Purpose: Evaluation of the commercial prototype open face mask (Fibreplast, Q-FixTM) used with surface rendering imaging system (AlignRTTM, London, UK) for setup and monitoring of proton therapy patients with cancers of the brain and head.

Methods: Fibreplastic open face masks were used with Base-of-Skull frame/moldcare pillow. Two sizes of the pre-made cutouts in the masks were investigated: leaving open skin surface in the oval-shaped area between (I) upper lip and forehead boss, II) between mandible and forehead boss in superior-inferior direction; and between zygomatic (cheek-) bones/sphenoid bones laterally. Calibration of AlignRT system was verified with SRS cube phantom (VisionRT) and 2D X-ray patient positioning system (DIPS, IBA). The accuracy of translational shifts and rotations was a) verified using a head&neck phantom and b) tested using volunteers. Within AlignRT software, only the open area was used as ROI for the registration; the option 'Intracranial SRS' used for surface capture.

Results: For the isocenter determination accuracy within 0.3mm/0.2 degrees, the head&neck phantom registration was performed with the 0.5mm/0.5 degree accuracy; the volunteer tests showed the registration accuracy within 0.5mm ±0.2mm (1 s)/0.7±0.2 (1 s) degree. The simulation of the noise in the surface data such as eye blinking and attempts to swallow/chew was performed, with negligible effect on the registration. No significant differences between the study results between the masks of type (I) and (II) were noticed.

Conclusions: The AlignRT surface rendering system has sufficient accuracy when used with the open face head&neck mask for localization/registration of the proton therapy patients with tumors of the head and brain.