Chemical pneumonitis from aspiration of rash protector spray

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Abstract. Within hours of accidental instillation of a popular diaper rash protector spray, a 23 day old male developed severe chemical pneumonitis, acute respiratory failure and pneumomediastinum. Despite optimal ventilatory management, the unconventional use of frequent bronchial saline lavages was necessary to maintain oxygenation and ventilation. The only listed active ingredient, 10% dimethicone was a non-toxic inhalant, but the undisclosed inactive ingredients included mineral oil and balsam of peru which may cause chemical pneumonitis and allergic reactions. This case serves as a warning on OTC product designs and formulations, and cautions us to search beyond the listed active ingredients for potential toxicity.

Keywords: Chemical pneumonitis, pneumomediastinum, over the counter products design, unintended use, toxicity, neonate

1. Introduction

Daily, many over the counter products (OTC) for children are introduced into the market for use by the general public. Generally, these OTCs are expected to be non-toxic and reliable when used appropriately. However, sometimes, the unintentional misuse of such a product can result in unexpected and significant morbidity. We hereby present such a case.

1.1. Patient presentation

The institutional Review Board of St. Peter's University Hospital approved this project (CPHSR Study # 10:48) and provided exemption of informed consent.

Three days prior to admission, a 23 day old male, one of ex-34 wk premature twin newborns developed a nasal discharge and congestion. At 5 am, the exhausted

sleeping father, after working two jobs, was awakened by the child's crying. He mistakenly picked up a can of rash protector spray (which was sitting on the night stand beside the can of normal saline spray, prescribed to clear the child's nose), and sprayed it into the child's nares. The child immediately went into a choking and coughing spell. Upon arrival in the emergency department, he appeared, initially well. Since the only active ingredient, 10% dimethicone, was listed as a non-toxic inhalant, expectant observation was advised by the local poison control center. However, within two hours, he was grunting, exhibiting nasal flaring and experiencing mild intercostal and subcostal retractions. His oxygen saturation also dropped to 85% on room air. His chest x-ray (CXR) showed diffuse bilateral infiltrates, right greater than left, suggestive of bilateral aspiration chemical pneumonitis. In the next 36 hr, his respiratory distress worsened to acute respiratory failure. His CXR (Fig. 1) showed increasing patchy pockets of air trapping and a small spontaneous pneumomediastinum. He was intubated and mechanically ventilated. However, we had difficulties in expanding his lung and

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Fig. 1. Shows a pneumomediastinum with air tracking up into the neck and moderately severe air-space consolidation on the right lung and bilateral perihilar infiltrates. This chest x-ray was taken prior to endotracheal intubation and mechanical ventilation.

in maintaining his oxygenation. He had tremendous amounts of thick whitish mucus that frequently welled up and plugged up his endotracheal tube. Frequent saline bronchial lavages and chest physical therapy were necessary to remove these mucus plugs. This resulted in progressive recruitment of lung volume. The need for saline bronchial lavages gradually decreased over the next 3 days. His CXRs, 12 hr after institution of bronchial saline lavages, showed significant diminution of the pneumomediastinum with resolution by 36 hr. By the seventh day, he was weaned off the ventilator.

On day 3, he developed an eosinophilia of 31–37% with an absolute eosinophilic count of 3100–4250 per microliter. This eosinophilia persisted, until on the sixth day when he was given dexamethasone. The rest of his laboratory investigations were non-contributory.

2. Discussion

It was unfortunate that the exhausted father in the dark of the night had mistakenly picked up the wrong container. The shapes of the containers for the normal saline nasal spray and for the rash protector spray were quite similar (Fig. 2). There was never a question that the event was accidental. A google search and a reading

Fig. 2. Showing the two similar shapes of the normal saline nasal spray container versus rash protector spray container. The only ingredient listed on the can was the active ingredient – 10% dimethicone. There was no listing of the inactive ingredients, which the authors believe caused this child's chemical pneumonitis.

of the consumer reviews and blogs on the internet revealed that this product was indeed popular as a diaper rash protectant.

The rash protector spray can listed 10% dimethicone as its only active ingredient. Dimethicone is a mixture of fully methylated linear siloxane polymers. The Cosmetic Ingredient Review Expert Panel considered it safe as used in cosmetic formulations [1], and safe in the event of short term inhalation exposure. Clearly this ingredient could not be the cause for this child's acute pneumonitis and respiratory failure. The product's container can, however, did not list any other active ingredients nor did it list the inactive ingredients. The local poison control center when called from the emergency department had found no listing of this new OTC and since no toxin was listed on the product's container, had advised only expectant management with the expectation that there would be no adverse outcome, if the child remained asymptomatic. The authors of this article, found listed on the manufacturer's web-site (available at <http://www.blairerx.com/BRashProtectorconsole.php>), the following as inactive ingredients of the rash protector spray: aloe oil extract, caprylic/capric triglyceride, mineral oil, peruvian balsam oil, shea liquid and tocopheryl acetate (vitamin E). Of these, mineral oil appeared to be the most likely cause of acute pneumonitis. Even silent micro-aspiration of mineral oil prescribed for chronic constipation can cause a pneumonitis [2] and our patient had received a massive dose.

We had used frequent saline bronchial lavages to remove the substance. This was against the conventional wisdom: to do only careful suctioning of aspirated contents and not to lavage the lung with physiological saline as it could increase the spread of the aspirate, and thus causing more pneumonitis. But for this child, it was what was necessary in order to mechanically ventilate and oxygenate the lung. Reviewing the literature suggested that this procedure may, in fact, be what is necessary to treat mineral oil lipoid pneumonitis. Ciravegna et al. [3] in 1997 was the first to show complete resolution of pulmonary infiltrates using whole lung lavage in a child with exogenous lipoid pneumonitis who was taking mineral oil for constipation. Sias et al. [4] in 2009 showed that 4 to 10 bronchoalveolar lavages, performed once weekly, in 10 patients, age 3 months to 10 yr, with lipoid pneumonitis due to acute (1–4 days of ingestion) and chronic (30–60 days) micro-aspiration of mineral oil improved oxygenation and resolved the pulmonary infiltrates. Early treatment with bronchoalveolar lavage was associated with resolution of pulmonary infiltrates. Those patients who did not get any bronchoalveolar lavage, despite discontinuing the offending agent, showed persistence of clinical symptoms and pulmonary infiltrates. It was postulated that bronchoalveolar lavages help to remove intra-alveolar mineral oil which can cause a slow local inflammatory reaction and fibrosis. In retrospect, we wonder if early elective intubation and bronchial saline lavage would have ameliorated this child's clinical course. Perhaps a double blind study can be formulated.

The cause for our patient's prominent eosinophilia was most likely due to one of the other inactive ingredients; peruvian balsam oil. Dimethicone on the other hand, has only been implicated in an allergic reaction in one case report of a 64 year old women exposed to phenyl dimethicone in a sunscreen lotion [5]. Peruvian balsam oil, meanwhile, has been frequently implicated as an allergen. Up to 3.8–6.7% of patients suspected of having a contact allergy are sensitive to this ingredient [6]. With respect to the eosinophilia, the eosinophilia did not resolve until the administration of dexamethasone; clearly this was not just an immature bone marrow stress response.

Our case represents an error that resulted in a severe medical outcome. Using Donebedian's model [7]: Structure (input) -> Process (treatments) -> Outcome, we can formulate a multiple layered sieve to prevent future episodes. At the structural level, the manufacturer's container was confused by the father who mistook the shape of the container with another container that was similar to him in appearance.

The manufacturer should consider making a unique shape/color combination for the product container so that parents are less likely to mistake the butt spray from other infant products, for example, a container in the shape of a butt. This unique container could serve a dual purpose, for patient safety and as a good advertisement for the product. Also, inactive ingredients that may potentially become toxic if used inappropriately can be listed on the container. At the process level, parents should be educated to keep potentially toxic products from non-toxic products. For example, on the product label, advise the parents to keep the product away from similar products. Regardless of the actual changes in the structure and process, the outcome we desire is prevention of future episodes and amelioration of future harm.

To summarize, this case cautions us: [1] to look beyond the listed active ingredients, and review the inactive ingredients and clinical situation in order to determine potential toxicity that may result from unintended usage of OTC products, [2] to design OTC containers such that, they are so dissimilar that they cannot be mistaken for each other when used concurrently, and [3] to require that, manufacturers of OTC products list all ingredients, both active and inactive, in their container's label.

Disclosures

The authors have indicated they have neither financial relationships nor conflict of interest relevant to this article to disclose.

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