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Value of Prognostic Nutritional Index on Complications After Radical Cystectomy and Ileal Conduit: Retrospective Clinical Research

Prognostik Nutrisyonel İndeksin Radikal Sistektomi ve İleal Kondüit Sonrası Komplikasyonları Öngörmedeki Değeri: Retrospektif Klinik Çalışma

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This study was presented as an oral presentation at the 4th National Urological Surgery Congress, October 31-November 4, 2018, Antalya, Türkiye.

ABSTRACT Objective: Prognostic nutritional index (PNI) is a method that can be easily calculated according to the serum albumin level and lymphocyte count and shows the nutritional and immune status of patients. PNI was originally developed as an indicator of the preoperative nutritional status of patients with gastrointestinal malignancies. The aim of this study is to evaluate the value of PNI in prediction of postoperative complications after radical cystectomy and ileal conduit. **Material and Methods:** We conducted a retrospective study of patients who underwent radical cystectomy and ileal conduit between 2011 and 2021. A total of 174 patients were included in this study. The patients were divided into 2 groups according to the cutoff value of the PNI: those with a PNI≥46 (normal group) and those with a PNI<46 (low PNI group). The clinicopathological features between the 2 groups were compared using the χ^2 test. **Results:** A total of 174 radical cystectomy with ileal conduit patients were available for analysis. The cohort included 140 males and 34 females. Overall, 36 (20.6%) patients encountered a Grade ≥ III complication after surgery. In the normal group, 9 (17.5%) of patients had Grade ≥ III complication and 27 of patients (34.04%) in low PNI group had Grade ≥ III complication after surgery. When the groups were compared in terms of major complication rates, there were statistically significant more Grade ≥ III complications in the low PNI group (p<0.001). **Conclusion:** PNI can be used clinically to predict the possibility of serious postoperative complications in patients who are candidates for radical cystectomy.

Keywords: Urinary diversion; cystectomy; nutrition assessment; complications

ÖZET Amaç: Prognostik nutrisyonel indeks (PNİ), serum albumin düzeyi ve lenfosit sayısına göre kolaylıkla hesaplanabilen, hastaların beslenme ve bağışıklık durumunu gösteren bir yöntemdir. PNİ ilk olarak gastrointestinal kanserli hastaların ameliyat öncesi beslenme durumunun bir göstergesi olarak geliştirilmiştir. Bu çalışmanın amacı, kasa invaze mesane kanseri nedeniyle radikal sistektomi ve ileal kondüit uygulanan hastalarda PNİ'nin postoperatif komplikasyonları öngörmedeki değerini araştırmaktır. **Gereç ve Yöntemler:** 2011-2021 yılları arasında radikal sistektomi ve ileal kondüit uygulanan hastaları retrospektif olarak değerlendirdik. Bu çalışmaya toplam 174 hasta dâhil edildi. Hastalar PNİ eşik değerine göre PNİ≥46 olanlar (normal grup) ve PNİ<46 olanlar (düşük PNİ grubu) olmak üzere 2 gruba ayrıldı. İki grup arasındaki klinikopatolojik özellikler χ^2 testi kullanılarak karşılaştırıldı. **Bulgular:** Toplam 174 radikal sistektomi ve ileal kondüit yapılan hasta analize uygundu. Kohort, 14 erkek ve 34 kadın hastadan oluşuyordu. Ameliyat sonrası 36 (%20,6) hastada Grade ≥ III komplikasyonla karşılaşıldı. Normal grupta 9 (%17,5) hastada cerrahi sonrası Grade ≥ III komplikasyon ile karşılaşılırken, düşük PNİ grupta 27 (%34,04) hastada Grade ≥ III komplikasyon görüldü. Gruplar majör komplikasyon oranları açısından karşılaştırıldığında, düşük PNİ grupta istatistiksel olarak anlamlı derecede daha fazla Grade ≥ III komplikasyon görüldü (p<0,001). **Sonuç:** PNİ, radikal sistektomi adayı hastalarda ciddi postoperatif komplikasyonları öngörmek için klinik olarak kullanılabilir.

Anahtar Kelimeler: Üriner diversiyon; sistektomi; beslenme değerlendirmesi; komplikasyonlar

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Radical cystectomy (RC) with urinary diversion is the most effective management for muscle invasive bladder cancer and ileal conduit is the most popular form of urinary diversion. However, these patients who are candidates for such a serious surgery are usually elderly, have poor nutritional status and have comorbid diseases.[1]

The literature shows that up to 66% of patients undergoing RC may develop a complication within the first 90 days after surgery, and major complications may develop in an average of 25% of these patients.[2,3]

Malnutrition is known to be a serious risk factor for complications after RC.[4]

PNI is a method that can be easily calculated according to the serum albumin level and lymphocyte count and shows the nutritional and immune status of patients.

PNI was originally developed as a sign of the preoperative nutritional condition of patients with gastrointestinal malignancies.[5]

Preoperative nutritional condition is an effective predictor of both postoperative complications and long time results in patients with malignancy.[6-8]

The purpose of our study was to enquire the value of the prognostic nutritional index (PNI) in predicting postoperative complications in patients with bladder cancer who underwent RC and ileal conduit.

MATERIAL AND METHODS

We retrospectively analyzed 174 data available patients with bladder cancer undergoing open RC and ileal conduit from 2011-2021 at our institution. Patients with a history of abdominal radiotherapy, neoadjuvant chemotherapy, hepatic or renal dysfunction and inflammatory bowel disease patients were excluded from the study. Preoperative oral intake was stopped at least 8 hours before surgery in all patients. Ceftriaxone and metronidazole was started for prophylaxis in all patients just before the operation and continued until the 3rd postoperative day. Deep vein thrombosis prophylaxis was applied to the patients by using low molecular weight heparin and elastic compression stockings. Data of patients were obtained from medical records. This study fulfills the Declaration of Helsinki.

We assessed the nutritional status of patients with PNI. The PNI was determined using the subsequent formula, using the data obtained from the blood tests performed during the preoperative evaluation (10×serum albumin level g/dL)+(0.005×total lymphocyte count).[9]

We defined the postoperative complications based on the modiffied Clavien Dindo classification system.

Patients were divided into 2 groups based on the PNI threshold defined by Jiang et al.: PNI≥46 (normal group) and PNI<46 (low PNI group).[9] The clinicopathological features between the 2 groups were statistically compared and analyzed.

STATISTICAL ANALYSIS

The Kolmogorov-Smirnov analyse was used for homogeneity of variance. Homogeneous distributed variables were reported as mean and nonhomogeneous distributed variables were addressed as median and interquartile range. The clinical and pathological features of the patients were compared using the χ^2 test. A p value of less than 0.05 was reflected on significant. Statistical analysis was made using the *SPSS software* (Version 23.0, SPSS Inc., Chicago, IL, USA).

RESULTS

A total of 174 RC with ileal conduit patients were available for analysis. The cohort included 140 males and 34 females. When the patients were divided into normal and low PNI groups based on their PNI values, there were 80 patients in the normal group and 94 patients in the low PNI group.

While the mean age of the patients in the normal group was 69.4±9, the mean age of the low PNI group was 69.1±8.4. The median body mass index was 25.6 (23.4-28.2) in normal group and 24.8 (23-26.4) in low PNI group. American Society of Anesthesiology score was ≥3 in 55% of normal patients and 55.32% in low PNI patients. Around 16 (20%) patients in normal group and 18 (19.14%) patients in low PNI patients had history of pelvic or abdominal surgery. There was no significant difference among

the groups regarding sex and smoking ratios. All patients' baseline information was shown in Table 1.

The mean operating time was 242.8±103.8 min. and 242.8±103.8 min, median postoperative hospital stay was 12 days (10-15) and 12 days (9-16) in normal and low PNI groups, respectively. There was no statistical significance (p=0.724, p=0.222). All patients, perioperative information was also shown in Table 1.

Minor complications (Grade < III complications) were seen in a total of 71 (40.8%) patients. While the incidence of minor complications was 42.5% in the normal group, this rate was 39.3% in the low PNI group.

When the 2 groups were compared statistically, no significant difference was found in terms of the incidence of minor complications (p=0.441).

Overall, 36 (20.6%) patients encountered a Grade ≥ III complication after surgery. In the normal group, 9 (17.5%) patients had Grade ≥ III complication and 27 patients (34.04%) in low PNI group had Grade ≥ III complication after surgery. When the groups were compared in terms of major complication rates, there were statistically significantly more Grade ≥ III complications in the low-PNI group (p<0.001). The data of complications were shown in Table 2.

DISCUSSION

Although RC has been used as first-line therapy for localized muscle invasive bladder cancer for many years, it is still associated with complications up to 64%.[10]

Mitropoulos et al. published a report in 2012 recommending the use of the Clavien-Dindo scoring system as a standard system after urological surgery and on how to classify complications with this system.[11]

According to this system, complications that are defined as early complications after RC which develop within the first 90 days postoperatively vary between 49% and 65% in the literature.[12-19]

TABLE 1: Clinicopathological characteristics of patients (n=174) who underwent radical cystectomy with ileal conduit.

	Normal group	Low PNI group	p value
Patients, n (%)	80 (45.97)	94 (54.02)	
Age	69.8±9.8	69.1±8.4	0.967
Gender, n (%)			
Male	66 (82.5)	74 (78.72)	0.489
Female	14 (17.5)	20 (21.28)	0.524
Smoker, n (%)	46 (57.5)	52 (55.31)	0.420
BMI	25.6 (23.4-28.2)	24.8 (23-26.4)	0.482
Previous abdominal or pelvic surgery, n (%)	16 (20)	18 (19.14)	0.824
ASA score, n (%)			
<3	36 (45)	42 (44.68)	0.758
≥3	44 (55)	52 (55.32)	0.654
pT, n (%)			
≤T1	8 (10)	6 (6.38)	0.211
T2	32 (40)	30 (31.91)	0.352
T3	26 (32.5)	36 (38.29)	0.258
T4	14 (17.5)	22 (23.42)	0.265
Grade < III complication, n(%)	34 (42.5)	37 (39.3)	0.441
Grade ≥ III complication, n (%)	9 (11.2)	27 (28.7)	<0.001
Operation time, minutes, mean	242.8±103.8	242.8±103.8	0.724
Postoperative hospital stay, days, median	12 (10-15)	12 (9-16)	0.222

PNI: Prognostic nutritional index; BMI: Body mass index; ASA: American Society of Anesthesiology.

TABLE 2: Grade ≥ III complications during the first 90 days after surgery according to the modified Clavien classification system.

		Normal	Low PNI
Grade 3 a	Urinary leakage requiring PCN	2	5
	Lymphocele	1	3
	Small bowel obstruction	0	2
	Hydronephrosis	0	1
	Pelvic hematoma	0	1
Grade 3 b	Re-exploration for urinary leakage	1	2
	Re-exploration for bowel obstruction/perforation	0	2
	Burst abdomen	0	1
	Stoma revision	1	2
	Rectal injury	0	1
	Ureteric injury	0	1
Grade 4 a	Myocardial infarction	1	1
	ARDS	0	1
	Renal failure	0	1
Grade 4 b	Sepsis	2	1
	DIC	0	1
Grade 5	Death	1	1

PCN: Percutaneous nephrostomy; PNI: Prognostic nutritional index; ARDS: Acute respiratory distress syndrome; DIC: Disseminated intravascular coagulation.

In our study, minor and major complications were seen in 61.4% of our patients in the first 90 days after surgery. This result of our study seems to be compatible with the literature.

According to the results of the most comprehensive studies on RC, mortality was reported as 1.2-3.2% in the first 30 days and 2.3-8.0% in the first 90 days.[20-24] Our mortality rate was 1.1% within the first 90 days after surgery.

Onodera et al. developed this simple scoring system called the PNI, which consists of serum albumin and lymphocyte counts, based on the fact that preoperative nutritional status will affect the results of abdominal surgery.[5]

Albumin value is a mark of nutritional capability and lymphocyte count is a mark of both nutritional and immune capability. Therefore, PNI, a marker obtained from albumin and lymphocyte values, is used to evaluate nutritional and immune condition. Patients with low PNI value preoperatively are anticipated to have low wound healing potential and low immune function in the postoperative period.[25,26]

Mohri et al. showed that the preoperative PNI value is a useful indicator of postoperative complications and disease free survival in patients with colorectal cancer.[7]

Nozoe et al. reported similar results that the preoperative PNI value can provide useful information about the postoperative clinical results of patients with colorectal carcinoma.[27]

Jiang et al. reported the optimal cutoff value for PNI as 46 in a study conducted on the value of PNI in predicting complications in patients with gastric cancer who underwent total gastrectomy.

In this study, they revealed that postoperative complications occurred more frequently in the group with low PNI than in the group with high PNI.[28]

Preoperative malnutrition independently increases morbidity and mortality rates in patients who underwent cystectomy.[29,30]

Although the preoperative PNI value is used as an important parameter to predict postoperative complications in patients undergoing major gastrointestinal surgery, its role in predicting morbidity and mortality after RC is not yet known.[31]

This is the first study which investigates the relationship between PNI and severe complications after RC and ileal conduit patients.

Our present study demonstrated that the PNI was linked with a higher risk of severe postoperative complications.

CONCLUSION

The results of our study suggest that the PNI value, which can be obtained with the help of a simple formula from the blood analysis results requested for preoperative preparation, can be easily used to predict postoperative complications in patients who will undergo RC.

As a result, in patients with low PNI value, more careful attention can be provided in the perioperative care process in terms of possible complications.

According to the results of our study, it can be suggested that the PNI value should be included in the preoperative routine evaluation of patients with bladder cancer who are candidates for RC.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

This study is entirely author's own work and no other author contribution

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