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Case Report

Preoperative Ultrasound-guided Head and Neck Non-palpable Tumor Detection

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Abstract

Objective: Preoperative ultrasound-guided breast cancer detection was developed in the 1980s for non-palpable breast cancers. This technique was applied to neck surgery in 5 specific cases.

Methods: Retrospective study to assess the efficacy and safety of this technique.

Results: The mean surgical time was 35.2 ± 15.2 min. There were no complications of this percutaneous target location procedure. All surgical procedures allowed easy target retrieval without any complications. All targets were later confirmed to be the site of cancer.

Conclusion: This adaptation of a senology technique to the head and neck region allows us to improve neck procedures by enhancing diagnostic precision, safety, and surgical efficiency.

Introduction

Head and neck non-palpable tumors pose a significant challenge in clinical practice due to the difficulty in identifying specific targets, especially when prior treatments or surgical interventions are involved. Preoperative ultrasound-guided breast cancer detection was developed in the 1980s for non-palpable breast cancers [1-6]. The metallic end of a sterile implantable percutaneous "harpoon" in the form of a hook or double hook is positioned in a non-palpable tumor. The other end, a radio-opaque or non-opaque wire, emerges from the skin. During lumpectomy, the gynecologist follows the wire until the harpoon is palpated and performs an excision with appropriate safety margins.

In cervical surgery, it is sometimes necessary to take a specific non-palpable sample determined by imaging for histological purposes. The challenges include avoiding critical anatomical structures such as major blood vessels and nerves and increasing the complexity of such interventions compared to breast surgeries. Ultrasound-guided techniques were described to improve the neck surgery, by needle [7,8] or harpoon/hook [9-12]. For two years, we have applied the technique of preoperative ultrasound-guided location to neck surgery in specific cases.

Case presentation

After feasibility was confirmed by preoperative ultrasound imaging and after disinfection and local anesthesia, the target was approached transcutaneously under ultrasound control. The tip of the needle (Fil d'Ariane™ Laurane Medical, Le Pradet, France) was positioned within the lesion (Figure 1), and then the harpoon was deployed under visual control, avoiding risky structures, particularly vascular ones. The guide wire was fixed by strips to the skin.

Immediately after the procedure, a CT scan without injection (without contrast) was performed to validate the correct positioning of the harpoon concerning the target to be sampled (Figure 2). On the day of surgery, the occlusive dressing was carefully removed. The incision site did not necessarily correspond to the cutaneous emergence of the guide wire.

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Figure 1: Ultrasound-guided harpoon positioning in patient No. 5. A: position of the patient. B: Fil d'Ariane™, Laurane Medical, Le Pradet, France. C: Zoom on the ultrasonography screen (red arrow = target/harpoon, white arrow = path of the needle)

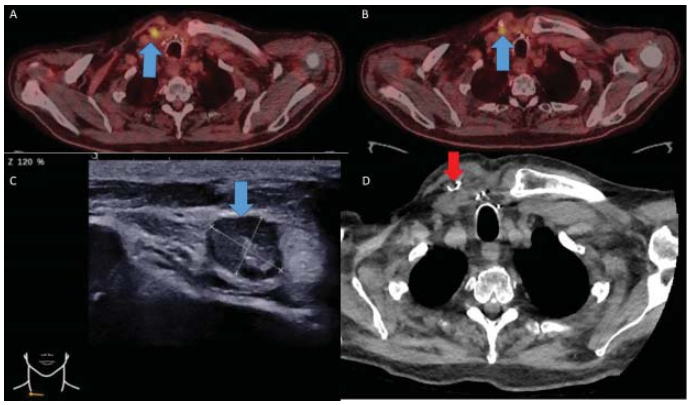

Figure 2: Procedure in patient No. 4. (A and B: preoperative pet scan, C: ultrasound location of the adenopathy, D: CT scan control after harpoon placement) (red arrow = harpoon, blue arrow = target).

Subcutaneous dissection allowed the guide wire to be followed to the swelling, which was located (by careful palpation of the tip of the harpoon) and removed with an appropriate margin planned in advance (surgical video in the appendix).

This study is retrospective. The internal review board of clinical research of our hospital approved this study on November 22, 2022, with ethical approval number NRIPH-CHV-03. A letter was sent to every patient informing them about the study and giving them the option of refusing to have their data used. No patient refused consent.

This procedure was used in 5 patients whose characteristics are presented in Table 1. The patients in this study had various conditions that increased the complexity of the procedure, with a previous history of surgery and/or radiotherapy for head and neck cancer or thyroid cancer, making the detection of non-palpable lymph nodes even more challenging. The cancer stage varied between early-stage and locally advanced cases, further contributing to the diversity of the cohort.

The mean surgical time (from skin opening to closure) was 35.2 ± 15.2 min. There were no complications from this percutaneous target location procedure. All surgical procedures allowed easy target retrieval. By limiting dissection spaces, no drainage was required, and no local complications occurred. All targets were later confirmed to be the site of cancer.

Discussion

Several diagnostic tools are available for detecting non-palpable head and neck tumors, including fine-needle aspiration cytology, MRI, and CT-guided biopsy. However, these methods have limitations. Fine-needle aspiration can yield insufficient samples, MRI may miss small or deep lesions and CT-guided biopsies are associated with higher radiation exposure. This ultrasound-guided technique provides a safer, more precise alternative, especially in patients with challenging anatomical structures or after prior surgeries.

Ultrasound-guided biopsy techniques, such as the one described in this study, have been shown to improve accuracy in head and neck tumor detection. Recent studies, including MacFarlane, et al. [13], highlight the increasing role of ultrasound in the management of head and neck tumors, noting its advantages in visualizing soft tissue structures compared to other modalities. Many examples are seen of using a technique from one specialty in head and neck [7-12] or in other domains [13-15]. This technique was first described almost 40 years ago in breast cancer management [1-5] to locate small, non-palpable tumors within the fatty tissue of the breast for minimal-impact removal in case the tumor was benign. From a radiologist's point of view, the technique applied in ENT is quite similar. Indeed, the target needs to be seen via ultrasound scan, and a harpoon must be deployed. The main difference is the presence of critical structures in the neck, particularly vascular, that are not present in the breast. Even though these vessels can easily be seen via ultrasound scan, it requires a skilled radiologist to perform. Once the preoperative preparation is done, the surgical procedure is very easy and quick. The other imaging techniques (CT scan, MRI, PET scan) give information on the location and/or the activity but don't give the radiologist any advantage compared to the US scan to put a kook within the target. The precision of ultrasound-guided techniques is further supported by studies [14-16], which have demonstrated the accuracy of ultrasound in guiding interventions, significantly reducing the risk of targeting errors compared to traditional palpation-guided methods.

However, every ENT surgeon has encountered such situations without being sure that the precise target was removed before the histological results were obtained many days later. This procedure enables avoidance of this surgical stress, allowing the surgeon to confidently confirm to the patient in the recovery room that the correct sample was removed.

Conclusion

This adaptation of a senology technique to the head and neck region allows us to describe a more refined neck procedure in terms of diagnostic quality (location of each previously targeted lesion), safety (no complications in the harpoon positioning and the surgery), and speed of the surgery.

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(Surgical video in the appendix)

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