

Internet suicide guidelines: Report of a life threatening poisoning using tobacco extract

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1. Introduction

As nicotine is readily available, commonly used and relatively cheap, accidental or deliberate nicotine intoxications regularly occur [1-4]. As tobacco ingestion is usually followed spontaneously by vomiting, most of nicotine is removed before absorption and a fatal poisoning will not take place. In nicotine overdose cases, gastrointestinal and systemic signs of nicotine intoxication develop within minutes [5]. In case of severe poisoning coma, cyanosis and dyspnoea are also observed. Death may occur within a few minutes due to paralysis of the respiratory muscles.

2. Case history

The 67 year old patient (80 kg, non smoker) had a history of severe depressive episodes and he was suffering from a moderate left-sided hemiparesis as sequels of a former cerebral infarct. He found a "recipe" for committing suicide on a freely available internet site [6]. It consisted in soaking 150 g tobacco for "a few days" in water, boiling off the water until 2 teaspoons were left and drinking them. In order to be sure to die, the patient doubled the dose. After drinking the extract he immediately fell sick and vomited. Two hours later the emergency medical team was onsite and observed the following signs: Glasgow coma scale 5/15, respiratory depression, hypothermia, hypersalivation, bradycardia and left-sided myoclonic shaking. At the emergency department of a local hospital he also showed marked opisthotonus and slurred speech. Acute meningitis was suspected and intravenous treatment with antibiotics was started. Later the patient himself pointed to nicotine intoxication. Activated charcoal was immediately given. He stayed at the ICU for 4 days then left the hospital with no visible sequels. Toxicological analysis consisted of quantification of nicotine and cotinine in serum and determination of nicotine content in the tobacco brand used for the suicide attempt. A general unknown screening was also performed on a urine sample.

3. Instrumentation

Nicotine and cotinine determination were performed on a LC/MS-MS system (LCQ Duo, Thermo Electron) equipped with an APCI interface run in the positive polarity mode. Component separation was achieved on an X-Terra MS C18 column (Waters), equipped with the same pre-column. The mobile phase consisted of a mixture of 5 mM ammonium bicarbonate (pH 8.0) and acetonitrile (ACN). The following ions were monitored: nicotine parent mass $m/z = 177.0$, isolation width 1.2 m/z , collision energy 30.0%, daughter ions: $m/z = 146.1$ and 177.0; cotinine parent mass $m/z = 163.0$ m/z , iw 1.2 m/z , ce 35.0%, daughter ions: $m/z = 132.0$ and 163.0; ketamine (istd): full mass m/z 200-250. The method has been validated for specificity; calibration curves; intraday and interday precision and accuracy; limit of detection; lower limit of quantification and absence of interferences.

4. Tobacco extracts

Nicotine was extracted from 2.5 g of the same tobacco brand used by the patient by “Soxhlet” extraction with 50 mL of water basified with 1 mL of ammonium hydroxyde (min. 25%). The extract was diluted and 5 μ L were injected into the LC/MS-MS. Nicotine extract has also been obtained by soaking tobacco in water as described in the internet files, 2.5 g of tobacco were added 50 mL of tape water and left at room temperature. After 3 days, the extract was diluted in water and 5 μ L of the solution were injected into the LC/MS-MS for determination of nicotine content.

5. Serum and urine extracts

Blood samples were taken 3.00 h, 7.40 h and 22.30 h after the suicide attempt. A urine sample was collected after 6 hours. Nicotine and cotinine in serum and urine samples were extracted using routine liquid/liquid extraction at pH 9.5. The extracts were taken up in 100 μ L of H₂O/ACN, 15 μ L were injected into the LC/MS/MS. Seven point standard calibration curves were prepared by fortifying blank serum.

6. Results and discussion.

The nicotine content in the tobacco was found to be 25.77 mg/g of tobacco. Preparing a nicotine extract as described in the internet files, a mean of 22.60 mg/g (87.7 % of total content) of the nicotine has been extracted. Nicotine and cotinine concentrations detected in serum are summarized in Table 1. Nicotine concentrations are slightly higher than those published in sub lethal acute nicotine poisonings [7].

Table 1: Serum concentrations of nicotine and cotinine after ingestion of the tobacco extract.

Time of blood sampling after suicide attempt (h)	Nicotine (μ g/L)	Cotinine (μ g/L)
3.00	322	9092
7.40	386	9955
22.30	18	5914

Considering that the patient prepared an extract from 300 g of tobacco, a total of amount of about 6780 mg of nicotine has been extracted. The fatal dose of nicotine for adults was estimated to be 40 - 60 mg but doubts about the validity of these data have been expressed as survival without complication after repeated ingestion of significantly higher amounts of nicotine has been observed [8]. The total amount ingested by the patient was less then the extracted amount as residues of the extract have been found and absorption of nicotine was not complete as the patient vomited soon after ingestion. Beside this, it is well established that bioavailability of nicotine is lower after oral ingestion than after smoking or application of transdermal patches.

General unknown screening of urine sample also revealed the presence of sertraline and dobutamine metabolites. As none of these substances was detected in serum, consumption of these drugs probably took place some days before the suicide attempt.

Assuming that the peak levels of nicotine and cotinine were reached before the second blood sampling the half lives were 200 and 1185 minutes respectively. These $t_{1/2}$ are slightly higher than values previously published [9] and may be explained by a decreased metabolism in elderly persons, the diet, physical exercise or interindividual genetic differences [10].

7. Conclusion

From the clinical point of view it is remarkable that the outcome was benign, despite the high amount of tobacco ingested and the elevated serum concentrations. Nevertheless, this case deserves several annotations:

- Guidelines for suicide were provided by a freely accessible internet site. In this perspective the internet is a double-edged tool, providing on one side comforting anonymous chat clubs for patients at risk for suicide and on the other side giving suicide instructions. Some of these websites not only provide recipes based on easily procurable and well known substances (i.e. tobacco) but also procure instructions for a "safe death" by more exotic substances. These intoxications may be particularly difficult to recognize and possibly facilitate suicidal attempts by reducing the inhibition threshold.
- The risks for clinicians to miss intoxication by tobacco extract are considerable. In our case, the myoclonic jerks, caused by exaggerated reflexes on the body side already damaged by a former stroke, were seen as features of an epileptic state. Bradycardia in combination with hypotonia and marked hyperextension of the neck were first interpreted as features of fulminating meningitis complicated by septic shock.

In conclusion in front of a patient with an inexplicable life-threatening symptoms or having succumbed to sudden inexplicable death, it seems to be cautious to conduct scrupulous "on site" investigations and intensive explorations of the patient's family or surroundings, as internet assisted suicides or suicidal attempts with peculiar agents may have to be considered.

References

1. Saxena K, Scheman A: Suicide plan by nicotine poisoning: a review of nicotine toxicity. *Vet Hum Toxicol.* 1985;27:495-497.
2. Montalto N, Brackett C, Sobol T: Use of transdermal nicotine systems in a possible suicide attempt. *J Am Board Fam Pract.* 1994;7:417-420.
3. Woolf A, Burkhardt K, Caraccio T, Litovitz T: Self-poisoning among adults using multiple transdermal nicotine patches. *J Toxicol Clin Toxicol.* 1996;34:691-698.
4. Lavoie F, Harris T: Fatal nicotine ingestion. *J Emerg Med.* 1991;9:133-136.
5. Higa de Landoni J: Nicotine. In "International Program on Chemical Safety (IPCS)." <http://www.inchem.org/documents/pims/chemical/nicotine.htm>, 1990. Last accessed 02 June, 2008.
6. http://fringe.davesource.com/Fringe/Information/Suicide_FAQ.html: In "Last Accessed: May 27, 2008." Last accessed: 02 June 2008.
7. Ekwall B, Clemenson C: Time-related Lethal Blood Concentrations from Acute Human Poisoning of Chemicals. Par 2: The Monographs. No. 18 Nicotine. In: www.cctoxconsulting.a.se/18_Nicotine.pdf Last accessed 02 June, 2008.
8. Metzler W, Wronski R, Bewig B: Die tödliche Zigaretten-Ingestion bei Erwachsenen. Gibt es sie wirklich? *Dtsch. med. Wochenschr.* 2005;130:1491-1493.
9. Hukkanen J, Peyton J, Benowitz N: Metabolism and Disposition Kinetics of Nicotine. *Pharmacological Reviews* 2005;57:79-115.
10. O'Loughlin J, Paradis G, Kim W, et al.: Genetically decreased CYP2A6 and the risk of tobacco dependence: a prospective study of novice smokers. *Tob Control.* 2004;13:422-428.