การศึกษาเกี่ยวกับ
องค์ประกอบภายในร่างกายของผู้ป่วยโรคมะเร็ง

Cross-sectional study of body composition in cancer patients

ณดี ชิตาพนารักษ์[1]   พิมประภัส แซ่โง้ว [2]   สมจิต บางสินธุ์[2]   จุลจิรา ทาเป็ง[3]   วราภรณ์ ทองดีพันธุ์ [3]

Nadee Chitapanarux[1],   PimprapasSaengoa[2],   SomnitBangsinthu[2],   JuljiraTapeng[3],   WarapornTongdeepan[3]

[1] Chiang Mai University Demonstration School, Chiang Mai, Thailand
[2] Health Promotion Unit, Maharaj Nakorn Chiang Mai Hospital, Chiang Mai, Thailand
[3] Division of Radiation Oncology, Maharaj Nakorn Chiang Mai Hospital, Chiang Mai, Thailand

ABSTRACT

Background: The human body composition is consisted of four important parts; water, muscles, bones, and fat. It can be used as an obesity indicator and nutritional status for general population. The assessment of body composition by noninvasive bioelectrical impedance analysis may be a tool to improve the management in cancer patients.

Objective: To study body composition in cancer patients.

Material and methods:This cross-sectional description study consisted of 78 volunteer cancer patients at Radiotherapy unit, Maharaj Nakorn Chiang Mai hospital in May, 2017. We divided patients into two groups; head and neck cancer and non-head and neck cancer. We hypothesized that the body composition of head and neck cancer patients is different from those with other types of cancer due to their disease and treatment. We analyzed patients' body composition by using a body composition analyzer (Bioelectrical impedance analysis: Tanita SC-330) and using Excel's descriptive statistics tool for statistical analysis.

Results: There were 49 females (62.8%) and 29 males (37.2%) with an average age of 61.2 years old. Most of the patients were diagnosed with cervical cancer (23%) followed by head and neck cancer (21.8%). The result showed that the average of body fat percentage was 21.8%, muscle mass was 37.8 Kg, basal metabolic rate (BMR) was 4806.7 KJ, and visceral fat rating was 6.38. For the body mass index (BMI), we found that 15.4% of patients were underweight, 65.4% were normal, and 19.2% were overweight. Comparing to other types of cancer, patients with head and neck cancer had statistically significant lower BMI and muscle mass.

Conclusions: Our results suggested that most of the cancer patients in this study had the body composition within the normal reference range. Head and neck cancer patients had lower body composition than others.

Key words: body composition, cancer

บทคัดย่อ

หลักการและเหตุผล: การวัดองค์ประกอบของร่างกายจะวิเคราะห์แยกส่วนประกอบของร่างกายออกเป็น 4 ส่วน คือ ส่วนของน้ำ กล้ามเนื้อ กระดูก และไขมัน รวมถึงอัตราการเผาผลาญขั้นพื้นฐาน โดยทั่วไปใช้ประโยชน์ในการประเมินความอ้วนผอม การวิเคราะห์หาค่าองค์ประกอบในร่างกายเหล่านี้ในผู้ป่วยมะเร็งอาจเป็นส่วนหนึ่งในการช่วยดูแลผู้ป่วยโรคมะเร็งเพื่อส่งผลให้ผลการรักษาดีขึ้นได้

วัตถุประสงค์: เพื่อศึกษาองค์ประกอบภายในร่างกาย (body composition) ของผู้ป่วยโรคมะเร็ง

วัสดุและวิธีการ:เป็นงานวิจัยเชิงพรรณนา ณ จุดเวลาใดเวลาหนึ่งทำการศึกษาผู้ป่วยโรคมะเร็งที่มารับการฉายรังสีที่หน่วยรังสีรักษาและมะเร็งวิทยา คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่ในเดือนพฤษภาคม2560 จำนวน 78 คน ได้ทำการวิเคราะห์แยกผู้ป่วยเป็น 2 กลุ่มคือผู้ป่วยมะเร็งศีรษะและคอกับผู้ป่วยมะเร็งชนิดอื่นๆโดยมีสมมติฐานว่าผู้ป่วยมะเร็งศีรษะและคอมีองค์ประกอบของร่างกายแตกต่างจากผู้ป่วยมะเร็งชนิดอื่นๆเนื่องจากลักษณะของโรคและวิธีการรักษา การศึกษานี้ทำการวิเคราะห์องค์ประกอบของร่างกายด้วยเครื่อง body composition analyzer (Bioelectrical impedance analysis: รุ่น Tanita SC-330) และใช้โปรแกรมเอกเซลในการคำนวณทางสถิติ

ผลการศึกษา: ผู้ป่วยมะเร็งจำนวน 78 คนพบมีเพศหญิง 49 คน (ร้อยละ 62.8) เพศชาย 29 คน (ร้อยละ 37.2) อายุเฉลี่ย 61.2 ปี โดยพบอุบัติการณ์มะเร็งปากมดลูกสูงสุดร้อยละ 23 รองลงมาคือมะเร็งศีรษะและคอร้อยละ 21.8 เมื่อวิเคราะห์องค์ประกอบของร่างกายด้วยเครื่อง body composition analyzer พบมีเปอร์เซนต์ไขมันเฉลี่ย 25.2 มวลกล้ามเนื้อเฉลี่ย 37.8 กิโลกรัม อัตราการเผาผลาญขั้นพื้นฐานเฉลี่ย 4806.7 กิโลจูล พบไขมันช่องท้องเฉลี่ย 6.38 พบมีดัชนีมวลกายต่ำกว่ามาตรฐานร้อยละ 15.4 ดัชนีมวลกายมาตรฐานร้อยละ 65.4 และดัชนีมวลกายสูงกว่ามาตรฐานร้อยละ 19.2 เมื่อทำการเปรียบเทียบผู้ป่วยมะเร็งศีรษะและคอกับมะเร็งชนิดอื่นพบว่าผู้ป่วยมะเร็งศีรษะและคอมีค่าเปอร์เซนต์ไขมัน มวลกล้ามเนื้อและดัชนีมวลกายที่ต่ำกว่าผู้ป่วยมะเร็งชนิดอื่นอย่างมีนัยสำคัญทางสถิติ

ข้อสรุป: ผู้ป่วยโรคมะเร็งส่วนใหญ่ในการศึกษานี้มีค่าองค์ประกอบภายในร่างกายที่อยู่ในเกณฑ์มาตรฐาน และพบว่าผู้ป่วยมะเร็งศีรษะและคอมีค่าองค์ประกอบภายในร่างกายส่วนใหญ่ต่ำกว่าผู้ป่วยมะเร็งชนิดอื่น

คำสำคัญ: body composition, cancer

Introduction

Body composition is the proportion of fat and fat-free mass in human body. Fat free mass included water, muscle, and bones. We often use body composition in the assessment of the healthiness. There are many techniques for measuring the body composition such as; skin fold thickness measurement or waist circumference which were assessed by the magnetic resonance imaging (MRI). The simpler way to predict body composition nowadays is using the body composition analyzer with bioelectric impedance analysis (BIA) technique. A small electric alternating current (1-2 volts) pass through the body. Because each body component impedes the current differently. Conductivity within blood and water is high, that of muscle is intermediate, and that of bone and fat is low[1]. BIA is a widely used technique to measure the body composition and used as an indicator of the inner health and a tool for weight loss program. In the recent years, body composition was used to improve outcome in cancer patient care by integrating it into the standard clinical care and supportive care.The common information reported by BIA machine were body fat percentage, muscle

mass, basal metabolic rate (BMR), visceral fat rating, and body mass index (BMI). Body fat percentage is the proportion of fat to the total body weight. It is the actual weight of fat in the human body. Factors that affect body fat are the level of activity and nutrition habits. Exercise, menstrual period, and chronic illness also associated with low level. There was a study of fat-free mass in colorectal cancer patients treated with chemotherapy[2]. Muscle mass includes the weight of the muscles in the human body in kilograms or pounds. Muscle wasting condition or cachexia was commonly found in advanced cancer patients[3]. In the majority of patients with advanced cancer, their muscles will gradually waste away from protein catabolism. This change is the result of cancer disease and their treatments; surgery, chemotherapy, and radiotherapy[4]. Cachexia is the most common consequence of cancer and is characterized by anorexia, early satiety, severe body compositional change with weight loss, adipose and muscle loss, weakness, and edema[4-5]. Basal Metabolic Rate (BMR) is the rate of metabolism that occurs at rest. Patients with cancer cachexia were often associated with increased BMR despite a decrease in physical activity[6]. Visceral fat is a hormone active component of total body fat. It influences both normal and pathological processes in the human body.Some cancers are well known as an 'obesity-related' cancer such as colorectal cancer (CRC). There was a study reported the association between visceral fat and the prevalence of CRC[7]. Body Mass Index (BMI)is a measure of body fat based on height and weight. A higher BMI increases the risk for many cancers such as colorectal cancer, uterus cancer, and pancreatic cancer. However, there is a study in metastatic CRC showed that lower BMI increased risk of progression and death[8]. An objective of this study was to examine the body composition of cancer patients.

Material and methods:

This study was a cross-sectional descriptive study. The subjects were 78 volunteer cancer patients who were being treated at Division of Radiation Oncology, Maharaj Nakorn Chiang Mai Hospital in May 2017. Body composition was measured by the calibrated body composition analyzer (Tanita SC-330; Tanita Corp., IL, USA). Sex, age, body weight, height, and type of cancer were recorded. Percentage fat, muscle mass, basal metabolic rate (BMR), visceral fat, and body mass index (BMI) were also reported by this machine. We analyzed the body composition in all volunteer cancer patients and divided them into 2 groups (head and neck cancer versus non- head and neck cancer) based on our knowledge that patients with head and neck cancer always had chewing, eating, and swallowing problem and would be affected on patient's weight.We used the Excel Analysis to generate descriptive statistics in this study. The assessment of body mass index (BMI) was divided into underweight (<18.5 kg/m^2), normal weight (18.5-24.9 kg/m^2), overweight (25-30 kg/m^2), and obesity (>30 kg/m^2).

Results:

The body composition of seventy-eight volunteer cancer patients were analyzed. There were 49 females (62.8%) and 29 males (37.2%). The mean age was 53.6 years (range, 28-79 years; SE1.3). The most common types of cancer were cervical cancer (23%), followed by head and neck cancer (21.8%), and breast cancer (16.7%), as shown in Table 1. Body composition analysis by BIA technologywas shown in Table 2. The means of body fat percentage, muscle mass, BMR, visceral fat rating were within the normal range. Most of the cancer patients in this study (65.4%) had the standard BMI. As shown in Table 3, we found 12 patients (15.4%) who had underweight; which were 5 head and neck cancer

Table 1 Patient Characteristics

Variables	No (%) (N=78)
Sex	
Male	29 (37.2)
Female	49 (62.8)
Age	
<40	9 (11.5)
40-59	46 (59)
60-69	12 (15.4)
≥ 70	11(14.1)
Types of cancer	
Head and neck	17 (21.8)
Non-head and neck	61 (78.2)
• Cervix	18 (23.1)
• Breast	13 (16.7)
• Gastrointestinal tract	9 (11.5)
• Brain	9 (11.5)
• Lung	2 (2.6)
• Others	10 (12.8)

Table 2 Analysis of body composition in 78 patients

Variables	Mean ± standard error (SE)
Weight (Kg)	54.8 (1.1)
Body fat percentage (%)	25.2 (1.1)
Muscle mass (Kg)	37.8 (0.8)
BMR (KJ)	4806.7 (85.2)
Visceral fat rating	6.4 (0.4)
BMI (Kg/m^2)	22.2 (0.5)

Discussion:

Although most of the cancer patients in this study had the body composition within the normal reference range in every variable, but these results should be interpreted with caution. Because there are many factors that affect the body composition including age, sex, menopausal status, activity, nutrition, chronic disease, and etc. In this study, we did not control these variables. Results from our investigation of BMI in head and neck cancer are consistent with the previous study[9]. The median BMI of head and neck cancer patients in their study was 21.5 Kg/m^2 whereas 20.3 Kg/m^{2}in our study which was normal weight[9]. In our population of head and neck cancer patients, we observed that, means of body fat percentage, muscle mass, and BMI were significantly lower than non-head and neck cancer patients.This can be explained by the low dietary intake and malnutrition in this group of patients. Although we did not find the significant difference of the mean of BMR between the two groups of patients, but this value is higher in the head and neck cancer patients. We knew that cancer patients had higher resting energy expenditure than non-cancer controls[4]. Head and neck cancer patients who lose more muscle mass and total body fat might have increase BMR.

patients, 4 gastrointestinal cancer patients, and 2 cervical cancer patients. We found 15 patients (19.2%) who had the body weight over the standard, four of them were obesity; 2 cervical cancer patients, 1 breast cancer patient, and 1 brain tumor. Head and neck cancer patients had statistically significant lower of body fat percentage, musclemass, and BMI than non- head and neck cancer patients. Mean ± SE of body weight and visceral fat in head and neck cancer group was lower than the other group but there was no statistically significant difference. BMR was also higher in head and neck cancer patients and again non-statistically significant difference was observed. (Table 4).

Table 3 Body mass index in 78 patients

BMI (Kg/m^2)	No (%) (N=78)
Underweight (<18.5)	12 (15.4)
Healthy weight (18.5-24.9)	51 (65.4)
Overweight (25-30)	11 (14.1)
Obese (>30)	4 (5.1)

Table 4 Comparison of body composition between head and neck and non-head and neck cancer patients

Variables	Head and neck cancer patients (n = 17) (Mean ± SE)	Non-head and neck cancer patients (n = 61) (Mean ± SE)	p-value (t-test)
Body weight	53.2 ± 2.3	55.3 ± 1.3	0.23
Body fat percentage (%)	17.4 ± 2.2	27.3 ± 1.2	<0.005
Muscle mass (Kg)	36.9 ± 0.9	40.8 ± 1.5	0.03
BMR (KJ)	4927.7 ± 181.5	4773 ± 95.9	0.23
Visceral fat rating	6.41 ± 0.8	6.4 ± 0.5	0.49
BMI (Kg/m^2)	20.3 ± 0.9	22.8 ± 0.5	0.01

Conclusion:

Our results suggested that most of the cancer patients in this study had the body composition within the normal reference range. Head and neck cancer patients had lower body composition than others. However, further studies with more number of cancer patients are needed.

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