

REMOTE MAGNETIC NAVIGATION FOR CATHETER ABLATION OF COMPLEX ARRHYTHMIAS IN
CONGENITAL HEART DISEASE: AN INITIAL EXPERIENCE USING A TRANSNATIONAL TELEROBOTIC
APPROACH

Jack R. Griffiths¹, Rui Shi¹, Stefan Ailoei¹, Piers Wright¹, Dan Hunnybun¹, Matt O'Connor¹,
Aleksander Kempny¹, Caterina Vlachou¹, Tom Pickworth¹, Brian Keogh¹, Tom Wong¹, Sabine
Ernst¹

¹ Royal Brompton Hospital (Guy's and St Thomas' NHS Foundation Trust), London, United
Kingdom; National Heart Lung Institute, Imperial College London, United Kingdom.

ABSTRACT

Background: The field of congenital electrophysiology (EP) is still in its relative infancy with a limited number of electrophysiologists capable of performing catheter ablation in the more complex forms of congenital heart disease (CHD). As a result, patients or physicians are often required to travel great distances to perform specialised ablation procedures, which was made near-impossible during the COVID-19 pandemic.

Objective: We aimed to explore the feasibility and safety of a telerobotic approach to catheter ablation where the remote operator was situated approximately 1200km away from the patient and local team.

Methods: A 3D-printed 'phantom' heart was used in a pilot experiment in which no significant difference was seen between the local and remote operators in electroanatomic (EAM) mapping of the phantom heart using remote magnetic navigation (RMN). Catheter ablation was subsequently performed in patients with severe CHD using a transnational telerobotic approach to catheter ablation where the remote operator was able to view the dedicated console with live fluoroscopy, EAM and EP signals, as well as control the mapping and ablation catheters from 1200km away. As a safety precaution, radiofrequency (RF) could only be delivered by the local team.

Results: In total, 10 procedures were performed in 9 patients with severe CHD (mean age 38, X female) between April and December 2021. All patients with CHD underwent ablation of an atrial arrhythmia and for one additional patient without CHD denervation of the pulmonary arteries was performed alongside AT ablation. Median procedure duration was 335 minutes (IQR 230-349) with 11.5 minutes (IQR 3-15.4) of fluoroscopy exposure and 752 (IQR 674-905) seconds of RF delivery. For one patient with twin atrioventricular (AV) nodes the procedure was halted due to an unacceptable risk of iatrogenic AV block. One patient with double-inlet left ventricular and transposition of the great arteries with an extracardiac total cavopulmonary connection had to undergo direct-current cardioversion due to failure of the local RMN system. There were no acute procedural complications.

Conclusions: Telerobotic catheter ablation is feasible and effective and creates the possibility of exciting new approaches to remote ablation and tele-proctoring of international fellows.