DEVELOPMENT OF A PROBE PRESSURIZATION MECHANISM FOR THE PURPOSE OF MOUNTING ON AN ULTRASONOGRAPHY SCANNING ASSIST DEVICE

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ABSTRACT

In this study, we developed a probe pressurization mechanism for the purpose of mounting on an ultrasonography scanning assist device. In current, the ultrasonography equipment required to hold a probe directly by an examiner and scan. This is a high physical burden for the examiner and low reproducibility of images. To solve these problems, we aimed to reduce the opportunity to intervene of examiner in the scanning motion by mechanical assistance. Therefore, we proposed and designed an assist device which reproduce the scanning fully automatically by dividing probe motions in different directions. In addition, we created a functional testing machine of the pressurization mechanism which is supposed to be mounted on the assist device by combining a motor, a ball screw unit, and some plastic parts. By turning on the power to this testing machine, we confirmed the mechanism could perform the expected pressurize motions.

In conducting examinations using an ultrasonography scanning motion assist device, it is necessary to set a target range of pressurization for clear images. Against this, we measured reaction force from the body surface using a load cell and considered to use it as the target range of pressurization. Then, we got images of the abdominal aorta from four examinees using a functional testing machine which mounted with a load cell. By this experiment, the reaction force affect depending on the thickness of fat and muscle layers above the aorta. In particular, it was necessary to pressurize which generates reaction force about 3.0[N] when get images from muscular examinees. On the other hand, it was found it is possible for examinees with thick fat to get clear images by applying pressure that generates reaction force of about 9.0 [N]. Based on the above results, we set the target range of pressurization from 2.0 to 9.5 [N] for abdominal examinations by the pressurization mechanism. It is taking into consideration the effects of examiners' body shape and body movements. Ultimately, we thought it would be possible for the various body locations to get clear images by setting a target range of pressure and constructing a control system for each target.