Purpose or Objective: Radiotherapy treatments are delivered in our centre using two twin linacs. This provides the possibility of treating patients in either of them. In case of breakdown of one of the linacs, the number of patients interrupting their treatment can be minimised as they can be treated in the linac that continues working.

With the aim of optimally doing so, the IGRT workflow is exceptionally changed in case of linac breakdown and IG is only performed when considered strictly necessary.

Prostate cancer patients treated in our radiotherapy department receive a moderately hypofractionated IMRT treatment with daily IG.

The purpose of this work was to assess the dosimetric differences that would result in prostate treatments if IG was not performed in 3, 5 or 7 fractions due to linac breakdown in the most sensitive patients to the lack of IG according to our IGRT protocol.

Material and Methods: 20 prostate plans were retrospectively modified and analysed. All of them were moderately hypofractionated treatments with prescription doses to the prostate and seminal vesicle (SV) PTVs of 70 Gy (2.5 Gy/fraction) and 56 Gy (2 Gy/fraction), respectively.

They corresponded to patients whose daily positioning shifts after an initial correction of the systematic error showed a standard deviation ≥4mm or an absolute displacement mean value ≥3mm.

Seven positioning shifts were randomly selected for each patient out of their recorded treatment data. Beams corresponding to 3, 5 or 7 fractions were accordingly displaced in the TPS, as if no IG had been performed.

Results: Dosimetric differences observed for the prostate and SV CTVs were negligible.

Mean absolute variations in the mean rectal dose when not performing IG in 3, 5 or 7 fractions were 35.2 ± 27.2 cGy, 50.9 ± 33.8 cGy and 63.2 ± 47.1 cGy, respectively. The results for the bladder showed the most important dosimetric variations. The dosimetric impact is greater when changing from 3 to 5 fractions without IG than when changing from 5 to 7.

Conclusion: This work has been carried out with the data corresponding to the most sensitive patients to the lack of IG. The observed dosimetric effect is greater than the one that would correspond to the mean patient population. In case of exceptionally not performing IG in 3, 5 or 7 fractions due to a breakdown in one of the twin linacs, the prostate and SV CTVs would still be treated correctly with the CTV to PTV margins currently used in our centre.

Regarding the organs at risk, the rectum showed the most important dosimetric variations. The dosimetric impact is greater when changing from 3 to 5 fractions without IG than when changing from 5 to 7.

Even in this group of patients, the effect of not performing IG in 3 or less fractions would be negligible. Not performing IG in a greater number of fractions could be relevant in cases in which the calculated dose distribution in the rectum is close to its corresponding dose restriction because further optimisation was not possible.