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The relationship between sarcopenia and cognitive dysfunction in bladder tumor patients

Mesane kanseri hastalarında sarkopeni ve postoperatif kognitif fonksiyon bozukluğu ilişkisi

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Abstract

Aim: There is no study in the literature to show whether there is a negative effect of sarcopenia on cognitive functions in patients over 65 years of age in the early postoperative period, who were operated under general anesthesia. The aim of this study was to determine the relationship between sarcopenia and cognitive dysfunction in the early postoperative period of transurethral resection of bladder tumor operation in the elderly population with bladder cancer.

Methods: The cognitive functions of patients over the age of 65 years who underwent transurethral resection of bladder tumor were evaluated before and 24 hours after the surgery with mini-mental tests in this single center, cross sectional study. All patients underwent a preoperative gait test and muscle mass was measured. The muscle strength of the patients with walking speed >0.8 m / sec in the walking test was measured by hand grip dynamometer. Low walking speed and muscle mass, and normal walking speed, but with low handgrip power and muscle mass were the accepted criteria of Sarcopenia.

Results: In the early postoperative period, a decrease in cognitive functions was observed in the population of 54 geriatric patients, 43 of whom were male. The mean age was 74 years in both sarcopenic and non-sarcopenic groups. Cognitive dysfunction was more common in the sarcopenic patient group of 15 patients in the early postoperative period compared to the non-sarcopenic group of 39 patients (P=0.001, P=0.026 respectively). However, this decrease in cognitive function in sarcopenic patients was not statistically significant compared to non-sarcopenic patients (P=0.644).

Conclusion: We demonstrated that cognitive functions decreased in early postoperative period in the geriatric patient population. The decrease in postoperative cognitive functions in sarcopenic patients was higher than that in non-sarcopenic patients, although the difference was not statistically significant. Therefore, larger studies with more patients are needed to achieve a statistically significant difference.

Keywords: Sarcopenia, Geriatrics, Gerontology, Cognition

Öz

Amaç: Sarkopeninin 65 yaş üzeri genel anestezi almış hastalarda ameliyat sonrası erken dönemde kognitif fonksiyonlar üzerine olumsuz etkisinin olup olmadığını gösterir çalışma literatürde yoktur. Postoperatif erken dönemde trans ürektal mesane kanseri rezeksiyonu olmuş yaşlı hasta popülasyonunda sarkopeni ve kognitif fonksiyon bozukluğu ilişkisini saptamak bu çalışmanın amacıdır.

Yöntemler: Trans uretral mesane rezeksiyonu operasyonu geçirecek olan 65 yaş üzeri hasta popülasyonunda; operasyon öncesi ve operasyondan 24 saat sonra erken dönemde minimental test yapılarak kognitif fonksiyonlar tek merkezli kesitsel bu çalışmada değerlendirildi. Tüm hastalara operasyon öncesi yürüme testi yapıldı ve kas kitlesi, kg/m² cinsinden biyoimpedans terazi ile ölçüldü. Yürüme testinde hızı >0,8 m/sn olan hastaların kas gücü ise, el sıkma dinamometresi ile ölçüldü. Düşük yürüme hızı ve kas kütlesi, normal yürüme hızı ancak düşük kavrama gücü ve kas kütlesi sarkopeni kriterleri olarak kabul edildi.

Bulgular: Postoperatif erken dönemde, çalışmaya alınan 43'ü erkek 54 kişilik tüm geriatrik hasta popülasyonunda kognitif fonksiyonlarda azalma saptandı. Hem sarkopenik hem de sarkopenik olmayan grupta ortalama yaş 74 idi. 15 kişilik Sarkopenik hasta grubunda postoperatif erken dönemde kognitif fonksiyon bozukluğu 39 kişilik sarkopenik olmayan gruba göre daha fazlaydı (sırasıyla P=0,001, P=0,026). Ancak Sarkopenik hastalardaki kognitif fonksiyondaki bu azalma Sarkopenik olmayan hastalara göre istatistiksel olarak anlamlı değildi (P=0,644).

Sonuç: Biz bu çalışmada anestezi sonrası erken ameliyat sonrası dönemde kognitif fonksiyonların tüm geriatrik hasta popülasyonunda azaldığını gösterdik. Sarkopenik hasta grubunda postoperatif kognitif fonksiyonlardaki azalma istatistiksel olarak anlamlı olmasa da Sarkopenik olmayanlara göre daha fazladır. Dolayısıyla, istatistiksel olarak anlamlı farkı yakalayacak daha çok hasta sayılı çalışmalara ihtiyaç vardır.

Anahtar kelimeler: Sarkopeni, Geriatri, Gerontoloji, Kognisyon

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Introduction

Sarcopenia is muscle loss characterized by a decrease in physical performance because of one or more numerous factors such as nutrition, decreased hormone levels and chronic inflammation. Inflammation, especially the proinflammatory cytokines IL-6, IL-1, TNF-alpha, play a prominent role in sarcopenia. It was first described in 1989 by Irwin Rosenberg. Its prevalence is highly different in diverse studies, ranging between 0.9-85.4 percent. Sarcopenia is associated with diabetes mellitus, depression and cardiovascular comorbid diseases, prolonged hospital stays, and increased mortality and morbidity, especially in the geriatric population [1-7].

Although several studies have shown that sarcopenia-related cognitive functions deteriorate more in the long term than non-sarcopenic ones, there are few studies investigating whether sarcopenic patients lose their cognitive functions more than non-sarcopenic patients in short-term stresses (such as anesthesia and operation).

We planned this study to determine whether there is a relationship between sarcopenia and cognitive dysfunction in the early postoperative period in the geriatric patient population.

Materials and methods

After the approval of the Prof. Dr. Cemil Taşcıoğlu City Hospital Ethics Committee (Date: 2/14/2017, No:600), patients who visited the internal medicine outpatient clinic for preoperative evaluation were included in the study on a voluntary basis. The acceptance time of volunteers for study was nine months. To standardize the operation and the anesthesia time as much as possible, male and female patients over 65 years of age who were to undergo transurethral resection of bladder tumor (TUR-BT) were selected instead of patients requiring different kinds of surgeries. Patients who were under 65 years of age, who required any surgeries other than TUR-BT, who are under antidepressant and antipsychotic treatments affecting cognitive functions, people with previous dementia, neurological and / or psychiatric diagnoses, and patients whose bioimpedance scales and handgrip manometers could not be measured for any reason were excluded from the study. Mini mental test was performed to evaluate cognitive functions for two times, before and 24 hours after the operation. Appropriate mini-mental test was preferred according to the educational status of the patients. To diagnose sarcopenia, bioimpedance measurements were performed with Tanita BC 532 InnerScan weighing scale and free fat mass index was measured, along with a walking test. Baseline digital handgrip manometer was used to determine the handgrip strength in patients with a walking test speed > 0.8 m / s. Handgrip force was performed 3 times when the patient was standing, with the preference of the strongest arm, while the elbow was at the 90 degree angle close to the body and the average handgrip power was recorded. Free fat mass index (FFMI) was calculated with FFMI calculator using body fat (%), height (cm) and length (kg) and evaluated according to the gender. Handgrip power according to age and Body Mass Index (BMI) was evaluated regarding the Cardiovascular Hearth Survey (CHS) table. Patients with low walking speed and muscle mass, and normal walking speed, but with low handgrip power and muscle mass, were diagnosed with sarcopenia.

Statistical analysis

Power analysis was performed with the G*power (version 3.1.9.7) program. The minimum calculated sample size was 16 (effect size 1.2, alpha error 0.05, power 0.95).

Percentage changes in the preoperative and postoperative cognitive function scores of the patients with and without sarcopenia were examined. The following formula was used to calculate this change:

Percent change (Δ) = (new value - old value) / (old value) X100.

The results were statistically analyzed with SPSS 25.0 version. Non-normally distributed data were evaluated using Mann-Whitney U and Wilcoxon tests. Pearson and spearman correlation tests were used for correlation analyses. Results were presented as mean (standard deviation (SD)). In the statistical evaluation of the data, *P*-value <0.05 was considered significant.

Results

In our study, 54 TUR-BT patients over the age of 65 years, 11 women and 43 men, were included.

Among study participants, 15 were sarcopenic and 39 patients did not have sarcopenia. The mean age was 74 (6) years in both sarcopenic and non-sarcopenic groups. While the mean result of the hand-grip test was 38.4 kg in the non-sarcopenic group, it was 23.5 in the sarcopenic group (*P*=0.004). The free fat mass index was 19.1 in the non-sarcopenic group and 16.6 in the sarcopenic group. A statistically significant difference was found between the non-sarcopenic and the sarcopenic groups regarding BMI, handgrip power, fat, free fat mass index and muscle ratios (*P*=0.01, *P*=0.004, *P*=0.02, *P*=0.001 and *P*=0.01, respectively) However, age, pre- and postoperative water, bone, and internal organ adiposity of the two groups were similar (*P*=0.65, *P*=0.05, *P*=0.09 and *P*=0.15, respectively) (Table 1).

The percentage change in the preoperative and postoperative cognitive function scores was 2.6% in the non-sarcopenic group and 3.1% in the sarcopenic group. There was a statistically significant decrease in postoperative cognitive functions compared with the preoperative results in both non-sarcopenic and sarcopenic groups (*P*=0.01 and *P*=0.026, respectively), however, the percentage changes of sarcopenic and non-sarcopenic groups were similar (*P*=0.644) (Table 2, 3).

Table 1: Comparison of data between sarcopenic and non-sarcopenic groups

	Non-Sarcopenic Patients (n=39) Mean (SD)	Sarcopenic Patients (n=15) Mean (SD)	*P*-value
Age (years)	74.5 (6)	74 (6.6)	0.656
Gender (M/F)	30/9	13/2	0.420
The mean handgrip strength (kg)	38.4 (19)	23 (5.4)	0.004
BMI (kg/m²)	27.8 (5.3)	22.4 (3.2)	0.001
Total Body Fat Percentage	27 (8.8)	21.2 (6.6)	0.028
Total Body Water Percentage	50.1 (6)	53.7 (4.4)	0.058
Free Fat Mass Index (kg/m2)	19.1 (2.7)	16.6 (1.3)	0.001
Total Body Internal Organ Fat Mass (kg)	14.2 (3.1)	12.8 (2.9)	0.150
Total Body Muscle Mass (kg)	53 (10.9)	46.8 (3.8)	0.012
Total Body Bone Mass (kg)	2.7 (0.5)	2.6 (0.4)	0.099

Table 2: Comparison of preoperative and postoperative cognitive function scores of all patients, and non-sarcopenic and sarcopenic group

	Preoperative Cognitive Function Score Mean (SD)	Postoperative Cognitive Function Score Mean (SD)	*P*-value
Al patients (n=54)	26.3 (3.4)	25.6 (3.5)	<0.001
Non-Sarcopenic Patients (n=39)	26.4 (3.1)	25.7 (3)	0.001
Sarcopenic Patients (n=15)	26 (4.3)	25 (4.6)	0.026

Table 3: Comparison of percentage changes between preoperative and postoperative cognitive function scores of non-sarcopenic and sarcopenic patients

	Non-Sarcopenic Patients (n=39)	Sarcopenic Patients (n=15)	*P*-value
Cognitive Function Score Percentage Change (Δ) Mean (SD)	-2.6 (4.7)	-3.1 (4.9)	0.644

Discussion

Although there have been studies in the literature stating that sarcopenia impairs cognitive functions, especially in geriatric patients over a long period of time, there are few studies showing the extent to which acute stress, such as an operation, affects cognition in the geriatric patient population. In fact, there is no study in the literature that evaluates the early postoperative cognitive functions in the sarcopenic patient group. Therefore, this study is a first. In this study, we examined patients over 65 years of age who underwent only TUR-BT operation to standardize patient population, operation, anesthetic agents and duration, and we found that cognitive functions decreased in all patients regardless of sarcopenia in the first 24 hours following surgery.

In the meta-analysis of Chang et al. [1] including 5994 patients, in the study of Cabett Cipolli et al. [8] on 7045 patients and in the studies of Tolea et al. [9] and Landi et al. [10], a strong relationship between sarcopenia and cognitive functions was reported. All previous studies clearly demonstrated the long-term relationship between sarcopenia and cognitive functions [11,12]. However, in our study investigating the early cognitive functions in the case of acute stress in sarcopenic patients, we found that a similar relationship was also present.

Although there is more than one factor in the etiology of sarcopenia, proinflammatory cytokines IL-6 and TNF-alpha play a significant role, especially with increasing age. Surgical trauma also stimulates the inflammatory response and inflammatory cytokines have a negative effect on cognition.

In their study on geriatric patients, Chen et al. [13] showed the relationship between cognitive functions and IL-6 levels on the 3rd postoperative day, reporting that decreased IL-6 levels with peroperative lidocaine administration revealed better postoperative cognitive functions. Similarly, Shan et al. [14] also reported that in the geriatric patient group, cognitive functions were better preserved with the use of Ulinastatin, which has anti-inflammatory effects, and suppresses neutrophil accumulation and activity, regardless of sarcopenia. These studies show that proinflammatory cytokines play an active role in the deterioration of cognitive functions. The greater loss of cognitive function in sarcopenic patients is likely due to proinflammatory cytokines, which also play a role in the etiology.

However, it is difficult to say the exact answer to the question of whether the decrease in muscle mass contributes to the deterioration of cognitive functions after anesthesia in the elderly patient group. Each patient's operation time, pre-existing disease states, different drugs used, the success of the operation, and the operator's experience can affect this process. Therefore, to standardize patients, we tried to recruit similar patients to the same operation team and patients to undergo the same operation. Although this slightly limited the number of patients, we can say that the operation still causes a decrease in cognitive functions in this study. Likewise, the greater decrease in sarcopenic patients showed that in these patients, we should be more careful in terms of postoperative mental changes.

As a result of our study, we found that, although statistically insignificant, there was a higher loss in cognitive functions in sarcopenic patients compared to non-sarcopenic patients, which may be due to the increased postoperative cytokine activity in sarcopenic patients. With larger studies including more patients, statistically significant results may be achieved in revealing the difference.

Limitation

This study has two potential limitations, one being the small number of sarcopenic patients. The second one is selecting patients who have malignancy, because cognitive functions may be affected in cancer patients due to depression or anxiety. Studies with more sarcopenic patients without malignancy could yield more valid results.

Conclusion

In conclusion, it was seen that operation in the geriatric patient population caused a decrease in cognitive functions in both the non-sarcopenic and sarcopenic patients in the early postoperative period. The decrease in cognitive functions in the sarcopenic geriatric group was more pronounced. In the geriatric sarcopenic patient group, more studies with different types of operations, durations of anesthesia, varying anesthetic drugs and measurement of cytokine levels should be conducted in order to explain the mechanism that disrupts the cognitive functions in acute stress conditions such as operation and anesthesia.

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