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Accidental intrathecal mercury application

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Abstract The authors present a case of accidental intrathecal mercury application. A 69-year-old white woman was admitted to our department with suspected meningitis following surgery for spinal stenosis at another hospital. Postoperatively, she had developed a cerebro-spinal fluid (CSF) fistula with a subcutaneous cavity. Local wound irritation had been suspected and, unfortunately, mercury-containing disinfectant was injected into the cavity. Within 24 h the patient demonstrated acute neurological deterioration due to meningitis and encephalitis and was admitted to our clinic with suspected meningitis due to postoperative CSF fistula. Lumbar puncture revealed disinfectant-stained, non-bloody CSF, while lumbar MRI demonstrated the large lumbar subcutaneous cavity. Additionally, CSF fistula was visualized on

MRI. Laboratory examination revealed extremely high mercury levels in CSF, blood and urine. Treatment consisted in insertion of a lumbar drainage to wash out the mercury. The patient underwent medical detoxication using chelating agents (DMPS: RS-2,3-dimercapto-1-propan-sulfonacid, DMSA: meso-2,3-dimercaptosuccinacid). Surgery was performed in order to close the cavity and the fistula. Postoperatively, the patient was admitted to the intensive care unit and remained intubated for 3 days. Within 4 weeks after surgery, she demonstrated good recovery. Eighteen months after intoxication, polyneuropathy and slight neuropsychological deficiencies were detectable.

Keywords Mercury · CSF fistula · Arachnoiditis · Meningitis

Introduction

Many substances have been injected into the cerebro-spinal fluid (CSF), mostly for diagnostic and therapeutic reasons [8]. This is the first report of an intrathecal mercury application.

Case report

History

A 69-year-old white woman was admitted to our department with suspected meningitis following surgery at another hospital. She had originally presented to that hospital with complaints of claudi-

catio spinalis. There, she had undergone decompressive surgery from L2 to S1. Intraoperatively, a spinal dural injury was closed by suture and covered by a piece of muscle. During the postoperative course, a subcutaneous fluctuating swelling had appeared adjacent to the wound. This had been interpreted as local wound irritation. At first, it was punctured twice with clear fluid detection. After persistence over 3 weeks, puncture was again performed, and 5 ml of mercury-containing Mercurochrome disinfectant was instilled into the cavity. The patient initially reported local pain, which was treated by analgesics. After having been discharged home, the patient developed impairment of consciousness, severe nuchal rigidity and focal neurological deficits (aphasia and facial weakness on the left side) within 24 h. She was admitted to our hospital with the suspected diagnosis of postoperative meningitis resulting from CSF fistula. Additionally, she was known to suffer from diabetes and hypertension.

Examination

On admission to our department, the patient was restless and did not respond adequately to questions. Her pupils were equal and round, but reaction to light was delayed. A subcutaneous swelling was palpable from the lower thoracic spine to the sacrum without evidence of local wound irritation. The body temperature was 39.7°C, blood examination revealed an increased white blood count of 15/nl (normal: 4–8/nl), C-reactive protein was elevated, at 109 mg/l (normal: <3 mg/l).

Cranial computed tomography (CT) demonstrated air bubbles in both lateral ventricles, whereas the brain parenchyma appeared normal. Lumbar puncture revealed red-colored but non-bloody CSF, consistent with the color of Mercurochrome. On further laboratory examinations, mercury was detected in extremely high levels in CSF, blood and urine. Results are demonstrated in Table 1. Fluid-attenuated inversion recovery MRI demonstrated hyperintensity of the cortical layers suspicious for encephalitis (see Fig. 1).

Table 1 Laboratory results on the 3rd, 8th and 19th day after intrathecal application of 26 mg mercury. (Reference values for CSF-mercury concentration are not available)

Laboratory results	3rd day	8th day	19th day	Reference
CSF (intradural)				
Cells (1/3)	1280		48	≤12/3
Protein (mg/l)	7305		3085	≤500
Mercury (μg/l)	2100	220	51	
Blood				
WBC (per nl)	15.0	8.6	5.9	4.0–8.0
CRP (mg/l)	109	18	8.0	<3.01
Mercury (μg/l)	290	21	8.5	<2.0
Urine				
Mercury (μg/l)	5000	160	57	<1.4

Fig. 1 Fluid attenuated inversion recovery magnetic resonance imaging (MRI) of the brain: hyperintense signal of the brain parenchyma demonstrates encephalitis (arrows)

Fig. 2 T1-weighted MRI of the spine after administration of gadolinium, showing attachment of the terminal filum at the L2/3 level (long arrow) and a subcutaneous cavity spanning L1–L4 (short arrow)

Lumbar MRI revealed attachment of the terminal filum to the dural sac at the L2/3 level and a large subcutaneous cavity spanning L1–L5 (see Fig. 2). Gadolinium-enhanced MRI revealed signs of arachnoiditis.

Operation

We inserted a lumbar drainage and began parenteral medical detoxication with DMPS (RS-2,3-dimercapto-1-propansulfonacid). After MR imaging, we performed surgery for closure of the cavity and fistula. We found a large, 1.5- to 6-cm subcutaneous and subfascial cystic cavity filled with Mercurochrome-containing CSF. The mercury concentration in this cavity was even higher than the concentration in lumbar CSF. A fistula was identified at the L2/3 level. Here, CSF pulsations were present, but CSF flow could not be provoked by elevation of the central venous pressure. The cystic cavity as well as the fistula was excised and the leakage point closed meticulously. A lumbar drainage was inserted at the level L3/4 to rinse out the mercury.

Postoperative course

After surgery, the patient was admitted to the intensive care unit. She remained intubated for 3 days because of her decreased level of consciousness. The parenteral application of DMPS (RS-2,3-dimercapto-1-propansulfonacid) was changed to the oral intake of DMSA (meso-2,3-dimercaptosuccinacid) on postoperative day 3. On the 5th postoperative day, she was in an adequate condition to be transferred to the regular neurosurgical ward. After removal of the lumbar drainage on postoperative day 10, we performed regular lumbar puncture. During the following 20 days, the patient underwent intense physiotherapy and made a good recovery. Finally, neurological examination revealed slight (grade 4 of 5) palsy of foot dorsiflexion of both feet, whereas sensation was normal. Elec-

troneurography and electroencephalography demonstrated general involvement of peripheral nerves (including motor and sensation fibers) as well as slight impairment of brain function. Later she developed a pancytopenia, for which DMSA application had to be discontinued. The blood count came back to normal within a few days, but the patient developed a deep vein thrombosis, which was also treated successfully. Finally, she was discharged after 7 weeks of in-patient treatment. During treatment, there were no signs of liver, lung or renal failure.

Eighteen months after intoxication, neurological examination revealed a senso-motor polyneuropathy with ataxia. Neuropsychological testing demonstrated impairment of memory, but otherwise good general cognitive function.

Discussion

Mercury-induced brain lesions have been described in detail in studies on Minamata disease, caused by ingestion of mercury-containing fish [3, 4]. Cinca described cases of oral intake of mercury-containing meat. In these patients, not only brain lesions were described, but also impairment of spinal motor neurons and peripheral nerve function [2]. Maynou and Ramdial reported cases of subcutaneous mercury application with only local irritation [6, 7]. Even in a case of suicidal intravenous mercury injection, no alteration of CNS, liver or renal function has been noted [1]. In contrast, in a case of iatrogenic mercury application to the peritoneum during abdominal surgery, the patient died after 40 days. In that case, high blood levels of mercury were found [5].

We report the first description of accidental iatrogenic intrathecal mercury application leading to severe encephalopathy and meningitis within 24 h. Although this condition is extraordinarily rare, it is possible that such a mistake could be made again in the future, given the widespread use of Mercurochrome.

In the present case, the patient received 5 mg Mercurochrome, equivalent to 26 mg mercury, via a CSF fistula. Clinical and technical findings revealed involvement of the brain as well as impairment of peripheral nerves including motor and sensation fibers. CT scan demonstrated air bubbles in both lateral ventricles, and CSF fistula was therefore suspected. MRI of the brain and lumbar spine revealed signs of encephalitis and meningitis. Laboratory examinations documented extremely high levels of mercury in CSF, blood and urine. Neurosurgical therapy consisted of local wound revision, insertion of a lumbar drainage to wash out the mercury and intensive care treatment including mechanical ventilation. Medical detoxication was applied by using chelating agents such as RS-2,3-dimercapto-1-propan-sulfonacid and meso-2,3-dimercaptosuccinacid. The patient recovered well within 4 weeks after exposure, though the postoperative course was complicated. Eighteen months after administration, examination revealed polyneuropathy and slight impairment of cognitive function. Obviously, mercury is resorbed in high levels via the meninges, whereas it may not be resorbed after subcutaneous administration. Systemic intoxication by oral or peritoneal application has also been described [3, 4, 5, 6, 7].

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