

# The Importance of Supervising Toothbrush Usage for Young Children at Risk of Lead Toxicity

**Sandra H. Jee, MD, MPH<sup>1</sup>**

**Richard K. Miller, PhD<sup>2</sup>**

**Rogelio Perez-D'Gregorio, MD<sup>3</sup>**

**Jennifer D. Becker, MPH<sup>4</sup>**

**Stanley J. Schaffer, MD, MS<sup>5</sup>**

## ABSTRACT

Lead exposure in childhood causes lasting deleterious health effects through multi-system organ toxicity, including in brain, skeletal system, and oral cavity. We report a case that illustrates the imperative for providers to give specific anticipatory guidance on supervising toothbrush usage for young children. A healthy 18-month-old male presented for routine well-child care and had an unremarkable physical exam and developmental assessment. Two days after his routine visit, his blood lead test result was more than 180 mcg/dL (acceptable level is less than five mcg/dL). Upon review of his home environment, the mode of exposure was determined to be the child rubbing his toothbrush against the window well and putting the toothbrush in his mouth, thus causing exposure to lead dust. Health care and dental providers who advocate for toothbrushing have a responsibility to provide specific guidance on toothbrush usage for toddlers with hand-to-mouth behavior. (J Dent Child 2020;87(3):175-8)

Received April 22, 2020; Last Revision May 20, 2020; Accepted May 20, 2020.

**KEYWORDS:** TOOTHBRUSH, CHILDREN, LEAD TOXICITY, PEDIATRIC DENTISTRY, PARENTING

Lead exposure in childhood causes lasting deleterious health effects through cumulative toxicity in multiple organ systems, including but not limited to the brain and central nervous system, blood, kidney,

liver, and skeletal system, including the teeth.<sup>1</sup> Even low levels of lead exposure have been recently associated with risk of caries in primary teeth.<sup>2</sup> Environmental lead exposure has also been postulated to be associated with weakening oral antimicrobial activity in children, thus increasing the caries risk.<sup>3</sup>

Lead is not a naturally occurring element in the body and has no health benefits. Pediatric providers are aware of this heightened risk for young children, with the predilection for hand-to-mouth behavior and proximity of the child's breathing zone to lead entrained from surface dust.<sup>4,5</sup> There is growing awareness among pediatric providers and their patients about potential exposures to lead in older homes, water sources, cosmetics, imported spices, and other sources. There is no safe blood lead

<sup>1</sup>Dr. Jee is an associate professor, Department of Pediatrics, <sup>2</sup>Dr. Miller is a professor, Department of Obstetrics and Gynecology, Environmental Medicine, and Pathology and Clinical Laboratory Medicine, <sup>3</sup>Dr. Perez-D'Gregorio is a research assistant professor, Department of Obstetrics and Gynecology, <sup>4</sup>Ms. Becker is a project coordinator, Finger Lakes Children's Environmental Health Center and Western New York Lead Poisoning Resource Center – Rochester Office, and <sup>5</sup>Dr. Schaffer is a professor, Department of Pediatrics and Center for Community Health and Prevention, all at the University of Rochester School of Medicine and Dentistry, Rochester, New York, USA.

Correspond with Dr. Jee at [Sandra\\_Jee@urmc.rochester.edu](mailto:Sandra_Jee@urmc.rochester.edu)

level in children, and even low levels of lead exposure can cause significant neurologic morbidity and hampered brain development.<sup>6</sup> The problem of lead exposure and toxicity remains a salient topic for pediatric health care providers,<sup>7</sup> who make important referrals to pediatric dentists<sup>8</sup> and provide critical anticipatory guidance on oral health.<sup>9</sup>

The purpose of this report is to discuss a case from a pediatric practice that illustrates the joint responsibility of pediatric health care and dental providers in giving specific anticipatory guidance on toothbrushing for young children.

## CASE DESCRIPTION

A healthy 18-month-old male presented to a pediatrician for routine well-child care. His mother reported no concerns. He was experiencing no somatic complaints, including no fever, weight loss, nasal congestion, cough or respiratory symptoms, abdominal pain or constipation, bruising, or rash. A review of all dietary, voiding and stooling, sleep, and social-emotional domains were unremarkable. He was reported to live with mother and grandmother; the latter was the primary caregiver throughout the day.

Routine screening questions revealed that the patient had a dental home but had not received a fluoride treatment in the past three months. Specific screening questions on potential lead exposures were negative, including questions about having peeling/chipping paint in the home, having a sibling with an elevated lead level, or recent painting/sanding/renovation being done in his home. The standardized Ages and Stages Questionnaire revealed that the patient's development was borderline for the personal-social domain. His physical exam was unremarkable except for a grade 2/6 flow murmur on his cardiac exam and very minimal bow leggedness. The patient was deemed healthy and went home after his routine health exam after completing venous bloodwork for his hematocrit (to assess for anemia) and blood lead level. Testing blood lead levels by primary care providers is a requirement in New York State for all one- and two-year-old children, and several but not all states mandate routine lead testing of young children, although guidelines for screening and follow-up may vary slightly.

Two days later, his venous blood lead test result was reported back as being over 180 mcg/dL. The Centers for Disease Control and Prevention and New York State use a reference blood lead level of five mcg/dL as the cutoff for what is considered elevated. Based on this test result (which was repeated and confirmed), along with a remarkable abdominal radiograph showing high-density metallic flecks throughout the colon, the clinical picture was consistent with recent lead ingestion (Figure).

The child was admitted to the hospital for lead chelation therapy. After five days of combination intravenous and oral chelation therapy, he was discharged home to

complete an additional 14-day course of oral chelation therapy. He has been followed closely since that time and has continued to have elevated lead levels (ranging from 30 to 40 mcg/dL) since undergoing the initial chelation. Physicians are monitoring his health and development for ongoing impacts of persistently elevated lead levels, hopeful that as he matures beyond hand-to-mouth behaviors his lead levels will decline.

After reviewing the patient's home environment and discussing possible toxic exposures, it was determined that the primary exposure for the child's lead toxicity was attributable to lead-based paint on his home windowsills. His mode of exposure, however, was from direct ingestion of lead dust found on the bristles of his toothbrush, which he enjoyed holding like a security blanket or transitional object, and which he liked to rub against the window well and then put directly into his mouth. It was not immediately apparent to the caregiver, pediatric health provider, or pediatric dentist that the toothbrush the patient enjoyed carrying was the vehicle for lead dust ingestion from the windowsills.

Given the child's elevated lead level, the health department conducted a home inspection. It was upon home inspection and observation of potential exposure that the toothbrush was determined to be the vehicle for lead exposure, especially as there were no other obvious sources of lead exposure, such as the presence of peeling



Figure. Abdominal radiograph showing lead exposure in toddler.

or chipping paint in a home built before 1978, recent renovations, or exposure to imported spices or cosmetics in the home, which are the most commonly identified sources of lead in the home environment. In this case, the child was observed to have hand-to-mouth behavior that involved running the toothbrush against the window well. Reportedly, the taste of lead paint is slightly sweet, which helps explain why some children seek to eat lead dust or paint chips.

While this is an extreme example of lead toxicity and ingestion, this case of an otherwise healthy toddler, who had previously tested with a blood lead level of less than one mcg/dl at his one-year well-child examination, demonstrated dangerously severe lead toxicity within six months. Importantly, he was asymptomatic and did not present with overt neurologic compromise or seizures, as might have been expected at such a high blood lead level.

## DISCUSSION

This case illustrates the importance of specific anticipatory guidance about supervising children who play with a toothbrush, which is a priority in pediatric health care and dental settings.<sup>8</sup> In many pediatric and dental practices, children are provided with free toothbrushes. Caregivers must be advised to supervise children when they play with or use toothbrushes, not only because of potential lead exposure but also because of trauma to the teeth or soft tissues if a child falls with a brush in his mouth. This guidance has been a priority for pediatric dentists<sup>10</sup> and has been advocated in oral health guidelines for young children.<sup>10,11</sup> Even when there are no ongoing home renovation or painting projects, if toothbrushes are used inappropriately (e.g., rubbed along dust-entrained floors or windowsills), the result may be inadvertent and potentially dangerous lead exposure for young children.

Lead exposure remains all too common. It was used for many years in paint, gasoline, building materials, pipes, cosmetics, ceramic dishware, spices and a host of industrial uses. The potential detrimental effects of lead exposure are manifold, particularly for young children whose brains are developing especially quickly in the first three years of life. During this crucial period of brain development, exposure to lead can lead to a permanent loss of IQ, difficulty maintaining attention, hyperactivity and emotional lability, especially if the exposure occurs over an extended period of time. These effects persist and often result in difficulty learning and later poor school performance, and have been associated with increased likelihood of conduct disorders, teens dropping out of school, and subsequent involvement with the criminal justice system.<sup>7</sup>

Lead is often stored in the bones and soft tissues of the body from which it can be slowly released back into the bloodstream over time.<sup>12</sup> It can also accumulate in teeth.<sup>13,14</sup> Pregnant and post-menopausal women who

had lead exposure early in life are potentially at risk of having lead released from their bones into their bloodstream in response to inadequate dietary calcium intake.<sup>15,16</sup> Individuals with persistent exposure to lead may have characteristic lead lines noted on their gums or on radiographs of their long bones.<sup>12,14</sup> While children usually are exposed to lead toxicity by direct hand-to-mouth behavior, this case demonstrates an opportunity for dental professionals to emphasize appropriate and supervised toothbrush usage for young children.

## ACKNOWLEDGEMENTS

This work was supported by the New York State Children's Environmental Health Center of Excellence. Grants Gateway ID: DOH01-CEHCE1-2017.

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