

## The Management of Iron Deficiency Anaemia & Treatment Prior to Cardiac Surgery

### Background:

Should we be worried about an anaemic patient having major surgery? Can clinicians stop ignoring pre-operative anaemia? The WHO definition of anaemia is a haemoglobin concentration  $<13\text{g.l}^{-1}$  in men and  $<12\text{g.l}^{-1}$  in women<sup>1</sup>.

Anaemia is often a simple diagnosis and largely reversible<sup>2</sup>. Iron deficiency anaemia is the most common cause of pre-operative anaemia<sup>2</sup>. If left untreated it can lead to increased chances of death, morbidity and complications post-operatively<sup>3</sup>. Pre-operative anaemia has been shown to be an independent risk factor for adverse outcomes<sup>4</sup>, increased rate of peri-operative blood transfusions and contributes to postoperative morbidity<sup>4</sup>. Therefore anaemia should be detected, investigated and treated. A study looking at the impact of pre operative anaemia ( $\text{Hb} < 12.5\text{g.l}^{-1}$ ) on patients undergoing elective cardiac surgery found that this was associated with mortality, renal failure, and stroke<sup>5</sup>.

### Introduction:

We have set up a pre-operative anaemia service which involves a multi-disciplinary approach to detecting, investigating, and treating iron deficiency anaemia.

### Detecting

All patients seen in the pre-operative clinic have their haemoglobin measured and these results are checked daily.

An  $\text{Hb} < 13\text{g.l}^{-1}$  is an indicator to assess their iron status with a specific focus on serum ferritin, the intracellular protein that stores iron and transferrin saturations in which iron is bound in the circulation.

### Investigating

The laboratory blood tests are reviewed and the patient's history is thoroughly examined to identify the likely cause of the anaemia. Specialist input is required if no reason for the anaemia is found. The patient is referred for gastrointestinal review if their  $\text{Hb}$  is  $<10\text{g.l}^{-1}$  often requiring endoscopy/colonoscopy prior to iron infusion and surgery.

### Treatment

The treatment goal is to increase the pre-operative  $\text{Hb}$  which is achieved by iron replacement. The service we provide replaces iron via intravenous infusion as this is achieved reliably and rapidly. Studies in several clinical settings have found that, compared to oral iron, treatment with intravenous iron results in a greater increase in  $\text{Hb}$ , higher levels of iron stores or both.

At pre-operative assessment  
 $\text{Hb}$  checked on every patient

**$\text{Hb} < 13\text{g.l}^{-1}$**

YES

NO

No further investigation

If  **$\text{Hb} < 10\text{g.l}^{-1}$**  review the patient's medical records to establish the cause. A Gastroenterologist referral may need to be made to investigate further.

**Check Iron Status** (Request Serum Ferritin, TSATS, U&Es, CRP, TFTs and evaluate MCV)

Serum Ferritin -  $<100\text{ ug/litre}$ -1 and/or TSATS  $<20\%$   
The NICE guidelines for the management of chronic kidney disease advises that a TSATS  $<20\%$  (and/or ferritin  $<100\text{ }\mu\text{g L}^{-1}$ ) indicates iron deficiency.

### Iron deficiency treatment

**Oral iron**- 4 weeks for a response and requires adequate gut absorption. Patients with inflammatory bowel disease should not be given oral iron. This method is more suitable for patients that cannot come to hospital for IV iron replacement.

**IV Iron**- Iron replacement achieved more rapidly and reliably if given IV. Should be offered if oral iron not tolerated or do not respond to oral iron.

**Erythropoietin**- IV iron combined with an erythropoiesis-stimulating agent is more effective than IV iron alone at increasing  $\text{Hb}$ .

### IV Dosage

Most patients will require 1000mg. If the patient weighs less than 50kg, a lower dose ( $20\text{mg/kg}$ ), will have been prescribed (e.g.  $45\text{ kg} = 900\text{ mg}$ ;  $40\text{kg} = 800\text{mg}$ ).  
Darbepoetin- 200 micrograms subcutaneous injection.

### Follow-up

The patient is called after discharge (within 48 hours) to check progress and enquire about any side effects.

### Patient assessment

- Past episodes of anaemia or other blood disorders
- Blood donation
- Vegan/vegetarian diet
- Alcohol consumption
- Appetite
- Recent weight loss
- Symptoms of upper or lower GI bleeding
- Change in bowel habit
- Menstrual bleeding
- Haematuria
- Medical conditions: arthritis, renal disease, malignancy, or chronic infection
- Drugs: Warfarin, antiplatelet and NSAIDs

### Next steps:

Pre operative IV Iron is not yet a NICE approved therapy as there isn't sufficient research to support it. However there is currently a national study underway looking at the benefit of IV Iron pre operatively in open abdominal surgery and cardiac surgery. We have set up this service in Royal Sussex County Hospital following this trial and have been collecting data for each patient. We would like to look at the impact of IV Iron and whether this therapy in our patients reduces the number of complications post op. In particular, strokes, renal failure, number of blood transfusions and mortality rate.

### References

1. Beutler E, Waalen J. The definition of anemia: what is the lower limit of normal of the blood hemoglobin concentration? *Blood* 2006; **107**: 1747–1750.
2. McLean, E., Cogswell, M., Egli, I. et al, Worldwide prevalence of anaemia, WHO Vitamin and Mineral Nutrition Information System, 1993-2005. *Public Health Nutr.* 2009;**12**:444–454.
3. Carson J, Duff A, Poses R, et al. Effect of anaemia and cardiovascular disease on surgical mortality and morbidity. *Lancet* 1996; **348**: 1055–1060
4. DunneJR, MaloneD, TracyJK, GannonC, NapolitanoLM. Peri-operative anemia: an independent risk factor for infection, mortality, and resource utilization in surgery. *Journal of Surgical Research* 2002; **102**: 237–244.
5. KarkoutiK, WijeyesunderaDN, BeattieWS. Risk associated with preoperative anemia in cardiac surgery: a multicenter cohort study. *Circulation* 2008; **117**: 478–484.