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Original Article
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A gynecological perspective on incisional hernia in patients after hysterectomy for benign vs. malignant indications

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ABSTRACT

Aims: The aim of this study is to compare demographic and perioperative data of patients who developed incisional hernia after hysterectomy at Kocaeli University Medical Faculty and to evaluate potential factors contributing to hernia formation.

Methods: Retrospective data were analyzed for patients who underwent hysterectomy for benign or malignant reasons and later developed incisional hernia at the same hospital. A total of 63 patients, including 27 with malignancy and 36 with benign conditions, were included. Demographic data such as age, body-mass index (BMI), smoking, incision, surgical site infection (SSI), drain, and duration were assessed.

Results: The mean age of the patients was 56.44±9.49 years. No statistically significant differences were found between the two groups regarding age, BMI, comorbidities, smoking, SSI, and drain duration. However, there was a significant difference in the incision, with the Pfannenstiel incision being preferred for benign hysterectomy ($p<0.0001$). Drain use was significantly more common in malignant cases ($p=0.002$).

Conclusion: Incisional hernia is one of the most common types of ventral hernia. Incisional hernias are most frequently observed in women, especially following gynecological and obstetric surgeries. In our study, benign cases showed a higher incidence of incisional hernia. Obesity is a significant risk factor for hernia. The average BMI in the study was 31.18±5.22, with no significant difference between the groups. The lower midline incision was identified as the most risky incision for hernia development, though most of our patients had a Pfannenstiel incision. Despite treatment, incisional hernia developed in many patients with SSI. SSI was presence in only 28.6% of those who developed hernia in both groups. Smoking causes tissue hypoxia, and the smoking rate among our patients was 39.7%. Modifiable risk factors can be managed or controlled to prevent hernia development.

Keywords: Benign, malignant, hysterectomy, incisional hernia, body mass index, drain

INTRODUCTION

Ventral (anterior abdominal wall) hernias can develop either spontaneously or as acquired (postoperative). Among these, incisional hernias are the most common, with a prevalence of 43%.[1] In patients who have previously undergone abdominal surgery with any incision, the incidence is between 10-15%.[2] They typically present as painful or painless swelling on the abdomen. Although they can be asymptomatic, they may present in a reducible, incarcerated, or strangulated state.[3] Incisional hernias are most frequently observed in female patients, particularly after gynecological and obstetric surgeries.[3] It occur due to a deficiency in fascial closure, and the development of this condition is influenced by various factors related to both the patient and the surgical technique.[4] Incisional hernias can be a secondary cause for either elective or emergency surgeries, potentially leading to significant morbidity, mortality, and a reduction in the quality of life, often associated with a degree of work loss. In this study, we aimed to compare demographic and perioperative data in patients who developed incisional hernias after hysterectomy and assess the factors that may contribute to the development of hernias.

METHODS

The study was conducted with the permission of Kocaeli University Non-interventional Clinical Researches Ethics Committee (Date: 11.06.2024, Decision No: 2024-146). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Patients who underwent hysterectomy for benign or malignant reasons and later developed incisional hernias, diagnosed and operated on at the same hospital, were

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retrospectively reviewed at Kocaeli University Faculty of Medicine, Department of Obstetrics and Gynecology between 2018 and 2024. A total of 27 patients with malignant diagnoses and 36 with benign diagnoses, who met the criteria within a 7-year period, were included in the study. Two separate groups were created to assess any differences in the incidence of incisional hernia between the two diagnostic groups. Data were collected regarding age, body-mass index (BMI), comorbidities such as diabetes mellitus (DM), hypertension (HT), thyroid disorders, chronic obstructive pulmonary disease (COPD), smoking history, type of incision, development of SSI, drainage use, and duration of drainage. Comparisons were made between the two groups. Laparoscopic cases were excluded, as only two patients met the criteria.

Statistical Analysis

The data analysis was performed using IBM SPSS 29.0 (IBM Corp., Armonk, NY, USA). The normality of the data was assessed with the Shapiro-Wilk and Kolmogorov-Smirnov tests. Continuous variables were expressed as mean±standard deviation, while categorical variables were presented as frequencies and percentages. Independent t-tests were used for comparisons between groups, and Chi-square analysis was used for determining relationships between categorical variables. A p-value of <0.05 was considered statistically significant.

RESULTS

The demographic and perioperative data of all patients are shown in Table 1. The mean age of the patients was 56.44±9.493 years, and the mean BMI was 31.182±5.221. Among the malignant diagnoses, endometrial cancer, ovarian cancer, cervical cancer, and sarcoma were identified, while benign diagnoses included leiomyoma, treatment-resistant abnormal uterine bleeding, and endometrial hyperplasias. A total of 31 (49.2%) patients had drainage, and the majority of those who developed incisional hernias (74.2%) had drainage for 1-3 days.

The comparison between patients with benign and malignant diagnoses is shown in Table 2. There were no statistically significant differences between the two groups in terms of age, BMI, comorbidities, smoking history, or SSI. The number of drainage days in the benign group was only 1-3 days, so statistical significance could not be assessed. However, regarding the incision type, there was a significant difference between the two groups, with a higher frequency of Pfannenstiel incisions in the benign group (p<0.0001). The presence of drainage was significantly more common in the malignant group (p=0.002).

Table 1. Demographic and perioperative data of all patients

	Study population (n=63)
Age, mean±SD	56.44±9.493
BMI, mean±SD	31.182±5.221
Pathology, n (%)	
Benign	36 (57.1)
Malign	27 (42.9)
Malignant diagnoses, n (%)	
Endometrium cancer	11 (17.5)
Ovary cancer	12 (19)
Cervix cancer	2 (3.2)
Sarcoma	2 (3.2)
Benign diagnoses, n (%)	36 (57.1)
Comorbidities, n (%)	
DM	15 (23.8)
HT	29 (46)
Thyroid disorders	13 (20.6)
COPD	9 (14.3)
Smoking, n (%)	25 (39.7)
Drain use, n (%)	31 (49.2)
Drain length of stay, n (%)	
1.-3. day	23 (74.2)
4.-7. day	7 (22.6)
8.-14. day	1 (3.2)
SSI, n (%)	18 (28.6)

SD: Standard deviation, BMI: Body-mass index, DM: Diabetes mellitus, HT: Hypertension, COPD: Chronic obstructive pulmonary disease, SSI: Surgical site infection

Table 2. Comparison of demographic and perioperative data of patients between the two groups

	Benign group (n=36)	Malign group (n=27)	p
Age, mean±SD	55.11 ±10.474	58.22 ±7.841	0.200
BMI, mean±SD	30.599 ±4.282	31.958 ±6.263	0.310
Incision, n (%)			
Pfannenstiel	26 (72.2)	1 (3.7)	**<0.0001**
Lower midline	10 (27.8)	5 (18.5)	
Midline	0	21 (77.8)	
Comorbidities, n (%)			
DM	9 (25)	6 (22.2)	1.000
HT	16 (44.4)	13 (48.1)	0.971
Thyroid disorders	6 (16.7)	7 (25.9)	0.559
COPD	4 (11.1)	5 (18.5)	0.480
Smoking, n (%)	14 (38.9)	11 (40.7)	1.000
Drain use, n (%)	11 (35.5)	20 (64.5)	**0.002**
Drain length of stay, n (%)			
1.-3. day	11 (100)	12 (60)	NA
4.-7. day	0	7 (35)	
8.-14. day	0	1 (5)	
SSI, n (%)	9 (25)	9 (33.3)	0.658

SD: Standard deviation, BMI: Body-mass index, DM: Diabetes mellitus, HT: Hypertension, COPD: Chronic obstructive pulmonary disease, SSI: Surgical site infection, p<0.05

DISCUSSION

Risk factors for the development of incisional hernias include advanced age, obesity, smoking, nutritional deficiencies, immunosuppressive therapy, and collagen disorders. Even with optimal suture techniques, poor wound healing in these cases can increase the risk of hernia formation.[5] Obesity is a significant risk factor for the formation, recurrence, and complications (e.g., strangulation) of hernias.[6] Studies have shown that the average BMI of patients with incisional hernias is 33 kg/m^2.[7,8] In this study, the average BMI was 31.18±5.22, with no significant difference between the two groups in terms of BMI. Given that hysterectomy patients tend to be older, age is an important factor, but there was no significant difference between the two groups in this regard.

When examining comorbidities, a study reported that 46 patients (35.9%) had no comorbidities, while 49 (38.2%) had COPD, and 25 (19.5%) had DM.[9] In our study, the most common comorbidity was HT (46%), followed by DM, thyroid disorders, and COPD. There was no significant difference between the groups in terms of comorbidities. Smoking has been shown to cause peripheral tissue hypoxia, which, in turn, disrupts the synthesis of collagen types I and III, and leads to connective tissue abnormalities.[10] The smoking rate among our patients was 39.7%, but no significant difference was observed between the two groups.

Technical factors related to abdominal surgery can also predispose to the formation of incisional hernias. Excessive tension during fascial closure, the inability to achieve a suture-to-wound length ratio of >4:1, and improper suture techniques can contribute to the development of hernias.[11] Vertical incisions have a higher risk for hernia formation than transverse or oblique incisions, and incisional hernias are most commonly observed after upper abdominal incisions among vertical incisions.[12] In female patients, the midline vertical incision is the most at-risk incision for hernia formation.[3] In the benign group, the absence of the lower midline incision and the predominance of Pfannenstiel incision led to a statistically significant difference ($p<0.0001$).

However, among all hysterectomy patients, the most common incision type was Pfannenstiel. In patients with incisional hernias, the sequence of incision types were most commonly the lower midline vertical incision, followed by the midline incision. The results obtained were not consistent with the literature regarding the type of incision.

Wound infections can disrupt normal wound healing.[13] In many patients who developed SSI, incisional hernias were observed despite additional interventions or medical treatments.[9] Only 28.6% of the patients who developed hernias had a postoperative SSI. There was no significant difference between benign and malignant patients regarding SSI rates.

Limitations

A limitation of the study is that the patients included were selected solely from those who underwent hernia surgery at our hospital. It is believed that the actual number of cases is higher, and the distribution of the included patients does not reflect the correct representation.

CONCLUSION

In patients who underwent hysterectomy, no statistically significant difference was found in the formation of incisional hernias between malignant and benign diagnoses. If modifiable risk factors can be eliminated or controlled, the development of hernias can be prevented, or at least patients can be managed more carefully during the perioperative period. Recommendations include the use of appropriate fascial closure techniques and the selection of the correct incision type, tailored to the patient's risk factors and the clinical context.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was conducted with the permission of Kocaeli University Non-interventional Clinical Researches Ethics Committee (Date: 11.06.2024, Decision No: 2024-146).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Cancer patients' rehabilitation needs and their fulfillment status

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ABSTRACT

Aims: Advances in cancer treatment have improved patients' survival rates; however, longer survival brings physical and psychosocial challenges. Cancer rehabilitation aims to mitigate these issues, preserving functionality and quality of life. This study aimed to evaluate the rehabilitation needs of oncology inpatients and the extent to which these needs are met, thereby raising awareness.

Methods: This cross-sectional, single-center study included 200 inpatients from the medical oncology service who voluntarily participated. A literature-based questionnaire was administered to assess patients' demographic and clinical characteristics, physical activity levels, and symptoms that may require rehabilitation. Performance status was determined using the Eastern Cooperative Oncology Group (ECOG) scale. Electronic patient records were reviewed to identify those who received a physical therapy and rehabilitation (PTR) consultation. The characteristics of patients who received and did not receive PTR consultation were statistically compared ($p<0.05$ significance level).

Results: The median age of the study participants was 61 years, with 59% being male. The most common symptoms requiring rehabilitation were fatigue (86%), pain (35%), and ambulation difficulty (32.5%). ECOG performance score was 2 and above in 41.5% of the patients. Only 27 patients (13.5%) received PTR consultation. Patients who received PTR consultation had significantly higher ECOG scores ($p<0.001$), higher rates of metastatic disease ($p=0.047$), and lower rates of independent feeding ($p<0.001$).

Conclusion: Although symptoms such as fatigue, pain, and mobility issues that require rehabilitation are common among oncology patients, referral rates to PTR clinics and access to rehabilitation services remain low. Identifying and addressing these needs is crucial for improving patient outcomes. Therefore, increasing awareness and strengthening collaboration between oncology and rehabilitation clinics is essential.

Keywords: Cancer, oncology, physical therapy and rehabilitation, consultation

INTRODUCTION

According to data from the International Agency for Research on Cancer (IARC), approximately 19.3 million new cancer cases were diagnosed worldwide in 2020, and 10 million deaths occurred due to cancer.[1] Advances in cancer diagnosis and treatment, along with developments in therapeutic approaches, have led to significant improvements in patient survival rates. However, prolonged survival increases the frequency of various physical and emotional problems arising from both the malignant disease itself and the treatment modalities used. These issues negatively affect patients' participation in daily activities, social relationships, and overall quality of life.[2,3]

Cancer rehabilitation aims to help patients overcome physical, social, psychological, and occupational limitations caused by the disease and treatment process, serving as a crucial component in improving functionality and quality of life during survival. Literature highlights the necessity of integrating oncological rehabilitation into the cancer care process and emphasizes the need to expand these services.[4,5] Despite the growing awareness that cancer rehabilitation is a fundamental aspect of oncological treatment, its clinical practice remains inadequate. This global deficiency, considering the increasing cancer incidence and prolonged survival, has the potential to cause significant public health

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problems in the long run. Furthermore, the number of cancer survivors worldwide is expected to double in the coming years, making the expansion of oncological rehabilitation services and their effective integration into healthcare systems a priority.[6]

The World Health Organization (WHO) launched the "Rehabilitation 2030" initiative in 2017 to enhance global access to high-quality rehabilitation services for individuals with non-communicable diseases. This initiative aims to strengthen healthcare systems in terms of rehabilitation services and make these services more accessible through a comprehensive rehabilitation intervention package. Given the short- and long-term effects of cancer and its treatment, WHO has identified oncological rehabilitation as a priority area within this initiative. This underscores the importance of integrating oncological rehabilitation into healthcare systems to maintain functionality and improve quality of life for cancer patients.[6]

This study aimed to analyze the rehabilitation needs and fulfillment status of inpatients in the oncology clinic and to raise awareness based on the results.

METHODS

Ethics

This study was approved by the Scientific Researches Evaluation and Ethics Committee of Ankara Etlik City Hospital (Date: 08.01.2025, Decision No: AEŞH-BADEK-2024-1244). Following ethics approval, the study was conducted from February 1, 2025, among 200 inpatients at the Medical Oncology Service of Ankara Etlik City Hospital who consented to participate by completing the prepared questionnaire. This cross-sectional, single-center study was conducted following the Helsinki Declaration and relevant ethical principles.

Data Collection Process

A standardized questionnaire, developed based on literature reviews, was used to assess patients' demographic and clinical characteristics, physical activity levels, and rehabilitation needs. This questionnaire included common symptoms in cancer patients that may require rehabilitation, such as pain, mobility issues, bowel and bladder dysfunction. Patients' physical performance levels were evaluated using the Eastern Cooperative Oncology Group (ECOG) performance scale, and ECOG scores were recorded based on self-reported information and face-to-face clinical evaluations. Volunteer patients participating in the study were assessed by a physical therapy and rehabilitation (PTR) specialist during the questionnaire administration.

During hospitalization, electronic medical records were reviewed to determine whether patients had been assessed by the PTR clinic (whether PTR consultation was requested). Patients who received PTR consultation were compared with those who did not in terms of demographic and clinical characteristics.

Inclusion Criteria

Inpatients aged 18 years and older in the Oncology Clinic of Ankara Etlik City Hospital who agreed to participate by signing the informed consent form.

Exclusion Criteria

Patients who refused to sign the informed consent form or who were unable to answer the questionnaire due to physical or mental conditions.

Statistical Analysis

Descriptive statistical methods were used to analyze patients' demographic and clinical characteristics. Differences between patients who received and did not receive PTR consultation were assessed using appropriate statistical tests. Relationships between ECOG scores and other parameters with PTR consultation were analyzed, with a statistical significance level set at $p<0.05$.

Sample Size Justification

A priori power analysis was conducted using G*power 3.1.9.7 software. With Cohen's $d=0.5$, $\alpha=0.05$, and $1-\beta=0.80$, the minimum required sample size was calculated as 190 patients. Since our study included 200 patients, the sample size was deemed statistically sufficient.

RESULTS

200 patients were included in the study, with a median age of 61 years (19-92); and 59% of the participants were male, while 41% were female. 64.5% of the study group was at the metastatic disease stage, and 49% had been diagnosed with malignancy within the last six months. Regarding the primary tumor localization, the most common malignancies were determined as lung cancer (21%), gastric cancer (15.5%), and pancreatic cancer (12%), respectively. In terms of comorbidities, 29.5% of patients had hypertension, while 23% had diabetes. Regarding medication use, 61% of the patients were using fewer than three medications. Continuation of oncological treatment (chemotherapy or radiotherapy), infection-related conditions, and electrolyte imbalances were identified as the three most common reasons for hospitalization. The demographic and clinical characteristics of the patients are summarized in **Table 1a**.

In the patients' subjective assessments of physical activity and performance status, 51% described themselves as active, 35.5% as limited, and 13.5% as completely dependent. ECOG performance score was 2 and above in 41.5% of the patients, and 59% were receiving enteral or parenteral nutritional support. Data on nutritional status, physical activity, and performance levels are summarized in **Table 1b**.

In hospitalized oncology patients, the presence of common symptoms that may require rehabilitation was systematically evaluated in accordance with the literature. Fatigue was detected in 86% of the patients, pain in 35%, and ambulation difficulties in 32.5%. Although less frequently, bowel dysfunction (27%), bladder dysfunction (23%), neurological symptoms (17.5%), and swallowing dysfunction (17%) were also reported. The distribution of symptoms that may require rehabilitation is presented in **Table 2**.

Among the 200 patients evaluated in the study, only 55 were able to engage in regular walking and exercise. Patients were divided into two groups: those who were consulted for PTR and those who were not. A total of 27 patients received a PTR consultation. When comparing patients with and without

Table 1a. Demographic and clinical characteristics of patients

Age median (range) year	61.0 (19.0-92.0)
Sex no (%)	
Male	118 (59.0)
Female	82 (41.0)
Primary tumor site, no (%)	
Lung	42 (21.0)
Breast	14 (7.0)
Pancreas	24 (12.0)
Gastric	31 (15.5)
Colorectal	19 (9.5)
Sarcoma	10 (5.0)
Prostate	3 (1.5)
Bladder	5 (2.5)
Colangiocarcinoma	6 (3.0)
Gynecological	22 (11.0)
Head&neck	14 (7.0)
Others	10 (5.0)
Stage no (%)	
Non-metastatic	71 (35.5)
Metastatic	129 (64.5)
Duration of malignancy no (%)	
<6 months	98 (49.0)
6-12 month	46 (23.0)
>12 months	56 (28.0)
Comorbidity no (%)	
Hypertension	59 (29.5)
Diabetes mellitus	46 (23.0)
Coronary artery disease	30 (15.0)
Cerebrovascular disease	12 (6.0)
Asthma/COPD	20 (10.0)
Other	33 (16.5)
Number of medications used no (%)	
<3	122/61.0)
≥3	78 (39.0)
Cause of hospitalization, no (%)	
Infection	35 (17.5)
Oncological treatment continued	57 (28.5)
Electrolyte imbalace	26 (13.0)
Blood transfusion	12 (6.0)
Palliative care	35 (17.5)
Interventional procedures	35 (17.5)

PTR: Physical therapy and rehabilitation COPD: Chronic obstructive pulmonary disease

Table 1b. Nutritional status and physical condition of patients

Nutritional status no (%)	
Independent	82 (41.0)
Enteral nutrition	77 (38.5)
Total parenteral nutrition	39 (19.5)
PEG/PEJ	2 (1.0)
How does one define oneself physiologically? no (%)	
Active	102 (51.0)
Limited	71 (35.5)
Immobile	27 (13.5)
ECOG PS no (%)	
0	20 (10.0)
1	97 (48.5)
2	46 (23.0)
3	21 (10.5)
4	16 (8.0)
Ability to walk & exercise no (%)	
Yes	55 (27.5)
No	145 (72.5)

PEG: Percutaneous enterogastrostomy, PEJ: Percutaneous enterojejunostomy, ECOG PS: Eastern cooperative oncology group performance status

PTR consultation, it was found that the mean age of those who received a consultation was higher (p=0.002), the proportion of those in the metastatic stage was higher (p=0.047), and the rate of independent nutrition (patients not receiving enteral or parenteral nutritional support) was lower (p<0.001). Additionally, the rate of PTR consultation was significantly higher in patients with a higher ECOG performance score (p<0.001). Furthermore, impaired walking and exercise capacity was significantly associated with PTR consultation (p=0.039). These findings are summarized in Tables 3a, 3b.

Table 2. Distribution of symptoms that may require rehabilitation (%)

Fatigue	
Yes	172 (86.0)
No	28 (14.0)
Pain	
Yes	70 (35.0)
No	130 (65.0)
Imbalance during ambulation	
Yes	65 (32.5)
No	135 (67.5)
Bowel dysfunction	
Yes	54 (27.0)
No	146 (73.0)
Bladder dysfunction	
Yes	46 (23.0)
No	154 (77.0)
Neurological symptoms	
Yes	35 (17.5)
No	165 (82.5)
Swallowing dysfunction	
Yes	34 (17.0)
No	166 (83.0)

Table 3a. Demographic and clinical characteristics of patients with and without PTR consultation

	Without PTR consultation (n=173)	With PTR consultation (n=27)	p value*
Age median(range) year	61.0 (20.0-92.0)	58.0 (19.0-72.0)	0.255
Sex no (%)			
Male	108 (91.5)	10 (8.5)	0.037
Female	64 (79.0)	18 (21.0)	
Primary no (%)			
Lung	35 (83.3)	7 (16.7)	
Breast	12 (85.7)	2 (14.3)	
Pancreas	22 (91.7)	2 (8.3)	
Gastric	28 (90.3)	3 (9.7)	
Colorectal	15 (78.9)	4 (21.1)	
Sarcoma	10 (100.0)	0 (0.0)	0.140
Prostate	3 (100.0)	0 (0.0)	
Bladder	4 (80.0)	1 (20.0)	
Colangiocarcinoma	5 (83.3)	1 (16.7)	
Gynecological	20 (90.9)	2 (9.1)	
Head&neck	12 (85.7)	2 (14.3)	
Others	6 (60.0%)	4 (40.0%)	
Stage no (%)			
Non-metastatic	66 (93.0)	5 (7.0)	0.047
Metastatic	107 (82.9)	22 (17.1)	
Duration of malignancy no (%)			
<6 months	86 (87.8)	12 (12.2)	0.518
6-12 month	41 (89.1)	5 (10.9)	
>12 months	46 (82.1)	10 (17.9)	

*Pearson Chi-square, PTR: Physical therapy and rehabilitation

DISCUSSION

In cancer patients, various symptoms arise due to both the disease itself and the medical treatments applied. Pain, fatigue, exhaustion, constipation and bowel dysfunction, gait and balance disorders, neuropathy, and bladder dysfunction are among the common symptoms that negatively impact patients' quality of life, lead to a decrease in functional capacity, and create a need for rehabilitation.[7-10] In our study, fatigue, pain, and ambulation problems were also observed at high rates in patients.

Physical activity contributes to improving the quality of life in oncology patients by supporting the treatment process. In the literature, systematic reviews have demonstrated that physical activity is effective in alleviating cancer-related symptoms.[11] In a study conducted by Mikkelsen et al.[12], it was

Table 3b. Nutritional status and physical activities of patients with and without PTR consultation

	Without PTR consultation (n=173)	With PTR consultation (n=27)	p value*
How does one define oneself physiologically? no (%)			
Active	100 (98.0)	2 (2.0)	<0.001
Limited	57 (80.3)	14 (19.7)	
Immobile	16 (59.3)	11 (40.7)	
Cause for hospitalization no (%)			
Infection	31 (88.6)	4 (11.4)	
Oncological treatment continued	53 (93.0)	4 (7.0)	0.019
Electrolyte imbalace	17 (65.4)	9 (34.6)	
Blood transfusion	11 (91.7)	1 (8.3)	
Palliative care	29 (82.9)	6 (17.1)	
Interventional procedures	32 (91.4)	3 (8.6)	
ECOG PS no (%)			
0	20 (100.0)	0 (0.0)	
1	95 (97.7)	2 (2.1)	<0.001
2	37 (80.4)	9 (19.6)	
3	12 (57.1)	9 (42.9)	
4	9 (56.3)	7 (43.8)	
Ability to walk & exercise no (%)			0.039
Yes	52 (94.5)	3 (5.5)	
No	121 (83.3)	24 (16.7)	

*Pearson Chi-square, PTR: Physical therapy and rehabilitation, PEG: Percutaneous enterogastrostomy, PEJ: Percutaneous enterojejunostomy, ECOG PS: Eastern cooperative oncology group performance status

reported that physical activity reduces cancer-related fatigue, has positive effects on psychological well-being, and decreases musculoskeletal losses. In this context, assessing the physical condition of hospitalized oncology patients and ensuring their access to appropriate rehabilitation services is of great importance. In our study, it was found that the consultation rate to the PTR clinic was significantly higher in patients with a high ECOG performance score (p<0.001); however, it was also observed that a large proportion of patients with physical activity deficiencies were unable to benefit from rehabilitation services. Current clinical guidelines emphasize the critical role of rehabilitation services in symptom management for cancer patients.

There are various studies in the literature evaluating the rehabilitation needs of oncology patients and the extent to which these needs are met. In a study conducted by Lehmann et al.[14], 805 cancer patients were evaluated, and it was determined that 35% had weakness, 25% had ambulation problems, and 7% had communication issues. Additionally, it was stated that rehabilitation needs were not adequately met. In another study conducted by Gerber et al.[15], it was reported that only 16% of medical oncology inpatients were referred to the PTR clinic and received rehabilitation services at the time of discharge, while the majority were unable to access these services. In our study, it was found that symptoms requiring rehabilitation were prevalent among hospitalized oncology patients, but the proportion of patients who identified themselves as active and engaged in exercise was low. Although 41.5% of patients had an ECOG performance score of ≥2, only 27 patients were referred for PTR consultation. In this regard, oncology teams need to be further informed about the positive effects of physical activity and rehabilitation on patients, and awareness in this field should be increased.

There are various studies in the literature evaluating the effectiveness of oncological rehabilitation. In a study conducted by Marciniak et al.[16] on 159 cancer patients, it was reported that cancer rehabilitation contributed to patients' functional gains. In a study by Fernandes et al.[8] in 2023, it was shown that multimodal physical exercise and functional rehabilitation programs were effective in alleviating cancer-related fatigue symptoms. In the study by Cole et al.[17], rehabilitation programs were found to result in significant improvements in patients' cognitive and motor functions.

Limitations

Considering that rehabilitation needs may vary depending on cancer types, our study did not include a detailed grouping and analysis of symptoms based on cancer types. Furthermore, the clinical outcomes and feedback of patients who received rehabilitation services were not reported, which limited the assessment of the effectiveness of these services. Although physical activity levels were evaluated using the ECOG performance score, it would be beneficial to support this with other methods for a more comprehensive and objective analysis. Additionally, since the study was conducted in a single center with a limited number of patients, the generalizability of the results is a significant limitation. These factors constitute the primary limitations of our study. Taking these limitations into account, it is important to plan future studies that include larger patient populations, grouped according to cancer types and stages, in a multicenter setting. Such studies would allow for a more detailed assessment of rehabilitation needs and a more comprehensive evaluation of the clinical effectiveness of the services provided.

CONCLUSION

In conclusion, it was determined that inpatients in the oncology clinic experience high rates of symptoms that negatively impact quality of life and disrupt functional integrity, such as cancer-related fatigue, pain, ambulation problems, and bladder and bowel dysfunction. However, it was also found that referral rates to PTR clinics and rehabilitation service utilization rates were quite low in these patients. Identifying and addressing these needs and improving patient outcomes require increasing awareness and strengthening collaboration between oncology and rehabilitation clinics, which is of critical importance.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was approved by the Scientific Researches Evaluation and Ethics Committee of Ankara Etlik City Hospital (Date: 08.01.2025, Decision No: AEŞH-BADEK-2024-1244).

Informed Consent

All patients freely and voluntarily signed an informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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The relationship between mindful eating, intuitive eating and orthorexia nervosa in adult individuals

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ABSTRACT

Aims: This study aimed to investigate the mindful eating, intuitive eating and orthorexia nervosa relationship among adult individuals.

Methods: Two hundred and seventy individuals working in a hospital (165 healthcare workers and 105 administrative staff) joined this cross-sectional research carried out between July and August 2023. The researcher collected the data from the participants in person. A descriptive facts form about participants' sociodemographic characteristics and anthropometric measurements, the Intuitive Eating Scale, the Orthorexia Nervosa Scale, and the mindful eating questionnaire were utilized to gather data.

Results: Participants' mean age was 35.27±10.22 (min.: 20 and max.: 58) years. In this study, 75.9% were female. The mean body-mass index (BMI) was 25.12±4.75 (min:15.58 and max: 40.40) kg/m². Participants BMI distribution was 4.4%, underweight; 52.2%, normal weight; 28.1%, overweight; 11.9%, first-degree obesity; 2.2% (six participants), second-degree obesity, and 1.1% (three participants), severe obesity. The mean Orthorexia Nervosa Scale total score had a positive, very weak association with the average values of emotional eating sub-domain (r: 0.233, p=0.000) and a very weak and negative association with conscious eating sub-domain (r:-0.122, p=0.046) of the mindful eating questionnaire. The mean scores on the total Orthorexia Nervosa and intuitive eating scales had a very weak and statistically meaningful positive association (r: 0.175, p=0.004). The mean mindful eating and the intuitive eating measure figures showed a statistically meaningful, low-level, and positive association (r: 0.480, p=0.000).

Conclusion: As tendency to orthorexia increased, their intuitive eating and emotional eating, a sub-domain under the mindful eating measure, decreased. Additionally, it was discovered that mindful eating rose in parallel with intuitive eating. The development and application of mindful and intuitive eating techniques in conjunction and doing more extensive research on the topic are crucial in the treatment of eating disorders like orthorexia nervosa.

Keywords: Orthorexia nervosa, intuitive eating, mindful eating, emotional eating

INTRODUCTION

In the last decade, there has been an increase in the emphasis on healthy eating and decision-making accordingly.[1] The preference for eating healthy foods is not a disorder in itself, but it is thought that the obsession with these foods, moderation, loss of balance, and isolation from life caused by this eating habit may result in orthorexia nervosa (ON).[2]

The increasing tendency towards ON today often causes a decrease in awareness about eating.[1] Mindful eating is 'consuming foods in return for satiety and hunger being aware of the impact of feelings and deliberations, understanding why and how eating behavior arise instead of just focusing on eating and the specific food consumed, free from the impacts of environmental factors, centering on the food to be consumed here and now, and avoiding judgments or criticism of food choices'.[3] The individual study involving mindfulness-based and informed interventions on eating behaviors and related disorders have pointed to the existence of a negative eating disorder and mindfulness association and underlined a comprehensive mindfulness and ON link.[4] Apart from these findings, the study have shown that intuitive eating behaviors decrease with an increase in the tendency toward ON.[5] People with eating disorders may have trouble recognizing and differentiating interoceptive cues like hunger and fullness, and people with orthorexia may also have this issue.[6] Controlling and developing intuitive eating behaviors will successfully improve individuals' concerns about eating, and the process will be better managed in ON.[7] In addition,

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mindful eating and intuitive eating potentially emerge as a solution to overcome incongruent dietary restrictions. Supporting this, the study has shown that individuals with higher intuitive eating exhibit higher mindful eating levels.[8] Improved psychological health markers, like higher self-esteem, greater acknowledgment of body and image, and reduced disordered eating behaviors, are associated with mindful and intuitive eating.[9] Exploring mindful eating, intuitive eating, and ON connections in adults was the objective of the present research.

METHODS

Ethics

In order to conduct the research, the approval of the İstanbul Okan University Health Sciences Institute Ethics Committee was obtained (Date: 10.05.2023, Decision No: 166). In addition, permission was obtained from the Antalya Provincial Health Directorate to conduct the study at Manavgat State Hospital (Date: 12.07.2023, Number: E-98360293-604.01.02-219609367). Individuals were given comprehensive information about the content of the study and signed a written consent form stating that they participated voluntarily. The research adhered to the Declaration of Helsinki principles.

Study Design and Participants

This cross-sectional study was conducted between July 15 and August 15, 2023. Volunteers aged between 20 and 64, not breast feeding or pregnant, and with no chronic disease joined the research. There were 900 people in the population of the research (550 healthcare workers and 350 administrative staff) working at Manavgat State Hospital. A power analysis was performed on the G*power software to find the smallest number of subjects and eventually it was estimated to be 266, considering a power value of 90%, an alpha value of $\alpha=0.05$, an effect size of $f=0.4$, and $1-\beta=0.90$.[10] Eventually, the study was completed with 270 adult volunteers. The research was thoroughly explained to the subjects, and their agreement statement was collected in writing.

Measures

The researcher collected the data from the participants in person. Data about individuals' sociodemographic and anthropometric characteristics were gathered with a 25-item descriptive facts form. Three other scales were used in the study, one with 30 questions to measure mindful eating, another with 23 questions to assess intuitive eating, and the last one with 11 questions to evaluate the tendency to ON.

The descriptive information form had items about sociodemographic (age, gender, marital status, education level, and occupation) and anthropometric characteristics (body weight (kg), height (cm), body-mass index (BMI), basal metabolic rate (BMR), body fat percentage (%)). Individuals' body weights (kg), body fat percentages (%), BMRs were calculated using the body analyzer "Tanita TT 730". BMI calculation formula was (body weight (kg) / (height $(m)^2$). The BMI classification of the World Health Organization (WHO) was utilized[11]: <18.5 kg/m^2=underweight; 18.5-24.9 kg/m^2=normal weight; 25-29.9 kg/m^2=overweight; 30-34.9 kg/m^2=first-degree obesity; 35-39.9 kg/m^2=second-degree obesity; and >40 kg/m^2 as=severe obesity.[11]

The Mindful Eating Questionnaire (MEQ-30)

Framson et al.[12] designed this scale. It consists of five sub-factors and 28 four-point Likert items. Higher scores mean higher mindful eating. Köse et al.[3] did the Turkish reliability-validity analyses of this measure under the name MEQ-30. The scale has 30 questions, seven sub-domains, and a five-point Likert-type evaluation structure[13] (never: 1 to always: 5). The factors and their items were disinhibition (items 4, 14, 17, 20, and 26); emotional eating (items 21, 22, 23, 28, and 30); eating control (items 3, 6, 27, and 29); mindfulness (items 8, 9, 12, and 13-15); eating discipline (items 1, 18, 24, and 25); conscious eating (items 2, 7, 11, 16, and 19); and interference (influence by external factors) (items 5 and 10). There are 20 reverse items on the scale. A high score of ≥3 on a sub-factor indicates that the individual has the characteristics assessed by the relevant sub-domain. High scores on all sub-factors are interpreted positively. For example, an individual with a high score on "emotional eating" can cope with emotional eating. The arithmetic averages of the sub-domains and the total score are calculated to obtain total sub-factor and scale scores. This scale gives a total mindful eating score.[13]

The Intuitive Eating Scale-2 (IES-2)

This instrument reflects nutritional behaviors impacted by physiological hunger and fullness prompts, rather than by situation or emotion-based triggers.[14] Hawks et al.[15] created the original version of the scale, but it was seen that the scale had a low alpha coefficient and did not provide enough reliability in repeated tests. Tylka[16] designed the intuitive eating scale-1. It consisted of twenty-one questions and three sub-domains. The intuitive eating scale-2 was created by Tylka and Van Diest[17] by modifying and developing the intuitive eating scale-1. Bas et al.[18] performed the Turkish validity-reliability examination of this latest version. This adapted version has four sub-domains and 23 questions, each of which is scored using five-point Likert options in the range of strongly disagree to strongly agree. The sub-factors of the scale are unconditional permission to eat (UPE) (items 1, 3, 4, 9, 16, and 17), eating for physical rather than emotional reasons (EFPR) (items 2, 5, 10, 11, 12, 13, 14, and 15); reliance on hunger and satiety cues (RHSC) (items 6, 7, 8, 21, 22, and 23); and body-food choice congruence (BFCC) (items 18, 19, and 20). There are seven reverse items on the scale (items 1, 2, 4, 5, 9, 10, and 11), and they are scored in reverse. High scores show high intuitive eating levels. A score can be calculated for each factor. Sum of item scores divided by 23 gives the scale score. Overall Cronbach's α was estimated as 0.89 for women, 0.83 for men, and 0.82 regardless of gender.[18]

The Orthorexia Nervosa Scale-11 (Orto-11)

A 10-item orthorexia short questionnaire was created by Bratman.[19] The statements on this questionnaire were developed and evaluated by Donini et al.[2] and the ortho-15 scale was created. Donini et al.[20] designed the 11-item ON "orto-11" Scale by removing some items from the original form and changing some others. Arusoğlu et al.[21] did the Turkish adaptation and the reliability-validity studies of the ortho-11. The ON scale (orto-11) has 11 four-point Likert questions with the following options: "always," "frequently," "sometimes," and "never." The items on the scale are scored between 1 and 4, and there are some reverse-coded items. Low scores indicate a high tendency to ON.[21]

Statistical Analysis

Descriptive statistics were employed in data assessment. Normality assumptions were examined with the Kolmogorov–Smirnov test. To compare two independent group means, Student's t-test was used in parametric distributions and the Mann-Whitney-U test was employed in nonparametric distributions. In nonparametric distributions, three or more groups were compared with the Kruskal-Wallis H test. When the difference was found to be significant in the comparison of three or more group means, the Dunnett T3 test, a post-hoc test, was employed. In nonparametric distributions, Spearman correlation was employed to reveal association of two continuous variables. The correlation coefficient was interpreted as follows: ≤0.25, very weak; 0.26-0.49, weak; 0.50-0.69, moderate; 0.70-0.89, strong; ≥0.90, very strong.[22] SPSS 26.0 was utilized to analyze the data. $p<0.05$ showed the threshold for statistical meaning.

RESULTS

Table 1 gives participants' sociodemographic characteristics. Mean age was 35.27±10.22 years (min.: 20 and max.: 58), 71.5% had an associate or undergraduate education, 75.9% were female, and 58.1% were married. Healthcare workers made up 61.1% of the research group, 34.4% of which were from the nursing profession (Table 1).

Table 2 shows the distribution of participants' anthropometric measurements. The mean BMI was 25.16±4.97 (min: 15.58, max: 40.40) kg/m² among women. The average BMR of the women was 1377.77±136.16 kcal. The average body fat percentage (%) of the women was 29.58±8.20 (Table 2).

The mean BMI was 25.02±3.99 (min.: 16.51 and max.: 35.36) kg/m² among men. The average BMR of the men was determined as 1918.32±265.56 kcal. The average body fat percentage (%) of the men was 13.90±9.10 (Table 2).

The mean BMI was 25.12±4.75 (min.:15.58 and max.: 40.40) kg/m² (Table 2). According to the BMI distribution of the group, 4.4% were underweight, 52.2% were normal weight, 28.1% were overweight, 11.9% had first-degree obesity, 2.2% had second-degree obesity, and 1.1% had severe obesity (not included in the tables).

Table 3 shows associations among participants' total and/or sub-domain figures of the orto-11, mindful eating scale, and intuitive eating scale (Table 3).

The mean orto-11 total score had a very small but statistically meaningful positive association with the emotional eating sub-domain score (r:0.233, p=0.000) and a very small, negative, and statistically meaningful association with (r:-0.122, p=0.046) the conscious eating sub-domain score of the MEQ-30 (Table 3).

A very small but and statistically meaningful positive association was detected the mean scores of the total orto-11 and the total IES-2 (r: 0.175, p=0.004). The mean orto-11 total score had a very weak and statistically significant positive correlation with the UPE (r: 0.228, p=0.000) and the EFPR sub-domain (r: 0.140, p=0.022) scores and a very weak, negative, and statistically meaningful negative association with the BFCC Factor (r: -0.180, p=0.003) of the IES-2 (Table 3).

The total scores on the IES-2 and MEQ-30 exhibited a small and statistically meaningful positive association (r: 0.480, p=0.000). A statistically meaningful positive relationship was detected between the total item score of the IES-2 and the MEQ-30 sub-domain scores, such as disinhibition (r:0.359, p=0.000), emotional eating (r:0.574, p=0.000), eating control (r:0.242, p=0.000), eating discipline (r:0.238, p=0.000), conscious eating (r:0.122, p=0.046), and interference (r:0.147, p=0.016) (Table 3).

The item score of UPE sub-domain of the IES-2 and the total item score of the MEQ-30 exhibited a weak and statistically meaningful negative association (r:-0.374, p=0.000). A negative, statistically meaningful association was detected between the UPE sub-domain and the sub-domains of the MEQ-30, namely disinhibition (r: -0.267, p=0.000), emotional eating (r: -0.149, p=0.014), eating control (r: -0.222, p=0.000), eating discipline (r: -0.285, p=0.000), conscious eating (r: -0.376, p=0.000), and interference (r: -0.297, p=0.000) (Table 3).

A moderate-level and statistically meaningful positive relationship was detected between the EFPR sub-domain of the IES-2 and the MEQ-30 (r: 0.569, p=0.000). The EFPR sub-domain and the sub-domains of the MEQ-30, such as disinhibition (r: 0.442, p=0.000), emotional eating (r: 0.706, p=0.000), eating control (r: 0.228, p=0.000), eating discipline

Table 1. Distribution of participants' sociodemographic characteristics

Variables	n	%
Gender		
Female	205	75.9
Male	65	24.1
Age (year) (mean±SD: 35.27±10.22. min.: 20. maks.: 58)		
<25	59	21.9
25-34	71	26.3
35-44	78	28.9
≥45	62	23.0
Marital status		
Married	157	58.1
Single	113	41.9
Education		
Elementary school	13	4.8
Middle school	11	4.1
High school	39	14.4
Undergraduate degree	193	71.5
Master's degree or PhD	14	5.2
Field		
Healthcare worker	165	61.1
Administrative staff	105	38.9
Job		
Physician	10	3.7
Nurse+midwife	100	37.1
Dietician+physiotherapist+psychologist	23	8.5
Pharmacist	15	5.6
Health technicians	17	6.3
Officer	4	1.5
Civil servant	18	6.7
Cleaning staff	35	13.0
Secretary	25	9.3
Security guard+police+engineer+worker	23	8.3

SD: Standard deviation, Min: Minimum, Max: Maximum

Table 2. Distribution of participants' anthropometric measurements

	Female				Male			
Measurements	**n**	**Mean±SD**	**Minimum**	**Maximum**	**n**	**Mean±SD**	**Minimum**	**Maximum**
BMI (kg/m²)	205	25.16 (4.97)	15.58	40.40	65	25.02 (3.99)	16.51	35.36
BMR (kcal)	205	1377.77 (136.16)	1099.00	1864.00	65	1918.32 (265.56)	1320.00	2703.00
Body fat percentage (%)	205	29.58 (8.20)	9.40	48.30	65	13.90 (9.10)	5.00	49.70
BMI (kg/m²)	270 (Total)	25.12 (4.75)	15.58	40.40				

BMI: Body-mass index, BMR: Basal metabolic rate, SD: Standard deviation

Table 3. Relationship with participants' mindful eating questionnaire, intuitive eating scale, and Orthorexia Nervosa Scale total and/or sub-scale scores

Scales	**n**	**Orthorexia Nervosa Scale-11 (Orto-11)**		**Intuitive eating scale -2 (IES-2)**									
				Total		**Unconditional permission to eat**		**Eating for physical rather than emotional reasons**		**Reliance on hunger and satiety cues**		**Body-food choice congruence**	
		r	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**
Mindful eating questionnaire (MEQ-30)	270	0.039	0.525	0.480	0.000***	-0.374	0.000***	0.569	0.000***	0.508	0.000***	0.235	0.000***
Disinhibition	270	0.037	0.541	0.359	0.000***	-0.267	0.000***	0.442	0.000***	0.361	0.000***	0.134	0.027*
Emotional eating	270	0.233	0.000***	0.574	0.000***	-0.149	0.014*	0.706	0.000***	0.382	0.000***	0.149	0.014*
Eating control	270	0.001	0.985	0.242	0.000***	-0.222	0.000***	0.228	0.000***	0.338	0.000***	0.148	0.015*
Mindfulness	270	-0.025	0.686	0.093	0.127	-0.014	0.814	0.111	0.068	0.153	0.012*	0.048	0.437
Eating discipline	270	-0.093	0.128	0.238	0.000***	-0.285	0.000***	0.216	0.000***	0.335	0.000***	0.309	0.000***
Conscious eating	270	-0.122	0.046*	0.122	0.046*	-0.376	0.000***	0.186	0.002**	0.253	0.000***	0.086	0.160
Interference	270	-0.017	0.780	0.147	0.016*	-0.297	0.000***	0.274	0.000***	0.160	0.009**	0.122	0.045*
Intuitive eating scale-2 (IES-2)	270	0.175	0.004**	-	-	-	-	-	-	-	-	-	-
Unconditional permission to eat	270	0.228	0.000***	-	-	-	-	-	-	-	-	-	-
Eating for physical rather than emotional reasons	270	0.140	0.022*	-	-	-	-	-	-	-	-	-	-
Reliance on hunger and satiety cues	270	0.071	0.248	-	-	-	-	-	-	-	-	-	-
Body-food choice congruence	270	-0.180	0.003**	-	-	-	-	-	-	-	-	-	-

*p<0,05, **p<0,01, ***p<0,001. Spearman's rho

(r: 0.216, p=0.000), conscious eating (r: 0.186, p=0.002), and interference (r: 0.274, p=0.000), yielded a positive, statistically meaningful association (Table 3).

The reliance on hunger and satiety cues sub-domain of the IES-2 and the MEQ-30 had a moderate-level, positive, and statistically meaningful association (r: 0.508, p=0.000). A positive, statistically meaningful association was detected between the reliance on hunger and satiety cues sub-domain and the MEQ-30 sub-domains, namely disinhibition (r:0.361, p=0.000), emotional eating (r:0.382, p=0.000), eating control (r:0.338, p=0.000), mindfulness (r:0.153, p=0.012), eating discipline (r:0.335, p=0.000), conscious eating (r:0.253, p=0.000), and interference (r:0.160, p=0.009) (Table 3).

A very small and statistically meaningful positive association was detected between the item score of the BFCC sub-domain of the IES-2 and the total item score of the MEQ-30 (r:0.235, p=0.000). A statistically significant positive relationship was determined between the item score of the BFCC sub-domain and the item scores of the disinhibition (r: 0.134, p=0.027), emotional eating (r: 0.149, p=0.014), eating control (r: 0.148, p=0.015), eating discipline (r:0.309, p=0.000), and interference (r:0.122, p=0.045) sub-domains of the MEQ-30 (Table 3).

DISCUSSION

ON is frequently prevalent today. It is thought to have a negative association with mindful eating and intuitive eating.[1,23] Developing mindful and intuitive eating can potentially promote general health and well-being in individuals.[1] Reflecting on all this information, the objective of this cross-sectional research was to study the associations of ON, mindful eating, and intuitive eating in adult individuals comprehensively.

In studies on ON and mindful eating associations, it was determined that as the orthorexic tendency increased, "emotional eating", one of the mindful eating sub-domains, decreased, similar to the results in this research.[2,24] This result may be based on the idea that orthorexic individuals have an increased desire to eat when they feel tense, excited, happy, or guilty.[2]

As the orthorexic tendency increased in the present research, "conscious eating", one of the mindful eating sub-domains, also increased. In similar study conducted in parallel with this study, as concerns about healthy nutrition increased in individuals with orthorexia, conscious eating, one of the sub-domains of mindful eating, also increased.[24] There is

an increase in healthy eating behaviors in individuals with orthorexia, which increases their tendency towards conscious eating.[25,26]

In the study conducted in parallel with this study, an increase in orthorexic tendency decreased intuitive eating.[5] This may be because individuals with orthorexia have anxiety and guilt psychology related to food and cannot show unconditional eating behavior without listening to their body and distinguishing foods as good or bad.[6]

A study about the evaluation of ON and intuitive eating associations revealed that as orthorexic tendency increased, "UPE" and "EFPR", which are sub-domains of intuitive eating, decreased.[5] In parallel with this study, as orthorexic tendency increased, "BFCC", which is a sub-domain of intuitive eating, increased, as well.[5] Actions taken on healthy nutrition are conceptualized by this fact of intuitive eating to a certain extent and are thought to be associated with food choices that support health in the body.[17] However, it has been seen that restrictive nutrition and strict food rules at high levels are associated with distress and deterioration, regardless of their focus.[27]

In studies on mindful and intuitive eating associations, parallel to the results in the present research, a positive association was detected between mindful eating and intuitive eating.[23,28] In some studies, consistent with the findings in the present research, as intuitive eating increased, the sub-domains of mindful eating, namely "disinhibition," "emotional eating," "eating control," "eating discipline," "conscious eating," and "interference" also increased and that as the "EFPR", one of the sub-domain of intuitive eating, increased, the total score of the mindful eating scale also increased.[29,30] Since mindful eating emerged as a response to physical hunger and satiety, EFPR, one of the sub-domains of the IES-2, also increased.[3]

In similar studies conducted parallel to the present research, a statistically meaningful negative association was detected among the mean scores on the "UPE" sub-domain score of the IES-2 and the total and sub-domains of the mindful eating scale, namely "disinhibition," "emotional eating," "eating discipline," and "interference". Contrary to these studies, Anderson et al.[8] did not detect any relationship.

In another study with parallel results to this study, a positive, statistically meaningful association was detected between the item scores of the reliance on hunger and satiety cues sub-domain of the IES-2 and the interference sub-domain of the MEQ-30 (r:0.160, p=0.009). It is thought that individuals who pay more attention to their internal and external experiences trust their bodies' hunger and satiety cues more.[28]

Previous research into the investigation of how intuitive and mindful eating were related to eating habits included positive, negative, significant, and insignificant results, which were parallel to this study. These different results regarding the relationship between intuitive eating and mindful eating[8,28] suggest that they may have different effects on food intake. Considering these issues, it is thought that further studies that will simultaneously include intuitive eating, mindful eating, and their connection to food intake are needed.[30]

Strengths of The Study

In the literature, no study has been found that examines the relationships between mindful eating, intuitive eating and ON specifically on healthcare professionals. In this respect, our study fills an important gap in the field. In addition, it is thought that the findings can guide both academic research and practical applications by providing new perspectives on understanding the eating behaviors of individuals working in the healthcare field.

Limitations

There are some limitations to this study. First of all, the cross-sectional design of the study makes it difficult to make direct inferences about cause-effect relationships. Considering the complex structure of eating behaviors and the various factors that affect these behaviors, longitudinal studies are needed to better understand the dynamics of these relationships over time. In addition, it is known that there are differences between genders in studies on intuitive eating and mindful eating. It is stated in the literature that female participants constitute the majority in such studies and that the participation rate of male participants in studies is lower. This situation also emerged as a limitation in our study. In the future, studies conducted with samples with a more balanced distribution in terms of gender may provide healthier comparisons between genders. In addition, the limited number of studies on eating disorders and the fact that existing studies include different sample groups, application methods and analysis techniques make it difficult to evaluate the general validity and clear results obtained. Conducting more research in the field and developing standard methods will contribute to obtaining more reliable and comparable results in future studies.

CONCLUSION

This study contributed to the identification of the relationship between the risk for ON and mindful eating and intuitive eating behaviors in adults. As individuals' tendency toward orthorexia increased, intuitive eating decreased, while "emotional eating" decreased and "conscious eating" increased. It was also observed in the study that as intuitive eating increased, mindful eating also increased. In the mindful eating approach, the individual decides physically rather than emotionally about why, how much, and when to eat. Therefore, mindful eating should be increased to prevent emotional eating in individuals with orthorexia. It is possible to successfully improve individuals' concerns about eating by developing and implementing intuitive eating behavior. Intuitive eating is also based on hunger and satiety cues to regulate food intake. Therefore, it also supports body weight control along with a decrease in BMI. Mindful eating should be increased and intuitive eating behavior should be developed in individuals with orthorexia. Thus, it will be possible to better manage the treatment process of individuals with orthorexia.

In eating disorders such as ON, intuitive and mindful eating approaches should be developed and used together. Also, more comprehensive and extensive studies should be conducted on this subject.

ETHICAL DECLARATIONS

Ethics Committee Approval

In order to conduct the research, the approval of the İstanbul Okan University Health Sciences Institute Ethics Committee was obtained (Date: 10.05.2023, Decision No: 166).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Ankyra Medical Journal

Case Report

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Bilateral optic atrophy as a sequela of delayed biotinidase deficiency diagnosis: a case report

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ABSTRACT

Biotinidase deficiency (BD) is a rare autosomal recessive metabolic disorder that can lead to severe neurological and ophthalmological complications if left untreated. Optic atrophy is a known but often under-recognized sequela of BD, particularly in cases with delayed diagnosis and treatment. We report the case of a 21-year-old female with a history of consanguineous parentage who presented with bilateral vision loss that was more pronounced in the left eye (OS). Her medical history revealed frequent hospitalizations in infancy due to refractory seizures, pulmonary infections, and dermatological manifestations. At the age of one, BD was diagnosed based on undetectable serum biotinidase enzyme activity (0 U/L), and biotin therapy (20 mg/day) was initiated. Despite treatment, ophthalmologic evaluation at age 21 revealed bilateral optic atrophy, decreased visual acuity (OD: 20/200, OS: counting fingers at 1 meter), and visual field defects. Visual evoked potential (VEP) testing showed a reduced amplitude in the OS, while electroretinography (ERG) remained normal. The patient was advised to continue biotin therapy and to undergo regular ophthalmologic monitoring. This case emphasizes the importance of early diagnosis and intervention in BD to prevent permanent complications, such as optic atrophy and vision impairment. We advocate universal newborn screening for BD and increased awareness among clinicians regarding its ophthalmological manifestations.

Keywords: Biotinidase deficiency, optic atrophy, newborn screening, visual impairment, metabolic disorder, consanguinity

INTRODUCTION

Biotinidase deficiency (BD) is a rare autosomal recessive metabolic disorder that impairs the body's ability to recycle biotin, an essential coenzyme for carboxylases involved in fatty acid metabolism, amino acid catabolism, and gluconeogenesis. The estimated global incidence of BD ranges from 1 in 80.000 to 1 in 100.000 live births, though higher rates have been reported in populations with a high prevalence of consanguineous marriages.[1] Early diagnosis and treatment with oral biotin supplementation can prevent most of the neurological and systemic complications associated with BD. However, delayed or missed diagnosis can result in irreversible neurological damage, including optic atrophy and visual impairment.[2]

The clinical manifestations of BD typically appear within the first few months of life, with refractory seizures being the most common presentation. Other symptoms include hypotonia, developmental delay, ataxia, sensorineural hearing loss, skin manifestations (seborrheic dermatitis, alopecia), and optic atrophy.[1] While optic atrophy is a recognized complication, its exact prevalence and pathophysiology remain unclear, and vision loss is often irreversible despite biotin supplementation.[3] This highlights the critical need for early detection, ideally through newborn screening programs that have been implemented in many countries.

In this report, we present the case of a 21-year-old female with a history of BD diagnosed at the age of one, who developed bilateral optic atrophy despite long-term biotin therapy. We emphasize the importance of early diagnosis and discuss the implications of delayed treatment on the visual outcomes.

CASE

A 21-year-old female presented to our ophthalmology clinic with progressive bilateral vision loss that was more pronounced in the left eye (OS). Her family history revealed first-degree parental consanguinity; however, no similar findings were reported in other family members.

At the age of one, the patient experienced recurrent pulmonary infections, generalized tonic-clonic seizures, and widespread erythematous exfoliation affecting both the body and scalp, requiring multiple hospitalizations. Owing to her neurological symptoms, a metabolic disorder was suspected, and biotinidase enzyme activity was measured at 0 U/L, confirming the diagnosis of profound BD. She was started on

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oral biotin therapy (20 mg/day, Gabioten), which successfully controlled her seizures and other systemic symptoms. However, her developmental milestones, hearing, and vision were not systematically assessed.

Upon presentation to our clinic, the patient's visual acuity (VA) was 20/200 in the right eye (OD) and counting fingers at 1 m in the OS. Intraocular pressure (IOP) was 18 mmHg in both eyes. Examination of the cornea and the anterior segment revealed no abnormalities. Fundus examination revealed bilateral optic atrophy, which was more pronounced in the OS (Figure 1A, 1B).

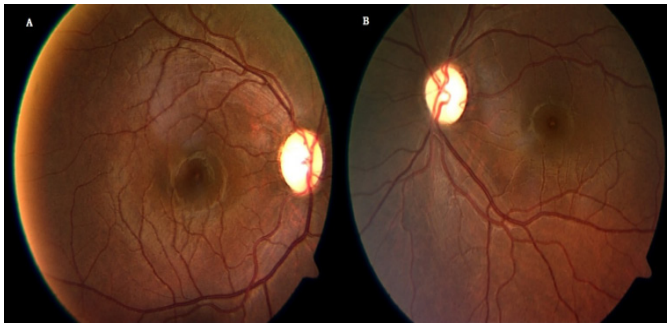

Figure 1. Fundus photography of both eyes. (**A**) Right eye (OD) showing a pale optic disc, consistent with optic atrophy. (**B**) The left eye (OS) demonstrates more pronounced optic atrophy, with significant pallor of the optic nerve head

Fundus fluorescein angiography (FFA) demonstrated a normal retinal vascular structure with normal arteriolar and venous filling and washout times (Figure 2A, 2B). Visual evoked potential (VEP) testing showed mild reduced amplitude and normal latency in the OD, whereas the OS exhibited decreased amplitude with normal latency (Figure 3A, 3B). Electroretinography (ERG) findings were normal in both eyes (Figure 4A, 4B).

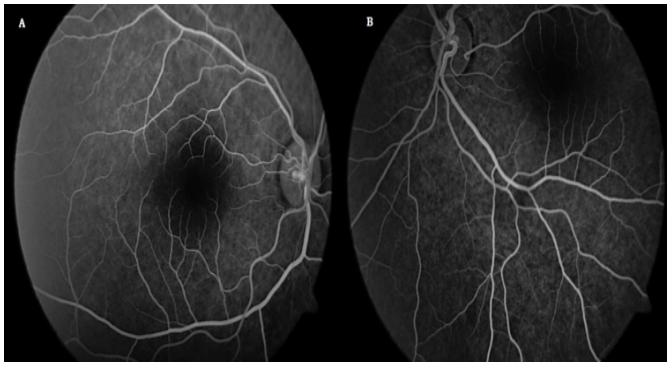

Figure 2. Fundus fluorescein angiography (FFA) in both eyes. (**A**) The right eye (OD) and (**B**) left eye (OS) show normal retinal vascular structures, with no abnormalities in arteriolar or venous filling or washout times. These findings indicate that the vascular pathology did not cause optic atrophy

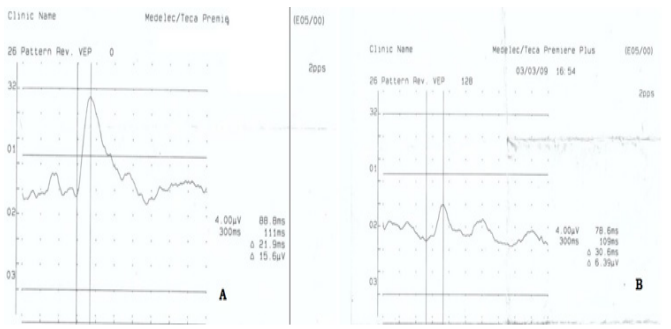

Figure 3. Visual-evoked potential (VEP) results. (**A**) Right eye (OD) showing mild reduced amplitude with normal latency, suggesting intact visual pathway function. (**B**) Left eye (OS) demonstrating a significantly reduced amplitude with normal latency, indicative of optic nerve damage and axonal loss

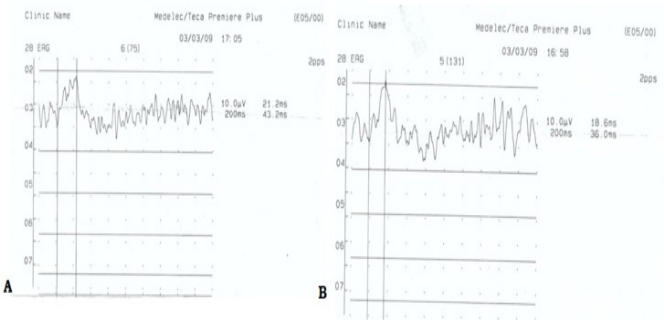

Figure 4. Electroretinographic (ERG) results. (**A**) The right eye (OD) and (**B**) the left eye (OS) showed normal responses, confirming that retinal function was preserved despite optic atrophy

On visual field testing (30-2), the OD demonstrated an enlarged blind spot, nasal step, and superior arcuate scotoma, findings consistent with inferior retinal nerve fiber layer damage (Figure 5A). The OS exhibited severe central visual field loss with marked fixation loss corresponding to total scotoma (Figure 5B).

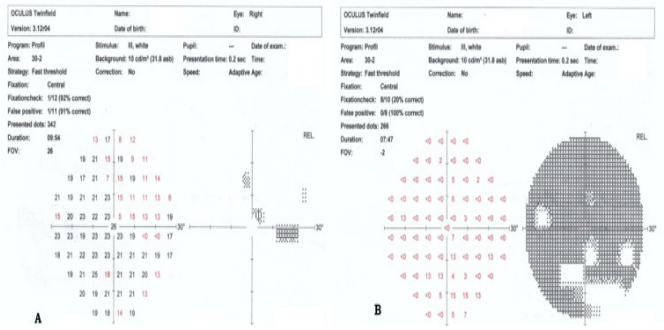

Figure 5. Visual Field testing (30-2). (**A**) Right eye (OD) demonstrating an enlarged blind spot, nasal step, and superior arcuate scotoma corresponding to inferior retinal nerve fiber layer damage. (**B**) The left eye (OS) exhibited severe central visual field loss with marked fixation loss, indicative of total scotoma

The patient was advised to continue the biotin supplementation (20 mg/day). Given the irreversible nature of optic atrophy, the primary goal of management is vision preservation through regular ophthalmologic follow-ups and possible low-vision rehabilitation strategies.

DISCUSSION

BD is a rare but treatable inherited metabolic disorder that, if undiagnosed or untreated, can lead to irreversible neurological and ophthalmic complications.[1] The disorder follows an autosomal recessive inheritance pattern and is more prevalent in populations with high consanguinity rates.[2] Early diagnosis and lifelong biotin supplementation (5–40 mg/day) effectively prevent most symptoms, but delayed treatment often results in permanent sequelae, particularly optic atrophy and sensorineural hearing loss.[3]

Optic atrophy in BD is attributed to progressive axonal degeneration due to prolonged metabolic stress and mitochondrial dysfunction, leading to retinal ganglion cell damage and visual impairment.[4] Our patient, despite receiving biotin therapy since infancy, developed bilateral optic atrophy and severe visual field loss, likely due to a late diagnosis at one year of age. Studies suggest that while metabolic and dermatologic symptoms improve rapidly with biotin therapy, neurological deficits, particularly optic and auditory damage, may remain irreversible if treatment is not

initiated within the first few weeks of life.[5] This underscores the critical importance of newborn screening, which has been implemented in several countries to enable early intervention before irreversible damage occurs.

In our case, neuro-ophthalmologic evaluation revealed bilateral optic atrophy with significant visual field defects, which were more pronounced in the OS. VEP testing confirmed decreased amplitude in the OS, further supporting optic nerve dysfunction. Despite continued biotin therapy at 20 mg/day, no visual improvement was observed, reinforcing previous findings that optic nerve damage in BD is largely irreversible. Given the progressive nature of BD-related optic atrophy, regular ophthalmologic monitoring is essential for assessing disease stability and visual function over time.

This case highlights the long-term visual consequences of delayed diagnosis of BD and emphasizes the urgent need for universal newborn screening programs. In many countries, BD is included in newborn screening panels, allowing for early diagnosis and immediate biotin supplementation. However, in regions where newborn screening is not widely implemented, cases such as ours may continue to occur, leading to preventable, but permanent vision loss.

CONCLUSION

Our case highlights the devastating effects of delayed BD diagnosis, particularly its association with irreversible optic atrophy and severe visual impairment. While biotin supplementation remains the cornerstone of BD treatment, it does not reverse established optic nerve damage. Therefore, early detection through newborn screening is essential for preventing permanent neurological and ophthalmic sequelae. We strongly advocate the inclusion of BD in newborn screening programs worldwide, particularly in populations with high rates of consanguinity. Additionally, clinicians should maintain a high index of suspicion for BD in infants presenting with refractory seizures, dermatological manifestations, or developmental delay, ensuring prompt diagnosis and treatment.

ETHICAL DECLARATIONS

Informed Consent

The patient signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Case Report

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Hydrofibre technology with silver ions in the treatment of wound; evaluation of a case report

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ABSTRACT

Pressure ulcers in bedridden patients can lead to significant morbidity and mortality, often causing pain and increasing the risk of infection. To address these challenges, specialized wound dressings have been developed to promote healing in such patients. This case report describes the successful treatment of an infected pressure ulcer in a 69-year-old female patient using a Hydrofiber wound dressing containing silver. The patient, with a body-mass index (BMI) of 32.7 kg/m² (obese), presented with a stage 4 pressure ulcer in the left gluteal region, measuring 10x6 cm in width and 4 cm in depth. Daily wound care was performed using a Hydrofiber material with a silver content and a foam (hydro polymer) cover on top. Dressing changes were performed every 72 hours during the treatment period. Dressing continued for 21 days. Then, silver sulfadiazine cream 2x1 was applied daily. At the end of 25 days of wound care, the patient's current pressure ulcers decreased to 6x3 cm and 2 cm deep. A pressure ulcer is regressed from stage 3 to stage 1. Silver wound dressing is an important treatment for the successful outcome of modern treatment of pressure ulcers.

Keywords: Silver ion, wound, Hydrofiber

INTRODUCTION

A pressure ulcer is a localized injury to the skin, underlying tissue, or both.[1] It usually occurs over a bone protrusion or any skin surface as a result of pressure, shear, friction, or a combination of these factors.[2] Pressure ulcers are difficult to heal, painful, expensive to treat, and adversely affect the quality of life. Prevention strategies include nutritional support and positioning. The correct application of wound care is very important.[3] Nowadays, increased resistance to antibiotics has become a problem in the treatment of infected wounds. When wound microflora is infected, wound healing becomes more difficult. In these situations, topical antibacterial agents like silver and iodine can help lower the bioburden of the wound, reducing the risk of systemic infection. These agents promote wound healing by creating an environment that hinders microbial growth while supporting the body's natural repair processes. Silver is a broad-spectrum antimicrobial agent effective against bacterial, fungal, and viral pathogens. Commercially available hydrocolloids, gauze, or various foam-film dressings combined with Hydrofiber technology and impregnated with silver can serve as effective wound coverings.[4,5] Aquacel Ag® (ConvaTec, Princeton, NJ, USA) represents a novel Hydrofiber wound dressing.[6] Composed of non-woven sodium carboxymethylcellulose fibers integrated with ionic silver, this moisture-retentive dressing forms a gel upon contact with wound exudate. It also exhibits antimicrobial properties due to the presence of ionic silver.[7] Furthermore, this dressing helps minimize local pain, reduces the frequency of dressing changes, and provides exceptional broad-spectrum antimicrobial efficacy.[6,7]

In this report, we describe our experience using Aquacel Ag® dressing in the management of patients with infected pressure ulcers.

CASE

A 69-year-old female patient was admitted to the palliative care unit due to a decline in her general condition. The patient had a 20-year history of hypertension (HT) and a 4-year history of Alzheimer's disease. She underwent a renal transplant 15 years ago and had been in stable condition for the past 3 years. The patient, with a body-mass index (BMI) of 32.7 kg/m² (obese), presented with a stage 4 pressure ulcers were detected in the left gluteal region, measuring 10x6 cm in width and 4 cm in depth (**Figure 1**).

Written informed consent was obtained from the patient for participation in the study, as well as for taking and using photographs. Laboratory tests revealed an elevated white blood cell (WBC) count of 22.450 cells/mm³, increased C-reactive protein (CRP) levels at 188 mg/L, and a creatinine level of 2.0 mg/dl. Wound cultures identified gram-negative

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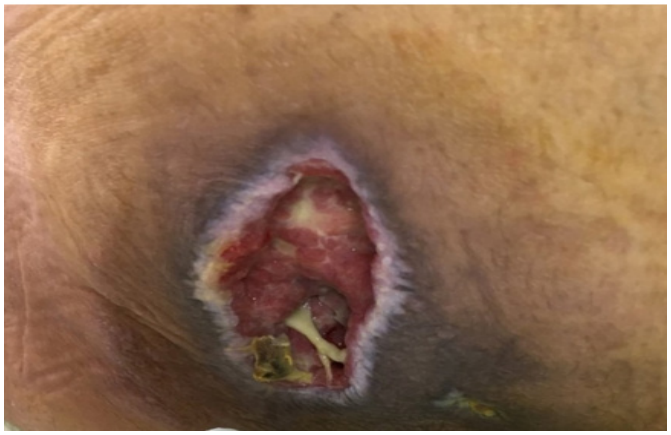

Figure 1. Stage four pressure ulcer appearance before treatment

rods, including *Morganella morganii* and *Escherichia coli*. Based on the antibiogram results, Tazobactam 4.5 g/day was initiated. Daily wound care was performed using a silver-impregnated Hydrofiber dressing covered with a foam (hydropolymer) layer. Dressings were changed every 72 hours during the treatment period, which lasted for 21 days. Following this, silver sulfadiazine cream was applied twice daily. After 25 days of wound care, the patient's pressure ulcers had reduced in size to 6x3 cm with a depth of 2 cm (**Figure 2**). Post-treatment laboratory values showed significant improvement: CRP decreased to 21.6 mg/L, WBC count normalized to 5.86 cells/mm^3, and creatinine levels dropped to 1.32 mg/dl. At this point, the treatment was concluded.

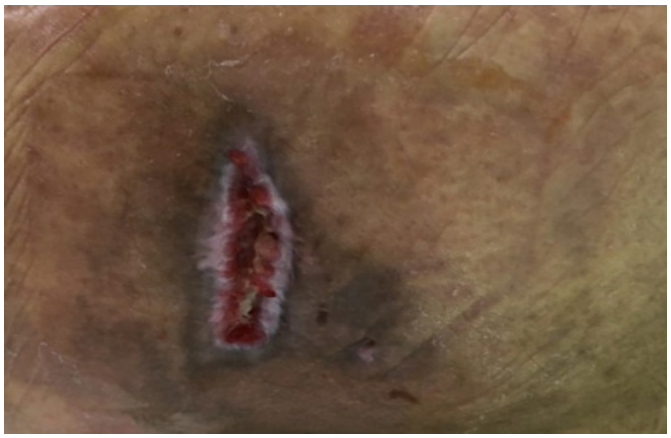

Figure 2. Stage four sacral pressure ulcer managed by Hydrofiber wound dressing, and 21 days follow-up

DISCUSSION

Pressure ulcers are a major health concern for bedridden patients. Once they occur, timely intervention is crucial to prevent progression. While most pressure ulcers can be prevented with proper care, there are still significant gaps in the understanding of both prevention and healing strategies.[8,9] In cases where purulent discharge is observed in the wound, drainage should be performed, and a culture must be obtained. Empirical antibiotic therapy should be initiated promptly, even before the culture results are available. Conversely, when serous discharge is detected, a culture should still be taken; however, empirical antibiotics should not be started until bacterial growth is confirmed by the culture results. If bacterial growth is identified, an appropriate antibiotic should then be initiated.

Another critical gap lies in the selection of appropriate wound dressings. Choosing the right dressing is essential for achieving faster, better, and more cost-effective treatment outcomes. Various types of wound dressings have been developed, each designed for specific purposes and functions.[10,11] Studies have demonstrated that silver-containing dressings effectively prevent bacterial growth in wounds by blocking the entry of external bacteria and trapping bacteria within the dressing. In recent years, silver-based dressings have gained prominence in the wound care market, particularly as antibiotic resistance has become a growing challenge in the treatment of infected wounds.[9-11]

CONCLUSION

This case report investigated the potential of silver-containing dressings in reducing bacterial survival and improving wound healing in a patient with a stage 4 pressure ulcer. Silver-based wound dressings represent an important component of modern pressure ulcer treatment, contributing to successful outcomes. Further randomized controlled studies are needed to evaluate the appropriate indications for the use of Aquacel Ag® and to compare its efficacy with other wound dressings.

In this case, the patient was treated with Tazobactam based on the antibiogram results, which confirmed sensitivity to this antibiotic. Appropriate antibiotic therapy is an essential component of wound treatment. However, the significant contribution of silver-containing dressings to wound healing cannot be overlooked. While it is challenging to isolate the direct contribution of silver in this context, its role in creating an antimicrobial environment and promoting healing is well-supported. The combined use of sensitive antibiotics and silver-based dressings likely contributed to the positive outcome observed in this patient.

ETHICAL DECLARATIONS

Informed Consent

The patient signed and free and informed consent form

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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