A Procedure For Handling Malignancies of Bone for Accurate Histopathological Assessment

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Abstract

Background Information

Bone resections involved by either benign or malignant disease are complex specimens and require special processing. Irrespective of experience, many pathologists, residents, and pathologists’ assistants (PA’s) are apprehensive of these specimens due to their infrequency. Standardized protocols provide reassurance as well as a systematic approach. This presentation offers such a protocol and utilizes a surprisingly simple technique of whole-specimen freezing and slab sectioning, as implemented at the sister institutions of Mayo Clinic Hospital in Phoenix and Phoenix Children’s Hospital.

Rational

The goals of specimen evaluation are multiple, including documentation of diagnosis, margin status, disease extent, tumor classification, imaging correlation, and response to neoadjuvant treatment, if applicable. To this end, standard protocols for processing bone extirpations are desirable because they yield reproducible results. The following procedure is easy to follow and affords the pathologist a precise gross examination and exceptional histology, thereby yielding all of the information necessary to render a clear diagnostic report.

Methodology

This presentation details the whole-specimen freezing and slab sectioning process; standard grossing elements are beyond the scope of this presentation and have been previously described. Once the intact specimen is received, gross photographs are taken, clinical imaging is reviewed, and vascular/neurovascular margins are taken prior to inking margins. The specimen is radiographed, and following imaging, any metal hardware is removed if possible. The specimen is placed in a freezer (-70 to -140) for a minimum of four hours. The resection must be completely frozen and may be left in the freezer overnight or over the weekend without risk of freeze artifact.

When sectioning the specimen, a saw suitable for cutting bone and soft tissue is utilized, such as a band or a comparable butcher saw. A small table top saw with a diamond blade may be used for smaller specimens. The first cut should be transverse to include the entire bone and soft tissue margin which is subsequently fixed, decalcified, and submitted. The specimen should then be cut along its long axis in 4-6mm serial slices, either coronal or sagittal, in the plane demonstrating maximum tumor burden, and utilizing one continuous cut. The resulting “slabs” are gently cleaned of bone dust under cool running water with the aid of a sponge or surgical brush and then photographed. The slabs are reviewed with the Pathologist, the appropriate slab for analysis is determined and the specimen is fixed in 10% formalin for a minimum of 24 hours. All soft tissue margins and malleable areas of noncalcified tumor are sampled prior to placing the specimen into decal. Remaining sections of the selected slab(s) are submitted following decalcification. All sections submitted should be mapped and annotated by using the photographed images. These sectioning maps are utilized by the Pathologist during review. (See figures)

Results

Slab sectioning following whole-specimen freezing results in crisply visible anatomic relationships by gross exam. In our experience, these multiple thin sections allow for superior visual inspection of the disease process and aids in the overall selection of the most desirable sections for analysis and margin evaluation. (See figures)

Conclusion

Due to their infrequency in standard practice, resections harboring bone tumors may intimidate even the most experienced prossector. Whole–specimen freezing followed by slab sectioning keeps the specimen crisply intact, thus providing superior gross evaluation of tumor involvement and margin status. We recommend slab sectioning following whole-specimen freezing for all bone tumor resections, and we and offer our standardized protocol in detail.