

CASE REPORT

Will an orange a day keep the doctor away?

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An 80 year old man, who relied on a home based meals-on-wheels service was admitted to hospital with non-specific symptoms, but had clinical and biochemical evidence of scurvy. Subsequently, all new admissions (n=37) to the department over a three week period were assessed for evidence of undernutrition. It was found that 73% had hypovitaminosis C, with 30% having concentrations suggestive of scurvy. There were no significant associations between level of vitamin C and type of accommodation, food provision, or age. The commonest symptom associated with vitamin C deficiency was anorexia, but overall, there was a paucity of clinical signs associated with vitamin C deficiency. The possible associations of vitamin C deficiency in the elderly are discussed.

An 80 year old man presented with a gradual deterioration in his wellbeing over the past nine months, escalating to a point where he was bed bound. He also described an undetermined amount of weight loss associated with loss of appetite. His daughter had noticed that he had also developed mild short term memory loss, and he had been described by his general practitioner to have “dementia”.

His past medical history included bilateral total hip replacements, hypertension, iron deficiency anaemia in 1994 investigated with oesophagoduodenoscopy and colonoscopy (which were normal), and a label of folate deficiency from 1996. Current medications included ranitidine (150 mg twice a day) for indigestion, and nifedipine (10 mg twice a day) for hypertension.

The patient was a widower and lived alone in his two bedroomed flat. He did not have home help, but did have daily meals-on-wheels. His daughter lived three miles away, visiting him every few days to help with shopping and cleaning.

On examination, he was a thin elderly man whose body mass index was 19.8 kg/m². He was not clinically anaemic and had no palpable lymphadenopathy, nor hepatosplenomegaly. There was marked superficial bruising and numerous “pigtail” hairs were present, mainly on his abdomen (fig 1). He was edentulous and had no stigmata suggestive of gingivitis. Minimal state examination (MMSE) score was 29/30. Further neurological examination was normal.

Initial investigations including full blood count, folate, B12, clotting studies, electrolytes, and liver function and acute phase reactants were normal. Plasma vitamin C concentrations confirmed our clinical suspicion of scurvy (vitamin C <5, normal range 40–100 µmol/l).

TREATMENT AND PROGRESS

The patient was referred to the dietitian for review. As previously noted, meals-on-wheels were provided, yet “he did not like the taste of the orange juice provided” and therefore did not drink any. He did not consume many of the vegetables, eating mainly meat. He was advised appropriate changes to

his diet and received a 1 g supplement of vitamin C for a period of one month.

At review, six weeks later, his bruising had disappeared, his weight had increased, and his appetite was improved. His MMSE was unchanged, but subjectively his short term memory had improved.

STUDY OF VITAMIN C STATUS IN AN ELDERLY POPULATION

For a period of three weeks, every admission to the Care of the Elderly department had fasting plasma vitamin C concentrations measured within 24–48 hours of admission and other assessments of nutritional status (haemoglobin, international normalised ratio, calcium, phosphate, albumin, magnesium, iron studies, folate, and B12). Details of accommodation, carers and type of meals (catered/ meals-on-wheels/ self prepared), as well as clinical features of vitamin C deficiency such as weight, bruising, gingivitis, perifollicular haemorrhage, and the presence or absence of pigtail hairs was ascertained. A MMSE was also performed.

RESULTS

There were a total of 37 new admissions, with an mean age of 85 years (range 65–97). The commonest medical causes of admission were lower respiratory tract infection (27%), cerebrovascular accident (12%), urinary tract infection (10%), and fractured pelvis (10%).

Using a reference range for plasma vitamin C as 40–100 µmol/l, hypovitaminosis C as 11–40 µmol/l, and concentrations <11 µmol/l as indicative of scurvy,¹ 27/37 patients (73%) had levels within the range for hypovitaminosis C. Eleven (30%) were within the range indicative of scurvy (see table 1).

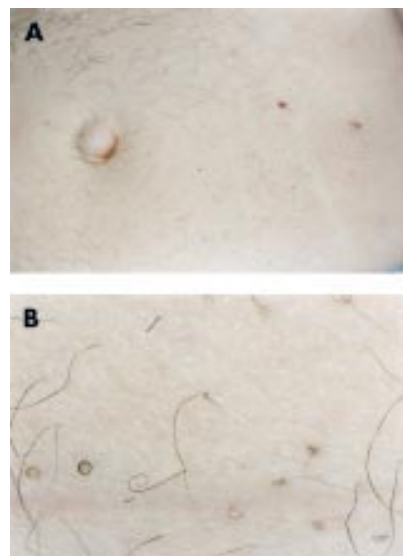


Figure 1 “Pigtail” abdominal hairs (A) and enlarged (B) (reproduced with patient’s permission).

Table 1 Variation between vitamin C concentration and various clinical and social parameters (n=37)

| | Normal vitamin C (40–100 µmol/l) | Hypovitaminosis C (11–40 µmol/l) | Scurvy range: hypovitaminosis C (<11 µmol/l) |
|-----------------------------|-------------------------------------|-------------------------------------|--|
| Mean (range) age (years) | 83 (72–97) | 90 (65–97) | 82 (67–88) |
| Accommodation (%) | | | |
| Nursing home | 2 (5) | 2 (5) | 2 (5) |
| Living alone | 8 (22) | 14 (38) | 9 (33) |
| Mean (SD) body mass index | 26 (3.9) | 23 (3.5) | 24 (5.4) |
| Mean (SD) MMSE (/30) | 27 (5.1) | 25 (6.0) | 23 (12.3) |
| Mean (SD) haemoglobin (g/l) | | | |
| Male | 139 (17) | 135 (19) | 106 (26) |
| Female | 114 (17) | 122 (15) | 120 (16) |
| Mean (SD) albumin (g/l) | 37 (5.8) | 37 (4.4) | 34 (4.7) |

MMSE, minimental state examination.

The commonest symptom associated with vitamin C deficiency was anorexia (29%), a symptom denied by all those with normal vitamin C levels. However, 18/37 (nearly 50%) of patients denied any symptoms suggestive of scurvy from our questionnaire (bruising, bleeding, anorexia, lethargy, weight loss). It was, however interesting to note that all (five) type 2 diabetic patients, four (80%) who were hypothyroid, and eight (75%) with dementia had low levels of vitamin C. There were no significant associations between level of vitamin C and type of accommodation, food provision, or age.

DISCUSSION

In new hospital admissions to our department, a high proportion of patients had low levels of vitamin C (73%), with 30% having levels suggestive of scurvy. Girodon *et al* also reported a similar percentage in a geriatric centre in France in 1997.²

It is difficult to rely on the well known clinical features of scurvy, as in the majority of cases, no specific symptoms nor clinical signs were elucidated. This could obscure or delay diagnosis of an easily cured disorder.³

In an attempt to discover which type of patient (from our group) was prone to hypovitaminosis C, we looked at a number of social, physical, and biochemical parameters. In our small study, we found no correlation between type of accommodation (house, hostel, or nursing home) and serum level of vitamin C. This is in contrast to the more commonly held belief that scurvy is found more often in elderly institutionalised subjects,⁴ although some previous studies have noted little difference in type of accommodation.⁵ There was also no relationship between food provider and vitamin C. This point is illustrated quite well in our patient, where he was receiving meals-on-wheels, yet still had scurvy. This reinforces the fact that despite providing food with sufficient nutrients (Randwick meals-on-wheels service, Sydney, verbal communication) it is not enough to hope that patients actually take in adequate amounts of vitamin C. There are a great many reasons why insufficient intake of active vitamin C may occur. This includes losses through storage, cooking, prolonged heating, and re-heating and boiling of food,⁶ as well as patient factors, including dislikes, poor dentition, poverty, lack of mobility, chronic disease, dementia, and low energy expenditure leading to reduced food intake.

Vitamin C deficiency remained remarkably constant across all the age ranges, and there was no difference in sex distribution in the survey, as noted in previous studies.⁷ It is noteworthy that a significant proportion of patients with severe dementia have lower vitamin C concentrations. Although this was probably due to deficient intake, Perrig *et al* observed that high vitamin C concentrations are associated with significantly better memory performance (and that supplementation in cases of deficiency causes some improvement in

Learning points

- Vitamin C deficiency is a relatively common condition in our elderly population.
- The diagnosis potentially overlooked.
- Clinicians should be alert for signs of undernutrition.
- It is often associated with co-morbidities.

behaviour and cognitive function).⁸ There were also an association between low vitamin C level and decreasing body mass index, as described by Marrazzi *et al*.⁹

Will an orange a day keep scurvy at bay? Almost certainly it would, if co-incident factors were equal, such as liking the taste and being able to open the orange juice/peel the orange and actually remembering to eat. Would supplementation reduce the likelihood of scurvy in the home? A dose of 40–80 mg daily of vitamin C has been recommended,⁶ in addition to basic dietary intake, yet the same potential problems arise. One may not be able to rely on patient compliance or ingestion of the supplements for similar reasons.

CONCLUSION

Vitamin C deficiency is still an important disease in the modern day, with large numbers of the elderly population at risk. It is relatively difficult to diagnose clinically because of a paucity of “hard” clinical signs, and yet, potentially very easy to treat. Further more extensive studies are needed to confirm the presence of scurvy and answer the question of adequate supplementation and its affect on morbidity.

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