A Proposed Management of Accidental Intrathecal Injection of a Wrong Drug: Spinal Washing

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ABSTRACT

The inadvertent intrathecal administration of drugs and other substances can result in devastating neurological consequences. We searched PubMed Register Case reports (1966 to September 2013), and reference lists of the studies included. The outcome of intrathecal administration of a wrong drug in these case reports varies from transient neurologic symptoms to permanent neurologic damage and death. In these catastrophic situations, if spinal lavage was applied, a better outcome was reported. A logical first step would be to remove cerebro-spinal-fluid as quickly as possible, and consider replacing the fluid with (preservative-free) saline.

KEYWORDS: Accidental injection, Intrathecal injection, Spinal.

INTRODUCTION

Accidental intrathecal injection is a catastrophic event that when it happens, the anesthesiologist have to manage it. Unfortunately no unique clinical guideline for management of this event was proposed.

Ajmal reported a case of accidental intrathecal injection of aminophylline. The patient remained paraplegic and died 2 years later (1). The outcome from similar medical error varies from transient neurologic symptoms to permanent neurologic damage and death. (1-2-3)

METHODS

The search strategies used via PubMed. We used the terms inadvertent intrathecal injection and accidental intrathecal injection (1966 to September 2013), and reference lists of the studies included. The adverse effects and the treatment protocol were evaluated.

RESULTS

We retrieved 48 case reports, some of them have no new comment, so 41 articles were selected. The adverse effects and the treatment protocol (using spinal lavage or not was summarized in table 1. We found reports from intrathecal injection of wrong drug such as tranexamic acid (3), atracurium (4-5), gallamine (6), pancuronium (7), vincristin (8-9), vindesine (10-11), magnesium sulfate (12), potassium chloride (13-14-15), chlorhexidine (16), Hypaque (17), meglumine diatrizoate (18), cefazolin (19), bortezomib (20), Ioxaglate (21), gadolinium (22), PEG-asparaginase (23), labetalol (24), bleomycin (25), tramadol (26), rifampicin (27), daunorubicin (28), doxorubicin (29), mercury containing fluids (30) and high dose of some authorized drug such as morphine (31-32-33), baclofen (34) and methotrexate (35).

A case of inadvertent intrathecal injection of dopamine who leads to over one mouth paraplegia of the patient was also seen, but not reported, no episode of hypertension was noted in this patient.

Both hypotention and hypertention after intrathecal injection of a wrong drug were reported. Salihoglu et al. after accidental subarachnoid injection of atracurium reported an episode of reduction in blood pressure.(4) The authors thought that the histamine release due to atracurium injection was the cause of this situation, but we think that this situation is due to a transient sympathetic block due to a change in neurons activity.

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After inadvertent intrathecal injection of some drugs such as potassium chloride an episode of hypertension was seen. The potentiating of the depolarisation of sympathetic neurons by potassium is thought to be the cause. (36).

Table 1:

<table>
<thead>
<tr>
<th>Agent injected</th>
<th>reference No</th>
<th>Spinal lavage</th>
<th>Adverse effect</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aminophylline</td>
<td>1</td>
<td>no</td>
<td>tetanic and spasm</td>
<td>yes</td>
</tr>
<tr>
<td>Tranexamic acid</td>
<td>2</td>
<td>no</td>
<td>Seizure</td>
<td>no</td>
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<td>Tranexamic acid</td>
<td>3</td>
<td>no</td>
<td>death</td>
<td>yes</td>
</tr>
<tr>
<td>Atracurium</td>
<td>4</td>
<td>no</td>
<td>muscle hypotonia</td>
<td>no</td>
</tr>
<tr>
<td>Atracurium</td>
<td>5</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Gallamine</td>
<td>6</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Vincristine</td>
<td>8</td>
<td>yes</td>
<td>paraplegia</td>
<td>no</td>
</tr>
<tr>
<td>Vinesine</td>
<td>9</td>
<td>yes</td>
<td>paraplegia</td>
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<tr>
<td>Magnesium sulfate</td>
<td>11</td>
<td>yes</td>
<td>Neurologic failure</td>
<td>yes</td>
</tr>
<tr>
<td>KCl</td>
<td>12</td>
<td>no</td>
<td>loss of consciousness</td>
<td>no</td>
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<td>KCl</td>
<td>36</td>
<td>yes</td>
<td>pulmonary oedema</td>
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<td>KCl</td>
<td>14</td>
<td>no</td>
<td>cramps</td>
<td>yes</td>
</tr>
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<td>Chlorhexidine</td>
<td>16</td>
<td>no</td>
<td>hydrocephalus</td>
<td>no</td>
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<tr>
<td>Hyapque</td>
<td>17</td>
<td>no</td>
<td>rhabdomyolysis</td>
<td>no</td>
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<tr>
<td>Meeglumine Diatrizoate</td>
<td>18</td>
<td>no</td>
<td>brain edema</td>
<td>yes</td>
</tr>
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<td>Cefazolin</td>
<td>19</td>
<td>no</td>
<td>seizure</td>
<td>no</td>
</tr>
<tr>
<td>Bortezomib</td>
<td>20</td>
<td>No</td>
<td>death</td>
<td>yes</td>
</tr>
<tr>
<td>Contrast medium</td>
<td>21</td>
<td>no</td>
<td>respiratory distress</td>
<td>no</td>
</tr>
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<td>Gadolinium</td>
<td>22</td>
<td>no</td>
<td>seizures</td>
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<tr>
<td>Bleomycin</td>
<td>25</td>
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<td>Tramadol</td>
<td>26</td>
<td>no</td>
<td>myoclonus</td>
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<td>Rifampicin</td>
<td>27</td>
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<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Daunorubicin</td>
<td>28</td>
<td>yes</td>
<td>cerebral atrophy</td>
<td>yes</td>
</tr>
<tr>
<td>Mercury application</td>
<td>30</td>
<td>yes</td>
<td>encephalitis</td>
<td>no</td>
</tr>
</tbody>
</table>

DISCUSSION

After intrathecal injection of a wrong drug, immediate CSF drainage and early irrigation is proposed and good outcomes were reported (8). Kaiser et al. for management of inadvertent intrathecal injection of 5 mg morphine aspirated 50 ml of CSF. After this the patient experienced headache, then 50 ml normal saline was injected for replacement of CSF. (33) So, for non neurotoxic drugs, aspiration with smaller volumes in several times may be preferable.

To avoid a higher spread of the wrong drug, aspiration of CSF must be done first, and then intrathecal infusion of crystalloids must be done. The aspiration of CSF and irrigation with crystalloid is better to do several times. Also it is better to perform the subarachnoid infusion of crystalloids from a higher space and aspiration of CSF from a lower space, to prevent upper spread of drug.

Dias et al. preferred using a 22-gauge needle for the spinal lavage who allows easier cerebrospinal fluid aspiration than a thinner needle. (36) In cases of unintended intrathecal injection of ionic contrast media, most authors emphasize the importance of minimizing the amount of agent reaching the brain by maintaining the patient in a head-up position.(17)

Saline 0.9%, lactated Ringer's solution and Plasma-Lyte have all been used for cerebrospinal fluid lavage, the needle placement can be performed by endoneurosurgery.(36-37- 38-39-40-41)

We must remember that the grade of neurotoxicity of drugs is different, for example the accidental addition of 0.1ml chlorhexidine with local anesthetic was lead to neuronal damage,(16) so the volume that we proposed for spinal lavage is at least 150 ml.

O'Marcaigh et al. performed a ventriculolumbar perfusion with 240 mL of warmed isotonic saline through ventricular and lumbar catheters for 3 hours to remove a high dose of a major overdose of intrathecally administered of methotrexate within 8 hours after administration. They reported a favorable outcome using this procedure and further supportive measures. (35) This method can be used for neurotoxic drugs.

Conclusion

Spinal lavage can lead to a better outcome after intrathecal injection of a wrong drug.
REFERENCES


