

Assessing accuracy and precision of a commercial bladder scan for prostate cancer radiotherapy treatments

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Purpose

To evaluate the accuracy of a commercial bladder scan in measuring bladder volume for men undergoing radiotherapy for prostate cancer. About 5-10% of men undergoing curative radiotherapy for prostate cancer develop radiation cystitis. Adequate bladder filling is important to reduce bladder irradiation and minimize treatment-related side effects.

Materials and Methods

SAMPLE SIZE

- 16 consecutive patients undergoing radiotherapy for prostate cancer

DATA ANALYSIS

- 27 pairs of data were acquired
- Accuracy and precision of the bladder scan:
 - Bland-Altman plot
 - Lin's concordance correlation coefficient

DATA ACQUISITION

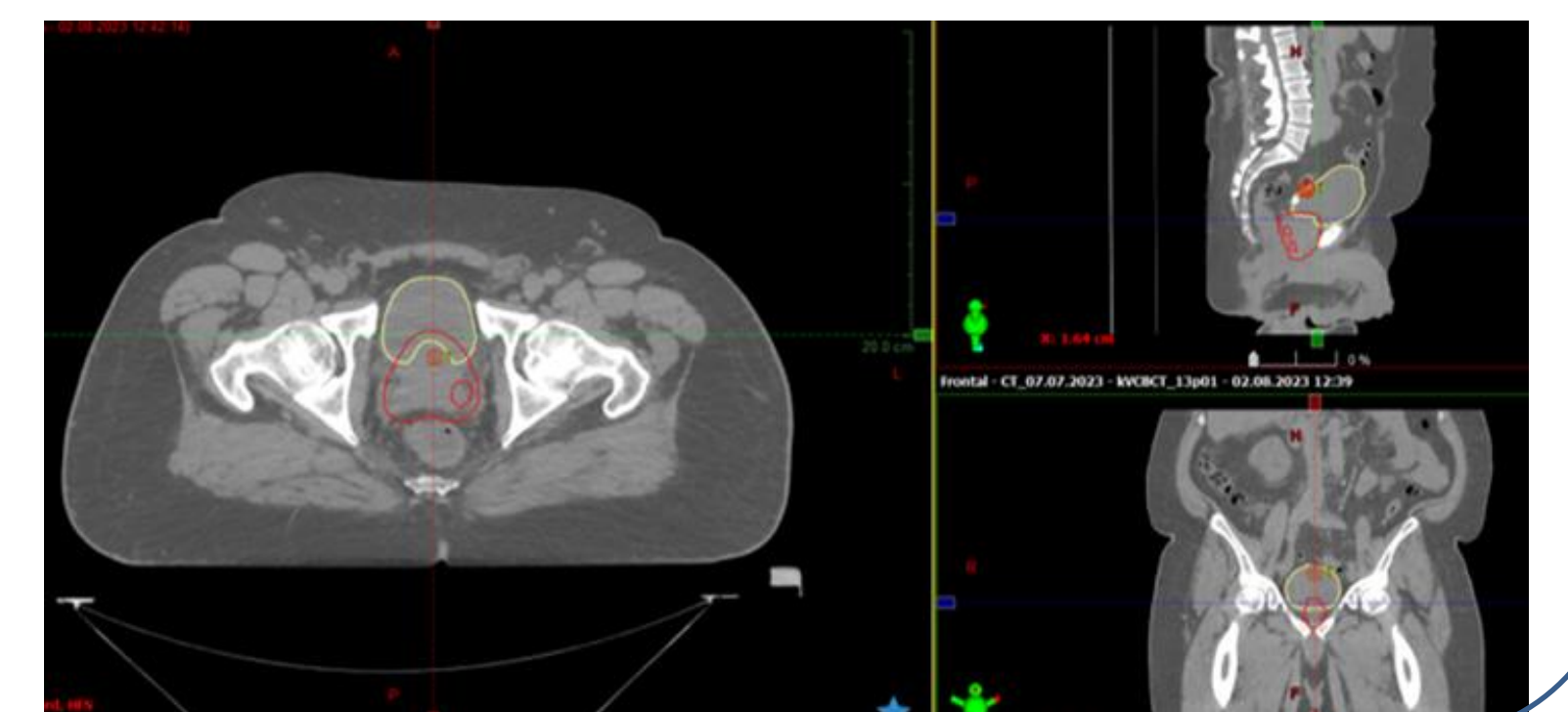
1 Bladder Scan measurement



- #### 2 Planning CT or pre-treatment CBCT images acquisition: within 5 min from Bladder scan measurement

3 Reference Bladder Volume evaluation: Manual Bladder volume contouring on CT/CBCT images

- Radiation oncologist
- Medical dosimetrist
- Radiotherapy Technologist



Results

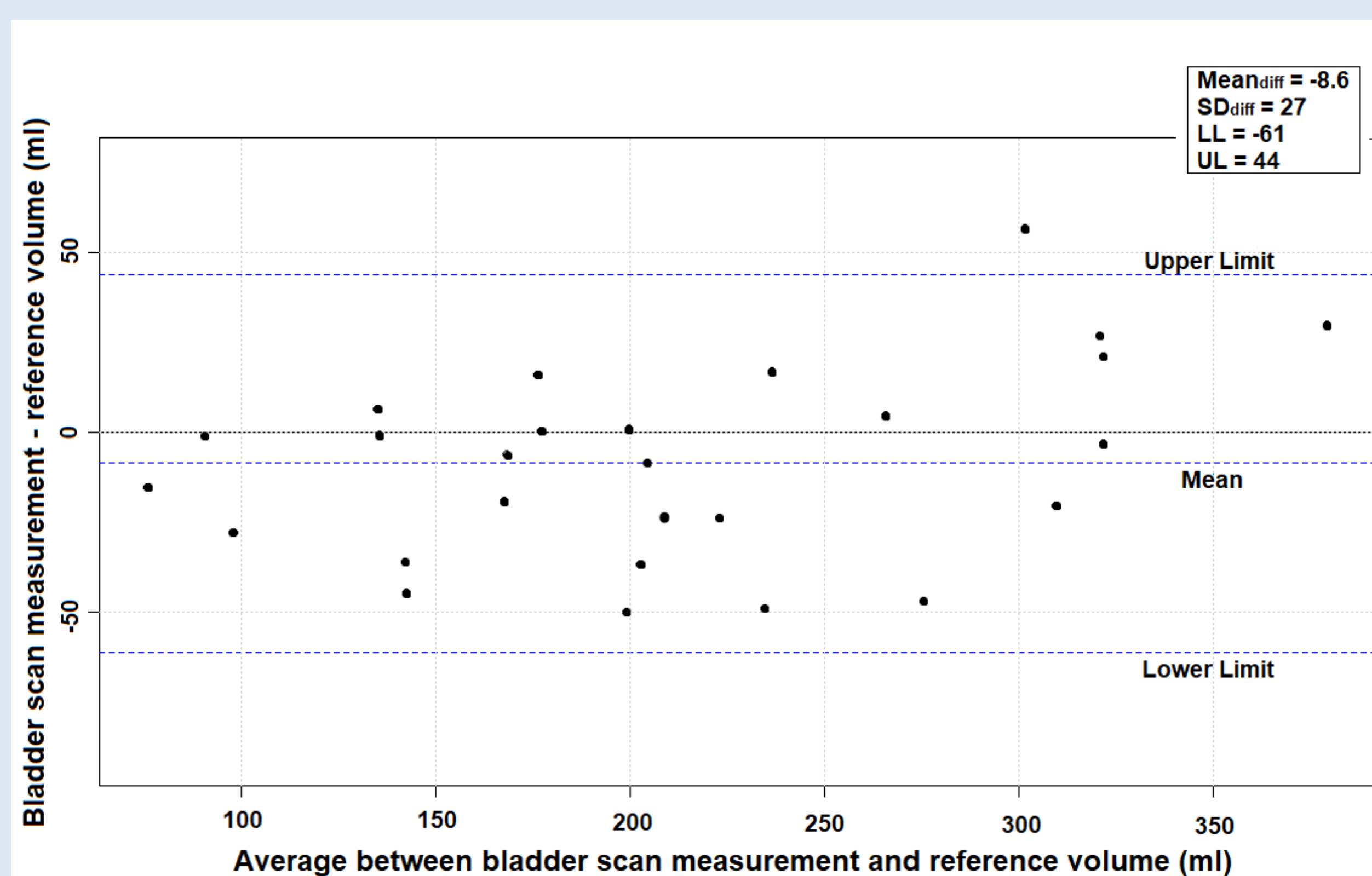


Figure 1: Bland-Altman plot

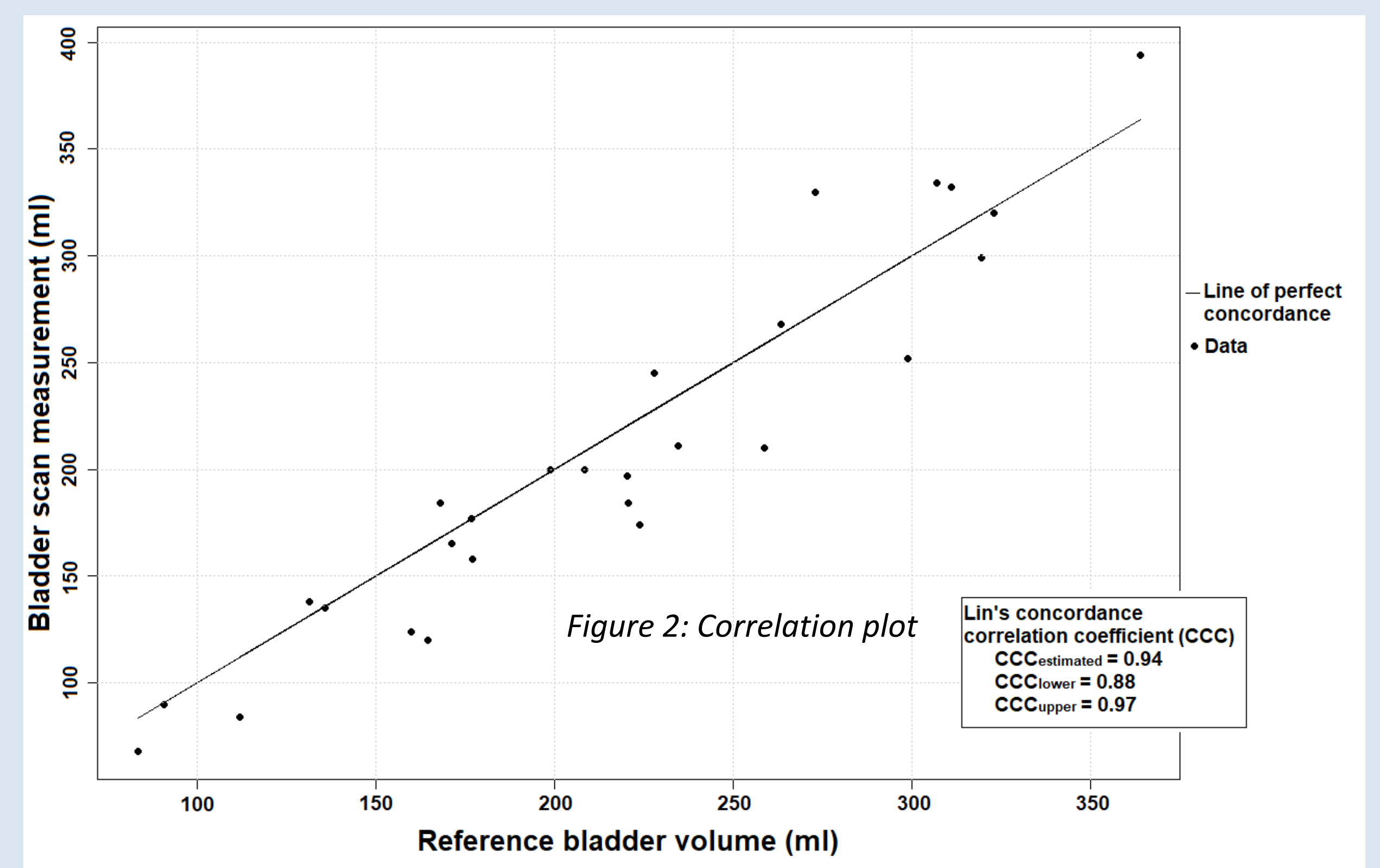


Figure 2: Correlation plot

- Reference bladder volumes ranged from 83 to 364 ml.
- The Bland-Altman plot (figure 1) showed a mean difference of -8.6 ml (range: [-61, -44.0] ml, 95% limits of agreement).
- The precision of the bladder scan was 26.8 ml. The differences were independent of the bladder volume.
- Lin's concordance correlation coefficient demonstrated high accuracy (Cb = 0.99) and moderate precision (p=0.95).

Conclusions

The bladder scan demonstrated high reproducibility in assessing bladder filling before planning CT simulation or radiotherapy treatments. Routine implementation of this technology is expected to improve treatment reproducibility, reduce imaging burden, and enhance patient compliance.