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3D printed models in complex perianal fistula as to boost education with patients and trainees

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Introduction: Perianal fistulas are a topic that is hard to understand let alone teach. The key to understanding the treatment options and the likely success, is deciphering the exact morphology of the tract(s) and the amount of sphincter involved. Our aim was to use explore alternative platforms to better understand complex perianal fistulas through 3D imaging and reconstruction.

Methods: Digital imaging and communications in medicine images of SPAIR MRI sequences were imported onto validated open-source segmentation software. A specialist consultant gastrointestinal radiologist performed segmentation of the fistula, internal and external sphincter. Segmented files were exported as STereoLithography files. Cura (Ultimaker Cura 3.0.4) was used to prepare the files for printing on an Ultimaker 3 Extended 3D printer. Animations were created by in collaboration with Touch Surgery™.

Results: Three examples of 3D printed models

demonstrating complex perianal fistula were created. The anatomical components are displayed in different colours: Red: Fistula Tract; Green: External Anal Sphincter and Levator Plate; Blue: Internal Anal Sphincter and Rectum. One of the models was created to be split in half, to display the internal opening and allow the complexity in the intersphincteric space to better evaluated. An animation of MRI fistulography of a trans-sphincteric fistula tract with a cephalad extension in the intersphincteric space was also created.

Conclusion: MRI is the reference standard for assessment of perianal fistula, defining anatomy and guiding surgery. However, communication of findings between radiologist and surgeon remains challenging. 3D reconstructions of complex perianal fistula are feasible with the potential to improve surgical planning, communication with patients and augment training.

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