Vacuum-Assisted Minimally Invasive Biopsy of Soft-Tissue Tumors


Some patients with soft tissue sarcoma experience a delay in initiating therapy due to the use of techniques that result in diagnostic failure, inadequate tissue samples, or an unplanned excision that complicates further treatment. Incisional biopsy and core needle biopsy have been the most effective techniques for obtaining tissue samples for a detailed histological evaluation; however, the small size of the sample obtained for both techniques may limit the accuracy of the histopathological assessment.

This retrospective study was performed to investigate whether vacuum-assisted biopsy could serve as a new diagnostic tool for soft tissue neoplasms by evaluating its accuracy and practicality and comparing this method with that of conventional incisional biopsy. A total of 150 patients were included in the study and were placed into either the vacuum-assisted biopsy (n=75) or open incisional biopsy (n=75) group. Vacuum-assisted biopsy was performed with a Mammotome system (Mammotome HH [Hand Held] Biopsy System, Ethicon Endo-Surgery, Norderstedt, Germany) and an 8-gauge needle. Incisional biopsy was performed under sterile conditions with the patient under general anesthesia.

Forty-nine (65%) of the 75 patients in the vacuum-assisted biopsy group were treated with early wide resection after biopsy, 61 (21%) with compartmental resection, and 10 (13%) with another type of resection such as palliative marginal resection. Forty-six (62%) of the 75 patients in the incisional biopsy group were treated with wide resection, 13 (18%) with compartmental resection, and 15 (20%) with another type of resection.

The vacuum-assisted biopsy procedure was performed successfully in 75 (99%) of the 75 patients. The accuracy of vacuum-assisted biopsy (96%) was comparable with that of incisional biopsy (99%). Tumors were correctly characterized as benign or malignant in 96% (95% confidence interval [CI], 92% to 100%) of patients in the vacuum-assisted biopsy group compared with 99% (95% CI, 96% to 100%) of the patients in the incisional biopsy group.

Vacuum-assisted biopsy correctly characterized the tumor grade in 95% (95% CI, 90% to 100%) of patients in the vacuum-assisted biopsy group compared with 99% (95% CI, 96% to 100%) of the patients in the incisional biopsy group.

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The sensitivity of vacuum-assisted biopsy was 93% (95% CI, 71% to 100%), the specificity and the positive predictive value were both 100%, and the negative predictive value was 91% (95% CI, 85% to 98%). The overall accuracy of vacuum-assisted biopsy was 96% (95% CI, 92% to 100%).

The overall complication rate after vacuum-assisted biopsy was lower than that after open biopsy (1.3% compared with 2.7%), and no major complications were identified in either group.

Vacuum-assisted biopsy combines the advantages of a minimally invasive procedure with reduced morbidity, appears to be a safe technique, and provides a new tool for the diagnosis of soft tissue tumors.
In this retrospective study conducted at HELIOS Hospital, Berlin, Germany, vacuum-assisted biopsy in 75 consecutive patients was compared with open incisional biopsy a group of 75 patients with a soft tissue tumor of unknown diagnosis. Patients who received chemotherapy or radiation therapy prior to tumor excision and patients who received palliative care without tumor excision were excluded. The vacuum-assisted biopsy was successfully performed in all but 1 patient, in whom the procedure was abandoned due to technical difficulties with the needle. All patients in the open incisional biopsy group successfully underwent the procedure. The authors reported an accuracy of 96% for vacuum-assisted biopsy compared with 99% for incisional biopsy. Vacuum-assisted biopsy also compared favorably to open incisional biopsy in characterizing tumor diagnosis and grade. The sensitivity of vacuum-assisted biopsy was 93% with specificity and positive predictive value of 100% and a negative predictive value of 91%. The overall accuracy was 96%.

The management and diagnosis of soft tissue tumors remains a challenge in orthopedic surgery. Fine needle biopsies and open incisional biopsies have been the most common types of biopsies, with computed tomography (CT)-guided biopsies reserved for more difficult to access tumors. Vacuum-assisted biopsies with ultrasonographic guidance seem to yield results comparable with open incisional biopsies at a significantly reduced cost. Although this technique probably will not replace in-office needle biopsies for easily accessible tumors, it certainly would be a viable alternative to CT-guided biopsies for more difficult cases. In addition, the patient would be spared the radiation associated with CT-guided procedures. The up-front cost of the required equipment will probably limit this procedure to centers that specialize in the management of soft tissue tumors. This is not necessarily a bad thing because one of the time-honored maxims in orthopedics is “do not biopsy it if you do not plan on taking care of it.” This technique adds another weapon to the armamentarium of the orthopedic oncologist and will no doubt aid in the management of these challenging patients.

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