

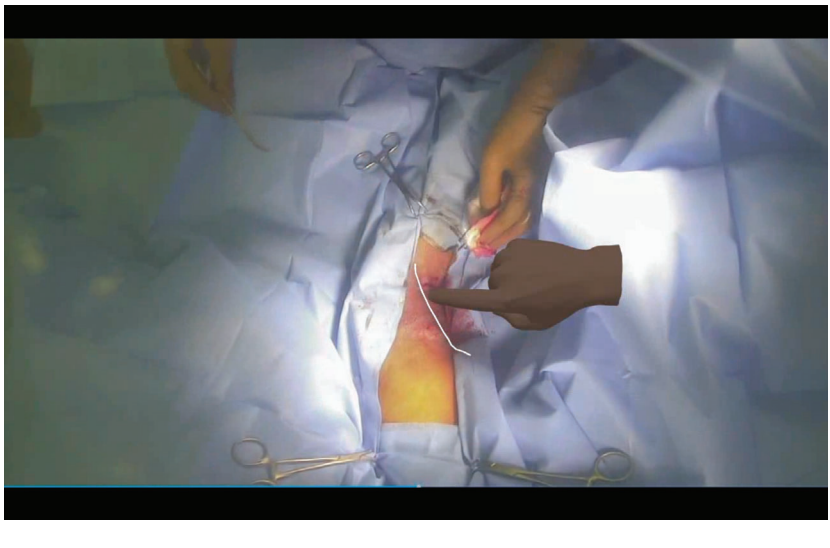
Employing augmented reality telesurgery for COVID-19 positive surgical patients

Editor

COVID-19 is presenting the international surgical community with unique challenges. Whilst surgical intervention is being reserved for the most critical cases¹, operating on patients who are COVID-19 positive poses an increased infection risk to surgical teams. Personal protective equipment (PPE) is being employed to reduce risk of transmission but this may rapidly become in shortage². Telesurgery helps reduce the number of healthcare professionals required to be physically present during a procedure, which in turn decreases risk of viral transmission and consumption of PPE. We present the case of a COVID-19 positive patient who underwent urgent incision and drainage of an acute forearm collection at our institution with assistance from an augmented reality (AR) platform.

A 59-year-old male patient was admitted with a persistent cough and fever of 39.2°C. His extensive past medical history included diabetes mellitus, hypertension, hypothyroidism, chronic renal impairment and dyslipidemia. Given the history of being in contact with a COVID-19 patient during the previous week, IgG and IgM immunoassay testing for COVID-19 was performed and returned positive. During his hospital stay, the patient developed pain and swelling in the left antecubital fossa at the site of a previously inserted intravenous cannula and was diagnosed with superficial thrombophlebitis of the cephalic and basilic veins, confirmed on ultrasonography. He was treated conservatively initially; intravenous antibiotics were added when his condition failed to improve. However, over the following days, the swelling and erythema progressed to include the lower arm and anterior aspect of the proximal forearm. The patient was persistently febrile with rising inflammatory markers. Repeat ultrasonography revealed a multi-loculated subcutaneous collection in the left forearm with associated subcutaneous

Fig. 1 Snapshot of the Proximie video feed showing the surgical field with a virtual hand cursor controlled remotely by a consultant to draw a suggested incision line using augmented reality tools



edema and partial thrombosis of the left brachial vein. He was taken to the operating theatre for incision and drainage under local anesthesia by a junior attending surgeon. Consent was obtained for surgery, including use of an AR telesurgery platform to remotely involve two consultant surgeons during the procedure. The Proximie™ platform was employed and the consultants used the AR tools to draw a proposed incision on the televised operative field on the screen (*Fig 1*), to provide real-time audiovisual feedback and remote mentorship. Post-operatively, the patient's condition improved and he had an uneventful recovery.



To our knowledge, this is the first case of a surgical intervention being performed for a COVID-19 patient facilitated by augmented reality. Telesurgery has previously been employed to remotely connect surgeons for proctorship of challenging cases³. At a time when infection control is of paramount importance, telesurgical technologies can help safeguard both patients and surgical teams against viral transmission by reducing the number of healthcare professionals who are physically present in theatre. This is especially important

for surgical patients who test positive for COVID-19 or whose status is unknown. PPE use is also consequently reduced.

Although, this was a relatively straightforward case, the successful implementation of augmented reality telesurgery paves the way for large-scale incorporation of this technology into the modern-day operating room⁴ and demonstrates its particular value during the current pandemic.

Competing interests

Dr. Hachach-Haram is the founder and CEO of Proximie.

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