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Adverse local reactions to vaccines containing diphtheria and tetanus toxoids and pertussis antigen (DTP) are common, but generally benign. Most often, these reactions are manifested by erythema, induration, and tenderness occurring at the injection site 12 to 24 hours following immunization.¹⁻³ Less frequently, abscess formation may complicate intramuscular injections and these may be staphylococcal, clostridial, or sterile in etiology.⁴

Tetanus toxoid has been associated with a reaction incidence of 3% to 13%,^{5,6} and adverse reactions appear to be related to the number of prior immunizations and the height of preexisting antibody responses.^{3,6} However, recurrent abscess formation associated with hypersensitivity to one or more of the components of the DTP vaccine has not been reported previously.

The purpose of this paper is to describe a child with recurrent local abscess formation following DTP immunizations. Results of delayed-type hypersensitivity (DTH) skin tests suggested that hypersensitivity to tetanus toxoid was causally related to her adverse local reactions. A testing procedure is suggested for patients with recurrent, severe, or progressive local reactions to DTP immunizations.

CASE REPORT

J.A., a 5-year-old white girl, was clinically well except for a history of severe local reactions to DTP immunizations. She had tolerated her first two DTP immunizations without incident. At 6 months of age, following intramuscular injection of her third DTP immunization in the left lateral thigh, she developed an abscess, which measured approximately 3 cm in diameter. This lesion eventually drained and left a slight indentation in the soft tissue of her leg. A fourth DTP immunization given when she was 18 months old resulted in immediate local erythema. Over several weeks, a 5- to 6-cm abscess formed, it was eventually treated with antibiotics and drainage. Cultures were not obtained. Resolution of this abscess was associated with a significant degree of local

soft tissue dystrophy. The patient was evaluated at 5 years of age because of her mother's concern with administration of a scheduled preschool "booster" immunization.

A nitroblue tetrazolium (NBT) dye reduction test⁶ was performed to rule out chronic granulomatous disease. The patient's antibody level to pertussis antigen was measured with a microagglutination technique, and antibody levels to diphtheria and tetanus toxoids were measured with enzyme-linked immunosorbent assay (ELISA) techniques (commercially available through Microbiology Reference Laboratory, Long Beach, CA). Intradermal skin tests were placed using a 1:20 dilution of fluid tetanus toxoid (Wyeth, 5 Lf limit of flocculation) 0.5, final concentration 0.5 Lf/mL and diphtheria toxoid (Massachusetts Public Health Biologic Laboratories, Boston). Initially, approximately 0.02 mL of each preparation was injected to assess for immediate hypersensitivity. Thereafter, 0.1 mL of each preparation was injected in the skin of the left forearm to assess for DTH. Reactions to these tests were measured after 48 hours.

RESULTS

Nitroblue tetrazolium dye reduction by the patient's neutrophils was normal (98% nitroblue tetrazolium dye plus cells). Antipertussis antibody was positive at a titer of 1:32 (normal). Antidiphtheria antibody was 0.4 U and antitetanus antibody was 6.2 U. Protective levels of these antibodies in this laboratory are considered to be greater than 0.1 U. Immediate hypersensitivity skin tests were negative.

Twenty-four hours after placement of the skin tests, a large local reaction was noted at the tetanus toxoid DTH skin test site. The patient was advised by telephone to begin application of topical corticosteroids. Despite this treatment, at 48 hours the tetanus toxoid reaction on the forearm measured 16 × 16 mm of induration and 32 × 60 mm of erythema and was exquisitely tender. The diphtheria toxoid DTH skin test was negative.

The severity of the tetanus DTH skin test reaction indicated impending local tissue necrosis and the patient was given prednisone, 15 mg, twice daily, for seven days. The skin lesion resolved over 48 hours and did not recur. Because of the extreme DTH sensitivity and the presence of protective antibody levels, further immunization with DTP vaccine was withheld.

DISCUSSION

Local reactions to DTP are common,¹⁻³ but abscess at the site of injection is rare, six to ten reactions per million doses.⁷ In 1978, one lot of DTP released in the United States (Sclavo DTP, lot 110D) was found to be associated with sterile abscesses in one per thousand vaccinees and was

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subsequently withdrawn.⁸ To our knowledge, recurrent abscess formation at the site of DTP injection has not been reported previously. That our patient did not have an underlying immune deficiency as a predisposing factor to these complications is suggested by the following: a negative history of other serious infections; normal findings on physical examination; normal nitroblue tetrazolium dye reduction by the patient's granulocytes; normal to elevated levels of antibodies to pertussis antigen, diphtheria, and tetanus toxoids; and a vigorous DTH skin test response to tetanus toxoid.

The routine parenteral exposure of young infants to tetanus toxoid has led to the use of this antigen as a skin test agent for measuring delayed-type hypersensitivity as a reflection of T-cell-mediated immune function.⁹⁻¹² In contrast, skin testing with tetanus toxoid has not been used as a measure for adverse clinical hypersensitivity to this antigen. The concentration of fluid tetanus toxoid for skin testing in this patient, 1:20, was at least four times more dilute than that previously suggested for tetanus toxoid skin testing as a measure of T-cell function. For example, Stiehm¹³ and Gordon et al¹² suggest a 1:5 dilution (2 Lf/mL) and Steele et al¹¹ used an undiluted preparation in screening for cell-mediated immunity in children.¹¹ In their study of normal adults, Gordon et al¹² noted a 12% incidence of severe local reactions (greater than 400-mm² induration). Our 5-year-old patient's 256-mm² induration with impending necrosis was in response to one fourth the amount of antigen administered to these adults and suggested a true hypersensitivity to this component of the vaccine.

We suggest that the development of progressively larger local reactions to DTP immunizations is an indication for assessment of the patient's immune status to the individual components of the vaccine. This is readily achieved by commercially available measurement of specific antibody responses to pertussis antigen and diphtheria and tetanus toxoids,

and immediate and delayed-type hypersensitivity skin tests to diphtheria and tetanus toxoids.

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Polaroid Confirmation of the 'Difficult-to-Demonstrate' Inguinal Hernia

Pediatric surgeons are often confronted with a

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child referred for an inguinal hernia, in which the hernia cannot be elicited or demonstrated at physical examination. The mother usually gives an excellent history, but in spite of pushing and prodding of the baby, and making the baby cry, the hernia does not appear. This report will demonstrate how a clever mother confirmed the presence of a bulge in spite of the surgeon's inability to demonstrate it on three visits.

CASE REPORT

A 15-month-old male infant was seen because the

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