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COMPARISON OF GRADING ACCURACY OF PROSTATE CANCER IN SAMPLES ACQUIRED BY A TARGETED AND SYSTEMIC PROSTATE BIOPSY

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ABSTRACT:

Introduction: All malignancies, including prostate cancer, require accurate diagnosing and staging before making a treatment decision. The introduction of targeted biopsies based on prostate MRI findings has raised prostate biopsy accuracy. Guided biopsies target the tumor itself during the biopsy instead of the most common tumor sites as is the case with a systemic biopsy. Some studies report that targeted biopsies should lower prostate cancer biopsy undergrading and overgrading.

Goals: To determine the incidence of prostate cancer biopsy undergrading in patients who underwent a classic systemic biopsy compared to patients who underwent a mpMRI cognitive targeted biopsy.

Materials and methods: We identified the patients from our database who underwent a radical prostatectomy at our institution from January 1st, 2021, to June 30th, 2021.There were 112 patients identified. Patients were stratified into two groups based on the type of biopsy that confirmed prostate cancer. The mpMRI (N=50) group had a mpMRI cognitive guided transrectal ultrasound (TRUS) prostate biopsy performed, and the non-mpMRI group (N=62) received a classic, systemic TRUS biopsy. We compared the biopsy results with the final pathological results, and searched for undergrading or overgrading in the biopsies compared to the final histological report.

Results: The undergrading was found in 17,7 % (N=11) cases in the non-mpMRI group and in 12,0 % (N=6) of cases in the mpMRI group (p=0,02, Mann-Whitney U test). No overgrading was found in our cohort. All cases of undergrading had Grade Group 1 in the biopsy report and Grade Group 2 in the final specimen report. The charasteristics of patients are listed in Table 1.

Discussion and conclusion: In our cohort, the patients who underwent a mpMRI targeted biopsy had a lower undergrading incidence. During a systemic TRUS biopsy, the urologist targets the areas of the prostate where cancer is most commonly located, which is usually the peripheral zone of the prostate. Since different areas of the tumor have different areas of differentiation, only a low-grade part of the tumor is sometimes biopsied, which results in a sampling error. Once the prostate is removed, the whole tumor is analyzed, so the obtained pathological results related to the removed prostate are far more accurate than the analysis of prostate cores obtained by biopsy.

Key words: *Prostate cancer, undegrading, overgrading, prostate biopsy, prostate MRI*

Introduction

All malignancies, including prostate cancer, require accurate diagnosing and staging before a treatment decision can be made. The diagnostic process usually starts with PSA level determination and a physical examination, most importantly, a digital rectal exam (DRE).[1] If indicated, a prostate biopsy is then performed which can be a tumor-targeted one, based on multiparametric prostate MRI findings, or a classic, systemic one.[2] Biopsy results often determine further diagnostic procedures as well as treatment options.[3,4,5] Unfortunately, sometimes there is no correlation be-

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tween prostate biopsy grading and final specimen grading due to the small amount of material provided by a prostate biopsy.[6] The introduction of targeted biopsies has raised prostate biopsy accuracy as the tumor itself is targeted during the biopsy instead of the most common tumor sites as is the case with a systemic biopsy. Targeted biopsies should lower prostate cancer biopsy undergrading and overgrading by reducing the sampling error, as some studies report.[7]

Goals

To determine the incidence of prostate cancer biopsy undergrading in patients who underwent a classic systemic biopsy compared to the patients who underwent a mpMRI cognitive targeted biopsy.

Materials and methods

We identified the patients from our database who underwent a radical prostatectomy at our institution from January 1st, 2021, to June 30th, 2021. There were 112 patients identified. The patients were stratified into two groups based on the type of biopsy that confirmed the prostate cancer. The mpMRI (N=50) group has had a mpMRI cognitive guided transrectal ultrasound (TRUS) prostate biopsy (13 cores, 10 systemic + 3 guided), and the non-mpMRI group (N=62) has received a classic, systemic TRUS biopsy (10 cores). All biopsies were performed using a Mindray DC-80 X-Insight ultrasound machine with an 18-gauge biopsy needle. All MRI examinations were performed using the 1,5T system Siemens MR ESPREE with the body and endorectal coil placed in the lateral decubitus position of the patient. We then compared the biopsy results with the final pathological report of the removed prostates and searched for undergrading or overgrading in the biopsies compared to the final histological report. If either was found, where was a case analysis performed to determine if the treatment decision would be different or if a further diagnostic evaluation would be indicated in case the biopsy grading was equal to the final specimen grading.

Statistical analysis was performed using Statsoft Statistica v. 2.4.

Results

The undergrading was found in 17,7 % (N=11) of cases the non-mpMRI group and in 12,0 % (N=6) of cases in the mpMRI group (p=0,02, Mann-Whitney U test)). No overgrading was found in our cohort.

In the mpMRI group, the average Grade Group was 2,6 (8 GG 1, 15 GG 2, 21 GG 3, and 6 GG 4) in 4,6 positive cores (range 3-11 positive cores). In the non-mpMRI group, the average Grade Group was 2,1 (12 GG 1, 33 GG 2, 16 GG 3, and 1 GG 4) in 3,4 positive cores (range 1 to 9 positive cores).

The mpMRI group was younger with an average age of 61,2 (range 58-69) vs. 63,7 (range 60-72) in the non-mpMRI group.

The mpMRI group also had a lower average PSA level of 5,7 (range 3,2 – 8,2) vs. 8,1 (range 4,6 – 19,2) in the non-mpMRI group.

All cases of undergrading had Grade Group 1 in the biopsy report and Grade Group 2 in the final specimen report.

Discussion

In our cohort, the patients who underwent a targeted biopsy had a lower undergrading incidence. The percentage of positive cores in the two groups was comparable (35,3 % in the mpMRI group vs. 34,0% in the non mpMRI group, p=0,09), however, the number of positive cores was higher in the mpMRI group (4,6 vs. 3,4, p=0.03). A larger amount of material allows the pathologist to grade the tumor more correctly, so the fact that guided biopsies yielded extra three cores on top of the systemic biopsy could be a factor that has led to less undegrading. Needless to say, the pathologist can only analyze the material provided by the urologist who performs the biopsy.

During a systemic TRUS biopsy, the urologist targets the areas of the prostate where cancer is most commonly found which is usually the peripheral zone of the prostate.[8] Since different areas of the tumor have different areas of differentiation, only a low-grade part of the tumor is sometimes biopsied, which presents a sampling error that finally results in undergrading.[9] Some studies suggest that lesions of higher PIRADS scores on prostate mpMRI translate to lesions with lower differentiation, that is, higher Gleason scores.[10] This can explain the phenomenon of higher incidences of biopsy undegrading in systemic biopsies. Targeted biopsies offer a chance to target mpMRI-detected lesions of the prostate with lower differentiation, which makes the undergrading less likely. Once the prostate is removed, the whole tumor is analyzed, so the resulting pathological analysis of the removed prostate is far more accurate than the analysis of the prostate cores obtained by biopsy.

We analyzed each case of undergrading in our cohort and determined that no patients would be treated differently if the undergrading were not present, no matter how easily such a scenario can be imagined. For example, a patient whose biopsy results show a Gleason grade 1 lesion, could, if other parameters allow it, be offered active surveillance (AS) as a treatment method when active treatment is more appropriate. Unfortunately, it is not possible to eliminate this scenario from everyday practice, however, active surveillance does include intensive PSA monitoring, imaging, and an additional biopsy if the initial biopsy is not a mpMRI-guided one, which identifies the patients on AS who are more suitable for active treatment.

Another scenario would be the situation in which a patient's biopsy result did not mandate additional imaging (CT and bone scan), but the "true" result would do so. Hypothetically, such a patient could receive local treatment for a systemic disease that was not diagnosed because the imaging was omitted, which could result in a shortening of life because a systemic treatment would be initiated only if a biochemical relapse was confirmed. It is a scenario that cannot be entirely avoided, but its incidence can be reduced with more accurate biopsies.

Treatment protocols that are in place for prostate cancer take into consideration prostate biopsy undegrading and the fact that guided biopsies are more accurate. The guidelines of the European Association of Urology quote the DETECTIVE consensus meeting where it was agreed that men eligible for AS after combined systematic and MRI-targeted biopsy do not require a confirmatory biopsy, thus placing a higher confidence in guided prostate biopsies to grade cancer more accurately than with a non-guided, systemic prostate biopsy.[11]

There are a lot of arguments why prostate mpMRI and subsequent guided biopsies are becoming a standard in prostate cancer detection. Guided biopsies show the potential to increase the detection of high-risk prostate cancer and decrease the detection of low-risk prostate cancer.[12] Also, positive cost-benefit analysis show both a financial benefit as well as a medical one.[13] Lower undergrading incidence reduced by a lower sampling error is just another argument for the technique to become a standard.

Conclusions

Prostate biopsy is a key point in prostate cancer diagnosis. and its results are an important factor in further decision making, treatment, and further diagnosis likewise. Biopsy undergrading is common in prostate cancer diagnosis, and the authors believe that all clinicians who treat prostate cancer have experience related to such situation. There are many tactics available to lessen the incidence with prostate mpMRI being the newest tool that increases the accuracy of the biopsy. Complete elimination of the phenomenon seems impossible at this point, however, further advances in imaging, biopsy technique and biopsy core analysis will surely lead to a decrease in incidence.

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Sažetak

USPOREDBA TOČNOSTI STUPNJEVANJA DIFERENCIJACIJE RAKA PROSTATE U UZORCIMA DOBIVENIM CILJANOM I SUSTAVNOM BIOPSIJOM PROSTATE

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Uvod: Sve maligne bolesti, uključujući rak prostate, zahtijevaju preciznu dijagnostiku prije odluke o liječenju. Uvođenjem ciljanih biopsija na temelju nalaza MRI prostate povećana je točnost biopsije prostate. Vođene biopsije ciljaju na sam tumor u umjesto na najčešće lokacije tumora u prostati kao što je slučaj sa sistemskom biopsijom. Neke studije pokazuju da bi ciljane biopsije trebale smanjiti podcjenjivanje stupnja diferenciranosti raka prostate u uzorcima dobivenim biopsijom prostate.

Ciljevi: Odrediti incidenciju podcjenjivanje stupnja diferenciranosti raka prostate kod pacijenata koji su bili podvrgnuti klasičnoj sistemskoj biopsiji u usporedbi s pacijentima koji su bili podvrgnuti mpMRI kognitivnoj ciljanoj biopsiji.

Materijali i metode: Identificirali smo pacijente iz naše baze podataka koji su podvrgnuti radikalnoj prostatektomiji u našoj ustanovi od 1. siječnja 2021. do 30. lipnja 2021. Identificirano je 112 pacijenata. Pacijenti su podijeljeni u dvije skupine na temelju vrste biopsije kojom je potvrđen rak prostate. Skupina mpMRI (N=50) primila je mpMRI kognitivno vođenu transrektalnu ultrazvučnu (TRUS) biopsiju prostate, a skupina non-mpMRI (N=62) primila je klasičnu, sistemsku TRUS biopsiju. Usporedili smo rezultate biopsije s konačnim patološkim nalazima i tražili smo podcjenjivanje stupnja diferenciranosti karcinoma prostate u biopsijama u usporedbi s konačnim histološkim nalazom.

Rezultati: Podcjenjivanje stupnja diferenciranosti nađeno je u 17,7 % (N=11) u non-mpMRI skupini i u 12,0 % (N=6) slučajeva u mpMRI skupini (p=0,02, Mann-Whitney U test). U našoj kohorti nije pronađeno precjenjivanje stupnja diferenciranosti. Svi slučajevi podcjenjivanja imali su Gradus grupu 1 na nalazu biopsije prostate i Gradus grupu 2 u konačnom patohistološkom nalazu.

Rasprava i zaključak: U našoj kohorti, pacijenti koji su bili podvrgnuti ciljanoj biopsiji imali su nižu incidenciju podcjenjivanja stupnja diferenciranosti što je posljedica točnijeg uzorkovanja. Tijekom sistemske TRUS biopsije, urolog cilja na područja prostate gdje se rak najčešće nalazi, što je obično periferna zona prostate. Budući da različita područja tumora imaju različita područja diferencijacije, ponekad se bioptira samo dio tumora koji je bolje diferenciran, što rezultira pogreškom uzorkovanja. Nakon što je prostata uklonjena, analizira se cijeli tumor, tako da su rezultirajući patohistolološki rezultati uklonjene prostate daleko točniji od analize uzoraka prostate dobivenih biopsijom.

Ključne riječi: *Rak prostate, podstupnjevanje, nadstupnjevanje, biopsija prostate, magnetska rezonanca prostate*