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Case Report

Perianal Mercury Deposition from a Broken Thermometer in a Small Child

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Abstract Deposition of mercury in the intraperitoneal and extraperitoneal compartments from a broken thermometer is quite rare. Neither the outcome nor the management for such a situation is certain. We report here a case in a 28-month-old boy who was exposed to elemental mercury from a broken mercury thermometer. Radiographic imaging data showed the mercury was scattered in the intraperitoneal and extraperitoneal pelvic cavity. Laparoscopic surgical procedure was performed, but it failed to remove the mercury deposits. Fortunately, clinical follow-up at 3+ years did not reveal any clinical or biochemical features of mercury toxicity.

Key words Child; Elemental mercury; Laparoscopy; Thermometer

Introduction

There are a few risks when mercury thermometers are used rectally to measure core body temperature. These risks not only include possible perforation.[1] but also mercury exposure.[2] Nowadays most paediatric hospitals have replaced mercury thermometers with the use of digital thermometers. Moreover, western centres have even discontinued the use of mercury manometers for measuring blood pressure, although the digital measurements are notorious for being accurate. However, traditional mercury thermometers are still widely used at home, especially in China. In this article, we present and discuss an unusual paediatric case of intraperitoneal and extraperitoneal exposure to elemental mercury from a broken thermometer. We describe the treatment process and the results of long-term follow-up in detail, which have not been reported in the English medical literature yet.

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Case Presentation

A 28-month-old boy was admitted to our hospital because of a broken mercury thermometer. The patient showed no obvious signs and symptoms. Blood biochemical features were normal. Abdominal radiograph revealed the existence of a foreign body, which like the bulb of a thermometer, as well as multiple small radiopaque densities scattered in the small pelvis (Figure 1a). Computed tomography (CT) scan, on the fourth day, suggested the possibility that the mercury particles were outside the lumen of the bowel and some of them were inside the abdomen (Figure 1b). Surgical intervention was performed on the 11th day after injury. Laparoscopy revealed no traumatic change in the wall of rectum and the sigmoid colon. During the operation we were unable to remove the mercury deposits since we were unable to locate the mercury or the glass fragments, pertaining to the thermometer, within the intraperitoneal cavity. The child remained stable throughout the operation, and was ultimately discharged three days later.

One month after the injury an abdominal radiography showed persistence presence of mercury. The serum mercury was 4.8 µg/L (ref <10 µg/L) and corresponding random urine mercury was 3.6 µg/L. The child did not receive chelation therapy before or after the operation. Further abdominal radiography performed on two separate dates, six months and eleven months after the injury, also showed similar findings. Magnetic resonance examination of the brain was normal eleven month after the injury. One year after the injury, the serum mercury concentration increased to 6.5 µg/L. Two years after the injury, the serum mercury level was 8.3 µg/L, while three years after injury, the serum mercury concentration decreased to 7.8 µg/L. Fortunately, clinical follow-up at 3+ years did not reveal any clinical or biochemical features of mercury toxicity.

Discussion

Rectal thermometers have been used for recording temperature in infants and small children for many years, especially in the developing country. Although it is uncommon, there is still a risk of perforating the rectum if thermometers are broken.

When perforation occurs, some elemental mercury from a broken thermometer may quickly be excreted outside of the body. However, some elemental mercury may penetrate the rectal wall into the intraperitoneal and extraperitoneal cavity. Small amount of ingested mercury may be harmless, because it is not readily absorbed,[3] mercury that remains in the body for a long period time can be harmful. Firstly, Mercury contamination of the peritoneum has been associated with granuloma formation and intestinal obstruction.[3] Secondly, systemic toxicity following peritoneal contamination with mercury and methylmercury, methylated by gut flora, may occur.[4] Mercury is toxic not only to central nervous system, but also to peripheral nerves and kidneys.[5]

We observed the persistent presence of mercury on consecutive abdominal plain films and CT scan, which was why we consequently performed laparoscopy. Unfortunately, we could not find that the mercury was free in the intraperitoneal cavity during the operation. C-arm fluoroscopy during the operation showed some mercury were located in the extraperitoneal pelvic cavity (mainly in the rectovesical pouch) and others were wrapped in the intraperitoneal cavity. It has been reported that the majority of mercury deposits can be removed by incising the peritoneal reflection in the rectovesical pouch.[1] However, considering that we had no experience to perform this surgical maneuver, we decided to end the operation.

The remaining mercury still posed the potential risks of chronic absorption. In some cases, the mercury became encapsulated in fibrous tissue and didn't induce systemic toxicity.[6-8] Luckily, the serum mercury and corresponding random urine mercury of this child was measured to be in the normal range, probably due to the small amount of retained mercury. The position of mercury had been relatively fixed on postoperative abdominal plain films. Fortunately, clinical follow-up at 3+ years did not reveal any clinical or biochemical features of mercury toxicity.

This is the first report in the English medical literature

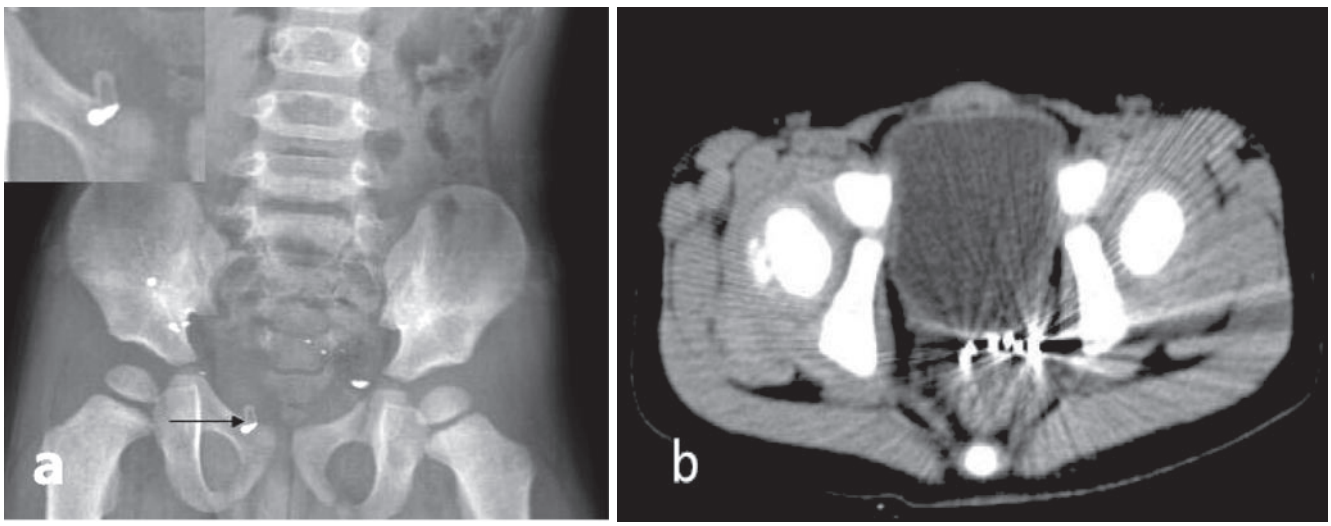

Figure 1 (a) Radiography on the 1st day. (b) CT scan on the 4th day.

concerning the treatment process and the results of long-term follow-up for intraperitoneal and extraperitoneal elemental mercury exposure from a broken thermometer. From this, some problems are still to be addressed which hadn't been descrided in detail in the previous literature. Firstly, whether it's necessary for digital rectal examination to be used in early stage. Inappropriate digital rectal examination may lead to injury of rectal mucosa and rectal perforation. Secondly, whether it is necessary for colonoscopy to be used. Colonoscopy maybe helpful when observing traumatic changes to the mucosa of the rectum and the sigmoid colon, but it also can induce damage to the mucosa. Furthermore, and the most important issue to address, whether or not surgical intervention is appropriate? It should be noted that it is difficult to remove mercury completely, even when performing open surgery.[9] When and how to perform the operation is also a problem. If the first operation is a failure, whether the second operation is necessary when the position of mercury had been relatively fixed on abdominal plain films. Finally, the significance of using chelation therapy. Chelation therapy with dimercaptosuccinate has been used to treat patients with peritoneal mercury exposure, but with limited success rate because of residual mercury deposits.[5] If blood mercury levels exceed 10 μg/L or urinary mercury levels exceed 50 μg/L, active chelation therapy will be administered.[10]

Conclusion

Intraperitoneal and extraperitoneal elemental mercury exposure from a broken thermometer is a rare but challenging situation to manage. A complete removal by surgical intervention is difficult and nearly impossible, therefore we should carefully balance the advantages against disadvantages of surgery. The standard therapeutic protocol can only be determined by long-term follow-up and symptomatic treatment.

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Conflict of Interest

We declare that we have no conflicts of interest.

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