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Diagnostic Value between 1984 and 2018 of Transrectal Biopsy Guided by Ultrasonography after Radical Prostatectomy

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Abstract: Objectives—to determine correlation between GSs (Gleason scores) on needle biopsy and RP (radical prostatectomy), evaluating diagnostic tests on biopsy and RP within the last years, between 1984 and 2018. Method—analysis of 100 patients, diagnosed with PCa (prostate cancer) needle biopsy using 18-gauge needle, who underwent RP with lymphadenectomy and for which preoperative and postoperative GSs were available. GS group analysis used three categorization schemes for differentiation: mild, moderate and poor for the whole group and we determined SE (sensitivity), SP (specificity), PVPR (positive predictive value), negative predictive value and accuracy. Results—we found that 42% of the patients had no changes between GS on biopsy and prostatectomy, while 20% were overgraded and 38% undergraded by needle biopsy. Graduation of +1 point in GS (32%) or -1 point (17%) was the most common. Most patients were classified as moderately differentiated by biopsies (78 and 35% in scheme 1 and 2 or 3, respectively), while 43% of patients received an intermediate differentiation classification. Biopsy accuracy varied from 44 to 76% for the analysis of all three schemes. Conclusion—there are differences in correlation between GS on biopsy and on surgical specimen, and Gleason's graduation also depends on the experience of the pathologist. We have shown that sextant biopsies using 18-gauge and a same group of pathologists showed acceptable concordance values (42%) between the GS on biopsy and prostatectomy.

Key words: PCa, transrectal biopsy guided by ultrasonography, RP, PSA (prostate specific antigen).

1. Introduction

(PCa) Prostate cancer is the second most diagnosed neoplasm in men and the second-leading cause of cancer death in men worldwide. There were estimated 1.1 million new cases, about 15% of male cancers, were estimated in 2012 in the latest worldwide estimate [1, 2].

Diagnosis is made through analysis of fragments obtained by prostate biopsy guided by ultrasonography, motivated by (PSA) prostatic specific antigen level changes and abnormalities found in DRE (Rectal Digit Exam) [3-6].

Two very important prognostic factors are staging, performed by AJCC's TNM system, and GS (Gleason score) [7, 8]. These factors are determinant for patient risk classification and for correct therapeutic decision making, radiotherapy and RP (radical prostatectomy) are the main treatments for PCa without metastasis [9, 10].

However, some studies have shown that in about 33% of patients, there is an incongruence between GS after

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RP when compared to biopsy [11-16]. And this divergence could be influenced by some factors such as: needle gauge; amount of biopsied tissue; percentage of neoplastic tissue and variation of the interobserver analysis or intraobserver variation [5, 11-16].

This study aims to determine the correlation between Gleasson scores on needle biopsy and RP, evaluating biopsy and RP diagnostic tests within the last years, between 1984 and 2018.

2. Materials and Methods

2.1 Ethical Conditions

The present study was approved by the Research Ethics Committee of the Hospital Base of the District Federal, Brasília, CAAE: 93792918.8.0000.8153.

2.2 Patients and Data Collection

A retrospective study was carried out analyzing from 2013 to 2017 a total of 100 patients diagnosed with prostate adenocarcinoma by biopsy and performed RP with lymphadenectomy. The information was collected from electronic medical records and anatomopathological reports. Biopsy indication took into account PSA level changes (> 2.5-4 ng/mL) and EDR [17-19]. Transrectal image of the prostate was obtained with a sectorial transducer for subsequent biopsy collection, the samples obtained by puncture were sextants at least 12 fragments using 18-gauge needle (18-Gauge). These fragments were sent for anatomopathological study, being stained with HE (hematoxylin and eosin) and graduation according to the Gleason methods by the same group of pathologists. Subsequently, all patients diagnosed with adenocarcinoma and with surgical indications were treated with RP with lymphadenectomy. Surgical specimens were sent to anatomopathological study and submitted to several histological sections, thus, determined pathological GS, the greater diameter of the prostate; measurement in centimeters (cm) of prostate's length, width and height to calculate prostate's volume (length × height × width × π/6); angiolymphatic invasion; perineural invasion, seminal vesicle invasion, extraprostatic extension; bladder and urethral surgical margins; pTNM pathological staging.

2.3 Statistical Analysis

The analyzed variables were computed using SPSS version 20.0. GSs of biopsy and RP were correlated. When we analyzed the GSs on biopsy and RP, we used the crosstabs to determine how many biopsies had undergraded, matched, and overgraded. We determined SE (sensitivity), SP (specificity), PVPR (positive predictive value), negative predictive value and accuracy of biopsies with GS of the surgical specimen as the gold standard.

3. Results

Our study analyzed 100 patients diagnosed with prostate adenocarcinoma who underwent RP with lymphadenectomy. Regarding age of the patients, the mean was 64.97 years, median of 65 years and age ranging from 45 to 77 years (Table 1). Preoperative PSA presented a mean of 14.74 ng/mL and when patients were classified as PSA < 10 ng/mL, they accounted for 49% of the sample, between 10-20 ng/mL, 40% of the sample and > 20 ng/mL added up to 11% of the sample. About 45% of the patients received cT1 clinical staging, 53% cT2 staging and 2% cT3 staging. When we analyzed the sum of GSs on biopsy, we found that 35% of the patients had a sum of 6, 43% had a sum of 7, 17% had a sum of 8 and 5% had a sum of 9. However, after RP and subsequent analysis of pathological Gleason score, 3% of patients had a sum of 6, 87% had a sum of 7, 3% had a sum of 8 and 7% had a sum of 9.

After macroscopic evaluation of the prostate for anatomopathological analysis, the largest diameter of the prostate was measured (cm) and the patients were classified in < 5 cm (40%) and≥ 5 cm (60%). We measured the length, width, and height of the prostate for calculating prostate volume (length × height × width × π/6), patients were classified as < 80 cm³ (53%).

Table 1 Clinical and pathological characteristics of patients.

Variable		All patients n = 100 (%)
Age (years)	Mean	64.97
	Median	65
	Range	45-77
Preoperative PSA (ng/mL)	Mean	14.74
	Median	10
	Range	2.9-281
PSA divisions (ng/mL)	< 10	49 (49.0%)
	10-20	40 (40.0%)
	> 20	11 (11.0%)
cT stage	T1	45 (45.0%)
	T2	53 (53.0%)
	T3	2 (2.0%)
Primary biopsy Gleason	3	72 (72.0%)
	4	28 (28.0%)
Secondary biopsy Gleason	3	42 (42.0%)
	4	52 (52.0%)
	5	6 (6.0%)
Biopsy Gleason sum	6	35 (35.0%)
	7 (3 + 4)	36 (36.0%)
	7 (4 + 3)	7 (7.0%)
	8	17 (17.0%)
	9	5 (5.0%)
Primary pathological Gleason	3	58 (58.0%)
	4	41 (41.0%)
	5	1 (1.0%)
Secondary pathological Gleason	3	35 (35.0%)
	4	59 (59.0%)
	5	6 (6.0%)
Pathological Gleason sum	6	3 (3.0%)
	7 (3 + 4)	55 (55.0%)
	7 (4 + 3)	32 (32.0%)
	8	3 (3.0%)
	9	7 (7.0%)
Greatest pathological measure of the prostate	< 5 cm	40 (40.0%)
	≥ 5 cm	60 (60.0%)
Estimated prostate volume (cm^3)	< 80 cm^3	53 (53.0%)
	≥ 80 cm^3	47 (47.0%)
Surgical specimens data (invasions)		(Present/Neoplastic free/Not evaluated)
	Angiolymphatic	10 (10.0%)/51 (51.0%)/39 (39.0%)
	Perineural	94 (94.0%)/6 (6.0%)/0 (0.0%)
	Right seminal vesicle	14 (14.0%)/83 (83.0%)/3 (3.0%)
	Left seminal vesicle	17 (17.0%)/80 (80.0%)/3 (3.0%)
	Extra-prosthetic extension	45 (45.0%)/52 (52.0%)/3 (3.0%)
	Vesical surgical margins	8 (8.0%)/90 (90.0%)/2 (2.0%)
	Urethral surgical margin	17 (17.0%)/79 (79.0%)/4 (4.0%)

(Table 1 continued)

Variable		All patients n = 100 (%)
pTN stage	pT2	50 (50.0%)
	pT2a/pT2b/pT2c	3 (3.0%)/5 (5.0%)/42 (42.0%)
	pT3	50 (50.0%)
	pT3a/pT3b	30 (30.0%)/20 (20.0%)
	pN0	93 (93.0%)
	pN1	7 (7.0%)
	Lymph Nodes examined/engaged	805/10
	(Mean ± standard deviation)	(8.05 ± 4.69)/(0.10 ± 0.41)

and ≥ 80 cm³ (47%). When we analyzed the perineural invasion, we found that 94% of patients had perineural invasion present. The left seminal vesicle was affected in 17% of the cases, and the right in 14% of the cases, showing a major involvement in the left seminal vesicle. Extra-prostatic extension was observed in 45% of the patients analyzed. The analyzed margins showed that 8% of the patients had involvement of bladder margin and 17% of the patients had involvement of the urethral margin, evidencing a greater involvement of the urethral margin. After TNM staging, 3% of the patients had pT2a, 5% pT2b staging, 42% pT2c staging, 30% pT3a staging, 20% pT3b staging. About 93% of the patients presented pN0 staging and 7% of patients presented pN1 staging. A total of 805 lymph nodes (mean of 8.05 lymph nodes and standard deviation of 4.69) were removed for analysis and only 10 lymph nodes (mean of 0.10 and standard deviation of 0.41) were affected by neoplasia.

3.1 Analysis of the Correlation between GS on Biopsy and Surgical Specimen

The correlation between biopsy and RP GSs showed an exact match in 42% of all patients, had no alterations in the attribution of punctuation, while 20% were overgraded and 38% undergradedby needle biopsy (Table 2). Based on biopsy analysis, most patients had a GS of 6 (35%), 7 (43%) or 8 (17%). Based on the analysis of surgical specimen, the majority had a GS of 7 (87%) and 9 (7%). Based on biopsies, while 35% of patients had a GS of 6, only 3% of the patients with a GS of 6 remained in the RP specimens.

Fig. 1 shows a histogram based on the differences between the two attributions of GS calculated as [(GS of RP with lymphadenectomy) - (GS of ultrasound-guided transrectal biopsy)]. The results with a positive difference reflect undergradedbiopsy, while a negative difference reflects overgradedbiopsy. When we analyzed data from Fig. 1, we showed that 42% of the patients evaluated had no change in the attribution of GS. A total of 20% of the patients were overgraded by biopsy, while 38% were undergraded by biopsy. The graduation of +1 point in the GS (32%) or -1 point (17%) were the most common.

When we analyzed correlation between the GS categories (well, moderate and poorly differentiated) for biopsies and prostatectomy specimens for three different categorization schemes (Scheme 1: GS 2-4, 5-7, 8-10, Scheme 2: GSs 2-4, 5-6, 7-10 and Scheme 3: GS 2-4, 5-6, 7 and 8-10) (Table 3), no patient was classified as well differentiated (GS 2-4). Most patients were classified as moderately differentiated by biopsies (78 and 35% in scheme 1 and 2 or 3, respectively), while 43% of patients received an intermediate differentiation score (Gleason 7). Regardless of the scheme used to analyze biopsies, between 22% (Schemes 1 and 3) and 65% (Scheme 2) of the patients were categorized as poorly differentiated. When we analyzed prostatectomy samples, we showed that 10% (Schemes 1 and 3) and 97% (Scheme 2) of the patients were categorized as poorly differentiated, with a total of 87% receiving a GS 7 (intermediate differentiated).

Table 2 Correlation between individual GSs based on biopsy and prostatectomy specimens.

		GS RP specimens				All
		6	7	8	9	
Biopsy specimen	6	1	32	1	1	35 (35%)
	7	2	37	-	4	43 (43%)
	8	-	15	2	-	17 (17%)
	9	-	3	-	2	5 (5%)
	All	3	87	3	7	100
	%	(3%)	(87%)	(3%)	(7%)	(100%)

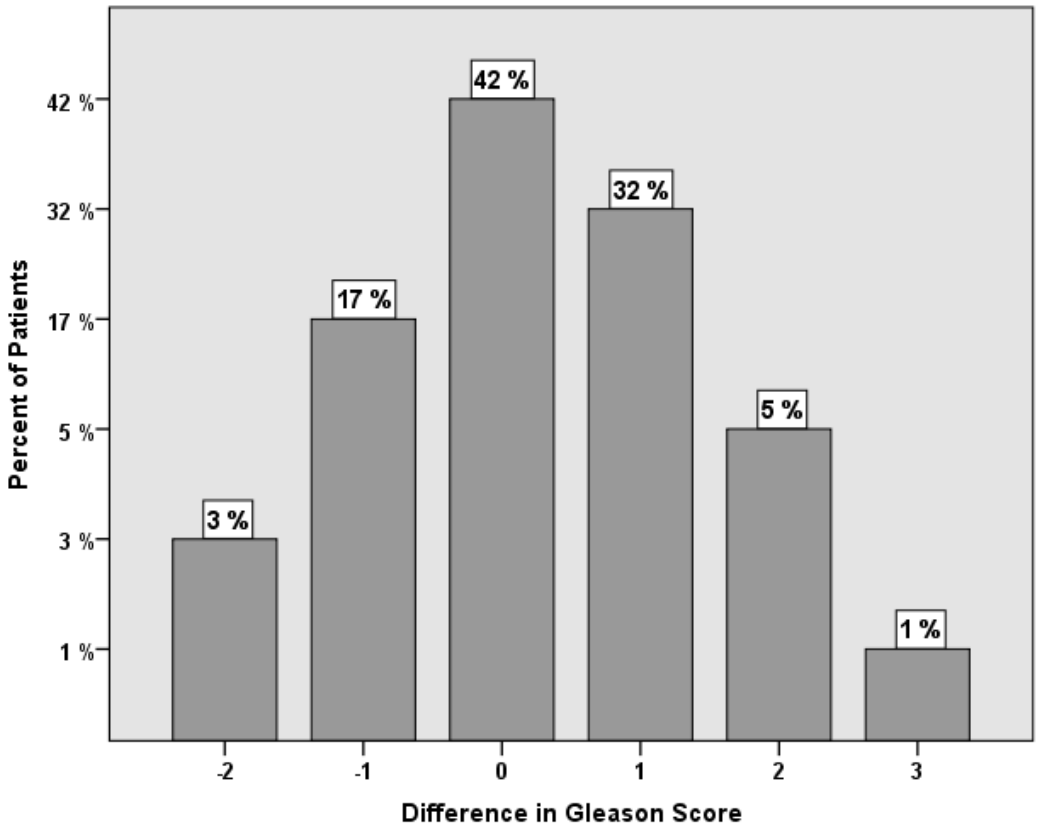

Fig. 1 Histogram with the differences between biopsy score and RP score. The value of 0 (x-axis) means all the patients who agreed, the others are positive and negative differences found. The percentage (axis y) of patients with observed differences and the total number of patients with observed differences (above the x-axis columns).

Table 3 Correlation of GS between biopsy and prostatectomy specimen based on GS categories using three different categorization schemes.

Categorization scheme 1				
Biopsy categories	RP specimen categories			All (%)
	Well	Moderate	Poor	
Well (2–4)	-	-	-	-
Moderately (5–7)	-	72 (72.0)	6 (6.0)	78 (78.0)
Poorly (8–10)	-	18 (18.0)	4 (4.0)	22 (22.0)
All (%)	-	90 (90.0)	10 (10.0)	100 (100)
Categorization scheme 2				
Biopsy categories	RP specimen categories			All (%)
	Well	Moderate	Poor	
Well (2–4)	-	-	-	-
Moderately (5–6)	-	1 (1.0)	34 (34.0)	35 (35.0)
Poorly (7–10)	-	2 (2.0)	63 (63.0)	65 (65.0)
All (%)	-	3 (3.0)	97 (97.0)	100 (100)
Categorization scheme 3				
Biopsy categories	RP specimen categories			All (%)
	Well	Moderate	Intermediate	Poor	
Well (2–4)	-	-	-	-	-
Moderately (5–6)	-	1 (1.0)	32 (32.0)	2 (2.0)	35 (35.0)
Intermediate (7)	-	2 (2.0)	37 (37.0)	4 (4.0)	43 (43.0)
Poorly (8–10)	-	0 (0.0)	18 (18.0)	4 (4.0)	22 (22.0)
All (%)	-	3 (3.0)	87 (87.0)	10 (10.0)	100 (100.0)

The table shows the number of patients and their respective percentages for each type of scheme. Scheme 1: GSs 2-4 = well; 5-7 = moderate; 8-10 = poor. Scheme 2: GSs 2-4 = well; 5-6 = moderate; 7-10 = poor. Scheme 3: GSs 2-4 = well; 5-6 = moderate; 7 = intermediate; 8-10 = poor.

Table 4 SE, SP, predictive value of a positive result (PVPR), predictive value of a negative result (PVNR), and accuracy (ACCU) for the biopsy score category to predict the radical score category for the three categorization schemes.

Score	Category	SE (%)	SP (%)	PVPR (%)	PVNR (%)	ACCU (%)
Categorization 1						
2–4	Well	-	-	-	-	-
5–7	Moderate	80.0	40.0	92.3	18.2	76.0
8–10	Poor	40.0	80.0	18.2	92.3	76.0
Categorization 2						
2–4	Well	-	-	-	-	-
5–6	Moderate	33.4	64.9	2.8	96.9	64.0
7–10	Poor	64.9	33.4	96.9	2.8	64.0
Categorization 3						
2–4	Well	-	-	-	-	-
5–6	Moderate	33.4	64.9	2.8	96.9	64.0
7	Intermediate	42.6	53.8	86.1	12.3	44.0
8–10	Poor	40.0	80.0	18.2	92.3	76.0

When we analyze the SE, SP, PVPR, negative predictive value (PVNR) and accuracy (ACCU) for each type of scheme (1, 2 and 3), we show that SE is very low for the categories of moderate biopsy in schemes 2 and 3, while SP is poor for the category of poor biopsy in scheme 2 (Table 4). Similarly, PVPR is very low for the category of moderate and poor biopsies (schemes 1 and 3) and the PVNR is very low for the poor and intermediate biopsy (Schemes 2 and 3). The ACCU of the samples varied from 44 to 76% for

the analysis of all three schemes.

4. Discussion

PCa is the second most prevalent cancer in the male population worldwide, affecting patients usually above 50 years old, being uncommon under 40, advanced age comprises a well-established risk factor, since both the incidence and mortality increase after 50 years old [1, 2, 20]. Roche et al. [21] after analyzing 606 retropubic radical prostatectomies, showed a mean age of this group of 65 years old and mean preoperative PSA of 12.8 ng/mL. Patients in the present study presented variations from 45 to 77 years old, mean of 64.97 years old (Table 1).

Several studies report that the prognosis of patients diagnosed with prostate adenocarcinoma is associated with histopathological parameters, such as staging, histological grade, GS and state of the surgical margins, as well as age and PSAdosage [22-26]. Our study, when grouping preoperative PSA values between (< 10, 10-20, > 20 ng/mL) found that about 49% of patients had a PSA level < 10 ng/mL. Some studies have determined the perineural invasion as the main mechanism of neoplastic dissemination beyond the prostate, and it is found in 17% to 38% of the cases [27-29]. Vascular invasion may be present in about 38% of cases of RP due to adenocarcinoma, being associated with extraprostatic extension, lymph node metastases, histological grade and staging. Metastases are more often found in bone tissue and regional lymph nodes [24, 30-35]. Eduardo et al. [22] after examining 118 radical prostatectomies, showed that GS 6 was the most frequent (46.61% of the cases), being associated with extraprostatic extension, however, the presence of nodal metastases is associated with a GS ≥ 7. When we analyzed perineural invasion, we found that 94% of the patients had perineural invasion present. Angiolymphatic invasion was present in 10% of patients (Table 1). We observed more often involvement in the left seminal vesicle (17%) followed by the right one (14%) and extraprostatic extension was evident in 45% of the patients analyzed. We observed more often involvement of the urethral margin (17%) followed by the bladder margin (8%).

Several studies have attempted to evaluate the concordance between GSs on biopsy and surgical specimen [36-52]. The major difficulties encountered in the exact evaluation are: sub-graduation or over-gradation of GSs on ultrasound-guided transrectal biopsy and surgical specimen, and possible factors contributing to this inconsistency, including pathological interpretation, sampling error, number of biopsies collected, and quantity of cancer within the collected biopsy material [48]. In Table 5, previous studies of the last 22 years totaled 7,021 patients comparing GS of the biopsy and RP using 18-gauge needle with different pathologists or even a group of pathologists. The weighted mean, showed an exact match in 53%, a difference of ± 1 unit in 34%, a difference of ± 2 units in 13%, overgrade in 12% and subgrade in 35% [36-52]. In Table 5, when we divided the patients according to categorization scheme 3 (Table 3), we showed an exact match in 62%, overgrade in 9% and subgrade in 29%. Our study presented a 42% exact match between Gleason on biopsy and prostatectomy scores, a difference of ± 1 unit in 49%, a difference of ± 2 units in 9%, overgrade in 20% and a subgrade in 38% (Tables 2-5). The GS difference between the exact match is shown in Fig. 1, which shows a higher prevalence of graduation of +1 point (32%) and -1 point (17%) in the sample analyzed.

Even though there is no universal consensus regarding the categorization of GS divisions, several categorization schemes are widely used (Table 3). Literature classifies a GS between 2-4 as well differentiated, GSs between 8-10 are classified, in most studies, as poorly differentiated. The scientific debate revolves around the classification of GSs between 5-6 which are labeled moderately and GSs equal to 7 that are labeled as intermediate differentiation [65, 66]. In Table 6, 31,147 patients were grouped according to the type 3 scheme (Table 3), showing that 55.0% of the

Table 5 Analysis of previous studies that were separated in order and precision terms from the GS.

Author	Year	No. of patients	Comparisons between biopsy and prostatectomy Gleason grades (%)						Correlation of biopsy and surgical score of Gleason by assignment of the Categorization scheme 3		
			Exact correlation (%)	% Difference by ± 1 unit (number/total)	% Difference by ± 2 (number/total)	Needle overgrade (number/total)	Needle undergrade (number/total)		% Exact correlation (number/total)	Needle overgrade (number/total)	Needle undergrade (number/total)
Thickman et al. [36]	1996*	124	28 (35/124)	34 (42/124)	38 (47/124)	15 (18/124)	57 (71/124)		44 (54/124)	9 (11/124)	48 (59/124)
Cookson et al. [37]	1997*	226	31 (70/226)	43 (97/226)	26 (59/226)	15 (33/226)	54 (123/226)		46 (104/226)	8 (19/226)	46 (103/226)
Steinberg et al. [38]	1997*	390	34 (131/390)	34 (133/390)	32 (126/390)	6 (25/390)	60 (234/390)		45 (175/390)	5 (21/390)	50 (194/390)
	1997**	499	58 (291/499)	36 (181/499)	6 (27/499)	6 (30/499)	36 (178/499)		66 (329/499)	4 (22/499)	30 (148/499)
Danziger et al. [39]	1997*	100	34	38	28	17	49		51	10	39
	1997**	100	42	43	15	22	36		49	17	34
Djavan et al. [40]	1998*	415	37 (154/415)	37 (153/415)	26 (108/415)	13 (53/415)	50 (208/415)		52 (214/415)	7 (31/415)	41 (170/415)
Carlson et al. [41]	1998**	106	68 (72/106)	29 (31/106)	3 (3/106)	8 (8/106)	25 (26/106)		70 (74/106)	6 (6/106)	25 (26/106)
Cury et al. [42]	1999**	120	33 (39/120)	30 (36/120)	37 (45/120)	5 (6/120)	62 (75/120)		51 (61/120)	2 (2/120)	47 (57/120)
King [43]	2000*	428	41 (177/428)	42 (178/428)	17 (73/428)	17 (71/428)	42 (180/428)		51 (219/428)	14 (61/428)	35 (148/428)
Fukagai et al. [44]	2001**	116	46 (53/116)	46 (53/116)	9 (10/116)	8 (9/116)	47 (54/116)		56 (65/116)	4 (5/116)	40 (46/116)
Lattouf and Saad [45]	2002*	393	29 (115/393)	45 (176/393)	26 (102/393)	32 (127/393)	38 (151/393)		48 (190/393)	20 (79/393)	32 (124/393)
San Francisco et al. [46]	2003**	340	69 (233/340)	29 (98/340)	3 (9/340)	6 (22/340)	25 (85/340)		76 (257/340)	10 (35/340)	14 (48/340)
Emiliozzi et al. [47]	2004**	89	49 (44/89)	37 (33/89)	13 (12/89)	11 (10/89)	39 (35/89)		58 (52/89)	10 (9/89)	29 (26/89)
Divrik et al. [48]	2007*	186	41 (76/186)	45 (84/186)	14 (26/186)	22 (40/186)	38 (70/186)		56 (104/186)	12 (22/186)	32 (60/186)
Moreira et al. [49]	2008**	464	57 (264/464)	34 (160/464)	9 (40/464)	14 (65/464)	29 (135/464)		65 (301/464)	12 (58/464)	23 (105/464)

(Table 5 continued)

Author	Year	No. of patients	Comparisons between biopsy and prostatectomy Gleason grades (%)										Correlation of biopsy and surgical score of Gleason by assignment of the Categorization scheme 3			
			Exact correlation (%)		% Difference by ± 1 unit (number/total)		% Difference by ± 2 (number/total)		Needle overgrade (number/total)		Needle undergrade (number/total)		% Exact correlation (number/total)		Needle overgrade (number/total)		Needle undergrade (number/total)	
Kvåle et al. [50]	2009*	1,116	53	(591/1,116)	37	(412/1,116)	10	(113/1,116)	9	(106/1,116)	38	(419/1,116)	60	(673/1,116)	6	(68/1,116)	34	(375/1,116)
Moussa et al. [51]	2009*	1,129	76	(862/1,129)	20	(223/1,129)	4	(44/1,129)	12	(136/1,129)	12	(131/1,129)	80	(904/1,129)	11	(129/1,129)	9	(96/1,129)
Helpap et al. [52]	2016**	580	74	(430/580)	24	(138/580)	2	(12/580)	4	(21/580)	22	(129/580)	74	(431/580)	4	(20/580)	22	(129/580)
Current study	**	100	42	(42/100)	49	(49/100)	9	(9/100)	20	(20/100)	38	(38/100)	42	(42/100)	20	(20/100)	38	(38/100)
Overall (weighted mean %)		7,021	53		34		13		12		35		62		9		29	

*18-Gauge, sextant, different pathologists; **18-Gauge, sextant, same (group) pathologist(s).

Table 6 Comparison of studies that have distributed the GSs of biopsy and surgery in well, Moderately, intermediate and poorly.

Author	Year	No. of patients	Biopsy GS group assignment								Prostatectomy GS group assignment							
			Well (2-4)		Moderately (5-6)		Intermediate (7)		Poorly (8-10)		Well (2-4)		Moderately (5-6)		Intermediate (7)		Poorly (8-10)	
			Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Garnett et al. [53]	1984*	115	24	20.9	75	65.2	11	9.6	5	4.3	14	12.2	70	60.9	25	21.7	6	5.2
Mills and Fowler [54]	1986*	38	8	21.1	15	39.5	10	26.3	5	13.2	3	7.9	8	21.1	16	42.1	11	28.9
Thickman et al. [36]	1996*	124	41	33.1	59	47.6	22	17.7	2	1.6	13	10.5	62	50	38	30.6	11	8.9
Cookson et al. [37]	1997*	226	37	16.4	128	56.6	47	20.8	14	6.2	5	2.2	109	48.2	85	37.6	27	11.9
Steinberg et al. [38]	1997*	390	87	22.3	220	56.4	70	17.9	13	3.3	1	0.3	188	48.2	176	45.1	25	6.4
	1997*	499	6	1.2	357	71.5	120	24	16	3.2	2	0.4	246	49.3	221	44.3	30	6
Danziger et al. [39]	1997*	100	13	13	57	57	19	19	11	11	5	5	44	44	33	33	18	18
	1997*	100	4	4	43	43	35	35	18	18	0	0	31	31	52	52	17	17
Djavan et al. [40]	1998*	415	97	23.4	240	57.8	69	16.7	9	2.2	31	7.5	232	55.9	116	27.9	36	8.7
Carlson et al. [41]	1998*	106	0	0	82	77.4	24	22.6	0	0	1	0.9	62	58.5	41	38.7	2	1.9

(Table 6 continued)

Author	Year	No. of patients	Biopsy GS group assignment								Prostatectomy GS group assignment							
			Well (2-4)		Moderately (5-6)		Intermediate (7)		Poorly (8-10)		Well (2-4)		Moderately (5-6)		Intermediate (7)		Poorly (8-10)	
			Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
King [43]	2000*	428	26	6.1	204	47.7	135	31.5	63	14.7	8	1.9	153	35.7	188	43.9	79	18.5
Fukagai et al. [44]	2001*	116	10	8.6	59	50.9	27	23.3	20	17.2	1	0.9	37	31.9	53	45.7	25	21.6
Lattouf et al. [45]	2002*	393	70	17.8	241	61.3	64	16.3	18	4.6	66	16.8	201	51.1	99	25.2	27	6.9
San Francisco et al. [46]	2003*	340	2	0.6	247	72.6	69	20.3	22	6.5	0	0	213	62.6	107	31.5	20	5.9
	2003**	126	0	0	96	76.2	20	15.9	10	7.9	0	0	91	72.2	24	19	11	8.7
Emiliozzi et al. [47]	2004*	89	8	9	49	55.1	26	29.2	6	6.7	1	1.1	42	47.2	38	42.7	8	9
	2004**	46	1	2.2	29	63	15	32.6	1	2.2	2	4.3	20	43.4	22	47.8	2	4.3
King et al. [55]	2004**	78	0	0	19	24.4	45	57.7	14	17.9	0	0	22	28.2	50	64.1	6	7.7
Chun et al. [56]	2006*	3,107	61	2	2,050	66	880	28.3	116	3.7	7	0.2	1,397	45	1,606	51.7	97	3.1
	2006**	1,682	29	1.7	1,156	68.7	440	26.2	57	3.4	8	0.4	797	47.4	812	48.3	65	3.9
Divrik et al. [48]	2007*	186	10	5.4	112	60.2	46	24.7	18	9.7	8	4.3	78	41.9	72	38.7	28	15.1
	2007**	206	20	9.7	114	55.3	44	21.4	28	13.6	4	1.9	98	47.6	66	32	38	18.4
Fine et al. [57]	2008*	1,455	23	1.6	1,057	72.6	343	23.6	32	2.2	0	0	978	67.2	406	27.9	71	4.9
Moreira et al. [49]	2008**	464	2	0.4	179	38.6	177	38.2	106	22.8	0	0	137	29.6	202	43.5	125	26.9
Moussa et al. [51]	2009*	1,129	0	0	0	0	960	85	169	15	0	0	63	5.6	869	76.9	197	17.5
Fanning et al. [58]	2009**	206	0	0	110	53.4	79	38.4	17	8.2	0	0	64	31	116	56.3	26	12.7
Kvåle et al. [50]	2009*	1,116	50	4.5	731	65.5	287	25.7	48	4.3	5	0.4	500	44.8	545	48.9	66	5.9
Tapia et al. [59]	2011**	168	2	1.2	76	45.2	64	38.1	26	15.5	1	0.6	51	30.4	90	53.6	26	15.4
Brookman et al. [60]	2012*	856	140	16.3	493	57.6	177	20.7	46	5.4	39	4.5	450	52.6	248	29	119	13.9
Van Praet et al. [61]	2014*	135	16	11.9	82	60.7	25	18.5	12	8.9	3	2.2	65	48.1	51	37.8	16	11.9
	2014**	193	0	0	68	35.2	90	46.7	35	18.1	0	0	48	24.9	111	57.5	34	17.6
Helpap et al. [62]	2016*	580	0	0	111	19.1	391	67.5	78	13.4	0	0	18	3.1	467	80.5	95	16.4
Xu et al. [63]	2017**	237	0	0	86	36.3	107	45.1	44	18.6	0	0	66	27.8	116	49	55	23.2
Danneman et al. [64]	2017*	15,598	149	0.9	8,448	54.2	6005	38.5	996	6.4	35	0.2	6,475	41.5	8,004	51.3	1,084	7
Current study	*	100	0	0	35	35	43	43	22	22	0	0	3	3	87	87	10	10
Overall (weighted mean %)		31,147	936	3.0	17,128	55.0	10,986	35.3	2,097	6.7	263	0.8	13,119	42.1	15,252	49.0	2,513	8.1

*****Diagnosed with cancer by sextant biopsy; ******Diagnosed with cancer by extended biopsies (≥ 10 core biopsies).

patients had a GS in biopsy between 5-6 (moderately) and 35.3% had a GS 7 (intermediate). However, these rates changed to 42.1% and 49.0% when RP specimens were evaluated. After using the weighted mean and the GS by groups (Table 6), we found that the overall Gleason biopsy between 2-4, 5-6, 7 and 8-10 presented 3.0%, 55.0%, 35.3% and 6.7% and in the surgical specimen presented 0.8%, 42.1%, 49.0% and 8.1%. The present study had a higher frequency of patients with intermediate GSs (43%) in biopsy than the literature review performed and after analysis of the surgical specimen increased considerably (87%).

After using RP as gold standard, SE, SP, positive and negative predictive value were calculated for needle biopsy graduation for each categorization scheme applied (Tables 3 and 4). Djavan et al. [40] in their study report that the SE decreases with the higher histological classification, because less and less the histologically higher graduated cancers are predicted with precision based on needle biopsy and the SP in general is lower for moderately differentiated cancers in needle biopsy, since many patients go from good to moderately differentiated, while some patients are actually “super graduates” and then change from poor to moderately differentiated cancer based on the prostatectomy specimen [40]. The independent accuracy of histological classification and categorization schemes ranged from 61.4 to 91.1% [40]. Overall, our study showed that SE increased with the higher histological classification, SP was low (33.4%) for poorly differentiated patients in scheme 2 and the accuracy of histological classification regardless of categorization varied from 44.0 to 76.0% (Table 4).

Despite our results, there are some points that could be improved in future studies, including a larger population sample with a GS well differentiated (2-4). Although the study is retrospective, the pathological descriptions are always rigorous and standardized for all patients with RP. More studies correlating pT staging with GS well differentiated (2-4) are needed to confirm whether this would affect the search results.

5. Conclusions

We conclude that there are differences in the concordance between GS in biopsy and in surgical specimen, and GS is also dependent on the experience of the pathologist. Although prostate needle biopsies are associated with significant graduation errors, they provide valuable information about pre-treatment histological pattern, reflecting the tumorpotential.

After analyzing the characteristics of the patients and comparing them with several studies, we can point out that clinical data, needle biopsy, prostate-specific antigen and pathological characteristics are available tools for good therapeutic management, so it is up to the physician to make good use of them for effective therapeutic potential. Thus, it is evident that sextant biopsies using 18-gauge needle and the same group of pathologists showed acceptable match values (42%) between GS onbiopsy and prostatectomy.

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