Whether inserted, ingested or implanted, batteries are a matter of life and death

February 22 2024, by Adam Taylor

Credit: Pixabay/CC0 Public Domain

If you've heard about the case of the Australian man who needed emergency removal of the three "button" batteries he'd inserted into his urethra, then it's likely your eyes will still be watering. According to the

case report, ten days later, he required follow-up surgery for penile tissue necrosis caused by the battery burns.

The urethra is the tube through which urine is expelled from the body. It is typically 4.5cm long and 7.5mm wide in females and averages up to 22cm in length and 8-9mm wide in males.

The presence of foreign bodies, particularly batteries, in the urethra is not new. There are cases where larger AA and AAA batteries have been removed, as well as other objects such as electrical wire, pencils and medical instruments.

There is a higher incidence of men inserting foreign bodies into cavities compared to women. But objects such as vibrators and sex toys four times the width and twice the length of the female urethra have been found in the bladder.

Insertion of foreign bodies and catheters into the urethra can result in damage, which causes longer term issues such as scar tissue. Scar tissue narrows the tube, makes it difficult to urinate, increases infections—and objects can travel up to the bladder, causing it to rupture.

Small and sweet-like: Button batteries appeal to curious kids

The most common button battery injuries, however, are related to ingestion rather than insertion.

Button batteries are notoriously attractive to children. They're small—only 5-25mm in diameter—round, shiny and can be easily mistaken for a sweet. Button batteries account for the vast majority of battery ingestion incidents in the US but it's a worldwide problem.

The signs of button battery ingestion can be difficult to recognize until it's too late. Ingestion causes non-specific symptoms, including coughing, fever, difficulty swallowing and vomiting. All of which can be easily mistaken for common childhood illnesses if the ingestion is not witnessed by anyone.

Once swallowed, these batteries, especially those that are 20mm or greater in width, often become lodged in the esophagus where it narrows. Within two hours the batteries can begin to cause irreparable damage.

Moist body tissues cause the battery to "complete" a circuit between the positive and negative poles, producing sodium (or potassium) hydroxide at the negative pole, making pH locally 12-13. This alkaline substance is highly corrosive and burns the oesophageal lining before continuing deeper.

Burns can occur in 15 minutes to an hour, passing through to neighboring tissues in as little as four hours. The more charge left in the battery, the quicker this occurs.

Erosion of tissues can progress to neighboring structures at the natural narrow points of the esophagus. Batteries lodged at any of these sites—including the opening of the esophagus, the point where the esophagus crosses the aorta (the main artery of the body), the left main bronchus (the tube taking air to the left lung) and where the esophagus enters the stomach—will cause burning and paralysis of the vocal cords, huge blood loss and potentially death.

Alternatively a tunnel can burn through to the trachea, creating a tracheoesophageal fistula that results in respiratory distress and feeding difficulties. Similar issues can occur when batteries are inserted into the nasal cavity, and cause burning, bleeding, discharge and tissue damage.

Batteries that make it to the stomach pose less risk—unless they are stuck there for 48 hours or more. After this time, stomach acid may begin to corrode parts of the battery causing the caustic contents to leak and lead to internal burning. The more batteries are ingested, the higher the risk of becoming stuck in the stomach.

When they end up where they shouldn't, batteries in the body can be agonizing—and even deadly—but there are other instances where the presence of batteries in the body is a necessity.

Not all batteries are health hazards

It's over 75 years since the installation of the first implantable cardiac pacemaker in a patient. Its nickel-cadmium batteries required charging once a week for 12 hours. Over time, pacemakers have advanced to lithium-iodide batteries, which have lifespans of six to ten years.

Self-charging pacemakers may not be too far away, converting the electrical energy of heartbeat back into stored energy for the pacemaker. These pacemakers utilize a very small amount of energy to maintain the rhythm of the heartbeat.

Those with severe issues may need an implanted cardioverter defibrillator (ICD), which delivers a much larger energy output to ensure hearts with serious irregularities don't suddenly stop.

Implantable devices such as pacemakers, ICDs, bone growth stimulators for fracture repair and neurostimulators for chronic pain use a variety of lithium-based batteries. Many of these devices have batteries located at the surface, beneath the skin, with insulated wires running to the organ they control or support. This enables performance monitoring, reduces potential for tissue damage and allows batteries to be changed easily.

The major exception is ingestible devices, such as endoscopy pill cameras which use a silver-based battery system for the camera. Unlike lithium batteries, the silver battery based system is not prone to an explosive chain reaction known as thermal runaway. This is important, given that the camera pills are swallowed and pass all the way through the gastrointestinal system.

All implantable device batteries are stringently tested and regulated by government agencies. So problems are connected to battery depletion, which means they don't last as long as hoped, rather than tissue damage.

The biggest risk from the batteries of these implanted devices actually comes after death: they can explode if not removed from a body prior to cremation. The elements in the battery form a gas, which reacts at sustained high temperatures to blow apart the battery casing, immediately discharging all of the battery's energy.

Batteries used in approved devices offer quality of life to millions around the world, but batteries in places they shouldn't risk serious injury and death.

Provided by The Conversation