

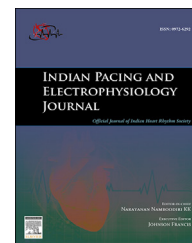
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# Anesthetic management in atrial fibrillation ablation procedure: Adding non-invasive ventilation to deep sedation

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## ABSTRACT

Anesthetic management of patients undergoing pulmonary vein isolation for atrial fibrillation has specific requirements. The feasibility of non-invasive ventilation (NIV) added to deep sedation procedure was evaluated.

Seventy-two patients who underwent ablation procedure were retrospectively revised, performed with (57%) or without (43%) application of NIV (Respironic® latex-free total face mask connected to Garbin ventilator-Linde Inc.) during deep sedation (Midazolam 0.01–0.02 mg/kg, fentanyl 2.5–5 µg/kg and propofol: bolus dose 1–1.5 mg/kg, maintenance 2–4 mg/kg/h).

In the two groups (NIV vs deep sedation), differences were detected in intraprocedural (pH  $7.37 \pm 0.05$  vs  $7.32 \pm 0.05$ ,  $p = 0.001$ ; PaO<sub>2</sub>  $117.10 \pm 27.25$  vs  $148.17 \pm 45.29$ ,  $p = 0.004$ ; PaCO<sub>2</sub>  $43.37 \pm 6.91$  vs  $49.33 \pm 7.34$ ,  $p = 0.002$ ) and in percentage variation with respect to basal values (pH  $-0.52 \pm 0.83$  vs  $-1.44 \pm 0.87$ ,  $p = 0.002$ ; PaCO<sub>2</sub>  $7.21 \pm 15.55$  vs  $34.91 \pm 25.76$ ,  $p = 0.001$ ) of arterial blood gas parameters. Two episodes of respiratory complications, treated with application of NIV, were reported in deep sedation procedure. Endotracheal intubation was not necessary in any case. Adverse events related to electrophysiological procedures and recurrence of atrial fibrillation were recorded, respectively, in 36% and 29% of cases.

NIV proved to be feasible in this context and maintained better respiratory homeostasis and better arterial blood gas balance when added to deep sedation.

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## Introduction

The delicate catheter ablation of atrial fibrillation (AF) involves a relevant risk of major complications although mortality is

less than 1 in 2000 [1–3]. Patients undergoing catheter ablation for AF are required to lie motionless on the procedure table for several hours, and repeated stimuli from ablation are sometimes painful. For these reasons, patients are treated with deep sedation or general anesthesia. The safety of deep

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sedation in this procedure has already been tested [4], and high-frequency jet ventilation during general anesthesia has also proved to be a safe technique [5].

Aid for anesthetic management in these setting can be non-invasive ventilation (NIV), first used in acute respiratory failure [6], sometimes during sedation [7], subsequently used outside of the intensive care unit [8] and in cardio-surgical procedures [9–12].

The aim of our study was to evaluate the usefulness of NIV during sedation in catheter ablation of use AF instead of atrial fibrillation compared to deep sedation.

## Materials and methods

### Study design and patient selection

In the study period (24 months), conducted in a single high-volume electrophysiology procedure center, consecutive patients undergoing catheter ablation for paroxysmal/persistent atrial fibrillation [1] were retrospectively revised (Fig. 1).

All patients provided informed consent to participate in the study. Exclusion criteria for the procedure were left ejection fraction less than 40%, moderate-to-severe mitral valve disease, severe heart failure (New York Heart Association functional class III or IV), expected surgery for structural heart disease, secondary AF (due to cardiac surgery, infection or hyperthyroidism), severe COPD with concomitant respiratory insufficiency ( $\text{PaO}_2 < 60$  mmHg), presence of inducible myocardial ischemia or other acute illness underway, or contraindications to anesthesia. Complications and recurrence of AF occurring within 48 h of the electrophysiological procedure were also examined.

### Anesthesiological management

Perioperative anesthesia visits and sedation procedures were performed according to SIAARTI (Società Italiana di Anestesia Analgesia Rianimazione e Terapia Intensiva) guidelines [13,14], including pulmonary function tests in the anesthetic assessment. Routine monitoring (electrocardiography, pulse oximetry, invasive arterial pressure, serial arterial blood gas analysis and apnea monitor) were performed. Sedation and NIV were performed after trans-septal puncture in order to rule out left-sided emboli through neurologic assessment.

Midazolam 0.01–0.02 mg/kg IV was administered immediately before monitoring, fentanyl (2.5–5  $\mu\text{g}/\text{kg}$ ) was administered as analgesic and sedation was performed by propofol infusion (bolus dose 1–1.5 mg/kg, maintenance 2–4 mg/kg/h). The infusion rate was carefully titrated to achieve a target sedation level of a Ramsay sedation scale [15] of 2–3. Mean arterial pressure was maintained above 75 mmHg during the entire procedure.

During deep sedation, the patients were breathing spontaneously and were given supplemental oxygen ( $\text{FiO}_2$  80–100%) to maintain the oxygen saturation level above 92%.

In patients undergoing NIV ventilation the procedure was performed with a Respirolic<sup>®</sup> latex-free total face mask connected to Garbin ventilator (Linde Inc., Herrsching, Germany) in Spontaneous/Temporized mode applying incorporated algorithms to improve patient-ventilator synchrony by adjusting to changing breathing patterns and dynamic leaks. I-PAP, E-PAP and respiratory rate were modified according to the clinical response, tolerance of the patient to obtaining exhaled tidal volume of 6–8 ml/kg;  $\text{FiO}_2$  requirement was 40% or less to maintain oxygen saturation above 92%. The ventilator settings were adjusted on the basis of pulse oximetry and serial measurement of arterial blood gases.

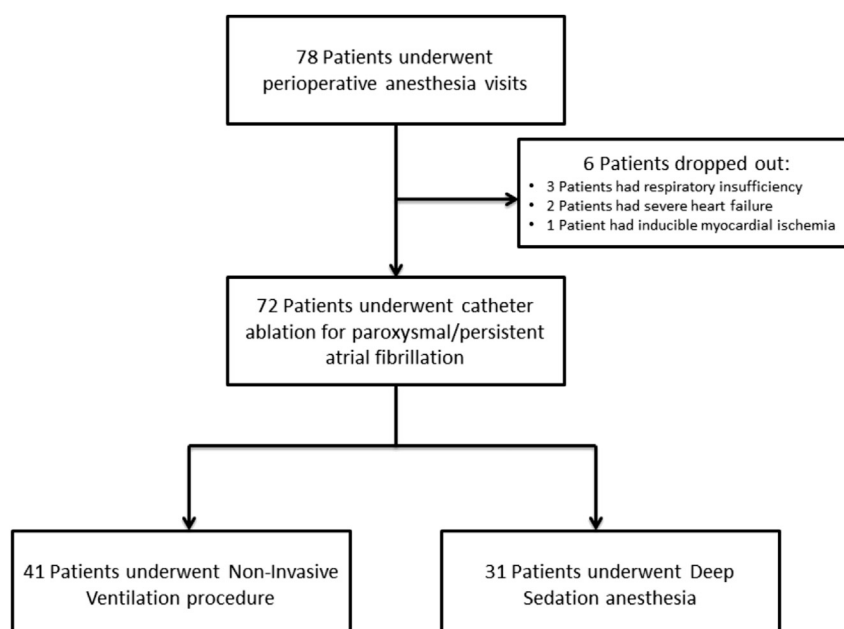


Fig. 1 – Patients flow diagram of the study.

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