

Theme: Clinical

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MiniProton 360 Upright Position Proton Therapy System Workflow Study:
Treatment Efficiency and Subject Comfort

Jianghua.Wei¹; Zhi.Chen¹; Changjian.Luo¹; Yuxiang. Wang²; Hailin Cao¹; Kaizhong.Ding¹;
Yonghua.Chen¹; Lu.liu¹; Hsiao-Ming.Lu²

¹Hefei CAS Ion Medical and Technical Devices Co. Ltd., China;

²Hefei Ion Medical Center, China;

Background / Aims:

Upright position particle therapy systems can substantially reduce the equipment cost and footprint of the facility. This study evaluated the workflow of a gantry-free upright proton therapy system, MiniProton 360, with a specific focus on treatment efficiency and subject comfort.

Subjects and Methods:

A total of 135 volunteers underwent simulated upright position proton treatments using the MiniProton 360 system. The simulation workflow included patient immobilization, optical surface-guided initial positioning, simulated CBCT-based position and postural correction, and virtual delivery of a three-field proton therapy plan. The duration of each step was recorded. Subject comfort was quantitatively assessed at intervals of 5, 10, and 15 minutes. Following the simulation, questionnaires collected feedback from volunteers regarding chair adjustability, stability, and perceived safety of the upright position.



Figure 1: The MiniProton 360 treatment room contains alignment lasers, optical surface-monitoring cameras, and upright CBCT system to enable rapid and accurate patient positioning.



Figure 2: Volunteer underwent simulated upright position proton treatments using the MiniProton 360 system.

Result:

The MiniProton 360 Proton Therapy System demonstrated high treatment efficiency, with the entire simulated treatment workflow completed within 10 minutes. The participants remained highly comfortable throughout the simulation. After 5 minutes, 90% of the participants rated their comfort at the highest level (score of 4.5/5). After 10 and 15 minutes, 90% of patients maintained a comfort rating of 3.5/5 or higher.

Detailed Workflow Duration			Comfort Evaluation (n=135) (1–5) , 5 = Very Comfortable	
Step	Mean	Standard Deviation	Time (min)	Comfort Levels
Patient positioning	2 min	0.39	After 5 min	90% rated 4.5
Initial optical positioning	1 min	0.14	After 10 min	90% rated ≥4
CBCT imaging and alignment	2 min	0.2	After 15 min	90% rated ≥3.5
Beam delivery simulation	3 min	0.24		
Patient exit	2 min	0.3		
Total	10 min	0.6		