CASE REPORT

Night blindness due to vitamin A deficiency associated with copper deficiency myelopathy secondary to bowel bypass surgery

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SUMMARY

We present an interesting case of combined vitamin A and copper deficiency after a history of gastric bypass surgery where symptoms improved after parenteral copper and vitamin A treatment. Gastric bypass surgery as a cause of fat soluble vitamin deficiency is generally under-reported. Copper deficiency has been reported after gastric bypass surgery. Vitamin A deficiency after gastric bypass surgery has also been reported in the literature, but the reported cases again fall below the actual figures. B₁₂ and folate deficiencies can produce a type of myelopathy similar to that produced by copper deficiency, and differentiation on the basis of laboratory tests, neurophysiology and improvement of symptoms after replacement therapy might be the hallmark of diagnosis. Combinations of vitamin deficiencies were previously reported, but no cases of combined vitamin A and copper deficiency could be found in the literature.

BACKGROUND

It is an interesting rare case of combined vitamin A and copper deficiency after a history of obesity surgery. The effect of these vitamins and minerals deficiency is sometimes deleterious and has a negative impact on the health of patients with all resultant change of life quality, economic disadvantage and loss of income. All these could be prevented by early and prompt recognition of signs and symptoms with a basic running of simple blood tests and investigations.

CASE PRESENTATION

We report an interesting case of a 43-year-old woman with a 2-month history of worsening night blindness associated with worsening paraesthesia of the lower limbs, more in the left side, and loss of touch, temperature and joint position sense. The clinical picture is a culmination of a 2-year history of diarrhoea, bacterial overgrowth, faecal incontinence and malabsorption. Between the ages of 0 and 7 years she was underweight; between the ages of 7 and 14 years she was overweight. She went on a diet and then put on weight subsequently to 23 stone. In 2005 and 2006 she underwent sleeve gastrectomy and duodenal switch surgery to treat overweight. She has a history of osteoporosis that became evident about 2 years after the gastric surgery. This has been confirmed by dual-energy X-ray absorptiometry scan and she was treated accordingly with vitamin D.

In April 2010, she began to notice weakness of her legs. This deteriorated, and between July and

November her legs became weaker and she lost balance and reported numbness in the feet. A few weeks later, the numbness moved up the legs and she reported electric shock sensations in the legs. She has had a difficulty in walking, driving and doing tasks at evening times. On examination, her ocular was normal. She had weakness in the legs with brisk reflexes, sensory loss and impaired joint position sense and was markedly ataxic with a slight increase in tone in the lower limbs.

INVESTIGATIONS

In December 2010, her serum vitamin A level was 1.24 µmol/L (normal 1.40–3.84 µmol/L), vitamin E 14.1 µmol/L (normal 11.6–41.8 µmol/L), copper 5.7 µmol/L (normal 12–25 µmol/L), ceruloplasmin 0.14 g/L (normal 0.20–0.60 g/L), hydroxyvitamin D₂ 1.00 ng/mL, D₃ 60 ng/mL and the total vitamin D (D₂+D₃) level was 61 ng/mL (normal 20–95 ng/mL). Lumbar puncture analysis and other blood tests results carried out including zinc level were within normal limits. Electrodiagnostic test conducted for her shows that pattern reversal visual evoked potentials (VEPs) are within normal limits bilaterally. Flash VEP reveal no definite abnormality. Pattern electroretinogram (ERG) is normal on the right; P50 is normal on the left but the N95:N50 ratio is suspiciously low. Rod ERGs are markedly subnormal bilaterally. Bright flash ERGs a-waves are subnormal bilaterally. Photopic 30 Hz flicker ERGs are mildly delayed without amplitude reduction. Single flash cone ERGs are within normal limits bilaterally. These findings are consistent with generalised retinal dysfunction affecting rod photoreceptors more than cones. There is no evidence of macular involvement. There is slight suspicion in relation to retinal ganglion cell function on the left. Her nerve conduction study was normal and this has excluded any evidence of a peripheral neuropathy.

TREATMENT

She has been started on oral and parenteral copper treatment on 10 December 2010 and oral vitamin A drops on 16 December 2010 and then parenteral vitamin A, in addition to folic acid and iron supplementation in the form of ferrous sulfate.

OUTCOME AND FOLLOW-UP

The condition was stabilised but not improved, she has ataxia due to loss of joint position sense, weakness in the legs with sensory loss. On examination when she was seen in March 2011, the tone in her

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legs was normal. Her vitamin A level measured in February 2011 was 1.52 µmol/L, copper 17.8 µmol/L and ceruloplasmin 0.39 g/L. In March the levels were 1.37 µmol/L, 19.3 µmol/L and 0.40 g/L, respectively. Her serum copper level measured later on 9 May 2011 is within normal (18.4 µmol/L, ceruloplasmin level is 0.36 g/L).

Her symptoms of night blindness were stabilised after starting parenteral vitamin A replacement therapy. An initial treatment with oral vitamin A was not effective mainly due to interference with its absorption.

DISCUSSION

Accurate data are generally few on vitamin A deficiency due to gastric bypass surgery,^{1 2} with a wide variation in incidence in different reports.

Night blindness and other visual complications were reported in many cases with vitamin A deficiency after bariatric surgery.³

At 1-year and 2-year follow-up, an incidence of 11% and 8.3%, respectively was noted in one of the reports.⁴

It was reported that the postoperative supplementation of vitamin A has stabilised or improved the symptoms of night blindness in some cases. Nevertheless, vitamin A deficiency may still occur despite supplementation.

In one report, 10% of patients who had undergone Roux-en-Y gastric bypass surgery, vitamin A was reported to be below normal levels.⁵

In our reported case, serum vitamin A level was below normal range and her rod ERGs are markedly subnormal bilaterally, which have confirmed the diagnosis of nocturnal visual symptoms secondary to vitamin A deficiency.

Her symptoms of night blindness were stabilised after starting parenteral vitamin A replacement therapy. An initial treatment with oral vitamin A was not effective mainly due to interference with its absorption.

On the other hand, copper deficiency was well known to be associated with haematological and neurological manifestations. However, neurological manifestations are usually diagnosed late and easily missed.⁶

The main neurological presentation of copper deficiency is spastic gait due to a form of myelopathy similar to that seen in patients with subacute combined degeneration of the spinal cord due to vitamin B₁₂ deficiency.^{6–8}

In our reported case, the diagnosis has been clinically made on the basis of her gradual symptoms that started to develop since she had the bypass surgery. Typically, she was presented with ataxic gait with numbness and loss of balance, the same clinical picture observed in cases of copper deficiency myelopathy.

Her B₁₂ and folate levels were within normal limits and that has actually ruled out subacute combined degeneration due to vitamin B₁₂ or folate deficiency.^{8 9} This fact has been more

substantiated by stabilising her symptoms on starting copper injections. Moreover, the nerve conduction study performed for her has actually excluded any possibility of peripheral neuropathy.

Interestingly, the fact that she also developed osteoporosis might reflect more the gradual development of signs and symptoms of fat soluble vitamin deficiency including vitamin A and D, in addition to copper deficiency.

Learning points

- ▶ Patients with surgical procedures for obesity need careful follow-up for symptoms of fat soluble vitamin deficiency and copper deficiency.
- ▶ These symptoms need to be promptly picked up and correlated with blood investigations and neurophysiological tests.
- ▶ There was a delay in the referral and diagnosis of the present case by a neurologist or ophthalmologist.
- ▶ Therefore, follow-up and monitoring is regularly needed after starting replacement therapy for those patients.

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Competing interests None.

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