Sargant Fund – Royal College of Anaesthetists

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Title

Pilot study of iron status in intensive care

Background

Our recent work has established that iron is an important factor in human pulmonary physiology,[1-5] introducing the possibility that iron deficiency may have adverse pulmonary sequelae in hypoxic patients, and that such patients could benefit from supplemental iron in the intensive care unit (ICU).[6] In order to begin exploring this possibility, we aimed to assess the prevalence and incidence of iron deficiency in our intensive care patient population.

Iron status has not been extensively studied in ICU. Although a small number of studies have reported a moderate prevalence of iron deficiency in ICU patients (e.g. 9%[7] and 13%[8]), in practice this is rarely treated or even measured. One reason for this is that historically it has been difficult to diagnose iron deficiency using standard blood tests in the ICU setting. Specifically, serum ferritin is an acute phase reactant and is therefore unreliable in the diagnosis of iron deficiency in critically ill patients.

We aimed to explore whether this problem can be overcome using assays of soluble transferrin receptor (sTfR)[9-11] funded by the Sargant Fund. Iron deficiency causes up-regulation of the transmembrane transferrin receptor on erythroblasts in the bone marrow. The sTfR present in the circulation is a truncated monomer of the transmembrane receptor which correlates closely with receptor expression and thus with true iron status, and does not significantly change with inflammation.[10,12]

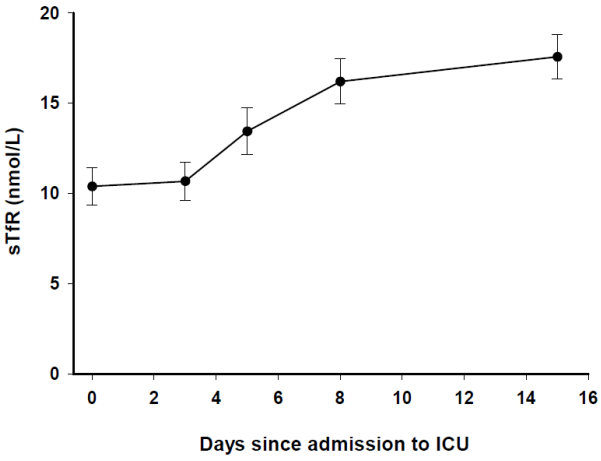
Methods

This was a retrospective study conducted using blood samples that had been collected from 100 Level 3 patients admitted to the Adult Intensive Care Unit, John Radcliffe Hospital, Oxford. On-going ethical approval was in place. Samples were available on admission to ICU and at intervals during the patients' stay in ICU up to a maximum of two weeks. Samples were analysed for sTfR by ELISA (R&D Systems, UK).

Results

Early analysis of results suggests that erythropoietic drive may exceed the availability of iron progressively over two weeks in intensive care. This is indicated by the rise in sTfR observed in patients who spent a full fortnight in ICU, shown in the figure pictured at right (mean ± SEM).

Note that the normal range for sTfR is 9-28 nmol/L.



Further sTfR results will be reported together with corresponding iron studies (serum iron, transferrin, transferrin saturation, ferritin) and hepcidin analyses, which are currently on-going. The data-set will then include both traditional and modern measures of iron status. The full results will be explored in relation to available patient information such as demographics, diagnoses, APACHE II scores and outcomes such as ICU length-of-stay, days ventilated and 30-day mortality.

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