Purpose: To study the impact of different smoothing parameters on IMRT plan quality and deliverability.

Methods: Five previously treated patients of carcinoma cervix were chosen. Planning target volume (PTV) and organ at risk (OAR) i.e. bladder and rectum were contoured. In each case, five different dynamic IMRT plans with 6MV photon beam were created in eclipse TPS for Varian 2300C/D linear accelerator. During optimization, dose volume constraints and priorities were kept constant and smoothing parameters were varied as follows: 10/5, 40/30 (TPS default value), 80/60, 100/80 and 200/150 in x/y direction. Total dose was 5040cGy in 28 fractions and prescribed at 95% isodose. Plan quality was analyzed by means of coverage index (CI=PTV covered by prescription dose/PTV), OAR mean doses and total monitor units (MUs) required to deliver a plan. In each case, deliverability of treatment plans were verified with ÎµmatriXX ion-chamber array and compared with TPS dose-plane using gamma index of 3% dose difference and 3mm distance to agreement criteria.

Results: The CI values were 0.9435±0.032, 0.9418±0.034, 0.9380±0.041, 0.9330±0.047 and 0.8681±0.072 for 10/5, 40/30, 80/60, 100/80 and 200/150 in x/y direction. PTV dose maximum decreases with the increase of smoothing parameters and values were 5724.38±106.08, 5723.30±131.60, 5708.44±116.74, 5697.92±116.82 and 5587.50±189.50cGy. The bladder mean doses were 4027.46±630.40, 3821.62±420.62, 3819.58±427.08, 3813.42±435.02 and 3814.78±438.0cGy. Rectum mean doses were 3839.88±466.02, 3835.52±473.18, 3837.52±472.88, 3839.10±471.20 and 3918.94±469.76cGy. Similarly, Total MUs were 1588±205, 1573±214, 1513±274, 1456±335 and 1219±68. Gamma pass rate increases with the increase of smoothing parameters and values were 99.16±0.21%, 99.07±0.19%, 99.24±0.28%, 99.29±0.29% and 99.75±0.15%.

Conclusions: When smoothing parameters decreased below TPS default value, plan quality increases, but deliverability decreases. If smoothing parameters increased above TPS default value, deliverability increases but plan quality decreases. Total MU decreases with the increase of smoothing parameters. Therefore, it’s a trade-off between plan quality and deliverability which needs to be justified clinically.