Guidelines for performing a skin prick test

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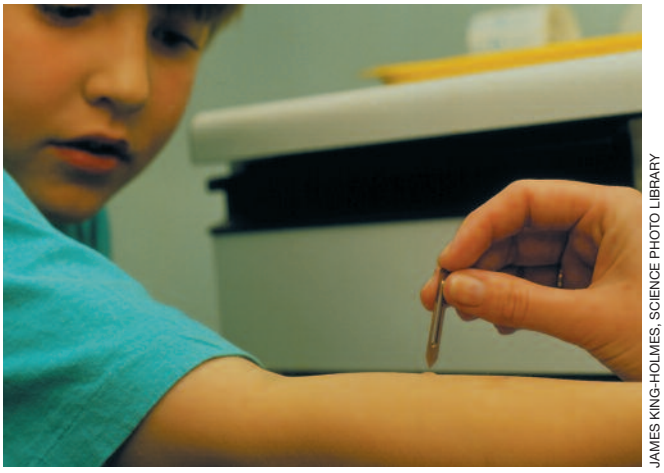

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Increasingly GPs are performing skin prick tests themselves. This is a brief guide to the procedure of skin prick testing and the interpretation of results.

The skin prick test is a highly sensitive and generally well tolerated technique for detecting the presence of IgE-dependent immediate reactivity to protein or peptide allergens. It is the gold standard test for determining reactivity to aeroallergens and food proteins, but it is not relevant to the testing of low molecular weight chemical substances (such as food additives or volatile environmental pollutants) or delayed food reactions.

The skin prick test has replaced the formerly used skin scratch method of allergy testing, largely because it is less traumatic to the patient and is more reproducible. Other skin tests in use are the intradermal test and the patch test. The skin intradermal test involves the injection of a small quantity of diluted allergens superficially into the skin. More sensitive but less specific than the skin prick test, the intradermal test is also more traumatic and more likely to cause anaphylactic reactions: it is, therefore, generally reserved for the specialist, usually in the context of testing for insect venom and drug sensitivity. Unlike the skin prick and intradermal tests, the skin patch test does not involve puncturing the skin. It is mainly used to confirm delayed hypersensitivity in contact dermatitis, and is not appropriate for testing IgE-mediated reactions.

Skin prick testing to common allergens, especially aeroallergens, is performed to determine whether the subject is atopic and to identify the specific allergen causing the reactivity (so avoidance and medication strategies or immunotherapy can be instituted). Atopy refers to the genetically determined tendency to make specific IgE responses to common environmental aeroallergens. A positive response to one or more of the tested inhaled allergens (i.e. the most prevalent pollen, mould, house dust mite and pet in a subject's environment), in the presence of satisfactory positive and negative controls, defines the subject as being atopic. If a subject has no positive reactions to these allergens, there is a low probability (less than 2%) that he or she is atopic.

Cases of allergy likely to benefit from skin prick testing are those in which IgE-mediated hypersensitivity has a role, or where IgE-mediated conditions are an important part of the differential diagnosis. For a more detailed discussion on the investigation of allergic conditions, see the recent article in this journal on investigating the atopic child (*Medicine Today* 2001; 2(11): 55-57).

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Treatment of anaphylactic reactions

Key measures

- Intramuscular injection of 1:1000 adrenaline at an initial dose of 0.01 mg/kg (equivalent to 0.01 mL/kg), with a maximum dose of 0.5 mg, and repeated in five minutes if necessary. Intravenous adrenaline can be lethal and must be administered with the utmost caution: a preparation diluted to 1:100,000 with normal saline, and slow infusion starting at a rate delivering the intramuscular dose over one hour is preferable to bolus therapy
- Standard supportive care: airway, oxygen 6 L per minute via mask
- Nebulised bronchodilator if bronchospasm is present
- Intravenous saline if hypotensive
- Transfer to hospital by ambulance

Note: Adrenaline is the key medication for treatment of anaphylaxis. Antihistamine and injected corticosteroids may reduce the risk of protracted or biphasic reactions but have no proven benefit in the acute situation. Injected promethazine may aggravate hypotension because it is an alpha-adrenergic blocker. Use of these agents must follow and not precede key measures.

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continued

How to perform the skin prick test procedure

Skin prick tests are usually performed on the volar surface of the forearm in adults and older children, and on the upper back in infants and young children.

- Ask the subject either to sit in a chair with their arms extended on the armrests or a pillow, or to lie on a couch in a prone position with their back exposed. A parent may hold a young infant in either a prone or a sitting position on his or her lap.
- Inspect the condition of the skin designated for prick testing, ensuring that it is intact and not affected by, for example, dermatitis. Clean the skin with a skin disinfectant, and use the marker pen to write on it numbers corresponding to the numbers on the extract bottles (Figure A). The test areas should be at least 3 cm apart.
- Squeeze a drop of test solution onto the skin next to the corresponding marked number (Figure B).
- Place the sharp end of a new sterile lancet through the droplet into the skin, and lift it so that the surface of the skin is slightly raised (Figure C). Bleeding indicates an over-vigorous technique. There are devices available that are designed to puncture the skin by direct thrust perpendicular to the skin, with the depth of puncture being limited by a 'shoulder' on the device. Use a new device for every puncture; this enhances accuracy and reduces risk of sharp injury to the operator. Discard the used device in the sharps container.
- Repeat the drop-and-prick procedure for the remaining extracts to be tested. The droplets on the skin can be blotted off two minutes after the skin pricks (make sure there is no wiping movement), without affecting the readings.
- Read the histamine control reaction at 10 to 15 minutes after the skin prick, and the other reactions at 15 to 20 minutes (Figure D and see results section on page 70).
- After reading the results, clean the skin with a dry swab and then warm water to remove the pen mark, and dry with cotton swabs or tissues.
- Observe subjects for at least 30 minutes after skin puncture, and 60 minutes if testing against foods, drugs and latex allergens as these are more likely to cause severe and sustained allergic reactions than inhalants.
- Rarely, a subject undergoing skin prick testing may develop a sufficiently large and troublesome reaction to benefit from an oral antihistamine. A topical corticosteroid cream may provide a placebo effect, but in theory would not be very helpful because the skin prick response is essentially an acute urticarial reaction to the allergen.

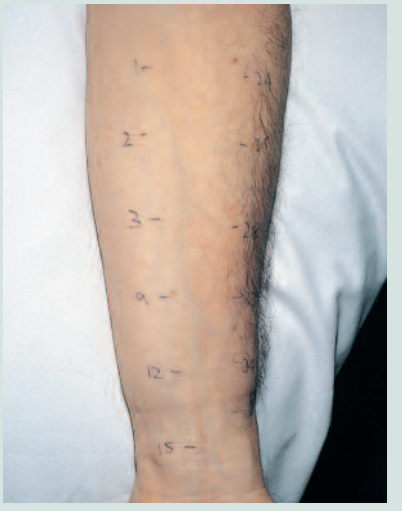

Figure A. Prepare the skin.

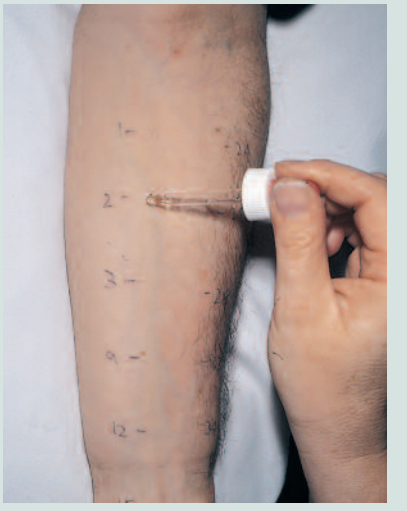

Figure B. Apply the test solution to the skin.

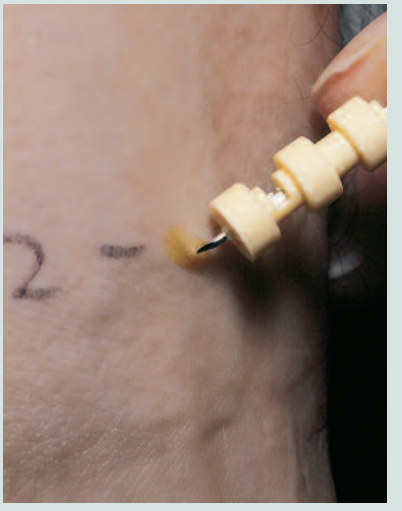

Figure C. Prick the skin through the drop.

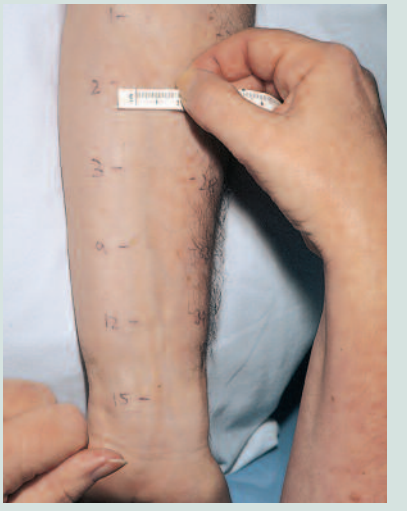

Figure D. Measure the wheal diameter.

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Before performing a skin prick test

While age is not a limitation for performing the skin prick test (although skin reactions may be diminished in infants and the elderly), there are several considerations to be taken into account before a patient undergoes skin prick testing.

Serious immediate allergic reactions to aeroallergens in skin prick testing are extremely uncommon. However, such testing is not recommended during asthma exacerbations or in patients taking beta blocker medication. The risks are significantly greater for skin testing in food allergies, particularly to peanuts and tree nuts, and in latex and drug allergies. Pregnant patients should undergo skin prick testing only if the results are expected to have substantial and immediate therapeutic implications as they may have uterine contractions or other changes threatening the fetus in association with any systemic reactions.

The skin at the test site must be intact and there must be no eczema (dermatitis), infection or rash. If dermatographism is present, the results of testing should be interpreted with caution.

Oral antihistamines should be discontinued at least three days before testing, and cetirizine and tricyclic antidepressants seven to 14 days before testing. H_2-receptor antagonists may cause mild suppression of skin reactions and should be discontinued 24 hours before testing.

Although short term systemic corticosteroids (for example, 30 mg daily for one week) do not suppress skin test reactions, chronic usage of relatively high dose corticosteroids (>20 mg/day) can partially suppress the responses. Regular administration of potent topical corticosteroids for many weeks may suppress immediate skin test reactions over areas where they have been applied; such drugs should, therefore, be discontinued over these sites two to three weeks before testing.

Materials required for testing

The allergen extracts and control reagents should be purchased from reputable manufacturers and satisfy minimum set standards. Store them in a temperature-monitored refrigerator and check the expiry dates regularly as the potency of the allergens deteriorates with time, dilution and exposure to increased temperatures. Strictly observe precautions to prevent cross-contamination between allergens and microbial contamination. Label the test reagent bottles with numbers and

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arrange them neatly in a tray for easy access during testing. Positive (usually histamine acid phosphate 10 mg/mL) and negative (saline or the diluent) control reagents must be included in all tests.

Other materials used for the procedure, including dry and wet swabs, sterile lancets for skin puncture (several brands are available), a sharps container, a marker pen, a ruler, a clean box of tissues and recording sheets, should be kept in a separate tray next to the tray of extracts.

Emergency equipment and drugs should be readily available, in case of anaphylaxis (see box on this page).

Skin prick test procedure

The procedure for skin prick testing is summarised in the box on page 68.

Reading and interpretation of results

A positive reaction is indicated by the appearance of a wheal surrounded by a ring of erythema. Traditionally, only the wheal size is used for recording and interpretation. To calculate the mean diameter of a wheal, first find and measure its longest diameter, and then measure the diameter at 90º to it; add the two diameters and divide by two.

A positive reaction is interpreted as a positive result if the mean wheal diameter is 3 mm or more and exceeds the mean diameter of the negative control by at least 2 mm.

There are some allergists who also use a semi-quantitative method of describing the severity of reactions by assigning a number of + signs (from + to ++++) to the test result. The criteria for selecting the number of +s vary, and this method is not universally accepted for scientific publication.

Rarely, the patient may develop a late phase cutaneous reaction after a skin test. This reaction is characterised by erythema, induration, oedema and dysaesthesia that develop progressively at the sites of immediate wheals and flares. It becomes apparent one to two hours after application, peaks at six to 12 hours, and usually disappears after 24 to 48 hours. The clinical significance of this interesting response is unclear.

As skin prick tests generally have high sensitivity but low specificity, a positive reaction simply indicates the subject's sensitisation to the reagent, and does not necessarily equate to a clinical role for the allergen. The result of the skin test must, therefore, be interpreted in the context of the subject's clinical history and physical findings, which are obtained by face-to-face contact. The size of the wheal is also important. For example, it has been shown with peanut allergy that a mean wheal diameter of 6 mm or more is highly predictive of an immediate systemic reaction on eating the food.

Studies have shown that the results of skin prick tests are robust and reproducible, even between different test persons (with reasonable levels of skill and experience), using different devices but the same extract, on the same subject. The results are even more reproducible when the same individual using the same device on the same subject repeats the tests.

Interpretation of results of skin tests to foods and especially drugs is complex and is best left to specialists.

Pros and cons of skin prick testing

Skin prick testing has both advantages and limitations compared with other means of allergy testing.

The advantages of skin testing are:

- it is highly sensitive
- the results are known immediately at the end of the test
- it is less painful than venepuncture
- the procedure is relatively safe
- recognition of a positive skin test by the patient may be useful in gaining co-operation for allergy avoidance measures.

The limitations are:

- it is not applicable to allergic reactions to low molecular weight chemical substances, or to delayed reactions
- both the risk during the testing procedure and the difficulty in interpreting the results are increased when testing against food and drug allergens
- subjects must meet selection criteria relating to medical status, drug usage and skin condition
- the appropriate equipment, skill and preparedness to treat anaphylaxis must be readily available
- positive test results only indicate sensitisation, and not necessarily clinical relevance. MT

Further reading

1. Bernstein IL, Storms WW. Practice parameters for allergy diagnostic testing. Joint Task Force on Practice Parameters for the Treatment and Diagnosis of Asthma. The American Academy of Allergy, Asthma and Immunology and the American College of Allergy, Asthma and Immunology. Ann Allergy Asthma Immunol 1995; 75: 543-625.

2. Board of Directors, American Academy of Allergy and Immunology. Position statement. Allergen skin testing. J Allergy Clin Immunol 1993; 92: 636-637.

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4. Reid MJ, Lockey RF, Turkeltaub PC, Platts-Mills TA. Survey of fatalities from skin testing and immunotherapy 1985-1989. J Allergy Clin Immunol 1993; 92: 6-15.

5. Bousquet J, Michel FB. Precision of prick and puncture tests [editorial]. J Allergy Clin Immunol 1992; 90: 870-872.

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