

# Significance Of Preoperative Hemoglobin As A Screening Test In Children Underwent Magnetic Resonance Imaging (MRI) In General Anaesthesia

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## Abstract

Background:

The use of magnetic resonance imaging is growing exponentially. In most of the pediatric patients undergoing magnetic resonance imaging, general anaesthesia is required. Routine preoperative screening tests consume patient's time, discomfort and financial resources. In our institute we have a large number of children undergoing MRI scanning requiring general anaesthesia. They are assessed in preoperative clinic and as per our guidelines hemoglobin is done in each patient. In this survey we wanted to observe the impact of preoperative hemoglobin level done in planning and conduct of general anaesthesia.

Method:

After approval from departmental research committee, all pediatric patients of 1 to 14 years of age who had MRI under general anaesthesia were included. Children less than 1 year of age and procedures done without GA or sedation were excluded. The medical records numbers of all these patients were obtained from MRI section of radiology department and their files were retrieved from medical record room.

Results:

A total of 174 pediatric patients had MRI under general anaesthesia were included in this survey. Average hemoglobin of the patients was  $11.28 \pm 1.51$  mg/dl. Low hemoglobin was observed in few patients, but it was not significant. There was no evidence that the decision to cancel or postpone the case by anaesthetist or any other perioperative management had occurred as a result of preoperative low Hb.

Conclusion:

On the basis of this study, we can recommend that children who do not have any clinical features of anemia can safely undergo MRI in general anaesthesia.

## INTRODUCTION

The use of magnetic resonance imaging is growing exponentially because it provides excellent anatomic and pathologic detail<sup>1</sup>. It is being used in pediatric population because of multiple reasons like lack of radiation, non invasive and superior contrast resolution<sup>2</sup>. Most pediatric patients would require general anaesthesia (GA) for MRI. This is required to facilitate imaging by control of patient behavior and movement<sup>3</sup>. Like all other procedures under general anaesthetics, children scheduled for MRI also needs pre-anaesthesia evaluation which comprises history,

examination and investigations. Use of laboratory tests has long being an element of the preoperative evaluation<sup>4</sup>.

Several studies have shown that preoperative testing should be based on clinical examination rather than routine protocols. Routine preoperative screening tests consume patient's time, discomfort and financial resources. Multiple studies have shown that unnecessary preoperative testing could be eliminated without affecting outcome<sup>5,6,7,8</sup>. Hemoglobin (hb) screening is the most widely recommended preoperative laboratory test in patients scheduled for any kind of surgical procedure. The agreed guidelines at our

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institution state that all out-patients should be evaluated at the anaesthesia pre-operative clinic before they are admitted for procedure. The children are also assessed and advised to get hemoglobin and hematocrit levels as a minimum required laboratory investigation for MRI procedure

Anemia is common in developing countries<sup>9</sup>, but there is no evidence that mild to moderate anemia contributes to perioperative morbidity<sup>10</sup>. Secondly, there is increasing realization that the perioperative period is not an appropriate setting for screening and investigating asymptomatic anemia. MRI is a diagnostic procedure without any blood loss and pricking the child is sometimes very distressing and also poses unnecessary cost.

We hypothesize that the prevalence of anemia of clinical interest by current practice in generally healthy outpatient pediatric candidates is too infrequent to warrant routine screening. This study examines the impact of preoperative hemoglobin screening in asymptomatic outpatient pediatric patients for MRI would results in any change in perioperative management. Our aim was to proposed new departmental guidelines for performing hemoglobin testing in these types of patients and procedures.

### MATERIAL AND METHODS

This retrospective audit was conducted in a tertiary care referral center. Institutional guidelines did not require the University Research Ethics Committee approval nor informed patient consent for this particular audit. After approval from departmental research committee, all pediatric patients of 1 to 14 years of age who had MRI under general anaesthesia were included. Children less than 1 year of age and procedures done without GA or sedation were excluded. The medical records numbers of all these patients were obtained from MRI section of radiology department and their files were retrieved from medical record room. A data collection form was designed and variables were entered and analyzed, using SPSS (Statistical Package for Social Sciences version 17.0). Information was obtained from preanaesthesia clinic notes, preoperative and intraoperative anaesthesia forms and any other relevant primary physician's notes in the patient's file were recorded.

### RESULTS

A total of 174 pediatric patients had MRI under general anaesthesia between January and December 2010. A total of 154 files were retrieved from medical records while 20 files could not be accessed. The average age of the children was

4.41±3.34 years (95%CI: 3.88 to 4.94). Of the 154 patients, 75 (48.7%) were male and 79 (51.3%) were female. In ASA I, there were 78 (50.6%) patients while 76 (49.4%) were in ASA II. Average hemoglobin of the patients was 11.28±1.51 mg/dl (range 16-8). Low hemoglobin was observed in few patients, but it was not significant. There was no evidence that the decision to cancel or postpone the case by anaesthetist and / or any other perioperative management had occurred as a result of preoperative low Hb.

**Table 1**  
Characteristics of Patients

Variables	Mean ± SD	95%CI	Max - Min
Age (Years)	4.41±3.34	3.88 to 4.94	14 – 1
Hemoglobin (mg/dl)	11.28±1.51	11.04 to 11.52	16 – 8
HCT	33.81±4.06	33.16 to 34.46	46.7 – 24.5

### DISCUSSION

The need for sedation or general anaesthesia for children in remote locations such as the magnetic resonance imaging (MRI) and computerized tomography (CT) scanning suites continues to markedly increase. This need is becoming more and more evident in many children's hospitals as the volume of cases in the non-operating room setting approaches that of the operating room. This is equally true in our institute as well where we have a large number of children coming for MRI scanning and require general anaesthesia.

The pre-anaesthesia evaluation for a child undergoing MRI with sedation or general anaesthesia is similar to that of a child undergoing a surgical procedure in the operating room. They are assessed in preoperative clinic and as per guidelines hemoglobin screening is advised to every pediatric patient. One purpose of the routine preoperative measurement of Hb is to detect anemia which is not clinically apparent. The conventional threshold for anemia below which postponement of surgery or preoperative transfusion might be considered is an Hb level of 10 g/dl. Now, there is evidence to suggest that the risks of surgery do not rise significantly until the Hb level falls below 7 g/dl<sup>11</sup>.

Transfusion is rarely indicated when the Hb concentration is greater than 10 g/dl and is almost always indicated when it is less than 7 g/dl, especially when the anemia is acute. The National Institute of Health, American College of Physicians, and American Society of Anaesthesiology consensus states that transfusion is not necessarily indicated in a patient with Hb as low as 7 g/dl if that patient is normovolemic, asymptomatic, and no further blood loss is anticipated. The determination of whether intermediate Hb concentrations (7–10 g/dl) justify or require RBC transfusion should be based on the patient's risk for complications of inadequate oxygenation<sup>11</sup>. So the decision to perform a preoperative hemoglobin (Hb)/hematocrit (Hct) evaluation depends on the presence of risk factors for hematologic disease, risk of perioperative blood loss and institutional guidelines.

In studies of routine testing, the highest proportion of cases in which management was changed by an abnormal Hb measurement is reported as 2.7%<sup>12</sup>. In that study, of children listed for ENT surgery, ten patients had their surgery postponed and was treated with oral iron therapy. In fact, only five of these children had an Hb level below 10 g/dl, and none had a level below 9 g/dl. Two other papers reported that changes in patient management resulted from findings from 0.1% and 0.2% of tests for Hb/haematocrit<sup>13, 14</sup>.

No controlled trials of the value of routine preoperative Hb measurement have been published. Routine preoperative measurement shows that the Hb level may be lower than 10–10.5 g/dl in up to 5% of patients, but it is rarely lower than 9 g/dl. The routine test leads to a change of management in 0.1% to 2.7% of patients. The evidence

reviewed does not support a policy of routine preoperative Hb testing in all patients, and there is no need to postponement or cancellation of surgery in an otherwise fit patient is necessary if the Hb level is > 8.0 g/dl<sup>15</sup>. In our survey none of the child had Hb < 8 g/dl. All children had MRI without the change in anaesthesia plan. Overall, the evidence suggests that any patient in whom anemia is severe enough to warrant postponement of surgery is likely to have either clinically evident feature of anemia itself, or of an associated disease. One shortcoming of this study is that patients with low Hb results had MRI delayed and advised transfusion from the preoperative clinic and so were included in the study after correction of anemia. Analysis of the events leading up to the referral to procedure would be needed. That information was not reliably available in this study.

## **CONCLUSION**

On the basis of this study, we can recommend that children who do not have any clinical features of anemia can safely undergo MRI in general anaesthesia. We should also revise our institutional guidelines regarding preoperative investigations in healthy ASA I-II patients, especially hemoglobin testing in selective cases where there is no or minimal chance of blood loss. This will not only reduce the patient's discomfort but also reduce the burden on financial resources. As a next step to this study, we will conduct a prospective audit to determine any change in anaesthesia planning, conduct and case cancellation if routine hemoglobin testing will not be performed in pediatric MRI.

## **References**

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