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Case Report

Refractory shock following ingestion of topical minoxidil solution

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Introduction

Minoxidil is a directly acting vasodilator, which was used as an antihypertensive agent in rare cases of refractory hypertension.^{1,2} In the present times, it is more commonly used as a topical application in alopecia.^{3,4}

There are only a few reported cases in literature of poisoning due to ingestion of topical minoxidil. We encountered a patient, who developed refractory shock and pulmonary edema following accidental ingestion of the topical minoxidil solution.

Case report

A 58-year-old male patient, a known case of primary hypertension on Telmisartan 80 mg daily, presented with giddiness and

vomiting about 12 h after having accidentally consumed approximately 20 ml of 5% topical solution of minoxidil (Tugain 5 hair oil – Cipla Pharmaceuticals Ltd., Mumbai, India).

On examination, he was conscious, afebrile and had tachycardia (120 min⁻¹), low volume pulse and hypotension (90/70 mmHg). Systemic examination was normal. ECG showed sinus tachycardia with no significant ST-T changes.

He was started on intravenous normal saline, initially 1 l rapid infusion and then at 250–500 ml per hour despite which he remained persistently hypotensive with hypoxia (SPO₂ – 89%) and oliguria (<0.5 ml/kg body weight per hour). Central venous pressure at this stage was 20 cm of water. He developed progressive drowsiness and pulmonary examination revealed extensive bilateral fine crackles. Investigations revealed normal renal and liver functions. Serial ECGs did not show any significant changes. Chest radiograph showed bilateral middle zone opacities suggestive of pulmonary edema. Serial ECGs and cardiac enzymes were normal. Echocardiography showed normal cardiac function.

He was started on supplemental oxygen by face mask and dopamine infusion to maintain SBP > 100 mmHg. Despite this line of management over next few hours, he continued to have hypoxia, persistent hypotension and tachycardia, for which he was put on mechanical ventilation. Noradrenaline and subsequently vasopressin was added in the view of persistent hypotension.

Over next 12 h, his BP stabilized and sensorium improved. Urine output normalized and on examination, lungs were clear. He was gradually weaned off mechanical ventilation and the vasopressor support was tapered off.

On day three, he complained of blurred vision and floaters in front of his eyes. Fundus examination showed bilateral papilledema. There were no focal neurological deficits. MRI

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Brain showed no evidence of raised intracranial tension or focal lesions. He remained asymptomatic on follow-up and papilledema subsided spontaneously with no residual visual complaints.

Discussion

Our patient presented with refractory shock after around 12 h of accidental ingestion of topical minoxidil 5% solution (1000 mg). Course of illness was complicated by pulmonary edema and type 1 respiratory failure, which required crystalloids, triple vasopressor support and mechanical ventilation. Dopamine was chosen as first line vasopressor as it can increase cardiac output more than norepinephrine and in addition to the increase in global blood flow, has the potential advantage of increasing renal and hepatosplanchnic blood flow. Also there are case reports of minoxidil poisoning successfully managed with dopamine and also dopamine/phenylephrine being recommended by the manufacturer especially, when there is an impaired organ perfusion.^{8,9} Phenylephrine was not available for use in the treating hospital.

Minoxidil is a potent direct arterial vasodilator, which acts by opening cardiovascular adenosine triphosphate sensitive potassium channels in vascular smooth muscle cells.⁵ Its role as an antihypertensive drug is limited due to its tendency to cause significant tachycardia and fluid retention.¹ It is used as a topical agent in the treatment of androgenic alopecia, and hence is widely available as an over-the-counter drug.

The topical solution is commercially available in two strengths, with 60 ml containing either 2% (1200 mg) or 5% (3000 mg) of minoxidil with ethanol and propylene glycol in water.⁶ Following oral dosing, the peak concentration in blood is achieved within 1 h, but due to active metabolite (minoxidil N-O sulfate) formation, the maximum therapeutic effect occurs much later (24 h), with a serum half-life of 3–4 h.⁷ It does not bind to plasma proteins and does not cross the blood brain barrier. Our patient had consumed 50 ml i.e. 1000 mg of minoxidil, which is ten times maximum oral dosage and reported almost after 12 h; hence gastric lavage was futile to consider. Since bulk of the drug is eliminated by hepatic metabolism, even hemodialysis was not a good option.

In most reports in literature, manifestation of ingestion includes severe hypotension and tachycardia presenting within a few hours of oral ingestion, requiring large volumes of intravenous fluids and vasopressor support.^{6–8}

Pulmonary edema has been documented in less than 2% of cases.¹ Our patient developed pulmonary edema, after nearly 14 h of ingestion. Fluid retention is one of the documented prominent effects of minoxidil therapy, and it is dose dependent.² The mechanism of salt and water retention has been attributed to not only being purely hemodynamic and

neurohumoral but also involving a direct tubular effect. It is recommended that while using minoxidil for refractory hypertension, a diuretic is administered along with it in order to counter its side effect of fluid retention.

Papilledema following minoxidil toxicity, as seen in our patient, has not been described in literature. Our patient did not have any raised ICP. We presume that this could be due to direct vasodilatory and fluid retentive effect of minoxidil. Findings of papilledema regressed over 4 weeks with no residual visual complaints or disc changes.

Conclusion

Ingestion of topical minoxidil can be a life threatening emergency with refractory shock due to its potent vasodilatory effect. Tachycardia and fluid retentive effects can further complicate its course and management. Pulmonary edema is a rare complication and papilledema without overt raised ICP can be an unusual manifestation. With increased over the counter availability and usage of topical minoxidil, physicians need to be aware of this entity and its management.

Conflicts of interest

The authors have none to declare.

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