Minoxidil Ingestion in a Toddler

Minoxidil is a direct arterial vasodilator used in the treatment of hypertensive emergencies. Minoxidil use can also cause hypertrichosis, and hence is widely used in treatment of male pattern baldness [1]. It is available over the counter as 2% and 5% topical hair formulation. Accidental ingestion of this topical solution even in lesser quantities can lead to significant cardiovascular toxicity. We report the youngest case of accidental ingestion of 5% topical minoxidil hair formulation in a toddler.

A developmentally normal one-and-a-half-years-old male child presented to pediatric casualty with history of accidental ingestion of 5% topical minoxidil hair formulation while playing. The child ingested around 3 -5 mL (150-250 mg of minoxidil) of the formulation and presented to hospital 45 minutes post-ingestion in a drowsy state. He did not have any history of vomiting or breathlessness at presentation. On examination, child's temperature was - 99.8° F, BP-90/62 mm of Hg (50^{th}-75^{th} centile), pulse rate - 150 /min with good volume and perfusion. His respiratory rate was 44/min, oxygen saturation - 99% in room air with bilaterally equal and reacting pupils. Cardiac examination revealed tachycardia with no murmurs, rubs or gallop rhythm. Examination of other systems was normal. Oxygen was supplemented at 2 L/min during initial stabilization. His BP dropped to 66/46 mm of Hg ($<5^{th}$ centile) within 3 hours post-admission and his pulse rate was 176 beats per minute. He received 20 mL/kg of intravenous normal saline bolus followed by maintenance fluids. Child was transferred to pediatric intensive care unit where dopamine infusion was started and titrated to a maximum dose of 12 mcg/kg/min. Child's sensorium improved after 6 hours. His blood pressures stabilized gradually within 12 hours and dopamine was tapered and stopped by 20 hours. His blood counts and electrolytes were within normal limits. Chest *X*-ray was taken 6 hours post ingestion, which did not show any features of aspiration. Initial cardiac markers showed negative TROP-I, CK- total : 196 IU/L and mildly elevated CK MB : 38 IU/L. ECG showed sinus tachycardia, flattening and inversion of T waves but no features of myocarditis. At 24 hrs post ingestion, repeat cardiac makers were within normal limits. Echo-cardiography done on day-4 showed normal LV function and EF: 65%. Renal function was normal throughout the course. During the course of hospital stay, the child had tachycardia around 170 to 180 per minute 3 hours post ingestion, which gradually reduced to 140-150 per minute on Day 2, and 100 to 110 per minute on Day 3. Child was normotensive after stopping dopamine, and tachycardia gradually reduced over next two days. He was discharged on day 4 of admission.

Minoxidil has a direct effect on arteriolar smooth muscles by opening of intracellular potassium channels that hyperpolarizes cell membranes resulting in marked vasodilation. The plasma half-life is around 3-4 hours. It causes reflex increase in myocardial contractility and cardiac output due to decreased peripheral resistance, which enhances venous return to heart and in turn decreases the blood pressure [1,2]. Minoxidil also stimulates renin secretion, which is mediated by renal sympathetic stimulation, resulting in sodium and water retention. Topical minoxidil preparations often contain denatured alcohol. In our case, the composition of each mL of ingested formulation had 95% alcohol equivalent to absolute alcohol 40% v/v.

In children, the usual therapeutic dose of minoxidil is 0.25-1 mg/kg to maximum dose of 50 mg/day [1]. Our index case consumed approximately 3 to 5 times of daily maximum dose. The toxic dose of minoxidil is not known but ingestion of few mL of solution will cause hypotensive effect and cardiovascular involvement in children. After ingestion, it gets absorbed quickly from gut and reaches the peak plasma level in first hour. Gastric decontamination or activated charcoal cannot be given because of its high absorption rate. Hypotension and cardiac effects usually develop 30 minutes after ingestion, peaking at 3 to 4 hours and can persist for 30 to 70 hours depending on the ingested dose [1-3]. This unusually prolonged cardiovascular action is thought to be due to persistence of the minoxidil in the vascular smooth muscle [4]. As expected, our index case developed hypotension and tachycardia 3 hours after ingestion and while hypotension settled 20 hours post ingestion, tachycardia reduced gradually over a period of 50 hours.

Since minoxidil 5% hair preparation is widely available over the counter drug for the treatment of alopecia, it should be marketed with child resistant packing and also kept away from the reach of children. Parents should be educated regarding the risk of accidental poisoning even with small quantity of minoxidil in children.

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