The Effect of a Five-Day Educational Program for Children with Asthma on Airways Inflammation: A Two-Year Study

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Methods and Materials

Ninety-four children with risk stratification and risk levels were enrolled in Camp Wheez in Santa Barbara, CA August 2018 and 2018. Of the 94, 26 children were enrolled. Written informed consent was obtained from each parent or guardian. Children were excluded from enrollment if they had the use of beta-agonist inhalers, wheeze free monitoring, early signs of asthma, and identification and avoidance of asthma triggers. Baseline measurements of asthma were not reviewed or interpreted for the purpose of this study. Measurements were made using the Micro AA device (Asthma Care, Ltd.) at the beginning of the camp. The baseline determination was measured using the Micro AA device. Non-parametric one-tailed Wilcoxon signed-rank test was used to measure difference scores between FeNO measurements on day one and five. Results were measured in parts per billion (ppb). Significance was defined as p < 0.05.

Discussion

Pulmonary function testing in children greater than 5 years of age has traditionally relied on spirometry with FEV1 response to short-acting β2-adrenergic bronchodilators. The American Thoracic Society criterion for diagnosing asthma is a 12% and 20% improvement in FEV1 after bronchodilators. We chose the FeNO single-breath test in order to define children at risk due to Th2 airway inflammation. One hundred and eighty-eight determinations were done during days one and five of Camp Wheez for the following reasons: 1. Simplicity of test, using a pediatric 6-10 second incentive breath test. 2. The incentive utilized “Blowing fire person” only one camper was unable to complete the test.

Conclusions

Clinical experience has shown that many asthmatic children are taken off their asthma controller medications during the summer months and are thereby susceptible to undiagnosed airway inflammation. Families mistakenly assume that in asymptomatic children, “asthma takes a vacation during the summer”. While this may be true due to fewer circulating viruses in the summer, ongoing inflammation occurs during asymptomatic periods. We demonstrated a significant improvement in airway inflammation as evidenced by FeNO reduction in at-risk children through the use of short-term education. Our long-term goal was to follow these campers throughout the fall asthma season in order to prevent asthma exacerbations.

Results

A total of 97 campers between the two years of Camp Wheez were enrolled. Average age was 8.5 years (67 years). Six children were excluded due to absence or inability to complete FeNO. Campers were stratified by baseline FeNO levels into low (<20 ppb), intermediate (20-35 ppb), and high (≥35 ppb) groups. Mean baseline FeNO for all campers was 38.3 ppb with a 10% improvement to 44.6 ppb by day 5 (p = 0.02, Table 1). Both intermediate and high baseline FeNO campers showed statistically significant decreases from their baseline FeNO day 1 to day 5. Intermediate FeNO campers had a 22% improvement from 24.2 to 19.5 ppb (p = 0.018) and high FeNO campers had an 11% improvement from 75.1 to 65.8 ppb for the high group (p = 0.03, Table 1). No difference was observed in campers with low FeNO (<20 ppb). The magnitude of improvement was greater than the magnitude of those unimproved (p = 0.05 by two-tailed test). One child in the high FeNO group required a hospitalisation in the fall of 2018.

Table 1. Baseline characteristics and Day 1 and Day 5 mean FeNO measurements

<table>
<thead>
<tr>
<th>Baseline FeNO levels</th>
<th>Camper N (%)</th>
<th>Mean Age (years)</th>
<th>Mean FeNO Day 1 ppb</th>
<th>Mean FeNO Day 5 ppb</th>
<th>% Change</th>
<th>p-value</th>
<th>z-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All campers</td>
<td>971</td>
<td>8.5</td>
<td>38.3</td>
<td>34.6</td>
<td>3.7</td>
<td>1.0</td>
<td>0.027</td>
</tr>
<tr>
<td>Low (≤20 ppb)</td>
<td>59 (40.2)</td>
<td>8.8</td>
<td>9.4</td>
<td>6.6</td>
<td>8.8</td>
<td>0.56</td>
<td>0.00</td>
</tr>
<tr>
<td>Intermediate (20-35 ppb)</td>
<td>10 (10)</td>
<td>8.9</td>
<td>24.2</td>
<td>19.5</td>
<td>22</td>
<td>0.018</td>
<td>-2.1</td>
</tr>
<tr>
<td>High (≥35 ppb)</td>
<td>35 (3.6)</td>
<td>8.7</td>
<td>73.9</td>
<td>65.8</td>
<td>8.1</td>
<td>0.037</td>
<td>-1.8</td>
</tr>
</tbody>
</table>

References

1. However, myron liebhaber m.d., jiminy chang m.d., victoria eng m.d. and gary moreno, r.n. "the effect of a five-day educational program for children with asthma on airways inflammation: a two-year study." sunsan clinic foundation, santa barbara, ca 2018-2019.

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