Clinical Analysis of Seven Cases of Trichloroethylene Medicamentose-like Dermatitis

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Abstract: To grasp the clinical characteristics, treatment and prognosis of trichloroethylene medicamentose-like dermatitis, seven hospitalized cases were analyzed in detail. The disease has various manifestations, among them, those accompanied by hepatitis or renal diseases are crucial. Adequate dose of corticosteroid hormone in earlier period could effectively control the patient’s condition. Besides paying close attention to changes of the patient’s skin, we should also keep an eye for the changes of the liver and kidneys and their relevant indices, as different patients have different prognoses.

Key words: Trichloroethylene, Medicamentose-like dermatitis, Clinical analysis

Trichloroethylene (TCE) is a frequently used organic solvent, and it is also used as a detergent in cleaning metal surfaces and defatting. In recent years, cases of TCE-induced medicamentose-like dermatitis complicated with liver and renal impairment have been reported in China. From 2005 to 2007, a number of TCE poisoning events have also taken place in Suzhou and seven cases of trichloroethylene medicamentose-like dermatitis were treated at our hospital. The clinical courses and their relevant analysis of these cases are reported as follows.

Clinical Data

General Conditions

Table 1 demonstrates the seven cases discussed in this paper. The ages of the patients—six males and one female—range from 18 to 31, with the average age of 22.3. Most of them use TCE as the detergent to clean metal surface. The incubation period of case is approximately 4–6 wk. Out of the seven cases, exfoliative dermatitis with liver damage—one case, Stevens-Johnson syndrome with liver damage—one case, Stevens-Johnson syndrome with liver damage—one case, erythema multiforme with kidneys damage—one case, erythema multiforme—two cases (one with liver damage).

Features

Table 1 and Table 2 show the basic features of the seven cases:
(1) Initial symptoms: Erythema with pruritus, fever, dizziness, debilitation, and upper abdominal pain.
(2) Common symptoms: Fever, debilitation, poor appetite, and erythema.
(3) Changes of erythema: Primary sites are often hands, forearms, and then lower extremities, cervical part, and gradually all over the body.
(4) Changes in liver: Cases 1, 2, 6 and 7 have hepatomegaly and diffuse inflammation at two or three-finger width under rib cage. One month later, fatty liver occurs and the hepatomegaly shrinks. In about two months’ time, echo of the hepatic region slightly thickens and densifies, fatty liver continues, and the liver is palpable under rib cage. Of the seven cases, five have liver dysfunction.
(5) Changes in kidney: Case 4 has diffuse inflammation over both kidneys, which undergo a slight swelling, enhancement and densification of cortical echo, and renal dysfunction as well.
(6) The count of white blood cell (WBC) in Cases 1, 2, 3, 6 and 7 is more than normal, especially in the initial stage.
Relapse: Case 5 was diagnosed trichloroethylene medicamentose-like dermatitis in the city of Shenzhen 10 years ago, and the disease relapsed three days after being re-exposed to TCE. At that time he was the door-keeper of a factory, and only smelt TCE. He had erythema with pruritus, red rash in arms and legs.

Table 1. Profiles of cases suffering from trichloroethylene medicamentose-like dermatitis

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Month and year of onset</th>
<th>Sex</th>
<th>Age</th>
<th>Health disorder</th>
<th>Job with TCE exposure</th>
<th>Subjective symptoms during work with TCE exposure*</th>
<th>Occurrence of similar disease in colleagues</th>
<th>Relapse due to re-exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dec. 2005</td>
<td>M</td>
<td>18</td>
<td>Exf+L</td>
<td>Cleaning metal parts</td>
<td>Erythema all over the body, dizzy, debilitation, poor appetite (15 d) with fever</td>
<td>(+) No.1 &amp; 2 &amp; 3 were colleagues</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Dec. 2005</td>
<td>M</td>
<td>18</td>
<td>SJS+L</td>
<td>Cleaning metal parts</td>
<td>Dizzy, debilitation, fever, erythema all over the body (10 d)</td>
<td></td>
<td>(+) No.5 &amp; 6 were colleagues</td>
</tr>
<tr>
<td>3</td>
<td>Dec. 2005</td>
<td>M</td>
<td>18</td>
<td>EM+L</td>
<td>Cleaning metal parts</td>
<td>Erythema with pruritus, debilitation (1 wk)</td>
<td></td>
<td>(+) The first onset was 10 yr ago.</td>
</tr>
<tr>
<td>4</td>
<td>May 2006</td>
<td>M</td>
<td>31</td>
<td>EM+K</td>
<td>Cleaning metal parts</td>
<td>Headache, debilitation, upper abdominal pain (17 d); erythema (13 d); oliguria (2 d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Sept. 2007</td>
<td>M</td>
<td>31</td>
<td>EM</td>
<td>Door-keeper</td>
<td>Erythema with pruritus in arms and legs, dizzy, debilitation (1 wk)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Oct. 2007</td>
<td>M</td>
<td>22</td>
<td>SLS+L</td>
<td>Cleaning metal parts</td>
<td>Dizzy, debilitation, poor appetite and fever (6 d); erythema (2 d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Oct. 2007</td>
<td>F</td>
<td>18</td>
<td>SLS+L</td>
<td>Cleaning metal parts</td>
<td>Erythema all over the body, fever, debilitation, poor appetite (10 d)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The days in parenthesis in this column refers to the period from the occurrence of the symptoms to the time of hospitalization.

Table 2. Clinical features of cases suffering from trichloroethylene medicamentose-like dermatitis

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Start of job ~ onset of rash</th>
<th>Skin lesion</th>
<th>Mucosal lesion</th>
<th>Liver disorder</th>
<th>Jaundice: Serum total bilirubin</th>
<th>White blood cell count</th>
<th>Renal damage</th>
<th>Type-B Ultrasonic test</th>
<th>Treatment: Initial dose (mg/qd) of corticosteroid hormones</th>
<th>Liver steatosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4W</td>
<td>Exfoliative dermatitis</td>
<td>Vesicles erupted on the oral mucosa and genitals</td>
<td>(+) GPT1319, GOT426</td>
<td>(+) 354.2</td>
<td>4,700–22,000</td>
<td>(-)</td>
<td>Hepatomegaly diffuse inflammation of liver</td>
<td>240 (+)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6W</td>
<td>Erythema with pruritus gradually all over the body</td>
<td>Conjunctivitis, oral involvement</td>
<td>(+) GPT654, GOT307</td>
<td>(+) 95.2</td>
<td>4,200–21,400</td>
<td>(-)</td>
<td>Hepatomegaly diffuse inflammation of liver</td>
<td>180 (+)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6W</td>
<td>Erythema with pruritus, red rash in arms and legs</td>
<td>(-)</td>
<td>(+) GPT565, GOT130</td>
<td>(+) 18.8</td>
<td>8,400–144,001</td>
<td>(-)</td>
<td>Hepatomegaly diffuse inflammation of liver</td>
<td>80 (-)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4W</td>
<td>Erythema with pruritus, red rash in arms and legs</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
<td>Normal</td>
<td>(+) BUN 23.2, Scr 426.4, Uric acid 660.2</td>
<td>Diffuse inflammation and slight accretion of both kidneys</td>
<td>160 (-)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3D</td>
<td>Erythema with pruritus red rash in arms and legs</td>
<td>(-)</td>
<td>(-)</td>
<td>(+) 20.3</td>
<td>Normal</td>
<td>(-)</td>
<td>Chronic liver lesion, fatty liver</td>
<td>80 (+)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4W</td>
<td>Erythema with pruritus gradually all over the body</td>
<td>Conjunctivitis, oral involvement</td>
<td>(+) GPT1457, GOT300</td>
<td>(+) 63.1</td>
<td>5,900–19,000</td>
<td>(-)</td>
<td>Hepatomegaly diffuse inflammation of liver</td>
<td>160 (+)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>4W</td>
<td>Erythema with pruritus gradually all over the body</td>
<td>Conjunctivitis, oral involvement</td>
<td>(+) GPT782, GOT364</td>
<td>(+) 196.9</td>
<td>4,100–13,700</td>
<td>(-)</td>
<td>Hepatomegaly diffuse inflammation of liver</td>
<td>240 (+)</td>
<td></td>
</tr>
</tbody>
</table>
Treatment

(1) Hormonal therapy: According to the degree of medicamentose-like dermatitis, different hormone doses and courses of treatment are used. Initial dose: Methylprednisolone Sodium Succinate for Injection (Solu-Medrol™), 80–240 mg/qd. Course of treatment: Depending on the seriousness of case, 2 wk to 3 months are needed. Change to smaller dose every 3–7 d. Switch to dehydrocortisone (20 mg) when Solu-Medrol™ is reduced to 20 mg, and then reduce the dose of dehydrocortisone by 5 mg every 5–10 d.

(2) Administration of gammaglobulin (GG): Cases 1, 2 and 7 are given medication of human immunoglobulin (HIg) 0.2–0.4 g/(kg.d) through intravenous drip for 3–7 d.

(3) Administration of one or two types of antihistamine simultaneously.

(4) Protection of liver, kidney, heart and stomach: Anti-inflammation; maintenance of balance of water, electrolyte and acid base.

(5) Reinforcement of care for skin all over the body and mucosa including eyes, nose, ears, oral cavity and the perineal region; prevention of infection and scar contracture.

Prognosis

The seven cases have all recovered after treatment and their lengths of hospitalization range from 15 to 135 d with the average of 60.6 d. After the hormonal therapy has been completely terminated, their liver and renal functions return to normal and they are discharged after their skin has recovered. Type-B Ultrasonic Test shows that Cases 1, 2, 5, 6 and 7 have fatty liver at the time of discharge.

Discussions

The onset of TCE-induced medicamentose-like dermatitis normally has subacute courses after TCE has been mostly absorbed by respiratory, and at the same time partly by the skin as well1–3).

Medicamentose-like dermatitis and the degree of liver and renal impairment

Except for Case 5, the onset of other cases mentioned in this paper occurs after approximately one month’s exposure to TCE. The patients’ conditions vary from one individual to another. Some are primarily pathological changes of liver and others are renal lesions. However, the degree of liver and renal impairment is largely consistent with that of dermatitis. By observing the degree of skin impairment we could roughly judge the status of liver or renal function. Case 5 was the case of relapse. This has in part proved some experts’ observation, that is, re-exposure to TCE after recovery may lead to a relapse in 24 h time1).

Use of hormones

TCE medicamentose-like dermatitis, hepatomegaly, diffuse inflammation of liver and both kidneys indicate that the organism is subject to such non-infectious wound and thus the systemic inflammatory reaction (SIR) occurs. According to various sources of literature, hormonal therapy works well for the treatment of TCE medicamentose-like dermatitis4–6). However, up till now, there is no agreed dose and course of treatment. In this paper, the 7 cases have different degrees of skin lesion with or without liver and renal impairment. Solu-Medrol™ is used with the initial dose of 80–240 mg/qd and the course of treatment varies from 2 wk to 3 months. The activity of hormones has close relationship to the dose. High-dose hormones have remarkable anti-inflammatory, immunosuppressant, antitoxic and counter-shock functions. For later stage of acute or chronic inflammation, hormones can suppress the hyperplasia of fibroblastic cells and the formation of granulation tissue, reduce collagen deposit, alleviate scar and adherence7). In order to prevent the TCE-induced SIR and the final occurrence of multi-organ dysfunction syndrome (MODS), adequate use of different doses in earlier period is very crucial depending on the patient’s condition. Furthermore, in order to prevent the recurrence of illness and to suppress the hyperplasia of fibroblastic cells and the formation of granulation tissue, the course of hormonal therapy should be duly lengthened and the hormones should be removed gradually, which has a lot to do with the prognosis and the function recovery.

Liver steatosis

5 of the 7 cases concerned have fatty liver. Cases 1, 2 and 7 suffer from above-middle-range toxic liver disease and experience a noticeable increase of cholesterol after approximately 1 month of hospitalization. The main pathological changes of acute toxic liver disease are swelling, degeneration and necrosis of hepatic cells. The manifestations of cell degeneration are turbid swelling, ballooning degeneration, and steatosis, the last of which is the most common8). TCE is largely metabolized in the liver. The oxidative process of fat is interfered, causing fat to deposit inside the liver. Is this related to the patient’s mild fatty liver? According to our experience, in order to prevent such complications as renal lithiasis, we should pay close attention to changes of the patients’ blood fat and give them antihyperlipidemic medication when the density of their cholesterol rises very rapidly. For above-middle-range toxic liver disease, fatty liver might be the sequela, which we have to explain to the patient.
Allergic Angiitis Syndrome (AAS)

For acute allergic nephritis (AAN), the relation between dose and response is not obvious, and is mainly concerned with individual susceptibility. AAS is not frequently found in AAN. In its earlier stage there is no renal dysfunction. But if AAS progresses rapidly, it will soon lead to renal failure and may induce death in severe cases. Since small vessels all over the body will be affected, and apart from renal impairment, there will be general symptoms which are most obvious on skin and in lungs. Even abdominal angina and bloody stools might occur, accompanied by fever, arthralgia, courbature, and asthma as well. In Case 4, after approximately 1 month’s exposure to TCE, the patient gets hospitalized because of such initial symptoms as fever, abdominal pain, cough, general erythema with arthralgia. After 1 wk, the patient complains of oliguria and quick deterioration of renal function. Results of Type-B Ultrasonic Test show diffuse inflammation and slight accretion of both kidneys, enhancement and densification of cortical echo, and no explicit disjunction in the integrative systemic echogenic band. We assume that among allergic nephritises, AAS is more likely to occur. On the basis of this judgment, we give the patient corresponding treatment. The patient’s condition is under control and gradually improves within 1 wk, and is discharged after 2 months.

TCE medicamentose-like dermatitis has different manifestations. Some cases are accompanied by liver disease or renal disease. It is related to individual susceptibility. We should take all factors concerned into consideration and adopt a most suitable treatment for the patient.

Adequate dose of hormone in earlier period can effectively control the patient’s condition. Besides paying attention to changes of the patient’s skin, we should also keep an eye for the changes of the liver and kidneys and their relevant indices. Different patients have different prognoses. And we have to explain to the patient the possible sequelaes.

References