Monitoring of iron status and iron supplementation- CKD patients

Markers used to monitor Iron status: (14)

1. Serum ferritin
   - 200 to 800 ng/ml (recommended range)
   - Correlates with storage iron in liver, spleen and bone marrow reticuloendothelial cells
2. Transferrin saturation (TSAT)
   - 20 to 50 % (recommended range)
   - = serum iron (ug/dl) / TIBC (ug/dl) x 100
   - Correlates with iron readily available for erythropoiesis
3. CHr (Reticulocyte haemoglobin content) (i) p 368
   - 25.9 – 33.9 pg (normal range)
   - Correlates with a real-time estimate of iron availability for haemoglobin production in the bone marrow
   - Levels are not elevated during inflammation
   - Greater sensitivity and specificity than classic iron markers

Frequency for monitoring Iron Studies: (1,2)

- Monthly:
  - during initiation or adjustment of EPO therapy
  - after completion of course of IV iron
  - during periods of iron overload
- 3rd monthly:
  - all patients with stable adequate iron stores

Indications for Iron deficiency: (2)

1. Initial serum ferritin level < 200 ug/L **
2. Initial Transferrin saturation < 20%
3. More than 10% hypochromic erythrocytes (individual cell Hgb < 28 g/dL)

CONTRA-INDICATIONS FOR IV IRON SUPPLEMENTATION: (12, 14)

1. Iron overload
   - Ferritin > 800 ng/ml or TSAT > 50%
2. Known allergies to Ferrosig and/or Venofer

INDICATIONS FOR IV IRON INFUSION:

1. Intolerance to oral iron
2. Worsening of iron deficiency or suboptimal response to EPO despite oral iron supplementation

IV IRON INFUSIONS AVAILABLE:

IV Iron solutions available: (Check with Pharmacy for availability and suitability)

1. Iron polymaltose (Ferrosig):
   a. Incidence of adverse reaction to Ferrosig is lower than iron dextran

2. Venofer:
    a. Available for patients who have had a previous allergic reaction to Ferrosig

ADVERSE REACTIONS TO IV IRON INFUSION: (12)

- Anaphylaxis-like reactions usually occur within a few minutes after the commencement of an infusion
- A Medical Officer needs to be advised prior to the commencement of the first infusion
- There must be immediate access to the medications required for the treatment of anaphylaxis in the rare event that it may occur

A. Immediate reactions:

a. Anaphylaxis: dyspnoea, faintness, hypotension, loss of consciousness
b. Headache
c. Nausea and vomiting
d. Joint and muscle pain
e. Dizziness
f. Flushing
g. Sweating
h. Rash, including urticaria

If any of the above signs or symptoms develop, STOP INFUSION IMMEDIATELY and call for medical assistance (Pace 2):

Treatment of anaphylaxis:

1. Lie patient flat and raise their feet

2. Administer 100 % oxygen via mask

3. Administer fluid including gelofusine IV to maintain systolic BP to 100 mg Hg

4. Medical Officer to give adrenaline (1:1000) immediately 0.5 ml subcut (repeat at 5 to 15 minute intervals if necessary) followed by hydrocortisone 200 mg IV and diphenhydramine 50 mg IV

5. Commence CPR in the event of a respiratory or cardiac arrest

B. Delayed reactions:

a. Dizziness
b. Myalgia and arthralgia
c. Stiffness in arms, leg or face
d. Chest and back pain
e. Chills and fever
f. Rash, including urticaria
g. Generalised lymphadenopathy

References:

1. McMahon L. Haemoglobin. Nephrology. 2008; 13:s44-s47

2. CARI: Caring for Australasians with renal impairment: Guideline summary; 2009 [cited 2010 July 14]. Available from: http:// www.cari.org.au/ DIALYSIS_bht_published/ Iron.pdf

3. MacDougall I, Eckardt K. Chapter 72: Anaemia in chronic kidney disease. In Feehally J, Floege J, Johnson R J. Comprehensive clinical nephrology. 3rd ed. Philadelphia: Mosby, 2007. p. 853-860

4. Singh A K, Hertello P. The benefits of IV iron therapy in treating anemia in patients with renal disease and co morbid cardiovascular disease. Nephrol Nurs J. 2005; 32(2):199-206

5. Goldsmith D, Covic A. Time to reconsider evidence for anaemia treatment (TREAT) = Essential safety arguments (ESA). Nephrol Dial Transplant. 2010; 25:1734-1737

6. FDA Information for Healthcare Professionals: Erythropoiesis Stimulating Agents (ESA): FDA ALERT [11/16/2006, Updated 2/16/2007 and 3/09/2007]. Available: http://www.fda.gov.au

7. Unger E F, Thompson A M, Blank M J, Temple R. Erythropoiesis-stimulating agents – Time for a reevaluation; 2010 [cited 2010 January 1]. Available from: www.nejm.org

8. Anker S D, Toto R. Future perspectives on treatment with erythropoiesis-stimulating agents in high-risk patients. NDT Plus. 2009; 2(Suppl 1):i3-i8

9. Eason A. Correcting iron-restricted erythropoiesis and improving anemia in patients on hemodialysis: practical tips that can make a difference. Nephrol Nurs J. 2009; 36(5):529-534

10. De Francisco A L M, Stenvinkel P, Vaulont S. Inflammation and its impact on anaemia in chronic kidney disease: from haemoglobin variability to hyporesponsiveness. NDT Plus. 2009; 2(Suppl 1):i18-i26

11. Burrows LaV, Muller R. Chronic kidney disease and cardiovascular disease: pathophysiologic links. Nephrol Nurs J. 2007; 34(1):55-63

12. Daugirdas J T, Blake P G, Ing T S. Handbook of dialysis. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2001. p. 159-162, 477-489

13. KDOQI (Kidney Disease Outcomes Quality Initiative). Clinical practice recommendation for anaemia in chronic kidney disease in adults. 2006 [cited 2009 September 15]. Available from: file:///F:/Anaemia%20identifying% 20patients.htm

14. Enders H M. Evaluating iron status in hemodialysis patients. Nephrol Nurs J. 2002; 29(4):366–369

15. Strippoli G F M, Navaneethan S D, Craig J C, Palmer S C. Haemoglobin and haematocrit targets for the anaemia of chronic kidney disease. Cochrane database of systematic reviews. 2006, Issue 4 [cited 2010 May 5]. Available from: http://www.mrw.interscience.wiley.com/cochrane/clsysrev/articles

16. Hayat A, Haria D, Salifu M. Erythropoietin stimulating agents in the management of anemia of chronic kidney disease. Patient Prefer Adherence. 2008; 2:195-200

17. Locatelli F, Covic A, Eckardt E-U, Wiecek A, Vanholder R. Anaemia management in patients in chronic kidney disease: a position statement by the Anaemia Working Group of European Renal Best Practice (ERBP). Nephrol Dial Transplant. 2009; 24:348-354