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Case Series

Anaesthesia Section

Ketodex for Electroconvulsive Therapy in Patients with Psychotic Disorders: A Case Series

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ABSTRACT

Before the introduction of antipsychotic medications, Electroconvulsive Therapy (ECT) was considered one of the first-line treatments for psychotic disorders. Although ECT is still recommended for certain patients with psychosis, the widespread use of antipsychotic drugs has made it less commonly utilised. However, the combination of ketamine and dexmedetomidine (Ketodex) may prove beneficial in controlling the haemodynamic response and preventing emergent confusion due to their opposing drug actions. Nonetheless, the use of Ketodex in patients with psychosis undergoing ECT has not been thoroughly explored. This series presents cases of five patients (22 years female, 25 years female, 28 years male, 19 years female and 25 years female patients) who underwent 25 sessions of ECT with the ketamine-dexmedetomidine combination. All patients demonstrated good cardiovascular stability without experiencing emergent confusion. Based on these findings, the study concludes that the combination of ketamine and dexmedetomidine is both effective and safe for patients with psychosis undergoing ECT.

Keywords: Anti-psychotic, Dexmedetomidine, Ketamine, Medications

INTRODUCTION

ECT has long been used in patients with psychosis for various indications. However, with the introduction of anti-psychotic medications, its use has been limited to specific circumstances. In schizophrenia, ECT may be employed for catatonia, a history of positive response to ECT, and treatment resistance, as recommended by several treatment guidelines [1].

Different anaesthetic agents have been tested for use in ECT. Ketamine, a non-competitive N-Methyl-D-Aspartate (NMDA) agonist, provides dissociative anaesthesia. It does not suppress muscle tone, respiratory effort, or cardiovascular function, while still offering analgesia and amnesia. Intravenous (IV) administration of ketamine leads to rapid anaesthesia and may prolong ECT seizures [2]. However, ketamine raises sympathetic tone, which can be concerning as ECT causes generalised autonomic nervous system stimulation, resulting in tachycardia and hypertension, potentially harmful to patients with pre-existing cardiovascular risk factors [3]. Additionally, there have been concerns about ketamine worsening psychosis, although practitioners have reported using it without encountering such issues [4].

Dexmedetomidine, a highly selective $\alpha 2$-adrenergic receptor agonist, has gained attention for its sedative, analgesic, peri-operative sympatholytic, anaesthetic-sparing, and haemodynamic stabilising properties. Furthermore, it provides a higher level of conscious sedation compared to other sedatives. The most common adverse effects of its use for procedural sedation are hypotension and bradycardia [5].

A descriptive study by Tobias demonstrated that ketamine can prevent the hypotension and bradycardia observed with dexmedetomidine. Furthermore, dexmedetomidine can prevent hypertension, tachycardia, increased salivation, and psychological emergence reactions caused by ketamine. Additionally, ketamine facilitated the onset of sedation when combined with dexmedetomidine alone [6].

Based on these findings, it appears that the Ketodex combination would be beneficial in controlling the haemodynamic response and is safe to use. However, as this combination has not been tested in Indian patients with psychosis undergoing ECT, the authors present a case series of five patients in whom the clinicians utilised the Ketodex combination as anaesthetic agents.

CASE SERIES

This case series was conducted as a pilot study before an ongoing RCT to determine the cardiovascular safety and adverse event profile. The study was carried out from July to December 2022, following ethical committee approval (MGMCRI/2022/IRC/105/04/IHEC/), and in accordance with the Helsinki Declaration of 1975, as amended in 2013. The study included five patients diagnosed with paranoid schizophrenia who were referred to undergo ECT due to treatment resistance. Two of the patients had suicidal intentions.

After obtaining written informed consent from the patients and their legally authorised representatives, the patients were premedicated with a tablet of ranitidine 150 mg and metoclopramide 10 mg on the morning of the procedure. Upon arrival in the procedure room, monitoring was established using electrocardiography, non-invasive blood pressure, and pulse oximetry. Peripheral IV access was secured using a 20-G IV cannula. Baseline mean arterial pressure and heart rate were recorded. IV glycopyrrolate 0.2 mg was administered. Preoxygenation with 100% oxygen was performed, followed by a ten-minute infusion of dexmedetomidine (1 µg/kg diluted in 100 mL of 0.9% saline) [4], and induction with ketamine (1 mg/kg) [4,7]. Additional ketamine was given in 10 mg increments if the patient did not lose responsiveness to verbal commands within 60 seconds. The total required dose was recorded. After applying a lower limb tourniquet, IV succinylcholine was administered at a dose of 0.5 mg/kg. A bite block was placed, and a suprathreshold electrical stimulus was delivered via bitemporal electrodes while ventilation was assisted with oxygen during the procedure. Once the patient achieved spontaneous breathing and an airway protective reflex, they were transferred to the recovery area. The recovery time was defined as the time taken for spontaneous breathing, eye opening, and obeying commands, which were all recorded.

Details of the patient characteristics and drug doses of individual patients are given in [Table/Fig-1]. The average duration of seizures for each patient was 42.8±10.52 seconds, which is considered adequate [7]. Details of changes in heart rate and mean arterial pressure are given in [Table/Fig-2]. None of the patients had hypotension or hypertension, and there was no fall in saturation during the procedure. The average time for resumption of spontaneous breathing was 7.3±1.2 minutes, while for eye-opening

	Age (years)	Gender	Height (cm)	Weight (kg)	Indication for ECT	Dose of Ketamine (mg)	Dose of Dexmedetomidine (µg)	Average duration of motor seizures (seconds)
Patient 1	22	Female	161	45	Partial response to treatment/Acute suicide risk	50	50	33.4±3.97
Patient 2	25	Female	156	61	Partial response to treatment/Acute suicide risk	80	100	49.8±21.72
Patient 3	28	Male	164	58	Partial response to treatment	80	100	51.6±8.26
Patient 4	19	Female	145	43	Partial response to treatment	40	50	49.8±8.17
Patient 5	25	Female	149	50	Partial response to treatment	50	50	29.4±4.98

[Table/Fig-1]: Patient characteristics and drug dosages.

Patient	Sessions	HR (beats per minute) (Baseline)	HR (beats per minute) (Immediately after seizures)	HR (beats per minute) (Discharge)	MAP (mm of Hg) (Baseline)	MAP (mm of Hg) (Immediately after seizures)	MAP (mm of Hg) (Discharge)
Patient 1	Session 1	87	93	68	102	112	87
	Session 2	80	75	69	85	115	100
	Session 3	87	63	67	98	93	99
	Session 4	78	60	69	87	96	91
	Session 5	88	76	78	109	82	96
Patient 2	Session 1	73	120	68	104	142	93
	Session 2	63	57	65	107	121	92
	Session 3	74	69	69	105	95	88
	Session 4	84	63	86	102	110	101
	Session 5	75	84	67	93	95	96
Patient 3	Session 1	109	100	96	104	121	70
	Session 2	109	73	88	99	139	93
	Session 3	92	79	96	105	74	77
	Session 4	73	124	75	99	146	72
	Session 5	77	71	66	98	149	76
Patient 4	Session 1	77	139	74	93	135	93
	Session 2	95	90	90	86	132	95
	Session 3	100	90	85	96	95	93
	Session 4	95	100	88	96	116	96
	Session 5	97	114	86	87	129	91
Patient 5	Session 1	83	110	74	91	100	84
	Session 2	88	74	69	85	96	73
	Session 3	93	86	74	84	84	86
	Session 4	86	105	88	71	99	78
	Session 5	93	84	69	95	104	92

[Table/Fig-2]: Details of changes in heart rate and mean arterial pressure.
*MAP: Mean arterial pressure (mmHg); *HR: Heart rate (beats per min)

and obeying motor commands, it was 32.8±7.7 minutes and 33.24±7.21 minutes, respectively. None of the patients developed post-ECT confusional state or delirium. Only one patient experienced nausea and vomiting after all sessions of ECT. There were no instances of post-procedural bradycardia, tachycardia, hypo- or hypertension, respiratory depression, or hypoxaemia observed in any of the patients.

DISCUSSION

This case series was conducted to determine the effectiveness and safety of the ketodex combination for patients with psychosis undergoing ECT. While various drugs are available for ECT anaesthesia, each has its own pros and cons. An ideal anaesthetic should have a short duration of action, not interfere with seizure duration, not have peri-procedural haemodynamic or respiratory effects, and not cause any post-ECT confusional state or other adverse effects [8]. The ketodex combination satisfies most of these criteria.

In patients of present series, the average duration of seizures was 42.8±10.52 seconds. Previous studies have also indicated that the use of the ketodex combination resulted in longer seizure durations [2,8]. Studies investigating the impact of anaesthetics on ECT seizure duration encompass a wide range of medication dosages and combinations [7]. Although treatment effectiveness has not been linked to mean seizure duration, it is preferable to avoid seizure suppression with a drug that would necessitate frequent second stimulation to achieve a seizure response [9]. None of present series patients required a second stimulation.

Circulatory dynamics were a major concern when using the ketodex combination. Earlier studies have demonstrated that adding dexmedetomidine to ketamine has a favourable effect on mean arterial pressure and heart rate [10,11]. As observed in present cases, none of the patients experienced hypo- or hypertension during the procedure. Tachycardia was observed in all patients immediately after the administration of the current, but it subsided within one to two minutes. Thus, based on these observations, this combination exhibited a safer haemodynamic profile.

One of the significant complications of ECT is emergent confusion and delirium. This is particularly a concern when ketamine is used for anaesthesia, as it can induce dissociation [4]. Previous studies have shown that dexmedetomidine is effective in mitigating emergent confusion in ECT [12]. In present series, as well, there were no instances of emergent confusion or delirium during any of the ECT sessions.

Studies have yielded conflicting findings regarding the time to recovery when dexmedetomidine is used [8,10,11,13]. Some studies have found that the recovery time is prolonged [8,10], while a few others have reported similar or faster recovery times with dexmedetomidine [11,13]. In this study, it was observed that the recovery time (33.24±7.21 minutes) was similar to that reported by Subsoontron P et al., (24.54±13.07 minutes) and Fu W and White PF (30±9 minutes) [3,14]. However, to draw a conclusive comparison, future studies should compare it against a standard regimen.

No post-procedure side effects were reported except for nausea and vomiting in one patient, which occurred after all sessions. Ketamine is known to induce vomiting when used [15], but further clarification is needed in future studies.

CONCLUSION(S)

This case series presents the experience of using ketodex for patients with psychosis who underwent ECT. The use of this combination in this particular subset of patients has not been attempted among Indian patients thus far. This study concludes that ketodex is safer for use in psychotic patients, but its effectiveness needs to be compared with standard regimens in future studies.

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