Suicidal poisoning by ingestion of Taxus Baccata leaves. Case report and literature review

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Abstract: A 43-year-old man was found unconscious at his home by the family members. He was transported to the local hospital where there was suspected the diagnosis of voluntary intoxication due to an unknown plant, possible Taxus baccata. He died 4 hours post admission and a medico-legal autopsy was performed, followed by histological and forensic toxicology analysis. Furthermore a botanical investigation was applied. Autopsy revealed fragments of greenish needle-like leaves in the stomach. Plant botanical investigation indicated the presence of Taxus baccata, also known as yew. The histological findings showed unspecific modifications of the internal organs, in concordance with the literature. No signs of violence could be found on the external exam or any relevant concentrations of alcohol, narcotic drugs and pharmaceuticals in the postmortem screening. Therefore, taking into account the history of the case, the clinical, paraclinical data, the autopsy findings and the ancillary examinations, the death was considered violent due to acute intoxication with Taxus baccata, this being a unique case in the activity of our Institute of Legal Medicine.

Key Words: fatal poisoning, Taxus baccata, alkaloids, suicide.

The yew trees - Taxus baccata are evergreen conifers widely spread all over Central and Southern Europe [1], that have been implicated with animal [2,3] and human poisonings [4, 5]. The toxicity of Taxus baccata has been known since antiquity [5] and extracts of yew leaves have been used for homicides as well as suicides [6,7]. Intoxication by parts of the yew plant (the seeds, the bark, the leaves) are well described in the literature but suicidal cases of yew ingestion are rarely known [8,5].

Taxus baccata contains a complex mixture of compounds, including phenolic constituents (e.g. 3,5-dimethoxyphenol), non-alkaloidal diterpenoids (e.g. 10-deactetylbaccatin III), alkaloidal diterpenoids (e.g. paclitaxel, taxine B) or flavonoids (e.g. myricetin) and bioflavonoids (e.g. bilobetin) [9-11]. The taxoid concentrations in the plant vary with the time of the year [12]. The lethal dose for an adult is reported to be 50 g of yew needles equal to 250 mg taxine alkaloids or approx. 3 mg taxine per kilogram body weight [9].

Ingestion of Taxus leaves can cause dizziness, nausea, vomiting, diffuse abdominal pain, cardiac arrest, respiratory paralysis and death [9]. Generally, the primary action of the Taxus toxins is the production of a block in the distal portion of the conduction system of the heart resulting in fatal arrhythmia [13]. Among the methods mentioned in the literature [5] for the analysis of Taxus

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compounds, we recall the immunoassay, thin layer chromatography, gas chromatography (GC), GC combined with mass spectrometry (MS), high-performance liquid chromatography combined with UV, diode array detection and MS.

CASE REPORT

**Clinical data:** A 43-years-old man, with medical history of recurrent depressive disorders treated randomly and for which he didn’t take any medical treatment recently, has been found unconscious by the family members at his home. The family reports that he was a successful engineer until approximately 10 years before, when he had developed a depressive mood, stopped working and became progressively interested in computers and suicide methods. From that period he was randomly treated by psychiatrists, and he was more or less compliant. At 19.00, the day of the suicide he was found by the family members, unconscious and with a brief suicide note nearby and an empty plastic bag with remnants of green leaves.

He was transported with the ambulance to the local hospital where there was suspected voluntary intoxication due to an unknown plant, and it was suggested a possible Taxus baccata ingestion. The family members told the doctors that in the last period of time he had been consulting the Internet information regarding the yew plant and its toxic effects. The police investigation revealed that near his home there had been found several ornamental yew bushes. At admission in the emergency room, the patient was comatose with GCS 3 points, had ventricular tachycardia, acute respiratory and liver failure, hypokalemia, hypotension (60/40 mmHg) and mixed acidosis. Next, toxicological samples and gastric lavage were performed and he was administrated activated charcoal. Following that, the supportive hemodynamic and electrolyte rebalancing treatment was initiated. He was transferred in the intensive care unit where the patient’s status remained weak and presented three resuscitated cardiac arrests. After 4 hours post admission he suffered an unresponsive cardiac arrest and was declared deceased.

**Autopsy findings:** There were no signs of violence on the body, but only traces of medical venous puncture marks. The internal examination resulted in nonspecific signs of intoxication such as swelling of the brain and congestion of the viscera. The stomach contained approx. 450 ml of dark liquid. On close inspection we have observed partially digested food fragments as well as green-brown plant particles. The botanical examination identified them as whole leaves as well as fragments of leaves of yew tree. Other significant pathological findings were pleural, pericardial and peritoneal effusions and hepatomegaly (2600 g). Alcohol, narcotic drugs and pharmaceuticals could not be detected by general toxicological screening. Significant findings on the microscopic examination revealed liver and kidney dystrophy, no other histological abnormalities being observed.

**DISCUSSION & CONCLUSION**

Taxus baccata is a plant mainly used for ornamental purpose. Its toxic effects had been known since ancient...
times, but besides these, in the last decades it has been extensively studied [14] and proven the benefic effects of the yew extract, especially in the treatment of neoplasia.

We have presented an unique case of suicide, in the way it had been accomplished, in the casuistry of the Institute of Legal Medicine Cluj-Napoca. The literature describes more frequently fatal accidental poisoning with yew leaves, especially in children and animals. However, the suicides websites contain plenty of information regarding the toxicity of Taxus baccata. Other cited cases [15,16] mention that the choice of this method of suicide involves minimal specialized knowledge. In our case we have found that the victim had visited a lot of websites on Taxus baccata in the days preceding his death.

The literature mentions different and new methods [17] of confirming the yew poisoning among them being the detection of active compounds from Taxus baccata, most commonly being the identification of 3,5-dimethoxyphenol (3,5 DMP). In our case the poisoning diagnosis has been determined by the corroborations of the personal medical history, the clinical and laboratory investigations with the autopsy findings, a determinant role being played by the botanical exam of the leaves and fragments of leaves taken from the gastric content. We recall the fact that the needed lethal amount of leaves to ingest is only of 50 g. We could not determine the exact quantity of yew leaves our patient had ingested due to the gastric lavage performed at the hospital, but the doctors estimated a whole quantity of approx. 300 g.

In the forensic literature there are scarce examples of Taxus baccata poisonings. However, Grobosch et al. [15] presented in 2012 a review of eight poisoning cases with Taxus baccata of which two were fatal and six were non-fatal. The victims presented an equal sex ratio of 4:4. Five of them were suicidal voluntary ingestions, among which two had previous psychiatric history, similarly to our own case and one of them was a drug addict. The other three cases were presented as group accidental poisoning of a mother and her 7-years-old son and 5-years-old daughter who had chewed some “fir tip leaves” to treat their coughs. We believe this was more probably due to the fact that in alternative medicine, a common cure for coughs is the ingestion of “fir tip leaves” syrup.

Among the methods of ingestion, we can recall cutting the leaves into small pieces before administration, ingesting two handfuls of yew leaves together with bread and chocolate or chewing them without swallowing. A particular case is one of a professional gardener with a known history of drug abuse (cannabis) who had been brought to hospital for detoxification. There he announced the intention to commit suicide using poisonous plants. Therefore he collected yew twigs from the hospital’s garden and brought them to his room.

Regarding this case, we recall that besides the leaves and seeds also the bark of the yew tree is poisonous. Among the symptoms mentioned there were severe nausea and sickness, vomiting, unconsciousness, except for the accidental poisoning cases, in which due to the small amount of chewed leaves the symptomatology was absent. In all cases there were collected samples for toxicological investigation such as stomach content, blood and urine in order to identify the toxic compounds of yew tree. The results showed the presence of Paclitaxel (Taxol A), 3,5-Dimethoxyphenol, Cephalomannine (Taxol B), 10-Deacetylbaccatin III, Baccatin III, 10-Deacetyltaxol III. Grobosch et al. also mention the fact that there is a direct relation between the way of preparing the plant material before ingestion and the toxic compounds concentration.

Roll et al. [16] in 2009, described an interesting case of suicidal by yew ingestion. The particularity of this case was that at the beginning, the doctors suspected a fatal epileptical attack, due to the prone position in which the victim had been found and also the spasm-like hands of the deceased. However, a forensic autopsy was performed, and revealed fragments of greenish needle-like leaves in the stomach and intestine. As well as in our case, a plant anatomical investigation was applied which indicated the presence of yew. Furthermore, the forensic toxicological analysis revealed the presence of 3,5-Dimethoxyphenol, the marker for intoxication with Taxus baccata. The novelty of this case resides in fact that Roll et al. highlighted hematopoietic histological modifications such as slightly hypopcellular with irregular distribution of hematopoietic cells, markedly left shift erythropoiesis, left shift hypoplastic granulocytopoiesis, decreases siderin, increase of small reactive plasma cells and focally edematous marrow. These prove the toxic effect of yew compounds upon the bone marrow.

In 2006, Pietsch et al. [5], presented a comparative study of five fatal cases of Taxus poisoning. There were all young people with ages between 16 and 26 years old, 2 females and 3 males. All of them were voluntary suicidal ingestions, 2 patients having a previous medical history of psychiatric disorders. Four of them were found dead and one had a 2 weeks survival. Similarly to our own case, in 2 of those presented, previous to suicide, the family members have noticed the subject’s concerning regarding the toxicity of yew plant; furthermore in one case a small plastic bag with yew leaves in a backpack was discovered. In all cases, previous to deocese, there were observed characteristic symptoms as dizziness, nausea, sickness and abdominal pain. The autopsy findings showed no signs of external violence and they were nonspecific such as blood congestion of the viscera and swelling of the brain.

However, in all cases there were identified fragments of yew leaves in the esophagus, stomach, duodenum and even colon for the patient with a 2 weeks survival. In 2 cases there was mentioned the exact amount of yew leaves found in the digestive system, namely 200 g and 150 g, this being more than the lethal dose of 50 g mentioned by Wilson, Sauer and Hooser [9]. In all cases the toxic exam for the Taxus baccata compounds was positive and the ancillary exams for alcohol and narcotic drugs were negative except in one case which proved to be positive for alcohol. As well as Grobosch et al., Pietsch et al. collected blood, urine and gastric content, but moreover the later also included fragments of brain, liver and kidney for the toxicological
evaluation. The toxic compound identified both quantitative and qualitative was 3,5-Dimethoxyphenol, this being the most common toxic marker in yew intoxications.

In 2003, Beike et al. [18], analysed the determination of taxine B and isotaxine B using high performance liquid chromatography-mass spectrometry (LC-MS), a rapid method for qualitative and semi-quantitative analysis of taxine alkaloids in human blood and tissue samples. This was performed on the biological samples collected from a schizophrenic 43-years-old man. He replaced his antipsychotic drug treatment by a regular intake of tea from Taxus and died. The interesting aspect of this case was that due to the unusual method of ingestion, the regular toxicological examinations and the autopsy internal findings did not reveal any cause of death. Consequently, the cause of death was established by the correlation LC-MS with the deceased’s sister’s statement that he had been searching for alternative medication for schizophrenia and had bought a small yew tree and prepared and consumed a decoction from the leaves few days previously.

Other authors, namely Beyer, Drummer and Maurer [19], presented a detailed article regarding the analysis of toxic alkaloids found in different plants, also mentioning the ones detectable in yew tree. Gausterer, Stein and Stimplf [17], proposed an alternative method of detecting yew intoxication, using direct PCR. We would like to point out that although there are different methods of determining the Taxus compounds, which in many cases imply high financial costs, we should not disconsider the simple and costless botanical examination.

Besides the articles from the forensic literature, we have also ran across upon some interesting information concerning the yew intoxication in the veterinary literature, due to the fact that many fatal Taxus intoxications occur in animals. Accordingly, Wilson and Hooser [20], presented the lethal doses of yew leaves in 10 species of animals comparing them to the ones in humans, concluding that the birds are most resistant to this intoxication in contrast with horses, mice and rats.

Also this intoxication concerned the cardiologists that studied the cardiac arrhythmias following yew leaves ingestion. In this way Willaert et al. [21], described a case of a non-fatal intoxication with Taxus baccata within an attempted suicide in a 43-years-old woman with psychiatric history. They focused on the cardiac rhythm effects and treatment. The electrocardiogram showed a polymorphic ventricular tachycardia which degenerated into ventricular fibrillation. Following electrical cardioversion, extreme bradycardia and electromechanical dissociation was noted. Reanimation procedures included the insertion of a temporary pacemaker. This author [21], reminded that because there was no known antidote and classic antiarrhythmic treatment, the management of Taxus intoxication should be essentially supportive.

The presentation in mass-media of such suicide methods and the widespread of yew trees in our geographic area, together with the quick lethal effects through the cardiac arrhythmias, make the Taxus baccata poisoning extremely accessible. Consequently we want to point out that besides the already common suicide methods such as hanging, drowning, common drug intoxication etc., in the daily practice we face unexpected ways of poisoning that can be a real challenge to the forensic expert.

References


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