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30 allergy skin testing

To avoid false negatives, a “positive control” substance consisting of a histamine analog is also injected into the forearm at the time of skin testing. This will cause a wheal and flare response even in the nonallergic patient unless the patient is immunosuppressed.

For inhalant allergens, skin tests are extremely accurate. However, for food allergies, latex allergies, drug sensitivity, and occupational allergies, skin tests are less reliable.

Contraindications

- Patients with a history of prior anaphylaxis

Potential complications

- Anaphylaxis

Interfering factors

- False-positive results may occur with dermographism.
- False-positive results may occur if the patient has a reaction to the diluent used to preserve the extract.
- False-negative results may be caused by poor-quality allergen extracts, diseases that attenuate the immune response, or improper technique.
- Infants and the elderly may have decreased skin reactivity.
- ✔ Drugs that may *decrease* the immune response of skin testing include ACE inhibitors, beta-blockers, corticosteroids, nifedipine, and theophylline.

Procedure and patient care

Before

PT Explain the procedure to the patient.

- Obtain a history to evaluate the risk of anaphylaxis.
- Identify any immunosuppressive medications the patient may be taking.
- Evaluate for dermographism by rubbing the skin with a pencil eraser and looking for a wheal at the site of irritation.
- Draw up 0.05 mL of 1:1000 aqueous epinephrine into a syringe in the event of an exaggerated allergic reaction.
- Observe skin testing precautions:
 1. Be sure that a physician is immediately available.
 2. Evaluate the patient for dermographism.
 3. Proceed with caution in patients with current allergic symptoms.
 4. Render great detail to the injection technique.
 5. Avoid bleeding due to injection.
- A negative prick-puncture test should be performed before an intradermal test.

During

Prick-puncture method

- A drop of the allergen solution is placed onto the volar surface of the forearm or back.
- A 25-gauge needle is passed through the droplet and inserted into the epidermal space at angle with the bevel facing up.
- The skin is lifted up and the fluid is allowed to seep in. Excess fluid is wiped off after about a minute.

Intradermal method

- With a 25-gauge needle, the allergen solution is injected into the dermis by creating a skin wheal. In this method, the bevel of the needle faces downward.
- In general, the allergen solution is diluted 100- to 1000-fold before injection.

Patch method

- Clean the skin area (usually the back or arm).
- Apply the patches to the skin (as many as 20-30).
- Instruct the patient to wear the patches for 48 hours and to avoid bathing or activities that cause heavy sweating.
- Tell the patient the patches will be removed at the doctor's office. Irritated skin at a patch site may indicate an allergy.

After

- Evaluate the patient for an exaggerated allergic response.
- In the event of a systemic reaction, a tourniquet should be placed above the testing site, and epinephrine should be administered subcutaneously.
- With a pen, circle the testing site and mark the allergen used.
- Read the skin test at the appropriate time.
- Skin tests are read when the reaction is mature, after about 15 to 20 minutes. Both the largest and smallest diameters of the wheal are determined. The measurements are averaged.
- The flare is measured in the same manner.
- Observe the patient for 20 to 30 minutes before discharge.

Abnormal findings

Allergic rhinitis

Allergy-related diseases

Angioedema

Asthma

Dermatitis

Food or drug allergy

Occupational allergy

notes

alpha-fetoprotein (AFP, α_1 -Fetoprotein)

Type of test Blood

Normal findings

Adult: < 40 ng/mL or < 40 mcg/L (SI units)

Child (< 1 year): < 30 ng/mL

(Ranges are stratified by weeks of gestation and vary according to laboratory.)

Test explanation and related physiology

Alpha-fetoprotein (AFP) is an oncofetal protein normally produced by the fetal liver and yolk sac. It is the dominant fetal serum protein in the first trimester of life and diminishes to very low levels by the age of 1 year. It is also normally found in very low levels in the adult.

AFP is an effective screening serum marker for fetal body wall defects. The most notable of these are neural tube defects, which can vary from a small myelomeningocele to anencephaly. If a fetus has an open body wall defect, fetal serum AFP leaks out into the amniotic fluid and is picked up by the maternal serum. AFP from fetal sources can normally be detected in the amniotic fluid or the mother's blood after 10 weeks' gestation. Peak levels occur between 16 and 18 weeks' gestation. Maternal serum reflects the changes in amniotic AFP levels. When elevated maternal serum AFP levels are identified, further evaluation with repeat serum AFP levels, amniotic fluid AFP levels, and ultrasound is warranted.

Elevated serum AFP levels in pregnancy may also indicate multiple pregnancy, fetal distress, fetal congenital abnormalities, or intrauterine death. Low AFP levels after correction for age of gestation, maternal weight, race, and presence of diabetes are found in mothers carrying fetuses with trisomy 21 (Down syndrome). See *maternal screen testing* (p. 603) and *nuchal translucency* (p. 890) for other pregnancy screening tests.

AFP is also used as a tumor marker; see p. 134.

Interfering factors

- Fetal blood contamination, which may occur during amniocentesis, can cause increased AFP levels.
- Recent administration of radioisotopes can affect values.

Procedure and patient care

- See inside front cover for Routine Blood Testing.
- Fasting: no
- Blood tube commonly used: red
- If AFP is to be performed on amniotic fluid, follow the procedure and patient care for amniocentesis (p. 43).
- Include the gestational age on the laboratory slip.

Abnormal findings

▲ Increased maternal AFP levels

Abdominal wall defects

(e.g., gastroschisis or omphalocele)

Fetal death

Fetal distress or congenital anomalies

Multiple pregnancy

Neural tube defects

(e.g., anencephaly, encephalocele, spina bifida, myelomeningocele)

Threatened abortion

▼ Decreased maternal serum AFP levels

Fetal wastage

Trisomy 21 (Down syndrome)

▲ Increased nonmaternal AFP levels

Embryonal cell or germ cell tumor of the testes

Germ cell or yolk sac cancer of the ovary

Liver cell necrosis (e.g., cirrhosis or hepatitis)

Other cancers (e.g., stomach, colon, lung, breast, or lymphoma)

Primary hepatocellular cancer (hepatoma)

notes

sex-linked diseases such as hemophilia) or the existence of many genetic and chromosomal aberrations (e.g., trisomy 21).

- ***Fetal status affected by Rh isoimmunization.*** Mothers with Rh isoimmunization may have a series of amniocentesis procedures during the second half of pregnancy to assess the level of bilirubin pigment in the amniotic fluid. The quantity of bilirubin is used to assess the severity of hemolysis in Rh-sensitized pregnancy. Amniocentesis is usually initiated at 24 to 25 weeks' gestation when hemolysis is suspected.
- ***Hereditary metabolic disorders,*** such as cystic fibrosis.
- ***Anatomical abnormalities,*** such as neural tube closure defects (myelomeningocele, anencephaly, spina bifida). Increased levels of alpha-fetoprotein (AFP) in the amniotic fluid may indicate a neural crest abnormality. Decreased AFP may be associated with increased risk of trisomy 21.
- ***Fetal distress,*** detected by meconium staining of the amniotic fluid. This is caused by relaxation of the anal sphincter. In this case the normally colorless or pale, straw-colored amniotic fluid may be tinged with green. Other color changes may also indicate fetal distress. There are, however, more accurate and safer methods of determining fetal stress such as the fetal biophysical profile (p. 397).
- ***Assessment of amniotic fluid for infection.*** Amniocentesis is used to obtain fluid for bacterial culture and sensitivity when infection is suspected. This is especially helpful if premature membrane rupture is suspected. Amniotic fluid can also be obtained if viral infections that may affect the fetus are suspected during pregnancy.
- ***Assessment for pre-mature rupture of membranes.*** Through amniocentesis, a dye can be injected into the amniotic fluid. If this same dye is found in vaginal fluid, rupture of the amniotic membrane is documented. This is sometimes referred to as the *amnio-dye test*. There are, however, more practical tests of vaginal fluid to determine membrane rupture. Most commonly, the pH of the vaginal fluid is determined using a *nitrazine test* strip. If the test strip turns dark or blue, amniotic fluid is present in the vagina, and membrane rupture is documented. There are now several commercial companies that provide easily performed immunoassays that are able to differentiate normal vaginal discharge from amniotic fluid associated with rupture of membranes. These immunoassays use monoclonal antibodies to identify *placental alpha microglobulin-1 (PAMG-1)*. The concentration of PAMG-1 in vaginal fluid is thousands of times higher in amniotic fluid than it is in normal vaginal secretions, thus allowing differentiation of the two.

46 amniocentesis

- **Paternity testing.** DNA from the fetus can be compared to DNA from the potential father.

The timing of the amniocentesis varies according to the clinical circumstances. With advanced maternal age and if chromosomal or genetic aberrations are suspected, the test should be done early enough (at 14 to 16 weeks of gestation; at least 150 mL of fluid exists at this time) to allow a safe abortion. If information on fetal maturity is sought, performing the study during or after the 35th week of gestation is best.

Chorionic villus sampling (CVS) may be even better than amniocentesis for karyotyping and genetic analysis. CVS can be performed earlier in the pregnancy than amniocentesis. Thus with CVS, a decision can be made concerning abortion much earlier in the pregnancy than with amniocentesis.

Contraindications

- Patients with abruptio placentae
- Patients with placenta previa
- Patients with a history of premature labor (before 34 weeks of gestation unless the patient is receiving antilabor medication)
- Patients with an incompetent cervix or cervical insufficiency
- Patients with anhydramnios
- Patients with suspected premature labor
- Patients with infections, such as HIV/AIDS, hepatitis B, or hepatitis C because these infections could be transferred to the fetus during the procedure.

Potential complications

- Abortion
- Abruptio placentae
- Amniotic fluid embolism
- Fetal injury
- Inadvertent damage to the bladder or intestines
- Infection (amnionitis)
- Leak of amniotic fluid
- Maternal hemorrhage
- Maternal Rh isoimmunization
- Miscarriage
- Premature labor

Interfering factors

- Fetal blood contamination can cause false AFP elevations.
- Hemolysis of the specimen can alter results.
- Contamination of the specimen with meconium or blood may give inaccurate L/S ratios.