

inated mucosal injury despite identical energy application, and further reducing the temperature of water circulating through the device to 5°C eliminated all evidence of thermal injury (both internally and externally). Temperature profiles determined by the model (Figure 1) corresponded to findings on histopathology, in which temperature rises sufficient to induce moderate-to-severe muscularis mucosa damage were eliminated with esophageal cooling using 5°C water.

Conclusions: Esophageal protection from RF ablation energy using a new esophageal cooling device appears effective experimentally, and can be modeled accurately, allowing for additional investigation and refinement of protective strategies during ablation of the left atrium for the treatment of atrial fibrillation.

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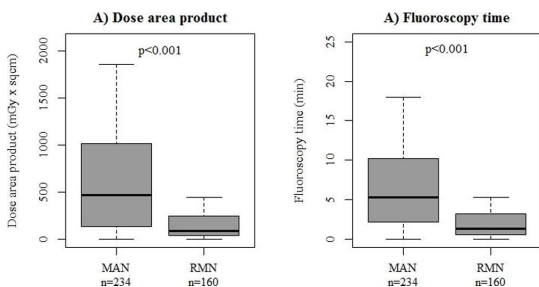
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Impact of the use of advance mapping and navigation techniques on radiation exposure in catheter ablation in adult congenital heart disease patients

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Introduction: Adults with congenital heart disease (ACHD) are exposed to an increasing amount of ionizing radiation from cardiac procedures, including arrhythmia ablation. In fact, arrhythmias are frequently encountered in this population and may be challenging to manage pharmacologically or invasively. Advanced mapping and navigation tools, such as 3D electroanatomical mapping, 3D "road map" imaging and remote magnetic navigation (RMN) are, thus, often required and may help reduce radiation exposure. We report on the impact of each these techniques on fluoroscopy exposure in a large ACHD cohort.

Methods and results: We retrospectively reviewed a total of 394 ablations performed in 284 ACHD patients between 2011–2017 in a tertiary centre. Median age at first ablation was 41 [29–51] and 148 were male. The majority of patients (83%) had ACHD of moderate or severe complexity (Bethesda class 2 or 3). The procedures included atrial tachycardia (n=221), supraventricular tachycardia (n=51), atrial fibrillation (n=73), ventricular ectopic or tachycardia (n=49). In all but 10 procedures (97%) a 3D mapping system was used (mostly 3D electroanatomical mapping 90%, 4% high density sequential mapping and 3% simultaneous non-invasive mapping). The use of the RMN system significantly reduced fluoroscopy exposure and time compared to manual procedures (MAN): median dose area product (DAP) 88.1 [41.9–246.8] $\mu\text{Gy}\cdot\text{m}^2$ and fluoroscopy time (FT) 1.3 min [0.6–3.2] for RMN procedures (n=160) vs 471.5 [134.8–1017.0] $\mu\text{Gy}\cdot\text{m}^2$ and 5.3 min [2.2–10.2] for MAN (n=234), $p<0.001$ for both. A significant reduction in radiation exposure was observed across all Bethesda anatomical complexity groups and all types of ablations. 3D electroanatomical mapping was associated with the lowest doses of DAP and FT. Ninety percent of the procedures were carried out with 3D roadmaps (mostly CMR 69% vs 31% CT), the type of pre-acquired scan didn't make any difference for radiation exposure.



Comparison of RMN and MAN procedures

Conclusions: Advanced technologies, such as RMN, 3D mapping and imaging merge, are becoming standard practice for ACHD ablations. Beyond facilitating the treatment of complex arrhythmias, they also result in a significant reduction in radiation exposure, which is especially important in this young population that may require multiple procedures over their lifetime.

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Long-term outcomes after "Zero X-ray" arrhythmia ablation: a six-year observational study

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Background: Radiation exposure due to tachyarrhythmia radiofrequency catheter ablation (RFCA) may determine small but definite risk for both patients and operators. Non-fluoroscopic mapping systems today enable to perform RFCA with minimal/zero fluoroscopy.

Purpose: The purpose of the study is to evaluate the long-term outcome of patients who had undergone "Zero X-ray" ablation, since few information are today available on the very long-term benefits

Methods: A total of 272 arrhythmias in 266 patients have been treated with RFCA by means of a zero-ray approach guided only by a nonconventional mapping sys-

tem (EnSite NavX™, Ensite™ Velocity™ mapping system; subsequently Ensite™ Precision™). Fluoroscopy was never used in our patient population

Results: Over a period of 6 years, patients were followed up for an average of 2.9±1.6 years. A 100% rate of acute success was observed in the study population, with a complication rate of 0.8%. Chronic success was achieved in 90.8% of the total number of procedures. Patients in whom the same arrhythmia recurred during follow-up underwent to a redo procedure in 60.0% of cases, while the remaining 40.0% underwent pharmacological treatment. A new post-ablation arrhythmia occurred in 7.7% of the sample.

Conclusions: The non-fluoroscopic approach is a safe and feasible alternative to fluoroscopy for arrhythmias ablation. This method ensures high acute procedural success rates, low complications rates and comparable long-term outcomes with clinical benefits for both patients and physicians. The complete elimination of fluoroscopy during catheter ablation is advantageous and does not reduce patient safety.

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Predictive factors and safety of non invasive mechanical ventilation in combination to Propofol deep sedation in left atrial ablation procedures

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Aims: Catheter ablation is nowadays the core treatment of atrial fibrillation (AF). Propofol infusion sedation is an accepted and generally safe strategy, however respiratory depression and unstable respiration with considerable respiratory variations are frequent. Non invasive mechanical ventilation (NIV) added to deep sedation could improve procedural safety and success. We sought to assess the predictive factors for the use of NIV in patients undergoing left atrial ablation procedures under propofol sedation.

Methods: Procedural data from 252 consecutive patients undergoing left atrial ablation (161 (64%) persistent, 86 (34%) for paroxysmal AF and 5 for atrial tachycardia (2%) were analysed. Sedation with 2% propofol and Fentanyl was used in all procedures and controlled by electrophysiologists. Arterial blood gaz analysis were performed regularly during the procedure. NIV was indicated for respiratory depression with pH <7.25 and/or pCO₂ >50mmHg and/ or agitated patient with need for deeper sedation.

Results: Endotracheal intubation was not necessary in any case and no procedure was abandoned due to adverse effects of sedation. Mean procedure time was 184.5±64 min. Mean propofol dose was 639.5±348.5 mg. NIV was used in 25 patients (10%) showing a mean PH of 7.27±0.06 and a mean CO₂ of 54±10 mmHg. Predictive factors for the use of NIV were high-dose propofol sedation (p=0.010), persistent AF (p=0.029), prolonged procedure time (p=0.006), increased body mass index (BMI) (p=0.008) and presence of obstructive sleep apnea (OSA) (p<0.001). In a cox regression analysis, OSA was an independent factor for NIV use (p=0.016). Higher BMI and longer procedure time remained also important factors (p=0.06).

Conclusions: Propofol deep sedation for patients undergoing left atrial ablation is safe. Adding NIV in high risk patients (i.e. OSA, high BMI, long procedure duration) provide a better respiratory homeostasis, better arterial blood gas balance and better controlled thoracic expansions improving catheter stability. This could impact long-term procedure results.

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Life threatening complications of atrial fibrillation ablation:16-year experience in a large prospective tertiary care cohort

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Background: Recent data from the USA Nationwide inpatient sample showed increasing life threatening complications of atrial fibrillation (AF) ablation with death rates at 0.4%. This may reflect wider adoption and possibly increasing trend of ablation in low-volume centers.

Purpose: To assess the incidence and outcomes of life threatening complications of AF ablation in a high volume center with quality improvement initiatives and surgical back up program.

Methods: All 10378 AF ablation patients at our institution (2000–2015) were enrolled in a prospectively maintained registry. All complications were prospectively identified including life threatening cardiac, neurological, respiratory or vascular complications.

Results: Life threatening complications occurred in 100 patients (0.9%). The most common was pericardial effusion requiring pericardiocentesis (0.5%), with 7 (0.07%) requiring emergent surgery. There was a trend towards lower pericardial complications in the last 2 years of the study. Stroke occurred in 27 patients (0.3%) and was mostly ischemic (93%) followed by hemorrhagic (3.5%) and ischemic with hemorrhagic conversion (3.5%). The stroke yearly incidence decreased from an average of 1.1%/year in the first tertile (2000–2004) to 0.2%/year in the last two tertiles (2005–2015). Neurological deficits persisted in 23 patients. Vascular complications causing hemorrhagic shock occurred in 7 patients