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The Buccal Space: A Doorway for Percutaneous CT-Guided Biopsy of the Parapharyngeal Region

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Summary: We performed percutaneous CT-guided needle biopsies with a transfacial approach in the diagnosis of lesions of the parapharyngeal region. Via the buccal space, core needle biopsy specimens were obtained in eight patients with known parapharyngeal abnormalities identified by CT and/or MR imaging. In all cases, sufficient tissue was obtained to provide a definitive histologic diagnosis. There were no significant complications. This approach provides a reliable method for evaluation of parapharyngeal lesions.

Fine-needle aspiration has played a major role in the evaluation of head and neck masses. More recently, core needle biopsies have provided the pathologist with more tissue, enabling a higher degree of diagnostic accuracy. A newly discovered mass at the base of the skull was once considered to be a diagnostic dilemma because of the well-described contraindications to early open biopsy, including seeding of malignant tumor cells (1, 2) and creation of a biopsy incision that would adversely affect future surgical procedures (1, 3). Definitive diagnoses of head and neck masses can often be readily formulated on the basis of material obtained from needle aspiration biopsy. Initially pioneered by Martin et al in the 1930s (4), fine-needle aspiration biopsy has gained general acceptance as a powerful tool in the evaluation of head and neck masses, with several large studies documenting its safety, high accuracy rate, and cost-effectiveness (5–9).

In head and neck masses, which are deep-seated and difficult to palpate, fine-needle aspiration with CT guidance has been especially useful. Various approaches to deep-seated masses using CT guidance have been described, including needle biopsy of lesions of the parotid gland (8, 10), Meckel's cave (11), foramen ovale (12), middle cranial fossa (13), nasopharynx (14, 15), sphenoid ridge and maxillary sinus (15), nasal cavity (8, 16), and infratemporal fossa (8, 16). Percutaneous needle biopsy of the parapharyngeal region has been reported previously (17). We describe our experience in using a transfacial approach for percutaneous CT-guided needle biopsy of parapharyngeal lesions via the buccal space.

Methods

From December 1990 through January 1996, 54 patients with lesions involving the parapharyngeal region had CT, MR imaging, and/or MR angiography. Eight of these patients had lesions that were not readily accessible by the otolaryngologist and therefore underwent CT-guided biopsy. In all eight patients, a core biopsy was performed via the buccal space.

All patients were scanned in the supine position. Normal laboratory values, including international normal ratio (INR), prothrombin time, partial thromboplastin time, hematocrit, and platelets, were required prior to any biopsy. One hundred forty milliliters of iodinated contrast material (Isovue-300) was injected intravenously with a power injector (PercuPump, E-Z-EM Inc, Westbury, NY) at a rate of 2 mL/s for a total of 60 mL, followed by a 20-second delay and then 1 mL/s for the remainder of the contrast bolus. The entire procedure was performed with the patient on the table of the CT scanner (Somatom-Plus, Siemens Medical Systems, Iselin, NJ). During the bolus injection, it is particularly important to note the location of the carotid artery relative to adjacent anatomic landmarks. The carotid artery is not opacified during the actual biopsy procedure, and its location is approximated relative to previously identified adjacent anatomic landmarks. To reduce the risk of carotid injury, biopsy needles were always directed medial to the region of the carotid space. After visualization of the lesion, the skin overlying the buccal space was prepped and draped in a sterile manner and anesthetized with 1% lidocaine. All biopsies were performed with a nurse present as well as with continuous monitoring of vital signs, cardiac rhythm, and oxygen saturation.

For tumor localization, either a 13-gauge 59-mm coaxial needle (Fig 1) or a 22-gauge tandem needle (Fig 2) was used. An 18-gauge core biopsy needle with a 15- or 22-mm excursion (Magnum, B.I.P., Turkenfeld, Germany) was subsequently introduced. As the core biopsy needle was advanced, the position of its tip was checked several times with CT scans until it was seen to be situated correctly. Two or three core biopsies were performed using a spring-loaded firing mechanism (High-Speed-Multi, B.I.P., Turkenfeld, Germany). Specimens were immediately handled by the pathology technologist who was in attendance. Postprocedural CT scans were obtained in all cases, and patients were observed closely for a minimum of 4 hours after the procedure.

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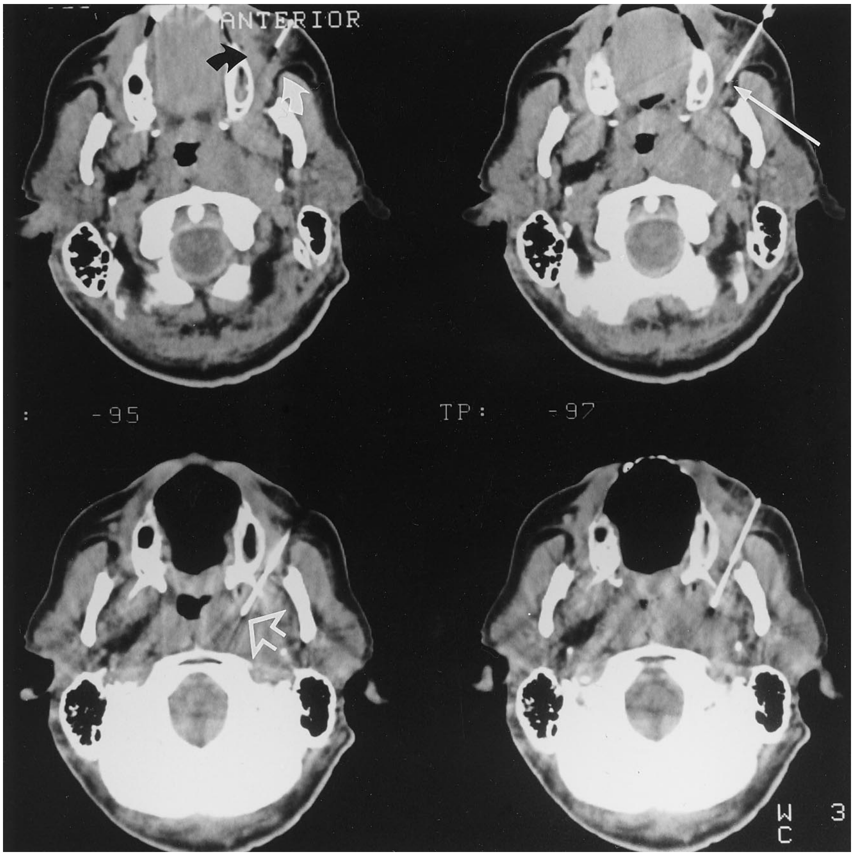

FIG 1. Parapharyngeal biopsy with 18-gauge needle and coaxial technique in a 55-year-old man with a history of myelofibrosis who presented with neck pain and dysphagia. *Top left*: The buccal space is bound medially by the buccinator muscle and maxillary alveolar ridge (*black arrow*) and posterolaterally by the masticator space (*white arrow*). *Top right*: Introducer needle (*arrow*) is shown within the buccal space. *Bottom left*: 18-gauge B.I.P. core biopsy needle (*arrow*) is introduced into the left parapharyngeal space. *Bottom right*: The needle tip position prior to second pass was confirmed. Tissue sample was tested for chloroma.

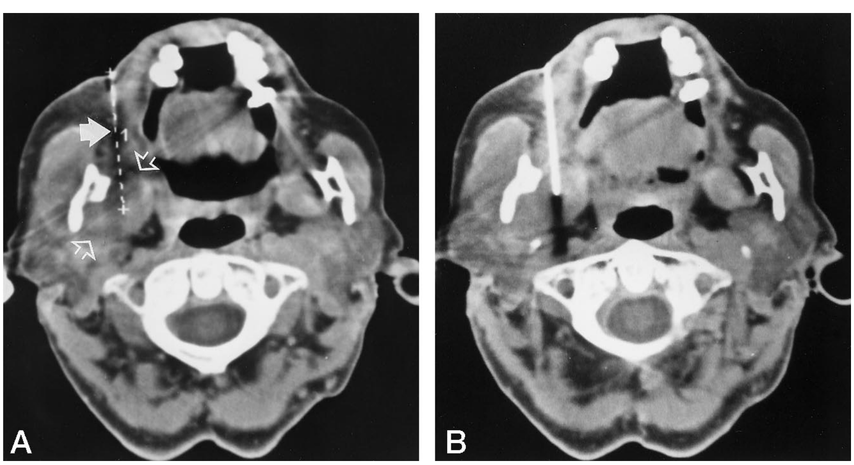

FIG 2. Masticator space biopsy using tandem needle technique in a 71-year-old woman with right-sided neck fullness but no clinical evidence of a distinct mass.

A, CT scan shows abnormal enlargement of the medial pterygoid muscle on the right (*open arrows*). The tip of the 22-gauge guiding needle is barely visible (*solid arrow*). *Dashed lines* indicate planned approach.

B, An 18-gauge B.I.P. core biopsy needle is subsequently introduced. Needle tip is visible within enlarged medial pterygoid muscle. Tissue sample was diagnostic for lymphoma.

Results

A coaxial localization technique was used in four patients and a tandem needle localization technique was used in the remaining four patients. In all eight patients, sufficient histologic material was provided for a diagnosis. These results are summarized in the Table. There were no postprocedural complications.

Discussion

The buccal space, which consists primarily of the buccal fat pad, is bound medially by the buccinator muscle and the maxillary alveolar ridge. The buccal space is bordered laterally by muscles of facial expression, which include the lesser and greater zygomatic muscles and the risorius muscle. The masticator space, including the masseter and temporal muscles, mandible, and lateral and medial pterygoid muscles, forms the posterior aspect of the buccal space (Fig 3). Superior to the buccal space lies the temporal fossa, while the submandibular space is located inferiorly. Notable anatomic structures located within the buccal space include the distal portion of the parotid duct (Stenson's duct), the facial artery and vein, the buccal artery, buccal branches of the facial and mandibular nerves, and accessory parotid lobules. CT and MR imaging characteristics of the buccal space have been well described (18).

Summary of CT-guided biopsies of the parapharyngeal space in eight patients

Case	Sex/Age, y	Clinical History	Biopsy Results	Comments
1	M/57	Throat pain for 2 mo	Squamous cell carcinoma	Surgical confirmation
2	M/61	Throat pain/dysphagia	Squamous cell carcinoma	
3	M/48	Throat pain for 1 mo	Squamous cell carcinoma	Surgical confirmation
4	F/68	History of squamous cell carcinoma now with dysphagia	Squamous cell carcinoma	
5	F/71	Neck fullness	Lymphoma	Confirmed by bone marrow biopsy
6	M/55	Neck pain	Chloroma	History of myelofibrosis
7	F/49	History of thyroid carcinoma now with neck pain	Metastatic thyroid carcinoma	Surgical confirmation
8	F/67	Fever with neck pain	Abscess	Surgical drainage

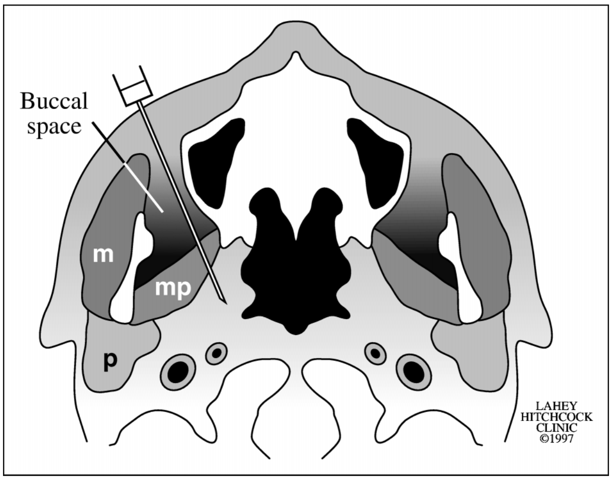

FIG 3. Schematic diagram shows the buccal space and biopsy needle. m = masticator muscle; mp = medial pterygoid muscle; p = parotid gland.

The parapharyngeal region forms the posteromedial border of the masticator space. It is this anatomic relationship that permits a transfacial approach from the buccal space, through the medial pterygoid muscle of the masticator space, to the parapharyngeal region.

In our series, a diagnosis was achieved in eight of eight patients. The success rate for definitive histologic diagnosis from needle aspirations of the head and neck has been reported to be quite high (80% to 100%) (2, 7, 9, 19–21). A notable exception, however, is in the diagnosis of lymphoma (7), in which a definitive diagnosis is occasionally confounded by the difficulty of differentiating lymphoid hyperplasia from lymphoma. The difficulty of immunophenotyping needle aspiration specimens may also represent a diagnostic dilemma. Core biopsy, however, provides more tissue for the pathologist and is thus more likely to provide a diagnosis.

Although we used both a coaxial and a tandem approach, we preferred the coaxial system. The coaxial technique requires the positioning of only one needle (ie, the outer guiding needle), which we believe reduces the risk of potential complications. In addition, the greater amount of tissue provided by a large-gauge biopsy needle was thought by our pathologists to increase the chance of making a definitive diagnosis, particularly in cases of lymphoma.

No complications were encountered in our series of eight patients. As previously noted, extreme care must be used to avoid injury to the carotid artery, as hemorrhage into a closed space could have potentially catastrophic results. Other possible complications include pseudoaneurysm formation from arterial injury, injury to the facial and mandibular nerves, injury to the facial artery, and sialadenitis subsequent to injury to the parotid duct. The use of either a tandem or coaxial needle for initial tumor localization is thought to decrease these risks. Furthermore, we believe that the use of a core biopsy needle in conjunction with a spring-loaded firing mechanism decreases overall risk because of the well-defined excursion length.

Conclusion

We used a transfacial approach for CT-guided needle biopsies via the buccal space. While we did not encounter any significant complications in our series of eight patients, more experience would be appropriate before this procedure is considered entirely safe.

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