***CORR* Insights®: Image Guided Core Needle Biopsy of Musculoskeletal Lesions: Are Nondiagnostic Results Clinically Useful?**

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Received: 29 July 2013 / Accepted: 6 August 2013 / Published online: 18 August 2013
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Where Are We Now?

Biopsy of musculoskeletal lesions commonly is indicated for indeterminate lesions (particularly when symptomatic, progressive, or aggressive), and lesions that are likely to be malignant. Clinic or image-guided core needle biopsies have largely supplanted the historical gold standard of open biopsies at many tumor centers in recent years because they are generally reliable and less expensive. While lesions with determinate diagnoses on imaging are relatively few in number [4], many benign-appearing lesions do not require biopsy, and can simply be monitored for clinical or radiologic stability. Conversely, many malignant tumors have imaging features such as heterogeneity, necrosis, adjacent tissue invasion, or destruction. The size, depth or location of the tumor is also highly suggestive of a malignant or aggressive process. The prebiopsy clinical and radiologic differential

diagnosis has important implications for the pathologic interpretation of biopsy specimens, particularly “nondiagnostic” biopsies.

The interesting study by Didolkar et al. reported a diagnostic yield rate of 74% for image-guided core needle biopsies, which is somewhat lower than some previously reported rates [2]. This is important, as the goal of a biopsy is to arrive at a definitive tissue diagnosis. However, the merit of this study lies in the authors’ analysis of data with regard to the clinical utility of the nondiagnostic biopsies (60% of which were deemed clinically useful), as well as the ability to predict lesions with the likelier result of nondiagnostic core needle biopsies. In fact, 91% of all nondiagnostic biopsies in the current study were for benign (or ostensibly benign) lesions. This study demonstrates the potential utility of nondiagnostic biopsies. Although the difference is small and perhaps semantic, this should not be interpreted as an excuse to perform core needle biopsies of

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This CORR Insights® is a commentary on the article “Image Guided Core Needle Biopsy of Musculoskeletal Lesions: Are Nondiagnostic Results Clinically Useful?” by Didolkar and colleagues available at: DOI: 10.1007/s11999-013-3170-9.

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This *CORR* Insights® comment refers to the article available at DOI: 10.1007/s11999-013-3170-9.

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lesions in which a diagnosis is unlikely or a biopsy potentially unnecessary; rather, I believe it is an indication that a lack of evidence of malignancy or aggressiveness on biopsy specimens can provide reassurance and useful clinical information for lesions in which a biopsy is indicated.

Where Do We Need to Go?

A major limitation of the study by Didolkar and colleagues was the retrospective determination of biopsy utility. Two experienced musculoskeletal oncologists reviewed the nondiagnostic biopsies, and assessed the clinical usefulness of nondiagnostic results on the basis of the clinicoradiopathologic information available. The oncologists also had the benefit of subsequent followup, observation, treatment decisions, and so-called 20/20 hindsight. Although one could argue this biases the clinical usefulness rate of nondiagnostic biopsies in a positive fashion, a counter-argument exists that many of these lesions were observed or excised without repeat biopsy. Although sometimes a repeat biopsy helps, even these sometimes are nondiagnostic, and in this setting, one needs to exercise the right balance of caution and courage in order to care for the patient. While it is true that the fewer nondiagnostic biopsies we obtain, the better, it is also true that we probably will always have some, and knowing what to do with these certainly remains an important question, which will need to be answered using prospective studies of similar design to that of Didolkar et al. Additionally, Didolkar's analysis did not include spine or pediatric lesions, for which the clinical utility of nondiagnostic biopsies remains largely undetermined. Finally, the differing propensities of different kinds of lesions to generate nondiagnostic results remain, for the most part, undefined.

As noted, the 74% diagnostic yield rate in the Didolkar et al. study is lower than some other reports [2]. However, as mentioned, perfect diagnostic accuracy for any biopsy technique likely is not an achievable goal. Rather, future investigations should seek to maximize the clinically and therapeutically useful information obtained with or without biopsy for lesions such as cysts and myxoid neoplasms, for which diagnostic accuracy is notoriously low [1], as even classic findings such as fluid-fluid levels are not diagnostic of any single entity [5].

How Do We Get There?

As with all single-facility studies, the applicability of these findings to other facilities, even tumor specialty centers, warrants evaluation. While always easier said than done, a prospective, multi-institution observational study would provide a greater volume of data and more broadly applicable findings.

Unspoken, but implied in the study by Didolkar et al. was that these patients were imaged, biopsied, and treated at a specialty center with evaluation of the more perplexing cases by a multidisciplinary tumor board. The importance of this has been supported by several studies on soft tissue sarcomas and cannot be overstated [3]. Pre and postbiopsy risk stratification and multidisciplinary evaluation may improve the clinical utility of nondiagnostic biopsies further by maximizing the clinicoradiopathologic expertise available to synthesize all available information. Doing so has important implications for patient counseling, confirming the necessity of biopsy, treatment or observation planning, and ultimately to avoid the undesirable scenarios of observing malignant or aggressive tumors, or performing inappropriate marginal excisions or unnecessary wide excisions [1]. Finally, improved biopsy diagnostic accuracy remains desirable; refinements of imaging modalities, use of novel tissue stains, discovery of more and better genetic markers, and selective use of alternate biopsy techniques as they are developed should help us get there.

References

1. Adams SC, Potter BK, Pitcher JD, Temple HT. Office-based core needle biopsy of bone and soft tissue malignancies: an accurate alternative to open biopsy with infrequent complications. *Clin Orthop Relat Res.* 2010;468:2774–2780.
2. Dupuy DE, Rosenberg AE, Punyaratabandhu T, Tan MH, Mankin HJ. Accuracy of CT-guided needle biopsy of musculoskeletal neoplasms. *AJR Am J Roentgenol.* 1998;171:759–762.
3. Gustafson P, Dreinhofer KE, Rydholm A. Soft tissue sarcoma should be treated at a tumor center: a comparison of quality of surgery in 375 patients. *Acta Orthop.* 1994;65:47–50.
4. Papp DF, Khanna AJ, McCarthy EF, Carrino JA, Farber AJ, Frassica FJ. Magnetic resonance imaging of soft tissue tumors: determinate and indeterminate lesions. *J Bone Joint Surg Am.* 2007;89:103–115.
5. Van Dyck P, Vanhoenacker FM, Vogel J, Venstermans C, Kroon HM, Gielen J, Parizel PM, Bloem JL, De Schepper AMA. Prevalence, extension, and characteristics of fluid-fluid levels in bone and soft tissue tumors. *Eur Radiol.* 2006;16:2644–2651.