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Advanced age in non-metastatic prostate cancer: does it matter on the oncological outcomes?

Metastatik olmayan prostat kanserinde ileri yaş onkolojik sonuçları etkilemekte midir?

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ÖZET

Amaç: Çalışmamızda radikal prostatektomi (RP) yapılmış, metastatik olmayan prostat kanseri hastalarında ileri yaşın onkolojik sonuçlara etkisini araştırmak amaçlanmıştır.
Gereç ve Yöntemler: Toplamda 593 hastanın verileri geriye dönük incelendi. Hastalar 70 yaş altı (n=454) ile 70 yaş ve üzeri (n=139) olarak iki gruba ayrıldı. Demografik, patolojik ve cerrahi sonrası onkolojik sonuçlar iki grup arasında karşılaştırıldı. Birincil hedef nokta olarak ileri yaşın biyokimyasal nüks olmaksızın sağ kalım (BNOS) ve genel sağ kalım (GS) üzerine etkisi değerlendirildi. BNOS ve GS üzerine etki eden faktörlerin değerlendirilmesi için lojistik regresyon analizi yapıldı. 10 yıllık takiplerde BNOS ve GS oranlarını gösteren Kaplan-Meier eğrileri oluşturuldu.
Sonuçlar: GS oranları sırasıyla 5 ve 10 yıllık takiplerde daha genç yaştaki hasta grubu ile ileri yaştaki hasta grubu karşılaştırıldığında %85,2'ye karşı %64 ve %67,2'ye karşı %23,7 olarak bulundu (her iki karşılaştırma için de p <0.001). BNOS oranları sırasıyla 5 ve 10 yıllık takiplerde daha genç yaştaki hasta grubu ile ileri yaştaki hasta grubu karşılaştırıldığında %83,9'a karşı 80.9% ve %85,2'ye karşı %39,4 olarak bulundu (sırasıyla p = 0.29 ve p <0.001). RP sonucundaki Gleason skorunun 7 ve üzerinde olması, seminal vezikül invazyonu ve ileri evre hastalık BNOS üzerine etkin faktörler olarak bulundu. Çok değişkenli analizde ise ileri patolojik evre (pT3) ve yüksek Gleason skoru (8 ve üzeri) BNOS üzerine etkili faktörler olarak bulundu. Genel sağ kalım ileri yaştaki hastaları içeren grupta daha düşük bulundu ve yaş GS üzerine etkin birincil faktör olarak saptandı.
Sonuç: Metastaz yapmamış prostat kanseri hastalarında radikal prostatektomi sonrası onkolojik sonuçlar üzerine ileri yaşın bir etkisi görülmemiştir.
Anahtar Kelimeler: prostat kanseri, radikal prostatektomi, biyokimyasal nüks, prostat spesifik antijen

ABSTRACT

Purpose: We evaluated the effect of advanced age on oncological outcomes after radical prostatectomy (RP) in non-metastatic prostate cancer (PCa) patients.
Materials and Methods: Totally 593 patients' data was retrospectively evaluated. All patients were divided into two groups: <70 (n=454) and ≥70 (n=139) years of age. Demographic, pathological and post-operative oncological outcomes were compared between these two groups. The primary endpoint was to evaluate the effect of advance age on biochemical recurrence free survival (BRFS) and overall survival (OS). Logistic regression analysis was performed to predict BRFS and OS. Kaplan-Meier pilots are provided for BRFS and OS up to ten years.
Results: The OS rates were 85.2% vs. 64%, and 67.2% vs. 23.7% in comparing the younger group to the older group at the 5^{th}, and 10^{th} year of follow-ups, respectively ($p < 0.001$ for the both comparisons). The BRFS rates were 83.9% vs. 80.9%, and 85.2% vs. 39.4% when comparing the younger group to the older group at the 5^{th}, and 10^{th} year of follow-ups, respectively ($p = 0.29$, and $p < 0.001$, respectively). Factors of a Gleason score higher than 7 on radical prostatectomy, seminal vesicle invasion, and advanced stage were found to be significant factors affecting BRFS, in univariate analysis. In the multivariate analysis, it denoted advanced pathological stage (T3) and high Gleason score (≥8) as prognostic factors affecting BRFS. OS was found to be worse in the older patients' group and age was found as a primary factor in prediction of OS.
Conclusions: There is no relationship between advanced age and oncological outcomes after RP in non-metastatic PCa patients.
Keywords: prostate cancer, radical prostatectomy, biochemical recurrence, prostate specific antigen

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INTRODUCTION

Prostate cancer (PCa) has been holding a major place in the aging men's healthcare and is still the leading cancer diagnosis in males (1). The diagnosis of the disease has evolved from purely clinical to mostly laboratory-directed prostate biopsy with the global usage of the Prostate Specific Antigen (PSA) tests. The implication of the PSA screening in clinical practice has enhanced patient awareness, and advancement in the treatment options have led to high survival levels as well as diagnosis of the disease in the lower stages. Whether a screening in the population level should be carried out or not is a matter of debate, while the primary concern is the potential harms of the treatment options (2). Thus, watchful waiting and active surveillance protocols are defined for elders who would not be faced with the complications of the disease in their natural lifetime and young patients with low-risk disease who may postpone the potential side-effects of the radical treatment under close follow-up without losing the surgical cure chance, respectively (3, 4).

One of the main determinants in the decision of the screening necessity and treatment modality is the patient's life expectancy, which is affected by the patient's age, comorbidities, family history, and the expected life of the general male population. Current guidelines suggest consideration of the radical treatment for patients who have at least ten years of active life expectancy remaining (5, 6). Considering the contemporary average lifetime in males as 80 years, there are many reports on the biochemical recurrence free survival (BRFS) rates of the patients who have undergone radical prostatectomy using the 70 years of age as the cut-off point between two groups (7-10).

In this study, we aimed to evaluate whether any difference exists between older and younger patients in term of oncological outcomes after radical prostatectomy (RP) in non-metastatic PCa patients.

MATERIALS and METHODS

Ethical approval for this study was obtained from Local Ethics Committee with approval number 161 and the date of 23rd June 2015. Written informed consent was obtained from all patients and the study was conducted according to World Medical Association Declaration of Helsinki.

Our study cohort comprises patients who have undergone radical prostatectomy (RP) with either open or robotic assisted laparoscopic techniques between 2006 and 2015 at our clinic. In total 842 patients' data was reviewed. Patients whose follow-up was not available or less than one year, and who have undergone immediate adjuvant therapy (because of the presence of surgical margin positivity and/or lymph node involvement) protocols were excluded from the analysis. These remaining 593 patients were included in the analysis.

Patients' demographics, prostate biopsy results, final pathology results, and PSA surveys were obtained from the electronic records and patient charts. Patients were divided into two groups: <70 (n=454) and ≥70 (n=139) years of age at the time of the surgical treatment. Our primary endpoint was to evaluate the effect of advance age on biochemical recurrence free survival (BRFS) and overall survival (OS) as well as other oncological outcomes; namely extra-prostatic extension (EPE), seminal vesicle invasion (SVI), and capsule invasion without EPE.

BCR was defined based on two consecutive PSA measurements of ≥0.2 ng/mL after RP.

Survival rates were compared between the groups in up to 12 years of follow-ups. Survival data was collected using electronic record queries and telephone surveys while required on the December of 2019. Overall survival (OS) is defined as being alive while BRFS is defined as never experiencing a confirmed PSA level ≥0.2 ng/mL after RP and being alive at the time of follow-up, namely 5th and 10th years postoperatively. Cause and time of death, and history of androgen deprivation was collected when available and appropriate. Patients whose cause of death was reported to be associated with PCa in the electronic records are classified as cancer-related deaths, which constitute the difference between the OS and CSS.

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Statistical analysis

SAS University Edition (SAS Institute Inc, Cary, NC, USA) was used for the statistical calculations. Fisher's exact test or χ^2 test was used for comparisons depending on the expected values of the cells in the table analysis. Cox regression analyses conducted to identify variables predictive of BCR. The statistical significance was deemed as *p* value lower than 0.05.

RESULTS

The mean PSA value, age, body mass index (BMI) of our cohort were 9.54 (1.09 –51.5) ng/ml, 62.9 (40 – 79) years and 27.8 (19 – 36) kg/m^2, respectively. The mean follow-up time for patients who had no BCR was 98 (12 – 120) months, while mean follow-up time for all cohorts was 57 (1 – 120) months.

EPE, SVI and capsule invasion without EPE were detected in 159 (26.8%), 62 (10.5%) and 83 (14%) patients. All demographic, pathological and other oncological variables of the cohort were detailed in Table 1. When we divided all patients into two groups; there were no statistical differences between groups in terms of EPE (p=0.07), SVI (p=0.2) and capsule invasion without EPE (p=0.25).

Logistic regression analysis included age, BMI, total PSA value, suspicious findings at digital rectal examination, number of positive cores, Gleason score, pathological stage, presence of EPE, presence of capsule invasion, and presence of SVI. These variables were analyzed to determine factors associated with BRFS, and OS. Higher total PSA value, higher (≥8) Gleason score, higher (pT3) pathological stage and presence of seminal vesicle invasion were found to be associated with BRFS in univariate analysis. In the multivariate logistic analysis, higher (≥8) Gleason score and presence of seminal vesicle invasion were associated with BRFS. Logistic regression analysis is detailed in Table 2.

The OS rates were 91.7%, 89.8%, and 87.2% for patients under 70 years of age on the 5th, 10th, and 12th years of follow-ups, respectively. Based on the outpatient and phone interviews, the most common causes of death were acute deterioration of the patient due to previously unknown coronary disease or traffic accidents. Three-fourths of the deceased patients were under androgen-deprivation therapy while they passed away.

The OS rates were 78.2%, 58.5%, and 29.2% for patients who were 70 years of age or older on the 5th, 10th, and 12th year of follow-ups, respectively. The most common cause of death was global loss of systemic functions and increased debility. Intensive-care unit admission history was available in roughly half of the deceased patients while androgen-deprivation therapy history was prevalent in one-fifth of these patients.

The OS rates showed significant differences between two groups for the postoperative 5th and 10th years ($p < 0.001$ for the both comparisons).

The BRFS rates were also similar for both groups, being 80.9% in the patients under 70 years of age and 80.9% in the older ones in the 5th year of follow-up. Further BRFS rates were 85.2% vs. 60.6% at the postoperative 10th year for the younger vs. the older patient groups ($p = 0.29$ and $p < 0.001$, respectively).

For the patients younger than 70 years of age, in the first 5 years of the follow-up, a total of 33 PCa related deaths and 15 deaths not related to the PCa were observed in patients who had BCR during the first five years of the follow-up. Between the fifth and the tenth year of the follow-up, 38 PCa related deaths and 16 deaths not related to the PCa were observed in patients who had BCR during the follow-up period. Among the patients who did not have BCR, 19 deaths in the first five years and 28 deaths in the second five years of the follow-up was observed. In the younger patient group 387 (62 of them had BCR) were alive at the end of the 5 years while 305 patients (45 of them had BCR) were alive after the end of 10 years of follow-up.

For the patients who were at 70 years of age or older, in the first 5 years of the follow-up, a total of 16 PCa related deaths and 10 deaths not related to the PCa were observed in patients who had BCR during the first five years of the follow-up. Between the fifth and the tenth year of the follow-up, 2 PCa related death and 7 deaths not related to the PCa were observed in patients who had BCR during the follow-up period. Among the patients who did not have BCR, 24 deaths in the first five year and 57 deaths in the second five years of the follow-up were observed. In the older patients'

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group 89 patients (17 of them had BCR) were alive at the end of the 5 years while 33 patients (13 of them had BCR) were alive after the end of 10 years of follow-up.

Kaplan-Meier pilots of OS, and BRFS are given in Figure 1.

DISCUSSION

PCa is the leading cancer diagnosis, avoiding cutaneous neoplasms, in the male with significant morbidity and even mortality. This past century has witnessed an evolution of the diagnosis, treatment and prognosis of the PCa. While the diagnostic capabilities were expanding from digital rectal examination to PSA screening, the stage of the disease at the time of the diagnosis fell from a metastatic to a localized disease (11). The contemporary guidelines endorse tailoring a treatment based on the clinical staging and the risk grouping of the disease, as well as the patients' life expectancy. In the aging world, urologists are facedwith septuagenarian or octogenarian prostate cancer patients who might benefit from the radical treatment. The main aim of our study was comparing the oncological benefit, in terms of the BRFS and OS, of the RP in patients younger than 70 years of age vs. the patients who are at 70 years of age or beyond. Thus, providing an evidence on the benefit of the radical treatment in the healthy seniors.

The potential harm or benefit of the prostate cancer screening in an asymptomatic individual is a matter of debate. The National Comprehensive Cancer Network, European Association of Urology and American Urology Association clinical guidelines suggests considering screening in an informed fashion for people who have ten years or more life expectancy (5, 6, 12). Previously, US-Preventive Services Task Force (USPSTF) opposed the screening due to potential harms without any evident benefits. However, USPSTF's most current point of view is in favor of offering PSA screening for healthy individuals younger than 70 years of age. On the other hand, USPSTF still recommends avoiding the screening after 70 years of age (13). In our study, 137 patients were diagnosed during the screening in the outpatient health-care service, which makes 23.1% of the study cohort. Patients diagnosed during screening were 32, 24, 55, 17, and 9 for pathological stages T2a, T2b, T2c, T3a, and T3b, respectively. Drawing a conclusion is far beyond the aim of this study. However, we can speculate that the screening can result in diagnosis of the disease before initiation of the symptoms even in advanced tumors.

Our results indicate that the OS is primarily affected by the age. The BRFS is found the be similar between two groups at the 5^{th} year of follow-up but was significantly different at the 10^{th} year of follow-up using χ^2 square test. However, variant analyses did not reveal differences. This contrary statistical result is because of the unbalanced distribution of the high number of patients who passed away during the follow-up period in the older patients' group. After ten years of follow-up, roughly one fourth of the seniors were alive and among them more than half did not experience BCR. Thus, we can suggest that a healthy male at the 70 years or slightly beyond this, has a 23.7% chance of being alive, and a 60.6% chance of living with a cured PCa after successful radical surgical treatment at the 10 year if the individual survives. The decrement of OS to one-third while BRFS decline to two-third between 5^{th} and 10^{th} year of follow-ups may reflect the benefit of surgical treatment. OS rates are also reported in the literature. Overall survive rates may be more prone to be affected by age rather than cancer specific survive rates. The OS rates were significantly worse in the older age group in our study which reflects the natural course of the life. Previous papers are all congruous with each other at this point as well as our results. Comparing the potential benefit with other management modalities is a matter of future studies. The younger patient group also had good BRFS rates which was over eighty percent during the whole follow-up. Considering the decrease from 85.2% to 67.2% of OS, increase of BRFS from 83.9% to 85.2% reflects the vivid benefit of radical surgery in this patient group.

Daskivich et al. investigated the effects of age, comorbidities, and PCa risk groups to CSS and OS in their prospective study that included 3183 patients. They concluded that age and comorbidities are affecting the OS without any effect on the CSS. Our results are compatible with the Daskivich and colleagues' and we can report that the age is not a sole

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prognostic factor for both BRFS, while the age is a primary predictor for OS (14). Maggio et al. reported the results of 1002 PCa patients who have undergone conformational radiotherapy as the primary treatment. They grouped these patients into the age groups of under 65 years of age, between 65 and 70 years of age, between 70 and 75 years of age, and above 70 years of age. After 90 months of prospective follow-ups, they found that 72 years of age was a cut-off point for prognostic importance for both CSS and OS (15). The contrary results between our study and Maggio's may be because of the difference of the treatment modalities, and the different patient groups. Gangdaglia et al. conducted a retrospective review of the health-care system records of 205551 patients. They evaluated the effect of age on PCa mortality in the different pathological stages. As a result, they reported the age as a prognostic factor that affects the cancer specific mortality in patients with a Gleason score between 5 and 7, and pathological stage pT2. However, prognostic value of the age was not validated in patients with a Gleason score 8 and above, and pT3 stage (16). The effect of age to the BRFS is not observed in any pathological stage sub-group in our study. This contrary result may be a result of a significant difference of the cohort size, and the follow-up period. Even though Bechis et al. have reported significantly higher mortality rates in older patients, this difference was not observed in their study after correction due to pathological stages and treatment modalities (17). The results of their case-series comprised 305 patients were recently reported by a tertiary health-care center in Turkey. In this paper Ozden et al. concluded that age was not an absolute prognostic factor for BRFS in prostate cancer; but the pathological stages, Gleason scores, and PSA levels are. They also reported less organ-confined disease in the older group (18). Our patient number exceeds Ozden's study, our follow-up time is also reasonable, our results are compatible, the age cut-off used is the same, and both studies involve the Turkish population. Thus, we can indicate that age seems to not be an influencing factor to oncological results after RP for non-metastatic PCa in Turkish population based on our and Ozden's results.

Drawing an exact cut-off for prostate cancer treatment or screening seems not possible with the current available evidence; and individualization is probably the best way to undertake a healthy senior's healthcare. However, using 70 years of age as a cut-off between older and younger patients was also considered by different authors. Ko et al. published their match-paired analysis results between patients who are older than 70 years of age vs. the range of 50 and 70 years of age. They concluded that seniors have significantly higher risk of adverse pathological results and clinical outcomes (19). Kim et al. also reported worse outcomes in older patients using 70 years of age as the cut-off between the two groups. Their cohort comprised 1333 patients from a single institution and they reported significantly higher BCR in the older patients' group (20). Results akin to Kim's and Ko's were also reported by Masuda and colleagues, who have used 70 years of age as the cut-off between older and younger patients. Their results showed that age is a predictor of worse outcomes in pT2 patients with no significant impact on the results of pT3 patient group (21). Liesenfield et al. also reported the age as a prognostic factor in their study that comprises the data of 2480 patients (22). Our results were contradictory to these results. We did not observe any significant difference between the groups in terms of BRFS rates. This difference can be a result of different demographics of the cohorts, such as used neoadjuvant therapy in the Liesenfield's cohort, or inclusion of only Japanese men in the Madusa's patient group.

Evaluating the potential benefit of RP or RT over watchful waiting in these age group is beyond our paper and an important area of further research.

Other limitations of our study were its retrospective design and respectively low patient numbers in subgroups. However, we think that our study brings important evidence to predict senior individuals further oncological results after RP performed for non-metastatic PCa.

In an intermediate-sized patient cohort of a single institution and retrospective analysis, we observed no significant effects of age on the BRFS rates using 70 years of age as the cut-off point. OS was primarily affected by age. A healthy senior individual has a 15% percent of being alive with a surgical cure at the tenth year postoperatively due to our results. Therefore, we can conclude that the

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healthy septuagenarians or even octogenarians may benefit from radical surgical treatment of the PCa. Comparison of the benefit with other modalities and confirmation of the benefit in different populations necessitate further studies.

Conflict of Interest: None.
Çıkar çatışması: Yok.

Table 1. Patient characteristics and comparison of the two groups

Parameters	**All patients (n=593)**	**<70 years of age (n=454)**	**≥70 years of age (n=139)**	**p value**
Mean Age (years), (min-max)	62.9 (40–79)	61.1 (40-69)	64 (70-79)	0.2
Mean BMI (kg/m^2), (min-max)	27.8 (19-36)	29 (21-36)	26 (19-36)	0.84
Mean Total PSA (ng/mL), (min-max)	9.54 (1.09-51.5)	9.1 (1.09–30)	9.8 (3–51.5)	0.45
Gleason scores on radical prostatectomy specimens, n (%)				
ISUP grade I	301 (50.7%)	237 (52.2%)	64 (46%)	0.2
ISUP grade II	134 (22.6%)	105 (23.1%)	29 (20.1%)	0.57
ISUP grade III	98 (16.5%)	71 (15.6%)	27 (19.4%)	0.29
ISUP grade IV				
Gleason score 4+4	26 (4.4%)	19 (4.2%)	7 (5%)	0.66
Gleason score 3+5	14 (2.4%)	9 (2%)	5 (3.6%)	0.27
Gleason score 5+3	4 (0.7%)	3 (0.7%)	1 (0.7%)	-
ISUP grade V	16 (2.7%)	10 (2.2%)	6 (4.3%)	0.17
Suspicious finding at DRE, n (%)	194 (32.7%)	146 (32.2%)	48 (34.5%)	0.67
Number of positive cores, n (%)				0.004
< 3 core positivity	247 (41.6%)	204 (44.9%)	43 (30.9%)	
≥ 3 core positivity	346 (58.4%)	250 (55.1%)	96 (69.1%)	
Presence of EPE, n (%)	159 (26.8%)	67 (14.8%)	30 (21.6%)	0.07
Presence of SVI, n (%)	62 (10.5%)	43 (9.5%)	19 (13.7%)	0.2
Presence of capsule invasion, without EPE, n (%)	83 (14%)	59 (13%)	24 (17.3%)	0.25
BCR development, n (%)	153 (25.8%)	110 (24.2%)	43 (30.9%)	0.11

BCR, Biochemical recurrence; BMI, Body mass index; DRE, Digital rectal examination; EPE, Extraprostatic extension; ISUP, International society of urological pathology; PSA, Prostate-specific antigen; SVI, Seminal vesicle invasion

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Table 2. Univariate and Multivariate regression analysis for predicting biochemical recurrence free survival.

	Univariate analysis			Multivariate analysis		
Variables	**OR**	**95% CI**	**p value**	**OR**	**95% CI**	**p value**
Age (≥70)	1.4	0.822-3.804	0.4	1.1	0.874-3.534	0.43
BMI (Higher)	0.8	0.184-1.962	0.2			
Suspicious finding at DRE	1.2	0.248-1.634	0.09			
Number of positive cores (≥3)	1.4	0.664-2.158	0.1			
Total PSA value (Higher)	1.9	1.03-6.174	*0.001	1.5	0.352-1.936	0.1
Gleason score (≥8)	2.6	1.462- 5.639	*0.001	2.2	1.018-5.116	*0.001
Pathological stage (>pT2)	3.2	2.258-6.082	*0.001	1.8	0.436-3.502	0.2
Presence of EPE	1.2	0.556-2.706	0.2			
Presence of SVI	3.6	2.019-6.552	*0.001	3.2	1.524-5.808	*0.001
Presence of capsule invasion without EPE	1.1	0.543-4.162	0.46			

**Statistically significant*
BCR, Biochemical recurrence; BMI, body mass index; DRE, Digital rectal examination; EPE, Extraprostatic extension; ISUP, International society of urological pathology; PSA, Prostate-specific antigen; SVI, Seminal vesicle invasion; CI, Confidence interval; OR, Odds ratio

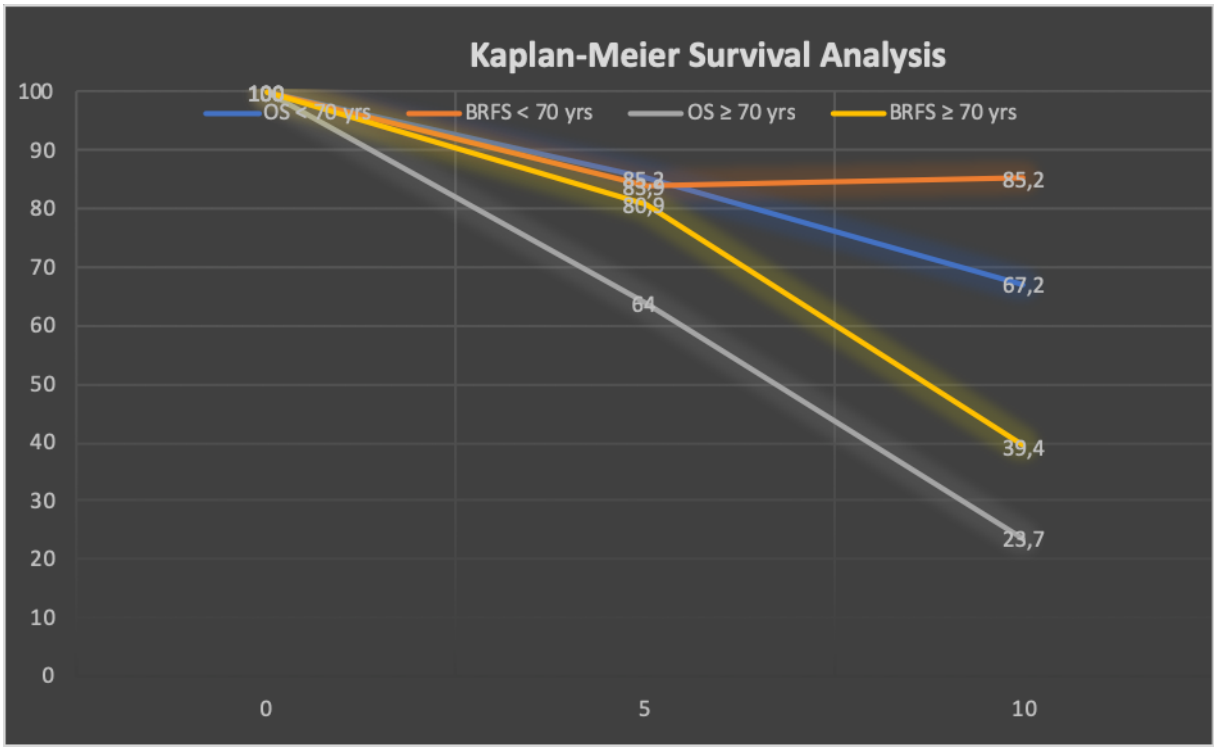

Figure 1. Kaplan-Meier survival analysis of the cohort.

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REFERENCES

1. Siegel RL, Miller KD, Jemal A. Cancer Statistics, 2017. CA Cancer J Clin. 2017 Jan;67(1):7-30
2. Alberts AR, Schoots IG, Roobol MJ. Prostate-specific antigen-based prostate cancer screening: Past and future. Int J Urol. 2015 Jun;22(6):524-32
3. Klotz L. Active surveillance for low-risk prostate cancer. Curr Urol Rep. 2015 Apr; 16(4):24
4. Filson CP, Marks LS, Litwin MS. Expectant management for men with early stage prostate cancer. CA Cancer J Clin. 2015 Jul-Aug;65(4):265-82
5. Mottet N, Bellmunt J, Bolla M, et al. EAU-ESTRO-SIOG Guidelines on Prostate Cancer. Part 1: Screening, Diagnosis, and Local Treatment with Curative Intent. Eur Urol. 2017 Apr;71(4):618-629
6. Bekelman JE, Rumble RB, Chen RC, et al. Clinically Localized Prostate Cancer: ASCO Clinical Practice Guideline Endorsement of an American Urological Association/American Society for Radiation Oncology/Society of Urologic Oncology Guideline. J Clin Oncol. 2018 Sep 5: JCO1800606
7. Dwyer-Lindgren L, Bertozzi-Villa A, Stubbs RW, et al. Inequalities in Life Expectancy Among US Counties, 1980 to 2014: Temporal Trends and Key Drivers. JAMA Intern Med. 2017 Jul 1;177(7):1003-1011
8. Arias E. Changes in Life Expectancy by Race and Hispanic Origin in the United States, 2013-2014. NCHS Data Brief. 2016 Apr;(244):1-8
9. Tokudome S, Hashimoto S, Igata A. Life expectancy and healthy life expectancy of Japan: the fastest graying society in the world. BMC Res Notes. 2016 Oct 28;9(1):482
10. Bakar C, Oymak S, Maral I. Turkey's Epidemiological and Demographic Transitions: 1931-2013. Balkan Med J. 2017 Aug 4;34(4):323-334
11. Zhou CK, Check DP, Lortet-Tieulent J, et al. Prostate cancer incidence in 43 populations worldwide: An analysis of time trends overall and by age group. Int J Cancer. 2016 Mar 15;138(6):1388-400
12. Carroll PR, Parsons JK, Andriole G, et al. NCCN Guidelines Insights: Prostate Cancer Early Detection, Version 2.2016. J Natl Compr Canc Netw. 2016 May;14(5):509-19
13. Cooperberg MR. The New US Preventive Services Task Force "C" Draft Recommendation for Prostate Cancer Screening. Eur Urol. 2017 Sep;72(3):326-328
14. Daskivich TJ, Fan KH, Koyama T, et al. Effect of age, tumor risk, and comorbidity on competing risks for survival in a U.S. population-based cohort of men with prostate cancer. Ann Intern Med. 2013 May 21;158(10):709-17
15. Maggio A, Panaia R, Garibaldi E, et al. Impact of age at diagnosis on overall and disease-free survival in men with prostate cancer following conformal 3D radiation therapy. Tumori. 2012 Nov;98(6):722-7
16. Gandaglia G, Karakiewicz PI, Abdollah F, et al. The effect of age at diagnosis on prostate cancer mortality: a grade-for-grade and stage-for-stage analysis. Eur J Surg Oncol. 2014 Dec;40(12):1706-15
17. Bechis SK, Carroll PR, Cooperberg MR. Impact of age at diagnosis on prostate cancer treatment and survival. J Clin Oncol. 2011 Jan 10;29(2):235-41
18. Ozden C, Aktas BK, Bulut S, et al. Effect of age on biochemical recurrence after radical prostatectomy. Kaohsiung J Med Sci. 2017 Feb;33(2):91-95
19. Ko J, Falzarano SM, Walker E, et al. Prostate cancer patients older than 70 years treated by radical prostatectomy have higher biochemical recurrence rate than their matched younger counterpart. Prostate. 2013 Jun;73(8):897-903
20. Kim JK, Cho SY, Jeong CW, et al. Patients aged more than 70 had higher risk of locally advanced prostate cancers and biochemical recurrence in Korea. BJU Int. 2012 Aug;110(4):505-9
21. Masuda H, Fukushima H, Kawakami S, et al. Impact of advanced age on biochemical recurrence after radical prostatectomy in Japanese men according to pathological stage. Jpn J Clin Oncol. 2013 Apr;43(4):410-6
22. Liesenfeld L, Kron M, Gschwend JE, Herkommer K. Prognostic Factors for Biochemical Recurrence More than 10 Years after Radical Prostatectomy. J Urol. 2017 Jan;197(1):143-148

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