CASE REPORT

# Anaphylactic Shock Associated with Scratch Testing

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**ABSTRACT** A 10-year old boy with bronchial asthma referred to allergy clinic for allergy work-up. He complained of abdominal pain and blurred vision 20-minutes after undergoing allergy skin scratch test. Physical examination showed clammy and cyanotic extremities, and hypotension. The skin test result showed positive rection for house dust, mite, and shrimp. Based on these findings the diagnosis of anaphylaxis associated with scratch test was made. The suggested offending extract was shrimp with possible interference of the other two extracts. Epinephrine 0.3 subcutaneously was initiated. The first dose gave a disappointing result, and then followed by the second dose which gave better result; dexamethasone was also administered. The eosinophilia, positive specific Ig E to shrimp, house dust and mite as indicated by RAST justify the atopic status of the patient. The management of the main disease consisted of house dust control, elimination diet, and symptomatic treatment were commenced. **[Paediatr Indones 1996; 36:258-264]**

## Introduction

Anaphylactic shock is an acute, generalized shock syndrome that results from the interaction of antigen with antibodies on sensitized body tissues, it is an allergic emergency that has a potentially life-threatening outcome.[1,2] It occurs at the rate of 0.4 cases per million per year in general population and 0.6 per 1000 patiens in hospitals.[3] Anaphylactic reaction may be triggered by many agents, including food antigens, medication or drugs, insect venom, heterologous sera, inhalant allergens inject-

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ed during hyposensitization, and many others.[2] In unusually sensitive patients, skin testing may induce anaphylaxis.[4]

Since more than a century, skin testing has been widely used in clinical practice to determine antigens.[5] Nevertheless, anaphylaxis reaction induced by skin testing has been rarely reported. In 1987 Lockey et al. reported 46 fatal cases that had occurred during immunotherapy or skin testing since 1945. Sufficient information for the complete analysis was reported on 30 of these cases for the period 1959 to 1984. Six of those cases were associated with skin testing, and only one of the six caused by anaphylactic shock associated with scratch combined intradermal testing.[6] It also had been reported 17 fatal cases associated with immunotherapy for the year 1985 to 1989 by Reid et al.; no report associated with skin testing for this period.[7] The annual fatality rate from administration of allergenic extract in the United States was about 1 per 2 million doses. The purpose of this paper is to report a rare case of anaphylactic shock associated with scratch testing.

## Report of the Case

An Indonesian boy of 10 years old was referred to the Pediatric Allergy and Immunology Clinic of Soetomo Hospital with the diagnosis of bronchial asthma possibly precipitated by allergic factors. The history as told by his father revealed that the boy has suffered from cough and dyspnea since he was 2-months old. The cough and dyspnea was paroxysmal, most commonly in the night, sometimes accompanied by wheezy sound when he was dyspneic. He suffered from recurrent cough and dyspnea, frequently for about 4-5 days every 3-4 months. There was no fever, rhinitis or sneezing previously.

The symptoms also appeared about 4-6 hours after he had eaten some fruits (i.e., tomato, sawo, or watermelon), ice-cream especially consisting chocolate, tomato sauce, 'ciki', wafer, and 'astor'. When he was 7 years old, he got bad experience with crab. His lips and both cheeks became edematous shortly after he had eaten a boiled crab. The boy slept on 'kapok' mattress and pillow. The symptoms also appeared while he was playing with it, and sometimes while someone was sweeping the floor. Frequently, the boy received medications from his doctor, especially promethazine when he was sick.

During pregnancy his mother was healthy. He was born spontaneously as a term baby with the body weight of 2600 grams. His immunization status was up to date. The boy never received breast feeding, but only cow's milk formula from birth on. He also has received bananas, biscuits, and milk porridge when was 3-months old. He started to receive rough foods when he was 1-year old. His parents were healthy. He was a second child. The history about hives, asthma, chronic rhinitis or dermatitis on his siblings were denied, but there was history of chronic dermatitis on his cousin.

Physical examination revealed an alert boy with the body weight of 28 kg, pulse rate 96, respiratory rate was 20, and body temperature 36°C. Neither anemia, cyanosis, nor dyspnea was observed. The chest was symmetrical, and there was no inter- costal retraction. The heart was normal. Mild wheezy expiratory sound was found in both lungs. The abdomen was not distended. The liver and the spleen were not palpable. The extremities were normal, BCG scar was noted..

The tuberculin (Mantoux) test done in pediatric pulmonology outpatient clinic showed induration of 5x7 mm. The blood examination revealed hemoglobin content 13,2 g/dl, WBC 5800/µl, differential count was showed eosinophils 4% with normal neutrophils and lymphocyte, ESR was 20mm/hour. The chest X-ray revealed : increasing of bronchovascular pattern and hyperaerated lungs.

Based on the data we attempted to ascertain the allergic factors that possibly causing the illness. At the time, we did testing to determine the allergens with various available extract of allergens with various available extract of allergens (i.e. house dust, mite, feather, cow's milk, dander of cat and dog, shrimp, peanuts, fish, egg, and also placebo and histamine as negative and positive controls respectively).

On 20-minutes after we had done the testing , the boy suffered from abdominal pain, and blurred vision. The physical examination at the time revealed: The boy looked pale and restless. No dyspnea was observed, the pulse rate was 80/60 mmHg. The chest moved symmetrically, there was no intercostal retraction. Feeble heart sound and bradycardia were noted. The wheezy expiratory sound still was heard minimally with stethoscope. The increased bowel sound was noted. The extremities was clammy and cyanotic. The scratch testing showed wheal and flare reaction to the house dust, mite, shrimp, and histamine as 15.4, 15.5, 20.5, and 10.4 respectively.

Based on the findings we treated the patient with 0.3 ml adrenaline solution 1:1,000 subcutaneously. 15 minutes after administration of adrenaline, the conditions has not ameliorated yet, so that we decided to give the second adrenaline as initial dose. On minute 30 observation, the symptoms of anaphylactic disappeared. We gave him dexamethasone 5 mg intramuscularly. One hour after initial treatment, the boy was alert and in stable condition. The blood pressure was 110/70 mmHg, the pulse rate was 94, then the patient was discharged from the clinic with special instructions to return to either clinic or hospital emergency room if there is any recurrent of symptoms.

For his asthma we decided to treat the patient as bronchial asthma due to house dust and possible food allergy as indicated by history, physical examination, laboratory examination, radiological examination and skin test. The treatment consist of ephedrine, chlortrimeton, aminophylline and salbutamol. We also advised the parents to do some efforts to minimize dust (environmental control of house dust) with special attention to the child's bed room, and suggested to do 'the elimination' to exclude mayor allergenic foods such as: fruits, cow's milk, egg fish and peanut to determine

possibility of food allergy. Some laboratory examinations were planned such as total Ig E, specific Ig E and eosinophil count to count to confirm the presence of atopic factors.

Three weeks later, the patient came to the clinic for evaluation. During the period, there was no history of recurrent anaphylactic reaction nor bronchial asthma. Signs and symptoms of bronchial asthma were not observed. The laboratory examinations revealed as follows: Total IgE was 99 iu/ml, Ig E to house dust was 3.5 iu/ml, IgE to shrimps was 0.8 iu/ml, IgE to crabs was 0.7 iu/ml, and eosinophil count was 737.

## Discussion

The patient manifested the signs and symptom of anaphylaxis 20-minutes after undergoing scratch test with several allergen extracts. The cause and symptom relationship was obvious in this case, so that we did not hesitate the anaphylaxis was associated with scratch test.

The problem arises now is which of the extracts causing anaphylaxis, because house dust, mite and shrimp were positive. It is very difficult to determine whether shrimp, mite or house dust extracts causing the anaphylaxis. In the literature it has been documented the stronger positivity of skin reaction the stronger possibility to cause anaphylaxis. Lockey et al. pointed out that the degree of skin sensitivity provide an important risk factor influencing the incidence of anaphylaxis or systemic reaction of skin testing in our patient showed that skin was more sensitive to shrimp extracts, so it was most possible extracts causing anaphylaxis, although possibility of simultaneous interference by all allergen extracts could not be excluded.

Positive result of specific IgE against shrimp, mite and house dust as indicated by RAST in this patients did not tell much which one of these allergens played a central role to induce the anaphylaxis, because it is also depend on the affinity of the IgE to mast cell receptors.[3] This data together with eosinophilia and the presence of atopic dermatitis attributed rather for atopic status of this patient.

Anaphylaxis can be classified as either :

- Uniphasic: a single episode of rapid onset reaction occurring within 2 hours of initial exposure allergen.
- Biphasic: initial episode of rapid onset reaction followed by a second late onset reaction later in time occurring within 6-12 hours after exposure to allergen.
- Protracted form of anaphylaxis : this is the most severe nature requiring aggressive and persistent management.

Which patient can be predicted whether he will develop uniphasic, biphasic or protracted anaphylaxis, no single sign or symptom manifested in initial anaphylaxis can distinguish or predict those patients in whom biphasic pattern would later develop. But interestingly in an inpatient study group, the absence of hypotension or severe

respiratory obstruction seem to distinguish those in whom a late phase reaction will develop or not. This was demonstrated by the majority of inpatients who did not manifest hypotension or severe respiratory obstruction as part of the initial anaphylaxis, none of the developed a late phase reaction.

Consideration of admission to the hospital after an episode of anaphylaxis will depend on:

1. Severity of the initial reaction.
2. Rapidity of response to therapy.
3. Stability of the patient in the observation room.
4. Distance of emergency medical service from of anaphylaxis.

In general, if the patient has complete resolution of signs and symptoms of anaphylaxis after adequate treatment and observation in the emergency room could be discharged home with special instruction to return to emergency room at the onset of any recurrent signs.

The anaphylactic reaction is believed to be immunological reaction belong to type I hypersensitivity or immediate hypersensitivity. The reaction is initiated if specific I E attached in mast cell or basophil bound with the offending allergen resulting in mast cell degranulation and release of preformed inflammatory mediators an the initiation of synthesis of newly generated inflammatory mediators. The rapid onset reaction is the result of performed inflammatory mediators, and it is widely agreed that the primary chemical mediator of anaphylaxis is histamine.

The effect of histamine in the body include the contraction of smooth muscle, dilatation of blood capillaries, increase capillary permeability, fall in blood pressure , and in superficial cutaneous blood vessels causing the swelling, erythema and itching that characterize urticaria, The symptoms occur almost simultaneously although not always to the same degree. The direct response of inflammatory mediator to the heart resulting the alteration of excitability and contractibility maybe responsible to the existing bradycardia in this patient. The possibility of syncope in a child who feel pain because of scratch test and fear because of strange experience must be considered as differential diagnosis, but in our patient the fall of blood pressure and other signs of anaphylaxis justify the diagnosis.

The newly generated inflammatory mediator such as arachidonic acid metabolites, kinins, platelet-activating factor and slow reacting factor of anaphylaxis (SRS-A) may also have roles[5,10] and strongly suggested responsible in the late onset reaction of anaphylaxis.

The question arises now is: why skin test including shrimp was done in this patient otherwise previous angioneurotic edema after ingesting crab was told by the parent. Previous symptoms of allergy is not contraindication of allergy skin test except previous history of anaphylactic reaction. Other factors contributed to risk factors of anaphylaxis associated with skin test are:

1. Asthma patient who have had factors associated with severity, lability, steroid dependence and prior hospitalization.
2. Time of seasonal exacerbation of patient's disease
3 Symptomatic at the time of testing
4. Receiving blocker
5. The degree of skin sensitivity.

The concentration of the extracts is not indicative in predicting the risk of anaphylaxis. We used allergen concentration as follows: house dust 1.5 : 10, mite 1.2 :100, and shrimp 1 :10 wt/vvol. Reid et al. reported that allergen concentration between 1 : 1 million to 1 : 10 wt/vvol were used in the United States during 1985 - 1989, they also noted fatalities with doses as low as 1 : 1 million wt/vol.[7] So, there is no dose absolutely safe for individual patient who is allergic to allergen extract.

Epinephrine (adrenaline) remains the drug of choice for the treatment of anaphylaxis. Other potentially, useful therapeutic adjuncts may include H1 antihistamines, glucocorticoids, agonist, intra-venous fluid drips, vasopressors and racemic epinephrine. Which drug we use in the adjunctive treatment of anaphylaxis depend on several factors, such as of reaction, site allergen entry and extent of involvement of the systemic reaction.

In conclusion, allergy skin scratch test, although considered safe as a diagnostic procedure in office setting, awareness must be born in mind for possibility of anaphylaxis. Emergency kit ideally consisted of epinephrine, antihistamine, aminophylline, vasopressor, barbiturate, corticosteroids, physiological saline, dextrose 5% in 0.45 % saline, sphygmomanometer, syringe, oropharyngeal airways, laryngoscope and sucking apparatus must be kept ready for the emergency use.

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