Fusion Imaging

Virtual Navigator is Esaote’s revolutionary technology for fusion imaging that allows the US examiner to work with real-time ultrasound side-by-side with CT scan and MR volumes, PET and other imaging modalities (e.g., lymphoscintigraphy).

- **Real-time**
- **Low cost examination**
- **No patient irradiation**
- **Extended field of view**
- **No patient depending**
- **Easy image interpretation**

Virtual Navigator takes all the advantages of different modalities and provides a real-time, low-cost and radiation-free solution that aims to guide operators in diagnosis, everyday clinical practice, interventional procedures, research and teaching.

Fusion imaging allows the merging of real-time US capabilities such as Doppler, microV, and elastosonography with information from other imaging modalities.

The Role of Fusion Imaging in Gynecologic Oncology

The approach to oncologic patients needs to be multidisciplinary. A continuous collaboration between all team members (including surgeon, US examiner, radiologist, radiotherapist, oncologist, nuclear medicine) is paramount.

Fusion imaging could simplify the dialogue between the different study team members, and has great educational value for US examiners because they can improve their ability to evaluate imaging examinations other than ultrasound.

Fusion imaging could have many possible applications in patients with gynecologic cancers:

**Ovarian cancer**

Ovarian cancer usually spreads through the peritoneal cavity. Before defining patient management, it’s important to stage the disease and to know its local and distant extension, in order to drive surgical procedures.

**CT scan** is usually the first imaging technique performed on a patient with suspected ovarian cancer, but its resolution for the pelvis is extremely poor. Fusion imaging with real-time US could merge the wide field of view in the CT scan with the high resolution of...
Virtual Navigator Gynecology

“A multidisciplinary approach to the patient is crucial for an oncological referral center: fusion imaging makes it easier and adds a great educational value.”

Ultrasound, in order to give a better picture of carcinomatosis and the relationship between the masses and adjacent organs.

In recent years, PET-CT has grown in importance when it comes to staging ovarian cancer, but sometimes it’s difficult to anatomically localize capitations defined as aspecific (lymph node versus ovary versus peritoneal nodule) and the co-registration CT has poor resolution. The fusion of PET, co-registration CT, and US could help to correctly localize capitation and to define structures affected by the disease.

Endometrial cancer, sarcomas and cervical cancer

MRI is considered the gold standard of imaging techniques worldwide, but in the last 10 years many Italian and European studies have come to light in literature that explore the role of US, where it has a similar, and sometimes better, level of accuracy in defining myometrial infiltration and cervical stromal invasion in endometrial cancer and in describing tumor characteristics and the local extent of the disease in cervical cancer patients. The fusion of MRI and ultrasound could enable real-time agreement in cases with discrepancies between radiological and ultrasonographic evaluation.

The same procedure (fusion) can also be used between US and CT scans and PET for patients affected by endometrial or cervical cancer or sarcoma.
"With fusion of PET CT and US, it’s possible to correctly locate aspecific capitations in patients with ovarian cancer"

Valentina Chiappa, MD, IRCCS, National Cancer Institute (INT) Milan, Italy

Vulvar cancer

The sentinel node biopsy is widely accepted as the nodal status assessment in patients with suitable vulvar cancers. The patient undergoes a SPECT-lymphoscintigraphy after a 99m-technetium peritumoral injection and the sentinel nodes are identified.

With fusion imaging, it’s possible to merge data from a SPECT-lymphoscintigraphy and ultrasound, to recognize the sentinel nodes in real time and to selectively remove them.

Virtually Guided Biopsy Procedures

Virtual Biopsy combined with Intelligent Positioning increases confidence during real-time ultrasound biopsy procedures. Thanks to the virtual tracking of the needle, the target can be reached quickly, precisely, and safely. The physical needle is highlighted by a virtual needle directly on the real-time ultrasound image with a proper 3D representation of the probe, scanning plane, and path to the target.

Colored targets with regular and irregular shapes can be visualized as well. The needle path is also visualized before the real needle is inserted, in order to plan in advance the best path of insertion so as to avoid critical structures.

Intelligent Positioning represents the needle tip as a fixed point in space, with the target as a moving object seen by the view point from the needle tip: the needle will become a gunshot viewfinder.

References


