

# Intracavitary Ultrasound Hyperthermia Applicators for Gynecological Cancer

Rena J. Lee, Ph.D., HyunSuk Suh, M.D.

1Radiation Oncology, Ewha Womans University Mokdong Hospital, Seoul, Korea

For evaluating the feasibility of treating recurrent lesions in the vaginal cuff and cervix by hyperthermia, ultrasound applicators were designed, constructed, and characterized. For the treatment A half-cylindrical transducer (d=1cm, length=1cm) and cylindrical transducer (d=2.5cm, length= 1.5cm) were used to construct ovoid type and cylindrical applicators. For the ovoid type applicator, each element was operated at 1.5MHz and characterized by measuring transducer efficiency and acoustic power distribution. Thermocouple probes were used to measure the temperature rise in phantom. The element sizes used in this study were selected to be comparable for high dose rate brachytherapy colpostat applicator. Each element was powered separately to achieve a desired temperature pattern in a target. The acoustic output power as a function of applied electric power of the element 1 and 2 was linear over this 1 to 40 W range and efficiencies were  $32.2\pm 3.4\%$  and  $46.2\pm 0.8\%$ , respectively. The temperature measurements in phantom showed that  $6^{\circ}\text{C}$  temperature rise was achieved at 2 cm from the applicator surface. As a conclusion, the ability of the ultrasound colpostat applicator to be used for hyperthermia was demonstrated by measuring acoustic output power, ultrasound field distribution, and temperature rise in phantom. Based on the characteristics of this applicator, it has the potential to be useful for inducing hyperthermia to the vaginal cuff in clinic.

**Key Words:** Ultrasound, Hyperthermia, High Dose Rate(HDR) Brachytherapy, Colpostat, Cervical Cancer