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Early and Targeted Mobilization After Surgical Interventions

Cerrahi Girişimlerden Sonra Erken ve Hedefe Yönelik Mobilizasyon

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Abstract

Early mobilization, which still has no standard definition, is an important component of enhanced recovery after all surgical interventions. By providing early and targeted mobilization, many postsurgical complications can be prevented, and the recovery period and hospital stay can be shortened. However, there are many obstacles reported by both healthcare team members and patients in the achievement of early and targeted mobilization. In addition, there is currently no strong evidence to guide clinical practice in this context. The establishment of mobilization programs specific to surgical patients in healthcare institutions, informing patients about the mobilization process in the preoperative period, determining step goals, promoting motivation, monitoring the number of steps, and encouraging patients to keep a mobilization diary are among the practices that can be implemented to ensure early and targeted mobilization. It is also underlined that early mobilization involves multidisciplinary teamwork. As healthcare professionals, nurses are important members of the multidisciplinary team in the implementation of early and targeted mobilization programs to maintain the quality of care after surgery. This review aimed to highlight the roles and responsibilities of surgical nurses in early and targeted mobilization practices after surgery and the importance of early and targeted mobilization and discuss the barriers encountered in achieving early and targeted mobilization and the recommendations of current guidelines on this subject.

Key words: Early mobilization; enhanced recovery after surgery; targeted mobilization.

Özet

Günümüzde hala standart bir tanımı olmayan erken mobilizasyon, tüm cerrahi girişimler sonrasında hızlı iyileşmenin önemli bir bileşenidir. Erken ve hedefli mobilizasyonun sağlanmasıyla, cerrahi girişim sonrası birçok komplikasyon önlenmekte, iyileşme ve hastanede kalış süresi kısalmaktadır. Ancak erken ve hedefli mobilizasyonun sağlanmasının önünde hem sağlık ekibi üyeleri hem de hastalar tarafından bildirilen birçok engel bulunmaktadır. Aynı zamanda, günümüzde bu konuda klinik uygulamalara rehberlik edecek ölçüde güçlü kanıtlar bulunmamaktadır. Sağlık kurumlarında cerrahi hastalarına özgü mobilizasyon programlarının oluşturulması, hastaların preoperatif dönemde bu konuda bilgilendirilmesi, adım hedeflerinin belirlenmesi, motivasyonlarının sağlanması, adım sayılarının izlenmesi ve mobilizasyon günlüğü tutmaları yönünde cesaretlendirilmesi, erken ve hedefli mobilizasyonun sağlanmasına yönelik atılabilecek adımlardır. Erken mobilizasyonun multidisipliner bir ekip işi olduğunun da altı çizilmektedir. Bir sağlık profesyoneli olarak hemşireler, cerrahi girişim sonrası bakım kalitesini sürdürmek için erken mobilizasyon programlarının uygulanmasında multidisipliner ekibin önemli bir üyesidir. Bu derleme, cerrahi hemşirelerinin ameliyat sonrası erken ve hedefli mobilizasyon uygulamalarındaki rol ve sorumluluklarını, erken ve hedefli mobilizasyonun önemini, erken ve hedefli mobilizasyonun sağlanmasında karşılaşılan engelleri ve güncel rehberlerin bu konudaki önerilerini vurgulamak amacıyla yazılmıştır.

Anahtar Kelimeler: Cerrahi sonrası hızlandırılmış iyileşme; erken mobilizasyon; hedefli mobilizasyon.

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INTRODUCTION

Since first described in 1899 (1), the concept of early postoperative mobilization has become an initiative recommended to be applied by various studies conducted in the following years (2). Although there is still no clear definition of mobilization (3,4), it can be described as activities including passive and active range of motion, in-bed and bedside movements, and walking (5,6).

Failure to provide early mobilization after surgery may result in negative consequences for many systems in the human body (5,7,8), extending the recovery period and hospital stay (9). Therefore, early mobilization is considered an important practice in minimizing morbidity and mortality (10). Guidelines published about perioperative care and process management of surgical patients include strong recommendations supporting early mobilization but with a low level of evidence (11-14). Although early mobilization has been regarded as an important element of postoperative care, there is currently no clarity concerning its optimal application (2,13), and it is one of the most frequently overlooked nursing practices for surgical patients (7,15). In the preoperative period, informing patients about the benefits of early and targeted mobilization (16-18), specifying postoperative step targets during this process, motivating patients in the postoperative period in line with these goals, monitoring the number of steps they take, and encouraging them to keep a mobilization diary are accepted as applications that can increase compliance with postoperative mobilization programs (3,4,19).

Early and targeted mobilization

Recovery after surgery is considered an important component of the surgical process (20), and early mobilization is an indispensable element of postsurgical recovery (6). Ries first defined early mobilization at the end of the 1800s (1), after which observational studies were carried out in the 1940s, determining that related practices did not harm patients, which led to increasing adoption of early mobilization. Furthermore, with growing evidence of the negative effects of immobilization, avoiding long-term bed rest after surgery has gained more importance (2).

Today, the Enhanced Recovery After Surgery (ERAS) protocols which support the accelerated recovery process of surgical patients and are accepted in many surgical disciplines highlight the importance of early mobilization (21) and recommend it for patients after undergoing surgical interventions (22). However, the ERAS guidelines published to date contain no structured mobilization programs (22) or specific definitions concerning the activities to be undertaken in the postsurgical period due to the limited number of studies in the literature that demonstrate the superiority of any mobilization program over another (3,23). Although early mobilization is considered to have independent positive contributions to postoperative patient outcomes, and the importance of the timing of early mobilization is emphasized, there is still a lack of sufficient evidence on the effects of frequency or duration of this practice on patient outcomes (24). Therefore, to obtain specific definitions of early mobilization after surgery, further studies are needed to underline the importance of implementing structured early mobilization programs starting from the day the surgery is implemented (23).

Importance of early and targeted mobilization

When early mobilization as described in the ERAS protocols is implemented together with dietary modifications and short-term regulation of hunger during the perioperative period, it

accelerates functional recovery by suppressing the increased catabolic process and surgical stress response that would result in postsurgical muscle loss (17). Studies examining the benefits of mobilization report a decrease in pain, fatigue, delirium development, and urinary catheter-related infections, and an increase in physical functioning (7). In a randomized controlled trial conducted with 40 patients that underwent radical cystectomy and ileal loop diversion, among the cases in which early mobilization had been performed preoperatively there was a significant decrease in the length of postoperative hospital stay, duration of opioid analgesic use, time to first defecation, and duration of nasogastric catheter application while a significant increase was observed in the quality of life (25). After long-term bed rest, many adverse outcomes occur related to gastrointestinal, cardiovascular, respiratory, urinary, endocrine, musculoskeletal, and nervous systems and skin (7). In particular, elderly patients or those having undergone orthopedic or general surgery are at higher risk of complications related to immobility (16).

Early mobilization is a very important factor in the prevention of postoperative pulmonary complications (26,27). Among the pulmonary complications caused by postoperative immobilization are pneumonia (13,16,26), atelectasis (12,14), impairment of lung functions and tissue oxygenation (28-30), and pulmonary embolism (8).

The catabolic process begins as a result of the stress response after surgery, and when combined with prolonged inactivity, the rapid physical loss of function leads to decreased muscle mass and strength (30,31). Without sufficient mobilization, an adult can lose up to 5% of his/her muscle mass (5). Results from studies conducted with healthy young adults showed that after two weeks of immobilization, there was a 5-9% loss in the quadriceps muscle mass and a 20-27% decrease in the quadriceps muscle strength. These effects occur more rapidly in older individuals, with the muscle loss percentage reaching three to six times that of young adults (31).

Long-term bed rest has also been found to increase the risk of developing thromboembolic complications after surgical interventions (11,16,30). Studies conducted with patients undergoing knee arthroplasty to examine the effect of early mobilization on patient outcomes reported that when early mobilization was provided, the risk of developing venous thromboembolism and deep vein thrombosis was reported to be significantly reduced (32,33). In a systematic review of nine non-randomized studies, it was concluded that early mobilization might reduce the incidence of venous thromboembolism and accelerate postsurgical functional recovery (30).

Other postoperative complications that may develop due to the lack of early mobilization include insulin resistance (13,26), pressure injuries (5,8), delayed recovery of gastrointestinal and bowel movements (34,35), bone loss, dehydration, malnutrition, sensory deficiency, isolation (5), neuromuscular weakness, joint contractures, and orthostatic hypotension (27).

Mobilization positively affects not only the physical functions of patients but also their emotional and social well-being. Mobilization is stated to reduce depression and anxiety and also increases patient comfort, independence, quality of life, and satisfaction (7). Long-term postsurgical immobility may also cause problems in functional capacity and ability to perform daily living activities (35). Through patient mobilization, pain and fatigue problems can be reduced, anxiety and depression risks can be minimized, and patient satisfaction can be increased (16). Furthermore, by providing early mobilization, patients can take a more active

role in their postoperative recovery (30), which prevents the decrease in their functionality, thereby significantly affecting their dependency on nurses (5).

Studies show that patients who are mobilized early and frequently after surgical interventions have a shortened length of hospital stay (10,36,37) and consequently reduced costs of care and treatment (37,38). In observational studies, the compliance rates of patients with mobilization targets vary between 28 and 69%, and many of them determined compliance with mobilization goals as an important determinant of early hospital discharge (12). In a systematic review examining the effect of early mobilization on hospital stay in orthopedic surgery, patients who were actively mobilized within the first 24 hours after hip and knee replacement surgery had a 1.8-day decrease in the mean length of hospital stay (39). In addition, in patients who had undergone cardiac surgery, a negative correlation was found between the number of steps taken after surgery and the length of hospital stay and need for re-hospitalization (40,41). Early and frequent physical activity, especially after abdominal surgery is an important factor in ensuring enhanced recovery and reducing costs, treatment, and hospital stay (9). For all these reasons, early mobilization is considered an important practice in minimizing morbidity and mortality (10).

Barriers to early and targeted mobilization

Identifying the barriers to early mobilization after surgery and creating strategies for modifiable elements are important keys to integrating early mobilization into multidisciplinary enhanced recovery protocols (6). Before mobilization, a thorough examination of patient safety criteria and related barriers is vital to minimize risks (42). In a systematic review and meta-analysis on patient safety during early mobilization in intensive care, which reviewed studies that investigated the events negatively affecting patient safety during early mobilization, it is reported that in 33 (69%) studies patients experienced decreased oxygen saturation and hemodynamic changes, and in 31 (65%) studies, intravascular catheter displacement or loss of function is described (43).

Supporting patients to increase their mobility is not only one of the basic nursing care practices but it has also been included in various definitions, care models, and theories on nursing (44). However, in a study conducted with 3143 nurses, patient mobilization was determined as one of the most overlooked nursing practices (45). Similarly, in a qualitative study, the nurses stated that patient mobilization always constituted problems in the care setting and was, therefore, often overlooked (46). The reasons for not complying with mobilization protocols and overlooking this practice are reported by healthcare personnel as staff shortage (44,47,48), walking aid/equipment shortage (44), presence of intravenous fluids and medical equipment, such as catheters, drains and probes (3,14,30,44), lack of consensus on the first mobilization time of the patient (47), intensive workload, time-consuming nature of monitoring mobilization (37,48), and unclear distribution of related responsibilities among team members and/or nurses not considering patient mobilization as part of their duties (16).

Although literature studies report a relationship between early mobilization and positive patient outcomes and guidelines have recommendations in this direction, the level of early mobilization remains low (49-51). Another important barrier to early mobilization after surgery is inadequate control of pain (3,6,13) and nausea-vomiting (24). Thus, there is a need for a multifaceted approach involving pain and nausea-vomiting control (24,34).

Although good management of pain after surgery facilitates early mobilization, orthostatic intolerance may prevent mobilization and extend the length of hospital stay even after daily procedures (52). It should be considered that there will be changes in the hemodynamic parameters of patients with postoperative mobilization (42), and to prevent the development of syncope during mobilization, the bedhead should be raised for one to two minutes before moving the patient (53), the patient should be placed in a sitting position on the edge of the bed to monitor hemodynamic parameters and mobilization should only be undertaken when no change in life signs is observed (42,53).

Early mobilization is also an important issue in patients undergoing obesity surgery. During mobilization, in addition to the safety of this patient population, the safety of healthcare personnel and the availability of appropriate equipment and resources are important priorities. Nurses have concerns about risky situations that may occur in the patient and/or themselves during the mobilization of the patient (e.g., falls and injuries due to the improper use of body mechanics) (44). Lack of motivation in the patient, insufficient cardiovascular reserves, patient safety, respiratory, cardiovascular, and neurological stability, equipment/tools used for nutrition, and comorbidities can also be listed among the other causes of early mobilization failure (6,13,30,54).

Preoperatively informing patients about the benefits of early mobilization might result in an increase in physical activity in the early postoperative period (16,18). Perioperative patient information and education concerning early and targeted mobilization is especially important in patients who tend to avoid mobilization (17). During this process, determining the goals for steps to be taken after surgery, putting up motivational posters, and encouraging the use of pedometers or mobilization diaries to achieve these goals are among other practices that can increase patient compliance with postoperative mobilization programs (3). Mobilizing patients through special programs that help them focus on daily goals will allow mobilization to become part of patient care and prevent considering mobilization simply as an activity to be undertaken if the time permits (16).

Guideline recommendations concerning early and targeted mobilization

The ERAS protocols can be defined as multicomponent and multidisciplinary evidence-based practices covering the perioperative process, created to ensure early recovery by maintaining the functions of organs and systems in the preoperative period and reducing stress response after surgery (2,55,56). In ERAS guidelines, evidence levels and recommendation grades related to early mobilization practices vary depending on the different types of surgical interventions and perioperative processes (2).

For patients to undergo lung, gynecological oncology, and colon/rectum surgery, mobilization within the first 24 hours after surgery is included in the ERAS guidelines as a recommendation with a low evidence level but strong recommendation grade (12,14,57). Although it is stated that promoting early mobilization after surgery in cystectomy surgery performed due to bladder cancer should be part of the ERAS protocols, early mobilization is also included in this guideline as it has a low level of evidence and a strong grade of recommendation (11). In the ERAS guideline created for planning the best perioperative care in major head and neck cancer surgery performed with free flap reconstruction, there is also a recommendation that mobilization should be performed in this patient population within the first 24 hours after surgery (moderate evidence-level, strong recommendation) (24).

In the Spain-ERAS guideline, which includes the perioperative care steps of patients who have undergone abdominal surgery, it is recommended that these patients should be mobilized within the first 24 hours after surgery and should spend two hours out of bed on the day of surgery, followed by at least six hours out of bed on the following days until discharge (high evidence level, strong recommendation) (26). According to the ERAS guideline published for gastrointestinal surgery patients, achieving mobilization goals requires a multidisciplinary approach, daily goals set for mobilization should be given to patients in writing, patients should be encouraged to increase their physical activities in the preoperative period, and they can be recommended to record their daily physical activities using a diary or step counter (weak recommendation) (4).

In the ERAS guideline for bariatric surgery patients, there is no recommendation for early mobilization (56). However, the ERAS guideline for elective colorectal surgery patients states that providing early mobilization through patient education and encouragement is an important component of enhanced recovery after surgery, prolonged immobilization is associated with various negative consequences, and therefore patients should be mobilized in the early period (moderate evidence level, strong recommendation) (13).

The ERAS guideline on the perioperative care of patients undergoing pancreatoduodenectomy suggests that patients should be actively mobilized from the morning of the first postoperative day and that daily mobilization goals should be determined and patients should be encouraged to achieve these goals (very low evidence level, strong recommendation) (34). ERAS guidelines prepared for esophagectomy patients state that the steps related to early mobilization may be variable, but the basic elements include creating a standardized and structured mobilization program, implementing a rehabilitation program before surgery, starting mobilization as soon as possible after surgery, increasing physical activities every day to reach the predetermined goals, introducing mobilization targets to the patient, explaining why each goal is important, and sharing visual/written material with the patient (moderate evidence level, strong recommendation) (30).

In the ERAS guideline specific to patients undergoing cesarean interventions, it is suggested that there are no randomized controlled studies with a strong methodology for early mobilization, but it is recommended that patients should be mobilized in the early period following cesarean section (very low evidence level, weak recommendation) (35). The ERAS guideline on perioperative care in gynecological oncology patients also recommends that early mobilization should be performed within the first 24 hours after surgery (low evidence level, strong recommendation) (57).

In the guideline prepared for patients undergoing liver surgery, it is emphasized that there is not sufficient evidence in the literature that early mobilization after hepatectomy will have negative effects and that patients should be encouraged to be mobilized in the early period from the morning after surgery until discharge from hospital (very low evidence level, weak recommendation). It is also stated that more studies are needed to determine the optimal mobilization time and frequency to improve outcomes after surgery (58). Due to surgical trauma, delayed bowel function causes a prolonged recovery period in patients who have undergone gastrointestinal surgery. Although there is insufficient evidence for early mobilization in gastrectomy patients, the ERAS guideline prepared specifically for this patient population suggests setting detailed structured mobilization goals after surgery, encouraging

patients to actively mobilize in the early period, and encouraging them to reach the determined daily mobilization goals and use simple monitoring devices to reach their targets and provide them with written daily mobilization instructions. It is also stated that mobilization programs implemented this way will improve cooperation with patients and the autonomy of individuals (very low evidence level, strong recommendation) (19).

In the ERAS guideline including the care steps of elective rectal/pelvic surgery patients, it is recommended that a caring environment that encourages patients to mobilize in the early period should be created, and a mobilization plan should be established to ensure that patients spend two hours out of bed on the day of surgery and six hours out of the bed on the following days (low evidence level, strong recommendation) (28). Patients who have undergone breast reconstruction surgery are also recommended to be mobilized within the first 24 hours postoperatively (moderate evidence level, strong recommendation) (8). Lastly, according to the ERAS guideline intended for the care of patients who have undergone total hip or knee replacement surgery, due to the known negative effects of extended immobilization time, it is suggested that patients be mobilized as early as possible after surgery to accelerate the process in which to meet the criteria for discharge from hospital (high evidence level, strong recommendation) (59).

Role of nurses in early and targeted mobilization

Early mobilization is an initiative that requires careful patient identification and management, and interdisciplinary team collaboration and training (54). It is also an evidence-based nursing practice that improves patient outcomes after surgery and prevents the development of many possible complications (7,16,45). Healthcare professionals advocate that the establishment of structured mobilization programs in healthcare institutions and surgical clinics can be an important approach to increase the mobilization of patients (16). In these institutions, nurses involved in all processes of surgery must be actively engaged in all stages of developing structured mobilization programs (3) and patient education (26). Thus, surgical nurses will be able to provide greater support for the mobilization of patients as early as possible (3) and they can become the most competent team members in implementing structured early mobilization programs (5). Therefore, the focus should be on developing mobilization programs aimed at minimizing the dependence of in-patients on nurses, promoting mobilization, and preventing functional decline (5). In this way, nurses will be able to assume more roles and responsibilities in ensuring early mobilization and the process of patients gaining independence in a shorter time will be supported (28). Thus, nursing care and follow-up play an important role in increasing the activity level of patients in the postoperative period and preventing complications related to immobility.

CONCLUSION

To increase compliance with early postoperative mobilization in healthcare institutions, the establishment of early and targeted mobilization programs for surgical patients, structuring of these programs specific to the types of surgical intervention, and patient information and education concerning these programs in the preoperative period are the primary steps to be followed. Other practices that help achieve early and targeted mobilization in the postoperative

period include patient mobilization in line with the predetermined goals, motivating patients to mobilize, creating a caring environment that supports patient independence, monitoring the number of steps taken using simple monitoring devices, and ensuring that patients keep a mobilization diary. In addition, further experimental studies are needed to determine the impact of early and targeted mobilization programs implemented with surgical patients on patient outcomes.

Lack of education and information is one of the barriers not only for patients but also for healthcare personnel, preventing the effective implementation of early mobilization practices. Therefore, nurses working in surgical units should be provided training on current and evidence-based practices concerning early and targeted mobilization programs. In addition, the role and responsibilities of surgical nurses should be emphasized during the preparation, implementation, and monitoring of structured early and targeted mobilization programs.

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Cut-off Sign in Ureter

Üreterde Cut-off İşareti

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Abstract
Obstructive uropathy occurs due to several common causes such as kidney stones, vesicoureteral reflux, posterior urethral valve and urothelial tumors. Additionally, there are some rare causes such as solid tumors, retroperitoneal fibrosis, primary lymphomas (e.g. Non-Hodgkin lymphomas). A 20-year old male with lower back pain underwent a bone scan for differential diagnosis of back pain. The bone scan findings were normal, except for the presence of unilateral renal stasis accompanied by a short segment ureteral stasis. Due to the abrupt termination of the ureteral activity, namely the "cutoff sign", a subsequent SPECT/CT imaging was performed for differential diagnosis of ureteral stasis. Non-diagnostic CT sections revealed a para-aortic soft tissue mass compressing the ureter. The abrupt termination of stasis in the ureter may warrant the application of SPECT/CT in cases with no previous history of urinary tract pathology. SPECT / CT may provide additional benefits of clarifying the etiology and this case underlines the added value of SPECT/CT imaging in subtle scintigraphic findings.

Keywords: Cutoff sign; SPECT/CT; Renal stasis in bone scan

Özet
Obstrüktif üropati böbrek taşları, vezikoüreteral reflü, posterior üretral kapak ve ürotelyal tümörler gibi yaygın nedenlere bağlı olarak ortaya çıkar. Ayrıca solid tümörler, retroperitoneal fibrozis, primer lenfomalar (Non-Hodgkin lenfomalar vb.) gibi nadir nedenler de vardır. Bel ağrısı olan 20 yaşındaki erkek hastaya sırt ağrısı ayırıcı tanısı için kemik taraması yapıldı. Kısa segment üreter stazının eşlik ettiği tek taraflı renal staz dışında kemik sintigrafisi bulguları normaldi. Üreteral aktivitenin ani sonlanması, yani "cut-off işareti" nedeniyle, üreter stazının ayırıcı tanısı için takip eden bir SPECT/BT görüntülemeye odaklanıldı. Tanısal olmayan BT kesitlerinde üretere bası yapan bir para-aortik yumuşak doku kitlesi saptandı. SPECT/BT uygulaması, üreterde stazın aniden sonlanması durumunda, özellikle de daha önce üriner sistem patolojisi öyküsü olmayan olgularda, etiyoloji aydınlatmada önemli ek faydalar sağlayabilir. Bu vaka ile ince sintigrafik bulgularda SPECT/BT görüntülemenin katma değerinin altı çizilmiştir.

Anahtar Kelimeler: Cut-off bulgusu; SPECT/BT; Renal staz

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INTRODUCTION

Two cases of Non-Hodgkin Lymphoma were reported recently which were diagnosed by means of ultrasound examination and a subsequent histopathological examination of groin lymph nodes [1, 2]. But to date, according to our knowledge, scintigraphic cut off sign in urinary tract has not been reported previously. In this case, we present a patient with an abrupt termination of the ureteral activity at the bone scan.

CASE REPORT

A 20-year old male with lower back pain underwent a bone scan for differential diagnosis of back pain. The bone scan findings were normal, except for the presence of unilateral renal stasis accompanied by a short segment ureteral stasis. Due to the abrupt termination of the ureteral activity, namely the "cutoff sign", a subsequent SPECT/CT imaging was conducted for differential diagnosis of ureteral stasis.
Following iv injection of 74 MBq Tc99m-MDP (methylenediphosphonate) whole body images were obtained. The only pathological finding of the bone scan was left-sided renal proximal ureteral activity stasis (Fig 1, white arrow). The ureter activity in the distal portion could not be seen as it could in the upper third, which formed an abrupt termination matching a "cut off sign."

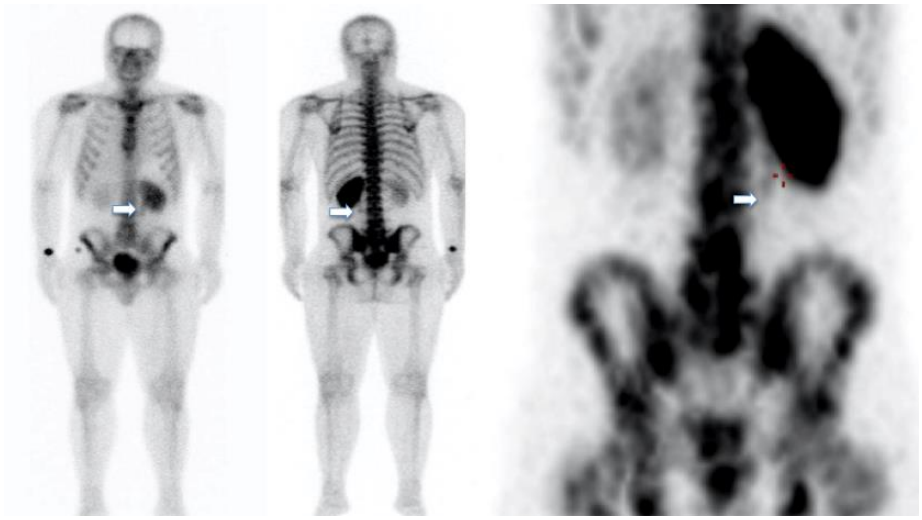

Figure 1: Tc99m-MDP (methylenediphosphonate) whole body images

SPECT / CT (Discovery NM/CT 670, Dual Head Camera, GE Healthcare) was applied to investigate the causes of the stasis. The SPECT scan was perfomed using low-energy high-resolution collimation, 180° tomography, a 128×128 matrix of 4.8 mm pixel size and 30 steps of 30 seconds in a continuous-rotation mode followed by a low-dose CT scan, which was carried out with 120 kV and 97 mAs using adaptive dose modulation. The CT data were generated with a 2.5-mm slice thickness using a smooth reconstruction kernel.
The dilated left ureter and radioactivity stasis were clearly observed on the SPECT/CT sections. Red arrows show the activity accumulation and dilatation of the ureter above the mass lesion. (Fig 2 a, Fig 2 b, Fig 2 c). The subsequent caudal sections of non-diagnostic CT images show a soft tissue mass surrounding the ureter in the aortocaval region. The stasis disappeared at the level of the incidental mass (Fig 2 d, Fig 2 e, Fig 2 f). The compressive mass diameters were 35 x 17mm. It was located at the level of the third vertebra. The non-specific bone scan finding of renal and ureteral stasis was compatible with the lower back pain defined by SPECT CT.

Early reporting of the mass lesion-induced renal stasis with SPECT / CT resulted in nephrostomy to maintain renal function in the patient [5].

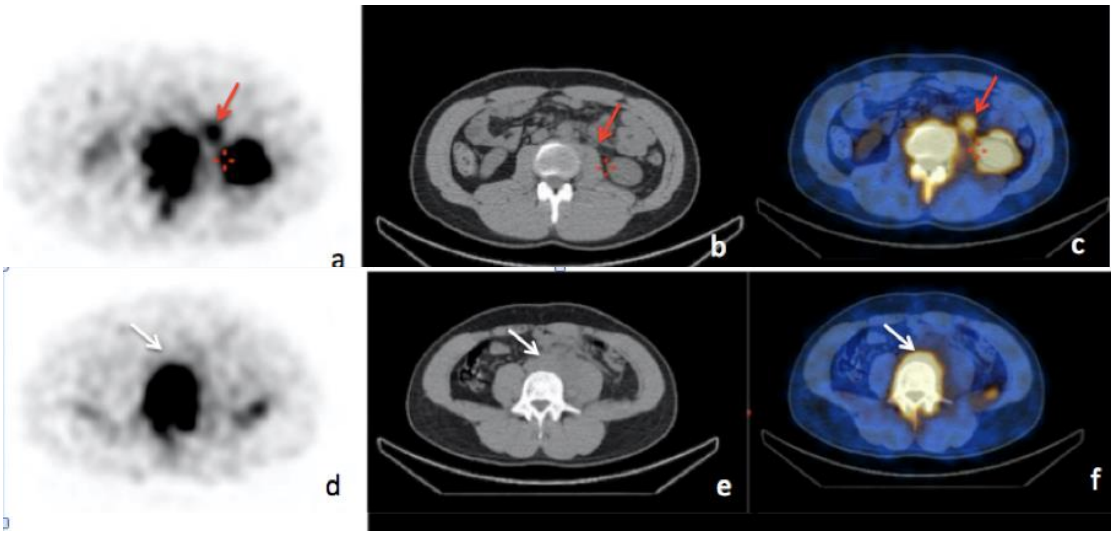

Figure 2: The dilated left ureter and radioactivity stasis were detected on the SPECT/CT sections (Fig 2 a, Fig 2 b, Fig 2 c). The subsequent caudal sections of non-diagnostic CT images show a soft tissue mass surrounding the ureter in the aortocaval region (Fig 2 d, Fig 2 e, Fig 2 f).

DISCUSSION

Obstructive uropathy is a common uropathology which happens due to occlusive causes such as renal stones, vesicoureteral reflux, posterior urethral valve, urothelial tumors and some compressive lesions including solid tumors, retroperitoneal fibrosis and primary lymphomas (quite rarely) that cause renal stasis and hydronephrosis, with or without invasion [3, 4]. Although the cutoff sign is described as an X-ray finding for colonic gas, which is a classical finding of acute pancreatitis, the scintigraphic cut off sign has not been previously reported [6, 7].

As a conclusion, the abrupt termination of stasis in the ureter may warrant the application of SPECT/CT in cases with no previous history of urinary tract pathology [8]. SPECT / CT may provide additional benefits while clarifying the etiology.

Ethical approval and consent to participate

Written informed consent to publish this information was obtained from study participant.

Consent for Publication

Patient included in this case report gave written informed consent to publish the data contained within this study.

Conflict of Interest

The authors declare that they have no competing interests.

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Authors Contribution

All authors (AC, AE, IK and AA) shared the collection of published data, analyzing the results, manuscript writing and final revision. All authors have read and approved the manuscript.

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A Case of Lithium Intoxication with Severe Neurological Findings

Ciddi Nörolojik Bulgularla Birlikte Giden Lityum Zehirlenmesi Olgusu

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Abstract

Lithium is used for the treatment of bipolar disorder and some other psychiatric disorders. Due to the narrow therapeutic range, intoxications are common. In this case, chronic lithium intoxication with severe neurological symptoms was discussed in light of the literature. A 72-year-old female patient. The patient had been receiving psychiatric treatment for 7 years with the diagnosis of unipolar depression. In the 6th month of lithium use, she was brought by her relatives with complaints of drowsiness, tremor, muscle twitching, and difficulty walking. On examination, consciousness was confused, there was no cooperation orientation and there was general rigidity, tremor, fasciculations, and ataxic gait. Vital signs; blood pressure 147/92 mmHg, heart rate 69 bpm, SpO2: 94%. The laboratory tests: lithium 2.98 mEq/L, potassium 5.8 mmol/l, sodium 129 mmol/l, creatinine 1.66 mg/dl, urea 166 mg/dl. The patient was transferred to the internal medicine clinic with the diagnosis of lithium intoxication. Lithium treatment was discontinued. On the 7th day, her neurological symptoms improved with supportive treatment, and biochemical parameters returned to normal. A lithium concentration of more than 3.5 mEq/L was defined as severe poisoning. Neurological findings are prominent in severe poisonings. Especially, geriatric population is at greater risk. In our case; age, use of three different groups of diuretics as antihypertensive treatment, and urinary tract infection were defined as factors that predispose to poisoning. In this case, it's emphasized that although the lithium blood level isn't very high, severe neurological symptoms can be seen clinically in the presence of risk factors.

Keywords: Lithium; Lithium Intoxication; Bipolar Disorder; Geriatric.

Özet

Lityum, bipolar bozukluğun ve diğer bazı psikiyatrik bozuklukların tedavisinde kullanılır. Dar terapötik aralık nedeniyle, zehirlenmeler yaygındır. Bu olguda ciddi nörolojik semptomlarla seyreden kronik lityum zehirlenmesi literatür ışığında tartışılmıştır. 72 yaşında, evli, eşiyle beraber yaşayan kadın hasta. Hasta unipolar depresyon tanısıyla 7 yıldır psikiyatrik tedavi alıyordu. Lityum kullanımının 6. ayında, halsizlik, uyku hali, vücutta yaygın titremeler, kas seyirmeleri, yürüme güçlüğü nedeniyle ile yakınları tarafından polikliniğe getirildi. Muayenesinde bilinç konfüzeydi, koopere değildi, oryantasyon bozulmuştu, yaygın rijidite, tremor, fasikülasyonlar ve ataksik yürüyüş mevcuttu. Vital bulgularında tansiyon 147/92 mmHg, nabız 69 atım/dakika, SpO2: %94 idi. Kan gazı normaldi. EKG normal sinüs ritminde idi. Kan tetkiklerinde; lityum 2.98 mmol/l, potasyum 5.8 mmol/l, sodyum 129 mmol/l , kreatinin 1.66 mg/dl, üre 166 mg/dl. Hasta lityum zehirlenmesi ön tanısı ile dahiliye kliniğine sevk edildi. Lityum tedavisi kesildi. 7. gününde destek tedavisi ile nörolojik semptomları düzelen hastanın biyokimyasal parametreleri normale döndü. Lityum konsantrasyonunun 3.5 mEq/L'den fazla olması şiddetli zehirlenme olarak kabul edilir. Klinikte gastrointestinal, kardiyovasküler, endokrin, nörolojik, renal bulgular görülebilir. Şiddetli zehirlenmelerde nörolojik bulgular ön plana çıkar. Özellikle geriatrik popülasyon daha büyük risk altındadır. Olgumuzda; yaşın ileri olması, antihipertansif tedavi olarak 3 farklı grup diüretik kullanılması ve idrar yolu enfeksiyonunun varlığı zehirlenmeyi kolaylaştıran etkenler olarak tanımlanmıştır. Bu olguda lityum kan düzeyi çok yüksek olmamasına rağmen risk faktörlerinin varlığında şiddetli nörolojik belirtilerin klinikte görülebileceğinin akılda tutulması gerektiği vurgulanmaktadır.

Anahtar Kelimeler: Lityum; Lityum Zehirlenmesi; Bipolar Bozukluk; Geriatrik.

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INTRODUCTION

Lithium is a drug that has been widely used in the treatment of bipolar disorder for many years (1). However, it has been frequently used in the treatment of recurrent major depressive disorders and is effective in increasing the treatment response in resistant cases that do not respond to antidepressant treatment (2). However, the potential side effects and risks of lithium treatment can make it difficult to apply in daily practice from time to time (3).

Factors that increase the concentration of lithium in the body include excessive intake and impaired excretion (4). Excessive lithium intake due to suicide attempts or accidental ingestion of excessive amounts of lithium may result in acute overdose (5). Many factors can cause impairment in lithium excretion. Decreased sodium and fluid volume due to any condition such as vomiting, diarrhea, febrile illness, renal failure, excessive exercise, water restriction, excessive sweating, low sodium diet, and congestive heart failure may increase the reabsorption of lithium in the kidneys. In addition, drugs that decrease the glomerular filtration rate (NSAID, ACE inhibitors, thiazides) may cause chronic toxicity (6).

Regarding the subtypes of lithium poisoning, there are acute, chronic over acute and chronic forms, which differ in their symptomatology due to the pharmacokinetics of lithium (7). In acute lithium poisoning and chronic use, gastrointestinal symptoms (nausea, vomiting, diarrhea), cardiotoxic findings (ECG changes, arrhythmias, QT interval prolongation, bradycardia), and late-developing neurological symptoms (Irreversible neurotoxicity syndrome (SILENT)) appear. While the chronic form primarily presents as neurological symptoms including confusion, myoclonus, and seizures, cardiological findings are similar to those seen in acute intoxication, and nephrogenic diabetes insipidus is seen as a renal effect (8). The rationale for clinical differences is compartment saturation. In cases of acute lithium toxicity, lithium concentrations tend to drop rapidly due to distribution in several tissues, while chronic toxicity is faced with lithium-saturated tissues. Therefore, lithium toxicity depends on the exposure pattern, which should be considered in terms of treatment strategy (9).

In this case, we aimed to examine the chronic poisoning in a patient who took lithium for treatment-resistant unipolar depression with the symptoms and findings we found and to present it in the light of the literature.

CASE PRESENTATION

Written and verbal consent was obtained from the patient and her relatives. 72-year-old female patient. She is married, has 2 children, primary school graduate, and lives with her husband. In her story; it was learned that she had a known hypertension disease and that she used the perindopril-amlodipine combination and hydrochlorothiazide-spironolactone combination for this. In her psychiatric history; the patient who started psychiatric follow-up and treatment with complaints of unhappiness, loss of interest, and hopelessness 7 years ago, applied to various centers with the diagnosis of unipolar depression and used various medical treatments. The last hospitalization of the patient was about 1 month in December 2021 in a university hospital, and lithium carbonate 600 mg/day treatment was started at the time of admission. The patient who was admitted to our outpatient clinic 2 months after her discharge due to her depressive symptoms continued, was receiving venlafaxine 225 mg/day, mirtazapine 15 mg/day,

olanzapine 5 mg/day, quetiapine 25 mg/day, and alprazolam 0.5 mg/day in addition to lithium. The results of the patient, whose blood tests (complete blood count, kidney and liver function tests, thyroid hormones, electrolytes) and lithium blood level were checked at her admission, were within the reference ranges.

The patient, whose follow-up was continued, was brought to the polyclinic by her relatives in a wheelchair in the 6th month of lithium use. The general condition of the patient was poor. In the history taken from her relatives, it was learned that she had weakness, sleepiness, widespread tremors in the body, muscle twitches, difficulty in walking and vomiting for the last 2 days.

In her mental examination, was not cooperatively oriented, her consciousness was confused, and her speech was dysarthric. In the physical examination; diffuse tremor, rigidity, and fasciculations were present, and ataxia was present. The patient was referred to the emergency room. Her vital signs were blood pressure 147/92 mmHg, heart rate 69 bpm, SpO2: 94%. As a result of the arterial blood gas test; pH: 7.338, Pco2: 33.1 mmHg, HCO3: 18.5 mmol/L. ECG was in normal sinus rhythm. In blood tests; lithium 2.98 mmol/l, potassium 5.8 mmol/l, sodium 129 mmol/l, creatinine 1.66 mg/dl, eGFR (CKD-EPI) 30.26 (ml/min/1.73 m^2), urea 166 mg/dl, BUN 77.57 mg/dl, TSH 12.79 mIU/L, fT4 0.58 ng/dl, WBC 11.5 (/mm^3) and other blood tests were within reference ranges. The urinary ultrasound of the patient, whose complete urinalysis was evaluated in favor of urinary tract infection, was normal. The patient was followed closely in the emergency department under appropriate hydration and treatment and was hospitalized in the internal medicine clinic with the diagnosis of lithium intoxication/ lithium-related acute renal failure. The patient's lithium treatment was immediately discontinued.

Forced diuresis (furosemide infusion) was applied on the first day, and the patient's clinic improved on the 7th day of hospitalization, creatinine value decreased to 0.98 mg/dl, urea 55 mg/dl, potassium 4.1 mmol/L, TSH 3.56 mIU/L, and lithium blood level to 0.54 mmol/L decreased, sodium level increased to 136 mmol/L. The patient's treatment for urinary tract infection was also completed. The patient was transferred to the psychiatry clinic.

DISCUSSION

Due to a narrow therapeutic range, lithium intoxication is a common clinical problem (10,11). While the effective dose range is 0.6-1.0 mmol/L, 1.2 mmol/L or more can be toxic in long-term use (12). The severity of lithium toxicity is generally divided into three grades; If the serum lithium concentration is between 1.5-2.5 mEq/L, it is considered mild, between 2.5-3.5 mEq/L is moderate, and more than 3.5 mEq/L as severe poisoning (13).
In lithium poisoning; gastrointestinal, cardiovascular, endocrine, neurological, and renal findings may be observed (14,24). These intoxication findings can be seen at high blood concentrations of lithium, as well as at concentrations within the therapeutic dose range in some patients (15). While there were mild gastrointestinal and endocrine findings in our case, cardiovascular findings were absent. Neurological effects and renal dysfunction were present in the foreground.

Especially the geriatric population is vulnerable to chronic poisoning. Most case reports have shown that elderly individuals are at greater risk for lithium-induced neurotoxicity, even in the

presence of lithium serum concentrations within the normal range (16). We think that advanced age was one of the factors that facilitated poisoning in our case.

In a retrospective cohort study of lithium poisoning cases published in 2016, factors associated with intoxication were examined and 9.9% of cases were associated with infections and 12.1% with initiation of interacting drugs. Volume reduction due to diuretics, dehydration, febrile illness, or gastrointestinal losses may cause elevated serum lithium levels (17). Our case was using 3 different groups of diuretics (hydrochlorothiazide, perindopril, and spironolactone) as antihypertensive treatment and had a urinary tract infection.

Although it has been determined in previous studies that lithium causes subclinical or clinical hypothyroidism more frequently, cases with hyperthyroidism and even thyrotoxicosis have also been reported rarely (18-20). Although it is not known for certain whether lithium-related hypothyroidism is reversible, in a retrospective cohort study conducted by Lieber et al., it was found that hypothyroidism resolved in most patients after lithium was discontinued (21). The TSH value of our patient was determined as 12.79 mIU/L and it was associated with lithium use. On the 7th day of the supportive treatment for lithium poisoning, TSH was 3.56 mIU/L, and this value is maintained in the ongoing follow-ups of the patient, and the patient did not receive thyroid replacement therapy. In addition, the incidence of hypercalcemia due to lithium-associated hyperparathyroidism (LIH) was found in a wide range of 3.6-62% (22). In our case, PTH and serum calcium levels were within normal limits.

Neurological manifestations of lithium poisoning are varied. In cases of mild lithium poisoning, symptoms may include a fine tremor, indifference to one's surroundings, fatigue, muscle weakness, and heightened reflexes. In moderate lithium poisoning, individuals may experience more severe neurological side effects such as pronounced tremors, difficulty with speech (dysarthria), ringing in the ears (tinnitus), loss of coordination (ataxia), increased muscle tension (hypertonia), sudden muscle jerks (myoclonus). In cases of severe lithium poisoning, symptoms can progress to include a state of stupor, epileptic seizures, coma, muscle twitching (fasciculation), muscle stiffness (spasticity), involuntary movements (chorea), slow, writhing movements (athetosis), weakness (paresis), and even paralysis(23). While lithium blood concentration was 2.98 mmol/l in our case, there were widespread tremor, rigidity, fatigue, dysarthria, ataxia, and fasciculations. Although neurological symptoms improved with treatment in our patient, tremor continued in the follow-up, and clinical improvement was achieved with propranolol 40 mg/day treatment.

Acute kidney injury was found in 32 of the attacks in a cohort study in which 91 poisoning attacks were examined in the literature (17). The lithium blood concentration level of our patient, who did not exhibit renal dysfunction during routine outpatient follow-ups, measured at 2.98 mmol/L. The creatinine level was 1.66 mg/dl, the estimated glomerular filtration rate (eGFR - CKD-EPI) was 30.26 (ml/min/1.73 m^2), urea was 166 mg/dl, and BUN (blood urea nitrogen) was 77.57 mg/dl. Renal function tests returned within the reference ranges at the end of treatment.

As a result, especially the geriatric population is at greater risk of lithium poisoning. In our case; old age, use of 3 different groups of diuretics as antihypertensive treatment, and the presence of urinary tract infection were defined as factors that facilitate poisoning. In this case, it is emphasized that although the lithium blood level was not very high, it should be kept in mind that severe neurological symptoms can be seen clinically in the presence of risk factors.

Ethical approval and consent to participate
Written informed consent to publish this information was obtained from study participant.

Consent for Publication
Patient included in this case report gave written informed consent to publish the data contained within this study.

Conflict of Interest
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Authors Contribution
All authors (TT, MŞC, SA and HB) shared the collection of published data, analyzing the results, manuscript writing and final revision. All authors have read and approved the manuscript.

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