Journal of Medical Ultrasound (2014) 22, 152—157

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.jmu-online.com

ORIGINAL ARTICLE

Optimizing Clinical Utility of the Ultrasound-guided Core Biopsy for Head and Neck Tumor

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Received 31 March 2014; accepted 4 June 2014
Available online 2 September 2014

KEY WORDS
head and neck tumor,
minimally invasive,
small-gauge core biopsy,
ultrasound

Background: The goal of this study is to validate the clinical utility and define the procedure setting of minimally invasive core biopsy that is performed under ultrasound guidance with small-gauge needles (USCB) in head and neck tumors.
Materials and methods: A consecutive 56 patients with head and neck tumors received USCB with informed consents. Patients received USCB with different gauges of core needles randomly. The adequacy rate of the specimen and other clinical parameters were analyzed. The adequacy is defined as the target lesion is taken under ultrasound and specific diagnosis could be made by the specimen.
Results: The overall diagnostic adequacy rate of USCB was 91%. Among different needle gauges of USCB, the 18-gauge group demonstrated a 100% adequate rate, a lower anesthetic demand (16.6%), and shorter postprocedure bleeding time (3.0 $\pm$ 1.4 minutes), showing significant differences when compared with others. No immediate or late complications were noted after procedure in all patients.
Conclusion: USCB is minimally invasive and provides pathological information for diagnosis. It is a precise, safe, and office-based procedure and is suggested to be included in the diagnosis of head and neck tumors.

Conflicts of interest: none declared.

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http://dx.doi.org/10.1016/j.jmu.2014.06.001

Introduction

Head and neck tumors are frequently encountered in clinical practice, and always pose demanding challenges for accurate diagnosis and appropriate treatments. To make definite diagnoses of head and neck masses, many disease entities should be differentiated, ranging from congenital anomalies, infection, and inflammation to neoplastic lesions [1]. Because of the lengthy list of differential diagnosis of head and neck tumors, harvesting a tissue specimen for making a pathological diagnosis is a mandatory requirement in treating head and neck tumors.

In tumor tissue harvest, open biopsy remains the standard procedure for decades. Because of its nature of surgical intervention, the procedure of open biopsy has several disadvantages including wound and scar formation, time consumption, higher cost, and contraindications for patients with multiple comorbidities. In addition, open biopsy is not generally recommended because of its invasiveness and the possibility of complicating subsequent management. [2—4]. However, fine needle aspiration (FNA) has been used for small wounds and is free of anesthesia, is better tolerated, and has few complications [5]. To make the definite diagnosis by FNA, the accuracy is largely dependent on cytopathological expertise and techniques [6]. Nonetheless, even with experienced surgeons, the incidence of nondiagnostic results is approximately 10—15%. Most importantly, it is difficult to grade and classify tumors by FNA because the results are based on cytological analysis.

In light of the drawbacks related to open biopsy and FNA, core biopsy (CB) is another choice of diagnostic procedure. It is a well-established, tissue-obtaining technique that has been widely applied in many medical specialties, such as breast and renal tumors [7—13]. In the head and neck, it has been successfully used in tissue harvest of lymph nodes, thyroid lesions, parotid tumors, and pediatric craniofacial masses [10,13—18]. For head and neck malignancy, CB is suggested to be a safe and efficient tool for tissue harvest [19,20], especially when guided by ultrasound [14].

However, needles with 12—16 gauges, which were originally designed for breast and abdomen lesions, were used for head and neck tumors in the previous attempts [19,21—23]. It is believed that needles with larger gauges are associated with an increased possibility of bleeding, wound dehiscence, anesthetic requirement, and tumor seeding potential [24,25]. These disadvantages made large-gauge CB clinically impractical for head and neck tumors. Core needles with smaller gauges had been tried in cervicofacial lesions [8,26—29]. Until now, a comprehensive study that defines the CB procedure for a better diagnostic yield and utility in head and neck tumors is still lacking.

In this study, we will verify clinical utility of ultrasound-guided small-gauge core biopsy (USCB) and establish the procedure of USCB specific to head and neck tumors.

Materials and methods

Fifty-six consecutive patients receiving USCB for their head and neck mass were enrolled in this study. Complete ear, nose, and throat field evaluation was performed in each patient and head and neck mass was confirmed by ultrasound examination. The study protocol was approved by the Institutional Review Board of National Taiwan University Hospital. Tumors smaller than 1 cm or with only cystic contents that were inappropriate for this procedure were excluded [30]. All eligible patients received sampling procedures with informed consent.

For the USCB procedure, patients were in the supine position with the neck hyperextended. A panoramic ultrasound examination of head and neck was performed prudently in each patient with a 12 MHz linear probe (Hitachi Hivision Avius with EUP-L75, Hitachi Aloka Medical, Tokyo, Japan or Toshiba Aplio SSA790 diagnostic ultrasound system, Tochigiken, Japan). Sonographic features and locations of the lesions were recorded. A color duplex model was used to avoid vasculature and exclude the presence of hypervascular tumor. After identifying the lesion of interest, the overlying skin was disinfected and draped. Under echo-guidance, the automatic adjustable biopsy needles (Temno Evolution™ Biopsy Devices, Cardinal Health Inc., Dublin, USA) that were 16 gauge (G), 18 G, or 20 G were used randomly for specimen harvest (Fig. 1). We used the core needles randomly in the beginning by a patients' chart number. However, pathological information tended to be satisfied in smaller needles during the study, so we used only 18 G and 20 G later. Two needle throw lengths (10 mm or 20 mm) could be adjusted for precise sampling. Local anesthesia (2% xylocaine) was injected at the subcutaneous area for core needle insertion. Local anesthesia was used only by patients' requests after detailed discussion. The core needle was inserted under ultrasound guidance like FNA, without any skin incision. We identified the needle into the mass under ultrasound and then pushed the inner needle forward. Then, the core needle was fired and the specimen was retained in the needle notch. Only one needle pass was done to avoid any possibility of tumor seeding. Bleeding was controlled with pressure and the wound was examined every minute to record bleeding time. Possible complications in the literature, including bleeding, hematoma, nerve palsy, and pneumothorax, were also monitored [25]. After the procedure, the patient was observed for 20 minutes before leaving, and followed up in regular clinic visits. All harvested samples were sent for staining and microscopic examination. The related clinical parameters and pathological findings were recorded and analyzed.

The diagnostic adequacy is defined as a definite diagnosis could be concluded by the specimen retrieved from USCB procedure. The adequacy rate was obtained by dividing the number of adequate samplings with the total number of specimens. The comparison of adequate rate was analyzed by the Fisher's exact test. The comparison of local anesthesia requirement was analyzed by a logistic regression test to calculate the odds ratio between different groups. The comparison of bleeding time between different USCB gauges was analyzed by the Kruskal-wallis post-hoc test. All statistical analysis was performed by IBM SPSS Statistics Version 22.0 (IBM Corporation, USA), and $p < 0.05$ was regarded as significant in all tests.

Results

In all 56 patients receiving USCB, there were 36 male and 20 female patients. The average age was 51 years