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Versatility of ExacTrac Dynamic for Patient Setup and Monitoring

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Purpose

We explored the versatility and feasibility of the ExacTrac Dynamic system for patient setup and monitoring for a variety of radiotherapy treatment sites in our clinical practice. Specifically, we investigated the usefulness and applicability of tattoo-less surface-based patient setup, and surface- and radiographic intrafractional monitoring.

Materials and Methods

We collected data for patients treated on two TrueBeam linacs between September 2022 and August 2023. All patients were setup using surface-guidance only, with tattoos initially available as backup. Monitoring thresholds were adapted from our ten-year experience of using surface-guidance. For cases with radiographic intra-fractional monitoring (brain and spine SBRT), the frequency of treatment interruption due to patient motion was quantified.

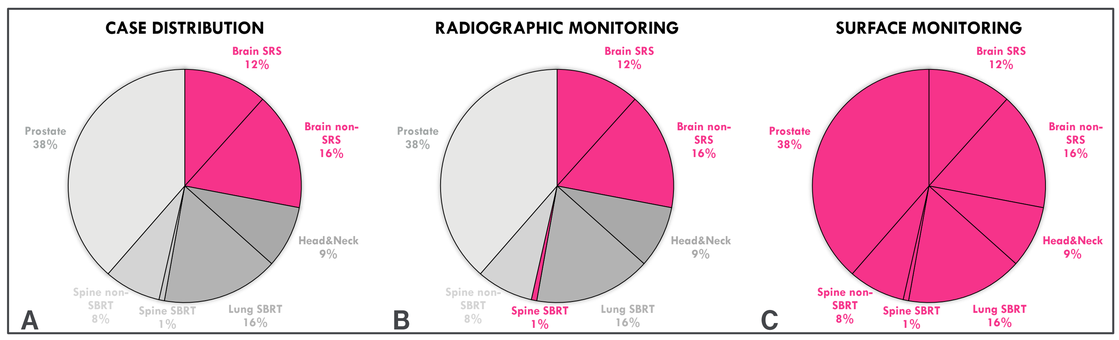

Figure 1.
A: distribution of cases treated on the TrueBeam platform with ExacTrac Dynamic (ETD). Primary imaging with ETD is shown in magenta.
B: cases for which the ETD system monitored the patient position using radiographic imaging (shown in magenta)
C: cases for which the ETD system monitored the patient position using surface scanning (shown in magenta)

Results

We treated 621 cases during the period, predominantly prostate cancer and brain lesions (Fig 1A). The tattoo-less, surface-only, setup was satisfactory. While CBCT was the primary imaging system for extra-cranial treatments (Fig 1A), ExacTrac Dynamic was utilized for radiographic monitoring for brain and spine SBRT (Fig 1B) as well as surface monitoring, augmented with temperature-data, for all patients (Fig 1C). The tolerances are shown in Table 1. For brain SRS, monitoring prompted position corrections in 42% of the fractions. For non-SRS brain and spine SBRT treatments position corrections were prompted in 5% and 0% of the fractions, respectively.

Conclusion

The ExacTrac Dynamic system was versatile and useful in a variety of radiotherapy cases treated in our department. The combination of intra-fraction radiographic and surface monitoring was optimized for each treatment site, as well as the applied tolerances for each case.

Table 1. Monitoring technique and tolerances for ExacTrac Dynamic

Treatment site	Primary imaging modality	Radiographic monitoring	Radiographic tolerance [mm/°]	Surface monitoring	Surface tolerance [mm/°]
Brain SRT	ETD	Yes	0.5/0.5	Yes	1/1
Brain non-SRT	ETD	Yes	1/0.7	Yes	2.5/1.5
Head&Neck	CBCT			Yes	3/1.5
Lung SBRT	CBCT			Yes	5/2
Spine SBRT	CBCT	Yes	2/1.5	Yes	4/3
Spine non-SBRT	CBCT			Yes	5/3
Prostate	CBCT			Yes	5/4