Impact of Local Anesthesia on Ciliary Dyskinesia Diagnosis by Digital High-Speed Videomicroscopy

Lionel Benchimol[1], Noemie Bricmont[1], Romane Bonhiver[1], Grégory A. Hans[2], Philippe Lefebvre[1], Céline Kempeneers[1], and Anne-Lise Poirrier[1]

[1]Centre hospitalier universitaire de Liege
[2]CHU de Liege Soins intensifs generaux

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Abstract

Summary: This prospective study investigates the impact of local anesthesia on ciliary function in nasal epithelium. The primary objective was to assess whether lidocaine 2% and naphazoline 0.5% nasal spray alter ciliary beat frequency and pattern in subjects undergoing nasal brushing, aiming to enhance primary ciliary dyskinesia (PCD) diagnosis. Hypothesis: It was hypothesized that local anesthesia administration would not significantly affect ciliary function in nasal epithelium. Study design: A prospective, simple-blind randomized study was conducted between 2020 and 2023. The study employed digital high-speed videomicroscopy to analyze ciliary beat frequency and pattern. Patient/subject selection: A cohort of 38 participants was recruited, consisting of 25 healthy volunteers and 13 referred individuals (including 7 diagnosed with PCD). Selection criteria ensured absence of chronic respiratory diseases, recent respiratory tract infections, or regular use of nasal medications. Methodology: Participants underwent nasal brushing with administration of lidocaine and naphazoline nasal spray in one nostril and saline in the contralateral nostril. Ciliary beat frequency and pattern were measured using digital high-speed videomicroscopy. Results: Nasal spray administration did not significantly alter ciliary beat frequency or pattern compared to saline ($p = 0.841$ and $p = 0.125$, respectively). Subgroup analysis revealed consistent results across healthy volunteers, referred patients, and PCD patients. Conclusion: Local anesthesia with lidocaine and naphazoline spray did not affect ciliary function outcomes. These findings support the safe use of these agents in clinical practice for PCD diagnostic procedures. Further research with larger cohorts is warranted for validation.

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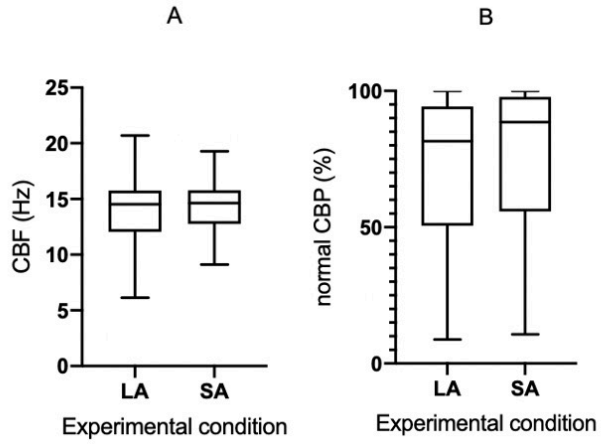

Figure 1: Effects of Local Anesthesia on CBF (A) and CBP (B) in total population, including referred patients (non-PCD referred patients and PCD-referred patients) and healthy volunteers. No significant difference was observed following nasal administration of Lidocaine 2% and Naphazoline 0.5% in terms of CBF and CBP. CBF (Hz) = Ciliary Beat Frequency in Hertz; Normal CBP (%) = Percentage of Normal Ciliary Beat Pattern; LA = Local Anesthesia containing Lidocaine 2% and Naphazoline 0.5%; SA = Saline.

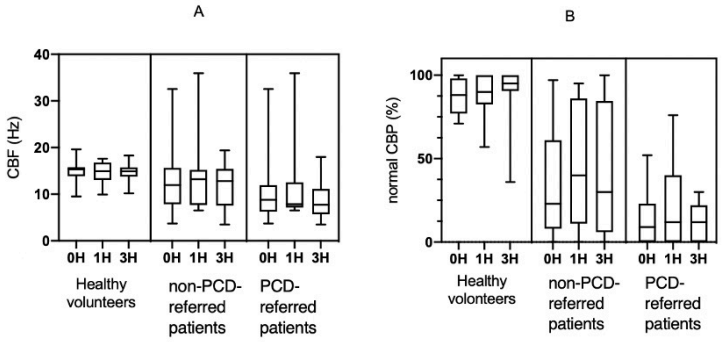

Figure 2: Temporal Evolution of CBF (A) and CBP (B) Following Nasal Administration of Lidocaine 2% and Naphazoline 0.5% in Healthy Volunteers and Referred Patients (Non-PCD and PCD). No significant difference observed among the three groups in terms of CBF and CBP. CBF (Hz) = Ciliary Beat Frequency in Hertz; normal CBP (%) = percentage of normal Ciliary Beat Pattern.

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