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# Comparison of prostate cancer grades after biopsy and radical prostatectomy

## Porównanie złośliwości raka stercza ocenione na podstawie biopsji i badania preparatów operacyjnych

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**Keywords**

prostate carcinoma (PCa), grade, Gleason score (Gl.s.), under/overgrading, prostate specific antigen (PSA), transrectal ultrasound-guided multiple-core biopsy ([TRUS]coreBx)

**Słowa kluczowe**

rak gruczołu krokowego, złośliwość raka, skala Gleasona, niedoszacowanie/przeszacowanie złośliwości, swoisty antygen sterczowy, biopsja rdzeniowej stercza pod kontrolą ultrasonografii przezodbytniczej, badania specymenów operacyjnych

Summary

**Introduction.** Prostate cancer is diagnosed on the basis of transrectal ultrasound-guided multiple-core biopsy ([TRUS]coreBx) done with a tru-cut needle. One of the most important issues in prostate cancer diagnosis is estimation of its malignancy. It is defined according to Gleason score system which grades malignancy according to 5 Gleason patterns, with 1 being the least, and 5 being the most malignant. There are discrepancies between prostate cancer grading in prostate biopsy and after radical prostatectomy.

**Aim.** To compare prostate cancer grade after biopsy and radical prostatectomy.

**Material and methods.** Research material consisted of prospectively collected medical data for 212 consecutive patients who underwent radical prostatectomy (RP) at the Urology Department of the CPME, and were diagnosed with PCa based on transrectal ultrasound-guided multiple-core biopsy ([TRUS]coreBx).

**Results.** The most frequent Gleason score in [TRUS]coreBx was 4 and 5 (46.3%), while Gleason score > 7 was found in 32 (15.2%) patients. The most frequent Gleason score in post prostatectomy material was 7 (34.8%) and 5 (23.3%). The differences between Gleason score in [TRUS]coreBx and post prostatectomy material were statistically significant. Concordance was found in 34.3% whereas a lack of it in 65.7%.

**Conclusions.** Our study demonstrates that there are differences between the global malignancy of prostate cancer (Gl.s.) determined on the basis of histopathological examination of tissue cores obtained in prostate biopsy and examination of surgery specimens.

Streszczenie

**Wstęp.** Raka stercza rozpoznaje się na podstawie biopsji mającej z reguły charakter wielomiejscowej biopsji rdzeniowej, wykonanej igłą *tru-cut* pod kontrolą ultrasonografii przezodbytniczej ([TRUS]coreBx). Ważnym elementem oceny PCa jest określenie stopnia jego złośliwości, którą definiuje się na podstawie skali Gleasona. Istniej odmienność ocen złośliwości raka określonej na podstawie badania rdzeni tkankowych oraz na podstawie badania materiału operacyjnego.

**Cel pracy.** Prównanie złośliwości raka stercza ocenione na podstawie biopsji i badania preparatów operacyjnych.

**Materiał i metody.** Materiał badawczy stanowiły gromadzone prospektywnie dane medyczne dotyczące kolejnych 212 chorych poddanych prostatektomii radykalnej (PR), u których raka stercza (ang. *prostate cancer* – PCa) rozpoznano na podstawie wielomiejscowej biopsji rdzeniowej stercza wykonanej pod kontrolą ultrasonografii przezodbytniczej ([TRUS]coreBx).

**Wyniki.** Złośliwością najczęściej rozpoznawaną na podstawie badania rdzeni tkankowych pochodzących z [TRUS]coreBx była złośliwość 4 i 5 w skali Gleasona (46,3%). Złośliwość określoną jako Gl.s. > 7 stwierdzono u 32 (15,2%) chorych. Z kolei na podstawie

**Conflict of interest**
**Konflikt interesów**

None
Brak konfliktu interesów

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badania specymenów operacyjnych najczęściej rozpoznano pierwotnie złośliwość Gl.s. 7 (34,8%) i Gl.s. 5 (23,3%). Różnice między ocenami złośliwości określonej na podstawie badania rdzeni tkankowych (Gl.s.$^{Bx}$) i ocenami złośliwości określonej na podstawie badania specymenów operacyjnych (Gl.s.$^{PR}$) są statystycznie znamienne. Zgodność dotyczyła 34,3% ocen, zaś brak zgodności 65,7% ocen.

**Wnioski.** Nasze badanie udowadnia, że występują różnice między globalną złośliwością raka stercza (Gl.s.) określoną na podstawie oceny histopatologicznej rdzeni tkankowych pochodzących z biopsji stercza, a określoną na podstawie badania preparatów po operacji.

## INTRODUCTION

9273 prostate cancer (PCa) diagnoses were registered in Poland in 2010. Analysis of epidemiological data indicates a gradual increase in PCa incidence and PCa-associated mortality in Poland over the last decades, with mortality climbing slower than incidence (fig. 1, 2). Prostate cancer is predominantly found in the peripheral zone (70%), particularly in the apex area. 10-15% of patients develop PCa in the transitional, and 15-20% in the central zone (fig. 3) (1-3). PCa is diagnosed based on the examination of biopsy specimens, typically transrectal ultrasound guided multiple-core biopsy performed with tru-cut needle ($^{TRUS}$coreBx). Finger-guided multi-core biopsy (FGcoreBx) or fine-needle aspiration multicore biopsy (FNABx) that is also a finger-guided type of biopsy are justified only in patients with clinically evident PCa that requires solely histo- or cytopathological verification, without the need to accurately determine features assessable in $^{TRUS}$coreBx (4-7). The key element of PCA evaluation is malignancy assessment, i.e. its grading. The malignancy is defined with Gleason score (Gl.s.) developed by Donald Gleason (1920-2008), in common use since 1978 (8, 9). According to this system, PCa is associated with 5 Gleason patterns ranging from the least (1) to most malignant (5), differing mostly by their architecture, and to a lesser degree by the features of the cancerous cells (fig. 4) (6). When grading a tumour, the dominant (primary) pattern within a given tumour is identified, along with the next-most frequent (secondary) one, and both are assigned numerical grades. The sum of these two numbers (referred to as Gleason numbers) reflects the cancer's global malignancy, and is known as Gleason sum or Gleason score (Gl.s.), e.g. Gl.s. 7 (Gl.n. 4 + Gl.n. 3) means that 4 is the predominant malignancy pattern, with 3 being the next-most common one, with a reverse sequence of numbers (3 + 4) being prognostically more favourable. Discrepancies in the malignancy scores identified on the basis of tissue core samples and surgical specimens (removed prostate) have already been widely researched (10), with numerous urological studies worldwide devoted to the accuracy of grading. Both intraobserver and interobserver variability have been determined to be of substantial significance here (11-13). Polish urological literature, however, has so far not included publications on this subject, except for studies by the author of this paper (14-17).

## AIM

To compare prostate cancer grade after biopsy and radical prostatectomy.

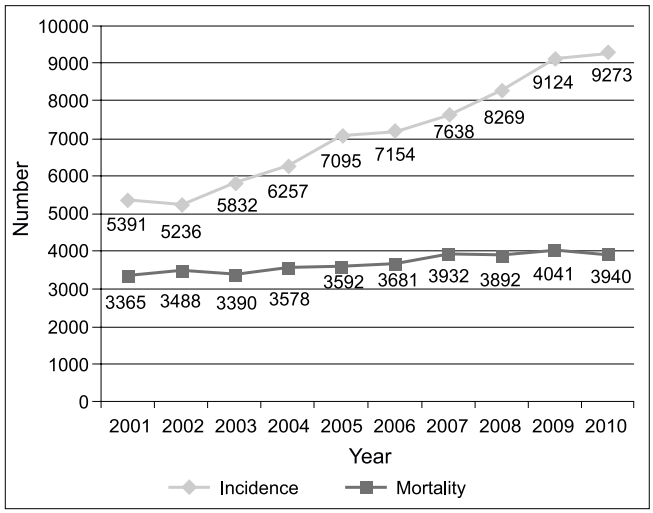


**Fig. 1.** Incidence of prostate cancer and prostate cancer-related mortality in Poland between 2001-2010. Data according to www.onkologia.org.pl

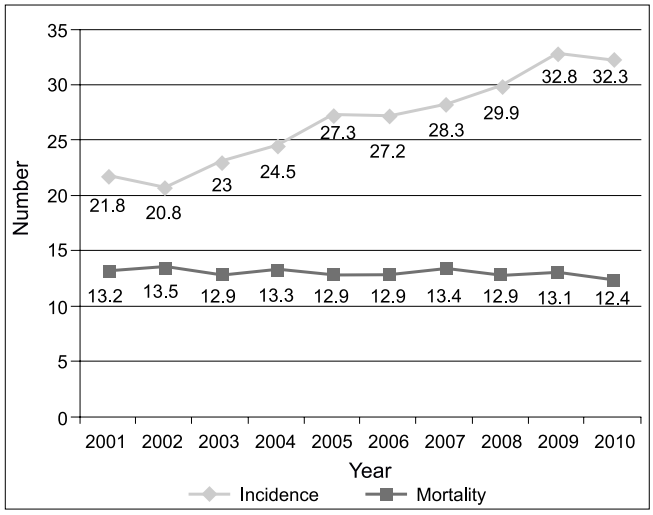


**Fig. 2.** Prostate cancer incidence rate and mortality rate in Poland between 2001-2010. Data according to www.onkologia.org.pl

## MATERIAL AND METHODS

Research material consisted of prospectively collected medical data for 212 consecutive patients who underwent radical prostatectomy (RP) at the Urology Department of CPME, diagnosed with prostate cancer (PCa) based on transrectal ultrasound-guided multiple-core biopsy ($^{TRUS}$coreBx). The tissue samples collected in prostate biopsy and the RP specimens were consecutively evaluated by the same experienced pathologist.

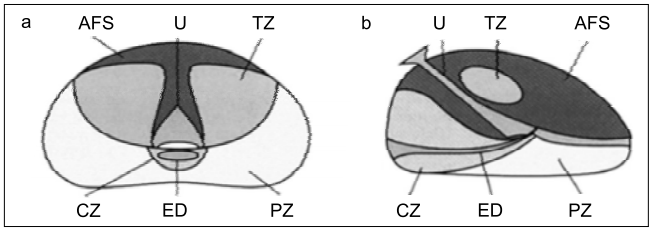


**Fig. 3.** McNeal's zonal anatomy of the prostate: a – transverse section, b – longitudinal section
TZ – transition zone; PZ – peripheral zone; AFS – anterior fibromuscular stroma; CZ – central zone; U – urethra; ED – ejaculatory ducts (1)

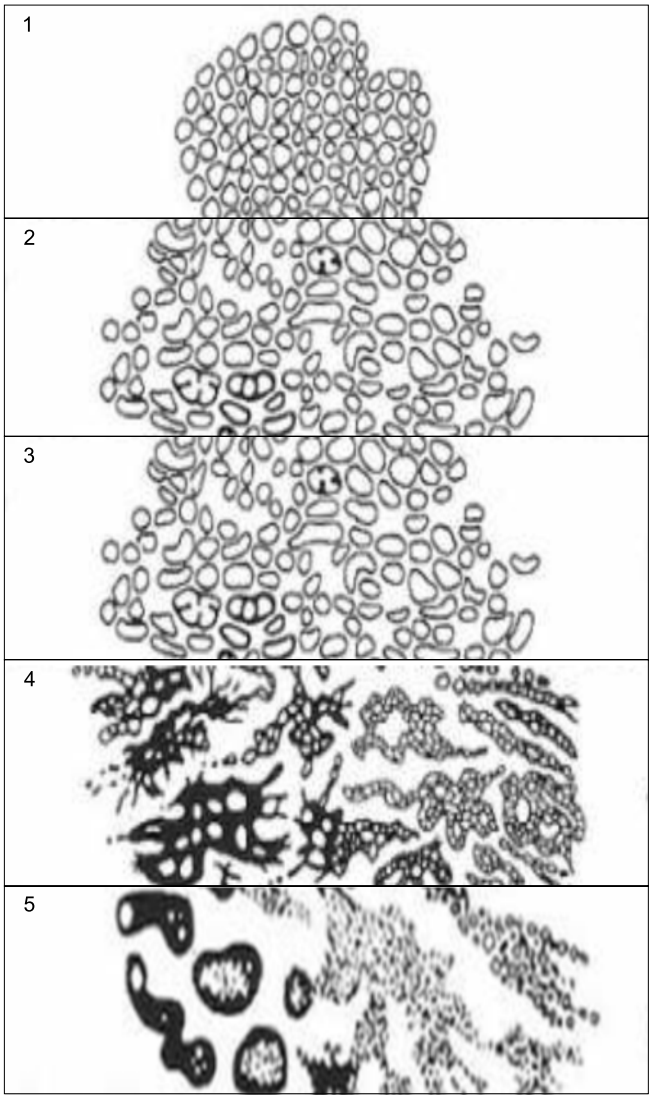


**Fig. 4.** The 5 malignancy patterns in Gleason system of prostate cancer grading (6)

## RESULTS

### Comparison of prostate cancer grades based on histopathological examination of tissue cores from $^{TRUS}$coreBx and of removed prostate and seminal vesicles specimens

The most common malignancy identified by the urologic pathologist in $^{TRUS}$coreBx (UP-1[1]) was Gleason score 4 and 5 (46.7%). Malignancy grade identified as Gl.s. > 7 was found in 32 patients (15.2%). The scores most frequently identified in radical prostatectomy specimens were Gleason scores 7 (34.8%) and 5 (23.3%).

Malignancy scores based on tissue core evaluation and examination of RP specimens (UP-1[1]) are shown in table 1. The data were tested with Stuart-Maxwell test of marginal homogeneity, showing the discrepancies between malignancy scores based on examination of multiple core biopsy (Gl.s.$^{Bx}$) samples and postoperative specimens (Gl.s.$^{RP}$) to be statistically significant ($p < 0.0001$), thus evidencing a significant lack of concordance to exist between the scores. Similarly, kappa coefficient calculated for these scores ($\kappa = 0.20$) showed a considerable discrepancy between the scores (with $\kappa = 1.0$ there is full concordance = 100%, whereas $\kappa = 0.20$ means that statistically there is concordance in one in five cases). Hence, concordance was determined for 34.3% of the scores, and a lack thereof for 65.7% (tab. 2).

**Tab. 1.** Gleason scores assigned by the urologic pathologist (UP-1[1]) based on multiple-core biopsy samples (Gl.s.$^{Bx}$) and on radical prostatectomy specimens (Gl.s.$^{RP}$)

| | Gl.s.$^{Bx}$ | | | Gl.s.$^{RP}$ | | |
|---|---|---|---|---|---|---|
| Gl.s. | Number (N) | Percentage (%) | | Number (N) | Percentage (%) | |
| 2 | 3 | 1.43 | | 0 | 0 | |
| 3 | 7 | 3.33 | | 7 | 3.33 | |
| 4 | 53 | 25.24 | 77.61 | 18 | 8.57 | 49.99 |
| 5 | 57 | 27.14 | | 49 | 23.33 | |
| 6 | 43 | 20.48 | | 31 | 14.76 | |
| 7 | 32 | 15.24 | 15.24 | 73 | 34.76 | 34.76 |
| 8 | 12 | 5.71 | | 18 | 8.57 | |
| 9 | 2 | 0.95 | 7.14 | 13 | 6.19 | 15.24 |
| 10 | 1 | 0.48 | | 1 | 0.48 | |
| Total | 210 | 100 | | 210 | 100 | |
| Data for 210 patients, comprising 99% of the cohort | | | | | | |

**Tab. 2.** Comparison of Gleason scores assigned by the urologic pathologist (UP-1[1]) based on multiple-core biopsy samples (Gl.s.$^{Bx}$) and on radical prostatectomy specimens (Gl.s.$^{PR}$)

| Gl.s. | Number (N) | Percentage (%) | | |
|---|---|---|---|---|
| Gl.s.$^{Bx}$ = Gl.s.$^{PR}$ | 72 | 34.29 | 34.29 | Concordance |
| Gl.s.$^{Bx}$ > Gl.s.$^{PR}$ | 19 | 9.05 | 65.71 | Lack of concordance |
| Gl.s.$^{Bx}$ < Gl.s.$^{PR}$ | 119 | 56.67 | | |
| Data for 210 patients, comprising 99% of the cohort | | | | |

The comparison of PCa scores identified by the urologic pathologist (UP-1[1]) based on multiple core biopsies (Gl.s.$^{Bx}$) and on examination of RP specimens (Gl.s.$^{RP}$) has been collectively presented in table 3.

The data presented in tables 1-3 may be summarized to the following effect: comparison of PCa malignancy scores based on examination of multiple core biopsy samples and RP specimens demonstrates the global concordance to be 34.29%, however the rate of concordance for given scores varies considerably (tab. 4). Even though considering the small numbers of patients assigned some of the scores it is difficult to clearly determine the ranges of proportion of concordant and

**Tab. 3**. Concordance of Gleason scores assigned by the urologic pathologist (UP-1[1]) based on multiple-core biopsy samples (Gl.s.$^{Bx}$) and on radical prostatectomy specimens (Gl.s.$^{PR}$): the number of concordant scores (Gl.s.$^{Bx}$ = Gl.s.$^{RP}$) is shown in coloured fields, with the number of undergraded Gleason scores shown to the right (Gl.s.$^{Bx}$ < Gl.s.$^{PR}$), and the number of overgraded Gleason scores (Gl.s.$^{Bx}$ > Gl.s.$^{PR}$) shown to the left

| Gl.s.$^{Bx}$ | Gl.s.$^{RP}$ | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| 2 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| 3 | 0 | 2 | 0 | 3 | 0 | 1 | 1 | 0 | 0 | 7 |
| 4 | 0 | 1 | 14 | 20 | 7 | 10 | 1 | 0 | 0 | 53 |
| 5 | 0 | 0 | 2 | 17 | 13 | 21 | 2 | 2 | 0 | 57 |
| 6 | 0 | 2 | 1 | 7 | 10 | 15 | 5 | 3 | 0 | 43 |
| 7 | 0 | 0 | 0 | 1 | 0 | 23 | 4 | 4 | 0 | 32 |
| 8 | 0 | 1 | 0 | 0 | 0 | 2 | 5 | 4 | 0 | 12 |
| 9 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Total | 0 | 7 | 18 | 49 | 31 | 73 | 18 | 13 | 1 | 210 |
| Data for 210 patients, comprising 99% of the cohort | | | | | | | | | | |

discordant scores, it is hardly surprising that among discrepancies (Gl.s.$^{Bx}$ ≠ Gl.s.$^{RP}$) we primarily deal with undergraded PCa based on $^{TRUS}$coreBx (Gl.s.$^{Bx}$ < Gl.s.$^{RP}$). Moreover, table 4 demonstrates that the lower PCa malignancy determined in $^{TRUS}$coreBx, the higher the risk of undergrading. The highest score concordance occurred in the case of Gl.s. 7 (nearly 70% Gl.s.$^{Bx}$ = Gl.s.$^{RP}$). Malignancy was overgraded (Gl.s.$^{Bx}$ > Gl.s.$^{RP}$) in all patients who were assigned Gl.s.$^{Bx}$ 9 prior to prostatectomy (even though they were few), and in nearly 25% of the patients assigned Gl.s.$^{Bx}$ 8 prior to prostatectomy. 55 patients were undergraded by 1 point (46.2% of undergraded scores), whereas even larger score discrepancy (undergrading) was found in as many as 64 patients (53.8% of undergraded scores).

## Comparison of the first number comprising Gleason score based on $^{TRUS}$coreBx and on examination of prostatectomy specimens

Another aspect of our comparison of PCa score assigned by the urologic pathologist (UP-1[1]) based on $^{TRUS}$coreBx (Gl.s.$^{Bx}$) and on the examination of RP specimens (Gl.s.$^{RP}$) is related to the first number (Gl.n$_1$) in Gleason score. Detailed data may be found in tables 5-7.

The most common Gleason number$_1$ in global PCa malignancy score based on $^{TRUS}$coreBx (Gl.s.$^{Bx}$) was 2, and the least common ones were 5 and 1, whereas the most common Gleason number$_1$ based on examination of RP specimens was 3 or 2, and the least common one – 5 or 1. The largest discrepancy is thus associated with Gl.n$_1$ 2 and 3. All Gl.n$_1$ = 1 were diagnoses made before 2005.

The relationship between Gl.n$_1^{Bx}$ and Gl.n$_1^{RP}$ has been presented in table 8: concordance (Gl.n$_1^{Bx}$ = Gl.n$_1^{RP}$) was established in 47.1% of the patients, with prevalence of undergraded Gl.n$_1^{Bx}$ (41.0% of the patients).

The result of Stuart-Maxwell test of marginal homogeneity showed the differences to be statistically significant ($p < 0.0001$), which means there is a lack of concordance between Gl.n$_1^{Bx}$ and Gl.n$_1^{RP}$. $\kappa = 0.215$ is associated with poor concordance.

## Comparison of the second number comprising Gleason score based on $^{TRUS}$coreBx and on examination of prostatectomy specimens

The next aspect of our comparison of PCa malignancy score assigned by the urologic pathologist (UP-1[1]) based on $^{TRUS}$coreBx (Gl.s.$^{Bx}$) and on the evaluation of prostatectomy specimens (Gl.s.$^{RP}$) is related to the second number (Gl.n$_2$) included in Gleason score. Detailed data may be found in tables 9-12.

The most common Gleason number$_2$ of Gleason score based on $^{TRUS}$coreBx (Gl.s.$^{Bx}$) was 3, and the least common one was 5 and 1, whereas the most common

**Tab. 4.** Percentage of Gleason scores assigned by the urologic pathologist (UP-1[1]) based on multiple-core biopsy samples (Gl.s.$^{Bx}$) and on radical prostatectomy specimens (Gl.s.$^{RP}$): the percentage of concordant scores (Gl.s.$^{Bx}$ = Gl.s.$^{RP}$) is shown in coloured fields, with the percentage of undergraded Gleason scores shown to the right (Gl.s.$^{Bx}$ < Gl.s.$^{RP}$), and the percentage of overgraded Gleason scores (Gl.s.$^{Bx}$ > Gl.s.$^{PR}$) shown to the left

| Gl.s.$^{Bx}$ | Gl.s.$^{RP}$ | | | | | | | | | Total Gl.s.$^{Bx}$ < Gl.s.$^{RP}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| 2 | 0 | 0.47 | 0.47 | 0.47 | 0 | 0 | 0 | 0 | 0 | 1.43 |
| 3 | 0 | 0.95 | 0 | 1.43 | 0 | 0.47 | 0.47 | 0 | 0 | 3.33 |
| 4 | 0 | 0.47 | 6.66 | 9.52 | 3.33 | 4.76 | 0.47 | 0 | 0 | 25.24 |
| 5 | 0 | 0 | 0.95 | 8.09 | 6.19 | 10.0 | 0.95 | 0.95 | 0 | 27.14 |
| 6 | 0 | 0.95 | 0.47 | 3.33 | 4.76 | 7.14 | 2.38 | 1.43 | 0 | 20.47 |
| 7 | 0 | 0 | 0 | 0.47 | 0 | 10.95 | 1.9 | 1.9 | 0 | 15.24 |
| 8 | 0 | 0.47 | 0 | 0 | 0 | 0.95 | 2.38 | 1.9 | 0 | 5.71 |
| 9 | 0 | 0 | 0 | 0 | 0.47 | 0.47 | 0 | 0 | 0 | 0.95 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.47 | 0.47 |
| Total Gl.s.$^{Bx}$ > Gl.s.$^{RP}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.47 | |
| Data for 210 patients, comprising 99% of the cohort | | | | | | | | | | |

**Tab. 5.** The first numbers of Gleason scores (Gl.$n_1$) assigned by the urologic pathologist (UP-1[1]) based on multiple-core biopsy samples (Gl.$n_1^{Bx}$) and on radical prostatectomy specimens (Gl.$n_1^{RP}$)

| Gl.$n_1$ | Gl.$n_1^{Bx}$ | | Gl. $n_1^{RP}$ | |
|---|---|---|---|---|
| | Number (N) | Percentage (%) | Number (N) | Percentage (%) |
| 1 | 8 | 3.8 | 4 | 1.9 |
| 2 | 105 | 5.0 | 72 | 34.3 |
| 3 | 72 | 34.3 | 76 | 36.2 |
| 4 | 24 | 11.4 | 55 | 26.2 |
| 5 | 1 | 0.5 | 3 | 1.4 |
| Total | 210 | 100 | 210 | 100 |
| Data for 210 patients, comprising 99% of the cohort | | | | |

**Tab. 6.** The first numbers of Gleason scores (Gl.$n_1$) assigned by the urologic pathologist (UP-1[1]) based on multiple-core biopsy samples (Gl.$n_1^{Bx}$) and on radical prostatectomy specimens (Gl.$n_1^{PR}$): the number of concordant Gleason numbers$_1$ (Gl.$n_1^{Bx}$ = Gl.$n_1^{RP}$) is shown in coloured fields, with the number of undergraded Gleason numbers$_1$ shown to the right (Gl.$n_1^{Bx}$ < Gl.$n_1^{RP}$) and the number of overgraded Gleason numbers$_1$ (Gl.$n_1^{Bx}$ > Gl.$n_1^{RP}$) shown to the left

| Gl.$n_1^{Bx}$ | Gl.$n_1^{RP}$ | | | | | Total |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| 1 | 0 | 5 | 2 | 1 | 0 | 8 |
| 2 | 2 | 51 | 38 | 13 | 1 | 105 |
| 3 | 2 | 14 | 31 | 25 | 0 | 72 |
| 4 | 0 | 2 | 5 | 16 | 1 | 24 |
| 5 | 0 | 0 | 0 | 0 | 1 | 1 |
| Total | 0 | 72 | 76 | 55 | 3 | 210 |
| Data for 210 patients, comprising 99% of the cohort | | | | | | |

**Tab. 7.** Percentage (%) of the first Gleason numbers comprising Gleason score assigned by the urologic pathologist (UP-1[1]) based on multiple-core biopsy samples (Gl.$n_1^{Bx}$) and on radical prostatectomy specimens (Gl.$n_1^{RP}$): the percentage of concordant Gleason numbers$_1$ (Gl.$n_1^{Bx}$ = Gl.$n_1^{PR}$) is shown in coloured fields, with the percentage of undergraded Gleason numbers$_1$ shown to the right (Gl.s.$^{Bx}$ < Gl.s.$^{RP}$), and the percentage of overgraded Gleason numbers$_1$ (Gl.$n_1^{Bx}$ < Gl.$n_1^{PR}$) shown to the left

| Gl.$n_1^{Bx}$ | Gl.$n_1^{RP}$ | | | | | Total |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| 1 | 0 | 2.38% | 0.95% | 0.47% | 0 | 3.8% |
| 2 | 0.95% | 24.28% | 18.09% | 6.19 | 0.47% | 50.0% |
| 3 | 0.95% | 6.66% | 14.76% | 11.9% | 0 | 34.28% |
| 4 | 0 | 0.95% | 2.38% | 7.62% | 0.47% | 11.43% |
| 5 | 0 | 0 | 0 | 0 | 0.47% | 0.47% |
| Total | 1.9% | 34.28% | 36.19% | 26.19% | 1.43% | 100% |

**Tab. 8.** Comparison of the first Gleason numbers assigned by the urologic pathologist (UP-1[1]) based on multiple-core biopsy samples (Gl.$n_1^{Bx}$) and on radical prostatectomy specimens (Gl.$n_1^{RP}$)

| Gl.$n_1$ | Number (N) | Percentage (%) | | |
|---|---|---|---|---|
| Gl.$n_1^{Bx}$ = Gl.$n_1^{RP}$ | 99 | 47.1 | 47.1 | Concordance |
| Gl.$n_1^{Bx}$ > Gl.$n_1^{RP}$ | 25 | 11.9 | 5.9 | Lack of concordance |
| Gl.$n_1^{Bx}$ < Gl.$n_1^{RP}$ | 86 | 41.0 | | |
| Data for 210 patients, comprising 99% of the cohort | | | | |

**Tab. 9.** The second numbers of Gleason scores (Gl.$n_2$) assigned by the urologic pathologist (UP-1[1]) based on multiple-core biopsy samples (Gl.$n_2^{Bx}$) and on radical prostatectomy specimens (Gl.$n_2^{RP}$)

| Gl.$n_2$ | Gl.$n_2^{Bx}$ | | Gl.$n_2^{RP}$ | |
|---|---|---|---|---|
| | Number (N) | Percentage (%) | Number (N) | Percentage (%) |
| 1 | 5 | 2.4 | 5 | 2.4 |
| 2 | 69 | 32.8 | 32 | 15.2 |
| 3 | 97 | 46.2 | 79 | 37.6 |
| 4 | 35 | 16.6 | 81 | 38.6 |
| 5 | 4 | 1.9 | 12 | 7.7 |
| Total | 210 | 100 | 210 | 100 |
| Data for 210 patients, comprising 99% of the cohort | | | | |

**Tab. 10.** The second numbers of Gleason scores (Gl.$n_2$) assigned by the urologic pathologist (UP-1[1]) based on multiple-core biopsy samples (Gl.$n_2^{Bx}$) and on radical prostatectomy specimens (Gl.$n_2^{RP}$)

| Gl.$n_2^{Bx}$ | Gl.$n_2^{PR}$ | | | | | Total |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| 1 | 1 | 1 | 3 | 0 | 0 | 5 |
| 2 | 3 | 20 | 24 | 21 | 1 | 69 |
| 3 | 0 | 11 | 42 | 37 | 7 | 97 |
| 4 | 1 | 0 | 10 | 21 | 3 | 35 |
| 5 | 0 | 0 | 0 | 2 | 2 | 4 |
| Total | 5 | 32 | 79 | 81 | 13 | 210 |
| Data for 210 patients, comprising 99% of the cohort | | | | | | |

**Tab. 11.** Percentage (%) of second Gleason numbers comprising Gleason score assigned by the urologic pathologist (UP-1[1]) based on multiple-core biopsy samples (Gl.$n_2^{Bx}$) and on radical prostatectomy specimens (Gl.$n_2^{RP}$): the percentage of concordant Gleason numbers$_1$ (Gl.$n_2^{Bx}$ = Gl.$n_2^{PR}$) is shown in coloured fields, with the percentage of undergraded Gleason numbers$_2$ shown to the right (Gl.$n_2^{Bx}$ < Gl.$n_2^{RP}$), and the percentage of overgraded Gleason numbers$_2$ (Gl.$n_2^{Bx}$ < Gl.$n_2^{RP}$) shown to the left

| Gl.$n_2^{Bx}$ | Gl.$n_2^{RP}$ | | | | | Total |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| 1 | 0.47% | 0.47% | 1.43% | 0 | 0 | 2.38% |
| 2 | 1.43% | 9.52% | 11.43% | 10.0% | 0.47% | 32.26% |
| 3 | 0 | 5.24% | 20.00% | 17.62% | 3.33% | 46.19% |
| 4 | 0.47% | 0 | 4.76% | 10.00% | 1.43% | 16.66% |
| 5 | 0 | 0 | 0 | 0 | 0.95% | 1.9% |
| Total | 2.38% | 15.34% | 37.62% | 38.57% | 6.19% | 100% |
| Data for 210 patients, comprising 99% of the cohort | | | | | | |

**Tab. 12.** Comparison of the first Gleason numbers assigned by the urologic pathologist (UP-1[1]) based on multiple-core biopsy samples (Gl.$n_2^{Bx}$) and on radical prostatectomy specimens (Gl.$n_2^{RP}$)

| Gl.$n_2$ | Number (N) | Percentage (%) | | |
|---|---|---|---|---|
| Gl.$n_2^{Bx}$ = Gl.$n_2^{PR}$ | 86 | 40.9 | 40.9 | Concordance |
| Gl.$n_2^{Bx}$ > Gl.$n_2^{PR}$ | 27 | 12.9 | 59.1 | Lack of concordance |
| Gl.$n_2^{Bx}$ < Gl.$n_2^{PR}$ | 97 | 46.2 | | |
| Data for 210 patients, comprising 99% of the cohort | | | | |

Gleason number$_2$ determined based on RP specimens was 4 or 3, and the least common one was 1. All Gl.n$_2$ = 1 were diagnosed before 2005.

The relationship between Gl.n$_2^{Bx}$ and Gl.n$_2^{RP}$ has been presented in tables 12: concordant grades (Gl.n$_2^{Bx}$ = Gl.n$_2^{RP}$) were established in nearly 41% of the patients, with prevalence of undergraded Gl.n$_2^{Bx}$ (46.2% of the patients).

The result of Stuart-Maxwell test of marginal homogeneity showed the discrepancies to be statistically significant ($p < 0.0001$), which means there is a lack of concordance between Gl.n$_2^{Bx}$ and Gl.n$_2^{RP}$. $\kappa = 0.168$ is associated with poor concordance.

## DISCUSSION

Analysing the oncologic features of RP specimens, identified in histopathological examination, we found the percentage of the least malignant PCa to be smaller and the percentage of the most malignant PCa to be larger than the percentage of corresponding scores based on $^{TRUS}$coreBx (50 vs 77.6% and 15.2 vs 7.1% respectively) (fig. 5).

Our study shows a lack of concordance between the global Gl.s. determined based on $^{TRUS}$coreBx and the Gl.s. identified in RP specimens. In $^{TRUS}$coreBx, low Gl.s. (Gl.s. ≤ 6) was predominantly obtained (77.6%), and the highest Gl.s. (Gl.s. > 8) was least frequently determined (7.1%). In the case of RP specimens, the same was true, yet the proportions clearly differed: the lowest Gl.s. accounted for 50%, whereas the highest Gl.s. was found in slightly over 15%. Moderate malignancy grade was also considerably more frequently established, rising from over 15% to nearly 35%. Concordant global scores were found in 34.3% of the patients. In the case of a lack of concordance, found in 65.7% of the scores, undergraded Gl.s.$^{Bx}$ was the most prevalent (Gl.s.$^{Bx}$ < Gl.s.$^{RP}$). The highest score concordance was associated with Gl.s. 7.

Comparison of Gl.n$_1$ and Gl.n$_2$ comprising Gleason score (fig. 6, 7) showed lower Gleason scores based on prostate multiple-core biopsy to be most common, with higher percentage of higher Gleason scores identified based on specimens obtained in radical prostatectomy.

For Gl.n$_1$, the concordance of scores based on multiple-core biopsy samples and specimens obtained in RP was 47.1%. In the cases where the scores lacked concordance (53.9%), undergraded scores based on multiple-core biopsy were most common (41%). Concordance was most often associated with Gleason number$_1$ = 4 (66.7%). The concordance of the second Gleason numbers identified in the two procedures was 40.9%. Wherever concordance was lacking, just as was the case with the first Gleason number, undergraded Gleason number$_2$ was most common (46.2%). The highest (60%) concordance was also associated with the second Gleason number identified as 4 (Gl.n$_2$ 4) in both procedures.

In 2008, "European Urology" published the results of a multi-centre study comparing PCa malignancy scores of a very large group of patients (n = 14.839),

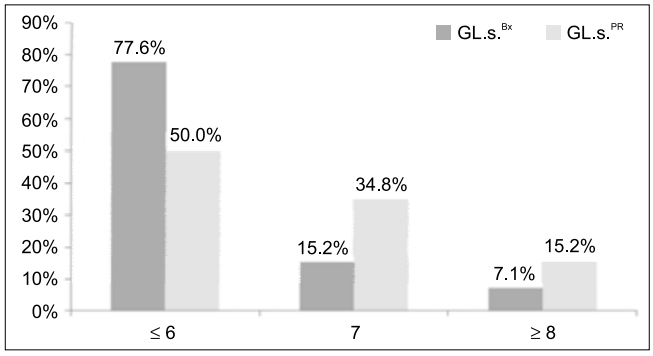


**Fig. 5.** Comparison of Gleason score assigned by urologic pathologist (UP-1[1]) based on multiple-core biopsy (Gl.s.$^{Bx}$) and on radical prostatectomy specimens (Gl.s.$^{RP}$)

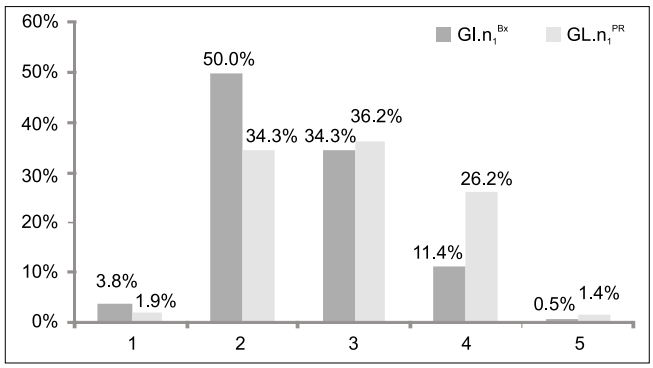


**Fig. 6.** Comparison of Gl.n$_1$ based on multiple-core biopsy and on radical prostatectomy specimens

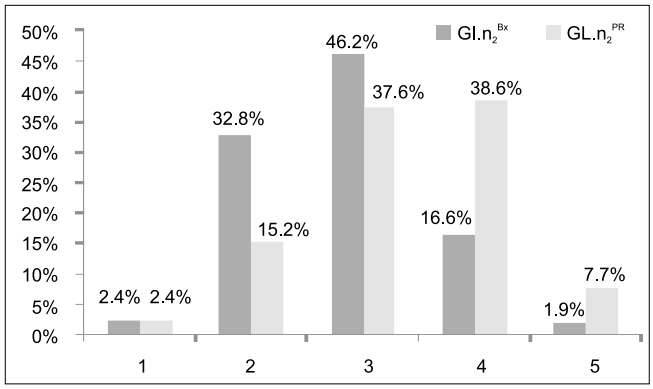


**Fig. 7.** Comparison of Gl.n$_2$ based on multiple-core biopsy and on radical prostatectomy specimens

based on multiple-core prostate biopsy and examination of specimens obtained in radical prostatectomy. Score concordance was found in 58% of patients. Among scores showing discrepancies, undergraded scores were the most common (36%) (18). Studies by other authors have reported initial PCa malignancy scores to be undergraded in 30-43% (19-22), while overgraded in 6-17% (23-26).

The occurrence of discrepancies between PCa malignancy score based on prostate biopsy samples and on specimens obtained in RP is evident. When assessing malignancy in biopsy samples, the urologic pathologist has access only to small tissue fragments obtained from various areas of the prostate gland (from several up to over a dozen of tissue cores sized several mm

x approx. 1 cm each), whereas when identifying malignancy grade in prostatectomy specimens they have access to the entire gland. The volume of the tissue cores obtained in biopsy makes up only for a small percentage of the entire gland's volume. Thus, tissue cores may not have come from the areas within the gland that reveal higher malignancy upon examination following radical prostatectomy. The obvious difference in tissue volume available for examination in these two types of grading justifies the discrepancies, particularly undergrading of prostate cancer prior to the surgery.

## CONCLUSIONS

Our study has evidenced the discrepancies between the global malignancy score (Gl.s.) based on histopathological examination of tissue cores obtained in prostate biopsy and on examination of specimens obtained in radical prostatectomy.

The complex Gleason system results in high interobserver and intraobserver variability due to its subjectivity (10, 27-36). It is of utmost importance, therefore, that the final diagnosis be based on reliable data obtained, where necessary, in repeat examination, and re-evaluated.

Therapeutic decisions made for prostate cancer patients largely depend on PCa grade based on the samples obtained in the biopsy of the prostate gland, whereas patient outcome relies on PCa grade based on the examination of prostatectomy specimens.

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