Correlation between the Gleason Scores of Needle Biopsies and Radical Prostatectomy Specimens

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Background: The Gleason score has been shown to offer important information with regard to prognosis and therapy for patients with adenocarcinoma of the prostate gland. In this study, Gleason scores, as determined by 18-gauge core needle biopsies, were compared with both Gleason scores and the pathological staging of corresponding radical prostatectomy specimens.

Methods: Records of 78 consecutive patients undergoing a radical retropubic prostatectomy between 1998 and 2002 were reviewed. In total, 78 patients were enrolled, all of whom had been diagnosed with adenocarcinoma by transrectal needle biopsies using an 18-gauge automated spring-loaded biopsy gun.

Results: Grading errors were greatest with well-differentiated tumors. The accuracy was 6 (23%) for Gleason scores of 2-4 on needle biopsy. Of the 36 evaluable patients with Gleason scores of 5-7 on needle biopsy, 28 (78%) were graded correctly. All of the Gleason scores of 8-10 on needle biopsy were graded correctly. Eighteen (33%) of 54 patients with a biopsy Gleason score of < 7 had their cancer upgraded to above 7. Tumors in 6 patients (60%) with both a Gleason score < 7 on the needle biopsy and a Gleason score of 7 for the prostatectomy specimen were confined to the prostate.

Conclusion: The potential for grading errors is greatest with well-differentiated tumors and in patients with a Gleason score of < 7 on the needle biopsy. Predictions using Gleason scores are sufficiently accurate to warrant its use with all needle biopsies, recognizing that the potential for grading errors is greatest with well-differentiated tumors.

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Key words: **prostatic neoplasms, needle biopsy, radical prostatectomy, Gleason score.**

Accurate prediction of the biological potential of prostate cancer remains important to clinicians treating patients with this disease. Since prostate cancer has a wide range of histological features which correlate closely with the behavior of the tumor, confidence that the histological appearance of biopsy specimens accurately reflects the histological appearance of the prostate cancer is clinically impor-

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tant, as it influences management decisions.[1-3] Research has shown that discrepancies exist between the Gleason score obtained by core needle biopsy and that of prostatectomy specimens. Prostate cancer is characterized by histopathologic heterogeneity, to which the grading discrepancy between the needle biopsy and subsequent prostatectomy specimens can be attributed.[4-13]

Histological grading separates cancers of the prostate into groups with markedly different rates of progression and dissemination over time. Gleason's system is popular because it is easy to learn and reproduce, and has been shown to correlate well with the clinical course in groups of patients.[14-17]

We compared the Gleason score determined by 18-gauge core needle biopsies with both the Gleason score and pathological staging of radical prostatectomy specimens.

METHODS

The records of 78 consecutive patients who underwent a radical retropubic prostatectomy for prostate cancer between 1998 and 2002 were retrospectively reviewed. Patient and tumor characteristics are shown in Table 1.

In all 78 patients, a radical retropubic prostatectomy for clinically localized prostatic carcinoma was performed after negative frozen sections came back from bilateral pelvic lymphadenectomies. All of the patients had initially been diagnosed with an adenocarcinoma using an 18-gauge biopsy gun. The age, preoperative and postoperative PSA levels, and Gleason scores from the transrectal needle biopsy and radical prostatectomy specimens were examined. All suspicious hypoechoic lesions were considered to be positive ultrasound findings and the basis for biopsy. According to standard procedures, all available biopsy materials were reviewed, and representative histological slides were assigned a Gleason score by the same pathologist at our institution. Two pathologic stages where recognized: (1) disease confined to the prostate (tumors that were confined to the parenchyma of the prostate or that had invaded but did not penetrate the capsule of the prostate) and (2) extracapsular extension. To obtain a Gleason score, the primary and secondary patterns were combined for a number score of from 2 to 10. Grouping the Gleason scores into 3 categories can be helpful, with well- (Gleason scores of 2-4), moderately (Gleason scores of 5-7), and poorly (Gleason scores of 8-10) differentiated disease. A comparison was made between the Gleason scores of the needle biopsies and prostatectomy specimens. Overall accuracy was evaluated using the sensitivity, specificity, and positive and negative predictive values. The accuracy of the needle biopsy was compared to the Gleason scores and clinical staging using chi-square analysis. A value of $p<0.05$ was considered statistically significant.

Table 1. Patient and Tumor Characteristics

Number of patients	78
Mean age in years (range)	62.15 (45-77)
No. at a tumor stage (%)	
T1c	32 (41%)
T2a	26 (33%)
T2b	14 (18%)
T3a	3 (3.8%)
T3b	3 (3.8%)
PSA (ng/ml)	
T1c	7.6
T2a	10.2
T2b	18.94
T3a	15.1
T3b	68
Mean PSA (ng/ml)	15.78

Abbreviations: PSA: prostate specific antigen.

RESULTS

Gleason scores for needle biopsy specimens and radical prostatectomy specimens were compared in 78 patients. Patient ages ranged from 45 to 77 (mean, 62.15) years. Preoperative serum PSA ranged from 3.2 to 132 (mean, 15.78) ng/ml. There were 32 patients with T1c, 26 with T2a, 14 with T2b, 3 with T3a, and 3 with T3b.

Gleason scores ranged from 3 to 10 for both needle biopsies and radical prostatectomy specimens. The relationship between Gleason scores for needle biopsies and for prostatectomy specimens is shown in Fig. 1. The Gleason score from the needle biopsy was identical to that of the prostatectomy specimen in 20 (25.6%) patients.

Thirty-six (46%) and 44 (56%) patients had Gleason scores of 5-7 (moderately differentiated tumor) on needle biopsy and prostatectomy specimens, respectively, whereas only 16 (21%) needle

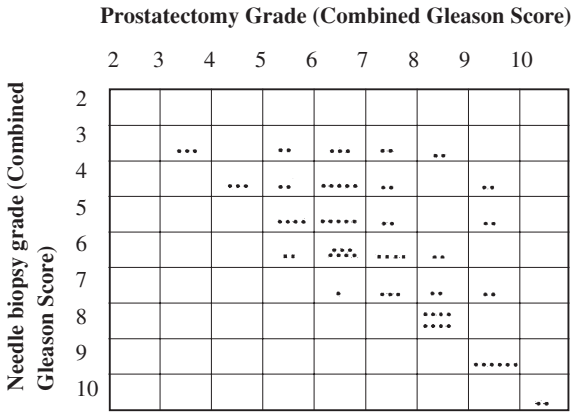

Fig. 1 Comparison of Gleason scores from needle biopsies and radical prostatectomy specimens.

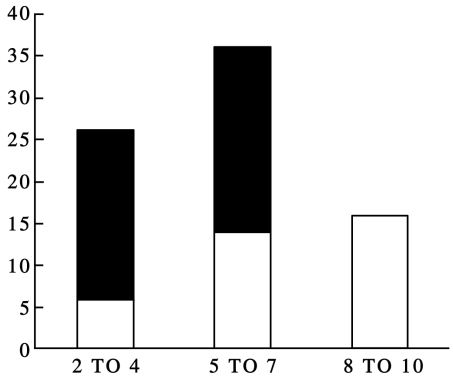

Fig. 2 Effect of biopsy grade on grading accuracy. Shaded areas represent cases in which biopsy specimens were accurately graded. Biopsy grading improved for higher Gleason scores.

biopsies and 28 (36%) prostatectomy specimens had Gleason scores of 8-10 (poorly differentiated tumor). The relationship between clinical under-staging of the primary tumor and discrepancies between the Gleason scores of the biopsies and prostatectomy specimens are shown in Fig. 2. Among the 26 patients with Gleason scores of 2-4 on needle biopsy, 20 (77%) were under-graded, with 16 (80%) of the 20 having moderately differentiated (Gleason scores of 5-7) tumors, giving an accuracy of 23% (6/26) for Gleason scores of 2-4. Of the 36 patients with Gleason scores of 5-7 on needle biopsy, 28 (78%) were graded correctly. In the remaining 8 (22%) patients, the tumors were graded incorrectly on the needle biopsy, with 8 having poorly differentiated tumors. All tumors with Gleason scores of 8-10 on needle biopsy were graded correctly. Overall, needle biopsies were under-graded in 39 (50%) cases, over-graded in 3 (3.8%), and correctly graded in 36 (46.2%). The positive predictive value of a Gleason score of ≤ 7 on needle biopsy was only 54.8%.

Clinical staging predominantly revealed T2 lesions. There were 32 patients with T1c, 26 with T2a, and 14 with T2b disease. Pathological staging predominantly revealed pT2 and pT3a lesions. The pathology of radical prostatectomy specimens identified pT2 in 25 cases, pT3a in 33, and pT3b in 20. When the preoperative Gleason score was less than 7, 20 (37%) patients had organ-confined lesions. When the preoperative Gleason score was ≥ 7, 5 (21%) patients had tumors confined to the prostate (Table 2).

Table 2. Comparison of Gleason Scores of < 7 and ≥ 7 for Needle Biopsies and the Pathological Staging of Prostatectomy Specimens

Needle biopsy Gleason score	Prostatectomy stage: No. (%) pT2	pT3a	pT3b	Total	*p*
< 7	20 (37)	25 (46)	9 (17)	54	
≥ 7	5 (21)	8 (33)	11 (46)	24	
Totals	25	33	20	78	< 0.001*

*Chi-square was used between Gleason score and tumor staging.

DISCUSSION

The histological grade of prostate cancer indicates its aggressiveness and may predict the prognosis, thereby influencing treatment decision-making. Since prostate cancer is characterized by histopathological heterogeneity and is frequently multicentric, it is important to understand the relationship between the grade obtained from needle biopsies and the grade identified on direct examination of the tumor. Muller et al. found a uniform pattern in 12 of 100 total prostatectomy specimens. Potentially, a greater amount of biopsy material could reduce sampling errors in heterogenous tumors. Accordingly, a larger number of biopsy specimens could reduce sampling errors in heterogeneous tumors.[18] Currently, the magnitude of reported differences in Gleason scores between biopsy and prostatectomy specimens is generally not large. There are multiple factors that

might account for potential differences in accuracy seen between studies using Gleason's grading system. Real differences in tumor homogeneity exist, so that the number of biopsy samples and prostatectomy specimen blocks examined may affect the final interpretation. Catalona et al. also showed that the anticipated incidence of regional lymph node metastasis is not measurably affected by grading errors.[19,20]

In our experience, the Gleason histologic scoring system for prostatic adenocarcinoma is one of the strongest predictors of biologic behavior, including invasiveness and metastatic potential, but it is not sufficiently reliable when used alone in predicting pathologic stage. The grade should be included among other prognostic factors in therapeutic decision-making, such as patient age and health, clinical stage, and serum PSA level. The likelihood of a large difference between the biopsy and prostatectomy specimen Gleason scores is greatest when only a single microscopic focus of the tumor is present in the biopsy specimen, and the tumor in the biopsy specimen is of low grade.

Over-grading tends to occur much less frequently than under-grading, and patients are rarely denied potentially curative surgery based on an incorrect Gleason score determined from a biopsy. In this study, grading errors were found to be greatest in tumors with Gleason scores of 2-4, for which the positive predictive value of needle biopsy was approximately 23%. Among the 26 evaluable patients with Gleason scores of 2-4 on needle biopsy, 77% had been under-graded, with 16 patients having moderately differentiated tumors. All needle biopsy specimens with Gleason scores of 8-10 were graded correctly. The concordance between needle biopsy and radical prostatectomy Gleason scores improved with higher values for the Gleason score. We correlated the biopsy Gleason score with the final pathological stage and found that when the combined preoperative Gleason score was < 7, 37% of patients had organ-confined lesions, while only 21% had tumors confined to the prostate when the preoperative score ≥ 7.

The mainstream use of the tumor grade as a prognostic indicator may have major ramifications for patients being treated for prostate carcinoma. Evaluation of Gleason scores in patients with well-differentiated tumors and Gleason scores of < 7 may eventually lead to guidelines regarding how management decisions in patients with prostate carcinoma should be considered. Before such protocols are implemented, further study is required to establish to what degree tumor grade affects prostate carcinoma needle biopsy efficacy.

Overall, Gleason grades from needle biopsies produced accurate predictions in only 36 (46%) patients when compared with prostatectomy specimens. Accuracy was best for poorly differentiated biopsy specimens. The predictive value of the Gleason score is sufficient to warrant its use with all needle biopsies, recognizing that the potential for grading error is greatest with well-differentiated tumors. This awareness affects treatment policy, particularly the watchful waiting criteria. These parameters can at least serve as useful, specific tools which, when used with biopsy-derived Gleason scores, can provide information concerning the treatment and prognosis of a patient with prostate carcinoma. Determining a more-precise definition of the minimum number of specimens to reliably predict tumor grade in subsequent prostatectomies requires further study.

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經直腸攝護腺切片葛里森分數與根除性攝護腺切除手術術後檢體之葛里森分數之差異

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黃信介 黃世傑

背 景： 病理學上，葛里森分數對於前列腺腺癌的治療和癒後提供很重要的資訊。在此項研究，我們比較18G粗針經直腸攝護腺切片所得之葛里森分數與根除性前列腺切除手術最終之病理切片之葛里森分數做一分析比對。

方 法： 自1998年至2002年，總計78名病患，接受根除性攝護腺切除手術。我們比較術前之切片與術後病理檢體之葛里森分數之差異。

結 果： 經直腸病理切片顯示分化良好，葛里森分數在2至4分者，術前切片與術後病理切片之差異性高，準確率只有23%。葛里森分數介於5至7的病理切片，準確率有78%，葛里森分數介於8至10者，術後病理切片準確率占百分之百。另外，葛里森分數小於7者，將近有33%，術後病理葛里森分數升高爲7分以上。術前切片葛里森分數小於7者與術後病理葛里森分數升高爲7分者，有60%腫瘤侷限於攝護腺內。

結 論： 分析結果顯示，術前經直腸切片葛里森分數小於7分者，術後葛里森分數病理差異極大。這結果充分告知，術前使用經直腸攝護腺切片者對於分化良好之檢體，整個治療方針需保持警覺心。

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關鍵字： 攝護腺腫瘤，粗針切片，根除性攝護腺切除，切片之葛里森分數。

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