# 論 文 要 旨

## A feasibility study of a hybrid breast-immobilization system for early breast cancer in proton beam therapy

氏名　　有村　健

Purpose: We aimed to develop a new breast-immobilizing system for proton beam therapy (PBT) of early breast cancer (EBC) that would provide the optimum breast shape during the treatment as well as increased fixation reliability by reducing the influence of respiratory movement.
Methods: The breast-immobilizing system (HyBIS; hybrid breast-immobilizing system) consists of a whole body immobilization system (WBIS), position-converting device (to change patient position), photo-scanning system, breast cup (made using a three-dimensional printer), breast cup-fitting apparatus, breast cup-holding device (to ensure the breast remains lifted in the supine position), and dedicated stretcher fixed to the WBIS (to carry the patient). We conducted a phantom experiment to evaluate the effect of the HyBIS on breast immobilization during the respiratory cycle. Thirteen markers were embedded in the right breast of a female phantom that simulated respiratory thoracic movement at an amplitude of 15 mm, and their displacements on four-dimensional computed tomography were compared between conditions with and without immobilization by HyBIS.
Results: When immobilization was applied with the HyBIS, breast protrusion was maintained in the phantom in the supine treatment position. The mean values of the anteroposterior, superoinferior, lateral, and three-dimensional (3D) displacement of the markers were 2.7±1.7, 0.3 ±0.5, 0.9±0.8, and 3.1±1.6 mm with HyBIS, and 5.5±2.9, 0.6±0.8, 0.5±0.4, and 5.6±2.9 mm without HyBIS, respectively; thus, the anteroposterior ($P = 0.014$) and 3D ($P = 0.007$) displacements significantly improved with HyBIS.
Conclusions: We demonstrated that the HyBIS can help retain the protruded breast shape in the supine position during treatment and can reduce the influence of respiratory movement. Thus, the HyBIS can help to reliably and precisely perform PBT for EBC.

ファイル名：Abstract_Arimura_Takeshi_4201830029_2017