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CASE REPORT

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Catatonia-asossicated urinary retention in geriatric patients: a case series report

Monica Parmar[1*] and Timothy Lau[1,2]

Abstract

Background Catatonia is an underdiagnosed neuropsychiatric condition, with only a few studies focusing on medical sequalae among elderly populations. Delayed treatment results in complications with high morbidity and mortality. Among elderly individuals, one such complication is urinary retention. Urinary retention can result in prolonged catheter use. In geriatric populations, prolonged use of catheters become particularly concerning and problematic as it can limit patient mobility, are potential sources for infection, and increase the risk for delirium. Catheter use has been independently associated with increased mortality in nursing home settings.

Given the above risks and implications of catheter use, this case series describes clinical cases of catatonia-associated urinary retention specifically in older populations, whereby the use of electroconvulsive therapy (ECT) resulted in resolution of urinary retention concurrent with resolution of depressive and catatonic symptoms using validated scales.

Case presentation This study involved four patients ranging from 66–84 years old who met criteria for major depressive disorder and catatonia. At admission, Montgomery-Asberg Depression Rating Scale (MADRS) scores ranged from 40–56, indicating severe illness in all patients. All patients also met criteria for catatonia as measured by the Bush Francis Catatonia Rating Scale (BFCRS). During the admission, each patient experienced urinary retention as evidenced by post-void residual (PVR) bladder volumes ranging from 569-1400 mL. Medical workup was completed to exclude alternative causes for urinary retention. Each patient completed ECT treatment, ranging from 14–19 sessions which resulted in resolution of catatonia. All four patients were also noted to have PVR volumes ranging from 6–75 mL, thereby suggesting concurrent resolution of urinary retention. Posttreatment, the MADRS scores ranged from 3–16, indicating a mild or subthreshold index of illness. There was no recurrence of elevated post-void residual volumes, and therefore, all patients were discharged from hospital without the requirements of urinary catheter insertion.

Conclusions To our knowledge, there are no case reports that describe the concurrent resolution of catatonia, depressive symptoms and urinary retention simultaneously using validated scales throughout the ECT treatment course. Furthermore, there are no prior reports describing catatonia-related urinary retention specifically among a group of geriatric populations. Identifying and treating catatonia in a timely manner can reduce the complications associated with prolonged catheter use. There remains a gap in current research to describe if there exists any overlapping mechanisms and pathways to explain how ECT can treat catatonia, depression, and catatonia-associated urinary retention.

Keywords Catatonia, Geriatric psychiatry, Urinary retention, Late life depression

*Correspondence:
Monica Parmar
mparm027@uottawa.ca
Full list of author information is available at the end of the article

Background

Catatonia is a neuropsychiatric syndrome with motor, affective, and cognitive-behavioural manifestations. Catatonia was initially described by Karl Kahlbaum in the 1870s, although many may argue that the syndrome was described much earlier [1]. Catatonia is a serious psychiatric and medical condition that requires prompt recognition and intervention [2]. Catatonia has been described as a recognizable cluster of clinical features that can vary from person to person. In fact, previous literature has described different variants of catatonia, including stuporous, excited, and malignant variants [3, 4]. Given the different variants of catatonia that exist, it is no surprise that catatonia is frequently underdiagnosed or misdiagnosed in clinical settings [5]. The precise reason for the under-recognition of catatonia is not entirely known; however, low catatonia knowledge, lack of physical examinations performed by clinicians, and variability in catatonic presentations have all been listed as possible reasons [6–8].

Catatonia was traditionally associated with schizophrenia, however newer studies now demonstrate broader links with other medical and psychiatric conditions, namely affective disorders [9]. Many of these reports have focused on interventions for catatonia among adult populations but there are even fewer studies focusing on catatonia among elderly populations and sequelae specifically affecting elderly populations.

When catatonia is not diagnosed promptly, treatment of the condition is delayed and complications arise (Table 1). One such complication is urinary retention. In fact, one case report observed a patient with schizophrenia and catatonia who developed bladder wall rupture potentially as a consequence of untreated urinary retention [10]. Phenomenological differences between the presentation of catatonia in affective disorders or psychotic disorders is not known. Historically, catatonia-associated urinary retention was also described primarily in patients with schizophrenia [11]. There is also insufficient current data on the prevalence of urinary retention among catatonic patients with an underlying mood disorder. There is even less information available on the prevalence of such complications in elderly populations despite the clear risks and problems associated with prolonged catheter use in geriatric populations.

It is important to note that urinary retention can result in prolonged catheter use. Catheter use results in limitations in mobility, is a potential source for infection, and increases the risk for delirium [12, 13]. Catheter use has also been independently associated with increased mortality in nursing home settings [14].

Aim

This retrospective case series identified elderly patients with catatonia and urinary retention who underwent ECT treatment while admitted to an inpatient geriatric psychiatry unit. The aim of this study was to assess whether improvement in depressive symptoms and catatonia from ECT treatment is related to improvement in urinary retention.

Setting and procedures

This study occurred at the inpatient geriatric psychiatry unit at The Royal Ottawa Mental Health Centre in Ottawa, Canada. This study received a no objection letter following a review from the Chair and Director of the Research Ethics Board committee at the Royal Ottawa Mental Health Centre. As such, this study was exempt from the need for approval. Informed consent from involved participants (or their appropriate substitute decision makers) was obtained for this study including the use of information and any resulting publications. Any identifying data have been anonymized to preserve confidentiality.

Participants

Inclusion criteria

Age ≥ 65 years, inpatient admission to the geriatric psychiatry unit, confirmed diagnoses of major depressive disorder, catatonia, urinary retention, and completion of ECT treatment. Patients meeting criteria for admission to the inpatient geriatric psychiatry unit are typically 65 years of age or older. Regarding the urinary retention, a documented pre-ECT postvoid residual bladder (PVR) volume and at least one mid-ECT PVR volume or

Table 1 Some complications of catatonia

Vascular	Thrombophlebitis, deep venous thrombosis, disseminated intravascular coagulation
Cardiac and Respiratory	Myocardial infarction, cardiac or respiratory arrest, aspiration, pneumonia, pneumonitis, pulmonary thromboembolism
Renal and Urinary	Renal injury/failure, urinary retention, urinary incontinence, bacteriuria, urinary tract infection
Gastrointestinal, Endocrine	Dehydration, hypernatremia, hyponatremia, malnutrition, hypokalemia, cachexia, liver damage, hypoglycemia
Neurological and Muscular	Muscle contractures, rhabdomyolysis, neuropathies secondary to posture, seizures
Other	Pressure ulcers, burns, sepsis, death

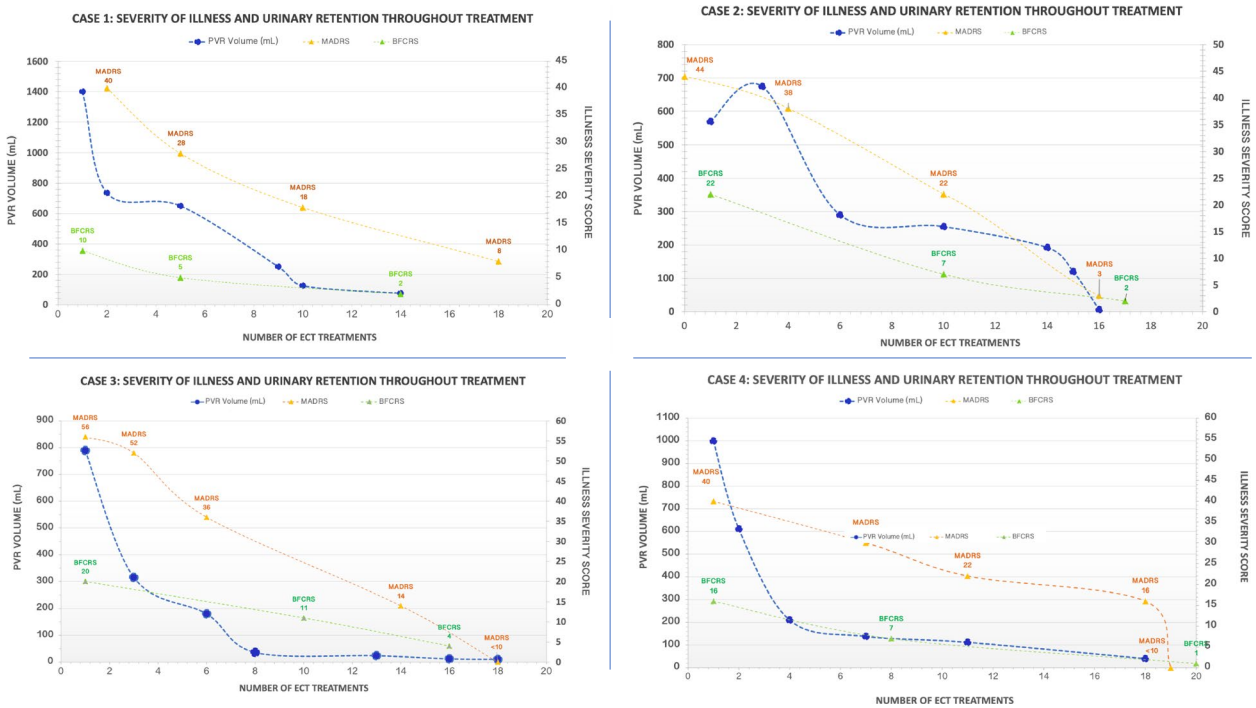

Fig. 1 Individual patient scales—severity of depression, catatonia and urinary retention during ECT

post-ECT PVR volume was also needed. The inclusion period was from 2015–2020.

Exclusion criteria

Patients were excluded from study if alternative medical causes of urinary retention were confirmed. Patients with a diagnosis of delirium (excluding post-ECT delirium), stroke or traumatic brain injury were also excluded from the study. Patients admitted to the unit for a primary diagnosis of major neurocognitive disorder were excluded.

Case presentations

A total of eight patients were identified with catatonia, six of whom were also diagnosed with urinary retention and therefore included in the study. Two patients were excluded from the study for one or more of the following reasons: ongoing symptoms of benign prostatic hypertrophy (BPH), concurrent treatment for a complicated urinary tract infection (UTI) and/or absence of a documented post-ECT PVR volume. Therefore, the four patients satisfying the parameters for criteria are described in this paper with their illness course illustrated below (Fig. 1).

These four patients were diagnosed with a DSM-5 defined psychiatric disorder and catatonia. All four patients met the criteria for major depressive disorder (MDD) as the underlying illness. Three of the patients presented with psychotic features as a specifier. With respect to diagnosing urinary retention, medical investigations were completed to rule out alternative medical causes for urinary retention. Depending on the clinical presentation, this included physical examinations, medication reviews, laboratory investigations, microbiology investigations, toxicology investigations, and/or radiological investigations.

In this case series, the severities of depressive illness and catatonia were measured throughout the course of ECT treatment using the Montgomery-Asberg Depression Rating Scale (MADRS) [15] and Bush Francis Catatonia Rating Scale (BFCRS) [16]. Using ultrasound, each patient's postvoid residual (PVR) volume was then measured over the course of ECT treatment due to the presence of urinary retention (Fig. 1). Urinary retention was described to be present when bladder volume exceeded the threshold of 300 mL, as defined by the American Urological Association in 2016 [17]. A post-void residual bladder scan was completed if either the patient described urinary symptoms, or at the discretion of the medical physician on the unit. A urinary catheter was inserted at the discretion of the medical physician on the unit and if urinary retention persisted.

Upon admission to the inpatient unit, all four patients were noted to have urinary retention, which was evidenced by PVR bladder scan volumes ranging from 569 to 1400 mL. Vital signs of each patient were obtained at

Table 2 Summary of clinical data at admission and discharge

			On admission				At discharge			
	Age	**Sex**	**Medications**	**BFCRS**	**MADRS**	**PVR (mL)**	**Medications**	**BFCRS**	**MADRS**	**PVR (mL)**
Case 1	73	M	venlafaxine XR 150 mg mirtazapine 30 mg olanzapine 5 mg	10	40	1400	venlafaxine XR 225 mg mirtazapine 30 mg olanzapine 5 mg	2	8	75
Case 2	84	M	desvenlafaxine 100 mg mirtazapine 15 mg olanzapine 5 mg	22	44	569	venlafaxine XR 225 mg mirtazapine 30 mg olanzapine 7.5 mg trazodone 25 mg	2	3	6
Case 3	69	M	No medications	20	56	789	venlafaxine XR150 mg olanzapine 2.5 mg	4	0	10
Case 4	66	F	venlafaxine XR 75 mg mirtazapine 30 mg quetiapine 12.5 mg	16	43	544	venlafaxine XR150 mg mirtazapine 30 mg quetiapine 25 mg	1	< 10	40

Sex: M-Male; F-Female

BFCRS: Bush-Francis Catatonia Rating Scale. A score of 2 or more on at least 2 of the first 14 screening items suggests a positive diagnosis for catatonia and completing the total 23 questions is recommended

MADRS: Montgomery-Asberg Depression Rating Scale. Scoring indicates that a total score ranging from 0 to 6 = normal range; 7 to 19 = mild severity; 20 to 34 = moderate severity; 35 and greater = severe

PVR: Post-void residual bladder volume; measured in millimetres (mL)

admission. Pre-treatment MADRS scores also ranged from 40 to 56, indicating that all patients had a severe index of illness. BFCRS scores ranged from 10 – 22, supporting the diagnosis and severity of catatonia.

Each patient then completed acute series ECT treatment while admitted to the inpatient unit, ranging anywhere from 14–19 treatment sessions in total. Each patient initiated ECT at a frequency of three sessions per week as part of the acute series treatment. After completion of ECT, all four patients had robust responses to treatment with notable improvement or full resolution of their catatonic symptoms. In fact, BFCRS scores ranged from 1–4 among these patients after ECT. There was also either full or near-full remission of depressive illness with MADRS scores ranging from 3 to 16, indicating a mild or subthreshold index of illness.

Interestingly, all four patients were noted to have full resolution of urinary retention after completing ECT sessions in the hospital, and this was evidenced by PVR bladder scan volumes ranging from 6 to 75 mL after ECT and resolution of catatonia. There was no recurrence of elevated postvoid residual volumes in these four patients after catatonia resolved (Fig. 1). All patients were discharged from the hospital without requiring urinary catheters (Table 2).

Case 1

73-year-old man with recurrent MDD with catatonia and psychotic features. The patient was transferred from a medical inpatient unit with a urinary catheter in-situ after a delirium workup was negative but was continuing to have retention. Investigations included a urine culture and CT of the abdomen and pelvis. In fact, the CT abdomen confirmed the presence of bladder distension. The CT scan did not indicate any potential causes for urinary retention. No mechanical causes of obstructions were present. Vital signs on admission comprised of a body temperature of 36.8 degrees Celsius, blood pressure of 106/66 mm Hg, heart rate of 98 beats per minute (bpm), respiratory rate of 20 breaths per minute (breaths/min), and oxygen saturation of 96%. On admission, the patient was severely depressed (MADRS 40) with catatonic features (BFCRS 10). A postvoid bladder scan revealed 1400 mL on admission, suggestive of urinary retention. The patient was taking venlafaxine XR 150 mg/day, mirtazapine 30 mg/day, and olanzapine 5 mg/day. The patient completed 18 sessions of ECT, with improvements in depressive illness severity (MADRS 8) and catatonia severity (BFCRS 2). There was simultaneous resolution of urinary retention after catatonia resolved. (PVR 75 mL). On discharge, relevant medications included venlafaxine XR 225 mg/day, mirtazapine 30 mg/day, olanzapine 5 mg/day.

Case 2

84-year-old man with recurrent MDD with catatonia and psychotic features. Preliminary bloodwork and urine culture were negative. At the time of admission, the patient was severely depressed (MADRS 44) with catatonic features (BFCRS 22). Relevant admission medications included desvenlafaxine ER 100 mg/day, olanzapine 2.5 mg twice daily, mirtazapine 15 mg/day, trazodone 50 mg nightly as needed. On admission, the patient did not demonstrate any signs of autonomic dysfunction. Vital signs comprised of a body temperature of 36.8 degrees Celsius, blood pressure of 140/76 mm Hg, heart rate of 67 bpm, respiratory rate of 17 breaths/min, and oxygen saturation of 98%. A postvoid bladder scan revealed 569 mL on admission, suggestive of urinary retention. The patient completed 16 sessions of ECT with complete remission of depressive illness (MADRS 3) and catatonia (BFCRS 2). There was simultaneous resolution of urinary retention after catatonia resolved (PVR 6 mL). On discharge, relevant medications included venlafaxine XR 225 mg/day, mirtazapine 30 mg/day, olanzapine 2.5 mg every morning and 5 mg every night, and trazodone 25 mg at bedtime.

Case 3

69-year-old man with first episode of MDD with catatonia features. The patient was not on any medications prior to admission other than sennosides 17.2 mg daily as needed. The patient's medical workup was negative for alternative causes for urinary retention. On admission, the patient did not demonstrate any signs of autonomic dysfunction. Vital signs comprised of a body temperature of 36.2 degrees Celsius, blood pressure of 105/67 mm Hg, heart rate 82 bpm, respiratory rate of 16 breaths/min, and oxygen saturation of 98%. The patient was severely depressed (MADRS 56) with catatonic features (BFCRS 20). A postvoid bladder scan revealed 789 mL on admission, suggestive of urinary retention. The patient completed 18 sessions of ECT, with full resolution of depressive illness (MADRS 0) and improvement in catatonia symptoms (BFCRS 4). There was simultaneous resolution of urinary retention after catatonia resolved (PVR 10 mL). Discharge medications included venlafaxine 150 mg/day and olanzapine 2.5 mg/day.

Case 4

66-year old woman with recurrent MDD with catatonia and psychotic features. Relevant admission medications included venlafaxine XR 75 mg/day, mirtazapine 30 mg/day, quetiapine 12.5 mg/day. This patient had mild hypokalemia in the context of poor oral intake and all other appropriate medical workup was negative. At the time of admission, the patient was

severely depressed (MADRS 43) with catatonic features (BFCRS 16). A postvoid bladder scan revealed 544 mL on admission, suggestive of urinary retention. The patient's vital signs on admission comprised of a temperature of 35.6 degrees Celsius, blood pressure 113/77 mm Hg, heart rate of 77 bpm, respiratory rate of 16 breaths per minute, and oxygen saturation of 96%. Malignant catatonia was not suspected nor did the vital signs and clinical presentation raise suspicion for this. The patient completed 19 sessions of ECT, with improvements in depressive illness severity (MADRS < 10) and resolution of catatonia (BFCRS 1). There was simultaneous resolution of urinary retention after catatonia resolved (PVR 40 mL). The patient was discharged with the following medications: venlafaxine XR 150 mg/day, mirtazapine 30 mg/day, quetiapine 25 mg/day.

Discussion and conclusion

In this case series, four elderly patients were admitted to hospital with catatonia associated with severe depressive illness. There were three males and one female, ranging from 66 to 84 years old. These patients were additionally diagnosed with urinary retention, a recognized medical complication of catatonia. Malignant catatonia was not suspected in any of the cases described in this study. Due to severe illness in all patients, ECT was pursued as the preferred treatment option. Upon completion of ECT, all four patients experienced resolution of urinary retention concurrent with the improvement of depressive illness and catatonic symptoms. As a result of prompt diagnosis and treatment of catatonia and urinary retention, all four patients clinically improved in the hospital and were discharged without the requirement of urinary catheter insertion.

Although prior reports have described catatonia-associated urinary retention and subsequent improvement with electroconvulsive therapy, this is the first study to quantify the severity of catatonia and urinary retention using validated scales and bladder volume measurements throughout the treatment course. Furthermore, this is the first case series describing catatonia-related urinary retention specifically among geriatric populations whereas many other studies describe catatonia in younger adult populations. This is an especially important topic to highlight in older populations given the clear impacts and risks of urinary retention in elderly populations.

Mechanisms underlying urinary retention

The prefrontal cortex (PFC) plays a key role in the voluntary control of bladder function, allowing individuals to delay or initiate micturition based on social, environmental, or situational factors [18, 19]. The PFC provides input to the periaqueductal gray (PAG) which subsequently results in activation or suppression of the pontine micturition centre (PMC) [20]. The PMC is then responsible for the supraspinal regulation of micturition via descending fibers throughout the spinal cord [21] (Fig. 2). Higher brain centres contain neurons that receive sensory and motor inputs that are responsible for initiating urination while others are responsible for urine storage [22].

While outlining the neuroanatomy involved in urine control provides a basic understanding of the structures at play, it is far less complex than explaining the neural mechanisms behind urine control. Understanding of the neural mechanisms requires delving into how such structures interact through intricate signalling, neurotransmitter dynamics, and feedback loops.

It is important to note that the precise neural mechanisms by which catatonia leads to urinary retention remain unclear, and more specific studies on this topic are required for further understanding. However, it is no surprise that the brain and bladder must communicate and must involve a complex interplay of various neural pathways involving the sympathetic and parasympathetic systems.

Both alpha-1 adrenergic receptors and gamma-aminobutyric acid-A (GABA-A) have been postulated to play key roles in urinary retention, nonetheless through different mechanisms. With respect to the sympathetic nervous system, alpha-1 adrenergic receptors are located in the internal urethral sphincter. When activated, these receptors promote contraction of the sphincter to prevent leakage of urine and promote storage of urine [23]. This can be useful in situations where there is a need to delay micturition based on social, environmental, or situational factors. However, when there is excess sympathetic activation, such as in states of catatonia, studies have suggested it can lead to excessive sphincter contraction and result in urinary retention and discomfort due to the inability to void [24]. However, these studies are limited to animal studies or brief clinical case descriptions [25, 26]. In malignant catatonia, autonomic instability (specifically sympathetic overdrive) is thought to be the basis for abnormal vital signs such as increased temperature, hypertension and tachycardia. However, it is important to note that autonomic instability does not occur in every patient presenting with catatonia. In this case series, there were no patients suspected to have malignant catatonia and vital signs were monitored.

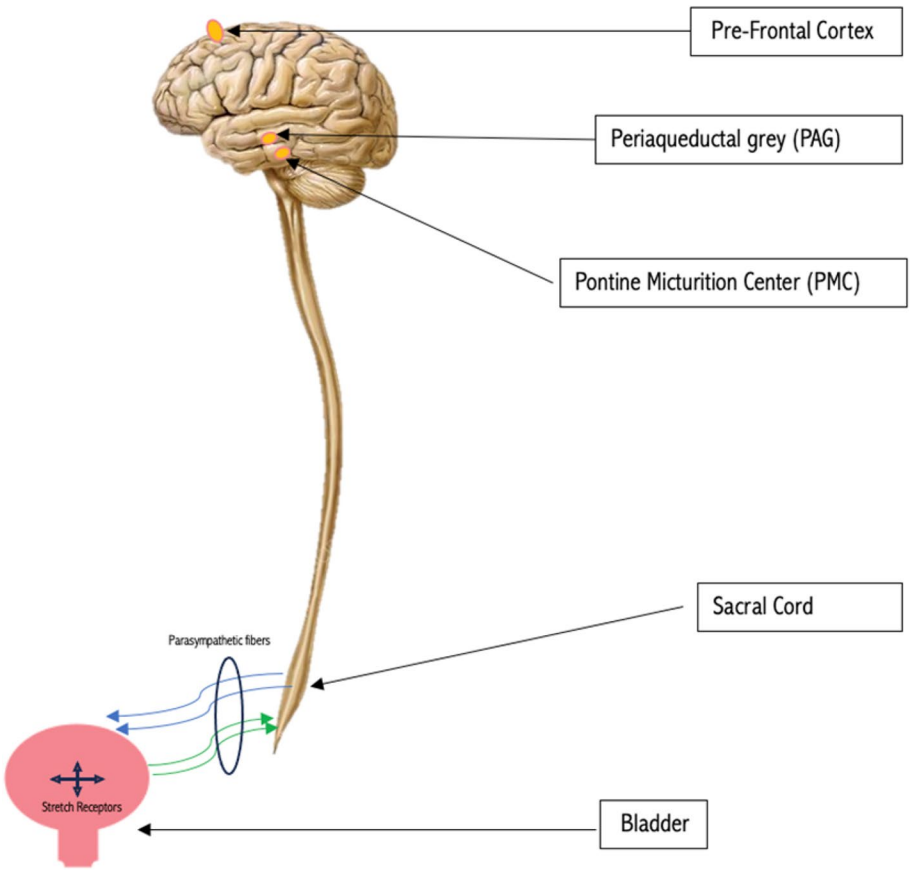

Fig. 2 Urinary control

On the other hand, GABA-A primarily functions as an inhibitory neurotransmitter in the central nervous system (CNS) and the PMC. GABA-A helps coordinate the timing and control of micturition, ensuring the appropriate sequence of muscle contraction and relaxation for effective bladder emptying [27]. When GABA acts on the parasympathetic pathway, it stimulates bladder detrusor contraction and therefore promotes urination [28]. However, when GABAergic signaling becomes altered or dysfunctional, just like in catatonia, it remains unclear if this same pathway becomes altered and whether this involves neuronal excitation, disruption of spinal reflex modulation, supraspinal control disruption, or muscle tone dysregulation.

While there are multiple potential pathways that could explain how catatonia may lead to urinary retention—such as the involvement of autonomic nervous system dysfunction or disruptions in brain-bladder communication—our study does not aim to speculate on these mechanisms. Instead, our goal is to emphasize the need for further investigation into the mechanisms underlying urinary retention in patients with catatonia.

Psychotropic medication and urinary retention

It is important to highlight that some antidepressant and antipsychotic medications are known to have anticholinergic effects which contribute to unwanted side effects such as urinary retention. In this case series, three of four patients presented to hospital with a serotonin-noradrenaline reuptake inhibitor (SNRI) and a dopamine D2 blocking agent (D2 antagonist) prescribed. None of the patients were on a tricyclic antidepressant. However, in the case studies reviewed, clinicians were able to increase the dose of D2 antagonists without exacerbating the urinary retention. Notably, the patients experienced resolution of urinary retention following ECT, even while the doses D2 antagonists were increased, suggesting that the medications in these cases were not the primary precipitant for urinary retention. Instead, it appears the catatonia was more likely responsible for urinary retention in these cases. In fact, one patient presented with catatonia and urinary retention however was not on any medications at the time of admission or prior to admission. The patient completed ECT and the addition of venlafaxine and olanzapine did not worsen urinary retention. Urinary

retention resolved when catatonia was treated with ECT. Similar findings demonstrating the resolution of urinary retention have been found when treating catatonia with the use of benzodiazepines when ECT is not the pursued treatment modality [29].

The role of GABA in catatonia

GABA-A receptors have also been implicated in the modulation of stress and anxiety [30, 31]. Some researchers have even described catatonia as an outward representation of severe anxiety [32–34]. As such, one widely accepted theory for catatonia describes alterations in GABA-A receptors and activity throughout various circuitries including the motor loop (i.e., the region between the motor cortex and basal ganglia), and as a result of GABA-A dysfunction occurring in the prefrontal cortex (PFC) [35, 36]. Alterations in the glutamatergic system, particularly NMDA-receptors, have also been described in catatonia as an additional mechanism, although the evidence remains less clear [37].

Benzodiazepines, which act as positive allosteric modulators of GABA-A, have been historically used to treat anxiety and have been thought to potentially treat catatonia through a similar mechanism [38, 39]. In fact, the benzodiazepine challenge test is widely used in clinical settings to support a diagnosis of catatonia or to determine benzodiazepine sensitivity [40].

The precise mechanism by which ECT addresses and treats catatonia remains unclear, although several studies are supportive of the GABA hypothesis of ECT whereby the release of GABA is central in achieving the therapeutic benefits of ECT in major depression and other neuropsychiatric disorders [41, 42]. ECT remains an effective treatment for catatonia, especially in severe illness or when there has been a suboptimal response from benzodiazepines. Response rates to ECT are excellent, with most recent studies reporting responses as high as 80–100%, including cases of nonresponse to benzodiazepines [43]. Since the introduction of ECT, mortality associated with catatonia has decreased [44, 45].

Few case reports have described the use of lorazepam to treat catatonia with similar responses in treating catatonia-associated urinary retention, although these reports have all been limited to single case reports [46, 47]. The decision to use benzodiazepine, ECT, versus combined treatment in catatonia is oftentimes based on clinical discretion, severity of illness, urgency to treat, risk versus benefit and accessibility to ECT. It is important to note that benzodiazepines are often held the night before ECT so as to optimize seizure threshold and quality during the ECT treatment while some clinicians may opt to completely discontinue the benzodiazepines while pursuing ECT treatment. In this case series, all patients presented to the hospital with a severe index of illness and access to ECT was prompt (i.e. ECT was made possible within 7 days or less of admission). Benzodiazepines were initiated until ECT became available. In this case series, all cases of urinary retention were resolved following ECT without any elimination of these D2 antagonist medications. In fact, the doses of medications that block dopamine D2 receptor were either simultaneously added or increased for all four patients to adequately treat psychotic symptoms, with most titrations occurring in between the ECT sessions.

Limitations of study

Limitations of this study include the fact that this study focused on urinary retention within a geriatric population rather than a general adult population and therefore findings should be interpreted accordingly. The patients in this case series were noted to have catatonia associated with depression and not schizophrenia. This may limit the generalizability of our findings to patients with catatonia secondary to schizophrenia. There also was a lack of urodynamic studies as part of the medical workup for urinary retention, although the invasive nature and sensitive nature of this intervention are important to consider in clinical settings. Therefore, this study did not distinguish between initiation and storage phases of urination in relation to urinary retention and would require further and potentially invasive urodynamic studies. This case series evaluated data solely from the acute illness episodes and while receiving ECT in the hospital. Therefore, no follow up data were evaluated after discharge from the hospital. Future studies looking at this could be valuable. Despite this case series study being the first study to look at numerous elderly patients with catatonia-associated urinary retention, it still involves a limited number of patients after inclusion and exclusion criteria. A prospective study design, rather than a retrospective study, may also help address this gap. It remains unclear exactly how catatonia alters the brain-bladder connection and specifically how or why urinary retention occurs as a result of catatonia [48]. Ultimately, further research on this topic may provide more information on the connection between both catatonia and micturition control. Additional research into the mechanism of action for ECT in catatonia and associated urinary retention may also further contribute to developments in understanding medical complications arising from catatonia.

Conclusion

In conclusion, this case series highlights an interesting phenomenon and is intended to raise awareness to healthcare providers that prompt recognition and intervention for catatonia is of paramount importance, especially in the case of older populations. If catatonia is left untreated,

life-threatening psychiatric and medical emergencies arise. Urinary retention is among one of the known associated consequences of catatonia. Urinary retention is usually treated with an indwelling catheter however this makes elderly patients susceptible to limited mobility, increased infection, delirium, and impaired quality of life. Catheter use has also been independently associated with increased mortality in nursing home settings. Elderly adults with a longer duration of untreated catatonia are more likely to experience poor outcomes in terms of complications. In a prospective study, the rate of complications among elderly patients with catatonia was estimated to be 40% and the mortality rate was 20% [49]. Therefore, identification and prompt treatment are important in catatonia syndrome.

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Authors' contributions
M. Parmar and T. Lau are primary co-authors of the manuscript. MP wrote the main manuscript text and TL prepared figures and provided edits. All authors reviewed the manuscript. MP will be primary corresponding author for purposes of contacting regarding submission process. Monica Parmar MB BCh BAO 1*, Timothy Lau, MD FRCPC MSc 1,2* 1.University of Ottawa, Faculty of Medicine, Department of Geriatric Psychiatry, Ottawa, ON, Canada 2.The Royal Ottawa Mental Health Centre, Department of Geriatric Psychiatry, Ottawa, ON, Canada.

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Data availability
Data from this case report series was gathered from patient health records and subsequently anonymized. Any data requests should be submitted to be Dr. Tim Lau at tim.lau@theroyal.ca.

Declarations

Ethics approval and consent to participate
This study received a no objection letter following a review from the Chair and Director of the Research Ethics Board committee at the Royal Ottawa Mental Health Centre. As such, this study was exempt from the need for approval. Written consent was obtained from involved parties to participate.

Consent for publication
Informed consent was obtained from involved parties or their respective substitute decision maker for publication of information/images in an online open-access publication.

Competing interests
The authors declare no competing interests.

Author details
[1]Faculty of Medicine, Department of Geriatric Psychiatry, University of Ottawa, Ottawa, ON, Canada. [2]Department of Geriatric Psychiatry, The Royal Ottawa Mental Health Centre, Ottawa, ON, Canada.

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