

IRON: supplement, infuse, inject or transfuse

Iron is essential for normal neurological function and physical growth; the key lies in iron balance: too little iron is just as health-threatening as too much iron. Because symptoms of iron out-of-balance in either direction can be similar, tests are needed to determine body iron status. In adults, fasting serum ferritin greater than 200ng/mL (females) or 300ng/mL (males) with an accompanying transferrin iron saturation percentage (TIS%) greater than 45% may be indicative of iron overload. Fasting serum ferritins of less than 15ng/mL (females) or 20ng/mL (males) with an accompanying TIS% less than 15% may be indicative of iron deficiency.

*"The use of iron pills as a tonic for the treatment of an undiagnosed anemia can never be condoned". Iron Deficiency: Misunderstood, misdiagnosed and mistreated. CK Arthur & JP Isbistor, *Drugs* 33: 171-182, 1987*

Except for those with anemia of chronic disease associated with cancer, inflammatory diseases or infections, replenishment of iron to correct many forms of anemia is appropriate. Anemia of chronic disease can mislead some physicians to believe they are dealing with anemia due to insufficient iron. Low hemoglobin may prompt a physician to prescribe iron pills, usually ferrous sulfate and generally in quantities well above 30 milligrams per day.

For those whose underlying cause of anemia is due to presence of inflammation or disease, iron supplementation may be harmful. These patients will likely demonstrate a normal to slightly low hemoglobin with an elevated ferritin. A natural *Iron Withholding Defense System* is working to keep iron away from developing diseases such as tumors, cancers or opportunistic pathogens such as salmonella, mycobacterium, candida, and E-coli, all of which thrive on and proliferate with iron.

When iron replenishment is needed, iron can be administered in several ways: orally by pill, infusion by intravenous method, intramuscularly by injection, or red blood cell transfusions. Methods will vary, depending upon several factors such as the extent of anemia, cause of anemia, patient and physician preferences.

Moderately low iron reserves or mild anemia due to insufficient daily intake of iron might be corrected with oral iron in the form of pills. Ferrous sulfate, ferrous fulminate, or ferrous gluconate are common forms of iron pills which are usually inexpensive. Anemia in women of child bearing age is generally due to insufficient daily intake of iron or blood loss due to heavy menstrual bleeding. Supplemental iron can be a good first line of therapeutic replacement for those with moderately low hemoglobin--less than 10.5g/dL in females or less than 11.9g/dL in males--with an accompanying serum ferritin--less than 15ng/mL females or 20ng/mL males.

Adequate daily iron may be obtained by supplemental **iron pill** of 30 milligrams per day with adjustment in diet to include three 4oz portions of lean meat per week. Meat contains the most easily absorbable form of iron; eating such meats with vitamin C-rich juice will improve absorption further. This will likely correct anemia within a month to six weeks. If hemoglobin and ferritin do not respond by rising to normal levels, further investigation is warranted.

Parenteral iron does not require the intestine for absorption. Administered by **infusion** or by **injection**, usually in the form of iron sorbitol, parenteral iron is one way of assuring adequate iron is supplied to bone marrow for red cell production.

Intravenous Infusion is preferred by most hematologists over intramuscular injections because fewer side effects accompany IV

infusions. Prior to each infusion, a test dose (25mg of iron dextran is given over period of five minutes) is given and the patient is closely supervised to assure he or she can tolerate iron given this way. If the patient develops no adverse reaction to the test dose, escalating doses are given over the next few days until 2 grams per infusion (3-4 hours) are tolerated. Possible side effects include low blood pressure, anaphylactic shock, chest pain, shortness of breath. When IV iron is administered carefully, with close observation, patients usually tolerate the treatments well.

Iron administered intramuscularly (IM) is probably the most controversial and not preferred by most physicians. IM iron is generally administered to the buttocks and can be painful, result in bleeding into the muscle and lead to intramuscular neoplasm (cancer). Some patients report an orange discoloration at injection sites which appear to be permanent. When iron is injected, it is properly done using a "Z technique" to prevent intramuscular bleeding or discoloration.

Transfusion:

Individuals with thalassemia, sickle-cell anemia, some renal diseases, some types leukemia and myelodysplasia have diminished ability to produce red blood cells. Because they cannot make adequate hemoglobin, transfusion of red blood cells helps correct anemia associated with these disorders. However, these patients are at risk of iron overload as each unit of blood transfusion has about 250 milligrams of iron. Given one blood transfusion a month, which is standard therapy for those with thalassemia, a patient will accumulate about 3 grams of extra iron within a year. When these excesses exceed 10-15 grams, vital organs begin to fail. This iron overload can lead to neurological disorders, liver, heart and pancreatic failure and thus must be addressed with iron chelation therapy. (See article on transfusion dependent iron overload this issue, page 13).

SIDE-EFFECTS AND COMPLICATIONS OF PARENTERAL IRON DEXTRAN

SHORT TERM

anaphylactic shock
low blood pressure
fever
joint pain (arthralgia)
muscle pain (myalgia)
swollen lymph nodes
chest, back or
abdominal pain
infection
urticaria (rash/hives)
nausea or vomiting
severe itching
seizures
flushing
headache
phlebitis (inflammation
of vein)
rigors (sudden shivering)

LONG TERM

both intramuscular and IV iron
IRON OVERLOAD

Complications of
intramuscular iron injection

chronic pain at injection site
skin staining
local skin atrophy (wasting)
abscess
sarcoma (cancer)

REFERENCE:

and suggested reading for physicians
David Burns and James Pomposelli
Risks and side effects of iron therapy
toxicity of parenteral iron dextran therapy
Kidney International, Vol. 55 suppl 69 (1999)
S 119-S124
Iain C. MacDougall Strategies for iron supplementation: Oral versus intravenous
Kidney International, Vol. 55, Suppl. 69 (1999)
pp S 61-S 66