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REVIEW ARTICLE

Application of Ultrasound-guided Core Biopsy in Head and Neck

CME Credits

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Abstract Head and neck tumor is frequently encountered clinically, but the list of differential diagnosis of neck lumps is lengthy. Consequently, the major concern of diagnostic procedure is to effectively narrow the possibility, and finally make an accurate diagnosis. Ultrasound-guided core biopsy (USCB) has been well established in many medical fields as the standard tissue sampling procedure, with less harm than open biopsy (OB) and more pathological information than ultrasound-guided fine needle aspiration (USFNA). In addition, using the small-cutting needle, USCB can be easily and safely performed for head and neck lesions. In this review, we present our optimal procedure of applying USCB and review its roles in head and neck, including cervical lymph nodes, thyroid tumors, salivary tumors, pediatric head and neck lesions, cervical infectious diseases, head and neck cancer and aerodigestive tumors. The procedure-related bleeding and tumor seeding are rarely reported even after 7-year follow up in the literature. The head and neck surgeons are competent to take care of any unpredictable complications caused by USCB. According to our experience, USCB can be utilized as a powerful tool in surgeon's hands to explore the possibilities of doing tissue sampling in many areas of head and neck.

Conflicts of interest: None.

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Introduction

Head and neck tumor is frequently encountered clinically, and a complete evaluation of head and neck fields is the first step to make the differential diagnosis. To make the definite diagnoses of head and neck tumors, numerous disease entities should be differentiated, including congenital anomalies, infectious and inflammatory diseases, and neoplastic lesions [1]. The origins of cervical tumors include lymph node, major salivary glands, thyroid, neurogenic tumor, vascular tumor, congenital cyst, acquired abscess, or hematoma. Because of the lengthy list of differential diagnoses of neck lumps, the major role of diagnostic procedures is to effectively narrow the possibility, and finally make an accurate diagnosis. Tissue sampling is regarded as the standard procedure to make the final diagnosis.

Conventionally, the standard tissue sampling methods of head and neck tumors include open biopsy (OB) and ultrasound-guided fine needle aspiration (USFNA). OB always provides sufficient specimens that help make the final pathological diagnosis. However, creation of a surgical wound and anesthesia are required for OB procedures. It is especially not favorable for women because esthetic outcome is always cause for concern. In addition, OB is contraindicated for infirm patients who cannot tolerate general anesthesia. USFNA can precisely harvest cells from the target lesions with only a small needle puncture wound. Because only cells are harvested for evaluation, the specimen read by an experienced cytopathologist is important for obtaining the correct diagnosis. Though immediate on-site interpretation of USFNA results can improve diagnostic accuracy by reducing inadequate sampling, it is expensive and not affordable by many health care systems [2].

The application of ultrasound-guided core biopsy (USCB) in head and neck lesions has recently drawn much attention. In addition to having a high diagnostic rate, USCB can reduce the need for general anesthesia and improve esthetic outcome [3,4].

Selection of the best diagnostic tool among OB, USFNA, or USCB for head and neck tumor depends on the pros and cons of each method. In cases with head and neck tumors that are contraindicated for OB, USCB is a better diagnostic tool than FNA because it provides pathological evidence. For parotid gland tumors as examples, OB is not suggested for tissue harvest because of a high risk of facial nerve injury and tumor seeding. Consequently, FNA and USCB are the diagnostic methods of choice for parotid gland tumors. A report based on an 11-year experience showed the nondiagnostic rate of USCB in the parotid gland was zero and that of FNAC was 33% [3]. In cases other than parotid gland tumors, the nondiagnostic rates of USCB, FNA, and OB were 3%, 44%, and zero, respectively [3].

Development of USCB

The needle biopsy technique was first available in 1982. Tissue biopsies could therefore be performed by one examiner under real-time ultrasound guidance [5]. USCB currently is well established in many medical fields as the standard tissue sampling procedure [5—11]. In solid organs such as breast lesions, USCB demonstrates diagnostic accuracy similar to that of OB, but with a lower complication rate [10]. It also bears minimal risk of tumor spreading in renal tumor diagnosis [9]. A systematic review proves the role of USCB in pediatric tumors, which was associated with a 94% biopsy adequacy rate, 94% diagnostic adequacy rate, and 1% complication rate [8]. USCB had also been used to diagnose thyroid nodules, with 87% adequacy and zero false-negative rates [11]. It was concluded that USCB is an accurate and safe alternative to USFNA in the assessment of thyroid nodules. For the head and neck, USCB has been used in the diagnosis of many diseases. For example, USCB for diagnosing superficial lymphadenopathy, especially in the neck and axilla, was first developed in Taiwan. Other disease entities, including metastasis of malignancy, lymphoma, tuberculosis, Kikuchi-Fujimoto disease, and benign lymphoid hyperplasia has also been diagnosed by USCB [6].

Optimizing the procedure of applying USCB for head and neck tumors

Though it is possible to apply USCB techniques in head and neck regions, the procedure routinely used in other medical fields certainly is not useful for diagnosing head and neck tumors. The 12—16-gauge cutting needles, which are frequently used in USCB, are originally designed for breast and abdominal lesions. They had been used for diagnosing head and neck lesions [12]. It is believed that large-gauge needles are associated with an increased possibility of procedure-related complications, such as bleeding, wound dehiscence, anesthetic requirement, and tumor seeding potential [13]. The head and neck is a restricted anatomical space with many complex and delicate structures. Diagnostic intervention should be less invasive to prevent any related morbidity. Therefore, using cutting needles with large gauges is clinically impractical for head and neck tumors. We attempted to optimize the USCB procedure for head and neck tumors [14]. Using the small cutting needle,

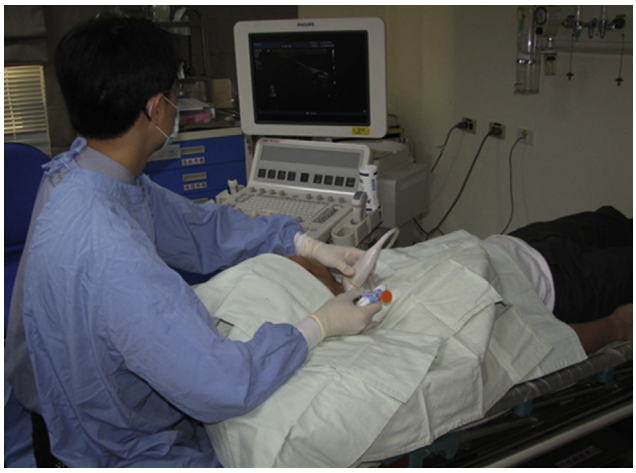

Fig. 1 Procedures of ultrasound-guided core biopsy. The probe is in the surgeon's left hand and the core needle is in the right hand. The target lesion is harvested under ultrasound guidance using the free hand method.