
LEAD POISONING PREVENTION & TREATMENT UPDATES

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Welcome

The newsletter will provide you with information from the current research literature and updates on available resources related to lead poisoning prevention. With your help we will strive to reach the goal of eliminating lead as an environmental hazard by 2010. This quarterly newsletter is a collaborative effort between the Virginia Department of Health's Lead-Safe Virginia Program and the University of Virginia's Virginia Children Division of Medical Toxicology.

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PHONE NUMBERS TO KNOW

- **Lead-Safe Virginia, Virginia Department of Health**
(877) 668-7987
- **Healthcare Lead Emergency Hotline**
(866) SOS-LEAD

RETAINED LEAD BULLETS AND LEAD POISONING

Case:

A 14 year-old girl suffered a shotgun blast to the face at close range. She survived multiple penetrating injuries to her head, neck, and thorax. Computerized topography of her head and neck revealed over 100 retained lead shotgun pellets (See images page 3). Three pellets were intracranial and in direct contact with her cerebral spinal fluid (CSF), with the remaining pellets retained within the subcutaneous tissue. Thirty days after her injury, a venous blood lead level (BLL) was 47 µg/dL and confirmed with a second venous BLL one week later. No other potential source of lead toxicity was found. Surgical removal of the intracranial pellets was considered, but due to the pellets location, the potential surgery complication risk was determined to be too high.

See images on page 3.

Discussion

Lead poisoning from retained lead foreign bodies has been commonly reported within the medical literature. The pathophysiology of lead absorption from retained bullets has not been clearly delineated. Many factors contribute to increased lead levels from retained bullets. Bullet fragmentation increases the surface area for lead absorption and has been reported to increase blood lead levels by 25.6%. The location of the lead foreign body also determines the amount of lead that will be absorbed. Bullets in contact with bony fractures and within synovial fluid, pleural fluid, and cerebrospinal fluid have all been associated with elevated absorption rates and lead toxicity.

Recommended surveillance for patients with known retained bullet fragments is based on the above-mentioned high-risk characteristics. Removal of bullet fragments status post gunshot wounds is an area of

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ONLINE LEAD EDUCATION

New! Education in lead poisoning topics for health care professionals.

Current courses:

- Lead Pathophysiology
- Sources of Lead Poisoning

More courses to follow. <http://www.leadpoison.org>

RESOURCES

Download copies of the *Guidelines for Childhood Lead Poisoning Screening in Virginia*:

http://www.vahealth.org/leadsafe/Rev_Screening_04.pdf

Lead-Safe Virginia Program

<http://www.vahealth.org/leadsafe/>

CDC Spotlights on Lead

<http://www.cdc.gov/nceh/lead/>

U. S. Consumer Product Safety Commission

www.cpsc.gov

EPA Lead Page

www.epa.gov/opptintr/lead/index.html

HUD Office of Lead Hazard Control

www.hud.gov/offices/lead

Children's Environmental Health

<http://www.niehs.nih.gov/oc/factsheets/ceh/home.htm>

National Lead Information Center

<http://www.nsc.org/ehc/lead.htm>

National Center for Lead Safe Housing

<http://www.cehn.org/cehn/resourceguide/nclsh.html>

DEVELOPED BY THE VIRGINIA DEPARTMENT OF HEALTH STATEWIDE SCREENING PLAN WORK GROUP, FOLLOWING CDC GUIDELINES AND VIRGINIA REGULATIONS.

FUNDED BY THE CENTERS FOR DISEASE CONTROL AND PREVENTION AND THE VIRGINIA DEPARTMENT OF HEALTH, LEAD-SAFE VIRGINIA PROGRAM.



controversy. Consultation with a toxicologist and surgeon should be considered to determine the benefit/risk ratio. All children with retained bullet fragments should be considered candidates for routine serum lead levels at the time of initial evaluation, at monthly intervals up to 3 months, 1 year post-injury, and yearly thereafter.

In symptomatic patients with retained bullet fragments, definitive treatment involves the removal of the lead fragments. Whether to perform this removal before or after the initiation of chelation therapy is not well defined. Systemic toxicity after surgery without the initiation of chelation therapy has been reported. Parenteral administration of calcium disodium ethylenediaminetetraacetate (EDTA) has been associated with the redistribution of lead from soft tissue to brain, increasing the risk of encephalopathy in patients with continued lead absorption and high body burdens of lead. Dimercaprol (BAL, British Anti-Lewisite) is an excellent chelator, but is only available as an intramuscularly injection and is associated with marked patient discomfort and a number of potential adverse drug events. Succimer (2,3-dimercaptosuccinic acid, DMSA) can be given orally, does not appear to cause redistribution from tissues to the brain, and has a much lower adverse-effect profile when compared with dimercaprol. Previous reports have demonstrated successful chelation with oral succimer before surgical removal of retained bullet fragments.

Case (continued)

The patient was started on oral succimer for a standard 19-day course. Her BLL 13 days following the completion of the initial course of chelation was 3 µg/dL. She was subsequently lost to follow-up for greater than 5 years. A venous BLL was drawn 5 years and 5 months after the last recorded BLL and was 10 µg/dL. She has no findings associated with lead toxicity on examination or by laboratory test.

Recommended further reading

1. Meggs WJ, Gerr F, Aly MH, et al. The treatment of lead poisoning from gunshot wounds with succimer (DMSA). *J Clin Toxicol.* 1994; 32: 377-385.
2. McQuirter JL, Rothenberg SJ, Dinkins GA, Kondrashov V, Manalo M, Todd AC. Change in blood lead concentration up to 1 year after a gunshot wound with a retained bullet. *Am J*

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Epidemiol. 2004; 159: 683-692.

3. John BE, Boatright D. Lead toxicity from gunshot wound. *South Med J.* 1999; 92: 223-224.
4. McQuirter JL, Rothenberg SJ, Dinkins GA, Manalo M, Kondrashov V, Todd AC. The effects of retained lead bullets on body lead burden. *J Trauma.* 2001; 50: 892-899.
5. Farrell SE, Vandevander P, Schoffstall JM, Lee DC. Blood lead levels in emergency department patients with retained lead bullets and shrapnel. *Acad. Emerg. Med.* 1999; 6: 208-212.
6. American Academy of Pediatrics, Committee on Drugs. Treatment guidelines for lead exposure in children. *Pediatrics.* 1995; 96: 155-160.
7. Cory-Slechta Da, Weiss B, Cox C. Mobilization and redistribution of lead over the course of calcium disodium ethylenediamine tetraacetate chelation therapy. *J Pharmacol Exp Ther.* 1987; 243: 804-813
8. Bolanos AA, Demizio JP Jr, Vigorita VJ, Bryk E. Lead poisoning from an intra-articular shotgun pellet in the knee treated with arthroscopic extraction and chelation therapy: a case report. *J Bone Joint Surg.* 1996; 78: 422-426
9. Coon T, Miller M, Shirazi F, Sullivan J. Lead toxicity in a 14-year-old female with retained bullet fragments. *Pediatrics.* 2006 Jan; 117(1): 227-330.

For sharper images, contact Kristin Wenger at 434-982-4386 or klw2s@virginia.edu to have this newsletter sent via email.

