intracytoplasmic cilia up to 12 months post infection. There was no correlation with any ongoing nasal symptoms or symptoms of long COVID. In contrast, ciliogenesis was normal in the Omicron infected, vaccinated cohort, and no mislocalised basal bodies or intracytoplasmic cilia were seen. Defects in cilia function were present in both cohorts compared to pre-pandemic controls: reduced cilia beat frequency (FOLLOW p<0.01), reduced amplitude per second in both: (FOLLOW p<0.01, ULTRON p<0.01).

This ciliogenesis defect led us to explore FOXJ1 expression post-COVID: qRT-PCR showed a significant reduction of FOXJ1 mRNA levels 6 months (p<0.001) and 12 months (p=0.002) following pre-Omicron variant infections compared with healthy volunteers; however, there was a significant improvement between 6-months and 12-months.

Conclusion Cilia loss and defective ciliogenesis linked to reduced FOXJ1 expression persisted for a year following infection with early SARS-CoV-2 variants. No such defects were seen in vaccinated individuals infected with the Omicron variant despite some functional ciliary defects. This work illuminates novel long-term effects of viral infection on human epithelial function through altered expression of a key cilial regulator gene.