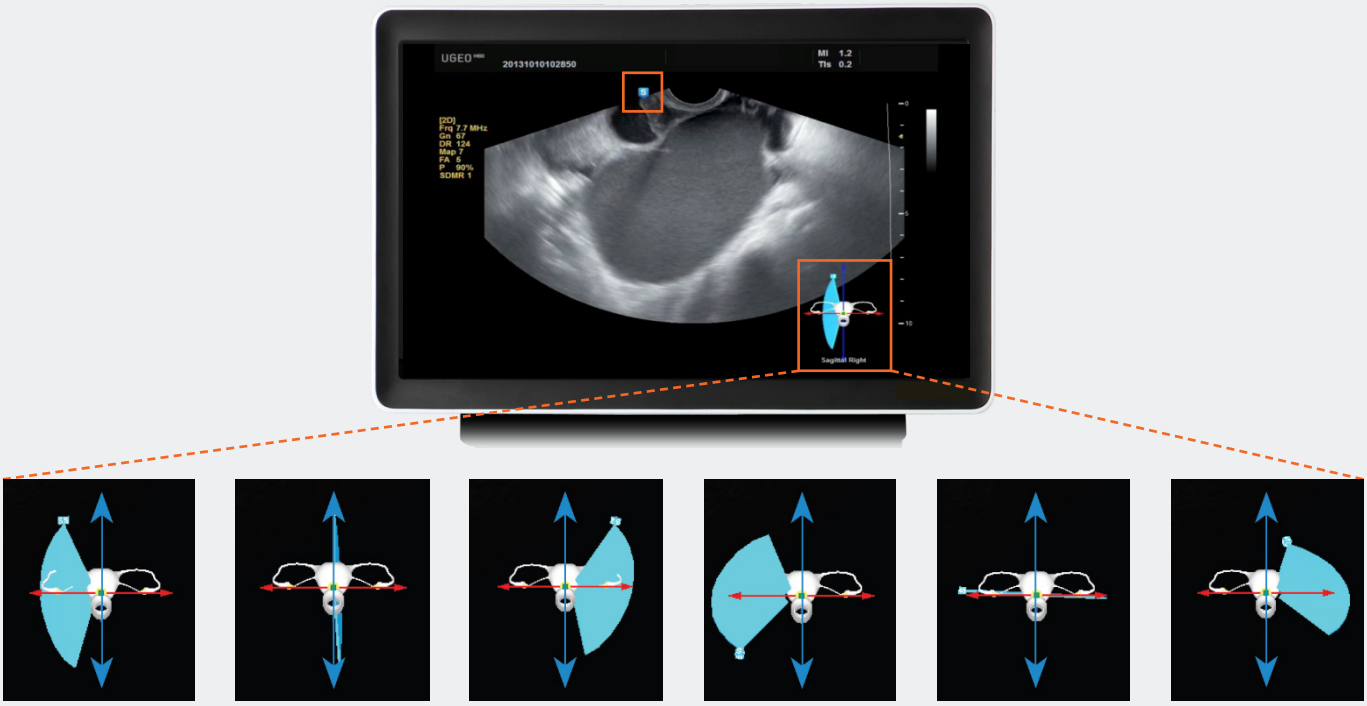
Article #WP201404-eMotionMarker / Issue Date 1 Apr, 2014

H60

Automated body-marking Tool for Transvaginal Scan, e-Motion Marker™

Fujita Health University Hospital / Prof. Sekiya Takao



Key Advantages

- Provides three-dimensional anatomical location information in real-time
- Improves workflow with automatic body marking features
- Elevates efficiency of communication with location information sharing

e-Motion Marker™

e-Motion Marker™ is advanced real-time body-marking feature providing anatomical locational information of transvaginal probe on B-mode image from monitor with ceramic oscillation gyro sensor. With this feature, physicians could recognize and save the direction and location information of probe on monitor during transvaginal scan.

As an automated body-marking tool for transvaginal ultrasound scans, e-Motion Marker™ is useful in clinical practice, education and information management. Thus it will be potential standard method of transvaginal ultrasound.

SAMSUNG MEDISON

The clinical value and user experience of the innovative technology, SAMSUNG e-Motion Marker™

Introduction

The ultrasound device performance has remarkably been improved both in hardware and software; operation speed, memory size, overall probe efficiency, various types of the probes, and new image processing applications. Moreover, highly reproducible two-dimensional sonography provided accurate diagnosis to doctors and sonographers. The multi-dimensional technologies and contrast-enhanced ultrasound (CEUS) also expanded ultrasound applications. Especially, the advent of vaginal probe in 1980s has significantly influenced on the workflow of ultrasound examination in obstetrics and gynecology.

The vaginal ultrasound has become a routine protocol using high frequency probe which simply provides high reproducible images of the inner genital organs. Even though, the overall performance of ultrasound has been progressed, the raveling of the ultrasound image still needs improvement. Although Japan Society of Ultrasonic in Medicine(JSUM) established routine protocols for performing and interpreting diagnostic ultrasound examination for each organ, the sonographers record the image that describes the lesion the best and do not follow the guided protocols except when performing screening procedures. 1) Currently, in abdomen scanning it is possible to correlate the probe location and body marks on the screen if the beam plane is perpendicular to the body surface. However, it is impossible to provide the locational information of probe on oblique scanned image in real-time. 2) Compared to abdomen, in vaginal scanning, it is difficult to match volumetric anatomical information obtained from continuous or discontinuous two-dimensional image and the directional information of probes by manual scanning.

Recently, the volumetric data from three-dimensional image indicating locational correlation of probe scanning and anatomical position of inner pelvis organ is used in clinical practice. However, the development of the new technology has been required because the image is not yet acquired in real-time and has lower resolution, larger amount of data and lower economic efficiency than B-mode image.

In 1996, Shinozuka and his colleagues developed the transvaginal sonographic orientation detection system using ceramic gyro-scopes and three-dimensional image reconstruction method as well as real-time image raveling method. Collaboration with Samsung Electronics, e-Motion Marker™ was commercialized as an option attached to transvaginal probe. (Fig.1)

Figure 1. e-Motion Marker™

How to prepare and use of e-Motion Marker™

e-Motion Marker™ is composed of two parts; 1) a gyro sensor which is attached to transvaginal probe and connected to the ultrasound system, and 2) a signal processor handling accelerated information obtained from the sensor. The operator could simply initialize the e-Motion Marker™ by mounting the gyro-sensor to transvaginal probe and turning on the initialize button. Please refer to following steps.

1. Installation of the sensor

The gyro-sensor is composed of two parts. One is the adaptor to fix the sensor, and the other is the gyro sensor block. The operator should hold a transvaginal probe with one hand and the unfolded adaptor with the other, and fix it to the bottom-center of the probe, then mount the gyro-sensor block by inserting from front of the probe. (Fig. 2 a-d)

2. Initialization

Turn on the power of the ultrasound diagnostic system, and have initial check with B-mode screen. If necessary, initialize e-Motion Marker™ and check the body mark display on bottom-right of the monitor screen. (Fig 2. e-f)

3. Scanning and Setting Plane Orientation

The most general way of setting beam plane orientation, is to press the initialize button of e-Motion Marker™ mounted on the probe. It shows mid-sagittal longitudinal direction of uterus and the orientation information of the body marker will be displayed on screen. (Fig 2. g-h)

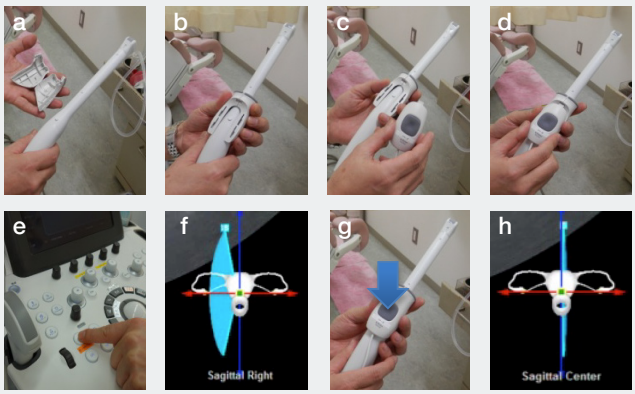


Figure 2. User Guideline for e-Motion Marker™

"**e-Motion Marker™** is simple to operate with one button by probe-grabbed hand. The sensitivity of the Marker movement synchronized with actual probe scanning is well-satisfied."

Usability of e-Motion Marker™

e-Motion Marker™ has a wide range of application in clinical practice and is expected to be applied as a clinical information tool in informed consent for outpatient and remote practice. Moreover, it can be implemented as a presentation and hands-on tool for medical education, as well as a tool for medical information management.

- Orientation of the operator

e-Motion Marker™ easily provides multi-dimensional information correlating inner-pelvic organs and direction of fan like- and rotational scanning probe that simultaneously indicates beam plane of B-mode image and body marks in real-time. Especially, in female reproductive examination, it can be used in monitoring sagittal and coronal plane of uterus and recognizing beam plane axis to evaluate follicles and corpus luteum condition as well as location of ectopic pregnancy. (Fig.3)

Furthermore, e-Motion Marker™ can provide tumor characteristics by accessing the spatial orientation and beam plane axis information of intra-pelvic organs, and anatomical shape and cross-sectional length of the lesion. (Fig.4)

- Image Sharing

e-Motion Marker™ is highly expected to have multiple functions by sharing images and locational information in real-time. First of all, by sharing images between physicians and patients in practice, it improves efficacy and level of diagnosis by connecting multi-medical center via internet to ultrasound diagnostic system. It is also valuable for remote practice. This function given by e-Motion Marker™ can be also applied in medical education for graduates.

- Medical Information Management

e-Motion Marker™ enables future re-evaluation with the recorded image information of the beam plane and the anatomical position. This simplifies the medical record administration and improves the quality and the quantity of medical information from one synchronized image. Moreover, this information is valuable as a three-dimensional data set including the volumetric locational information since it is able to save not only as a single image but as a form of video. Meanwhile, when it is informed consent, e-Motion Marker™ makes the client easy to understand by providing probe beam plane on B-mode image and body mark on monitor screen.

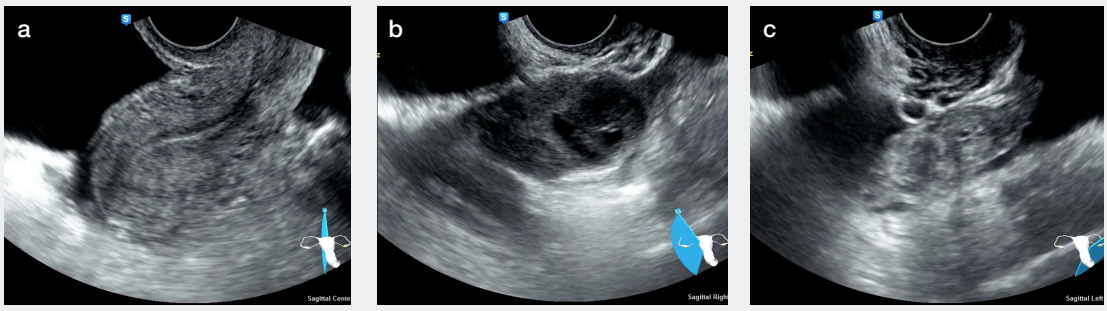


Figure 3. Ectopic Pregnancy. a) longitudinal plane of uterus: thin endometrium, fluid in Douglas pouch, b) right adnexa: circular corps luteum of ovary , c) left adnexa: a oval shaped tubal pregnancy of uterine tube .

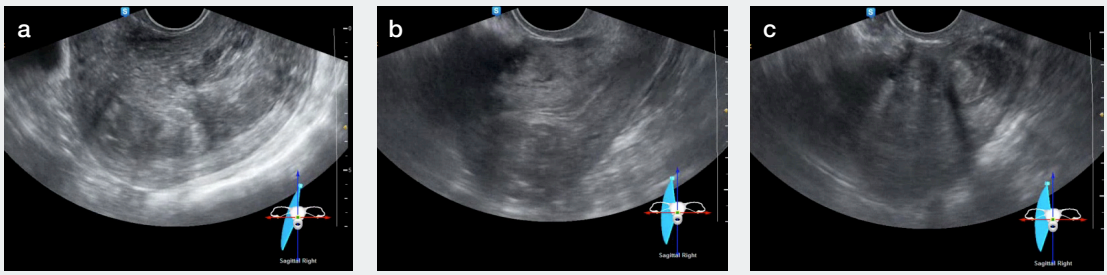


Figure 4. Uterine Myoma. a) single myoma in the right side of uterine lining, b,c) multiple myomas: one in slightly right-side of mid-sagittal longitudinal plane, two in right-side wall of uterine .

Reference

(1) The Japan Society of Ultrasonics in Medicine eds. Igaku-shoin Ltd. Tokyo, pp195-218.2000.

(2) Shinozuka N et al. J Ultrasound Med. 1996 Feb;15(2):107-13.

General Requirement

Supported System:
(1) H60 V1.00.00
(2) SonoAce R7 V3.01.00

Samsung Medison H.Q.
42, Teheran-ro 108-gil, Gangnam-gu, Seoul, Korea

Samsung Electronics Japan Co., Ltd.
Ichigaya Tokyu Bldg., 4-2-1, Kudankita, Chiyoda-ku, Tokyo, Japan

Please visit http://www.samsung.com/global/business/healthcare

SAMSUNG SAMSUNG MEDISON