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CASE REPORT

OBESITY AND POSTOPERATIVE DELIRIUM IN A MIDDLE-AGE SURGICAL PATIENT

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Abstract:
The literature for bladder cancer patients outlines the role of malnutrition as one of the key factors for postoperative outcomes, including postoperative delirium (POD). However, there is still a debated question whether obesity has a protective, or etiology role in the process of occurrence of POD. Here, we present a case of a 56-years-old man with obese class 1 admitted to City General Hospital "8th of September", Skopje, Macedonia, for an elective major surgical procedure, radical cystectomy, presenting with postoperative delirium (POD). Anthropometric measurements (weight, high) and nutrition screening tools (body mass index, NRS-2002) verified his nutrition status. We additionally performed The Confusion Assessment Method and Mini-Mental Status Examination on admission and days 1, 2, 3, and 7 to evaluate signs of POD and his cognition level. Clinical presentation and radiographic imaging confirm the diagnosis of POD. We faced a few challenges writing this case report, including the impact of older age, selection of appropriate and available laboratory markers, examination of how body mass index affects POD, and identification of precipitated factors for POD.
We determined that hypoxia could be a key link that connects inflammation, nutrition status, and POD in our patient.

Key Words: *body mass index; delirium; middle age.*

Introduction

The literature for bladder cancer patients outlines the role of nutrition status as one of the key factors for postoperative outcomes (1). Considerable attention has focused on the role of

malnutrition in the carcinogenic process and postoperative outcomes (2). Also, the effect of malnutrition on neurocognitive decline was reported (3). Malnourished bladder cancer patients who undergo elective major surgery have been shown to have cognitive problems like postoperative delirium in addition to other adverse effects on the outcome (4). Unlike malnutrition, the role of obesity in the carcinogenic process of bladder cancer and its potential role in the development of POD is a subject of ongoing debate within literature. The main question is whether obesity has a protective or etiological role in the occurrence of POD (5). In this case report, we aimed to investigate the impact of BMI on POD and to test the possible mechanism for developing POD in middle-aged patients with obesity.

Case Report

In the presenting case, a 56-years-old man with a diagnosis of bladder cancer was admitted to City General Hospital "8th of September", Skopje, Macedonia, for an elective major surgical procedure, radical cystectomy. This case involved a patient who underwent aortic valve replacement with preexisting hypertension and an ongoing smoking habit of 25 cigarettes per day. The patient's respiratory function remained unaffected despite his preexisting conditions. We categorized our patient as an ASA 2 according to his condition**.** Upon admission, the patient's nutrition status and cognition were assessed. We employed a comprehensive range of tools, including the mini-mental status (MMSE) for basic cognitive evaluation, anthropometric measurements (weight, height), and nutrition screening tools (Body Mass Index, NRS-2002) for nutrition status evaluation. The confusion assessment method (CAM) was used for postoperative evaluation of cognition, and the C-reactive protein was used for inflammation; they were measured postoperatively on days 1-7.

The results of evaluations on admission day were negative for the CAM and MMSE tests, 32.4kg/m2 for BMI and low risk of malnutrition for NRS-2002, and 54.3mg/l for C-reactive protein, where the normal range is 0-10mg/l. Upon entering the operating room, routine monitoring was conducted, including electrocardiography, pulse, blood oxygen saturation monitoring, and noninvasive arterial pressure measuring device. The patient's condition was as follows: without an oxygen mask, his blood pressure was 130/70mmHg, heart rate 60/min, and saturation 98%. Total intravenous anesthesia (TIVA) was used in conjunction with epidural anesthesia to induce and maintain anesthesia**.** We skillfully placed an epidural catheter at the T10 vertebral level before the patient received general anesthesia. The patient received general anesthesia as follows: 2mg Midazolam, 0.1mcg Fentanyl and 150mg Propofol i.v. Bolus, followed by intubation with 50mg Rocuronium and ETT number 8. Continuous infusion of 0.05mg/kg/h of Propofol and 0.25% bupivacaine at 4-5ml/h through the epidural catheter was used to maintain anesthesia. Rocuronium was added intermittently every 40 minutes after induction and stopped 1 hour before surgery ended. Throughout the surgery, the patient's vital signs remained remarkably stable. The systolic pressure ranged from 90-130mmHg, the diastolic pressure from 60-90mmHg, the heart rate was maintained at 60-70 beats per minute, and blood oxygenation was consistently high at 99-100%. Capnography monitoring revealed an end-title

CO2 level of 31, suggesting adequate ventilation. Intraoperatively, we administered gastroprotective therapy with Famotidine 20mg and Metoclopramide 10mg. The patient received 1000ml NaCl 0.9%, 500ml Dextrosa 5%, one blood transfusion, and 1000ml Ringer solution for fluid replacement. Seven hours after surgery successfully ended, the patient was extubated and mobilized to the intensive care unit for further monitoring and care. The postoperative pain management plan involved a continuous infusion of bupivacaine 0.5% at the rate of 4ml/h. It significantly reduced the patient's pain scores and opioid requirement postoperatively. During the first 24 hours after surgery, he remained communicative, responsive to verbal commands, and oriented regarding time and space. He did not exhibit postoperative hemorrhage and had spontaneous diuresis and breathing, indicating a positive response to the treatment. We observed stable postoperative vital signs and laboratory analysis, with decreased oxygen saturation and increased heart and respiratory rates on the third day. The patient's vital signs on these 3 days were systolic pressure ranging from 90-130mmHg and diastolic pressure from 60-90mmHg. However, on the third day, we observed a significant decline in condition and oxygen saturation. The heart rate was 80-110 beats per minute, and blood oxygenation was consistently low at 85-90%. He manifested symptoms of agitation, including restlessness and anxiety, and displayed unwillingness to collaborate with medical staff. He went so far as to attempt to remove his nasogastric tube and urinal catheter. This disruptive behavior, coupled with ongoing attention disruption, hallucinations and insomnia, continued for the next 2 days. We performed cranial and chest computed tomography on the fifth postoperative day, followed by pulmonary angiography. The results indicated suspected thrombotic formation in arteries on the pulmonary angiography and mild-age-related cerebral atrophy on the cranial computed tomography. The patient received anxiolytic and antidepressant drugs as follows: risperidone 2mg twice a day and promazine 25mg daily until the seventh postoperative day, when he became completely asymptomatic. The control computer scanning on the 12^{th} day was without changes. After 20 days, the patient was discharged from the hospital in a stable mental and urological status, indicating a successful recovery process.

Discussion

Postoperative delirium is an organic mental syndrome involving changes in thinking, cognition and perception unrelated to previous dementia (6). Postoperative delirium disproportionately affects older patients, especially those aged 65 and above, who represent a substantial portion of surgical patients, including those undergoing complex procedures like radical cystectomy (7). In this case, however, a 56-years-old man, who was not considered to be in the typical age range for postoperative delirium, developed POD on day 3 upon surgery. To assess the nutrition status of our patient, we used the Body Mass Index calculator and NRS-2002 screening toll, and the results were as follows: obesity class 1 after body mass index calculation and a low risk of malnutrition after nutrition screening. The relationship between nutritional status, including obesity and postoperative delirium, is still subject to ongoing debate**.** Current studies suggest that malnutrition is a significant risk factor for postoperative delirium, especially in vulnerable

populations such as older cancer patients, including those with bladder cancer, where malnutrition is prevalent (8). Patients with a BMI between 30 and 34.9, classified as obesity class 1, may experience a reduced risk of postoperative delirium (POD) compared to those who are underweight or have more severe obesity (9). However, patients with obese class 1 may face a higher risk of POD if comorbidities are present (10). In our patient's medical history, we record cardiovascular disease among the comorbidities. Fat mass in obese patients leads to an inflammatory state characterized by sustained low-grade metabolic inflammation**.** While obesity-related inflammation is chronic, surgical interventions induce more acute inflammatory response. Both conditions lead to elevated CRP levels due to their activation of systemic inflammatory pathways (11). On the admission day, our patient's C-reactive protein level was 54.3mg/l, significantly higher than the standard 0-10mg/l range, indicating inflammation and inflammatory response. Elevated CRP levels cause blood-brain barrier disruption by increasing paracellular permeability, which allows leukocytes and inflammatory mediators to enter the brain parenchyma. This leads to brain edema and inflammation, impairing blood flow and oxygen delivery, and hypoxia in the end (12). When delirium started, we observed a significant increase in the patient's C-reactive protein level from 54.3 to 130mg/l and a decrease in oxygen saturation while monitoring vital signs corresponding with blood-brain barrier disruption and hypoxia. The patient's oxygen saturation without oxygen supply before receiving anesthesia was 98%. His vital signs, including oxygen saturation, were stable until the third day when the oxygen saturation decreased to 85%. It has been shown that decreased oxygen saturation, whether systemic or cerebral, increases the risk of experiencing postoperative delirium during major surgeries (13). Additionally, a combination of respiratory dysfunction, increased carbon dioxide levels, and reduced breathing effort, which are frequently seen in obese patients, often leads to postoperative hypoxia and a decrease in oxygen saturation (14). Radiology investigation reported another possible reason for hypoxemia in our patient: pulmonary thromboembolism. Among the factors that increase the risk for pulmonary thromboembolism are a hypercoagulable state associated with obesity and Increased Operative Time (15)**.** Our patient, in addition to being obese, was under a prolonged time of 7-hours surgery, a situation that corresponded to that risk.

Conclusion

In our case report, we determined that hypoxia is a key link between systemic inflammation, obesity, and POD. In addition to subjective tests like the CAM test, nutrition tools and inflammatory markers can help identify patients at risk for POD.

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