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EXPANSILE SUPERABSORBENT POLYMER BALL FOREIGN BODY IN THE EAR

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Abstract—Background: Superabsorbent polymers (SAPs) are materials that can absorb large quantities of water. Small spherical SAPs are commonly marketed as toys for children. **Case Report:** We report the case of a 4-year-old female who presented to a pediatric emergency department with a small, marble-sized SAP that was placed in her ear by herself during the course of play at daycare. On examination, the object was translucent and difficult to visualize. After multiple attempts at removal, the object was partially removed using an ear curette. The patient sustained a small tympanic membrane perforation. During a follow-up operative intervention by otorhinolaryngology, the remainder of the object was removed using a suction device and the tympanic membrane was repaired. **Why Should an Emergency Physician be Aware of This?:** While large SAPs associated with intestinal obstruction have been removed from the market, smaller SAPs can present a health risk when placed in orifices such as the ear or nose. Cases of foreign body SAPs have been misdiagnosed as ear infections and treated with topical antibiotics, which can lead to enlargement of the foreign body. Irrigation techniques and topical medications should not be used. SAPs are friable and can break into multiple pieces during removal attempts. Blunt tools, such as ear curettes, may be best suited for their removal. If the item breaks up during removal or if removal fails, urgent consultation with an otorhinolaryngologist is recommended. © 2019 Elsevier Inc. All rights reserved.

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INTRODUCTION

Superabsorbent polymers (SAPs) are materials that can absorb large amounts of liquids relative to their own mass. SAPs absorb large quantities of water through cross-linked hydrophilic bonds with water molecules, while maintaining sufficient structural integrity so as to not dissolve. These items were first mass-produced in the 1970s and have found broad applications including use in tissue scaffolding, disposable diapers, and agricultural products (1).

SAPs have been commonly available as toys in the past decade, though several products have been recalled because of their association with bowel obstructions, including at least one case ending in a fatality (2,3). However, smaller objects are still widely available. These items are also used as household products, including air fresheners and floral arrangements. In one study evaluating the expansibility of Orbeez (Maya Toys, Cypress, CA), a popular SAP product still marketed today, the diameter of an item increased from 0.18 cm to 1.10 cm after exposure to water, representing an increase in volume by 230 times

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the original size (4). These objects can become lodged in the ear in children during play. Such SAPs as foreign bodies can be a challenge to manage because of their expansile nature, translucency, and friability. Here, we review the case of a 4-year-old girl who presented to the emergency department (ED) for removal of an SAP lodged in her ear and we discuss management techniques for these foreign bodies in the ear.

CASE REPORT

A 4-year-old previously healthy female presented to the ED with her mother because of concerns for a foreign body in the child's right ear. Her teachers witnessed her placing the object in her right ear earlier that day. They warned her mother that these objects increased in size when they were wet. Her pediatrician referred her to the ED for further management. The patient had no ear drainage or ear pain. She had an otherwise unremarkable medical history.

On examination, the patient was anxious appearing. A small, translucent, bluish-colored spherical object could be seen in the external auditory meatus of the right ear. The object was difficult to distinguish from the tympanic membrane. Attempts at removal made using an ear curette were unsuccessful. After consultation with an otorhinolaryngologist, the patient was sedated. The area was cleared with a suction catheter. A right-angle curette was inserted under direct visualization to mobilize the object laterally, after which it was then partially removed with alligator forceps. The patient was discharged home and instructed to return 3 days later for an exploration under anesthesia. During this procedure, remnants of the object were removed with suction. A myringoplasty was performed to treat a 10% perforation of the tympanic membrane.

DISCUSSION

In the past decade, SAPs have been incorporated into a variety of toys and decorative items. These items are sold as translucent balls that expand when wet. These SAPs have a bright, colorful appearance and are commonly the size of marbles (Figure 1). Reports of SAPs that grew to large sizes or cases of ingestions of multiple smaller balls causing intestinal obstruction have been reported in the United States and internationally (2,3,5,6). Many SAP-based toys that expand to such an extent have been recalled by the U.S. Consumer Product Safety Commission (7). Nonetheless, smaller objects are still widely marketed. In the United States, these items are commonly sold under the trade names Orbeez or Magic Beadz.

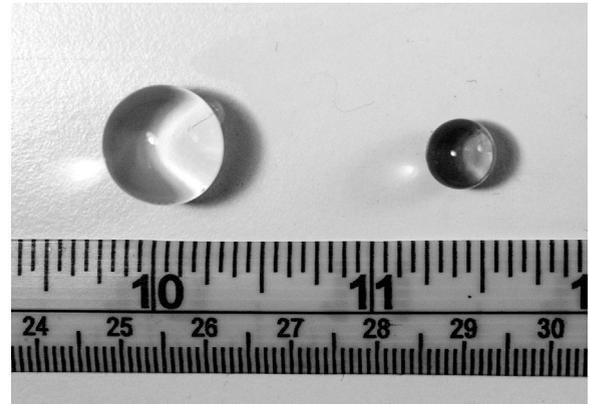


Figure 1. Demonstration of a commercially available super-absorbent polymer toy similar to the one encountered in this patient, in both fully expanded (left) and original (right) and states.

Children may place SAPs in their ears during play. SAPs in the ear represent a particular challenge because of 1) their ability to expand beyond their original size when in contact with moisture, 2) their translucent appearance, which can make them difficult to distinguish from the tympanic membrane, and 3) their friable nature, which means that they easily break apart with many commonly used interventions. One previous report has documented 2 children with such an event. In that report, one child sustained a 40% tympanic membrane perforation. The second child was treated for a prolonged period with antibiotics before she was found to have erosion of the temporal bone with labyrinthitis ossificans and sensorineural hearing loss (8). Because these objects are radiolucent, they cannot be easily diagnosed with radiographic techniques.

Identification of foreign bodies in the ear and nose requires attention to technique. Assistance is required for positioning, especially for an agitated child. Otoscopy may be performed in the sitting or supine positions. A nasal speculum may be useful to displace the tragus and better visualize the ear canal. For infants, the auricle should be moved inferiorly and posteriorly. For older children, the auricle should be moved superiorly and posteriorly. Nasal foreign bodies can be evaluated by pressing the nasal tip to rotate it superiorly and by using an appropriately sized nasal speculum. Even a thorough examination may fail to visualize all foreign bodies, and in such cases where one is suspected, referral to an otorhinolaryngologist is appropriate.

In cases where the history or examination is suggestive of an SAP foreign body in the ear or nose, removal should be done with the utmost care. Consultation with an otorhinolaryngologist may be prudent, especially if the material appears to be enlarged or expanded, or if removal is unsuccessful. Techniques that involve irrigation should be

avoided because these may cause the foreign body to further increase in size. L-shaped hooks and Rosen needles carry the risk of perforating and fragmenting the object. Ear cures, wax cures, and rigid suction devices may be useful if they are used under direct visualization through an otoscope or microscope. Although one manufacturer recommends the use of alcohol on a cotton swab placed in the external auditory meatus for 15 min to partially shrink the ball, the efficacy of this technique has not been reported (9). This should not be attempted if tympanic membrane perforation is present (including tympanostomy tubes) or if the tympanic membrane status is unknown.

For an SAP foreign body in the nose, we recommend a similar approach toward removal. However, these objects are of relatively greater concern because of the risk of posterior dislodgement with aspiration and enlargement in the airway. Alcohol should not be used because this may cause severe discomfort of the nasal mucosa. Care should be taken to avoid pushing the object posteriorly. Cures and balloon inflation devices may be best in these scenarios.

WHY SHOULD AN EMERGENCY PHYSICIAN BE AWARE OF THIS?

SAP-based foreign bodies in the ears of children are difficult to visualize and challenging to remove. Removal may be attempted by the emergency physician, but consultation with an otorhinolaryngologist should be strongly considered if removal is unsuccessful, if the

object breaks up, or if there is concern for a longstanding or expanded foreign body. Removal should be done with care given the friability and expansile nature of these materials. Multiple attempts, especially without direct visualization of SAP-based foreign bodies, should be limited to avoid trauma that may cause edema and inflammation, complicating eventual timely retrievable of object. Given the friable nature of these objects, the use of blunt instruments, such as an ear cures and suctions, are preferred.

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