

# Malignant arrhythmia and cardiac arrest following intentional Yew tree leaf ingestion salvaged by VA-ECMO

William Ries<sup>1</sup>, Muhammad Faisal<sup>1</sup>, Thomas Kirk<sup>1</sup>, Aqib Hafeez<sup>1</sup>, Laura Vincent<sup>1</sup>, David Clarke<sup>1</sup>, and Graham Barker<sup>1</sup>

<sup>1</sup>John Radcliffe Hospital

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## **Malignant arrhythmia and cardiac arrest following intentional Yew tree leaf ingestion salvaged by VA-ECMO**

### **Authorship:**

William Ries<sup>1</sup>

*William.Ries@ouh.nhs.uk*

Muhammad Faisal<sup>2</sup>

*Muhammad.Faisal@ouh.nhs.uk*

Tom Kirk<sup>3</sup>

*Tom.Kirk@ouh.nhs.uk*

Aqib Hafeez<sup>2</sup>

*Aqib.Hafeez@ouh.nhs.uk*

Laura Vincent<sup>3</sup>

*Laura.Vincent@ouh.nhs.uk*

David Clarke<sup>3</sup>

*David.Clarke@ouh.nhs.uk*

Graham Barker<sup>3</sup>

*Graham.Barker@ouh.nhs.uk*

1. *General Medicine, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust*
2. *Emergency Department, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust*
3. *Oxford Critical Care, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust*

### **Corresponding author:**

William Ries – *William.Ries@ouh.nhs.uk*

*General Medicine, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust*

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## Key clinical message

This case emphasises the role of multidisciplinary involvement and early decision-making in Yew Tree (*Taxus baccata*) poisoning. *Taxus baccata* contains taxine alkaloids which predispose to malignant arrhythmia (1,2). We present a case of *Taxus baccata* toxicity presenting with refractory cardiac arrest, salvaged ultimately by venoarterial extracorporeal membrane oxygenation (VA-ECMO).

## Introduction

*Taxus baccata*, a tree endemic to Europe but found worldwide, has been known for its noxious effects since ancient times (1). There is no known antidote (3). Treatment strategies are largely informed by case reports of successful therapies internationally (2,4). Early institution of VA-ECMO is evolving as a central pillar of successful treatment of clinically significant overdose (5).

## Case history

A woman in her 20s ingested approximately 30 grams (equivalent to a dose of 0.46 grams of leaves per kg) of *Taxus baccata* in a concerted suicide attempt. She self-presented to the local emergency department 90 minutes after ingestion but collapsed in the hospital grounds before entering the building.

## Methods

Cardiopulmonary resuscitation (CPR) was commenced immediately by a nearby ambulance crew. Cardiac rhythm analysis revealed ventricular fibrillation. The patient was transferred to the emergency department with resuscitation ongoing. Intravenous adrenaline and amiodarone were given during the resuscitation attempt in accordance with Advanced Life Support (ALS) UK guidelines (6). Return of spontaneous circulation (ROSC) was achieved after 17 minutes. A total of seven biphasic defibrillations at 200J were administered during the resuscitation effort, with cardiac rhythms evolving from ventricular fibrillation to ventricular tachycardia to pulseless electrical activity (Table 1). A post-resuscitation 12 lead-ECG demonstrated an irregular broad complex rhythm (Figure 1). Arterial blood gases revealed a metabolic acidosis with a lactate of 5.8 mmol/L. Glasgow Coma Scale score was 3.

The patient underwent tracheal intubation and was ventilated in the emergency department. She remained hypotensive and suffered alternating bouts of wide complex tachy- and bradyarrhythmias, with the latter transiently responsive to an intravenous isoprenaline infusion. An intravenous adrenaline infusion was commenced due to extreme haemodynamic instability. The patient suffered a second cardiac arrest with cardiac rhythm analysis demonstrating asystole. ROSC was achieved after one minute of CPR and additional boluses of intravenous adrenaline.

An emergency oesophagogastroduodenoscopy (OGD) was performed at the bedside. Several tree leaves were seen in the gastric body which were successfully retrieved using a Roth net and aspiration. The gastric

mucosa was then washed copiously and aspirated completely. The tree leaf residue was sent to the laboratory for analysis.

In attempts to mitigate the destabilising arrhythmogenic effects of *Taxa baccata*, the patient received two 80 mg doses of intravenous digoxin specific antibody (Digibind), 100 mL of intravenous 8.4 percent sodium bicarbonate, 4 mmol of intravenous magnesium sulfate and an intravenous amiodarone infusion. Intravenous intralipid therapy was also administered, first as a 100 mL bolus and then as an infusion. 200mg of intravenous hydrocortisone was administered due to previous case reports indicating benefit when used in Yew tree overdose.

Despite these measures, the patient continued to suffer progressive haemodynamic instability and was thus referred emergently to the regional ECMO service. She was established on peripheral VA-ECMO approximately seven hours after *Taxa baccata* ingestion. Computed tomography (CT) imaging of the head, chest, abdomen and pelvis was unremarkable.

## Conclusion and results

The patient was successfully decannulated from VA-ECMO on day 3 of tertiary centre admission. Decannulation was complicated by right femoral artery embolus for which she underwent successful embolectomy. After transfer back to the referring centre, the patient was weaned from sedation and ventilatory requirements without incident. The patient was soon afterwards discharged from hospital with close psychiatric support in the community.

A bedside transthoracic echocardiogram (TTE) immediately following her cardiac arrest showed evidence of right ventricular volume and pressure overload. Agitated saline did not demonstrate any obvious intracardiac shunt. A subsequent TTE and transoesophageal echocardiogram (TOE) on day 2 of VA-ECMO demonstrated normal right ventricular size and function. A cardiac magnetic resonance scan performed 2 months following discharge confirmed sustained normal cardiac function with no evidence of cardiomyopathy.

## Discussion

*Taxus baccata* has long been known for its lethal side effects (1). Folklore reports that Boudica, the Celtic queen of ancient Britain attempted suicide by ingesting the tree's evergreen leaves, distraught by her defeat to the Romans (7). In modern times, the tree has gained traction amongst patients with strong suicidal intent as a readily available toxic substance, which in overdose, has no known antidote (8). Its lethality derives from the alkaloid toxin taxine B, which predisposes to malignant arrhythmia by disrupting myocyte voltage gated calcium and sodium channels (1,7,8). The malignant electrophysiological traces seen in this case demonstrate the effect of extreme membrane channel blockade on cardiac rhythm – agonal sinusoidal rhythms alternating with recurrent bouts of ventricular tachycardia followed by junctional escape rhythms.

A literature search reveals several dozen case reports of *Taxus baccata* poisoning over the past two decades. Recognised treatment options include intravenous sodium bicarbonate to correct profound metabolic acidosis and encourage intracellular sodium transport (9); early gastric decontamination either by emergency endoscopy or activated charcoal; administration of intravenous Digibind as digoxin specific Fab fragments have been found to bind taxines (10); and administration of lipid emulsion therapy as taxine B is believed to be lipophilic (9).

In recent decades, the anti-mitotic effects of *Taxus baccata* have been harnessed as chemotherapy agents – giving rise to the taxane class of cancer treatments including medications such as paclitaxel and docetaxel (11). Strategies for mitigating taxane-class toxicity can also be trialled in intentional *Taxus baccata* poisoning (12). For example, in this case, we also used intravenous hydrocortisone.

Other case reports have shown transient stabilising effects of varying interventions - for example Farag *et al.* demonstrating conversion of asystole to a broad complex tachycardia with administration of Digibind (10). In our patient, we trialled all these treatments in tandem – Digibind, lipid emulsion therapy, intravenous sodium bicarbonate and hydrocortisone, and gastric decontamination. It is difficult to identify a direct

benefit from any one single intervention we made. Instead, our case indicates that these treatments may form part of a best supportive care bundle that can act as a bridge until VA-ECMO can be commenced (2,9). It also serves as a reminder that an excellent outcome is possible in what may seem like an unsalvageable presenting clinical state, both biochemically and haemodynamically.

This case highlights that complete neurological and cardiovascular recovery is possible with extensive rapid multi-specialty input and early institution of VA-ECMO. It also supports the use of several medications as potential temporising measures until VA-ECMO can be established.

### Learning Points

- Expedited institution of VA-ECMO may maximise chances of salvaging *Taxa baccata* toxicity.
- Combination therapy of intravenous sodium bicarbonate, digoxin specific antibody, lipid emulsion therapy, hydrocortisone and gastric decontamination may serve as a therapeutic bridge until VA-ECMO can be established.
- In this case, *Taxa baccata* toxicity was associated with an acute right ventricular cardiomyopathy, which rapidly resolved once established on VA-ECMO.

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### Figures:



**Figure 1:** Post-resuscitation 12 lead-ECG demonstrating an irregular broad complex rhythm.

Time	Rhythm	Therapies
<i>Arrival to Emergency Department</i>	VF	CPR ongoing
<i>+ 2 minutes</i>	VF	Defibrillation
<i>+ 4 minutes</i>	VF	Defibrillation
<i>+ 6 minutes</i>	VF	Defibrillation
<i>+ 8 minutes</i>	Pulseless VT	Defibrillation
<i>+ 9 minutes</i>	-	Intubated
<i>+ 10 minutes</i>	PEA	CPR
<i>+ 13 minutes</i>	PEA	CPR
<i>+ 15 minutes</i>	PEA	CPR
<i>+ 17 minutes</i>	ROSC	ABCDE, Central line insertion

**Table 1 :** Cardiac rhythms recorded during the resuscitation attempt in the emergency department before being transferred to intensive care unit.

**Author Contributions:**

William Ries – Preparation and review of manuscript

Muhammad Faisal - Preparation and review of manuscript

Thomas Kirk – Preparation and review of manuscript

Aqib Hafeez – Clinical Advice

Laura Vicent - Review of manuscript

David Clarke - Review of manuscript

Graham Barker - Review of manuscript

