

Review Article**Factors Affecting Surgical Fatigue****Yasemin Ozhanli, RN, MSc**

Research Assistant, Kocaeli University, Faculty of Health Sciences, Surgical Nursing Department, Kocaeli, Turkey.

Ahmet Karaman, RN, MSc

Research assistant, Istanbul University-Cerrahpasa Florence Nightingale Faculty of Nursing, Surgical Nursing Department, Istanbul, Turkey.

Nuray Akyuz, RN, PhD

Associate Professor, Istanbul University-Cerrahpasa Florence Nightingale Faculty of Nursing, Surgical Nursing Department, Istanbul, Turkey.

Correspondence: Nuray Akyuz, RN, PhD Associate Professor, Istanbul University-Cerrahpasa Florence Nightingale Faculty of Nursing, Surgical Nursing Department, Istanbul, Turkey. e-mail: nakyuz1@hotmail.com

Abstract

Fatigue is a process that is feeling by patient as debilitating exhaustion, loss of energy or malaise and that causes the physiological and psychological changes and the generally poor performance. It is known that surgical fatigue developed by the post-operative response of the metabolism to surgical intervention is one of the most frequent cause for complaint and that it takes longer than the pain. When reviewing the studies in the literature that studying surgical fatigue, it is seen that for patients, feeling themselves tired is associated with post-operative fatigue, anxiety and boredom; with their previous experiences about surgical intervention; malnourishment as well as the type and size of surgery. In this context, surgical fatigue is a diagnostic criteria that evaluates the patient's psychological and physiological condition as well as it is an important symptom to provide a holistic and qualified care. Many factors have influence on the development of surgical fatigue, which can be defined as the sum of the post-operative psychological and physiological symptoms that delay the return of daily living activities. This symptom that extends the healing process in patients experiencing surgical intervention can only be determined by a comprehensive / sophisticated evaluation. By clinical studies to be conducted, the factors causing the development of surgical fatigue can be measured in an objective manner and focused on its effective management. The aim of this review is to emphasize the importance of the factors affecting surgical fatigue in pre-, intra- and post-operative periods.

Keywords: Surgery, fatigue, postoperative fatigue.

Introduction

Fatigue is defined as "a period that patients feel collapsed, weak, lack of energy or malaise; also that causes physical and psychological changes and generally bad performance" (Zargar-Shostari & Hill, 2009; Sturn et al., 2009). According to another definition it is a subjective expression of tiredness, impotency and lack of energy (Radbruch et al., 2008). Fatigue emerges during the postoperation period as a hormonal and metabolic reaction of metabolism against surgery intervention. It is stated that fatigue is one of most complained reasons by patients during post-surgery period and it lasts longer than pain

complaints (DeCherney et al., 2002; Salmon & Hall, 1997; Zargar-Shostari & Hill, 2009); and severe fatigue is observed in patients for 12 hours following the surgery operations (Cilingir & Bayraktar, 2006). Medical problems such as multiple sclerosis, chronic fatigue syndrome, Addison's disease, depression and courses of radiotherapy and chemotherapy lead to fatigue (Heesen et al., 2006; Papanicohau, 2004; Kirsbaum, 2010; Özgünen, 2011). It is known that post-surgery fatigue is typically observed after surgeries on abdominal region and lasts more than a month (Zargar-Shostari & Hill, 2009). It is determined that patients experience severe fatigue and lack of energy after day

surgery operations (Çilingir & Bayraktar, 2006). Furthermore, fatigue is an important symptom which is mostly observed on the patients subjected to bone marrow transplantation (Kim & Kim, 2005) and breast surgery (Kirshbaum, 2010).

Physiopathology : Various disciplines try to explain physiopathology of fatigue through different models, theories and systems. This symptom is typically observed in patients of cancer and multiple sclerosis. The mechanism of fatigue is tried to be explained by using two models (depletion hypothesis and central nervous system) which are established through assessment of patients (Anderson & Dean, 2006). The importance of idea increases as it suggests post-operative fatigue is induced by anemia that arise from the activation of inflammatory period after surgery operation and massive bleeding during perioperative period. Depletion hypothesis can be embodied by anemia which is known as destruction of red blood cells or hemoglobin deficiency. By considering extend of surgical procedure, the predisposing factors that lead anemia such as volume of bleeding and the disease itself cause the fatigue. The studies reveal that erythropoietin application on patients with end stage renal failure, orthopedic surgery, and chemotherapy regulates the fatigue, exercise capacity and daily performance capacity (Anderson & Dean, 2006). Central nervous system model explains the fatigue through inflammatory period that begins after the surgical procedure. According to recent studies, it is suggested that inflammatory period affects the central nervous system and causes fatigue. After tissue injury cytokines become free and reach central nervous system; such an inflammatory stimulation causes fatigue and changes in sleeping patterns, sexual passion and social behaviors (Anderson & Dean, 2006).

The Factors Affecting Fatigue : The etiology of post-operative fatigue can also be assessed within the scope of sub-topics such as physiological response to surgery operation, decrease in the nutritional and physical activities beside its' biological assessment.

Surgical Procedure : The symptoms such as fatigue, fever, pain and inattention are induced with the production of pro-inflammatory cytokines (Zargar-Shostari & Hill, 2009). The organism considers surgery operations as a trauma and begins to release cytokine as a

response against such a trauma. The interleukin and interferons which are the mostly known cytokines enable growth and differentiation of leucocytes and increase the strength of immune system (Akyolcu, 2012). Physiologically, fatigue can be evaluated in two parts: central and peripheral fatigue. Inattention, disruption of motor neurons, hypothalamic dysfunction cause fatigue through hormonal system; neuromuscular conduction disorders or tendon activation disorders which emerge together with traumas cause peripheral fatigue (Usta-Yeşilbalkan, 2015). As the vagus nerve is affected during the surgery operation, this situation causes both the production of cytokine and excitation of central nervous system which ultimately lead fatigue in the post-surgery period. So this reveals the relationship between surgical procedure and fatigue (Zargar-Shostari & Hill, 2009). The fatigue, myogenic pain and back pain may be observed post-operation due to keeping the patient in same position for long hours during the surgical procedure and medication of antispasmodic agents (Cilingir & Bayraktar, 2006). The protein catabolism is one of the reasons for energy decrease. The general anesthesia that is applied during the surgery operation cannot lead protein catabolism solely by itself. The protein catabolism may vary according to type of surgery operation; on this basis it may lead fatigue at various levels. It is known that surgical procedures at the abdominal regions and orthopedic surgery operations lead severe fatigue; and the laparoscopic cholecystectomy leads less fatigue in comparison with open cholecystectomy (Zargar-Shostari & Hill, 2009).

Malnutrition : It can be considered that the level and quality of nutrition is an effective factor for the post-surgery fatigue pathogenesis. The emergence of fatigue is associated with the indicators of patient's malnutrition. Abdominal surgery operations lead under-nutrition and loss of gastrointestinal functions. This situation explains somewhat the level of fatigue after the ear surgery operation is lower in comparison with the fatigue level of abdominal surgery operations. Due to there is no loss in working performance and no loss of function in musculoskeletal system after major surgery operations on the individuals who follow healthy diet, the reason of the fatigue cannot be presented as solely nutritional. Despite this, as the patients are supported with anabolic agents (human growth hormone, nutritional

support etc.) during the catabolic response period of metabolism after the surgery operation decreases the level of fatigue (Zargar-Shostari & Hill, 2009).

Decrease in Physical Activity : Decreased physical activity following the surgical procedures affects the muscle strength, muscle functions and cardiovascular capacity negatively. The energy which is lost due to such functional losses lead more energy spending for daily activities accordingly it increases the level of fatigue (Zargar-Shostari & Hill, 2009). Despite this, the physical activity decreases the fatigue level that is experienced in the early period of surgery operations (Houborg et al., 2006). It is thought that physical activity can be effective to decrease fatigue level during the pre and post treatment period for the patients with breast cancer (Kirshbaum, 2010).

Psycho-social factors : The fatigue observed in post-surgery period, is considered on the basis of somatization and cognitive-behavioral theory from the psychological point of view (Salmon & Hall, 1997). According to somatization system, the patient missenses post-surgery symptoms and express that he/she has fatigue. Individual's level of fatigue affects his/her mental status according to cognitive-behavioral theory. In the post-surgery period, sensing the symptoms and treatments for such symptoms by the patient are two important issues in regulation of daily activities. Usually the patients limit their activities due to they think that any symptom may arise in the post-surgery period. For instance, it is found that the patients who are unwilling to take physical therapy after an orthopedic surgery operation, experience higher level of fatigue after the sixth month following the operation. As the social support system of patients is sufficient and good quality, their emotional status is affected positively in the post-surgery period. This also affects the perception of patient positively with regard to treatment and care period; and accordingly it decreases the risk of fatigue incidence (Rubin, Cleare & Hotopf, 2004; Zargar-Shostari & Hill, 2009).

Nursing Care – Diagnosis : In the diagnosis of fatigue, each individual must be examined by considering physiological systems and thought dimensions. In the assessment of fatigue many scales (The Multidimensional Assessment of Fatigue, Fatigue Scale, the Fatigue Observation Checklist, and Visual Analogue Scale for Fatigue

etc.) are developed that can be used in clinical and scientific researches; however, there is no perfect scaling instrument in this phase, the awareness of patients with regard to their individual fatigue status is one of the most effective methods for that purpose. Also the findings of fatigue are not stationary like other symptoms, it may vary daily even hourly according to phase of disease (Anderson & Dean, 2006). The assessment of fatigue must be considered in 13 articles as shown on the Table 1:

Nursing Intervention : Post-operative fatigue affects the self-care ability of the individual negatively due to scars and pain at the incision region. The main purpose of post-operative treatment and care for patients is to recover their health in shortest period, prevent the complications and maintain life quality at highest level. A comprehensive assessment and care planning with regard to risks that might be caused by surgical procedure is required for an effective post-operative treatment and care (Dal, Bulut, & Demir, 2012). In this context, the enthusiasm of patients - with post-operative fatigue - and their families is very important in the treatment period. Interventions towards diagnosis of fatigue are suggested to be applied in two different levels as managing the causative factors and achieving the balance between activities and resting (Anderson & Dean, 2006).

Giving Information: The patient is to be informed about that fatigue is not an extraordinary situation and it might occur due to treatment or disease itself (medical or surgery) and it is very important to share his/her thought with healthcare professional.

Symptoms Management: A patient may have fatigue in relation with various reasons such as pain, nausea, diarrhea, fluid-electrolyte imbalance and anemia. The situations that require energy are to be managed efficiently and the comfort of the patient is to be controlled at intervals.

Adjusting the Nutrition: Patients must eat nutritious foods in small portions in frequent intervals. If it is not contraindicated proteins are added to diet and ensure the patient to drink 8 -10 glasses of water in a day to maintain hydration. In order to sustain sufficient and quality diet oral care is to be performed.

Regulating the Sleep: The non-stop sleeping is to be achieved through identifying the sleeping and awareness times of the patient in a day. If required, the patient might be advised to rest or

sleep all day on condition that without affecting the night sleeps. The ambient factors such as light and noise are to be arranged for a high quality sleep rhythm. The patient must be encouraged to participate in appropriate activities before sleep. If the cognitive and behavioral approaches are not sufficient then the pharmaceutical method can be applied.

Physical Activity: In order to prevent the negative effects of physical inactivity and dehydration in the post-surgery period, the patient is to be advised to do physical activity. In this period the patient is forced to move slowly and the speed of his/her movements are to be

observed. Thus the pain that may arise due to physical inactivity can be prevented and the flexibility of articulation is maintained.

Preserving the Energy: The priorities are to be determined and unnecessary ones (answering a phone call etc.) are postponed or supported by someone else in order to preserve the energy that is spend in a day by patient. The patient is advised about energy saving daily procedures in daily life activities (to use shower chair when having shower, to sit while brushing teeth or combing hair etc.). The patient must be advised to listen to his/her body's voice and to rest when he/she is tired (Anderson & Dean, 2006).

Table 1: Diagnosis of Fatigue

Region	At which region you feel fatigue? <ul style="list-style-type: none"> ▪ Upper or lower extremities ▪ All the muscles of the body ▪ Cognitive dimension ▪ General
Density/ Level	Does fatigue affect the working and social life, roles and responsibilities of the patient?
Duration	How long (minute, hour, day) does fatigue continues? Is it chronic? (lasts longer than 6 months) How is the sleeping pattern? <ul style="list-style-type: none"> ▪ Wake up in the middle of night ▪ Feel fatigued in the evening ▪ Short period sleeps ▪ Continuous/non-stop sleeping ▪ Circadian rhythms are affected
Increasing factors	Does fatigue increase with the factors such as resting, activity, ambient temperature and loud?
Decreasing factors	Does fatigue decrease with variables such as resting, music, exercise etc.? How patient perceives the fatigue status? The knowledge of patient about the fatigue: How does patient express the fatigue symptoms?
Medication	Does patient use any medication (for pain or sleeping) that may lead fatigue?
Physical examination	Is there any factor found in the examination that may lead fatigue such as nerve damage, undernutrition, dehydration?
Muscular force	What are the results of tests that measure muscular force (Jamar muscular force, nerve conduction studies)?
General view	Is there any symptoms such as sallow, monotone voice, slow speaking, difficulty in breathing, loss of weight, dull face look?
Vital signs	Is there any abnormal finding (fever, low blood pressure, low pulse) that can explain the fatigue?
Laboratory findings	What is the level of hormonal values such as oxygenation status (blood gases, hemoglobin, hematocrit), electrolytes, thyroids etc.?
Activity level	The daily life activities are affected?
Effects	Is there any psychological change (anxious, depressive, quite etc.)?

Reference: (Anderson, P. R., Dean, G. E. (2006). *Fatigue*. In Ferrel, B.R., Coyle, N. (Eds.), *Textbook of Palliative Nursing, Second Edition (sy.155-168)*. New York, United States of America: Oxford University Press.

Conclusion

As a result; the nurse must know the fatigue and the factors that affect it; and do his/her duty and responsibilities in diagnosis of fatigue, performing required interventions and assessment of results.

References

- Akyolcu, N. (2012) Wound healing and nursing care. In Aksoy, G. Akyolcu, N., Kanan, N. (Eds.), Surgical Nursing I, 1.Print (p.79-114). Nobel Medical Bookstores.
- Anderson, P. R., Dean, G. E. (2006). Fatigue. In Ferrel, B.R., Coyle, N. (Eds.), Textbook of Palliative Nursing, Second Edition (p.155-168). New York, United States of America: Oxford University Press.
- Cilingir, B., Bayraktar, N. (2006). Günübirlık cerrahi süreci ve hemşirelik bakımı. Hacettepe University Journal of Nursing School, 13(1), 69-81.
- Dal, U., Bulut, H. & Demir, S. G. (2012). Cerrahi girişim sonrası hastaların evde yaşadıkları sorunlar. Bakırköy Medical Journal, 8(1), 34-40.
- DeCherney, A. H, Bachmann, G., Isaacson, K. and Gall, S. (2002). Postoperative fatigue negatively impacts the daily lives of patients recovering from hysterectomy. Obstetric Gynecology, 9(1), 51–57.
- Heesen, C., Nawrath, L., Reich, C. Bauer, N. Schulz, K. H. and Gold, S. M. (2006) Fatigue in multiple sclerosis: An example of cytokine mediated sickness behaviour? Journal Neurol Neurosurg Psychiatr, 77(1), 34–39.
- Houborg, K. B., Jensen, M. B., Rasmussen, P., Gandrup, P., Schroll, M., & Laurberg, S. (2006). Postoperative physical training following colorectal surgery: a randomised, placebo-controlled study. Scandinavian Journal of Surgery, 95(1), 17-22.
- Kim, S. D., Kim, H. S. (2005). Effects of a relaxation breathing exercise on fatigue in haemopoietic stem cell transplantation patients. Journal of Clinical Nursing, 14(1), 51-55.
- Kirshbaum, M. (2010). Cancer-related fatigue: a review of nursing interventions. British Journal of Community Nursing, 15(5), 214-219.
- Papanicolaou, D. A, Amsterdam, J. D., Levine, S (2004). Neuroendocrine aspects of chronic fatigue syndrome. Neuroimmunomodulation, 11(2), 65–74.
- Radbruch, L., Strasser, F., Elsner, F., Gonçalves, J. F., Løge, J., Kaasa, S., Stone P. & Research Steering Committee of the European Association for Palliative Care (EAPC) (2008). Fatigue in palliative care patients—an EAPC approach. Palliative Medicine, 22(1), 13-32.
- Rubin, G. J., Cleare, A. & Hotopf, M. (2004). Psychological factors in postoperative fatigue. Psychosomatic Medicine, 66(6), 959-964.
- Salmon, P., Hall, G. M. (1997). A theory of postoperative fatigue: An interaction of biological, psychological, and social processes. Pharmacology Biochemistry and Behavior, 56(4), 623-628.
- Sturm, L. (2009). The effect of fatigue on surgeon performance and surgical outcomes. Australian Safety & Efficacy Register of New Interventional Procedures-Surgical, South Australia, ASERNIP-S Report No. 68, 1-5.
- Usta-Yeşilbalkan, Ö. (2015). Yorgunluk. In Can, G. (Ed.), Onkoloji Hemşireliği (p. 335-346). Istanbul Turkey: Nobel Tıp Kitabevleri.
- Zargar-Shoshtari, K., & Hill, A. G. (2009). Postoperative fatigue: A review. World Journal of Surgery, 33(4), 738-745.