

# Introduction of a portable device for long-term „Rhinoflowmetry“



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## Introduction

Current methods for functional rhinological diagnostics (Rhinomanometry, Rhinoresistometry, Acoustic rhinometry) quantify the situation of the nose at the time of examination only. In clinical practice, patients often complain about temporary nasal obstruction, for example during the night. Additionally, discrepancy between conventional diagnostics, clinical symptoms and endoscopic findings can be seen. All currently used methods do not give insight into alterations by the nasal cycle or temporary nasal complaints. Therefore, in cooperation with RhinoMetrics A/S, Denmark, we developed a portable, battery powered device for long-term registration of nasal airflow. This method was called “Rhinoflowmetry” (RFM, Fig 1).

## Method

The pressure fluctuations during nasal inspiration are transmitted to connected pressure transducers at the data-logger (Fig. 2) with the help of tubes on both nasal sides at the bottom of the nasal vestibule (Fig. 3). The measured data are recorded by an inbuilt memory. The recorded data can be transferred to and analysed by a personal computer after measurement. The time period of the measurement is freely selectable.

The used pressure transducers are calibrated at a linear pressure-flow relationship and therefore the pressure can be used as a direct measure of nasal flow during inspiration. Since the pressure-flow relation is linear the nasal flow is exactly quantifiable.

By RFM, measurement over a long time-period under physiological and everyday life conditions is possible. We would like to demonstrate the wide ranging applications of RFM, with the help of some practical examples:

RFM enables an exact registration and investigation of the nasal cycle. Figure 4 and Fig. 5 show two examples of a classical nasal cycle with reciprocal and simultaneous change of cyclic phases. Duration and alteration of the cycles differ in both patients.

Figure 6 represents an example for an *in-concert* type of nasal cycles meaning left and right nasal side are both in the same cyclic phase. Flow is high during the day and low during the night in both nasal sides at the same time.

An example of a nasal cycle in a volunteer with a deviation of the septum to the right side is represented in Fig. 7. The duration of working phases with a decongested mucosa is clearly shorter in the narrow right side. We assume this as a compensational mechanism of the nose due to the higher airway resistance caused by the narrowness in the side with the septal deviation.

RFM is a helpful complementary tool in addition to the established rhinological diagnostics. Indications to use the RFM are a temporary obstruction, a discrepancy between clinical symptoms, endoscopic findings and conventional diagnostics as well as allergy and health care assessments.

Figure 8 shows an example of a patient, who reported on temporary high-grade nasal obstruction. Endoscopy revealed a moderate septal crest in area IV on the left side. A low flow at the left side is recorded for the entire registration period. By the time the right side flow decreases as well, as in its resting phase, the patient suffers nasal obstruction because the total flow is too low.

Figure 9 represents the RFM of a patient who had a nasal obstruction especially during the night. We note a clearly decreased flow during the sleep. By the help of RFM we can demonstrate the nocturnal nasal obstruction exactly.

## Conclusions

We started to use long-term RFM investigating the physiology of the nasal cycle in volunteers as well as in daily routine in patients with septum and turbinate pathology, before and after functional rhinosurgery, and nasal mucosa pathology. Measurement over a long time-period under physiological and everyday life conditions is an important benefit.

The method is helpful in terms of a better assessment and understanding in causes of nasal complaints and gives more information to ensure indications for functional rhinosurgery. We consider long-term RFM to be an important complementary tool in rhinological functional diagnostics.

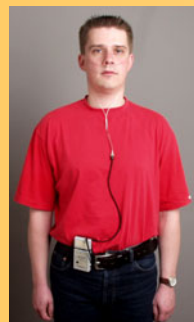


Fig. 1: Portable long-term device for RFM



Fig. 2: Data logger with tubes and pressure transducers



Fig. 3: Position of nasal tubes at the bottom of nasal vestibule

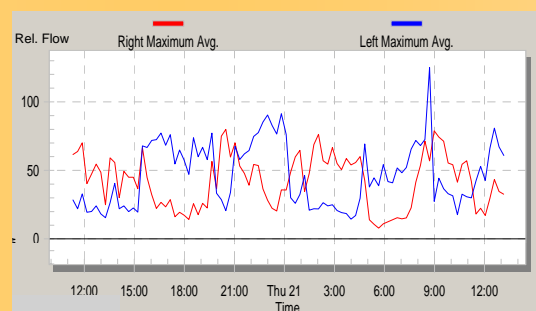


Fig. 4: Classical nasal cycle. The duration of cyclic phases is short.

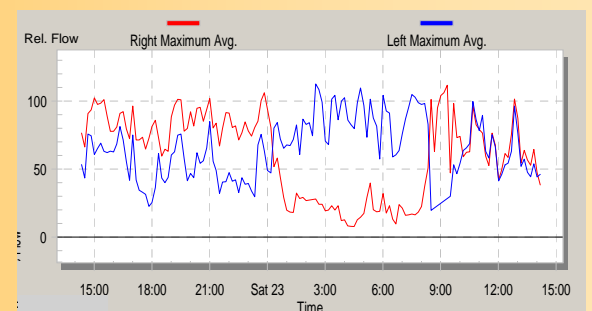


Fig. 5: Classical nasal cycle. The duration of cyclic phases is long.

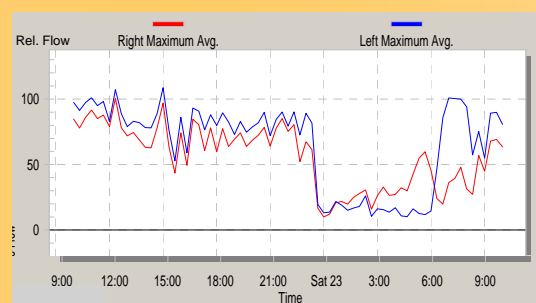


Fig. 6: *In-concert* type of the nasal cycle. Both sides are in the same cyclic phase.

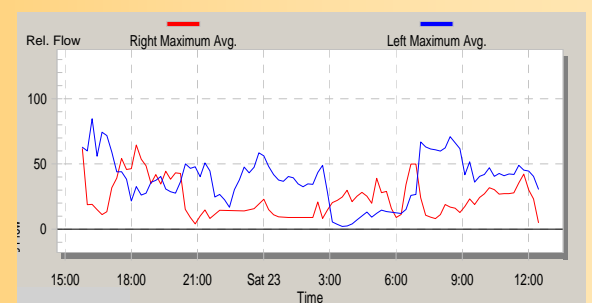


Fig. 7: Nasal cycle in a volunteer with septal deviation to the right side. The duration of the working phase is clearly shorter on right nasal side.

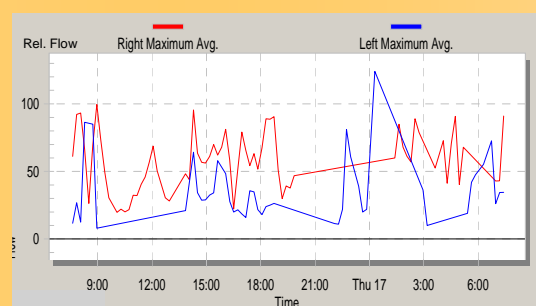


Fig. 8: Patient with temporary high-grade nasal obstruction, septal crest on the left side. The obstruction occurs at phases with low total flow.

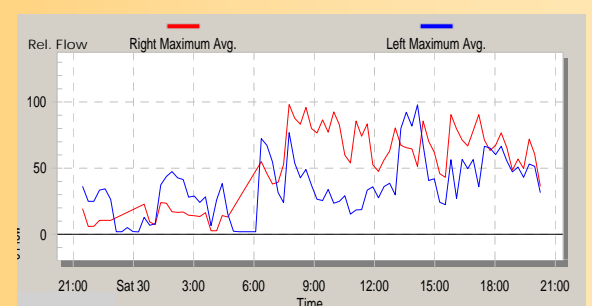


Fig. 9: Patient with nasal obstruction during the night. The total flow is clearly lower during the sleep.