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Short Communication

Contrast Enhance Ultrasonography for Oncology

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Abstract

Background: Ultrasonography is a diagnostic method for determining the diagnosis of various diseases. It is non-invasive, non-ionizing and very cost effective diagnostic in compare to Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) scan. Similarly contrast enhanced Ultrasonography (CEUSG) uses contrast agents used intravenously and sometimes intravesically in some cases which improve the diagnostic sensitivity, specificity and accuracy.

Conclusion: Contrast-enhanced Ultrasonography (CEUSG) has a prominent role in lesion characterization with a diagnostic accuracy comparable with CT and MRI scan. CEUSG is a fast, cheap and widely used technique in most of the oncological diseases with additional benefit of lack of nephrotoxicity and radiation.

Keywords: Contrast-enhanced Ultrasonography (CEUSG); Ultrasound Contrast Agent (UCA); Computed Tomography (CT); Magnetic Resonance Imaging (MRI)

Introduction and Background

First-generation ultrasound contrast agents contained micro-bubbles of air that were dissolved in blood when exposed to acoustic pressure in the ultrasound field. First-generation contrast agents were therefore present in the bloodstream for a limited time [1]. Second and third generation ultrasound contrast agents (UCA) include micro-bubbles of perfluorocarbon, nitrogen gas or sulfur hexafluoride stabilized in a phospholipids membrane. The bubbles oscillate when exposed to the ultrasound beam (they are being compressed by the effect of positive pressure created by the ultrasound waves and they expand in the negative pressure phase). The compression of the gas is greater than expansion which creates a non-linear response (echo). This greatly affects ultrasound backscatter and increases vascular contrast in a similar manner to intravenous contrast media used in CT and MRI scan [2]. Examples of ultrasound contrast agents available commercially: SonoVue/Lumason® (Bracco) and Sonazoid. The most common use for CEUSG is for dynamic evaluation of the vascularity of a target lesion, most commonly in the liver or kidney, and the other used is to measure organ perfusion, which can be useful in diagnosing diffuse processes e.g. cirrhosis.

Contrast-enhanced Ultrasonography has a prominent role in lesion characterization with a diagnostic accuracy comparable with CT and MRI scan. CEUSG is a fast, cheap and widely used

technique in most oncological centers with the additional benefit of lack of nephrotoxicity and radiation. In planning biopsies, CEUS can identify necrotic and viable areas of tumors and improve the diagnostic accuracy [3].

For malignant abdominal tumors, sensitivities over 90% in Ultrasonography-guided biopsies have been reported [4,5]. Limitations to success rely on how well the tumor is identified on USG, the location, extent of necrosis and reactive fibrotic tissue within the tumor. CEUS often identifies the tumor, which are invisible on B-mode scan and differentiate the necrotic and viable tumor parts by contrast enhancement. Using a split screen, both the contrast and the B-mode images are visible, optimal for CEUSG-guided biopsy. The diagnostic accuracy with CEUS-guided biopsy from liver tumors increased from 87 to 95.3% [2]. In lung tumors, the necrotic areas can be identified and it also allows easy differentiation of tumor from atelectasis [6]. The accuracy also seems to increase in CEUS-guided biopsies from prostate adenocarcinoma [7] and is expected to increase in retroperitoneal tumors.

Intradermal and subcutaneous injections of Ultrasound Contrast Agent (UCA) in the mammary areola region may have clinical application value for the identification and localization of SLNs in breast cancer patients. The identification rate is higher than those of blue dye method, which can be used as a new tracer of sentinel lymph node biopsy and complement other staining methods to improve the success rate [8].

Overall, CEUS detected 2.7% additional CRLMs (including 4.0% in tumor stage T3/T4) with a significant impact on the oncological therapeutic strategy for 75% of these patients. Patients with tumor stage T_3/T_4 would particularly benefit from CEUSG. We propose CEUS as the first imaging modality for CT-detected lesions of unknown dignity [9]. CEUS is a feasible method of examining blood flow in malignant breast tumors [10].

Conclusion

Middle income country like Nepal, CEUSG is a fast, cheap and widely used technique in most of carcinoma with the additional benefit of lack of nephrotoxicity and radiation. CEUSG has an important task in lesion portrayal with a diagnostic accuracy as good as CT and MRI scan.

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