ACTA SCIENTIFIC CANCER BIOLOGY

Volume 3 Issue 1 January 2018

Research Article

Will MRI-TRUS Guided Prostate Biopsies Replace the Standard Multi-Core Biopsies?

Mustafa Al-Kawaaz*, Constantin S Friedman and Maria M Shevchuk

Department of Pathology and Laboratory Medicine, Weill Cornell Medical College, New York

***Corresponding Author:** Mustafa Al-Kawaaz, Department of Pathology and Laboratory Medicine, Weill Cornell Medical College, New York.

Received: November 23, 2018; **Published:** December 12, 2018

Abstract

Context: MRI-TRUS fusion has emerged as a promising technology for targeted prostate biopsies, using transrectal ultrasound, guided by pre-biopsy MRI findings.

Objective: This is one of the first studies to compare Artemis-guided prostate biopsies with the standard 10 to 14-core biopsies for primary prostate cancer detection and for evaluation of Gleason grade and percent involvement, performed in the same patient at the same time.

Design: Forty five patients underwent an Artemis-targeted biopsy (4-8 cores) in combination with the standard 10 to 14-core biopsies, which were performed either at the same time, or within 6 months of the Artemis biopsy.

Results: Twenty seven (27) of 45 patients (60%) were found to have prostatic carcinoma (PCa). In 14 cases (31% of the cancer patients), both Artemis-guided and standard biopsies detected PCa. In 5 cases (11%), only Artemis-guided biopsy showed PCa and in another 8 cases (18%), only standard biopsies showed PCa. Benign findings were present in 18 cases (40%) by both Artemis and standard biopsies. Out of the 5 cases in which PCa was only detected by Artemis.

Conclusion: Based on this pilot study we showed that Artemis is capable of finding lesions that can be missed by the standard prostate biopsy protocol, Artemis-guided biopsies tended to detect lesions with higher Gleason scores and tumor volume, which are the more clinically significant carcinomas. When used together, however, they result in the highest rate of prostatic carcinoma diagnosis and in the best identification of Gleason grade and tumor volume.

Keywords: Biopsies; Artemis; Biopsy; Prostate; Gleason

Introduction

Detection of prostate cancer is dependent on combinations of clinical, evaluations, laboratory testing and radiologic modalities. Abnormal digital rectal exam and elevated PSA are the usual triggers for further testing. Ultrasound guided standard biopsies are the usual methods of obtaining prostate tissue cores for pathologic evaluation. Due to blinded nature of standard biopsies, the focus has recently shifted towards MRI-targeted biopsies [4].

Multiple studies have been performed to assess the effectiveness of MRI aid in targeting abnormalities of the prostate. Those studies concluded that MRI tends to outperform standard biopsies in detecting clinically significant tumors [4-6].

MRI-TRUS fusion has emerged as a promising technology for targeted prostate biopsies, using transrectal ultrasound (TRUS), guided by pre-biopsy MRI findings. The Artemis system is one such recently FDA-approved MRI-TRUS fusion device. This is the first study to compare the results of Artemis-guided prostate biopsies with those of the standard 10 to 14-core biopsies in the same patients and at the same time, for primary prostate cancer (PCa) detection and for evaluation of Gleason grade and % involvement. We address the question: Could the better targeted biopsies replace the standard biopsies?

Methods

The Artemis device (Eigen, Grass Valley, CA) differs from other MRI-TRUS fusion methods in that it incorporates a mechanical arm used to scan and digitize the prostate; the needle and probe positions are tracked by angle-sensing encoders built into each joint of the arm. Forty-five (45) patients underwent Artemis-targeted biopsy (4-8 cores) in combination with the standard 10 to 14-core biopsies, which were performed either at the same time, or within 6 months of the Artemis biopsy. The biopsy results were evaluated by genitourinary pathologists at our institution. This study was performed under the umbrella of the institutional review board.

Results

Twenty seven (27) of 45 patients (60%) were found to have prostatic carcinoma (PCa). In 14 cases (31% of the cancer patients), both Artemis-guided and standard biopsies detected PCa. In 5 cases (11%), Artemis-guided biopsy showed PCa, which was not detected on standard biopsy; and in another 8 cases (18%), the standard biopsies showed PCa which was not detected by Artemis. Benign findings were present in 18 cases (40%) by both Artemis and standard biopsies. In one of the benign cases, however, the standard biopsy contained an atypical small acinar proliferation (ASAP), which could have been a minute focus of carcinoma. Insofar as Gleason grade, Artemis-guided biopsies detected higher-grade disease overall. Out of the 5 cases in which PCa was only detected by Artemis, two cases showed Gleason scores of 4+3, two cases showed Gleason 3+4, and one case showed Gleason 3+3. On the other hand, out of the 8 cases in which PCa was detected by standard biopsy only, seven showed Gleason 3+3 and one showed Gleason 3+4. Furthermore, in the 14 cases in which both Artemis-guided and standard biopsies revealed adenocarcinoma, 5 of 14 (35%) were underestimated (lower Gleason grades or lesser extent) by the standard biopsies; while 2 of 14 (14%) were underestimated by the Artemis-guided biopsies.

Discussion

Recent studies have reported that MRI-guided biopsies of the prostate resulted in a higher prostatic carcinoma detection rate and some of the authors advocate of the use these biopsies to replace the standard multi-core protocol for the detection of carcinoma. This study was conducted to address the feasibility of such a recommendation.

Pinto., *et al.* looked at the combination of pre-biopsy MRI findings with real-time transrectal ultrasound imaging in 101 cases. They concluded that MRI guided biopsies detected more cancer regardless of the level of clinical suspicion [1]. Hadaschik., *et al.* used MRI-US fusion to perform perineal prostate biopsies on 106 patients. In 68.9% of the biopsies, lesions with high suspicion on MRI were found to have prostate cancer [2].

A recent study, conducted by Sonn., *et al.* used MRI-US fusion on 171 cases. This study also demonstrated high correlation between MRI findings and biopsy outcomes. They also showed that MR-US fusion had a tendency to detect higher Gleason scores. Kuru., *et al.* demonstrated similar findings after evaluating 200 cases [3,7].

In a systemic review of 15 studies by Vario., *et al*. MRI-US fusion was shown to detect more clinically significant prostate cancer with fewer cores than the standard method [8].

Our study contributes to this literature, because it is the first to compare the rate of prostatic carcinoma detection in the same patients and at the same time, using both the MRI-guided (Artemis) biopsy system and the standard multi-core biopsy protocol. Artemis-guided biopsies detected 11% of PCa's which were missed by standard biopsy; most of these tumors had high Gleason grades. Among PCa's detected by both standard biopsies and by Artemis-guided biopsies, another 11% of the detected PCa's would have been underestimated (considered to be a lower Gleason grade or tumor volume) by standard biopsy. Therefore, a total tumor underestimation or non-detection rate of 22% of cases was associated with standard protocol. However, if only Artemis-guided biopsies had been performed, 18% of PCa's would have been be missed, most of them low Gleason grade, and an additional 4% higher grade PCa's would have been missed, for a total of 22% of cases.

A case of ASAP (potentially a carcinoma case) also have been missed by Artemis-guided biopises. Therefore Artemis-guided biopsies outperformed standard biopsies in identifying more significant disease, but not in detecting tumor overall. Adding Artemis-guided biopsies to the standard protocol would increase the diagnostic yield and grading accuracy. However, replacing standard biopsies entirely with Artemis-guided biopsies would miss or underestimate PCa in 22% of cases, although most of these were Gleason score 6. Larger studies are needed to further evaluate the sensitivity and specificity of this novel prostate biopsy protocol as compared with the standard multi-core prostate biopsy protocol, and to study longer term patient outcomes. Is it clinically safe and desirable to miss Gleason 6 (3+3) cancers?

In summary, our study results are the following: First, we showed that Artemis is capable of finding lesions that can be missed by the standard prostate biopsy protocol. Second, Artemis-guided biopsies tend to detect lesions with higher Gleason scores and tumor volume, which are the more significant carcinomas. Third, the Artemis technology is probably not advanced enough yet to completely replace the standard biopsies. When used together, however, we showed that they result in the highest rate of prostatic carcinoma diagnosis and in the best delineation of Gleason grade and tumor volume. Being able to reliably and confidently diagnose the Gleason grade and extent of tumor is now even more significant, with the new protocols for active surveillance

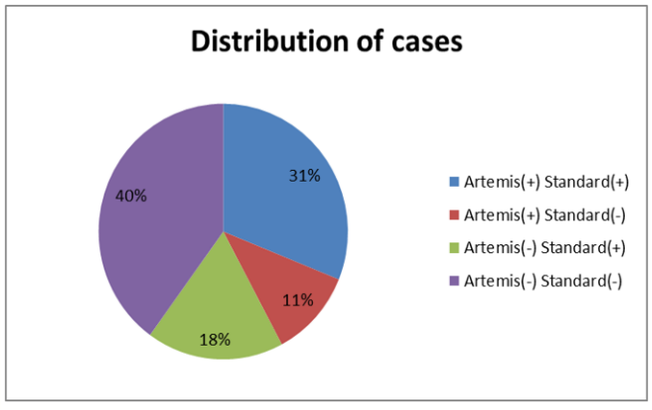

Figure 1: Cancer detection by Artemis versus Standard biopsies.

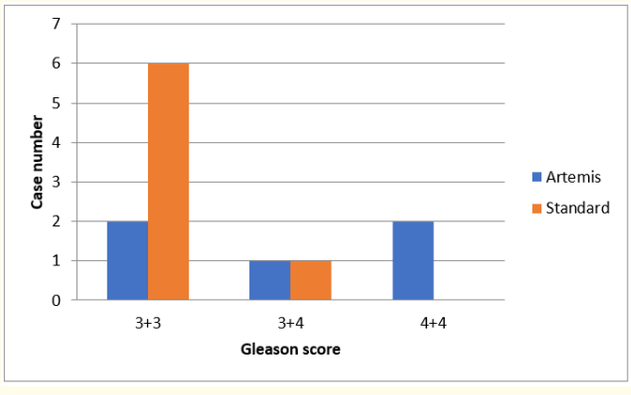

Figure 2: Gleason Score in Artemis versus Standard biopsies (Gleason scores for those cases where cancer is identified by either Artemis or Standard biopsies but not both).

Conclusion

Based on this pilot study we showed that Artemis is capable of finding lesions that can be missed by the standard prostate biopsy protocol, Artemis-guided biopsies tended to detect lesions with higher Gleason scores and tumor volume, which are the more clinically significant carcinomas. When used together, however, they result in the highest rate of prostatic carcinoma diagnosis and in the best identification of Gleason grade and tumor volume.

Bibliography

1. Pinto PA., *et al*. "Magnetic resonance imaging/ultrasound fusion guided prostate biopsy improves cancer detection following transrectal ultrasound biopsy and correlates with multiparametric magnetic resonance imaging". *The Journal of Urology* 186.4 (2011): 1281-1285.

2. Hadaschik BA., *et al*. "A novel stereotactic prostate biopsy system integrating pre-interventional magnetic resonance imaging and live ultrasound fusion". *The Journal of Urology* 186.6 (2011): 2214-2220.

3. Sonn GA., *et al*. "Targeted biopsy in the detection of prostate cancer using an office based magnetic resonance ultrasound fusion device". *The Journal of Urology* 189.1 (2013): 86-91.

4. Gayet M., *et al*. "The value of magnetic resonance imaging and ultrasonography (MRI/US)-fusion biopsy platforms in prostate cancer detection: a systematic review". *BJU International* (2015).

5. Mowatt G., *et al*. "The diagnostic accuracy and cost-effectiveness of magnetic resonance spectroscopy and enhanced magnetic resonance imaging techniques in aiding the localisation of prostate abnormalities for biopsy: a systematic review and economic evaluation". *Health Technology Assessment* 17.20 (2013): 1-281.

6. Moore CM., *et al*. "Image-guided prostate biopsy using magnetic resonance imaging-derived targets: a systematic review". European Urology 63 (2013): 125-140.

7. Kuru TH., *et al*. "Critical evaluation of magnetic resonance imaging targeted, transrectal ultrasound guided transperineal fusion biopsy for detection of prostate cancer". *The Journal of Urology* 190 (2013): 1380-1386.

8. Valerio M., *et al*. "Detection of Clinically Significant Prostate Cancer Using Magnetic Resonance Imaging-Ultrasound Fusion Targeted Biopsy: A Systematic Review". *European Urology* 68.1 (2015): 8-19.

Volume 3 Issue 1 January 2019