Effect Of Using Nose Clip During Spirometry Procedure On Its Measurement

Anand K. Patel¹, Helee M. Thakar²

1MD Associate Professor, Department of Respiratory Medicine, GMERS Medical College & General Hospital, Gotri, Vadodara, Gujarat.
²MBBS Medical officer, Shishumangal hospital, Borsad, Gujarat.

ABSTRACT
BACKGROUND: The use of nose-clips while performing spirometry in the clinical setting is infrequent, at best. OBJECTIVE: This study aims to establish whether or not the use of nose-clips significantly affects the measurements of forced expiratory volume in one second (FEV₁), forced vital capacity (FVC); peak expiratory flow rate (PEFR), and forced expiratory flow 25-75% (FEF₂₅₋₇₅%) in healthy adults.
METHODS: The subjects were selected from a pool of healthy volunteers from the medical school and where asked to perform spirometry twice—once with the nose clip and then without it after a gap of 15 minutes.
RESULTS: Paired data obtained on 50 adults (34 male, 16 female) with a median age of 23 years showed no significant difference in the data for FEV₁, FVC with or without the nose—clip. There seems to be no clear advantage to wearing a nose-clip while performing spirometry.
CONCLUSION: Use of nose clip can be avoided in India, especially in children and females who wear nose ornaments and for whom it can be a discomfort.

KEYWORDS: spirometry, nose clip, with and without, FEV₁, FVC

Introduction
Spirometry is a pulmonary function test that aims to measure lung functions, focusing on the flow volumes and rates. It is one of the most widely used tests to distinguish between restrictive and obstructive lung diseases, finding use in following the natural history of a disease, identifying patients susceptible to pulmonary barotraumas and bronchial hyperresponsivity, in assessing pre-operative anesthetic risk in patients and patients about to undergo cardiothoracic surgery and to measure the efficacy of treatment of pulmonary diseases that show quantifiable defects.¹²³

Spirometry is usually performed in the outpatient setting using a spirometer that displays graphs pertaining to the data being collected, including flow-volume loops and volume-time curves. To measure Functional vital capacity (FVC), the subject is asked to blow forcefully into the sensor after maximum inspiration, and the expiration is recorded for a minimum duration of at least 6-8 seconds. Peak expiratory flow meters (mini Wright meters) are used to measure PEFR and are reset after each use. Nose clips are prescribed for accurate measurements as they theoretically prevent air escape from the nose during expiration and thus should provide more accurate values than tests done without them. To the best of the authors’ knowledge, the efficacy of using nose clips during spirometry has not been confirmed in India before, and this study aims to ascertain whether or not the nose-clips affected the measurements of FVC, forced expiratory volume in one second (FEV₁) and mean forced expiratory flows (FEV₂₅₋₇₅%).

Methods
The present study was one in SBKS Medical Institute & Research Centre, Piparia, Vadodara, Gujarat from January to March 2010. Subjects were chosen randomly from healthy, non-smoker volunteers who studied at the medical school and worked at the hospital where the author works. Any subject showing signs of respiratory illnesses or acute exacerbation of an underlying illness were excluded. The subjects were made to perform two sets of spirometry— one with the nose-clip and one without, in a random order. The tests were performed within one day with a minimum gap of 15 minutes between tests on the same subject and subjects were given time to recover between tests. Each set consisted of 4 to
Effect Of Using Nose Clip During Spirometry Procedure On Its Measurement

Table 1- Subject Characteristics

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n)</td>
<td>34</td>
<td>16</td>
<td>50</td>
</tr>
<tr>
<td>FVC (L)</td>
<td>4.41 ± 0.76</td>
<td>2.93 ± 0.31</td>
<td>3.94 ± 0.94</td>
</tr>
<tr>
<td>FEV₁ (L)</td>
<td>3.85 ± 0.61</td>
<td>2.69 ± 0.30</td>
<td>3.48 ± 0.76</td>
</tr>
<tr>
<td>PEFR (L, sec⁻¹)</td>
<td>8.77 ± 1.05</td>
<td>6.19 ± 1.06</td>
<td>7.94 ± 1.6</td>
</tr>
<tr>
<td>FEF25-75% (L, sec⁻¹)</td>
<td>4.59 ± 1.15</td>
<td>3.58 ± 0.77</td>
<td>4.27 ± 1.14</td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD, unless otherwise stated. FVC: forced vital capacity; FEV₁: forced expiratory volume in one second; FEF25-75%: mean forced expiratory flows. Baseline FVC and FEV₁ performed without nose-clips.

There was no significant difference between measurements made with and without nose-clips. The mean difference ± SD in FEV₁ (measurement with clips - measurement without clips) was 0.115 ± 0.17 L. In three subjects, the higher value was obtained without using nose-clips whilst in the rest it was greater with nose-clips although the p-value was 0.44. There was no relationship between the optimal technique and order of testing. The mean difference ± SD in FVC was 0.123 ± 0.18 L with a p-value of 0.52. The mean difference ± SD in FEF25-75% was 0.117 ± 0.57 L sec⁻¹ and a p-value of 0.59. The mean difference ± SD for PEFR was 0.427 ± 0.78 L sec⁻¹ with a p-value of 0.19.

Data are presented as mean ± SD. PEFR: Peak expiratory flow rate

Discussion

The main finding of this study is that the use of nose-clips during spirometry does not introduce any significant bias in the measurement of FEV₁, FVC, FEF25-75% or PEFR. Similar results have been demonstrated in adults in a study, more than 20 years back, but no such study has been done in India regarding the same. To maintain the efficacy of the study and eliminate variables, the subjects had been previously educated about spirometry and were given a demonstration about the techniques. If any subject required a break, one was provided between sessions but not lasting more than a few minutes, till he/she recovered enough to complete the set of maneuvers with/without the nose-clip and it was ensured that the other set was completed within the same day. Subjects who had acute respiratory complains were excluded to avoid introduction of variables into the study. The age group was selected in order to provide adequate and acceptable data that can be applied to normal population. Being a cross sectional study, the authors were not able to study if the findings were consistent with the same subject over a period of time or on repeat testing after more than twenty-four hours. While most data collected showed a better performance with the nose-clip, it is unclear whether it was due to a personal preference of the subject or not. However, as significance with all the tests is not established (p > 0.05), it is safe to say that in a healthy adult population under clinical settings, the measurements taken without nose-clips would be comparable to those taken with nose-clips and thus, their use can be avoided in patients if wanted. The use of nose-clips, however, should be encouraged in the research setting to ensure accurate data collection and to ensure that the integrity of the research is maintained.
**Conclusion**

The use of nose-clips does not introduce any systematic bias in open-circuit spirometry. It would be beneficial, even, to avoid use of nose-clips in children and Indian women who wear nose ornaments to provide adequate comfort while testing. However, it would be prudent to test the subject over a longer time and more than once to remove variability over time and to gather data regarding change in measurements in any subsequent test. Any discrepancy between observed clinical findings and spirometric data should be addressed with a repeat test to ensure authenticity and removal of variables.

**References**


