




Methanol Intoxication in the Differential Diagnosis of COVID-19

COVID-19 Ayırıcı Tanısında Metanol İntoksikasyonu

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Abstract

Although central nervous system findings are prominent in methanol intoxication, the lungs are also affected. There have been several studies in literature describing autopsy-based lung findings, while there have been no clinical cases reported on to date. We present here a case identified radiologically as pulmonary edema that was included in the differential diagnosis of COVID-19.

Key words: Methanol intoxication, pulmonary edema, COVID-19.

Öz

Metanol intoksikasyonunda merkezi sinir sistemi bulguları ön planda olsa da akciğerler de etkilenmektedir. Literatürde otopsi olgularında akciğer bulguları tariflenmekte olup klinik olgulara rastlanmamıştır. Olgumuz, radyolojik olarak akciğer ödemi varlığı olması ve COVID-19 ayırıcı tanısında yer alması nedeniyle sunulmaktadır.

Anahtar Sözcükler: Metanol intoksikasyonu, pulmoner ödem, COVID-19.

RESPIRATORY CASE REPORTS

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Acute methanol intoxication occurs as a result of the accidental or suicidal consumption of fraudulently produced alcoholic beverages (1). During the latent 12–24 hour period, methyl alcohol is metabolized into formaldehyde and formic acid, which are more toxic than methanol, and multiorgan failure develops due to the inhibition of cellular respiration and cytochrome oxidase (2). The clinical findings can include visual impairment, headache, dizziness, nausea, vomiting, dyspnea, weakness, seizure, stupor, coma, respiratory failure and sometimes death.

Diagnosis is based on the presence of high anion gap metabolic acidosis and high serum methanol or formic acid levels (3). To prevent the conversion of methanol into toxic metabolites, ethanol or fomepizole, which has a 10–20 times higher affinity for alcohol dehydrogenase enzyme than methanol, is administered as a treatment (4). Gastric lavage, and the correction of acidosis with sodium bicarbonate, folic acid or hemodialysis may also be required, although mortality is as high as 44% (5). The characteristic magnetic resonance (MR) finding in methanol toxicity is bilateral putaminal necrosis, and while central nervous system findings are prominent, pulmonary involvement may rarely occur. Previous studies of the issue in literature are based on autopsies with focus on lung findings, in which edema, hemorrhage, atelectasis, acute bronchitis and tracheobronchitis have been reported to develop in the lungs in the first 4–36 hours post-mortem (6,7). The case presented here is of particular interest as a clinical example of methanol intoxication with lung involvement.

CASE

A 34-year-old male patient was brought to the emergency room with confusion and headache, nausea, and vomiting after imbibing methyl alcohol the previous day. The patient, who had bilateral mydriatic eyes, had a Glasgow coma score of <8 and so he was intubated and followed on a mechanical ventilator. The patient's methyl alcohol level could not be measured with decompensated metabolic acidosis due to the lack of the necessary facilities in our hospital. The pathological laboratory results were as follows: C-reactive protein of 37.7 mg/L (normal range: 0–5 mg/L), leukocytes of 20.300 K/uL, lymphocyte of 0.92 K/uL, and potassium of 5.8 mmol/L. A cranial MRI revealed symmetric diffusion restriction in the bilateral putamen (Figure 1). A chest computed tomography (CT) of the patient who underwent hemodialysis and bicarbonate replacement revealed bilateral diffuse ground

glass and consolidated areas (Figure 2). The patient's nasopharyngeal swab was negative for SARS-CoV2 PCR, and there was radiological regression after two days of intensive care follow-up (Figure 3). The symptoms subsequently regressed entirely, and the patient was discharged. Written approval was obtained from the patient to publish his case report and images.

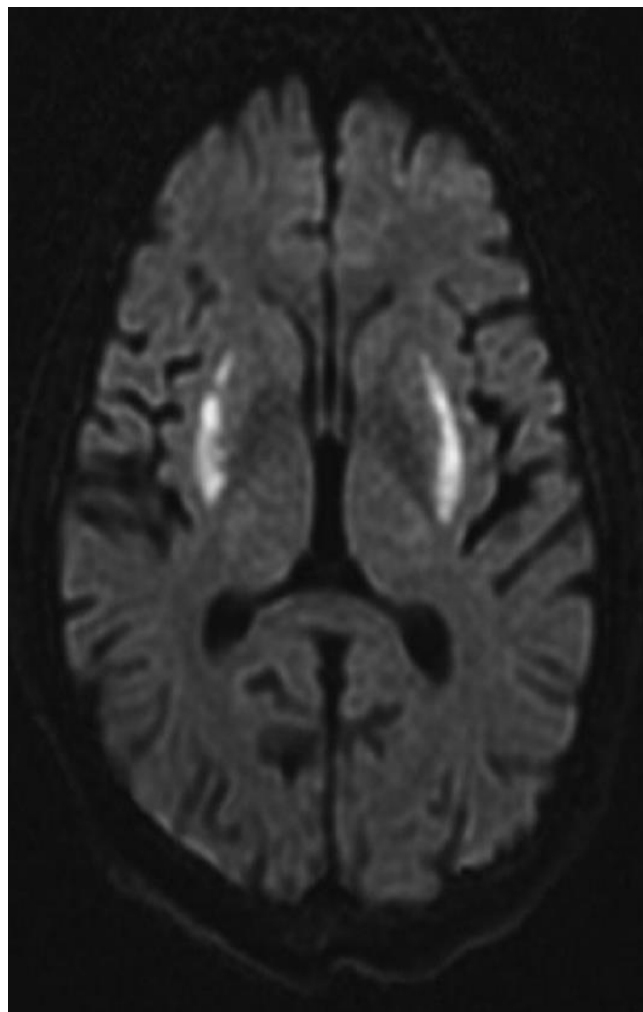


Figure 1: Diffusion restriction in bilateral putamen on cranial MR

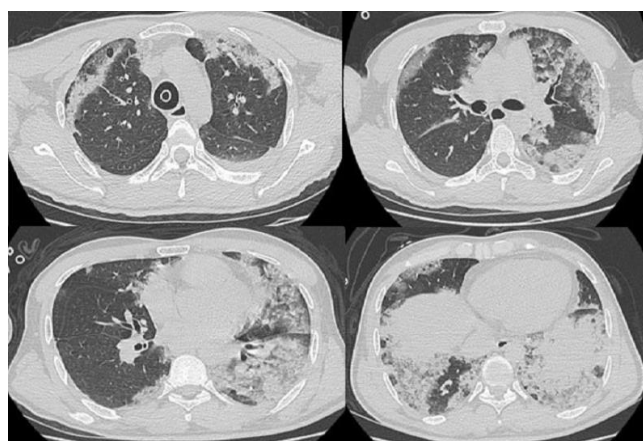


Figure 2: Bilateral diffuse ground glass and consolidated areas on thorax CT

DISCUSSION

The clinical presentation of methanol intoxication can vary greatly from patient to patient, from agitation, tetanic convulsions, seizures and hypothermia to coma accompanied by acute pulmonary edema (8). Cough and shortness of breath due to aspiration pneumonia may occur following the loss of consciousness that usually develops in the late stages of methanol poisoning. Most drug addicts live in environments with poor hygiene and crowded places where comorbidities are rife, and so the risk of contracting COVID-19 is also high. There can be overlaps in the laboratory findings of drug addicts and COVID-19 patients, and so the risk of contracting and transmitting the virus is higher, and the risk of a late and challenging diagnosis of COVID-19 symptoms is greater. COVID-19 should be suspected in cases of substance abuse (9). Despite the widespread parenchymal involvement in the chest CT in our case, and the ongoing pandemic and the suggestion of COVID-19 pneumonia, a SARS-CoV2 PCR was negative, and pulmonary edema was diagnosed due to the rapid recovery of the clinic, the absence of hypoxemic course and the radiological response.

If metabolic acidosis becomes evident, respiratory failure may develop (10) and the risk of mortality increases. Dyspnea has been reported in 61.1% of cases of methanol intoxication and the need for mechanical ventilation in 44.4% (11). The clinical findings of the present case regressed significantly after extubation following the second day of intubation.



Figure 3: Chest X-ray after two days of intensive care follow-up

The most characteristic MRI finding in methanol toxicity is bilateral putaminal necrosis, which may present with various degrees of hemorrhage. This finding is not specific to methanol toxicity, as it can also be determined in Wilson's and Leigh's diseases (12). Our diagnosis was supported as putaminal necrosis was also observed in our patient with compatible clinical and laboratory findings.

The pulmonary findings of methanol intoxication are based mainly on autopsy data. Buhas et al. (7) defined autopsy findings as acute edema or hemorrhage in the lungs. In our case, the identified radiological bilateral extensive involvement and the exclusion of COVID-19 were beneficial in indicating the pulmonary effect of methanol intoxication.

CONCLUSION

Although methanol intoxication is better known for its neurological, ocular and gastrointestinal effects, it can also present in the lungs. In the presence of bilateral lung involvement and confusion in the pandemic period, methanol intoxication should be included in the differential diagnosis.

CONFLICTS OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Concept - E.A., F.K., M.E.K.; Planning and Design - E.A., M.E.K., F.K.; Supervision - E.A., F.K., M.E.K.; Funding - E.A., F.K.; Materials - E.A., F.K.; Data Collection and/or Processing - E.A., M.E.K.; Analysis and/or Interpretation - E.A.; Literature Review - E.A., F.K.; Writing - E.A.; Critical Review - E.A., M.E.K.

YAZAR KATKILARI

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REFERENCES

1. Kuteifan K, Oesterlé H, Tajahmady T, Gutbub AM, Laplatte G. Necrosis and haemorrhage of the putamen in methanol poisoning shown on MRI. *Neuroradiology* 1998; 40:158-60. [\[CrossRef\]](#)

2. Kaewput W, Thongprayoon C, Petnak T, Chewcharat A, Boonpheng B, Bathini T, et al. Inpatient Burden and Mortality of Methanol Intoxication in the United States. *Am J Med Sci* 2021; 361:69-74. [\[CrossRef\]](#)
3. Zakharov S, Pelclova D, Navratil T, Belacek J, Komarc M, Eddleston M, et al. Fomepizole versus ethanol in the treatment of acute methanol poisoning: Comparison of clinical effectiveness in a mass poisoning outbreak. *Clin Toxicol (Phila)* 2015; 53:797-806. [\[CrossRef\]](#)
4. Unsal A, Basturk T, Sakac T, Ahbap E, Koç Y, Yılmaz M. Epidemic acute methanol intoxication as a result of illicit alcohol ingestion. *Nephro-Urol Mon* 2011; 4:366-71. [\[CrossRef\]](#)
5. Md Noor J, Hawari R, Mokhtar MF, Yusof SJ, Chew N, Norzan NA, et al. Methanol outbreak: a Malaysian tertiary hospital experience. *Int J Emerg Med* 2020; 13:6. [\[CrossRef\]](#)
6. Erlanson P, Fritz H, Hagstam KE, Liljenberg B, Tryding N, Voigt G. Severe methanol Intoxication. *Acta Med Scand* 1965; 177:393-408.
7. Buhas CL, Buhas BA, Daina LG, Hanganu B, Manolescu IS, Pusta CTJ, et al. Multiple fatal intoxications caused by improper consumption of an alcoholic parapharmaceutical product. *Rev Chim (Bucharest)* 2019; 70:2471-6. [\[CrossRef\]](#)
8. Belis V. *Tratat de Medicina Legală*. Ed. Medicală, Bucharest, 1995, p. 234-45.
9. Farhoudian A, Baldacchino A, Clark N, Gerra G, Ekhtiari H, Dom G, et al. COVID-19 and substance use disorders: Recommendations to a comprehensive healthcare response. *An International Society of Addiction Medicine Practice and Policy Interest Group Position Paper*. *Basic Clin Neurosci* 2020; 11:133-50. [\[CrossRef\]](#)
10. Benton CD Jr, Calhoun FP Jr. The ocular effects of methyl alcohol poisoning: report of a catastrophe involving three hundred and twenty persons. *Trans Am Acad Ophthalmol Otolaryngol* 1952; 56:875-85.
11. Çetinkaya A, Sırakaya HA, Aydın K. Methyl alcohol poisoning: an analysis of 18 consecutive cases. *Turk J Nephrol* 2021; 30:57-62. [\[CrossRef\]](#)
12. Hsu HH, Chen CY, Chen FH, Lee CC, Chou TY, Zimmerman RA. Optic atrophy and cerebral infarcts caused by methanol intoxication: MRI. *Neuroradiology* 1997; 39:192-4. [\[CrossRef\]](#)