A suspected case of anaphylaxis due to adrenocorticosteroids

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Abstract

We encountered a case suspected as anaphylaxis due to treatment with dexamethasone phosphate in a patient with left median nerve injury. In this case, past use of adrenocorticosteroids, such as methylprednisolone succinate injections and inhaled fluticasone propionate, had not caused any abnormalities; however, anaphylaxis-like symptoms occurred following use of dexamethasone phosphate during intravenous regional sympathetic block. We report anaphylaxis-like symptoms occurred when dexamethasone phosphate was administered.

Key words: anaphylaxis, adrenocorticosteroids, dexamethasone phosphate, intravenous regional sympathetic block

Introduction

Adrenocorticosteroids are an essential medication in the treatment of anaphylaxis. Since Mendelson et al.1 reported anaphylaxis, the synoptome of which were hives and breathing difficulty associated with adrenocorticosteroid use in 1974, cases of hypersensitivity to steroid drugs have been receiving more attention.2-3

We report herein a case of deafferentation pain due to a severed left median nerve in which anaphylaxis-like symptoms occurred when dexamethasone phosphate was administered during intravenous regional sympathetic block (IRSB).

Case Report

The patient was a 35-year-old woman with a history of somatization disorder, panic disorder and borderline personality disorder, who had been brought to the emergency medical center of our hospital three times with acute drug intoxication (overdose of sleeping medications). In addition, she had been receiving fluticasone propionate as a spray for 1 year as a treatment for bronchial asthma.

When the patient was 34 years old in April, she had severed the left median nerve in a suicide attempt and underwent neurorrhaphy of the median nerve in the Department of Plastic and Reconstructive Surgery of our hospital in July, 17. The patient experienced numbness and hypoesthesia from the wound to the nerve periphery immediately after the operation and underwent neurolysis in July, 31 for pain relief. Postoperatively, as the patient reported a painful sensation, as if electricity was running down to the left palm, she was referred to our department 3 months after the first surgery.

At the time of the first examination, the patient complained of an electric-shock-like pain in the left palm; however, no evidence of decalcification or atrophy of the upper bones of the left hand was apparent on radiography (Fig. 1). In addition, the injury was class 2 on the Cornell medical index (CMI). Based on radiographic findings and localized symptoms from the wound to the peripheral region of the median nerve (Fig. 2), we diagnosed her symptoms as deafferentation pain resulting from distal medial...
Fig. 1 Radiography at the time of first examination.
No signs of atrophy or decalcification were apparent in bones of the left hand.

Fig. 2 Schema at the time of first examination.
The patient experienced numbness and hypoesthesia in the area from the wound to the nerve periphery (area innervated by the median nerve).

Discussion

Medications commonly known to cause anaphylaxis include antibiotics and analgesic antipyretics. Treatments for anaphylaxis include intramuscular injections and intravenous injections of epinephrine, fluid resuscitation treatment, antihistamine medication, bronchodilators (beta-adrenergic receptor agonists), adrenocorticosteroids, and glucagon injections. If the patient is in a state of cardiopulmonary arrest, immediate cardiopulmonary resuscitation and advanced cardiac life support are necessary.

Conversely, case reports on anaphylaxis caused by adrenocorticosteroids (an anaphylaxis treatment) have become fairly common in recent years. Mendelson et al. were the first to report a case of hives and exacerbation of asthma due to intravenous injection of methylprednisolone succinate in 1974. Taniguchi et al. reported that the mechanism of hypersensitivity to this injectable steroid medication is caused by sensitivity to the esterified structure of the drug. As adrenocorticosteroid crystals are difficult to dissolve in water, esterification is needed to increase water solubility for injection purposes. Succinic
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Diagnosed distal medial neuropathy

IRSB (2% lidocaine 5 ml, reserpine 1 mg, saline solution 15 ml)

2 month

Ineffective

IRSB (2% lidocaine 5 ml, reserpine 1 mg, saline solution 15 ml, dexamethasone phosphate 4 mg)

Immediately

Itching sensation on the left upper extremity

Hydroyzine (25 mg) i.m.

Itching resolution

Removal of the tourniquet

Aminophylline (75 mg) i.v.

Wheezing

Wheezing abated

Fig. 3 Therapeutic process
IRSB (intravenous regional sympathetic block), i.m. (intramuscular injection) i.v. (intravenous injection) During which time no marked changes in electrocardiography, blood pressure or peripheral artery oxygen saturation were apparent.

Acid, phosphate, and ester acetate all are be used to achieve esterification, but Freedman et al.\(^8\) reported that esterification using succinic acid produces the greatest frequency of anaphylaxis-like symptoms.

Reports have also described hypersensitivity to additives present in adrenocorticosteroid medications as the cause of anaphylaxis-like symptoms. Schorr et al.\(^9\) reported additives, namely the preservative paraben (Solu-Cortef\(^\circledR\), Hydrocortone\(^\circledR\), Decadron\(^\circledR\)), as a cause of adverse reactions. Preiner et al.\(^10\) reported that sulfur-containing antioxidants (Hydrocortone\(^\circledR\), Decadron\(^\circledR\), Rinderon\(^\circledR\)) caused reactions. We show the table of various adrenocorticosteroid drugs. (Table 1)

Reactions to the steroid structure of adrenocorticosteroids have also been reported. Freedman et al.\(^8\) proposed a hypothesis that low-molecular-mass substances such as steroids showed be bound to a different, high-molecular-mass substance in order to cause an allergic reaction. In this way, steroids act as haptens to induce allergic reactions; within this class of allergens, reactions due to hydrocortisone are the most common.

In the present case, no allergic reactions were induced by inhaled fluticasone propionate and intravenously injected methylprednisolone succinate. However, the patient had the history feelings of illness by external use of betamethasone butyrate propionate, and anaphylaxis-like symptoms due to the use of dexamethasone phosphate during IRSB. Judging from these reactions, the esterified structure or additives may have caused the anaphylaxis-like symptoms. Moreover, the patient had a history of asthma. It is generally presumed that patients with aspirin-induced asthma are also susceptible to not only to analgesic antipyretics, but also to other medications, preservatives and coloring agents, and may thus be potentially hypersensitive to succinate compounds.\(^7\) Use of steroid phosphate esters in aspirin-induced asthma patients is regarded as safe; however, the use of steroid phosphate esters in the present case caused anaphylaxis and cannot be considered safe.

These findings suggest that adrenocorticosteroids primarily used as anaphylaxis treatment have the possibility of causing anaphylaxis-like symptoms. If symptoms worsen following the administration, medication must be immediately changed to another adrenocorticosteroid and antihistamine. In addition, follow-up may be necessary.

In this case, we hoped to investigate the underlying cause of this reaction through histamine release tests and immunoglobulin E measurements, but were unable to perform a complete evaluation as the patient declined to participate. The patient underwent another neurolysis procedure 2 years after the first occurrence of symptoms, but has yet to achieve any improvement in the condition of the left palm area and the symptoms remain.

Conclusion

Adrenocorticosteroids are an effective treatment for anaphylaxis-like symptoms, but have the potential to cause anaphylaxis-like symptoms. Sufficient caution must thus be exercised.
<table>
<thead>
<tr>
<th>Drug (INN)</th>
<th>Drug (trade name)</th>
<th>assortment</th>
<th>Additives</th>
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<tr>
<td>Hydrocortisone sodium succinate</td>
<td>Solu-Cortef®</td>
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<td>Methylparaben, Propylparaben</td>
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<td>Saxizon®</td>
<td>solution</td>
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<td>bulk</td>
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<tr>
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<td>Rinderon®</td>
<td>liquid</td>
<td>Sodium sulfite, D-sorbitol</td>
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during administration. As soon as an adverse reaction following adrenocorticosteroid use is detected, hypersensitivity to adrenocorticosteroids should be suspected and addressed immediately. In addition, there is a wide range of possible causes of adrenocorticosteroid hypersensitivity and the underlying cause may be different in each case. A clear definition of which medications elicit hypersensitivity reactions and which may be used to treat the patient is required on a case-by-case basis; therefore, sharing information is required to prevent anaphylaxis.

References

7. Taniguchi M, Sato A (1988) Aspirin induced asthmatics have cross-sensitivity with the steroid succinate esters. NER Allergy PRC 9 : 338