Original Article

Acute oleander poisoning: A study of clinical profile from a tertiary care center in South India

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Abstract

Introduction: Yellow oleander (*Thevetia peruviana*), which belongs to the Apocyanaceae family, is a common shrub seen throughout the tropics. All parts of the plant contain high concentrations of cardiac glycosides which are toxic to cardiac muscle and the autonomic nervous system. Here, we describe the clinical profile of patients with oleander poisoning and their outcomes. **Methods and Materials:** This retrospective study was conducted over a period of 12 months (March 2016 to February 2017). The data was extracted from the inpatient electronic medical records. Adult patients with a diagnosis of acute yellow oleander poisoning were included in the study. Descriptive statistics were obtained for all variables in the study and appropriate statistical tests were employed to ascertain their significance. **Results:** The study comprised 30 patients aged 30.77 ± 12.31 (mean ± SD) who presented at 12.29 ± 8.48 hours after consumption of yellow oleander. Vomiting (80%) was the most common presenting symptom. Metabolic abnormalities at presentation included hyperchloremia in 22 patients and metabolic acidosis (bicarbonate <24 mmol/L) in 29 patients. Fifteen (50%) patients had abnormal ECG, of which second-degree AV block was the commonest ECG abnormality seen in 4 (13.3%). Fifteen (50%) patients had transvenous temporary pacemaker insertion (TPI). Having a TPI significantly prolonged the duration of hospital stay (OR 1.85, 95% CI 1.06–3.21, *P* 0.03). The mortality in the cohort was 2 (6.7%). **Conclusion:** In patients with yellow oleander poisoning, dyselectrolytemia with ECG abnormalities was common. TPI prolonged the duration of hospital stay. Further studies are required to know the indication for and to ascertain the effect of temporary pacing on survival.

Keywords: Deliberate self-harm, oleander, plant poison, temporary pace maker

Introduction

Yellow oleander (*Thevetia peruviana*), which belongs to the Apocyanaceae family, is a common shrub seen throughout the tropics. Deliberate self-harm by consumption of this plant is a common toxicological emergency in South Asian countries, especially in India and Sri Lanka.[1-3] Ingestion of any part of this plant is toxic, as all parts contains a variety of cardiac glycosides including neriifolin, thevetin A, thevetin B, oleandrin, and other unidentified substances.[4]

Ingestion of yellow oleander (*Thevetia peruviana*) results in clinical symptoms similar to those of digitalis toxicity.[5,6] Common symptoms include nausea, vomiting, abdominal pain, diarrhea, dysrhythmias, and restlessness. A common electrolyte abnormality is hyperkalemia. Cardiac toxicity, due to the cardiac glycosides, is a common life-threatening clinical manifestation. Patients may develop bradycardia with atrioventricular (AV) block, atrial tachycardias, ventricular tachycardia including bidirectional ventricular tachycardia,

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and ventricular fibrillation. Cardiogenic shock with myocardial depression can also occur. The arrhythmogenic effects of the cardiac glycosides are caused due to a combination of the direct effects of the toxin on the myocardium and the conducting system of the heart and the neurally mediated increases in autonomic activity.

Cardiac glycosides exert various direct cardiotoxic effects through a variety of mediators such as histamine, nitric oxide, leukotrienes, endothelin, angiotensin, and superoxide radicals. Increased central sympathomimetic activity on the heart also plays an important role in the development of cardiac arrhythmias in patients with cardiac glycoside poisoning. Hence, the use of parasympathetic system blockade with atropine, or the use of β-adrenergic agonists, may result in tachyarrhythmias.

In most cases, clinical management of poisoning, by yellow oleander (T. peruviana), involves administration of activated charcoal and supportive care including temporary pacemaker insertion. This study aimed to describe the clinical profile and outcomes among patients with yellow oleander poisoning requiring admission to a tertiary care center in South India.

Patients and Methods

Patients and setting

Adult patients with a diagnosis of yellow oleander poisoning, between March 2016 and February 2017, requiring admission to a medical ward, the Medical ICU, or high dependency unit (HDU) of a tertiary care teaching hospital in India were included in the study. The patients were identified from the Emergency Department (ED) database and the data was extracted from inpatient electronic medical records.

A diagnosis of yellow oleander poisoning was made when a patient presented with an alleged history of consumption of yellow oleander seeds and exhibited clinical symptoms of yellow oleander toxicity.

A detailed history of the number of seeds consumed, time of consumption, time of presentation to hospital, and any form of treatment given prior to presenting to the hospital were documented. The results of routine blood tests were noted including complete blood count, liver function tests, renal function tests, and electrolytes. Heart rate, ST-T changes, and rhythm abnormalities from the baseline electrocardiogram (ECG) were also noted. The severity of illness at admission using the Acute Physiology and Chronic Health Evaluation II (APACHE-II) score was documented.

Patient management and outcome parameters

All patients were managed with supportive therapy including fluid resuscitation, correction of dyselectrolytaemia, hemodynamic support, mechanical ventilation, renal replacement therapy as indicated, and temporary pacemaker insertion as decided by the treating physician.

The outcomes of interest were ECG findings, shock, electrolyte abnormalities, duration of hospital stay, and mortality.

Ethical approval and funding

This retrospective study protocol was approved by the Institutional Ethics Review Board (IRB NO: 10923), Christian Medical College, Vellore, India. In this study, data was collected from the hospital inpatient electronic medical records and the collected information was anonymized.

Statistical analysis

Descriptive statistics were employed for all the variables in the study. Categorical and continuous variables were compared for outcome using the Fisher's exact test and student t-test, respectively. All continuous data were expressed as mean with standard deviation (SD) unless the data was not normally distributed. A *P* value of <0·05 was considered statistically significant. Statistical analysis was done using Statistical Package for Social Sciences for Windows (SPSS Inc. Released 2007, version 16.0. Chicago).

Table 1: Demographic, symptoms, and laboratory parameters of patients with oleander poisoning (n-30)

Characteristics	Number (*n*)	Value
Demographic		
Age, mean (SD) years	30	30.77 (12.31)
Gender ratio (Female: Male)	30	21: 9
Number of seeds consumed, Median (IQR)	27	4 (3-5)
Symptoms (*n*)		
Vomiting	30	24 (80%)
Nausea	30	11 (36.7%)
Giddiness	30	17 (56.7%)
Diarrhea	30	2 (6.7%)
Laboratory parameters		
Potassium, mean (SD) m mol/L	30	4.11 (0.65)
Magnesium, mean (SD) mg/dL	17	1.86±0.30
Chloride, mean (SD) m mol/L	28	112.14±3.77
Random blood sugar, mean (SD) mEq/L	30	115.53±61.69
Calcium, mean (SD) mg %	9	8.86±0.69
Phosphorus, mean (SD) mg %	9	2.97±0.68
Creatinine, mean (SD) mg %	30	0.79±0.27
Bicarbonate, mean (SD) m mol/L	30	19.23±3.07

Table 2: ECG changes in patients with oleander poisoning (n-30)

Characteristics	Value *n* (%)
Normal ECG	15 (50)
Sinus bradycardia	3 (10)
First degree AV block	1 (3.3)
Second degree AV block	4 (13.3)
Third degree AV block	1 (3.3)
T wave abnormality	3 (10)
Sinus arrhythmia	2 (6.7)
RBBB	1 (3.3)

AV- Atrioventricular block, RBBB- Right bundle branch block

Table 3: Comparing patients with and without TPI in oleander poisoning (*n*-30)

Characteristics	With TPI (Mean±SD)	Without TPI (Mean±SD)	OR	95% CI	*P*
APACHE II score	5.40±3.35	5.2±6.47	1.01	0.87-1.16	0.91
Time of presentation, minutes	709.00±469.08	790.00±596.53	1.00	0.99-1.001	0.67
Number of seeds consumed	5.93±7.11	4.38±1.98	1.07	0.88-1.31	0.48
Heart rate, beats/min	61.27±23.11	81.33±20.40	0.96	0.92-0.99	0.03
Potassium, mmol/L	4.39±0.54	3.84±0.66	5.32	1.12-25.25	0.03
Bicarbonate, mmol/L	19.87±2.06	18.60±3.79	1.17	0.88-1.54	0.27
Chloride, mmol/L	112.14±3.74	110.00±3.62	1.21	0.93-1.57	0.16
Duration of stay in days	6.53±1.96	3.67±1.84	2.20	1.26-3.84	0.005

APACHE- Acute Physiology and Chronic Health Evaluation

Table 4: Multivariate logistic regression analysis of factors associated with TPI in oleander poisoning

Variable	Odds ratio	95% confidence interval	*P*
Duration of stay, days	1.85	1.06-3.21	0.03
Heart rate, beats/min	0.97	0.93-1.01	0.19
Potassium, mmol/L	1.74	0.25-12.03	0.57

Results

Baseline characteristics

Baseline characteristics are summarized in Table 1. The study comprised 30 patients aged 30.77 ± 12.31 (mean ± SD) who presented at 12.29 ± 8.48 hours after consumption of yellow oleander. The number of seeds consumed by patients ranged from 2 to 30 seeds with a median of four seeds and there was no association between the quantity of seeds consumed and mortality (p value 0.548). Twenty six (86.7%) patients received treatment in a primary or secondary level hospital prior to presentation of which 22 (73.3%) patients received gastric lavage, four (13.3%) patients received atropine, and two (6.7%) patients received activated charcoal. On presentation at our hospital, 24 (80%) patients received gastric lavage, 15 (50%) patients received TPI, and nine (27%) patients were treated with intravenous magnesium and oral activated charcoal. Vomiting (80%) was the most common symptom followed by giddiness in 17 (56.7%) and nausea in 11 (36.7%). Admission APACHE-II score was 5.30 ± 5.06(mean ± SD). Metabolic abnormalities at presentation included hyperchloremia in 22 (78.5%) patients and metabolic acidosis (bicarbonate <24 mmol/L) in 29 (96.6%) patients. The serum potassium and magnesium levels were 4.11 ± 0.65, 1.86 ± 0.30 (mean ± SD) mmol/L, respectively [Table 1].

ECG parameters

ECG parameters are summarized in Table 2. Fifteen (50%) patients had abnormal ECG at admission of which the commonest ECG abnormality was second-degree AV block seen in four (13.3%) patients followed by sinus bradycardia and T wave abnormality in three (10%) patients each.

Outcomes

Five (16.7%) patients presented with shock and one patient required intensive care. The mean ± SD duration of TPI and hospital stay was 4.00 ± 1.85 and 5.10 ± 2.37 days, respectively. Of the 15 patients who received TPI, 13 (86.7%) patients had abnormal ECG findings of whom 10 (66.7%) patients presented with bradycardia. The mean ± SD duration of hospital stay in patients with TPI and without TPI was 6.53 ± 1.96 and 3.67 ± 1.84 days, respectively (*P* value <0.001) [Table 3]. The overall hospital mortality was 2 (6.7%).

Discussion

Yellow oleander poisoning is a common form of plant poisoning in South Asia. All parts of the plant are poisonous, especially the seeds and leaves. Deliberate self-harm by consuming yellow oleander seeds is common in young women. The number of seeds consumed in our study was not associated with increased mortality, which is similar to the findings of Bose *et al.*[1] In our study, gastrointestinal toxicity was a common presenting symptom including vomiting and nausea. Common electrolyte abnormalities in our study at admission were hyperchloremia and metabolic acidosis.

Fifteen (50%) of the patients had abnormal ECG findings with Mobitz type II AV conduction block, a rare finding in isolated digoxin poisoning,[7] being the commonest rhythm abnormality, which is consistent with other studies on oleander poisoning.[1,2,8] The myocardial effects of these compounds are attributable to increased intracellular concentrations of Ca^{2+} and Na^{+} resulting from inhibition of the transmembrane Na+/K+ATPase pump.[9]

Management of yellow oleander poisoning is essentially supportive, comprising aggressive fluid resuscitation and correction of dyselectrolytemia.[10,11] Evidence for specific management exists for use of multidose activated charcoal (MDAC) and digoxin specific antibody fragments. MDAC acts by two mechanisms: it prevents absorption of cardiac glycoside and it causes interruption of enterohepatic circulation of cardiac glycosides facilitating gastric elimination.[10,12] Clinical trials have not shown consistent benefit for the use of MDAC. In a clinical trial by De Silva *et al.*,[13] use of MDAC at a dose of 50 grams every six hours for 72 hours caused a significant reduction in mortality, as well as decreasing the occurrence of life-threatening arrhythmias. In another major trial by Eddleston *et al.*, consisting of 1647 patients, use of MDAC did not show a mortality benefit.[14]

Digoxin specific antibody fragments are specific for neutralizing the cardiac glycosides.[10,11] These fragments have been found to successfully reverse the occurrence of cardiac arrhythmias with resultant decrease in mortality.[15-17] Clinical dose finding studies have agreed upon a single dose of 1200 mg.[16,17] However, its use is precluded in developing nations due to its nonavailability and high cost.[18] Hemodialysis and hemoperfusion have not demonstrated any mortality benefit.[19]

There have been no clinical trials evaluating the effect of temporary pacemaker insertion on survival, as they would be ethically difficult to perform. Temporary cardiac pacing is the usual treatment for a patient with a heart rate below 40 beats per minute, with any form of sick sinus syndrome or heart block. However, there are no current guidelines on the indication for temporary pacemaker insertion in yellow oleander poisoning.

The proportion of patients requiring TPI in our study (50%) is higher than in earlier studies (6%).[20] This is probably due to selection bias as patient recruitment, unlike earlier studies, was from a tertiary care center. Patients with abnormal ECG finding and bradycardia were more likely to receive TPI. The mortality in our cohort was 6.7%, which is similar to other studies.[5,21,22] TPI did not have added mortality benefit in our study and it prolonged the duration of hospital stay [Tables 3 and 4]. This reiterates the need for the development of guidelines on the use of TPI in yellow oleander poisoning. In developing nations, where availability and cost constraints preclude the use of digoxin antibody fragments cautious monitoring, early aggressive fluid resuscitation, correction of dyselectrolytemia with prompt identification of appropriate candidates for TPI could decrease the morbidity yellow oleander poisoning.

Acute poisoning with oleander is a common rural problem; assessment of severity at the primary care level and triage of patients with severe toxicity to higher centers for temporary pace maker, imitation of multidose activated charcoal by the primary care physician can be lifesaving.

Conclusion

Yellow oleander poisoning leads to significant morbidity in South India. Dyselectrolytemia with ECG abnormalities were common in these patients. TPI prolonged the duration of hospital stay. Further studies are required to develop guidelines on the use of TPI in yellow oleander poisoning.

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Conflict of interest

There is no conflict of interest.

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