ORIGINAL ARTICLE

Atropa belladonna (Deadly Nightshade) Poisoning in Childhood

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ABSTRACT

Objective: *A very small amount of* Atropa belladonna *(AB) can lead to serious symptoms of poisoning and can cause death in children. In this study, demographic, clinic and laboratory results of AB poisoning were evaluated.*

Methods: *A total of 108 cases with belladonna poisoning were retrospectively evaluated. At time of admission, age, age groups, gender, signs and symptoms caused by poisoning, duration of stay in hospital, laboratory data, intensive care needs, and applied treatments were recorded.*

Results: *Approximately 44.4% were females and 55.6% were males. While the most common symptoms were xeroderma and flushing, the most frequent findings were tachycardia and mydriasis. Eight patients complained about astasis and five of them were taken into the intensive care unit. Astasis complaint was relatively higher (*$p < 0.01$*) in the patients who needed intensive care than those who did not. Creatine kinase levels were relatively higher (*$p = 0.06$*) in the intensive care patients as compared to non-intensive care patients. Neostigmine was given to all patients. Five patients, who failed to respond to therapy, were taken into the intensive care and respond to treatment successfully with physostigmine.*

Conclusion: Atropa belladonna *poisoning may seriously progress in the act of late diagnosis and treatment in childhood. Thus, it is crucial to realize that AB poisoning should be taken into consideration in the patients with flushing, xeroderma with mydriasis, tachycardia, tremor, abdominal pain, and fever symptoms. Patients with astasis complaints should be evaluated carefully in terms of intensive care need. Patients with a Glasgow Coma Scale lower than 12 should be observed in the intensive care.*

Keywords: Anticholinergic symptom, *Atropa belladonna*, child, poisoning.

INTRODUCTION

Atropa belladonna (AB) is a poisonous plant. Its roots, leafs and fruits are very toxic and contains atropine, hyoscyamine and scopolaminxe alkaloids (1, 2). Reports have shown that the fruits and leafs of the belladonna can be used to treat gastrointestinal problems. The plant is also used in herbal medicine, owing to its antispasmodic effects and treatment of asthma and bronchitis (3, 4). Although used for suicidal and hallucinogen effects in adults, AB is often mistakenly used by children due to its resembling with cherry or blueberry (5, 6).

Atropa belladonna alkaloids lead to anticholinergic syndrome by competitively blocking the postganglionic muscarinic receptors and the binding site of acetylcholine in the central nervous system (3, 7–9). Due to the fact that children are more sensitive to the alkaloids, a very small amount can lead to serious symptoms of poisoning and death (10).

Physostigmine is used to eliminate both peripheral and central anticholinergic effects (11). However, physostigmine is difficult to obtain in our country; therefore, neostigmine is mostly given in cases of AB poisoning.

The purpose of this study is to evaluate demographic, clinical and laboratory data of AB poisoning. In addition, successful treatment of five patients with physostigmine that failed treated with neostigmine is presented.

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SUBJECTS AND METHODS

This retrospective study, with a history of AB poisoning, consists of 108 subjects admitted to Training Research Hospital in Van, Turkey and Dicle University Emergency Department of Children's Diseases in Diyarbakir, Turkey during the time between October 2011 and December 2012. Patients were categorized into groups by age and gender.

The patients were divided into three groups based on duration between the start of complaints and admission to the hospital: group 1 admitted between 1 and 3 hours, group 2 admitted between 4 and 7 hours and group 3 admitted after 7 hours. According to Glasgow Coma Scale (GCS), it was divided into two groups: < 12 and ≤ 12. Some comparisons, between those admitting to an intensive care and those not, were practised with regard to demographic data, duration of admission to the hospital, clinical findings, laboratory data (complete blood cell count, alanine aminotransferase [ALT], aspartate aminotransferase [AST], lactate dehydrogenase [LDH], creatine kinase [CK], glucose, creatinine, prothrombin time), and treatments (gastric lavage, activated charcoal, neostigmine, physostigmine, sedation). Patients with inaccessible records and/or older than 18 years were excluded from the study.

Local non-interventional clinical researchers for this study received ethics committee approval.

Statistical analysis

Data collected were analysed by SPSS v 18.0 (IBM Corp, Armonk, NY, USA) statistical software. Descriptive statistics were provided for all the study and outcome variables. Analysis of variance test was performed. The categorical variables were expressed as percentages and continuous variables were expressed as mean ± standard deviation. Pearson Chi-square and Mann–Whitney ***U*** test were also used.

RESULTS

A total of 108 patients, 48 (44.4%) females and 60 (55.6%) males, were included in this study. The average age of the patients was 76.1 ± 28.9 months with most of the patients were children between 5 and 8 years old (n = 59, 54.6%).

The most common symptoms were xeroderma and flushing, while the most frequent findings were tachycardia and mydriasis (Table 1) in patients admitted for AB poisoning.

The laboratory data of the patients showed the following complications: leucocytosis (n = 51, 47.2%),

Table 1: Demographic, clinical, treatment and outcomes features of patients with *Atropa belladona*

Clinical features of *Atropa belladona*	**Mean + SD or number (%) (n = 108)**
Age (year)	76.1 ± 28.9 months
2–4	29 (26.9%)
5–8	59 (54.6%)
9–12	17 (15.7%)
13–18	3 (2.8%)
Sex	
Male	60 (55.6%)
Female	48 (44.4%)
Seasonal case number	
Spring (March to May)	52 (48.1%)
Summer (June to August)	46 (42.6%)
Autumn (September to November)	10 (9.3%)
Winter (December to February)	–
Residence	
Rural area	78 (72.2%)
Urban area	30 (27.8%)
Interval from intoxication symptoms onset to hospital admission (hours)	
1–3	42 (38.8%)
4–7	60 (55.6%)
> 7	6 (5.6%)
Central nervous system symptoms and clinical findings	
Headache	89 (82.4%)
Agitation	81 (75%)
Hallucination	68 (63%)
Delirium	36 (33.3%)
Lethargy	26 (24.1%)
Choreoathetosis	18 (16.7%)
In capability to walk	8 (7.4%)
Coma	5 (4.6%)
Ataxic gait	4 (3.7%)
Peripheral nervous system symptoms and clinical findings	
Flushing	108 (100%)
Dry skin	108 (100%)
Tachycardia	106 (98.1%)
Mydriasis	106 (98.1%)
Abdominal pain	100 (92.6%)
Flicker	100 (92.6%)
Fever	93 (86.1%)
Glob vesicale	87 (80.6%)
Decreased bowel sounds	68 (63.0%)
Constipation	31 (28.7%)
Nausea	17 (15.7%)
Vomiting	10 (9.3%)
Hypertension	6 (5.6%)
Duration of hospitalization (hours)	
0–12	5 (4.6%)
12–18	61 (56.5%)
18–24	37 (34.3%)
24–36	3 (2.8%)
36–48	2 (1.9%)
Treatment	
Gastric lavage	108 (100%)
Activated charcoal	108 (100%)
Sedation	77 (71.3%)
Neostigmine	108 (100%)
Physostigmine	5 (4.6%)

Table 1 (*continued*)

Clinical features of *Atropa belladona*	Mean + SD or number (%) (n = 108)
Clinical outcomes	
Uncomplicated recovery	103 (95.4%)
Support for the intensive care (GCS < 12)	5 (4.6%)
Mortality	–

GCS = Glasgow Coma Scale.

thrombocytopaenia (n = 17, 15.7%), abnormal levels of AST (n = 83, 76.9%), abnormal levels of ALT (n = 68, 63%), abnormal levels of LDH (n = 82, 75.9%) abnormal level of CK (n = 22, 20.3%), glucose (n = 15, 13.8%), creatinine (n = 3, 2.7%), and prothrombin time (n = 77, 71.3%) (Table 2).

Table 2: Laboratory features of patients with *Atropa belladona*

Parameters	Minimum–maximum	Mean ± std deviation
White blood cell count (K/µL)	2.30–27.60	12.2 ± 6.54
Haemoglobin (g/dL)	8.70–14.60	11.99 ± 1.12
Platelet count (K/µL)	3.10–9.27 × 10^5	3.09 ± 1.19
Aspartate aminotransferase (U/L)	20.00–285.00	69.61 ± 46.19
Alanine aminotransferase (U/L)	19.00–232.00	64.14 ± 46.07
Lactate dehydrogenase (U/L)	88.00–1396.00	503.00 ± 287.56
Creatine kinase (U/L)	36.00–354.00	111.40 ± 63.81
Creatinine (mg/dL)	0.30–1.50	0.58 ± 0.21
Glucose (mg/dL)	34.00–178.00	83.01 ± 19.87
Prothrombin time (second)	12.00–23.00	16.72 ± 1.75

Gastric lavage was performed in all patients, and activated charcoal and neostigmine were given to all patients. Physostigmine was applied to five (4.6%) patients because they did not respond to neostigmine therapy. These patients were taken into intensive care and observed. Sedation was practised in 77 (71.3%) patients.

Five patients with a GCS < 12 were taken into the intensive care unit.

Also eight (7.4%) patients complained about astasis and five patients were taken into the intensive care unit. Astasis complaint ($p < 0.01$) and CK levels ($p = 0.06$) were relatively higher in the intensive care patients. No significant differences were found regarding demographic data, duration of admission to the hospital, clinic (flushing, xeroderma, tachycardia, mydriasis, abdominal pain, chills, fever, headache, globe vesicle, agitation, decreased bowel sounds, hallucinations, delirium, constipation, lethargy, choreoathetosis, nausea, vomiting, coma, hypertension, ataxia), and laboratory data (white blood cell count, haemoglobin, platelet count, ALT, AST, LDH, glucose, creatinine, prothrombin time) ($p > 0.05$) between patients requiring and those not requiring intensive care.

DISCUSSION

One of the important causes of morbidity and mortality during childhood is poisoning. Anticholinergic poisoning rarely appears during childhood, and our literary knowledge regarding AB poisoning is limited. Exposure to anticholinergic poisoning mostly leads to non-specific symptoms, but may also cause peripheral and central anticholinergic signs and symptoms, which are related to the mortality and morbidity (12). Many symptoms and findings related to peripheral and central anticholinergic effects are defined. To our knowledge, astasis symptom is described for the first time in this study. Symptomatic treatment and physostigmine form the basis of AB treatment (1, 5). However, it is underlined that neostigmine is also used in cases (7, 13). In our study, successful treatment of five patients with physostigmine who failed treatment with neostigmine is presented.

The severity of symptoms caused by AB poisoning can vary depending on dose and resources (1). The anticholinergic effects of AB alkaloids may affect both central and peripheral nervous systems leading to speech impairment, memory loss, agitation, confusion, disorientation, ataxia, delirium, hallucinations, increased respiratory rate, coma, seizures, respiratory and cardiovascular failure, tachycardia, cardiovascular changes, decreased secretion that cause xerostomia, decreased bowel (abdominal) sounds or ileus, erythema, mydriasis, vomiting, constipation, urinary retention, fever, and hypertension (1, 7, 9, 13–15).

In this study, 7.4% of the patients suffered from astasis. Although the reason for astasis is unclear, we speculated that it may be connected with the deterioration of muscle coordination due to the central anticholinergic effect and their need for intensive care by going into central effects of coma. The central effects of atropine are dose and resource dependent, cross the blood–brain barrier and cause confusion, disorientation, hallucinations, uncoordinated movements, and delirium by leading to the central anticholinergic syndrome (5, 10, 16).

Convulsions and speech disorders are referred in different proportions depending on AB poisonings (1, 4, 7, 12). Unlike other studies, we did not find convulsions and speech disorders in our study. This may stem from drugs used for sedation or low amount of AB value taken. Furthermore, the amount of AB has not been fully evaluated, since most of our patients are paediatric and the study is retrospective.

In this study, the patients with AB poisoning were presented with the following laboratory data: leucocytosis in 51 cases, thrombocytopaenia in 17 cases, elevation of AST in 83 cases, elevated ALT in 68 cases, elevated LDH in 82 cases, elevated glucose in 15 cases, elevated creatinine in 3 cases, and deranged prothrombin time in 77 cases. Caksen *et al* found leucocytosis in 3 cases, hyperglycaemia in 17 cases and slightly elevated serum aspartate transaminase elevations in 4 cases, within the series at laboratory presentation (7). In contrast to other studies, we found high CK levels in 22 patients. The mechanism related to increased CK levels is not clear in AB poisonings. We postulated that the increase in CK levels is related to muscle breakdown due to activation of intracellular calcium alkaline protease and the lipases. Moreover, CK elevation in the AB poisonings may be linked to intensive care admission and severity of poisoning. In another study, it is stated that fever may be concerned with CK elevation; therefore, another possible cause of CK elevation may be fever.

Treatment of AB poisoning is symptomatic. It is important to perform gastric lavage and to use activated charcoal in early phase. In addition, benzodiazepines possess sedative that may be used. Despite symptomatic treatment, physostigmine should be used in the patients whose clinical symptoms fail to improve and in cases of tachycardia, agitation, somnolence, delirium, coma, or respiratory arrest (5, 16, 20). Physostigmine is a specific antidote and reverses both central and peripheral anticholinergic effects by crossing the blood–brain barrier and producing anticholinesterase reversible inhibition (5). Studies have shown successful results with neostigmine (7, 13). In this study, gastric lavage was performed and activated charcoal was given to all patients. All patients were treated with neostigmine to suppress the anticholinergic effects of AB. Five patients with astasis complaints during admission were taken into the intensive care due to GCS below 12. All the five patients were treated with physostigmine and discharged with healing. In the event that it is difficult to provide physostigmine, treatment with neostigmine may be practicable, yet physostigmine treatment should be practised in early stages in the patients with low GCS.

CONCLUSION

Atropa belladonna poisoning may seriously progress in the act of late diagnosis and treatment in childhood. Thus, it is crucial to consider AB poisoning in the patients with flushing, xeroderma with mydriasis, tachycardia, tremor, abdominal pain, and fever symptoms. Patients with astasis complaints and low GCS scores (lower than 12) should be evaluated carefully in terms of intensive care needs. Moreover, it is vital to keep in mind that administration of physostigmine, instead of neostigmine, is needed in the patients with advanced central effects just as coma. This will lead to improved prognosis in the affected patients.

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