Dose Accumulation with CBCT Conversion in Head and Neck and Prostate

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Background

\begin{itemize}
  \item In standard radiotherapy, only one planning CT is used but the size and position of the tumor and organs at risk (OARs) changes during treatment.
  \item Specifically, in head and neck cancers patients lose weight and the parotid glands shrink during treatment and in the prostate the size of the bladder varies fraction-to-fraction (see Figure 1).
  \item Daily cone beam (CT) is already used in the clinic for patient positioning.
  \item CBCT is easy to acquire via on-board imagers but provides limited field of view and is of poorer quality than CT.
  \item Correcting CBCT via deformable image registration (DIR) enables “dose of the day” calculations.
\end{itemize}

Methods

\begin{itemize}
  \item Planning CTs, weekly CTs, and daily CBCTs were imported into a commercial treatment planning system (TPS), RayStation (RaySearch Laboratories, Stockholm, Sweden).
  \item First, rigid registrations were applied. Then, ANACONDA hybrid intensity DIR’s were created. CBCT conversion was performed using the commercial algorithm that uses DIR.
  \item Dose was evaluated in the TPS on all images. Dose on weekly CTs, daily CBCTs, and corrected CBCTs was deformed to the planning CT image. Finally, dose was accumulated on the planning CT and dose differences were qualitatively evaluated.
\end{itemize}

Results

\begin{itemize}
  \item CBCTs were successfully converted.
  \item Transition areas between the CT and CBCT were smooth.
  \item Dose was calculated on CBCT’s and corrected CBCT’s.
  \item Dose differences were observed between planning CT and accumulated CBCT; clinical impact is being determined.
  \item No dose differences were observed between CBCT’s corrected with primary and with weekly inside organs at risk.
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Conclusions

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  \item Transition areas between the CT and CBCT were smooth.
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  \item No dose differences were observed between CBCT’s corrected with primary and with weekly inside organs at risk.
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References

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