Purpose: The uncertainties in brachytherapy source localization can cause significant errors in dose estimation around the sources because of the high dose gradient in brachytherapy. The effects of applicator movement on the dose values in gynecological brachytherapy are investigated in this study.

Methods: The MCNP4C Monte Carlo code was used for estimation of the effects of applicator movements on the dose distribution around Selectron Cs-137 LDR source (Nucletron Trading BV, Netherlands). The simulations were done for vaginal applicator and tandem-ovoid set. The applicator movements of 1 to 5 mm in both longitudinal and transverse planes and the applicator rotation of 1° to 5° were also simulated in both cases. The small spherical tally cells were used in dose estimation around LDR sources using *F8 tally.

Results: For typical source configurations in vaginal and tandem-ovoid applicator, an upward superior movement of 5 cm in vaginal applicator causes an error of 1.9% in dose of reference points, while 5 cm movement in transverse direction would led to an error of about 54.9%. In case of tandem-ovoid set, those errors were 8.1% and 27.6% respectively. The uncertainties caused by 5° rotation of vaginal and tandem-ovoid were 73.1% and 2.8% at reference points. The rotation angle of 1° caused a dose error of 11.9% and 1.2% at reference points for vaginal and tandem-ovoid applicators.

Conclusions: The results obtained for Cs-137 source indicate that the displacement of the applicator in longitudinal direction has less pronounced effect on doses than in transverse. The difference in dose error values of vaginal and tandem-ovoid is mainly due to the more complicated geometry of tandem-ovoid set and the different number of sources inside the applicators.