



Oncology

A Novel Approach for Performing Bone Marrow Aspiration at the Time of Radical Prostatectomy



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ABSTRACT

The bone marrow microenvironment represents a “metastatic niche” in which prostate cancer cells may persist and evade cytotoxic therapy. In order to study the biology of prostate cancer dissemination, we have established a safe and efficient method for performing pubic bone marrow aspiration at the time of radical prostatectomy. We herein describe our experience with this technique.

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Introduction

There is increasing evidence that metastatic cancer cells utilize the microenvironment of the bone marrow (BM) as a “metastatic niche” in which they can persist and grow.^{1,2} The clinical significance of a limited population of cancer cells reaching the marrow, however, is unclear. To facilitate investigation of this phenomenon, we sought to establish efficient methodology for assessment of the BM milieu in men with prostate cancer. Herein we present the case of one such participant and describe our novel approach.

Case presentation

A 65 year-old Caucasian male presented with serum PSA of 9.35 ng/mL and a small left-sided nodule on digital rectal examination (clinical stage T2a). Transrectal ultrasound-guided 12-core biopsy revealed Gleason score 4 + 5=9 adenocarcinoma in two of two cores from the left apex, as well as Gleason score 4 + 3=7 and 4 + 4=8 in the left mid-gland and base, respectively.^{99m}Tc-methylene diphosphonate whole body bone scan was negative. As such, the patient was diagnosed with clinically localized high-risk localized prostate cancer.

After appropriate counseling, the patient elected to undergo robot-assisted radical prostatectomy (RARP). The patient was informed of our bone marrow aspiration (BMA) protocol and the risks and benefits of participation. He ultimately elected to participate and provided written informed consent. The study protocol was approved by the institutional review board at the Johns Hopkins Medical Institutions.

Our study protocol was developed for intra-operative obtainment of BMA at the time of radical prostatectomy. The patient was treated with general anesthesia per routine. Aspiration was obtained from the pubic bone using a standard manual device (11G x 100 mm Hospital Trapsystem – HS Hospital Service S.p.A., Aprilia, Italy) as demonstrated in [Video 1](#).

Ten cubic centimeters of aspirate was obtained; total procedure time was approximately 1 min. RARP was performed without complication. The patient recovered from surgery without complication and reported no pain at the site of BMA. He was discharged on postoperative day one. His final pathology revealed organ-confined Gleason score 4 + 5=9 prostate adenocarcinoma; surgical margins and 21 obtained lymph nodes were negative for tumor.

Discussion

There is great interest in better understanding tumor dissemination and persistence in non-native environments. Bone marrow represents a common site of metastasis in men with advanced

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prostate cancer.³ Nonetheless, our understanding of the BM microenvironment remains limited. Despite playing a central role in the evaluation of hematologic disorders, bone marrow aspiration has traditionally represented a clinically burdensome procedure associated with significant discomfort. BMA has most frequently been described from the posterior superior iliac crest,^{4,5} with adequate samples obtained in less than 50% of cases in some series. The inefficiency of these methods presents a significant limitation to our understanding of the metastatic process.

In this report, we have demonstrated a percutaneous approach to BMA, which we have routinely used prior to RARP for men in the lithotomy position. We have similarly derived an open approach for use prior to traditional retropubic radical prostatectomy (Video 2). In some cases, aspiration was performed percutaneously during open procedures due to physician preference. To this point, these methods have demonstrated great success; at the time of analysis, aspirate was successfully obtained in 173 of 180 attempts (96.1%; 99 of 101 open, 74 of 79 percutaneous). All samples analyzed to date have been adequate for bone marrow analysis. These findings suggest the pubic bone is an acceptable site to obtain BMA and may be comparable to the more commonly described iliac crest. We believe these methods provide an efficient means by which the surgeon can routinely obtain bone marrow aspirate.

Conclusion

This report details our initial experience performing bone marrow aspiration at the time of radical prostatectomy. These

methods have proven to be effective and are associated with minimal patient discomfort, thus, we believe this approach may prove useful to others in the appropriate setting.

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.eucr.2016.02.006>.

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