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Health

Medical Mystery: Why was toddler left paralyzed by routine injection?

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An injection had a rare and tragic outcome.

by **Mark E. Bruley**, For the Inquirer

A 14-month-old boy developed a fever and swollen neck glands after a family outing. His parents took him to a hospital, where he was diagnosed with infection of a thyroglossal duct cyst located in the front of the neck. This is a rare cyst that forms from thyroid gland tissue left over from when the child was a developing embryo.

The tot's doctor prescribed 600,000 units of penicillin. The antibiotic came in a popular brand of a prefilled cartridge used with a reusable syringe.

As the father looked on, a nurse injected the penicillin into the toddler's right buttock. Moments later, the skin on the child's legs appeared pale and mottled. An allergic reaction to the antibiotic was suspected, so the toddler was given medications to counteract it.

Several hours later, the parents noticed that their son's legs were not moving as they typically did when he cried.

Tests administered over several days led to the conclusion that the boy was paralyzed in both legs.

But why? It turned out the boy was not allergic to penicillin, so doctors next suspected there might be a tumor pressing against the nerves controlling the child's legs. Yet in the operating room, no tumor was found.

The surgery did, however, reveal the cause of the paralysis: An artery was blocked, keeping blood from getting to the nerves serving the lower spine. His paralysis would be permanent.

How could a simple penicillin injection lead to such devastating consequences?

Solution:

The penicillin the child received was a white viscous solution, about as thick as common household white glue and intended to be given only in a muscle. In this case, the prefilled drug cartridge with the preattached, 1¼-inch-long needle was accidentally injected into a major artery in the small patient's buttock.

If injected into an artery, this thick drug will permanently clog blood flow. Plus, the pressure of the injection can cause the penicillin to flow "upstream," in turn clogging arteries of the lower spine that control other parts of the body.

Worse, as in this child's highly unusual case, such blockage can cause transverse myelitis — inflammation of the spinal cord — leading to paralysis.

But children and adults often get injections. Why are such complications so rare?

ECRI
Years after the original investigation, Mark E. Bruley of ECRI re-created how he discovered a design flaw in the product used to give the toddler penicillin.

For intra-muscular injections, clinicians typically pull back slightly on the syringe plunger after inserting the needle in the patient, as was done for this injection. If the needle tip is accidentally in a vessel, blood will be seen in the medication, and the clinician will know to pull out the needle and insert it elsewhere.

The child's nurse followed that procedure, but said she did not see blood in the medication cartridge when pulling the plunger back.

But the boy's father stated in legal proceedings that he did see blood in the white medication on the side of the drug cartridge facing him. Of course, he did not realize what it could mean.

Well before this incident in the 1980s, the clinical recommendation was that infants and small children should never receive such injections in the buttocks, due to rare clinical reports of transverse myelitis. Giving the injection in the thigh and, where possible, using a shorter needle was determined to be safer.

Unfortunately, that recommendation was not practiced on this child. Still, plenty of children have had penicillin injected as this boy did without a problem. So, what went wrong?

During ECRI Institute's investigation into this case, injection simulations were performed, using human blood in a simulated vessel pressurized to mimic arterial pressure.

We found that between the thickness and opacity of the penicillin, and the design of the cartridge and needle, there was a 1-in-5 chance that medical staff would not see blood if the needle tip went into a vessel.

But even though it couldn't be seen, it was there. The blood either formed a bubble inside the white medication that couldn't be seen, or just a small amount appeared on the side of the cartridge, where the clinician could not see it.

Because of this little boy's tragic case and the subsequent investigation, the manufacturer changed the design of the cartridges and needles to ensure that any blood would always be easy for clinicians to see.

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