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Vitamin B12 deficiency and megaloblastic anemia in elderly female patients in a rural community

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Vitamin B12 deficiency is a common problem in elderly females. The purpose of this study is to determine if macrocytic anemia is a useful indicator of vitamin B12 deficiency.

This study was conducted in the rural town of Noel, Nova Scotia, where one of the authors was the sole family practitioner. A retrospective chart review was completed on the 102 females over the age of 65 who were part of his family practice. Of the 50 women with documented B12 levels, 10 were deficient in vitamin B12. Of those 10, only 2 had red blood cell changes that suggested vitamin B12 deficiency. Thus, in elderly women with B12 deficiency, 90% were not anemic and 90% had normal mean corpuscular volumes. These results emphasize that vitamin B12 deficiency is often present without macrocytic anemia. This is important to consider because other studies have shown that irreversible neurological damage can occur without changes on the complete blood count, especially in the elderly population, and that early treatment can reverse the damage before it becomes permanent.

La carence en vitamine B12 est un problème courant chez les femmes âgées. Cette étude vise à établir si l'anémie macrocytaire est un indicateur utile de la carence en vitamine B12.

L'étude s'est déroulée dans la ville rurale de Noel (Nouvelle-Écosse), où l'un des auteurs était le seul médecin de famille. Les dossiers de 102 femmes de plus de 65 ans au nombre de ses patients ont fait l'objet d'une étude rétrospective. Parmi les 50 patientes dont les taux de vitamine B12 étaient documentés, 10 présentaient une carence en vitamine B12. Seulement deux de ces dix patientes présentaient des changements sur le plan des globules rouges indiquant une carence en vitamine B12. Par conséquent, au nombre des patientes âgées aux prises avec une carence en vitamine B12, 90 % n'étaient pas anémiques et 90 % présentaient un volume corpusculaire moyen normal. Ces résultats signalent qu'il arrive souvent que l'anémie macrocytaire n'accompagne pas la carence en vitamine B12. Il importe d'en tenir compte car d'autres études ont indiqué que des déficits neurologiques irréversibles peuvent survenir sans changement dans la formule sanguine, surtout chez les personnes âgées, et qu'un traitement rapide peut permettre d'enrayer l'apparition des déficits avant qu'ils ne deviennent permanents.

Introduction

Vitamin B12 is essential for proper bodily functioning. It is required for DNA synthesis, red blood cell maturation, and neuronal function. There are many causes of vitamin B12 deficiency, including inadequate diet, inadequate absorption, inadequate utilization, increased requirements and increased excretion. In the elderly, vitamin B12 deficiency can be caused by a decreased ability to absorb B12 from food sources.1,2 Although the exact pathology is not clearly understood, it is thought that reduced pepsin activity and reduced gastric acid secretion decrease the removal of B12 from dietary protein, making the vitamin unavailable for absorption despite adequate intrinsic factor production.3

The signs and symptoms of vitamin B12 deficiency tend to be nonspecific. Gastrointestinal manifestations may include anorexia, constipation, diarrhea or abdominal pain. Weight loss and glossitis may occur. Neurological

difficulties usually involve peripheral nerves causing decreased vibration and proprioception of the extremities as well as weakness and decreased reflexes.1,4 Ataxia, dementia, psychiatric disorders, impaired memory, impotence and changes in gait may also occur.3,5

Because the symptoms of vitamin B12 deficiency tend to be nonspecific, it can be overlooked when other common diseases in the elderly are identified, including diabetes mellitus, peripheral vascular disease, osteoarthritis and Alzheimer's disease.6 Reports from the United States have found that between 10% and 30% of older adults may develop vitamin B12 deficiency and that only 34% of patients with low vitamin B12 levels are receiving appropriate treatment.2,3 This is distressing because studies have shown that early treatment of vitamin B12 deficiency can reverse the neurological and hematological damage before it becomes permanent.2-4

The purpose of this study was to determine how often vitamin B12 deficiency is present without macrocytic anemia. This is important to consider because other studies have shown that neurological involvement may occur without anemia, especially in elderly patients.1,3,4,7

Methods

Noel, Nova Scotia, is a remote community 45 minutes by car from the nearest community hospital and has a population of 200 to 250 with a catchment area of 4000. At the time of this study there was only one family doctor practising in the area. Clinic computer records were used to obtain a list of all female patients 65 years or older. The original list was reduced by eliminating all the deceased patients and patients no longer seen at the clinic. The remaining 102 charts were used in the study.

The charts were reviewed, and vitamin B12 levels prior to treatment and the corresponding mean corpuscular volume (MCV) and hemoglobin level were noted. Age at time of testing was also noted.

The laboratory normal range for vitamin B12 was 116 to 781 pmol/L. Patients with vitamin B12 levels less than 116 pmol/L were considered deficient. The laboratory normal range for hemoglobin was 110 to 150 g/L. Patients with hemoglobin levels less than 110 g/L were considered anemic. The laboratory normal range for the MCV was 76 to 100 fL. Patients with MCVs higher than 100 fL were considered to have macrocytosis.

Data were entered and processed using Microsoft Excel and checked to reduce clerical error. Two-tailed t-tests were applied to the data for statistical analysis. Ninety-five percent confidence intervals and p values were determined to compare the mean age, B12 level, hemoglobin and MCV between the B12 deficient and non-deficient groups.

Results

Of the 102 charts reviewed, 50 contained a record of vitamin B12 levels from patients prior to treatment. The remaining 52 charts were not used in the study because 44 of them had no vitamin B12 levels available and 8 charts were from patients who received B12 treatment regularly but the chart information did not contain a B12 level prior to treatment.

Of the 50 women with documented vitamin B12 levels, 10 were deficient. Of these 10 patients, 1 was anemic and 1 had macrocytosis. Table 1 compares the vitamin B12 deficient women to the non-deficient women. This table shows that there are no significant differences between the 2 groups of women with respect to age ($p = 0.9177$), hemoglobin level ($p = 0.8183$) and MCV ($p = 0.9347$).

Discussion

We have conducted a retrospective chart review of elderly female patients in a rural family practice. We have shown that 20% of the tested women were vitamin B12 deficient. Although this is not a prevalence study, it does emphasize how common vitamin B12 deficiency is in the elderly female population.

More importantly, we have shown that in elderly women with vitamin B12 deficiency, 90% were not anemic and 90% had normal MCVs. No significant differences with respect to age, hemoglobin or MCV were found between

vitamin B12 deficient and B12 non-deficient women (Table 1). These results emphasize the importance of not relying on the information provided in a CBC to screen for vitamin B12 deficiency.

Previous studies have shown that vitamin B12 deficiency can occur in the absence of anemia.4,6,8,9 However, this study found a much larger percentage of non-anemic, normocytic, B12 deficient patients compared with some of the previously reported values. A 1988 New England Journal of Medicine study showed that 28% of vitamin B12 deficient people were not anemic compared with the 90% found in this study.4 A 2000 review of cobalamin deficiency stated that between 17% and 33% of vitamin B12 deficient people have normal MCVs, but this study demonstrated that 90% of the vitamin B12 deficient women were normocytic.10

Limitations

This study would have been more complete if all the women in the community could have been sampled so that the true prevalence of vitamin B12 deficiency could have been determined. This would have improved the power of the study as well, making the conclusions more valid. It would have been interesting to examine the elderly male population as well.

An additional limitation to this study was that the reason for the vitamin B12 deficiency was not determined as part of the chart review. The main reason that time was not spent determining this information was that other reports have suggested that the large majority of elderly people who are B12 deficient have malabsorption of protein-bound vitamin B12 with no other underlying disease.2,3,5,8,9 However, additional information concerning the comorbidities of the patients could have been obtained to see if this population differed from the currently available data.

In this study no information was gathered on the symptoms, if any, that the women were experiencing. An interesting follow-up study would be to examine how many of the elderly patients with vitamin B12 deficiency experienced symptoms attributable to the deficiency and if the symptoms improved after treatment. Previous studies have shown that early detection and treatment of vitamin B12 deficiency can improve neurological and hematological damage related to vitamin B12 deficiency before it becomes permanent.3,4,7

Conclusions

Given how common vitamin B12 deficiency is in the elderly and the benefits of early treatment, it is important to watch for the associated signs and symptoms and to screen for vitamin B12 deficiency using serum B12 levels. As this study clearly shows, patients do not have to be anemic or have an increased MCV when they are B12 deficient. Given the severe and irreversible neurological consequences associated with vitamin B12 deficiency, it is important to test elderly patients for vitamin B12 deficiency.7,9 The test is easily available to rural physicians in Nova Scotia. The treatment and follow up for vitamin B12 deficiency can be done in the rural practice without referring the patient elsewhere. This is a major advantage, given the lack of resources available in some rural settings and the difficulties associated with accessing major health care centres.

This article has been peer reviewed.

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