AbstractID: 13801 Title: Clinical evaluation of three automatic image registration algorithms from two commercial systems

Purpose: Commercial image registration systems are often directly used in clinics to determine treatment setup for patients. It is imperative to assess the accuracy of these commercial systems because of their direct impact of radiation delivery. The purpose of this study is to investigate the accuracy of two commercially available image fusion systems implemented in our clinic.

Methods and Materials: A pelvic anthropomorphic phantom was CT-scanned and the pelvic bone, femoral heads, and sacrum were contoured. The phantom was setup in fifteen different positions and the corresponding MV-CBCTs were acquired with 8 MU for a 200° arc. Two commercially available image fusion systems (Syngo from Siemens and Mosiaq from Elekta) were used to automatically align the MV-CBCTs with the planning CT based on a maximizing mutual information (MMI) algorithm. Furthermore, a chamfer algorithm was evaluated for the Mosiaq system. Based on contours of bony structures, manual alignments in Syngo were conducted carefully by an experienced physicist and were used as the benchmark.

Results: Compared to the manual alignments, the mean differences in lateral shifts from automatic registrations were 0.7 cm, 0.2 cm, and 0.2 cm for $Syngo_{auto}$, $Mosaiq_{MMI}$, and $Mosaiq_{Chamfer}$, respectively. The mean differences in longitudinal/vertical shifts were 0.5/0.3 cm, 0.0/0.0 cm, and 0.0/-0.1 cm, respectively. The standard deviations for measurements were 0.1 cm.

Conclusion: The accuracy of automatic image registration varied from system to system. The Mosaiq system aligned datasets automatically within 2 mm accuracy for both algorithms. Larger deviations were observed in the Syngo system with automatic alignment, indicating that additional manual adjustments were necessary.

Conflict of Interest: A contributing author has grant support from Siemens Medical Solutions.