

Robotic Surgery

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Barts Health **NHS**
NHS Trust

Why robotics in surgery?

- Minimising exposure to hostile environment
 - both patient and operator
- Increasing precision/decreasing human error

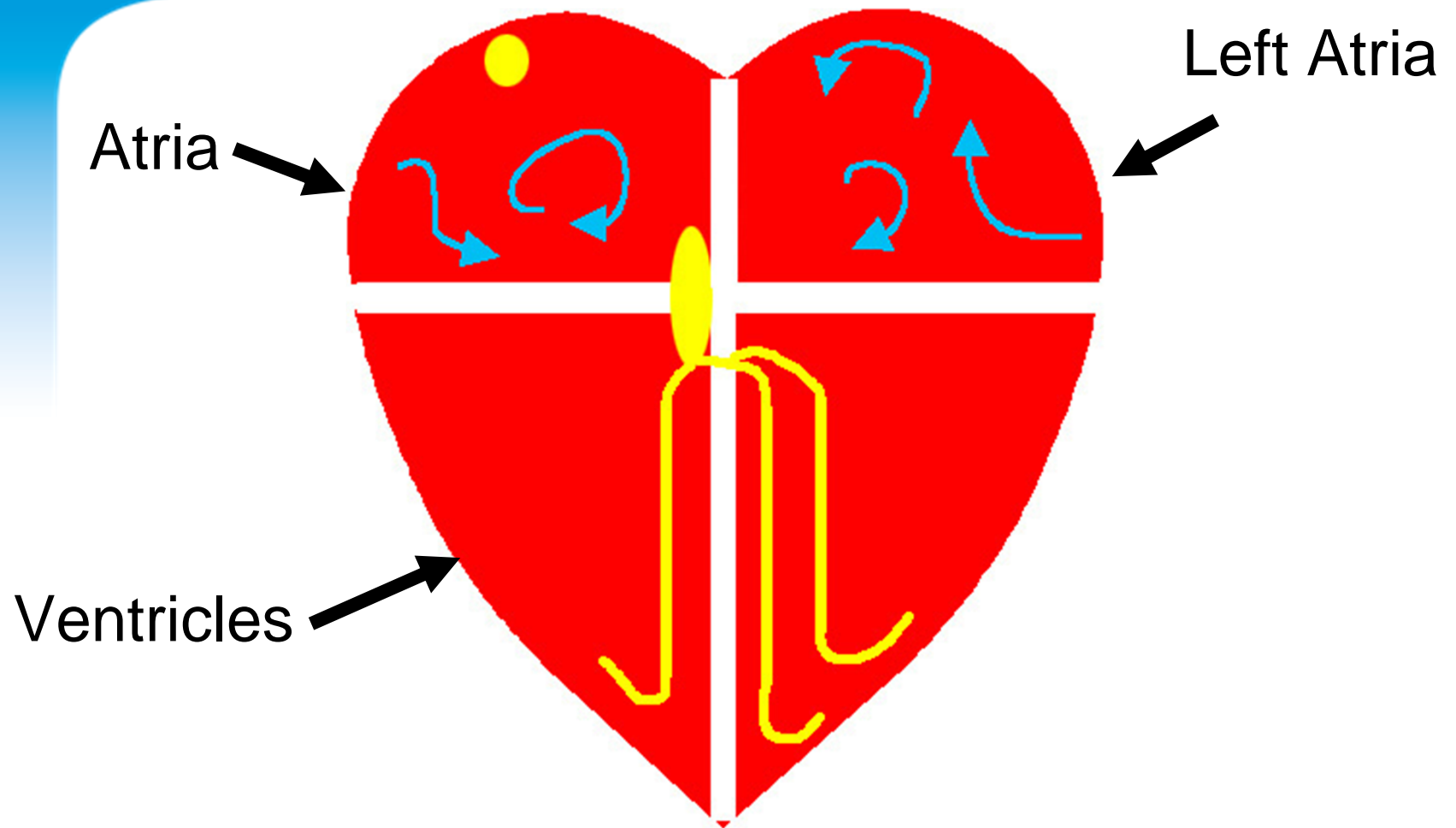


The fall and rise of robotics in surgery

- Atrial fibrillation 1-2% of population, 20% >80 year olds
- Common in large mammals
- Heart failure, stroke, premature death
- Considered untreatable 15 years ago

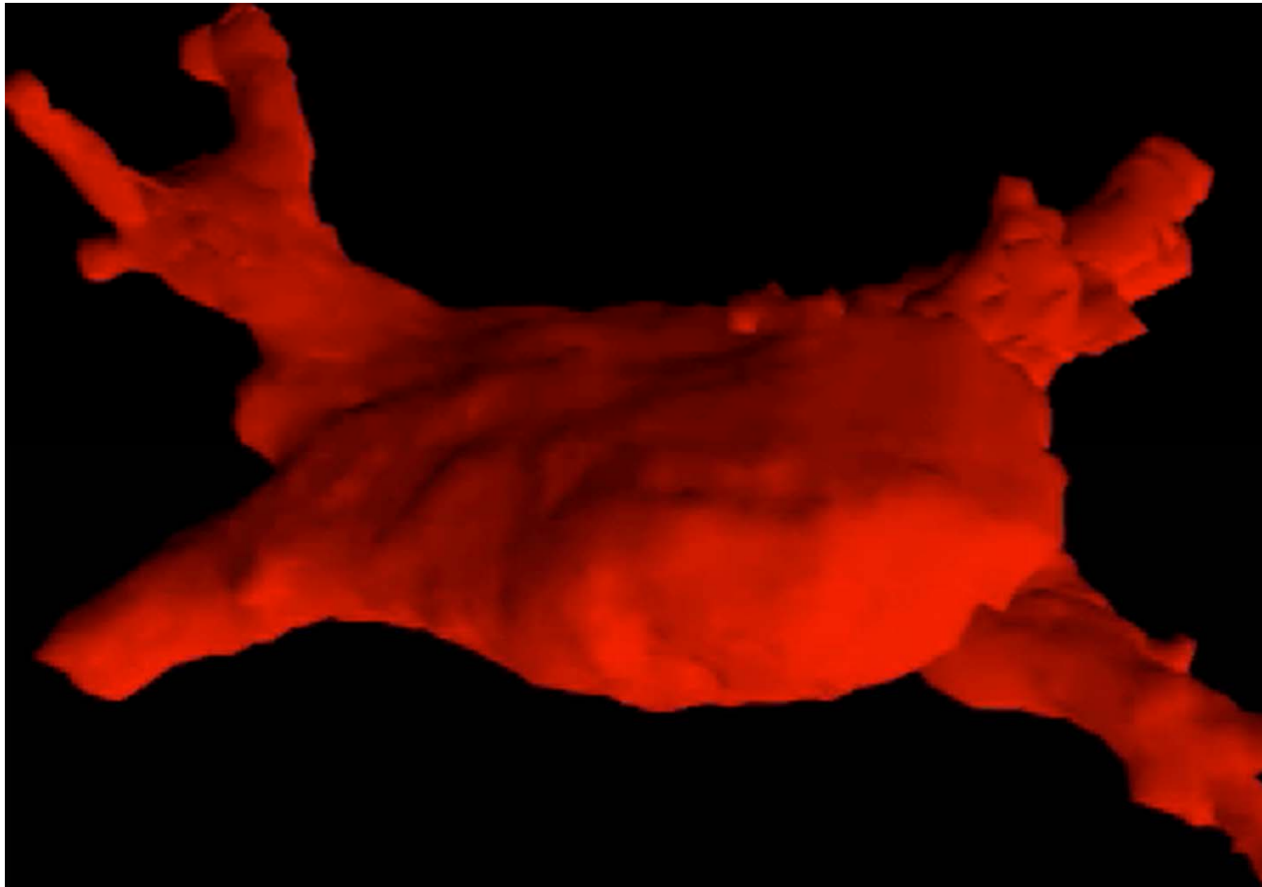


The mechanism of AF



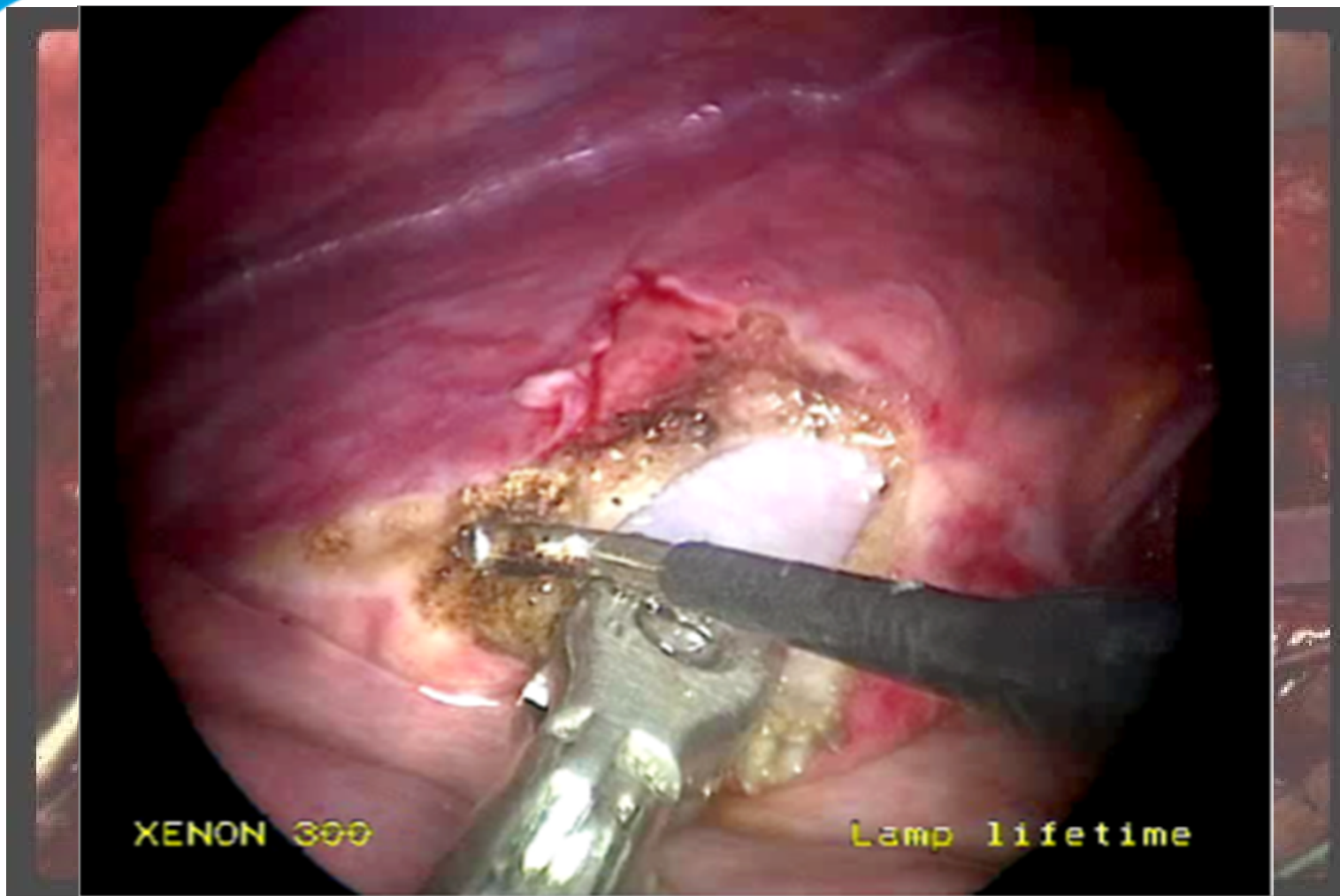
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The source of AF



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Surgical ablation



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Surgical ablation

- The internal organs are exposed to hostile environment
- Access limited
- Expensive/complex

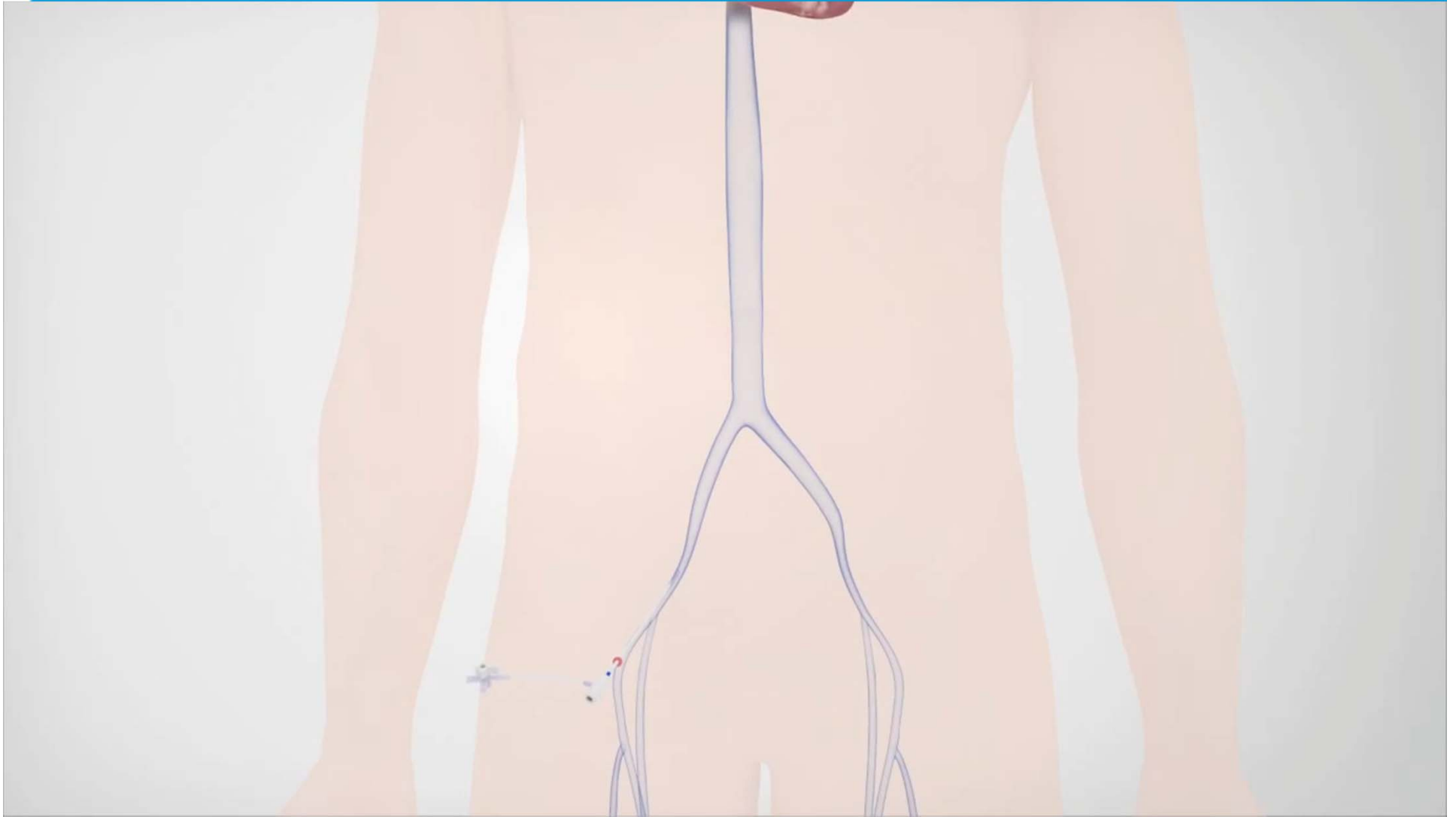


Internal catheter ablation

- Challenges to overcome
 - Access to heart and left atrium
 - Visualisation/localisation
 - Manipulation
 - Delivery of sufficient therapy at correct location

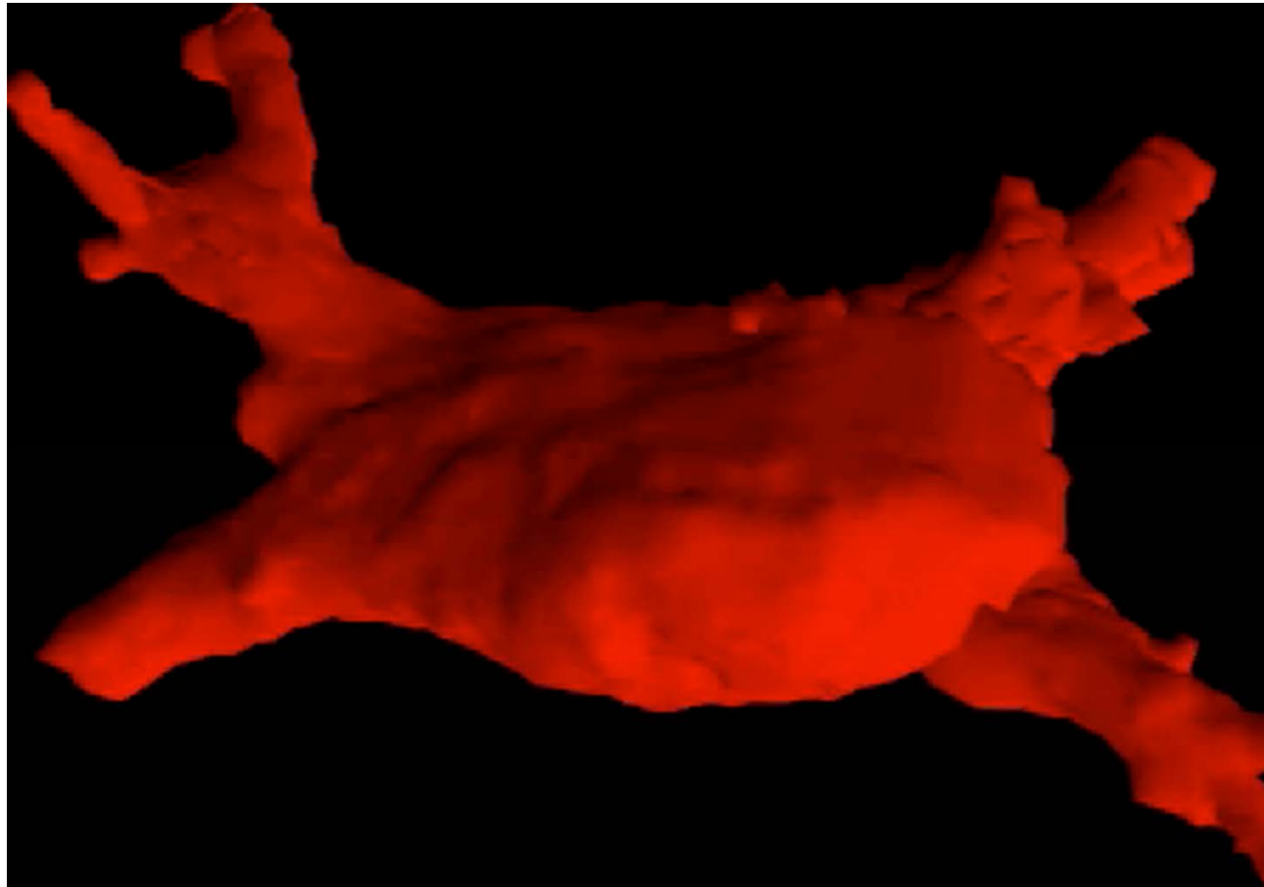


Access to the heart and left atrium



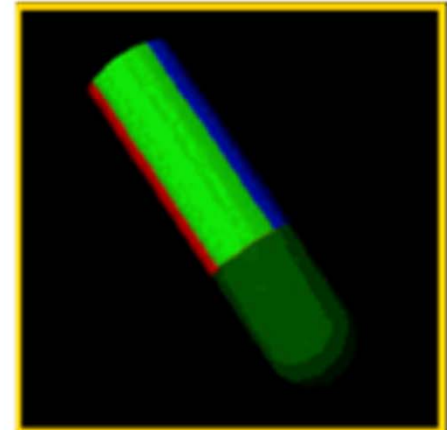
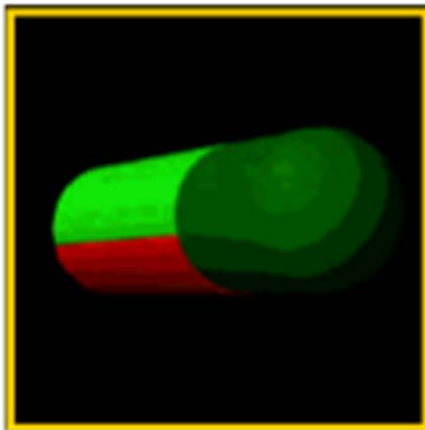
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Localisation within the heart



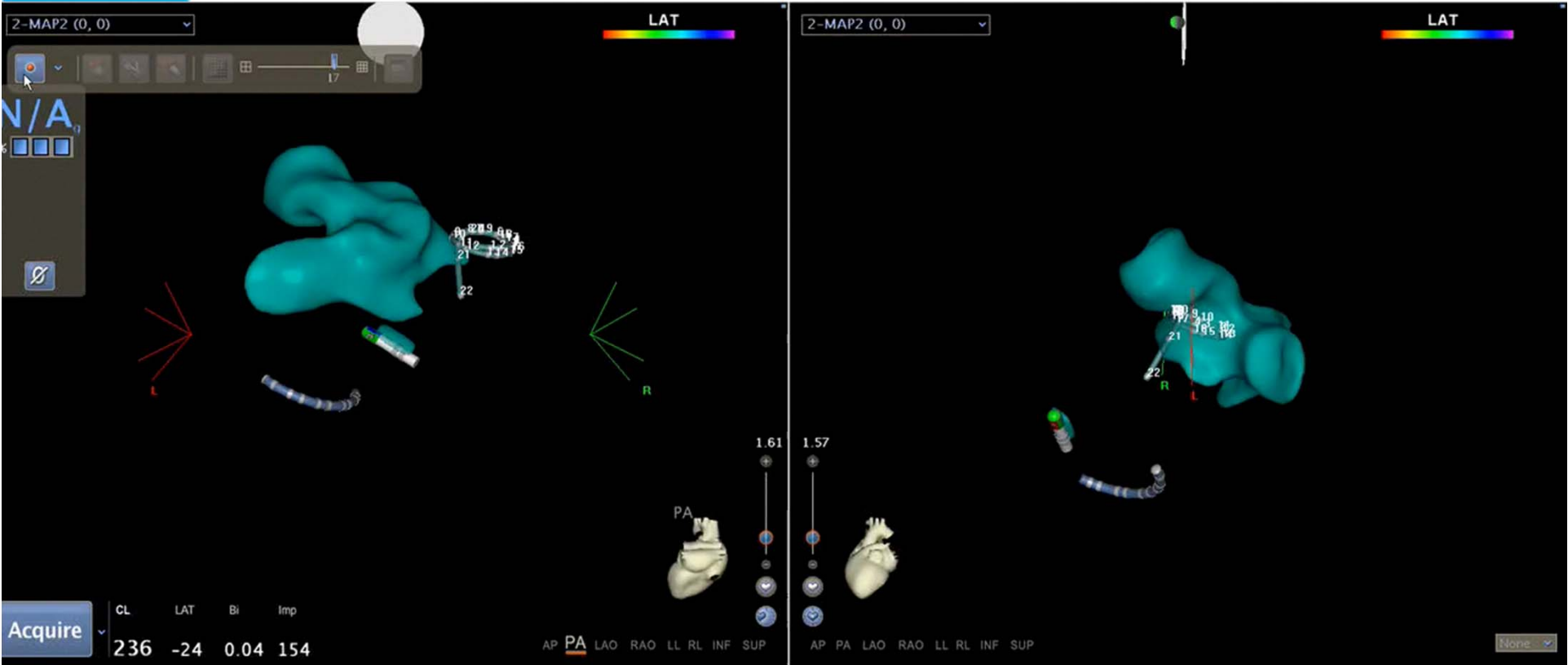
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Localisation

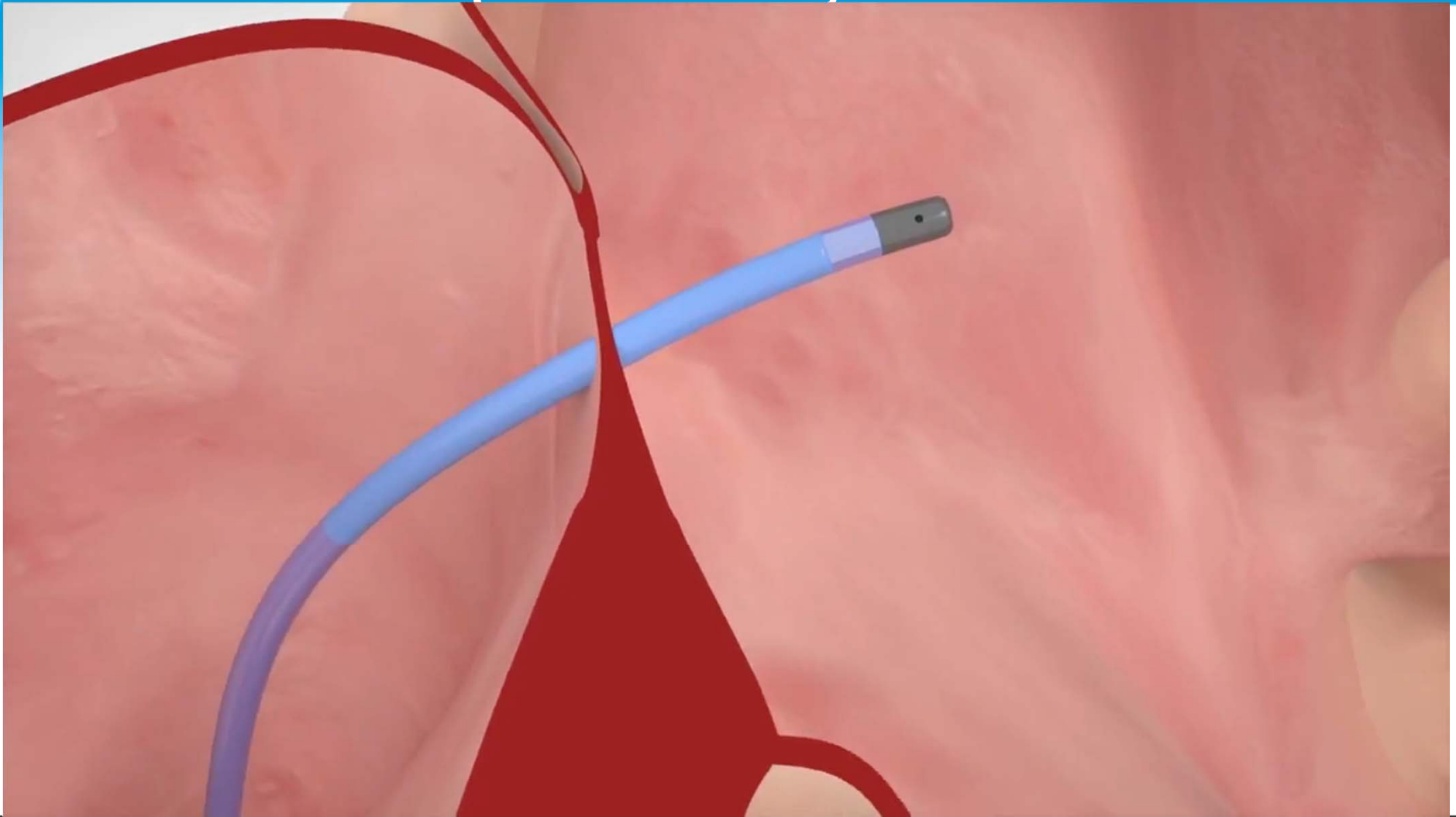


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Localisation

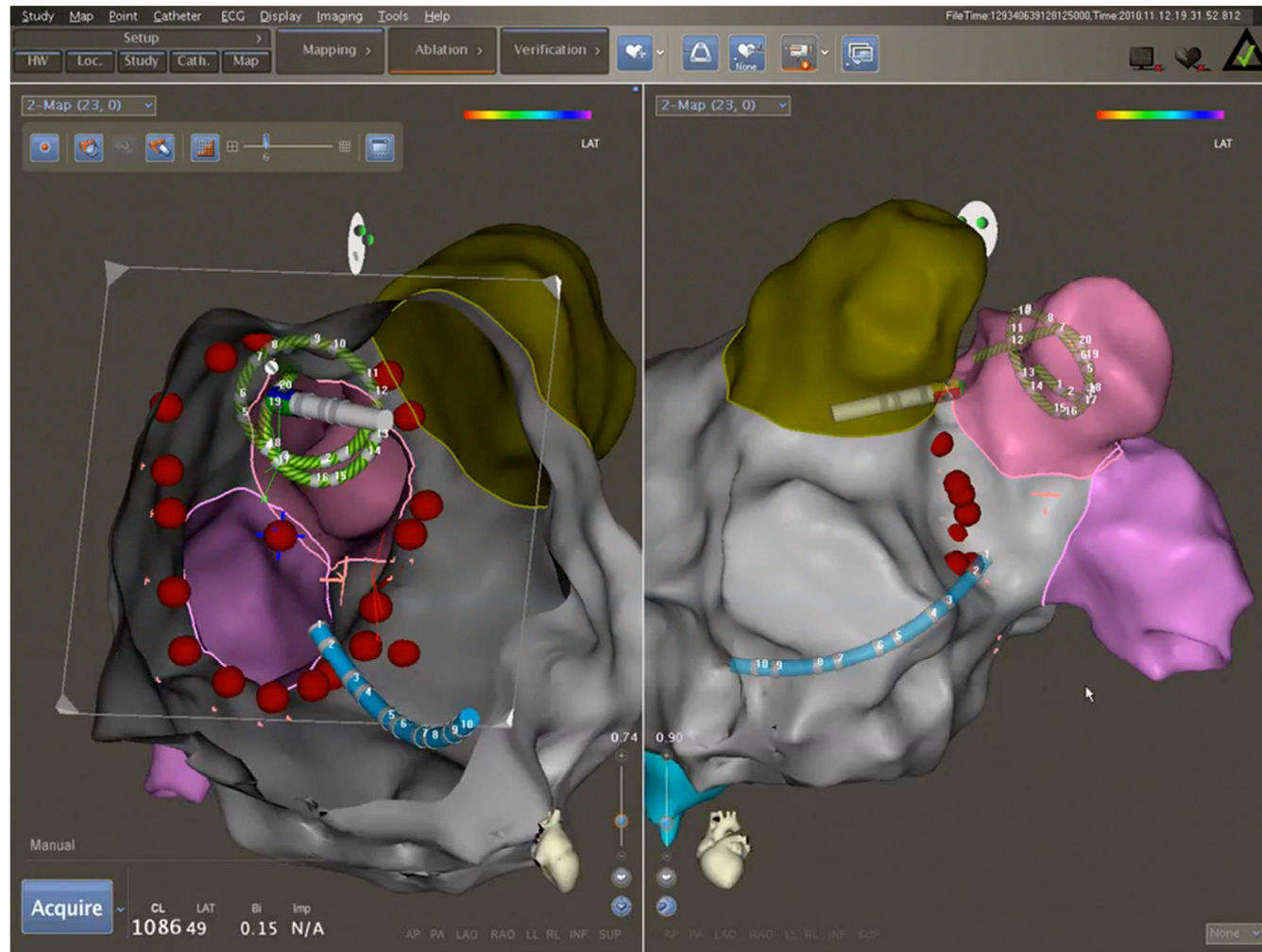


Catheter ablation to isolate the pulmonary veins



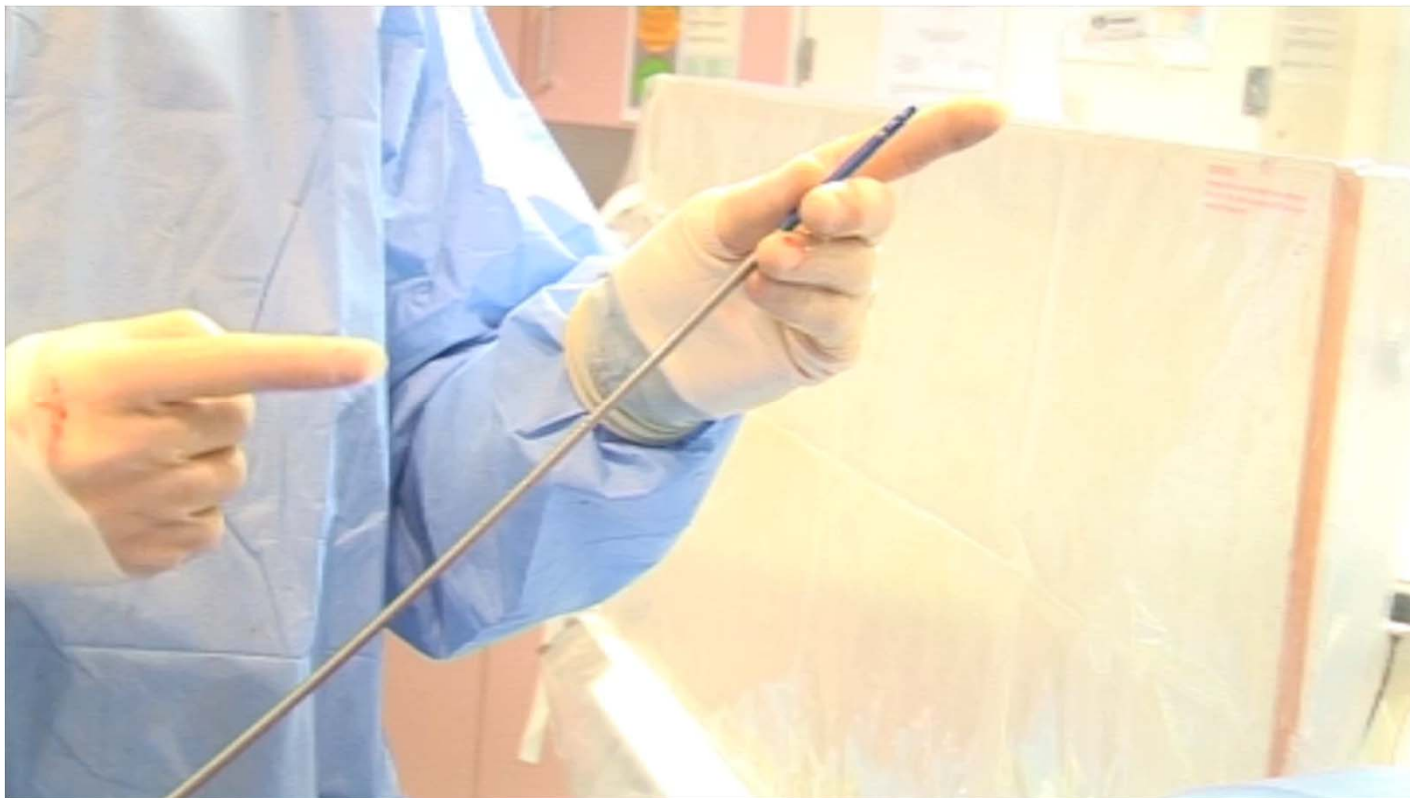
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Manipulation



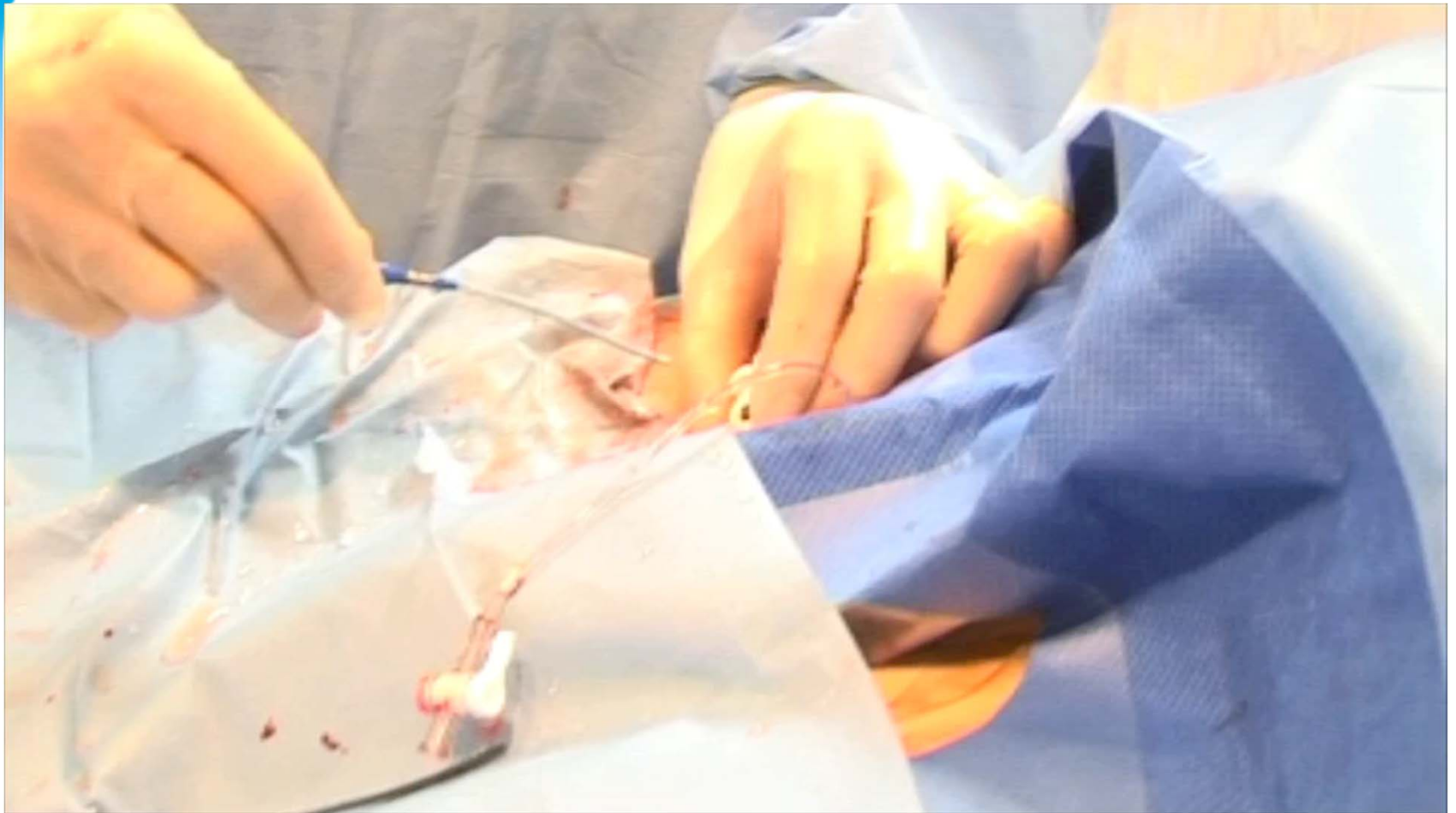
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Robot sheath with catheter



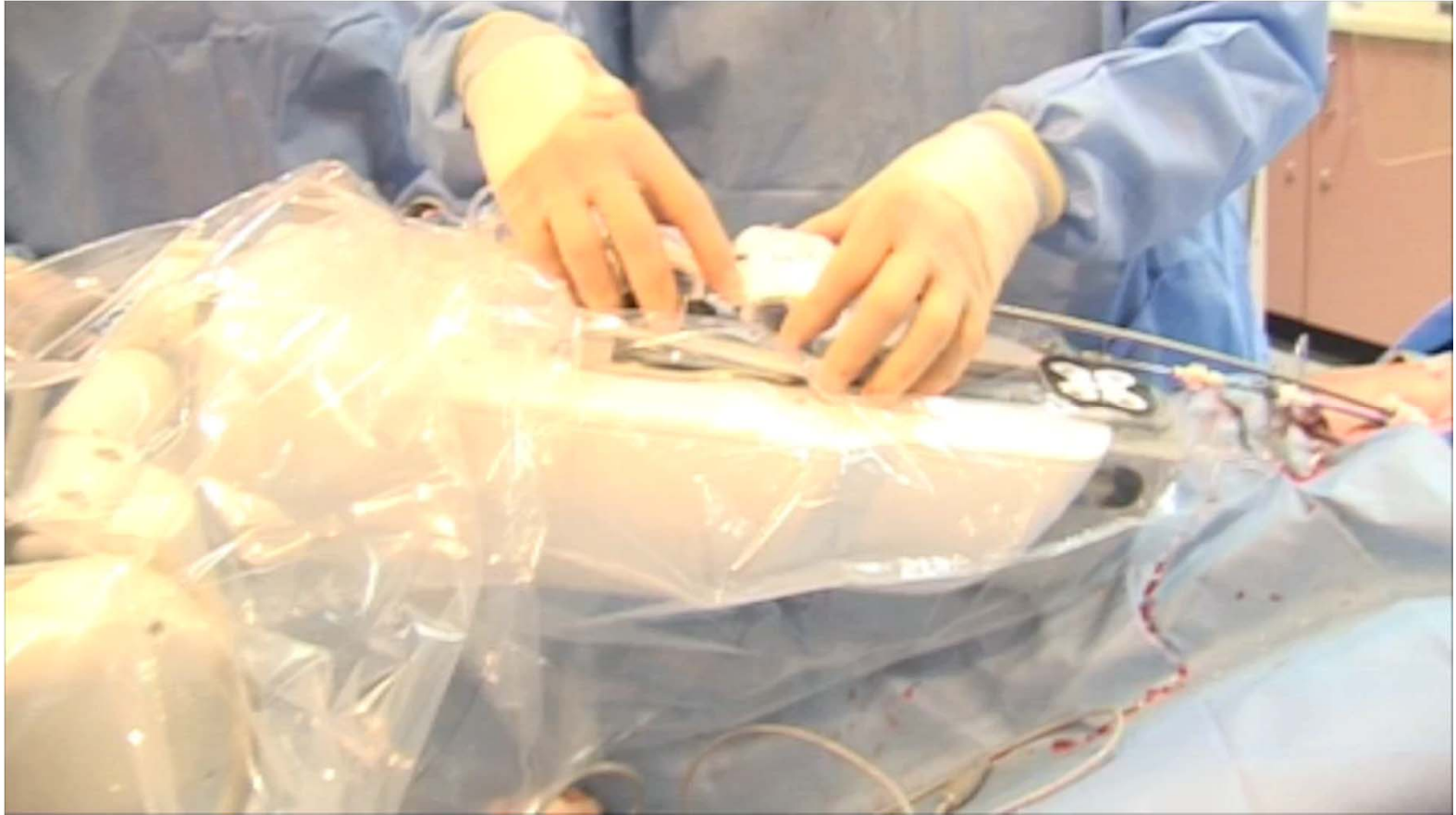
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TS Sheath positioned in SVC



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Sheath loaded onto robot arm



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Sensei - Robotic navigation

- Joystick controlled sheath
- Controlled remotely
- Wide range of reach and movement
- Indirect pressure sensing



Manipulation



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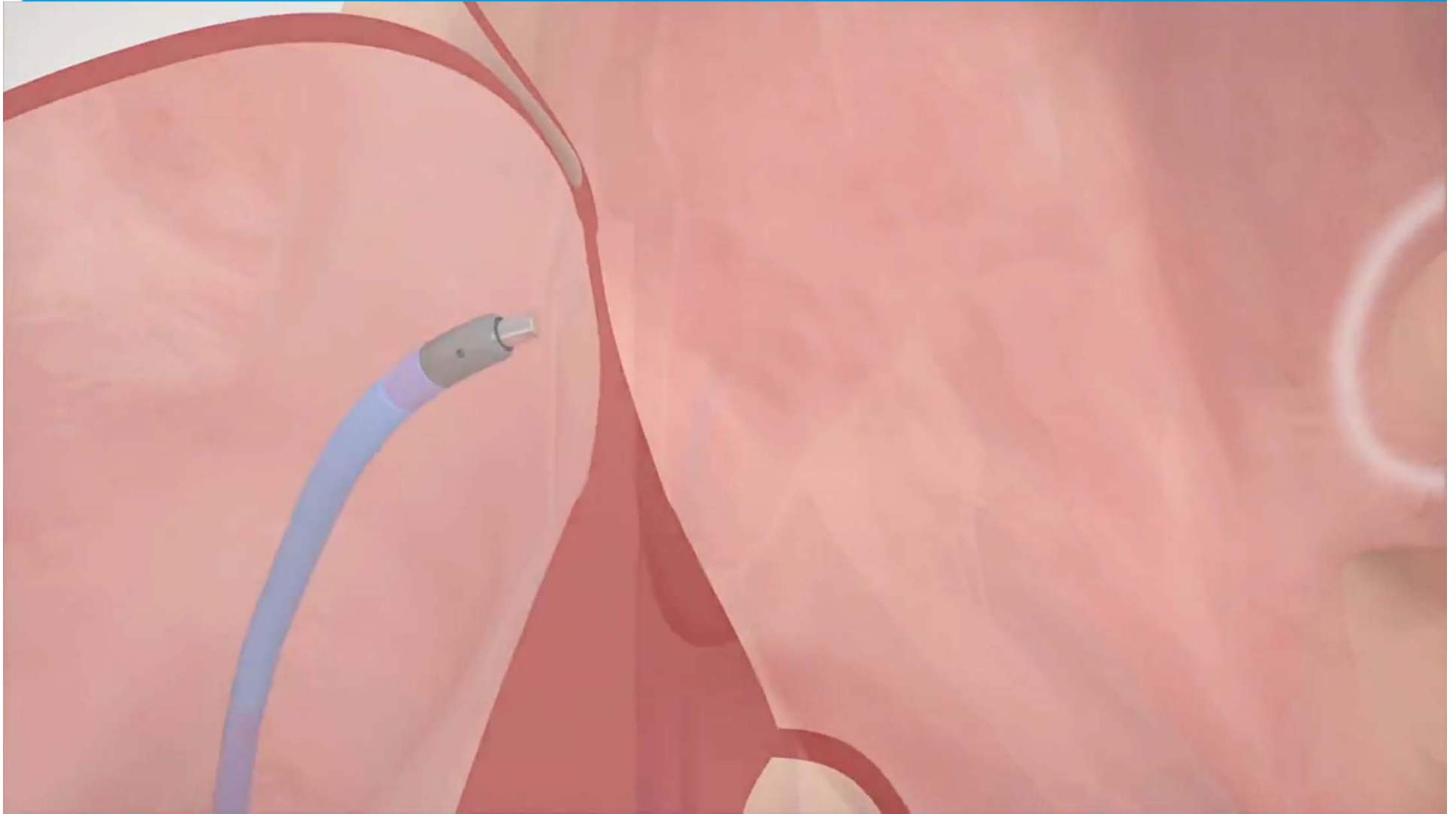
low risk environment

- Seated outside X-ray field
- Minimally invasive for patient



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Patient home same or next day



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Hansen robot ablation

- Randomised study 157 pts Manual vs robot
- Procedure times
- Complications
- Success rates (freedom from AF)

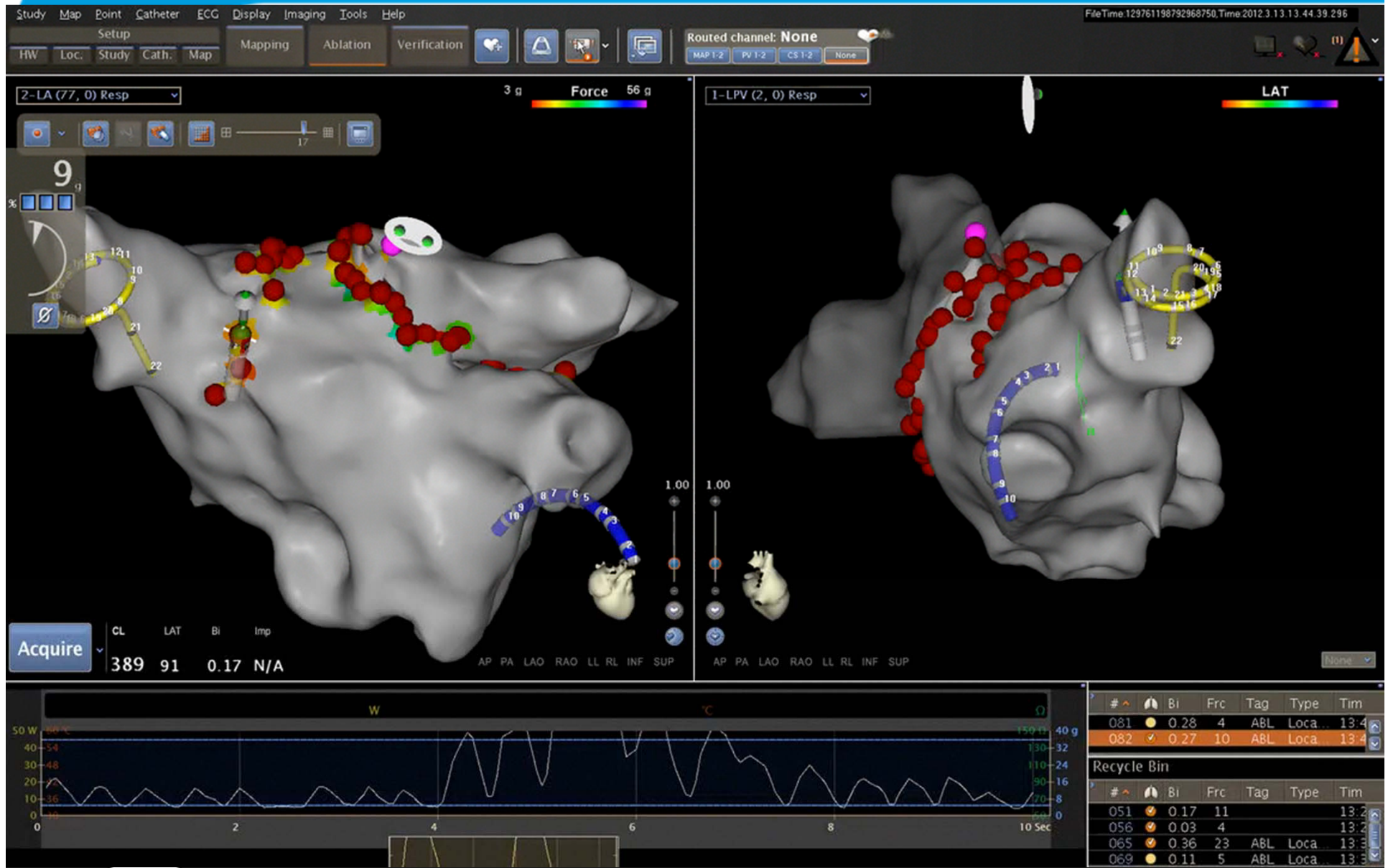


Hansen robot ablation procedure

	Manual	Robot	p value
Procedure (min)	273	289	ns
Fluoroscopy (min)	50	46	ns
time to ablation start	31	43	<.0005
Catheter displacement	5	1	<.0005
1st time success	33%	24%	ns



Catheter force sensing

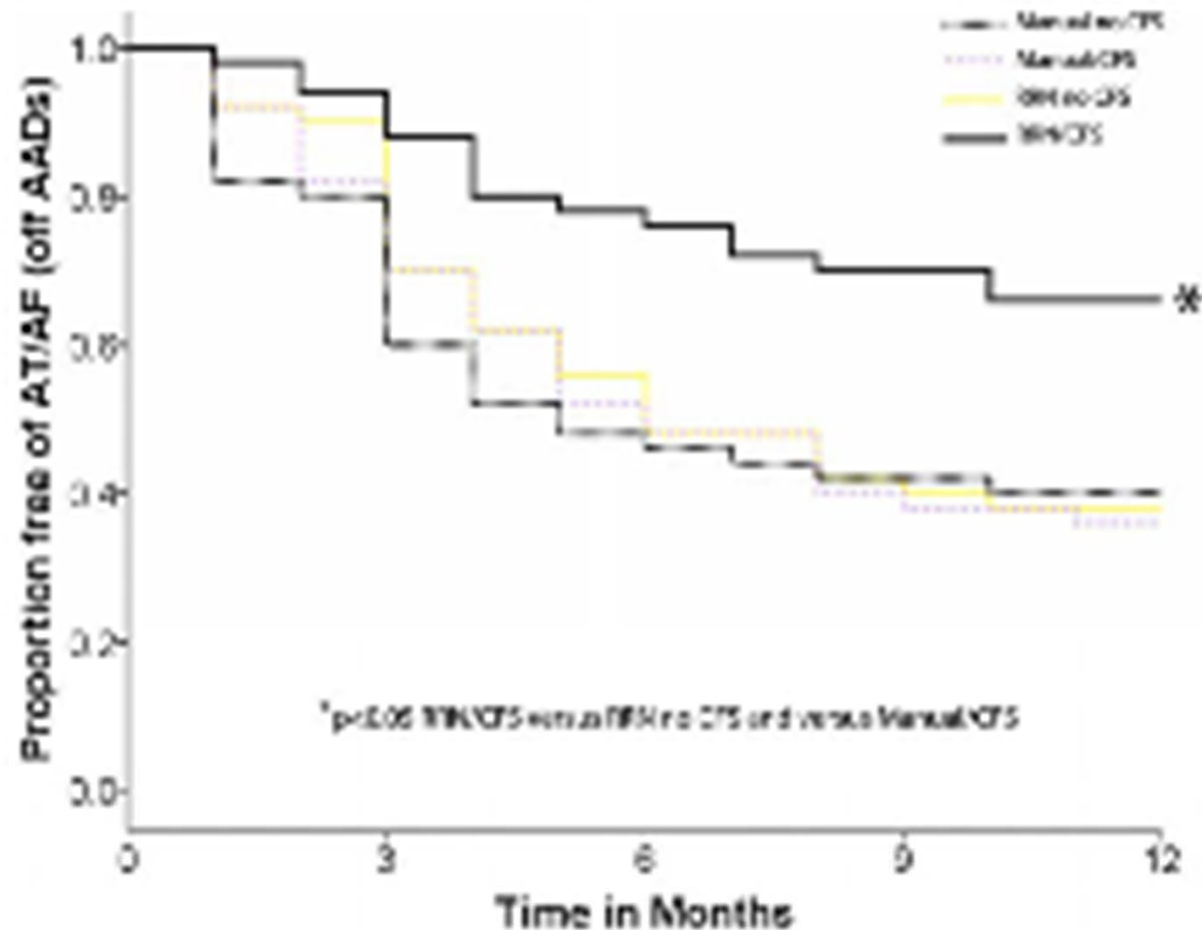


Influence of contact force

- International multi-centre case cohort comparison 200 pts
- Robot vs Manual, contact force vs no CF
- 1 year 1st time success



Influence of contact force



What did we learn

- Keep robot simple
- Re-creating of humanoid experience may detract rather than enhance (e.g. haptics)
- Robotic manipulation only useful if combined with other “senses”

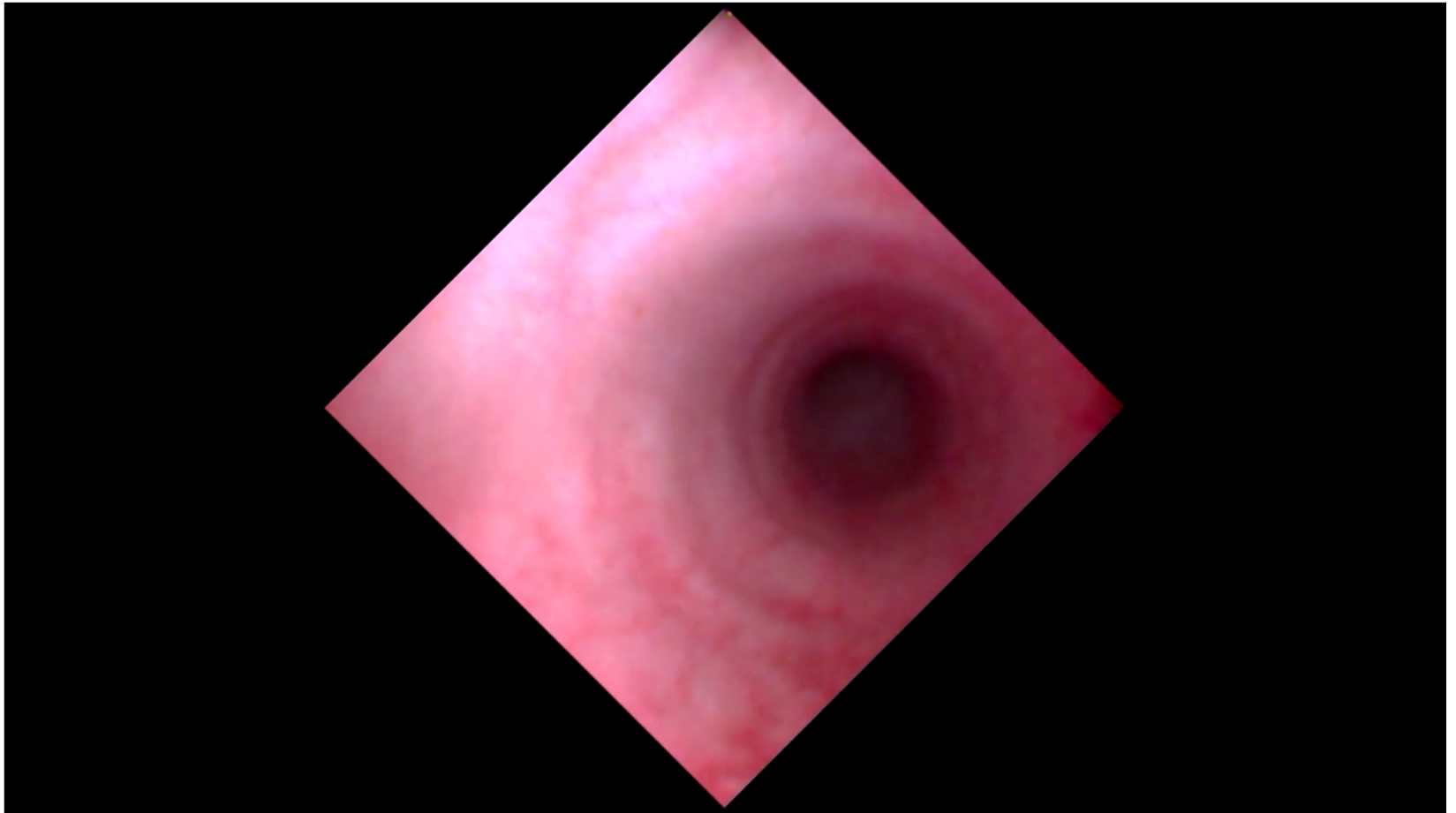


Future challenges



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Human lung



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