The haematological management of patients with cyanotic congenital heart disease

A time for consensus?

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Aims Recurrent venesection of patients with cyanotic congenital heart disease may be detrimental, with an increased risk of cerebrovascular events and symptomatic iron-deficiency. The aim of this study was to determine the venesection policies as practised in hospitals within a U.K. region and to determine if these policies followed current recommendations.

Methods and Results Fifty-eight consultants (56% response rate) in cardiac specialties completed self-assessment questionnaires regarding the indications for and practice of venesection. Sixty-one percent of those responding were involved directly in the care of patients with cyanotic congenital heart disease and of these clinicians 97% used venesection. Indications for venesection varied, with 51% of those responding using an elevated haemoglobin per se (6.5–21.0 g . dl⁻¹); 78% an elevated haematocrit (0.55–0.75) and 83% symptoms. Desired maintenance haemoglobin and haematocrit levels also varied greatly. Fifty percent of the consultants responding routinely screened their patients for iron deficiency and 23% felt there was no indication for investigating a low mean corpuscular volume. Only 18% of the policies described followed any evidence based principles.

Conclusions The practice of venecsecting patients with congenital cyanotic heart disease varies greatly. Policies in many hospitals do not reflect the minimal benefits and considerable risks associated with recurrent venesection.

Key Words: Cyanotic congenital heart disease, adult venesection erythrocytosis.

Introduction

Chronic hypoxia in congenital heart disease results in alterations of serum erythropoietin stimulation with a rise in red-cell mass and total blood volumes. In children with cyanotic congenital heart lesions, an increased red cell mass has been linked with an increased risk of cerebrovascular events and in particular cerebral venous occlusions. The association has not, however, been documented in adults. Despite this, venesection has been regularly performed on erythrocytotic adult cyanotic patients, on the assumption that bringing the haematocrit down to a 'safe level' helped to reduce the risk of cerebral infarction. The definition of 'safe' was left to the discretion of the individual practitioner.

These attitudes have been challenged by Perloff et al. (1993) who reported on 112 cyanotic patients followed for a total of 748 patient-years. During this study, no patient progressed to clinical stroke despite haematocrit of up to 0.75. It was concluded that as an increased risk of stroke was not demonstrated and because of the potential for symptomatic iron deficiency that phlebotomy should be reserved for 'temporary relief of significant, intrusive hyperviscosity symptoms'. Symptoms were scored according to a specific haematology questionnaire.

The conclusions of Perloff et al. were recently endorsed by Ammash and Warnes who identified iron deficiency and recurrent phlebotomy, rather than an elevated red cell mass, as independent risk factors for cerebrovascular events in a cohort of 162 adult congenital cyanotic patients followed for up to 51 years (total of 3135 patient-years). Iron deficient red cells are relatively rigid microcytes with impaired deformability. This results in an increase in whole blood viscosity and thus the tendency to thrombosis. These findings have
encouraged a more conservative approach towards phlebotomy and the aggressive treatment of microcytosis. The aim of this study was to characterize the haematological management of cyanotic congenital heart disease patients, as practised by consultants with a special interest in cardiac disease in a U.K. region and to assess if there was consensus in management. This was compared to the more evidence-based recommendations of Perloff, and Ammash and Warnes.

Methods

One hundred and five members of the Scottish Cardiac Society (1996 Mailing List) were contacted by post and asked to complete a brief anonymous self-assessment questionnaire. The Cardiac Society encompasses all the clinical cardiac specialists in Scotland. Of those contacted 87.6% currently practise in Scotland, 10.4% in England and 2% in Wales. Forty-three consultant cardiologists (including eight professors), 49 consultant general physicians/cardiologists and 13 consultant cardiac surgeons were asked to complete five questions related to indications for and practice of venesection in patients with cyanotic congenital heart disease (Appendix 1). The remaining 24 consultant members of the Scottish Cardiac Society were not contacted as their specialties had no direct clinical access to patients with congenital heart disease e.g. physicists.

Results

Fifty-eight completed questionnaires were returned (55% response rate). Sixty percent of consultants responding currently had cyanotic congenital heart disease patients under their care — of these 48% were caring for less than five patients; 33% for 5–10 patients; with four caring for more than 15 patients. Four cardiac surgeons reported having only operative care for the patient, with no part in the patient's wider medical management. Five individuals were unaware of the number of cyanotic patients under their care.

Venesection formed part of the management of cyanotic congenital cardiac patients in 97% of those replying and was coordinated either by the cardiologist (56%), haematologist (12%), general physician (9%) or rarely by the family general practitioner. This task was occasionally shared (15%).

Indications for phlebotomy

The indications for phlebotomy varied greatly. Fifty-one percent stated that an elevated haemoglobin per se was an indication, quoting values between 16.5–21.0 g. dl⁻¹; 78% an elevated haematocrit (0.55 greater than 0.75; mean value 0.60).

Symptoms, most commonly breathlessness, lethargy and headaches, were used by 83% to decide when venesection was appropriate. Two individuals referred to Perloff's 1993 guidelines, which contained a hyperviscosity symptom questionnaire. Other indications included pre-operative erythrocytosis, and patient or parental request. Only 18% of those responding stated indications that were in line with the principles outlined above.

Phlebotomy techniques

Venesection was performed most commonly by junior medical staff and occasionally by nurse practitioners or family general practitioners. A minority of centres venesection more than one unit at any one time (25%). Concurrent fluid replacement was given in 60% of centres. One qualified this by stating only if an obstructive cardiac lesion was present. The most commonly used replacement was 500 ml, or a 'volume in = volume out regimen' of saline.

Participants were asked about desired maintenance haematological indices and 48% stated a maintenance haemoglobin (target from within the normal range, 24 g. dl⁻¹) and 77% a maintenance haematocrit level (target 0.53–0.65). Eleven percent did not feel the concept of a maintenance haematological index was appropriate, being guided by symptoms alone.

Iron deficiency and microcytosis

Eighteen consultants (51% of those responding to the question) routinely screened patients for iron deficiency using ferritin, transfer factor, mean corpuscular volume and blood film appearances. When asked specifically if a low mean corpuscular volume was investigated, 58% said 'yes' and 9% did not know. Twenty-three percent of consultants who responded felt there was no indication to treat either a low mean corpuscular volume or iron deficiency, whereas others suggested a low ferritin, symptoms or frank anaemia as adequate indications for therapy.

Ferrous sulphate was the most common drug therapy for iron deficiency. Dosing schedules varied from 200–600 mg per day, although the majority did not make specific comment. Only two individuals cautioned regarding the need for short courses of iron replacement therapy with monitoring for a sudden rise in haemoglobin.

Discussion

This study contacted the providers of cardiology services for a major U.K. region and confirmed the great variation in venesection practice in both district general and teaching hospitals. The majority of cyanotic congenital
heart disease patients identified were cared for outside a specialist centre. Unless this changes, there is an obvious need for widely available management guidelines.

The haematological management of patients with cyanotic congenital heart disease, as with many other areas in this field, has in the past suffered from a lack of evidence-based management protocols due to the small numbers of patients involved and the specialist area of practice. The papers by Perloff and more recently Ammash and Warnes, although retrospective in nature and conflicting with regards to prevalence of cerebral events, have been of value in assessing the benefits and disadvantages of phlebotomy in this population. In addition The Canadian Cardiovascular Society 1996 Consensus document on Adult Congenital Heart Disease[8] and the most recent edition of the Oxford Textbook of Medicine[9] also highlight the potential disadvantages of recurrent venesection. The current evidence available may be less than conclusive but is, at present, the best available. The need for a large multi-centred prospective study is obvious.

Only a minority of the practice described in this study followed the principles laid out by Perloff. Many venesections were performed for dubious indications, for example to bring haematological indices to an arbitrary 'acceptable' level or for questionable symptoms such as breathlessness. The involvement of haematologists in the management of these patients has the potential danger of clouding the distinction between this patient group and those with polycythaemia rubra vera, a completely different disease process with other management objectives. In addition, non-cardiac specialists and junior medical staff are not ideally placed to assess a patient with a complex cardiac lesion.

Venesection is not a benign therapy and may be detrimental to the health of the patient with potential for acute haemodynamic upset, iron deficiency and an increased risk of cerebrovascular events. Caring for patients with cyanotic congenital heart disease is frustrating due to our lack of therapeutic options but the desire to 'do something' must not lead us to prescribe inappropriate therapy.

Re-education of both medical care providers and patients is essential to avoid these problems and to end the phenomenon of inappropriate 'patient-led' phlebotomy.

References


Appendix I

Self-assessment questionnaire

1. Do you have patients with cyanotic congenital heart disease under your care? If yes, approx. how many?

2. Does venesection form part of their care? If yes, who co-ordinates this?

3. Which of the following do you believe are indications for venesection?
   - Elevated Haemoglobin, haematocrit, symptoms, other?
   - Please specify details.

4. Venesection
   - Whom is venesection physically performed by?
   - Max. no. of units removed at one time?
   - Is fluid replacement given? If yes please give details
   - What is your desired maintenance Hb/HCT?

5. Iron deficiency
   - Are patients routinely screened for iron deficiency?
   - If so using what parameters and how often?
   - Are low MCVs investigated?
   - What are the indications for treatment?
   - Is corrective therapy given?
   - Please include drug doses and duration of therapy

Appendix II

The current guidelines for phlebotomy from the Adult Congenital Heart Disease Clinic at the Western Infirmary, Glasgow.

Cyanotic congenital heart disease: guidelines for haematological management

Patients with cyanotic congenital heart disease should regularly have a full blood count, ferritin, urate, and biochemical profile measured at the clinic. This permits the early detection and assessment of erythrocytosis, thrombocytopenia, iron deficiency, electrolyte imbalance and renal or liver dysfunction.

Phlebotomy should not be performed for elevated haemoglobin levels or a raised haematocrit
per se being reserved for those with troublesome symptomatic hyperviscosity as assessed by Perloff's haematology questionnaire.

This should be performed only if iron deficiency and dehydration have been excluded.

Phlebotomy, when necessary, should be performed by an experienced member of medical staff who is able to assess the patient's haemodynamic state and the indication for phlebotomy.

A maximum of one unit of blood should be removed with fluid replacement, in the form of colloid, in a 'volume out = volume in' regimen. Saline should not be used as replacement.

Ferritin levels should be checked regularly in conjunction with observing for the onset of microcytosis. If indices of iron deficiency are detected iron replacement therapy should be instituted using low doses of oral iron e.g. ferrous sulphate 200 mg once a day (i.e. one tablet) and the cause for deficiency investigated. This is usually recurrent venesection.

A full blood count should be checked within the first week of iron therapy. Iron therapy should be terminated once the haemoglobin level begins to rise. This procedure may be repeated if necessary.

Aspirin or formal anticoagulation is not recommended treatment for erythrocytosis as many of these patients have bleeding disorders and deranged platelet function which may be exacerbated by these drugs.