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Vitamin A Treatment for Recurrent Urinary Tract Infections in a Post-Roux-en-Y Gastric Bypass Patient: A Case Report

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Abstract

This case describes a 35-year-old female who developed recurrent urinary tract infections (UTIs) after Roux-en-Y gastric bypass surgery. Cystoscopy and biopsy revealed severe keratinizing desquamative squamous metaplasia (KDSM) of the urinary tract. Further evaluation uncovered deficiencies in vitamins A, D, and E, with vitamin A deficiency suspected as the primary contributor to urinary symptoms and night blindness. High-dose vitamin A supplementation, along with other micronutrients, resolved both urinary and visual symptoms, and follow-up cystoscopy showed restoration of healthy epithelium. This case highlights the importance of comprehensive micronutrient assessment in post-bariatric patients with recurrent UTIs.

Introduction

Bariatric surgery has become an increasingly common and effective treatment option for individuals struggling with obesity and its associated metabolic comorbidities [1,2]. However, the profound anatomical and physiological changes resulting from these procedures can also lead to various nutritional deficiencies and unexpected complications [3]. Careful monitoring and management of post-bariatric patients is crucial to identify and address such issues promptly.

One area of particular concern is the potential impact of micronutrient imbalances on the urinary tract. Certain vitamins and minerals play crucial roles in maintaining the integrity and function of the bodies specialized epithelial lining, including the urothelium. Deficiencies in these essential nutrients may predispose patients to various urological complications, including recurrent urinary tract infections (UTIs), bladder irritation, and even structural changes within the urinary tract.

In this report, we describe the case of a 35-year-old female patient who, despite significant improvements in her overall health following Roux-en-Y gastric bypass surgery, developed recurrent UTIs and was ultimately diagnosed with a rare condition known as keratinizing desquamative squamous metaplasia (KDSM) of the urothelium. Further investigation revealed underlying deficiencies in key micronutrients, particularly vitamin A, which likely contributed to her urological symptoms.

This unique case highlights the complex interplay between post-bariatric metabolic adaptations and micronutrient imbalances and their impact on unexpected clinical manifestations. It underscores the importance of a comprehensive, multidisciplinary approach to managing post-bariatric patients, with a particular emphasis on proactive screening and treatment of micronutrient deficiencies, even in the absence of typical presenting symptoms. By gaining a deeper understanding of these relationships, healthcare providers can optimize long-term outcomes and quality of life for this patient population.

Case Report

History and Presentation

A 35-year-old female patient presented with a 2-year history of recurrent urinary tract infections (UTIs) following Roux-en-Y gastric bypass surgery. The patient had a past medical history significant for mild hypertension, type 2 diabetes, obstructive sleep apnoea, obesity (BMI 39), and dyslipidaemia.

Prior to moving from the United States to Australia in 2020, the patient underwent Roux-en-Y gastric bypass surgery in California, which resulted in significant weight loss and improvement in her metabolic parameters. After the surgery, she was able to discontinue all her medications, and her HbA1c ranged between 6-6.6%, with normal lipid profiles and a BMI of 23. She was generally doing well in the initial post-operative period.

Diagnostic Workup and Initial Management

Approximately two years after the bariatric surgery, she started experiencing recurrent UTIs. Urine cultures grew Escherichia coli, and occasionally Enterococcus faecalis, but blood cultures remained sterile throughout these episodes. These episodes of urinary tract infections responded to trimethoprim, Ampicillin and gentamycin. Imaging studies, including a CT of the renal tract and a voiding cystourethrogram (VCUG), did not reveal any anatomical abnormalities or evidence of obstruction or reflux.

Further extensive workup showed normal results for complete blood count, kidney and liver function tests, ferritin, immunoglobulins, autoimmune, and tumour markers. Tests for sexually transmitted infections, tuberculosis, and fungal infections were also negative.

In view of recurrent Urinary Tract infections, she was referred to urologist and had a cystoscopy,

which showed an abnormal-appearing urothelium. Biopsies of the urinary bladder and renal pelvis were obtained, and histopathological analysis revealed severe keratinizing desquamative squamous metaplasia (KDSM) of the urothelium, without any evidence of dysplasia.

Diagnosis and Management

Given the unexpected histopathological findings, the medical team sought further evaluation for potential underlying micronutrient deficiencies. Blood tests revealed deficiencies in vitamin A (3 µg/dL, reference range 12-50 µg/dL), 25-hydroxyvitamin D (7 ng/mL, reference range 35-100 ng/mL), and vitamin E (1 mg/dL, reference range 0.6-1.7 mg/dL).

The patient was subsequently treated with a loading dose of vitamin A, followed by a daily regimen of 50,000 IU, in addition to supplementation of vitamin D and vitamin E. Upon further questioning, the patient also reported experiencing night blindness, a classic symptom of severe vitamin A deficiency. Subsequently, she was referred to ophthalmologist who diagnosed with severe xerophthalmia and bitot spots.

Outcome

After initiating the targeted vitamin supplementation, the patient reported resolution of her urinary symptoms and night blindness also improved. The patient's clinical course was monitored, and a repeat cystoscopy performed one year later showed restoration of healthy transitional epithelium in the bladder, ureters, and urethra.

Discussion

This case report highlights the complex interplay between bariatric surgery, micronutrient deficiencies, and unexpected clinical manifestations in the urinary tract. The patient's presentation of recurrent urinary tract infections (UTIs) and night blindness, ultimately attributed to severe vitamin A deficiency, underscores the importance of comprehensive nutritional monitoring in post-bariatric patients.

Bariatric surgery, while effective for weight loss and metabolic improvements, carries a significant risk of micronutrient malabsorption. The altered gastrointestinal anatomy, particularly in Roux-en-Y gastric bypass, can reduce absorption of fat-soluble vitamins, including vitamins A, D, and E [4-6]. This malabsorption risk persists long after surgery, necessitating lifelong nutritional surveillance and supplementation. Additionally, patients may lose follow-up and fail to comply with the dietary recommendations after surgery, further increasing the risks of nutritional deficiencies. Numerous studies have indicated that individuals often do not consistently follow multivitamin supplementation guidelines after bariatric surgery [7].

In the context of post-bariatric surgery, the altered intestinal anatomy and changes in the gut microbiome can predispose patients to UTIs caused by gut-derived organisms like E. coli and Enterococcus. This altered microbial profile, combined with the compromised urothelial integrity due to vitamin A deficiency, may contribute to the recurrent UTIs observed in this patient.

The metabolism of fat-soluble vitamins is intricately linked to the body's ability to absorb and process dietary fats. Vitamin A, crucial for epithelial cell differentiation, vision, reproduction, embryonic development, cell differentiation and immune function, requires adequate fat intake and bile acid secretion for optimal absorption [8,9]. Similarly, vita-

mins D and E rely on micelle formation and chylomicron packaging for intestinal uptake and systemic distribution [10]. Post-bariatric patients may experience disruptions in these processes, leading to deficiencies even with standard supplementation.

Vitamin A plays a vital role in maintaining the integrity and function of epithelial tissues throughout the body, enhances the oral mucosa's functional defence, strengthens intestinal mucus's integrity, and preserves the structure and quantity of urothelial cells [11-13]. In a study examining mice with vitamin A deficiency (VAD) and combined vitamin A and D deficiency (VAD+VDD), researchers observed squamous cell metaplasia of the renal pelvis, accompanied by ascending bacterial urinary tract infections (UTIs) and renal scarring, highlighting the crucial role of vitamin A in maintaining normal urothelial integrity and preventing UTIs [14].

The relationship between vitamin A deficiency, keratinizing desquamative squamous metaplasia (KDSM) of the urothelium, and recurrent urinary tract infections (UTIs) is complex and not yet fully elucidated in human studies. While animal studies have suggested a potential causal link between vitamin A deficiency and squamous metaplasia in the urinary tract [14], the exact mechanism and sequence of events in humans remain unclear.

Vitamin A is known to play a crucial role in anti-infective defence by maintaining epithelial integrity, and modulating immune function by playing a role in antibody production and the proper functioning of B cells, T cells, and NK cells [15,16]

In our patient, the concurrent presentation of vitamin A deficiency, KDSM, and recurrent UTIs raises important questions about their interrelationship. Vitamin A deficiency possibly contributed to the development of KDSM, which increased susceptibility to UTIs. Alternatively, the vitamin A deficiency may have directly compromised the patient's immune function and epithelial barrier integrity, leading to recurrent UTIs, with KDSM developing due to chronic inflammation and infection.

The resolution of urinary symptoms and night blindness following high-dose vitamin A supplementation suggests a strong association between these conditions. However, the exact causal relationships and sequence of events cannot be definitively established based on this single case.

This case underscores the need for further research to elucidate the complex interactions between vitamin A status, urothelial health, and susceptibility to UTIs in post-bariatric surgery patients. Prospective studies examining the prevalence of KDSM, vitamin A levels, and UTI frequency in larger cohorts of post-bariatric patients could provide valuable insights into these relationships and inform better screening and management strategies.

Our findings have several important clinical implications. First, they underscore the necessity of regular, comprehensive micronutrient screening in post-bariatric patients, even years after surgery. Second, they highlight the importance of maintaining a high index of suspicion for atypical presentations of nutrient deficiencies. Finally, they demonstrate the potential for reversing significant pathological changes through targeted nutritional intervention.

The rising global prevalence of obesity and the subsequent increase in bariatric procedures underscore the importance of recognizing and addressing the long-term consequences of these surgeries. As our

case demonstrates, the ramifications of nutritional deficiencies can manifest in unexpected ways, often years after the initial procedure. This highlights the critical need for healthcare providers across various specialties to maintain a high level of awareness regarding the potential complications associated with post-bariatric nutritional deficiencies. By developing a keen understanding of the diverse clinical presentations of these deficiencies, clinicians can implement timely preventive strategies, conduct appropriate screenings, and initiate prompt interventions. This proactive approach is essential to safeguard the long-term health and well-being of the growing population of post-bariatric patients, ensuring that preventable nutritional complications do not overshadow the benefits of weight loss surgery.

Conclusion

This case report provides important insights for the medical fraternity on the potential consequences of vitamin deficiencies in post-bariatric surgery patients. This highlights the need to think outside the box when investigating recurrent UTIs in this patient population and the importance of comprehensive micronutrient screening. By proactively monitoring vitamin levels and addressing deficiencies, healthcare providers can prevent similar cases and improve the overall health and quality of life for post-bariatric surgery patients.

Figure Legends:

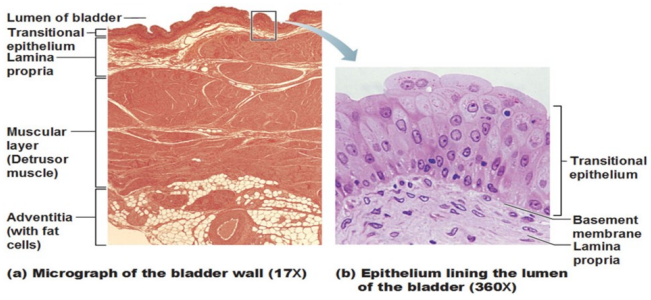

Fig-1: Normal Urothelium

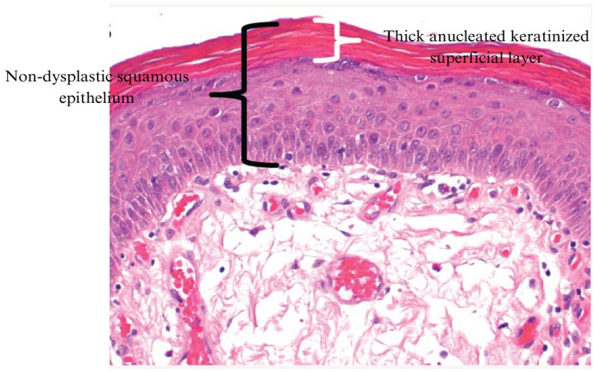

Fig-2: Keratinized Desquamative Squamous Metaplasia [17]

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