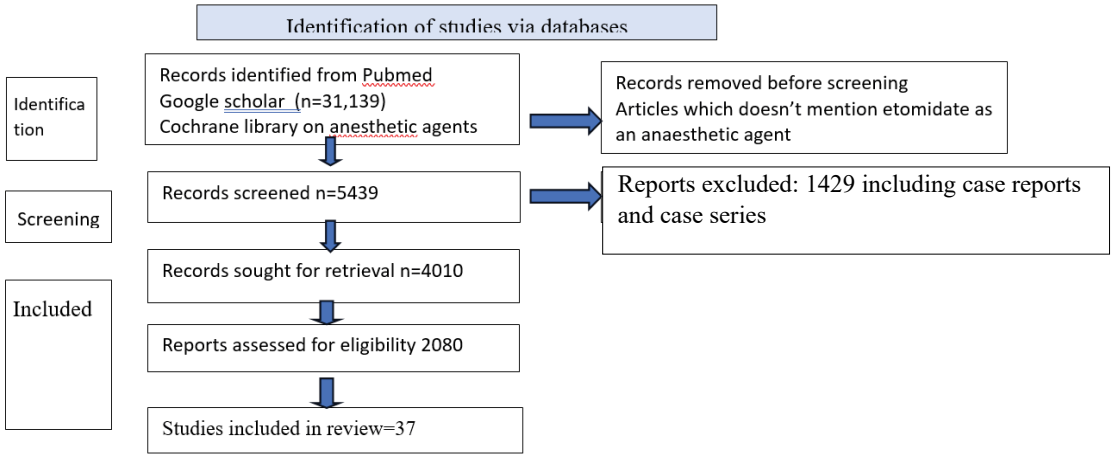
Methodology: Search Strategy

This systematic review was done in a tertiary care centre. Studies on etomidate as an anaesthetic agent in modified ECT were searched in scientific search engines like Pubmed,

Citation: Lakshmi, Nithin P, Vikram S, Monic Dolli, Jitendra Mugali, Fakirappa B Ganiger, Suhasini Hubli. A Systematic Review on Efficacy of Etomidate as an Anaesthetic Agent in Modified Electroconvulsive Therapy. Journal of Psychaity and Psychaitric Disorders. 8 (2024): 275-286.

Lakshmi A, et al., J Psychiatry Psychiatric Disord 2024
DOI:10.26502/jppd.2572-519X0228

Google scholar and Cochrane from 1965 to 2024. The terms used for searching data were "Etomidate", "Electroconvulsive therapy", "Seizure duration", "anaesthetic agents", "Side effects", "Recovery", "Depression", "Schizophrenia" and "Catatonia" using MeSH terms "and" and "or".Initially, the search yielded5439 articles with the search keywords 'electroconvulsive therapy and etomidate'. We excluded 1429 case reports and further refined with the addition of the key words and only including studies mentioning key words such as seizure duration, hemodynamic profile, clinical response, side effects and recovery, which are the parameters to assess the efficacy of etomidate. We analysed the abstracts of all these studies and whenever necessary, read the complete articles. Finally, we included the37articles that contained important recommendations which are the efficacy parameters for the preparation of this systematic review. Publications dealing with ECT in special situations are scarce and most of the literature is based on clinical cases, usually short series and reviews based on expert opinions. All research articles excluding case reports and case series mentioning the above parameters are included for the study. The search was limited to studies done in humans, published in English without regard to the level of evidence.



Results

ECT relies on general anaesthesia to create a controlled environment for seizures while mitigating its risks. The anaesthetic strategy aims to induce amnesia, brief immobility and protect patients and staff from injury, while ensuring adequate oxygenation, hemodynamic stability, and timely recovery.We have compared etomidate with studies using common agents like thiopental, propofol, methohexital, ketamine and midazolam. Many studies have found propofol, etomidate and thiopental have similar safety and efficacy with etomidate giving better seizure duration and less side effects. Some of the anaesthetic agents are found to be better in particular mental disorders compared to other whereas some studies failed to reveal any. Etomidate's ability to produce adequate seizure duration and theophylline's ability to be used as an adjunct to prolong seizures where also noted. Selecting an anaesthetic agent considering its safety on hemodynamic were analysed and found many studies revealing inconclusive results. Recovery from anaesthesia was also taken as a parameter and found studies comparing the various commonly used anaesthetic agents in its efficacy on cardiac and other hemodynamic parameters. Clinical responses following sessions of modified ECT on the mental disorders found few studies revealing similar clinical efficacy profiles at discharge with some benefit of etomidate in some mental disorders.

Seizure duration

Etomidate stands out as a superior induction agent for electroconvulsive therapy (ECT) due to its ability to prolong seizure duration, a critical factor in ECT efficacy. A comprehensive meta-analysis of revealed that etomidate significantly outperformed propofol and thiopental in terms of both EEG and motor seizure duration [15]. In a study comparing the impact of thiopental and etomidate anaesthesia on seizure duration. The results revealed that etomidate sessions resulted in significantly longer mean seizure durations compared to thiopental sessions potentially leading to improved treatment outcomes [16]. A study conducted investigated etomidate's efficacy in improving seizure duration compared to thiopental showed a significant reduction in electric stimulation dose and a substantial increase in seizure duration and electroencephalograph-recorded duration. Noted particularly in patients with high seizure thresholds,and should be considered as the primary anaesthetic for augmenting seizures [17]. A retrospective analysis investigated the potential dose-dependent relationship between etomidate and seizure duration in ECT found a weak negative correlation between etomidate dose and seizure duration, indicating no clinically relevant dose-dependent relationship between etomidate and seizure duration in ECT [18]. Theophylline may be a valuable adjunct for patients with inadequate seizure duration as per

Citation: Lakshmi, Nithin P, Vikram S, Monic Dolli, Jitendra Mugali, Fakirappa B Ganiger, Suhasini Hubli. A Systematic Review on Efficacy of Etomidate as an Anaesthetic Agent in Modified Electroconvulsive Therapy. Journal of Psychaity and Psychaitric Disorders. 8 (2024): 275-286.

Lakshmi A, et al., J Psychiatry Psychiatric Disord 2024
DOI:10.26502/jppd.2572-519X0228

Table 1: various anaesthetic agents used in Electroconvulsive therapy

	Author	Title	Aim	Sample	Results	Conclusion
1	Zahavi GS et al.	"Comparison of anaesthetics in electroconvulsive therapy: an effective treatment with the use of propofol, etomidate, and thiopental"	To evaluate the effects of the anesthetic agents used in ECT on seizure, hemodynamics, and recovery from ECT and its immediate side effects.	91 patients out of which 39 were anesthetized with thiopental, 29 with etomidate, and 23 were with propofol	Seizure duration was longer in thiopental group and also patients under they received lower electrical dose.	Thiopental is a better anaesthetic agent for modified ECT
2	O Canbek et al.	"Comparison of propofol, etomidate, and thiopental in anesthesia for electroconvulsive therapy: a randomized, double-blind clinical trial"	To compare the effects of propofol, thiopental and etomidate	All male hospitalised patients	No significant differences were found among groups with respect to effects on cardiovascular system, seizure, and cognitive functions.	Propofol, Etomidate and thiopental have similar safety and efficacy
3	H. Janouschek	"Comparison of methohexital and etomidate as anaesthetic agents for electroconvulsive therapy in affective and psychotic disorders"	To evaluate the difference in effects of etomidate and methohexital on clinical features, ECT parameters and its side effects	Patients with affective and psychotic diagnosis with etomidate or with methohexital for ECT	Methohexital had declining trends of EEG seizures and had more side effects during and immediately after the ECT.	Etomidate gives better seizure duration and has lesser side effects
4	AS Patel et al.	"Anaesthesia and electroconvulsive therapy: a retrospective study comparing etomidate and propofol"	To compare the effect of etomidate and propofol by assessing the length of course of ECT, adverse effects of each induction agent, the number of missed seizures,and stimulus	65 patients out of which 36 received etomidate and 29 received propofol for ECT	Propofol had a significant longer course of ECT, higher seizure thresholds, and increased amounts of electrical charge.	Etomidate is a better anaesthetic agent

a retrospective study to examine the relationship between anaesthetic management and seizure duration in ECT. It showed that theophylline administration was the sole factor significantly associated with prolonged seizure duration, whereas other variables, including S-ketamine, remifentanil, thiopental, age, sex, session number, and energy level, had no significant impact [19]. Althesin significantly shortened seizure duration in comparison with methohexitone and Etomidate as per a comparative study on etomidate and althesin. Seizure duration was the same when either etomidate or methohexitone were used, whereas local pain on injection andsuperficial thrombophlebitis occurred frequently with methohexitone and did not occur with etomidate or Althesin [20]. Premedication with low-dose midazolam before etomidate anaesthesia induction significantly reduced the incidence and intensity of myoclonus compared to low-dose etomidate as per a comparative study. Compared to etomidate alone, it showed significant differences in myoclonic movement frequency between the groups, with the midazolam group experiencing fewer myoclonic movements than the placebo and etomidate groups [21]

Hemodynamic profile

The evolution of ECT has seen a shift from its initial use without anaesthesia to the introduction of general anaesthesia in the 1950s, aimed at mitigating complications such as fractures, dental damage, and muscle injuries. [22]. The administration of anaesthesia for ECT requires specialized training emphasizing the need to possess an in-depth knowledge of hemodynamics and the effects of ECT. The electrical currentstimulate the autonomic nervous system, inducing unique hemodynamic changes in both systemic and cerebral circulation. To ensure safe and effective treatment, medications with anticholinergic and antihypertensive properties along with adequate ventilation should be used to mitigate excessive changes in heart rate, blood pressure, and cardiac function. Even when serious complications are rare, patients with pre-existing ischemic heart disease or cerebrovascular disease require careful management to prevent adverse cardiac or neurological events [23]. It is associated with significant cardiovascular changes, prompting concerns about the optimal anaesthetic choice. Despite numerous studies, the debate still persists due to inconsistent

Lakshmi A, et al., J Psychiatry Psychiatric Disord 2024
DOI:10.26502/jppd.2572-519X0228

findings. An RCT revealed that etomidate, propofol, and thiopental exhibited comparable cardiovascular profiles, providing valuable insights for ECT anaesthetic selection [24]. Comparing two widely used anaesthetic agents propofol and etomidate, etomidate revealed a significant increase in mean heart rate (HR) from baseline, during and after seizure activity,also a significant increase in mean blood pressure (MBP), Propofol did not exhibit any significant changes throughout the monitoring period. This can be attributed towards propofol's cardiovascular depressant effect, which outweighs the sympathetic stimulation caused by seizure activity during ECT [25]. Dexmedetomidine may be a useful adjunct in ECT, reducing hemodynamic stress without interfering with seizure duration or recovery timeuse of dexmedetomidine with reduced-dose propofol did not prolong recovery time [26]. Etomidate caused a significant increase in QTc after seizure cessation, whereas propofol did not have an impact. This was a study conducted on patients with major depression. Etomidate was associated with increased HR and MAP at all measurement times, whereas propofol demonstrated better hemodynamic control [27].Alfentanil significantly decreased heart rate, diastolic arterial pressure, and mean arterial pressure without affecting the increase in these variables during seizures. Alfentanil did not influence seizure duration but had prolonged apnea duration as found by a prospective study. It may be beneficial in reducing tachycardia and hypertension during ECT in high-risk patients without impacting seizure duration, and it does not have a proconvulsive effect when combined with etomidate [28]. In a prospective study conducted by Tejaswini et al on 50 adults, it was found that Etomidate has better hemodynamic profile with few changes in Blood pressure, Heart rate and mean arterial blood pressure compared to propofol [29]. Whereas Erdil et al [30] & Gazdag et a [31] have observed that propofol has a better hemodynamic response compared to propofol. However, there are reviews which provide findings which are inconclusive regarding the effects of intravenous anaesthetics on ECT treatment quality and respiratory and cardiovascular side effects [22].

Clinical response

Etomidate was associated with significantly longer motor and electroencephalogram seizure durations compared to propofol as per a retrospective study conducted to investigate the impact of general anesthetic agents on the efficacy of ECT. The study compared the clinical effects and seizure variables of etomidate and propofol in patients undergoing ECT. However, both agents demonstrated similar clinical efficacy profiles at discharge, with no significant differences in Clinical Global Impression scale scores, mood at discharge, or adverse effects [32]. Etomidate led to a greater reduction in depression scores compared to sodium thiopental in an RCT comparing the efficacy of etomidate and sodium thiopental in alleviating depression symptoms in patients undergoingECT. Additionally, the etomidate group also exhibited significantly longer seizure durations across all sessions indicating that etomidate may be more effective than sodium thiopental in improving major depressive disorder symptoms in patients undergoing ECT [33]. Patients who received etomidate for ECT required significantly fewer sessions compared to the propofol and that patients receiving propofol may need additional treatment sessions to achieve similar clinical outcomes as those receiving etomidate. But there weren't any significant differences in mood during the time of discharge, remission, and length of hospital stay between the two groups [32].

Side effects and recovery

The effects of etomidate and propofol on adrenocortical function and hemodynamics during electroconvulsive therapy (ECT) were assessed by Wang et al showed that etomidate caused a temporary decrease in serum cortisol levels, remaining within normal ranges, while propofol had no significant effect. Adrenocorticotropic hormone levels remained unchanged in both groups. Both anaesthetics were deemed safe for ECT, with no significant impact on adrenocortical function [37]. A study compared methohexital and etomidate anaesthesia for ECT showed comparable hemodynamics to methohexital but had significant drawbacks, including a 24% longer mean wakeup time and a higher incidence of pain on injection. However, these disadvantages may outweigh etomidate's advantages, particularly in patients where rapid recovery is crucial [34]. It also has adverse effects including etomidate-induced myoclonus [21] and painful injection [15] resulting in unpleasant experiences for patients. A study conducted by Moacir a rosa et al by comparing propofol etomidate and thiopental showed that Propofol needed higher charge but had shorter recovery when compared to etomidate and thiopental [35].

Discussion

Historically, methohexital a short-acting barbiturate has been the preferred anaesthetic for modified ECT due to its ability to induce prolonged seizure duration. However, etomidate has emerged as a popular alternative, offering advantages such as a rapid onset, brief duration, and stable hemodynamics. Notably, etomidate has been linked to extended EEG and motor seizure durations, potentially due to its lack of anticonvulsant properties. As a result, etomidate may be the optimal induction agent for patients who experience insufficient seizure activity, making it a valuable option for modified ECT procedures [36].

Our review compared etomidate with common agents like thiopental, propofol, methohexital, ketamine, and midazolam. Numerous studies found that propofol, etomidate, and thiopental have similar safety and efficacy profiles, with etomidate offering better seizure duration and fewer side effects. However, some agents are more suitable for

Lakshmi A, et al., J Psychiatry Psychiatric Disord 2024
DOI:10.26502/jppd.2572-519X0228

Table2: Efficacy of Etomidate using various parameters

Sl.no	Parameter	Author	Title	Aim	Results	Conclusion
1	Mental disorders	SV Eranti et al.	"Methohexitone, propofol and etomidate in electroconvulsive therapy for depression: a naturalistic comparison study"	To compare treatment parameters and response to ECT in patients anaesthetised with different anaesthetics	Mean seizure duration was lowest with propofol and also had a greater proportion of failed seizures	Choice of anaesthetic agent did not appear to significantly affect therapeutic response to ECT
		M Zavorotnyy et al.	"S -ketamine compared to etomidate during electroconvulsive therapy in major depression"	To compare S-ketamine and etomidateregarding their influence on safety aspects, seizure characteristics and outcome of ECT in major depression.	S-ketamine group was noted to have a lower initial seizure threshold, stimulation charge, higher postictal suppression, EEG ictal amplitude, EEG coherence and a maximum heart rate	S- ketamine is better in major depression
		Gazdag et al.	"Etomidate Versus Propofol for Electroconvulsive Therapy in Patients With Schizophrenia"	Comparing propofol and etomidate in patients with schizophreniaon the basis of impact on seizure activity and on seizure-induced hemodynamic changes.	Etomidate had longer seizure duration and had no significant difference in pulse frequency, in postictal suppression, or in the energy index	Etomidate has better evidence in schizophrenia
		G Gabor et al.	"Comparison of propofol and etomidate regarding impact on seizure threshold during electroconvulsive therapy in patients with schizophrenia"	To compare the effect of propofol on seizure duration and seizure threshold with that of etomidate during the ECT on patients with schizophrenia	Propofol reduces electric and motoric seizure duration	Propofol does not increase electrical load on patients than etomidate in schizophrenia
2	Seizure duration	Paula T Trzepacz et al.	"Etomidate anesthesia increases seizure duration during ECT: a retrospective study"	Chart review on depressive psychiatric in patients who had received ECT tocompare the effectiveness of etomidate and thiopental on seizure duration	Use of etomidate enhanced seizure duration in ECT	Etomidate is better than thiopental in terms of seizure duration
		PM Singh et al.	"Evaluation of etomidate for seizure duration in electroconvulsive therapy: a systematic review and meta-analysis"	The efficacy of etomidate against other induction agents in terms of seizure duration both EEG and motor	In etomidate group, the pooled EEG seizure duration was longer than methohexital	Etomidate is better than thiopental, methohexital and propofol
		N Khalid et al	"The effects of etomidate on seizure duration and electrical stimulus dose in seizure-resistant patients during electroconvulsive therapy"	To compare the seizure duration and the electric charge needed to produce the seizures for a total of 46 pairs of ECT sessions given under two anaesthetics	Etomidate has a distinct advantage over thiopental in producing seizures of adequate duration during ECT and should be used as the first-line measure in augmenting seizures in patients who have very high seizure thresholds	Etomidate is better than thiopental

Citation: Lakshmi, Nithin P, Vikram S, Monic Dolli, Jitendra Mugali, Fakirappa B Ganiger, Suhasini Hubli. A Systematic Review on Efficacy of Etomidate as an Anaesthetic Agent in Modified Electroconvulsive Therapy. Journal of Psychaity and Psychaitric Disorders. 8 (2024): 275-286.

Lakshmi A, et al., J Psychiatry Psychiatric Disord 2024
DOI:10.26502/jppd.2572-519X0228

		Lammeren et al.	"Etomidate and seizure duration in electroconvulsive therapy: is there a dose-dependent relation?"	To determine a dose-dependent relation between etomidate and motor andEEGseizure duration in ECT	No clinically relevant dose-dependent relation between etomidate and seizure duration in ECT	No dose dependent relationship
			"Intravenous theophylline is the most effective intervention to prolong EEG seizure duration in patients undergoing electroconvulsive therapy"	To know the impact of anaesthetic management on seizure duration, and the impact of theophylline, remifentanil, S-ketamine on seizure duration.	Theophylline can be a useful adjunct for patients with inadequate seizure duration	Theophylline as an adjunct can prolong seizure duration
		L Gran et al.	"Seizure duration in unilateral electroconvulsive therapy a comparison of the anaesthetic agents etomidate and althesin with methohexitone"	To compare the seizure duration in unilateral ECT with etomidate and althesin with methohexitone	Seizure duration was the same with etomidate and methohexitone. Althesin significantly shortened seizure duration in comparison with methohexitone	Seizure duration is same with etomidate and methohexitone and lesser with althesin
		Behzad et al.	"Comparison of Premedication with Low-Dose Midazolam Versus Etomidate for Reduction of Etomidate-Induced Myoclonus During General Anesthesia for Electroconvulsive Therapy: A Randomized Clinical Trial"	To compare the effect of low-dose etomidate and low-dose midazolam to suppress etomidate-induced myoclonus in ECT.	Myoclonic movements were significantly lower in the midazolam group than in the both placebo and etomidate groups. Also, the intensity of myoclonic movements was significantly higher in the midazolam group than in placebo and etomidate groups	Low-dose midazolam before anaesthesia induction with etomidate haslower incidence and intensity of myoclonus than low-dose etomidate
	Hemodynamic profile	WW van den Broek et al	"Double-blind placebo controlled study of the effects of etomidate-alfentanil anesthesia in electroconvulsive therapy"	Effect of etomidate and alfentanil on heart rate, systolic arterial pressure, diastolic arterial pressure, and mean arterial pressure	Alfentanil administration resulted in decreased heart rate, diastolic arterial pressure, and mean arterial pressure, both prior to and following the stimulus, without impacting seizure duration. Additionally, alfentanil prolonged apnea duration. However, it did not demonstrate a significant reduction in myoclonus occurrence after etomidate administration compared to placebo, and postictal agitation following ECT did not appear to increase with alfentanil use	Alfentanil is useful to reduce tachycardia and hypertension during ECT in high-risk patients without effects on seizure duration.

Lakshmi A, et al., J Psychiatry Psychiatric Disord 2024
DOI:10.26502/jppd.2572-519X0228

3	Hemodynamic profile	WW van den Broek et al	"Double-blind placebo controlled study of the effects of etomidate-alfentanil anesthesia in electroconvulsive therapy"	Effect of etomidate and alfentanil on heart rate, systolic arterial pressure, diastolic arterial pressure, and mean arterial pressure	Alfentanil administration resulted in decreased heart rate, diastolic arterial pressure, and mean arterial pressure, both prior to and following the stimulus, without impacting seizure duration. Additionally, alfentanil prolonged apnea duration. However, it did not demonstrate a significant reduction in myoclonus occurrence after etomidate administration compared to placebo, and postictal agitation following ECT did not appear to increase with alfentanil use	Alfentanil is useful to reduce tachycardia and hypertension during ECT in high-risk patients without effects on seizure duration.
		R Wojdacz et al.	"Comparison of the effect of intravenous anaesthetics used for anaesthesia during electroconvulsive therapy on the hemodynamic safety and the course of ECT"	To assess how various anaesthetic agents affect the quality of ECT and presence of any hemodynamic complications after ETC.	inconclusive when it comes to the effect of intravenous anaesthetic on the quality of the ECT and side effects related to respiratory and cardiovascular system	Inconclusive
		X Li et al.	"Dexmedetomidine combined with intravenous anaesthetics in electroconvulsive therapy: a meta-analysis and systematic review"	To investigate how the combined use of dexmedetomidine with intravenous anaesthetics influences seizure duration and circulatory dynamics in electroconvulsive therapy (ECT).	Additional use of dexmedetomidine significantly reduced maximum MAP and HR after ECT	Worthwhile for patients to receive dexmedetomidine before the induction of anaesthesia in ECT.
		Tejaswini et al.	"Comparison of etomidate and propofol as induction agents in modified electroconvulsive therapy"	To compare the effects of induction agents Propofol and Etomidate on hemodynamic parameters (Heart rate, Systolic Blood Pressure, Diastolic Blood pressure, and mean arterial pressure) in modified electroconvulsive therapy (ECT).	Propofol has the advantage of having rapid and smooth recovery as compared to Etomidate. Minimum side effects were seen in both groups. Subseizure was seen with the Propofol group more than Etomidate. Hence, we conclude that Etomidate is a better induction agent as compared to Propofol in modified ECT.	Recovery with Propofol is smooth and rapid than etomidate
		F Erdil et al.	"Effects of propofol or etomidate on QT interval during electroconvulsive therapy"	the effects of propofol or etomidate on the corrected QT (QTc) interval during ECT in patients with major depression.	QTc interval was shorter in Propofol group compared to Etomidate group and controlled the hemodynamic response better than etomidate during ECT.	Propofol has better cardiac and hemodynamic response than etomidate

Citation: Lakshmi, Nithin P, Vikram S, Monic Dolli, Jitendra Mugali, Fakirappa B Ganiger, Suhasini Hubli. A Systematic Review on Efficacy of Etomidate as an Anaesthetic Agent in Modified Electroconvulsive Therapy. Journal of Psychaity and Psychaitric Disorders. 8 (2024): 275-286.

Lakshmi A, et al., J Psychiatry Psychiatric Disord 2024
DOI:10.26502/jppd.2572-519X0228

		G Gazdag et al.	"Etomidate Versus Propofol for Electroconvulsive Therapy in Patients with Schizophrenia"	To compare propofol and etomidate during the ECT of patients with schizophrenia, on the basis of their impact on seizure activity and on seizure-induced hemodynamic reactions.	Seizure induced increase in MAP was reduced by propofol to a significantly greater degree than by etomidate	Propofol is better than etomidate
4	Clinical response	IY Yoon et al.	"Etomidate versus propofol for electroconvulsive therapy in patients with major depressive disorders in terms of clinical responses to treatment: a retrospective analysis"	To retrospectively compare the clinical effects and seizure variables of etomidate and propofol during ECT. Patients treated with ECT under anesthesia with etomidate or propofol	There were no significant differences in the Clinical Global Impression scale scores, mood at discharge, and adverse effects between the two groups	Etomidate and propofol were associated with similar clinical efficacy profiles at discharge
		MH Abdollahi et al.	"Effect of etomidate versus thiopental on major depressive disorder in electroconvulsive therapy, a randomized double-blind controlled clinical trial"	RCT comparing the effect of etomidate and sodium thiopental on the depression symptoms in ECT patient	Linear regression analysis showed that etomidate decreased the depression score more than did sodium thiopental.	Etomidate may improve major depressive disorder more than sodium thiopental in patients who are receiving ECT.
5	Side effects and recovery	N Wang et al.	"The effect of repeated etomidate anaesthesia on adrenocortical function during a course of electroconvulsive therapy"	comparative effects of etomidate and propofol during ECT on adrenocortical function and hemodynamic.	Etomidate and propofol would not affect the adrenocortical function during ECT, and hemodynamic reached normal level in a short time after ECT. Etomidate and propofol were both safe intravenous anaesthetics during ECT, although etomidate was associated with comparatively longer seizure duration.	No effect on adrenocortical function and hemodynamic profile
		Kovac et al.	"A Comparison Between Etomidate and Methohexital for Anaesthesia in ECT"	To compare Etomidate and methohexital for ECT	Etomidate has longer wake up time, pain on injection but with stable hemodynamics	Propofol offers better recovery profile
		Moacyr A Rosa et al.	"Recovery after ECT: comparison of propofol, etomidate and thiopental"	To compare post anaesthetic recovery between three of the main drugs used in ECT thiopental, propofol and etomidate	Propofol needed higher charge but had shorter recovery when compared to etomidate and thiopental	Propofol has better recovery

Citation: Lakshmi, Nithin P, Vikram S, Monic Dolli, Jitendra Mugali, Fakirappa B Ganiger, Suhasini Hubli. A Systematic Review on Efficacy of Etomidate as an Anaesthetic Agent in Modified Electroconvulsive Therapy. Journal of Psychaity and Psychaitric Disorders. 8 (2024): 275-286.

Lakshmi A, et al., J Psychiatry Psychiatric Disord 2024
DOI:10.26502/jppd.2572-519X0228

specific mental disorders, while others show no difference. Notably, etomidate's ability to produce adequate seizure duration and theophylline's potential as an adjunct to prolong seizures were observed. The selection of an anaesthetic agent considering its impact on hemodynamics was analyzed, revealing inconclusive results in many studies. Recovery from anaesthesia was also evaluated, with studies comparing the efficacy of various agents on cardiac and hemodynamic parameters. Clinical responses following modified ECT sessions on mental disorders showed similar efficacy profiles at discharge, with some benefits of etomidate in specific disorders. The efficacy of etomidate was analysed using various parameters such as seizure duration, hemodynamic profile, clinical profile, side effects and recovery. Etomidate's efficacy in various mental disorders was analysed, revealing its potential in enhancing seizure duration during modifiedECT. Etomidate demonstrated a longer seizure duration compared to thiopental and methohexital, with no significant differences in hemodynamic profile, although few studies mentioned propofol to be a better agent. It also has a distinct advantage over thiopental in producing seizures of adequate duration during modifiedECT and can be used as the first-line measure in augmenting seizures in patients with very high seizure thresholds.Our study also found that theophylline can be a useful adjunct for patients with inadequate seizure duration. Sub threshold seizure was seen with the Propofol group more than Etomidate. Clinically, etomidate showed a good response in patients undergoing modifiedECT, with equivalent remission and response rates in unipolar and bipolar depression groups had lesser number of modifiedECTs without triggering manic episodes. However, etomidate had a longer wake-up time and was found to cause pain on injection. In terms of side effects, etomidate had a lower incidence of myoclonic movements compared to midazolam and methohexital. On the contrary, there were also studies mentioning that QTc interval was shorter in Propofol group compared to etomidate group and controlled the hemodynamic response better than etomidate during modifiedECT. Recovery-wise, etomidate had a stable hemodynamic profile, although propofol had a faster and smoother recovery. Notably, etomidate decreased depression scores more than sodium thiopental, and its use did not trigger manic episodes in depressed patients. Overall, etomidate appears to be a better induction agent than propofol in modified ECT, with a distinct advantage in producing seizures of adequate duration

Conclusion

In our systematic review it is found that etomidate stands out as a superior choice in modified ECT particularly in patients with schizophrenia where it has demonstrated better evidence. Its advantages are evident in seizure durationsurpassing thiopental methohexital and propofol. While propofol offers asmoother and faster recovery, etomidate and propofol share similar clinical efficacy profiles at discharge. Notably, etomidate may have a more significant impact on improving major depressive disorder compared to sodium thiopental in modified ECT patients. Although propofol has a better recovery profile, etomidate's benefits in seizure duration and clinical efficacy make it a preferred choice in certain cases.

Funding: None

Conflict of interest: Nil

References

1. Forman SA, Warner DS. Clinical and molecular pharmacology of etomidate. The Journal of the American Society of Anesthesiologists114(2011):695-707.
2. Kaliora SC, Zervas IM, Papadimitriou GN. [Electroconvulsive therapy: 80 years of use in psychiatry]. Psychiatriki29(2018):291-302.
3. Peng L, Min S, Wei K, et al.,Different regimens of intravenous sedatives or hypnotics for electroconvulsive therapy (ECT) in adult patients with depression. Cochrane database of systematic reviews 4 (2014).
4. Payne NA, Prudic J. Electroconvulsive therapy: Part II: a biopsychosocial perspective. J PsychiatrPract 15(2009):369-390.
5. Ray AK. How bad was unmodified electroconvulsive therapy! A retrospective study. Indian J Psychiatry. 2016 Apr-Jun;58(2016):212-225.
6. Eranti SV, Mogg AJ, Pluck GC, et al.., Methohexitone, propofol and etomidate in electroconvulsive therapy for depression: a naturalistic comparison study. Journal of affective disorders113(2009):165-1671.
7. Zavorotnyy M, Kluge I, Ahrens K, et al.,S-ketamine compared to etomidate during electroconvulsive therapy in major depression. European Archives of Psychiatry and Clinical Neuroscience267 (2017):803-813.
8. Gazdag G, Kocsis N, Tolna J, et al.,Etomidate versus propofol for electroconvulsive therapy in patients with schizophrenia. The journal of ECT20(2004):225-229.
9. Gábor G, Judit T, Zsolt I. Comparison of propofol and etomidate regarding impact on seizure threshold during electroconvulsive therapy in patients with schizophrenia. Neuropsychopharmacol Hung9(2007):125-130.
10. S. Bailine, M. Fink, R. Knapp, G. Electroconvulsive therapy is equally effective in unipolar and bipolar depression.
11. Zahavi GS, Dannon P. Comparison of anesthetics in electroconvulsive therapy: an effective treatment with the use of propofol, etomidate, and thiopental.

Lakshmi A, et al., J Psychiatry Psychiatric Disord 2024
DOI:10.26502/jppd.2572-519X0228

Neuropsychiatric disease and treatment20 (2014):383-389.

12. Canbek O, Ipekcoglu D, Menges OO, et al.,Comparison of propofol, etomidate, and thiopental in anesthesia for electroconvulsive therapy: a randomized, double-blind clinical trial. The journal of ECT31(2015):91-97.
13. Janouschek H, Nickl-Jockschat T, Haeck M, et al.,Comparison of methohexital and etomidate as anesthetic agents for electroconvulsive therapy in affective and psychotic disorders. Journal of psychiatric research47(2013):686-693.
14. Patel AS, Gorst-Unsworth C, Venn RM, et al., Anesthesia and electroconvulsive therapy: a retrospective study comparing etomidate and propofol. The journal of ECT22(2006):179-183.
15. Singh PM, Arora S, Borle A, et al., Evaluation of etomidate for seizure duration in electroconvulsive therapy: a systematic review and meta-analysis. The Journal of ECT31(2015):213-225.
16. Trzepacz PT, Weniger FC, Greenhouse J. Etomidate anesthesia increases seizure duration during ECT: a retrospective study. General hospital psychiatry15(1993):115-120.
17. Khalid N, Atkins M, Kirov G. The effects of etomidate on seizure duration and electrical stimulus dose in seizure-resistant patients during electroconvulsive therapy. The Journal of ECT22(2006):184-188.
18. van Lammeren A, Dols A, van de Ven PM, et al.,Etomidate and seizure duration in electroconvulsive therapy: is there a dose-dependent relation? J ECT29(2013):101-105.
19. Tzabazis A, Wiernik ME, Wielopolski J, et al., Intravenous theophylline is the most effective intervention to prolong EEG seizure duration in patients undergoing electroconvulsive therapy. BMC anesthesiology17 (2017):1-5.
20. Gran L, Bergsholm P, Bleie H. Seizure duration in unilateral electroconvulsive therapy a comparison of the anaesthetic agents etomidate and althesin with methohexitone. ActaPsychiatricaScandinavica69(1984):472-83.
21. Nazemroaya B, Mousavi SM. Comparison of premedication with low-dose midazolam versus etomidate for reduction of etomidate-induced myoclonus during general anesthesia for electroconvulsive therapy: A randomized clinical trial. Anesthesiology and Pain Medicine9(2019).
22. Wojdacz R, Święcicki Ł, Antosik-Wójcińska A. Comparison of the effect of intravenous anesthetics used for anesthesia during electroconvulsive therapy on the hemodynamic safety and the course of ECT. PsychiatriaPolska51(2017).
23. Kadoi Y, Saito S. Anesthetic considerations for electroconvulsive therapy-especially hemodynamic and respiratory management. Current Psychiatry Reviews5(2009):276-286.
24. Rosa MA, Rosa MO, Marcolin MA, et al., Cardiovascular effects of anesthesia in ECT: a randomized, double-blind comparison of etomidate, propofol, and thiopental. The Journal of ECT23(2007):6-8.
25. Wojdacz R, Święcicki Ł, Antosik-Wójcińska A. Comparison of the effect of intravenous anesthetics used for anesthesia during electroconvulsive therapy on the hemodynamic safety and the course of ECT. PsychiatriaPolska51(2017).
26. Li X, Tan F, Cheng N, et al., Dexmedetomidine combined with intravenous anesthetics in electroconvulsive therapy: a meta-analysis and systematic review. The journal of ECT33(2017):152-159.
27. Erdil F, Demirbilek S, Begec Z, et al., O. Effects of propofol or etomidate on QT interval during electroconvulsive therapy. The journal of ECT25(2009):174-177.
28. van den Broek WW, Groenland TH, et al., Double-blind placebo controlled study of the effects of etomidate-alfentanil anesthesia in electroconvulsive therapy. The Journal of ECT20(2004):107-111.
29. Sharma t, makker r, ranjan p, et al.,Comparison of etomidate and propofol as induction agents in modified electroconvulsive therapy. Asian J Pharm Clin Res16(2023):57-61.
30. Erdil F, Demirbilek S, Begec Z, et al.,Effects of propofol or etomidate on QT interval during electroconvulsive therapy. The journal of ECT25(2009):174-177.
31. Gazdag G, Kocsis N, Lipcsey A. Rates of electroconvulsive therapy use in Hungary in 2002. The Journal of ECT20(2004):42-44.
32. Yoon IY, Ryu JH, Do SH, et al., Etomidate versus Propofol for Electroconvulsive Therapy in Patients with Major Depressive Disorders in Terms of Clinical Responses to Treatment: A Retrospective Analysis. Brain Sciences13(2023):1023.
33. Abdollahi MH, Izadi A, Hajiesmaeili MR, et al., Effect of etomidate versus thiopental on major depressive disorder in electroconvulsive therapy, a randomized double-blind controlled clinical trial.The journal of ECT28(2012): 10-13.
34. Kovac AL, Pardo M. A comparison between etomidate and methohexital for anesthesia in ECT.The Journal of ECT 8(1992):118-125.

Lakshmi A, et al., J Psychiatry Psychiatric Disord 2024
DOI:10.26502/jppd.2572-519X0228

35. Moacyr A Rosa, Marina O Rosa, Iara M T Belegarde, et al.,Fregni Recovery after ECT: comparison of propofol, etomidate and thiopental.

36. Chomrikh L, Ahmadi M, Kuijper TM, et al.,The influence of anaesthetic choice on seizure duration of electroconvulsive therapy; etomidate versus methohexital. BMC anesthesiology22(2022):206.

37. Wang N, Wang XH, Lu J, et al.,The effect of repeated etomidate anesthesia on adrenocortical function during a course of electroconvulsive therapy. The Journal of ECT27(2011):281-285.