RENAL ANAEMIA
&
ERYTHROPOITIN

Lt Col. Dr. S.B. Bajracharya
M.D.(Consultant Physician)

In last 4 to 5 decades there has been considerable improvement in renal replacement therapy [Ref Chart-I]. With the advent of artificial kidney in 1960 many patients of end stage Renal disease enjoy fairly good quality of life. But in spite of regular haemodialysis they complained of weakness and lethargy obviously due to chronic Renal Anaemia. Chronic Renal Failure due to any cause is associated with Anaemia except due to polycystic disease of the kidney. The explanation is large kiney produces large amount of erythropoitin. The most common cause of anemia in of C.R.F. is due to deficiency of Erythropoitin which is produced in the particular kidney fibroblast. It is produced as a response to anaemia and hypoxia.

Chart - I

Replacement of renal functions by artificial kidneys:

Activity of normal kidneys	substitution by artificial kidneys
(1) Excretion of waste fluid	Almost possible
(2) Removal of surplus water	Possible
(3) Adjustment of balance of electrolytes	Almost possible
(4) Adjustment of blood pH	Possible by adjustment of dialyzing fluid
(5) Secretoion of erythropoietin	Almost possible by medication
(6) Activation of vitamin D	Possible to a certain degree by medication ?
(7) Secretion of renin	Possible to a certain degree by medication ?
(8) Inactivation of hormones	Basically impossible

MECHANESM OF ACTION:

Normal Erythropoisis is characterised by:

- Adequate Red call mass
- Hb concentration

In this process stem cells give rise to progenitor cells B.F.U.E. (The burst forming unit erythroid) and GF.U.E. (Colony forming unit erythroid). This differentiation requires No of growth factors such as:

- Interleukin 3
- Granulocyte Macrophage colony stimulating factor.
- Insulin like growth factor.
- Erythropoitin (Which regulates the level B.F.U.E and CF.U.E)

A part from erythropoitin there are howewever causes of Anamia in C.R.F. (Chronic Renal Failure); they are :-

1. Reduced intake of iron due to
   - Anorexia
   - Dietary restriction
2. Impaired absorption of iron.
3. Toxic effects of uraemia on marrow.

Treatment guidelines:

Erythoropoitin is recommended for the treatment of the anaemia associated with the following indications:

- Anaemia related to chronic renal failure patients treated with dialysis.
- Symptomatic anaemic in renal failure patients not yet undergoing dialysis.

Correction phase:

The dosage amount of erythoropoitin appropriate for the correction of anaemia depends largely on the condition of each patient. A variety of factors can alter the response to and effectiveness of Erythoropoitin treatment. These include:

- Iron deficiency
- Occult blood loss
- Chronic infections
- Reduced response of uraemic bone marrow

A patient-specific dose titration, based on individual haematocrit/haemoglobin concentrations, may be necessary to find the correct dosage amount.

Initiation of treatment:

Treatment of renal anaemia with erythoropoitin should start with the moderate and steady correction of haematocrit values to a range of 30-35%. A more rapid attempt to raise haemoglobin concentrations is non-vital and increases the risk of hypertension. A slow increase of haemotocrit to a subnormal level is recommended for the initiation of erythoropoitin.

Subcutaneous adminstuation:

As a result of the latest studies performed with erythoropoitin, subcutaneous administration is the recommended route of administration for all patients. The dosage amount for the first four weeks of erythoropoitin treatment is 20 IU/Kg of body weight three times each week. If necessary, this dose may be doubled in monthly intervals to a maximum weekly dose of 240 IU/Kg administered in three weekly injections of erythoropoitin.

Intravenous administration:

The initial intravenously administrated dose of erythoropoitin is 40 IU/Kg three times each week for the first four weeks of treatment. If necessary, the dose may be doubled in monthly intervals to a maximum weekly dose of 240 IU/Kg administrated in three weekly injections.

Maintenance Phase:

Once the desired haematocrit value range has been reached, the maintenance phase of treatment should be undertaken to sustain haematocrit in the 30-35% range by halving the last correction phase dosage amount. Subsequent doses will depend on individual response, and further adjustments should be made at one-or two-week intervals.

Dosages for childern:

Clinical trial results has shown that on average, the required dosage amount of erythoropoitin per kilogram of body weight tends to be higher the younger the age of the child (Scigalla et.,al1989). However, the individual response to treatment cannot be predicted and the recommended dosage guidelines, with the appropriate individual adjustments, should be adhered to for children.

Clinical monitoring during erythoropoitin treatment:

There are several factors that can influence the response to and effect of erythoropoitin including:

- Haemoglobin/haematocrit levels.
- Iron stores/transferrin satutration
- Deficient folic acid, vitamin B_{12}
- Blood pressure.

Clinical monitoring of these parameters can optimise treatment and may improve response to therapy.

We have treated about ten patients with erythoropoitin and their response is fairly good. The following chart shows their response to erythoropoitin.

No of patient	Haemoglobin gm%		
	Before erythoropoietin	2 months after	At present on maintainance dose of erythoropietin
1	4	7	10
2	6	9	11
3	5.2	8	12
4	3.6	9	12
5	4.5	8	9
6	6.4	10	8.5
7	4.5	9	7.5
8	6.7	8	9.5
9	7	7	11
10	5.5	8.5	12

Treatment Guidelines in Renal Anaemia
Initial Dosage 3x20 IU/kg/wk.