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Collagen Peptide Supplementation Improves Lean Muscle Mass in Patients with Rectal Adenocarcinoma Postoperatively - A Case Report

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ABSTRACT

Introduction: Rectal adenocarcinoma patients are advised to increase protein intake especially after surgery for speedy recovery. Concentrated collagen peptides might help to improve compliance of protein prescription and ultimately muscle bulk. **Case presentation:** A 35-year-old man diagnosed with low rectal adenocarcinoma was discharged and referred to diet clinic for continuous intervention. At the time of attending the diet clinic, patient looked cachectic and lethargic. Patient's height was 164cm, weight 44kg, BMI 16.4 kg/m^2, muscle mass 37.6kg and body fat 9.7%. He had lost 27% of his weight (16kg within 6 months) and had a C for SGA (Score Global Assessment). Estimated intake was 1560kcal/day and 38g/day protein. Patient reached satiety early and did not comply with oral nutritional supplement (ONS) due to distaste and concern for his high stoma output. The nutritional diagnosis was inadequate protein intake related to decreased ability to consume sufficient protein as evidence by diet history. High protein high calorie diet (HPHC) and collagen peptides supplement daily were prescribed. Patient was requested to recall diet and to drink a bottle of collagen peptides in the diet clinic daily for a week to ensure compliance to diet prescription. After a week, his anthropometry improved: weight reached 46.2kg, muscle mass 38.6kg and body fat 12.7%. Patient was able to walk and to start working the following week. Total energy intake was 1690kcal/day with 56g/day protein. As patient was able to achieve protein requirement via food, collagen peptide was withheld. After a month, anthropometry improved and complied to HPHC as well as ONS. Concentrated collagen peptides were found to help the malnourished patient to achieve protein requirement in small volumes. **Conclusion:** Concentrated collagen peptides improve lean muscle mass in patients with rectal adenocarcinoma postoperatively. It is recommended that further investigations be conducted to provide concrete evidence on the role of collagen peptides.

Key words: Collagen peptides, rectal adenocarcinoma, postoperation

INTRODUCTION

Stage III rectal adenocarcinoma is treated conventionally with surgical resection of the malignant lesion and draining of the lymph nodes with adjuvant or neoadjuvant chemotherapy and radiotherapy to reduce risk of recurrence. This is followed by surgery to remove the rectal tumour and nearby lymph nodes, usually by low anterior resection (LAR) (Rullier *et al*., 2013). Patients with rectal adenocarcinoma are at high risk of developing malnutrition due to the catabolic effect of cancer as well as the gastrointestinal side effects of nausea, vomiting, anorexia, diarrhoea and, in some cases, dysphagia and malabsorption

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(Nitenberg & Raynard, 2000; Fettes *et al*., 2002; Chate, 2006). Traditional surgical nutrition practices (for example nil-by-mouth periods) and side effects of adjuvant treatments can also reduce nutrient intake at a time when nutritional status is already compromised (Nitenberg & Raynard, 2000; Weimann *et al*., 2006). Nutritional intake is invariably affected by perioperative requirement of fasting the patient and the adverse effects of adjuvant or neo-adjuvant chemo-radiotherapy. This may further compromise an already precarious nutritional status. Malnourished rectal adenocarcinoma patients have a higher nutritional requirement postoperatively to enhance recovery (Yang *et al*., 2014).

In the outpatient setting, dietitians prescribe and explain nutrition intervention to patients. This includes methods/ways to carry out to the plan. However, adherence of nutrition intervention depends on patient's understanding, willingness and family/social and financial support. There are also rules and policies that need to be followed and other factors such as restricted manpower and the patient's income that could contribute to poor compliance with intensive nutrition intervention. The patient in an outpatient setting is prone to risk of malnutrition due to lack of intensive nutrition intervention to optimise nutrition status. This will make it challenging to comply with a diet intervention at home. Intensive nutrition intervention approaches such as a daily supply of oral nutrition supplement - concentrated collagen peptide - may improve protein intake in a malnourished post-surgery patient resulting in positive protein balance and muscle building.

CASE PRESENTATION

A case report of a post-surgery malnourished low rectal adenocarcinoma is reported. The thirty-five-year-old man was diagnosed with low rectal adenocarcinoma (Stage III)with CEA - 11.77ng/ml 6 months ago. He underwent concurrent chemotherapy and radiotherapy treatment. This was and followed by an ultra-low anterior resection. During the surgical treatment period, he experienced significant weight loss (from 60kg to 44kg; 27% weight loss within 6 months) with cachexia and lethargy. The patient was discharged from the ward and referred to diet clinic for further dietary intervention post discharge.

While attending the diet clinic, the patient looked lethargic and used a walking frame. At this point, patient's height was 164cm, weight 44kg, BMI 16.3kg/m^2, muscle mass 37.6kg and body fat was 9.7%. Total weight loss was 27% within 6 months and his nutrition status was SGA C (severe malnourished). Total estimated energy intake at home after discharge was 1560kcal/day (35kcal/kg/day) and protein intake 38g/day (0.86g/kg/day) [37% protein from ONS; 1% from high biological value protein (HBV)]. The patient was bored with the taste, experienced early satiety and did not comply with the oral nutritional supplement as planned in the ward due to distaste and a concern for high stoma output. Oral supplement support (ONS) was consumed for the past one month. Patient was bored with the taste of ONS although an attempt had been made to modify the taste. Nutritional diagnosis was inadequate protein intake related to decreased ability to consume sufficient protein as evidence by his diet history.

A high protein and high calorie diet involves 1740kcal/day [35kcal/kg/day with ideal body weight (49.7kg) at BMI 18.5] and 60g/day (1.2g/kg/day with ideal body weight at BMI 18.5) protein. From the diet recall, patient reported that he was only able to take high biological value protein in small amounts which was less than the recommended portion. There was difference of 20g between current protein intake and requirement. Hence, a bottle of collagen peptides supplement,

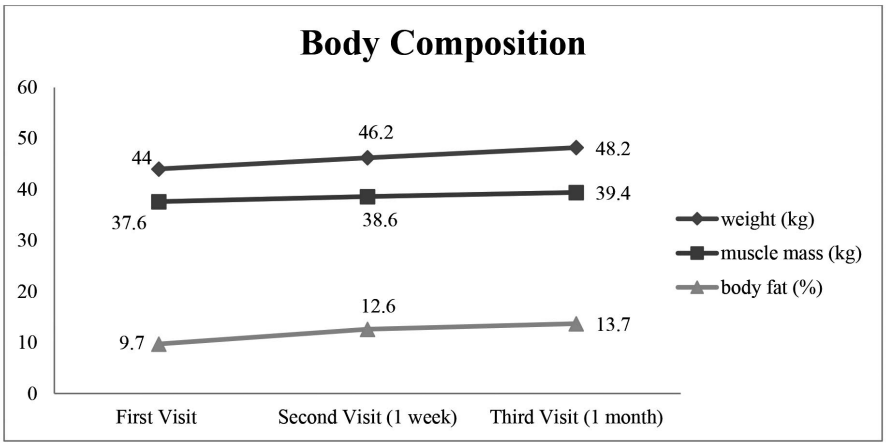

Figure 1. Comparison of body composition between out-patient visits

which contains 20g protein, was prescribed for daily consumption. The patient was encouraged to take small and frequent meals with energy dense food. The patient's wife was given health education on ways to increase energy content in food. The patient attended diet clinic and was subjected to 24-h diet recall and also prescribed a supplement of a bottle of collagen peptides daily, after dressing of his wound at surgical clinic for a week to ensure compliance to diet prescription.

After one week, the patient was able to walk without any assistance, appeared cheerful and returned to work the following week. The patient's anthropometry improved. His weight was 46.2kg, muscle mass 38.6kg and body fat was 12.7%. Total energy intake was 1690kcal/day (37kcal/kg/day) with 56g/day protein (1.21g/kg/day) [27% protein from ONS; 36% from collagen peptides; 12% from HBV]. Collagen peptide concentrate was prescribed for one week only since patient was able to consume protein from food. At this point of time, patient's appetite improved and complied with the high protein high calories diet as planned. The patient's HBV protein from his daily meals was adequate. Hence, patient was advised to continue with standard ONS and a diet of high protein high calories

After one month, patient looked energetic and started working. Anthropometric data showed positive progression with weight 48.2kg, muscle mass 39.4kg and body fat 13.7%. Total energy intake was 1760kcal/day with 60g/day protein [46% from ONS; 54% from HBV]. He took three main meals and two snacks as well as ONS four times a day. Patient claimed that his appetite had significantly improved and that he was able to consume the recommended portions of high biological value protein.

DISCUSSION

Patients with rectal adenocarcinoma are at risk of malnourishment even prior to treatment. Surgical intervention may result in a further decline in the nutritional status in malnourished cancer patients which can prolong their recovery period. Patients need a longer period of oral nutritional support (ONS) to ensure replenishment of nutritional status. However, poor compliance of rectal adenocarcinoma patients to ONS, especially after discharge, proved challenging. Proteins are the major

component of body tissues and are essential for recovery. They affect the physiological and sensory properties of protein rich foods and many possess specific biological properties.

Oral nutritional supplements are complete nutrition powder products that provide macronutrients and micronutrients with the aim of increasing oral nutritional intake. Systematic reviews, trials and studies indicate that appropriate consumption of ONS has significant outcomes for patients with disease related malnutrition. These include reducing infections, less time spent in hospitals, improved well-being and daily activity, fewer pressure ulcers, reduced mortality and other complications (Stratton, Green & Elia, 2003; Isenring, Capra & Bauer, 2004; Stratton *et al.* 2005; Stratton *et al.,* 2007). Nutrition intervention has become one of the important aspects in managing patients with cancer to improve the patient's nutritional status, minimising weight lost and improving quality of life (QoL) in hospitalised patients. Intensive nutrition intervention can easily carried out in inpatient settings. These include regular and intensive nutrition counselling by a dietitian and adhering to a prescription of ONS for those who require it. Dietitians in outpatient settings provide intensive nutrition counselling tailored to the patient's nutrition requirements. ONSwill be prescribed if patient is unable to achieve energy and protein requirements through a normal diet. However, successful treatment depends on the patient's financial status (to purchase the ONS as planned) and the patient's adherence to consume ONS prescription at home, where there may be no one to monitor patient's oral intake.

Collagen is a common protein and a significant part of the living body of mammals. As a structural protein, collagen is essential to creating physical structure, and as an extracellular matrix protein, it acts as a supporting framework over which cells are arranged (Jongjareonrak *et al.,* 2005). Collagen has been utilised as a material in foods, cosmetics, pharmaceuticals, and experimental reagents. Collagen peptides concentrate is made from hydrolysis of collagen from Bluefin tuna. In the hydrolysis process, Bluefin tuna abdominal skin type I collagen and other collagens are isolated and hydrolysed by trypsin (Omenn *et al*., 1996; Knekt *et al.,* 1997). Collagen peptides concentrate, used in the current case, contained 18 types of amino acids: alanine, arginine, asparagine, aspartic acid, cysteine, glutamine, glutamic acid, glycine, isoleucine,leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tyrosine and valine. Concentrated collagen peptides can help malnourished patients increase protein intake (20g) in a very small volume (50ml). Its fruity flavour and small volume increases patient's tolerance and compliance to protein supplements especially for those whose appetite is poor or if they are unable to increase protein intake as recommended even after ONS is given. For the current case, estimated cost of collagen peptides iwas RM 11 per day and is affordable for temporary usage in an outpatient setting. According to Clemente (2000), beneficial effects of oral administration of collagen peptides results in crossing of the intestinal barrier, by dietary bioactive peptides. These reache the blood circulation and become available for metabolic processes. Collagen peptides are used in medical applications such as high-energy supplements, geriatric products and enteric, therapeutic or weight-control diets. Amplification of protein peptides for treatment of patients with specific disorders of digestion, absorption and amino acid metabolism is needed. Collagen peptides are used for clinical cure of patients with malnutrition associated with trauma, burns, cancer and hepatic encephalopathies (Zaque, 2008; Udenigwe & Aliko, 2012).

Research on the use of high-protein nutritional supplements and wound healing is scarce (Langer *et al.,* 2003). The

limited availability of rigorously performed clinical trials to develop evidence-based guidelines for nutritional support(collagen peptides) in improving muscle mass underscores the need for further research (Thompsom & Fuhrman, 2005)

Increased nutrients (energy and protein) requirement post-surgery aims to promote speedy recovery and wound healing. Nutrition intervention includes approaches to assist and guide patients on type of diet to ensure adequate oral intake. Oral nutritional supplement formulations are to be administered via oral or enteral. If patient is unable to achieve 50% energy protein requirement within 5 days, the dietitian will suggest starting enteral feeding in order to achieve the nutritional requirements (Standard of Operation Enteral Nutrition Support, 2013). Since the patient was able to swallow and achieve total energy intake of 1560kcal/day, the patient was encouraged to consume food orally instead of enteral feeding (Nasogastric/Percutaneous endoscopic gastrostomy feeding). Hence, in this case, we might summarise that concentrated collagen peptides and intensive nutritional intervention in diet outpatient clinic were helpful in optimising cancer patient's nutritional status postoperatively.

Further studies are required to identify the extent to which the results of the present trial are attributable to the study product's amino acid profile, its hydrolysed form, or the ease with which extra protein can be consumed in this form. Additional studies are also needed to evaluate optimal dosing and duration of treatment to achieve complete healing and to assess the benefits and costs of concentrated, fortified, collagen peptides supplementation.

CONCLUSION

This reported case shows that intensive nutritional intervention in an outpatient setting and concentrated collagen peptides can help to improve lean muscle mass in a patient with rectal adenocarcinoma post-operatively. It is recommended that further clinical trials be conducted to provide concrete evidence on the role and exact dosage of collagen peptides in this area.

Conflict of interest

The authors are not aware of any conflict of interest arising from the findings of the reported case and its management.

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