

A Rarely Adverse Reaction Case of Combined Diphtheria, Tetanus, Pertussis (DTP) Vaccination

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Abstract

A rarely adverse reaction case of combined diphtheria, tetanus, pertussis (DTP) vaccination was reported. The injection site in the arm of a two-year-boy presented swelling and redness, and itching four hours after having given the second dose of DTP vaccine. Meanwhile, he showed drowsiness, non-stop crying and fretfulness, and felt severe pain and soreness or tenderness in the arm. Then, his arm displayed local edema and scattered rash. The boy had a low-grade temperature fever, and came out mucous blisters in the arm, allergic rash or hives (urticaria) and angioneurotic edema one day later. However, his symptoms and conditions alleviated and improved gradually after the combined treatment of anti-infection, anti-allergy and local wet compress of a week. The child recovered fully one week later.

Key Words: DTP Vaccination, Adverse Reaction, Symptom, Allergy, Treatment, Recovery.

Introduction

Vaccines are intended to produce active immunity to specific antigens in children and adults. Modern vaccines are safe and effective, but an adverse event or an undesirable side effect could occur after a vaccination [CDC 1996, Kroger 2011]. Adverse events of combined diphtheria, tetanus, pertussis (DTP) (adsorbed) vaccine could occur after injection, but they are uncommon [WHO 2014]. The adverse reactions of DTP vaccination at the injection site may be mild, moderate and severe [GC 2016, Melanie 2016, WHO 2017]. Redness, swelling and pain are the most common adverse reactions or side-effect to childhood DTP vaccination [CDC 2016, GC 2016, Melanie 2016]. Other mild problems include low fever (at least 100.4°F or 38°C), irritability, fussiness, tiredness, nausea, chills, headache, body aches, sore joints, stomach ache, poor appetite, diarrhea, vomiting, itching (pruritus), swollen glands [Liese 2001, CDC 2015, GC 2016, Melanie 2016]. Moderate reactions following DTP vaccine are pain, redness, fever (over 102°F or 38.9°C), headache, nausea, vomiting, diarrhea, stomach ache, abscess, swelling of the entire arm, rash [Rennels 2000, CDC 2015, GC 2016]. However, the moderate problems are rare [CDC 2015]. Severe adverse events of DTP vaccine show redness, significant swelling, severe pain, bleeding, high fever (over 104.9°F or 40.5°C), non-stopping or persistent crying, seizure or convulsion, hypotonic–hypo-responsive episode (HHE), encephalopathy, Dravet's syndrome, anaphylaxis or severe allergic reactions (i.e. hives or urticaria, angioneurotic edema [Blumberg 1993, PHAC 2005, Rüggeberg 2007, GNBC 2011, WHO 2014, CDC 2015]. Nevertheless, the serious problems are very rare [Kroger 2011, WHO 2014, Staff 2015].

Case Report

A two-year-boy was given the second dose of DTP vaccine of 0.5 ml at a local town hospital in Yunyang county according to the regular vaccination plan. The injection site in the arm of the boy presented swelling and redness, and raised mucous blisters four hours after the vaccination. Meanwhile, he showed drowsiness, non-stop crying and fretfulness, and felt severe pain and soreness or tenderness in the arm. Then, his arm displayed local edema (5 x 6cm in injection site) and scattered rash. He had a low-grade temperature fever of 38.3°C one day later, and came out systemic rash and mucous blisters in injection arm, which were diagnosed as allergic rash or hives (urticaria) and angioneurotic edema. The symptoms and conditions of the boy alleviated and improved gradually after the combined treatment of chlorpheniramine, intravenous penicillin, dexamethasone, vitamins C and magnesium sulfate wet compress of a week. The child recovered fully one week later.

Discussion

The symptoms of the boy showed that he had mild, moderate and severe adverse reactions after DTP vaccination of the second dose, which included local, systemic or allergic reactions. Therefore, it was a very rare case in vaccination [Kroger 2011, GNBC 2011, WHO 2014]. In particular, occurring time of adverse reaction of DTP vaccination in the case was different with that in other reported cases. Many of case reports reveal the adverse reactions occur more often after the 4th and 5th doses of the DTaP series than after earlier doses, and usually occur 1-3 or 4 days after the shot, lasting 1-7 days [Rowe 2005, Staff 2015, CDC 2015, CDC 2016, Melanie 2016]. However, some of mild, moderate and severe adverse reaction symptoms of the boy were similar to those of many of reported cases, such as there are similar swelling in injection site [GNBC 2011, CDC 2015, WHO 2014, CDC 2016, Melanie 2016]. For example, the case reports expose that local swelling or edema in injection site was 2.5 to 5 or over 5 cm diameter [Bell 1999, Liese 2001, Rowe 2005, Rennels 2008].

Anaphylaxis is a severe, acute and potentially life-threatening medical condition caused by the systemic release of mediators from mast cells and basophils [Lieberman 2008, Cheng 2011]. In infants, symptoms of anaphylaxis may include fussiness, irritability, drowsiness or lethargy, and etc [GC 2016]. The reported case reveals that DTP vaccination could arouse allergic reaction or anaphylaxis of the boy. However, allergic reactions or anaphylaxis is a rare complication of immunization [GC 2016], in particular, severe or serious allergic reactions from a vaccination are very rare [Staff 2015, CDC 2015], which was estimated at fewer than 1 in a million doses, and would happen within a few minutes to a few hours after the vaccination [CDC 2015, CDC 2016]. Nevertheless, a study displays that DTP vaccination appeared to increase the risk of allergies in children and adolescents [Hurwitz 2000]. Meanwhile, neurological complications of immunisation could occur after DTP vaccination, but are rare too. A case report reveals that neuroallergic reaction occurred 5 days after receiving the second course of DTP vaccine [Wierzba 2000].

Usually, adrenaline (epinephrine), antihistamines and corticosteroids are used in treatment for anaphylaxis or allergy [ASCIA 2016, Cheng 2011]. Epinephrine is the undisputed initial therapy for anaphylaxis [Lieberman 2008, Laemmle-Ruff 2013], additional interventions such as oxygen therapy, fluid resuscitation, beta-agonists, antihistamines, and corticosteroids should be strongly considered [Lieberman 2008]. H(1)- and H(2)-antihistamines (i.e. chlorphenamine, diphenhydramine, ranitidine) are effective for treatment of acute urticaria or rhinoconjunctivitis [WGRC 2008, Norred 2012, Ring 2014], and commonly used as an adjuvant therapy or second line treatment choice in the treatment plan of anaphylaxis [Lin 2000, Sheikh 2007, WGRC 2008]. Moreover, Corticosteroids (i.e. glucocorticosteroids, dexamethasone, hydrocortisone) play a minor role in the acute phase of anaphylaxis treatment [Wierzba 2000, Choo 2010, Simon 2012, Laemmle-Ruff 2013].

It has been known that DTP vaccination led to urticarial rash and angioneurotic edema of the boy in the reported case. Clinical observations show that urticarial rash (i.e., hives or urticaria), an allergic reaction or anaphylaxis at the injection site, is a transient erythematous swelling of the skin, associated with itching, which usually resolves within 24 hours, and can occur after a vaccine shot [Kaplan 2014, GC 2016]. Meanwhile, clinical analysis reveals that angioneurotic edema or angioedema is a non-pitting edema which is characterized by swellings caused by edema in the deeper dermal, cutaneous and sub-mucosal tissue (i.e. mucous membranes of the face and upper aerodigestive tract) [Zanoletti 2003, Shafer 2012, Kaplan 2014]. Both of urticaria and angioedema are important components of systemic anaphylaxis which is an acute life threatening condition [Prasad 2001, Chaitra 2012]. Some of clinical reports show that urticaria and angioedema could occur lonely, but half of all patients with urticaria or more have angioedema [Finn 1999, Kaplan 2014, UMMC 2016]. Frequently, urticaria is associated angioedema in children [Kaplan 2002, Tuncer 2004, Leech 2011]. Antihistamines (i.e. chlorphenamine, loratadine or desloratadine, levocetirizine, cetirizine) could be used to treat or control urticaria and angioedema [Ring 2001, Agostoni 2001, Staevska 2010, Powell 2016], because they are the mainstay of treatment for children with urticaria [Leech 2011, Powell 2015]. Meanwhile, corticosteroid (i.e. prednisone) could be added to standard treatment with H1antihistamines for the management of acute urticaria and angioedema in outpatients [Pollack 1995, Powell 2015]. Nevertheless, some of studies reveal that epinephrine, steroids and antihistamine have not been proven to be efficacious for treatment of some

angioedema, in particular, inhibitor-induced angioedema [Gaboriau 1997, Peltekis 2009, Vasekar 2012]. On the contrary, they are effective for immunologic or allergic angioedema [Kaplan 2008, Wilkerson 2012].

On the other hand, medical practices reveal that some of herbs can be helpful for treatment and prevention of urticaria and angioedema, such as goldenseal (*hydrastis canadensis*) may be used to prevent or reduce allergic reactions, Licorice root (*Glycyrrhiza glabra*) has been used traditionally to reduce inflammation in the allergic reaction, and Chamomile (*Matricaria recutita*) has been employed customarily to treat hives [UMMC 2016]. Furthermore, some of studies show that magnesium sulfate wet compress could be used effectively to treat swelling or edema, and reduce inflammation and pain [George 2015, D'souza 2016, Chi 2016]. Additionally, ice may reduce swelling [PHAC 2005].

Therefore, the combined treatment of chlorphenamine, dexamethasone and magnesium sulfate wet compress for urticaria and angioneurotic edema of the boy was a suitable therapy in the reported case.

Conclusion

Adverse reaction of DTP vaccination of the child was a very rare event. Though the combined treatment was effective and successful, it is necessary to improve appropriately treatment for adverse reactions of the vaccination and to reduce side effect of vaccine for protecting children's health. Meanwhile, vaccines and vaccination should be administered systematically and strictly; adverse events after DTP childhood immunisation should be carefully monitored and punctually reported; and practicable treatment plans should be made, and treatment medicines should be used appropriately and effectively [WHO 2014, GC 2016]. Furthermore, allergic reaction cases of vaccination should be analyzed and evaluated completely [Franceschini 2015].

Competing interests

All of the authors declare that they have no conflict of interests.

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