Purpose/Objective: Planning and executing a HDR (High Dose Rate) intracavitary brachytherapy treatment for cervical carcinoma can involve several patient bed transfers. In the current study, patients have to be moved twice, and undergo four bed transfers which can imply a cylinder dislocation from its initial position immediately after the cylinder implant. This study aims to quantify the cylinder displacement due to patient manipulation after the initial implant position, at CT scan acquisition moment and during treatment.

Materials and Methods: Nineteen patients were included in this study. The patients underwent three fractions of intracavitary brachytherapy using vaginal cylinders with diameters ranging from 20 mm to 40 mm. In the first session, after cylinder positioning, two orthogonal x-rays (antero-posterior and lateral) are acquired. Then the patient is transported to the CT room for treatment planning image acquisition. At last, the patient is carried to the treatment room, where two additional x-ray images, in the same conditions as after the implant, are also acquired. The treatment dose is prescribed at a point located 0.5 cm from the cylinder wall and the treated extension is 3 cm. The deviations of the applicator caused by the movement of the patient were assessed with regard to distances and angles between fixed points on the cylinder and the bony structure of the patient. The evaluated parameters were: A) the distance between the lower ring of the cylinder and the superior limit of the pubic symphysis (point ‘x’ in Figure 1A); B) the angle formed by two straight lines that start at the intersection of the central axis of the cylinder with the superior limit of the pubic symphysis (angle ‘α’ in Figure 1B) extending to the upper ring (point ‘a’ in Figure 1B) and the other to the supero-lateral limit of obturator foramen (point ‘b’ in Figure 1B); and C) distances between the treatment couch and the central axis on the upper and lower rings (points ‘y1’ and ‘y2’ in Figure 1C).

Results: The observed geometrical deviations of the vaginal cylinders from its initial position varied as follows: ‘x’ varied from 0 cm to 1.4 cm with an average of 0.39 cm (SD = 0.36 cm); ‘α’ from 0.06º to 6.53º, with and average of 1.93º (SD = 1.61 cm). Measurements of y1 and y2 could not be evaluated due to large geometric uncertainty.

Conclusions: Although the maximum deviation of ‘x’ exceeds the prescription depth, the dose delivered to the vaginal mucosa is equal, since this tissue is elastic and follows the cylinder movement. Nevertheless, undetermined consequences on the dose distribution in organs at risk might arise. The evaluation of the dose uncertainty at healthy tissues will be assessed in a future development of this work.