CASE REPORT

Bluish discolouration of stomach in dextropropoxyphene poisoning: an unusual finding at autopsy and discussion of differential diagnosis

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SUMMARY

Many times at autopsy, on the basis of colour change of the stomach and intestinal mucosa, the forensic pathologist is able to suspect a particular nature of poisoning which leads to conclusive investigation of the case. An intense bluish discolouration of the gastric mucosa owing to capsule shell instead of the content is rarely encountered at autopsy. We report a case of fatal dextropropoxyphene poisoning, where gastric and small intestinal mucosa showed bluish discolouration owing to the gelatine capsule of the drug. Other causes of bluish discolouration of gastrointestinal tract mucosa at autopsy are also discussed.

BACKGROUND

Discolouration of the gastrointestinal mucosa at autopsy gives a clue to the forensic pathologist to predict the nature of the substance, poison or drugs ingested by the deceased. Drug abuse is one of the common causes of death in India. Dextropropoxyphene and its various combinations are widely abused drugs in the north-eastern region of India and predominantly affects younger population.¹ Bluish stomach content or mucosal staining, usually gives a clue at autopsy towards the ingestion of copper sulfate or other common food colourants. This patient's case is being presented owing to the rarity of autopsy finding in drug poisoning and described for the first time in the case of this substance abuse.

CASE PRESENTATION

A 30-year-old woman was brought dead to the emergency medicine department with a history of ingestion of multiple unknown tablets. On the fateful day, she was apparently alright at the morning and was found in an unconscious state by her neighbours at her residence around 18:00 h. She had a history of abdominal pain during her first pregnancy 10 years ago and the same persisted in the postpartum period. She was prescribed 'spasmocip plus' containing acetaminophen (400 mg), dextropropoxyphene (65 mg) and dicyclomine hydrochloride (10 mg) for the same. In course of time she became addicted to the medication owing to dextropropoxyphene and continued to consume the drug without physician's advice. According to the family members, she was depressed owing to this chronic illness. The investigating officer had recovered 30 empty blister packets of spasmocip plus from the crime scene.

INVESTIGATIONS

The body was that of a 30-year-old woman, moderate built of 4.9 ft height, in a state of rigor mortis all over the body. Postmortem lividity of bluish-purple hue was present over the back and dependent parts of the body. Bluish discoloration of nails was present. Multiple linear scar marks, parallel to each other, were seen over the ventral aspect of left forearm. No other fresh external antemortem injury was seen. Upon internal examination both the lungs were found to be congested. Stomach contained about 500 ml of blue colour indistinguishable liquid and gastric mucosa was bluish stained (figure 1A,B). The small and large intestines contained the same material with similar staining of mucosa. All the internal organs like liver, spleen, kidney and brain were congested.

An experiment was performed after the autopsy using 'spasmocip plus' capsule (used by the deceased) to ascertain whether the capsule or its content was responsible for the discolouration of stomach and intestinal mucosa. Two plastic jars filled with normal saline were taken. In one of the jars the content of the capsule (whitish powder) was dissolved and the capsule cover without the content added to another (figure 1C). Both the jars were observed for half an hour. It was found that there was intense bluish discolouration in the jar containing the capsule cover, while the jar containing the capsule content did not reveal any colour change (figure 1D). The colour change was similar to that of the gastrointestinal mucosa colour (bluish) found at autopsy.

Toxicological analysis of blood by thin-layered chromatography revealed positive for dextropropoxyphene (figure 2). Histopathology of stomach showed normal mucosa with mild congestion of submucosa (figure 3A). Crypt-to-villous ratio was normal in duodenum. Sections from liver showed maintained lobular architecture with dilatation of sinusoids. Portal tract and hepatocytes were within normal histological limits. Sections from both the lungs (figure 3B), spleen and kidney showed congestion. Sections from brain were also within normal histological limits. Cause of death in this case was reported as because of dextropropoxyphene poisoning.

DIFFERENTIAL DIAGNOSES

- Poisoning owing to copper sulfate.
- Poisoning owing to copper subacetate.
- Food-colouring agent.
- Dyes such as methylene blue and toluidine blue used in chemoendoscopy.

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Figure 1 (A) Stomach containing bluish material. (B) Bluish discolouration of stomach mucosa. (C) Capsule covering and spasmocip plus powder dissolved in water. (D) Capsule covering showing bluish discolouration.

DISCUSSION

An observation of intense bluish discolouration of gastrointestinal tract mucosa at autopsy gives an important clue regarding the ingestion of substance by the deceased and other therapeutic procedure. The common causes of bluish discolouration of stomach are related to ingestion of copper sulfate, copper subacetate and traditional food containing dye. In occasional cases,

bluish discolouration of gastric mucosa could be because of ingestion of liquid used in the windscreen washer system during winters and owing to different dyes used in procedures like chemoendoscopy.^{2 3}

Among poisons, we observed, copper sulfate is the most common cause of bluish discolouration of stomach content and mucosa at autopsy. It is otherwise called blue vitriol or blue stone. It is found as large blue crystals, freely soluble in water. In acute copper sulfate poisoning, the postmortem findings are bluish or greenish-blue tinge of the mucous membrane of mouth, tongue, oesophagus and stomach. In such cases congestion, desquamation and haemorrhagic patches are found in the gastric mucosa. Mucosa of small intestine shows signs of moderate irritation. Liver shows centrilobular necrosis and biliary stasis. Kidney shows degenerative changes in the proximal tubules.^{4 5} Similar observations are also found in cases of poisoning owing to copper subacetate, which occurs as a powder.⁵

Food-colouring agent or colour additive is any dye, pigment or substance that imparts colour when it is added to food or drink. It is added to food products for cosmetic purposes and sometimes could be responsible for bluish staining of the gastric mucosa. The colouring agent could be a natural food dye like butterfly pea (*Clitoria ternatea*) or artificial colourant like Blue No. 1—Brilliant Blue FCF, E133 (blue shade) and Blue No. 2—Indigotine, E132 (indigo shade).

Nadjem *et al*² observed bluish liquid with aromatic smell in the oesophagus and stomach at autopsy in one case which was found to be because of ingestion of liquid used in the windscreen washer system during winters. In their case, they noted that the deceased was a chronic alcoholic and consumed this liquid because it contained ethanol. This liquid had stained the mucosa of the gastrointestinal tract.

Besides poisoning and traditional food dyes, indicator dyes used in diagnostic procedures can also lead to an unusual bluish discolouration of mucous membrane reported by Osterwald *et al*.³ There are some dyes used in chemoendoscopy which can cause bluish colouration of the gastrointestinal tract like indigo carmine, methylene blue and toluidine blue. Indigo carmine stains normal gastric and intestinal mucosa as it pools in the mucosal grooves and depressed areas. Methylene blue stains normal small and large intestinal cells. It also stains abnormal intestinal metaplastic cells seen in Barrett's oesophagus and

Figure 2 Thin layer chromatography showing positive for dextropropoxyphene.

Figure 3 Photomicrograph shows normal gastric fundic mucosa with mild submucosal congestion. Stromal cells (A, H&E $\times 40$). Sections from lungs show congestion and oedema (B, $\times 200$).

gastric carcinoma. There occurs active absorption of dye into the intestinal type of cells. Toluidine blue produce bluish discoloration of gastrointestinal mucosa, as this dye passively diffuses into the cells and bind with the cellular nuclei.

In this case, we found bluish gastric content and discolouration of gastrointestinal mucosa which was found to be because of the covering of the spasmocip plus capsule shell. The majority of capsule shells are made of hard gelatine which is a mixture of gelatine, sugar and water. They are clear, colourless and tasteless and water soluble. Colourant is added to the gelatine solution to prepare capsule shells with a variety of colours for better compliance of the patients. When this capsule is ingested, it gives colour to the stomach content and stains the mucosa of gastrointestinal tract.

The colour change of the mucosa of stomach can be distinguished from other conditions by histopathology and toxicological analysis. In histopathology, gastric mucosa showed no signs of inflammation or mucosal erosion. It only stained the gastric mucosa uniformly and findings of all other organs are within normal limits. However, we observed many cases of dextropropoxyphene poisoning where there was no such staining of gastric mucosa. The reason may be the numbers of capsules consumed were less and there were other factors like food, drinks, etc present in the stomach interfering with discolouration of mucosa.

Competing interests None.

Patient consent Obtained.

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Learning points

- Nature of ingested substance can be predicted on visualising the gastrointestinal mucosa and its content.
- Crime scene investigation and proper history should be taken before concluding any poisoning case.
- Forensic pathologist should consider medicinal substance abuse as one of the causes in the case of bluish discolouration of gastrointestinal mucosa.