**Respiratory Muscle & Diaphragmatic Weakness Secondary to Cushing’s Syndrome**
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**Background**
- A high index of suspicion is required for the diagnosis of Cushing’s syndrome, as commonly only few of the pathognomonic symptoms/signs are present.
- We report a case of Cushing’s syndrome (CS) who presented with respiratory failure secondary to respiratory muscle weakness and diaphragmatic failure which is one of its rare presentations \(^1\).

**Case history and investigations**
- 60-year-old female with PMH of Rheumatoid arthritis, biliary cirrhosis and primary hypothyroidism.
- Presented to the Respiratory Physicians with progressive worsening of shortness of breath
- Clinical assessment, chest X-rays/CT, Echocardiogram excluded common cardiorespiratory causes
- Pulmonary function tests (PFT) showed restrictive defect and reduced transfer factor (Table 1.)
- Lung biopsy showed non-specific changes
- In view of progressive symptoms and absence of any identifiable cause, lung transplantation was considered

**Table 1.**

<table>
<thead>
<tr>
<th>Year</th>
<th>TLCO%</th>
<th>FEV1%</th>
<th>FVC%</th>
<th>FEV1/FVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>Low transfer factor and restrictive defect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>57.3</td>
<td>73</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>57.1</td>
<td>73.5</td>
<td>78</td>
<td>79.9</td>
</tr>
<tr>
<td>2012</td>
<td>32.2</td>
<td>56.3</td>
<td>62.2</td>
<td>97.8</td>
</tr>
<tr>
<td>2013</td>
<td>48.4</td>
<td>63.1</td>
<td>66.7</td>
<td>100</td>
</tr>
</tbody>
</table>

**Further course:**
- During an episode of pneumonia she required ITU admission for severe respiratory failure
- Ultrasonography (USG) undertaken for unrelated reasons described severe reduction in diaphragmatic movement.
- Respiratory muscle tests confirmed global respiratory muscle and diaphragmatic weakness (Table 2)
- EMG/NCV, myasthenia gravis negative

**Table 2.**

<table>
<thead>
<tr>
<th>Date (RS muscle)</th>
<th>MEP% predicted</th>
<th>MIP% predicted</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012 (pre-surgery)</td>
<td>100</td>
<td>41</td>
</tr>
<tr>
<td>2014 (post-surgery)</td>
<td>112</td>
<td>89</td>
</tr>
</tbody>
</table>

**Observations in Endocrine Clinic**
1 year after initial presentation to the Respiratory Clinic
- Worsening hypertension
- Significant weight gain
- Severe proximal muscle weakness
- Facial features of Cushing’s syndrome

**Endocrine tests (Table 3):**

<table>
<thead>
<tr>
<th>Investigations</th>
<th>Results</th>
<th>Normal range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1mg DST</td>
<td>447</td>
<td>&lt;50 nmol/l</td>
</tr>
<tr>
<td>Urinary cortisol</td>
<td>500</td>
<td>0-130 nmol/l/24hr</td>
</tr>
<tr>
<td>ACTH</td>
<td>&lt;5</td>
<td>7.2 - 63.3 ng/L</td>
</tr>
<tr>
<td>Pituitary profile</td>
<td>Normal</td>
<td></td>
</tr>
</tbody>
</table>

**Imaging:**

**Image 1.** Abdominal CT - 2.6cm enhancing mass in the left adrenal

**Discussion**
- The exact mechanism of the muscle pathology in CS unclear, it may be related to:
  - Decreased synthesis and increased degradation of protein
  - Alters in carbohydrate metabolism
  - Mitochondrial alterations
  - Electrolyte disturbances
  - Decreased sarcolemmal excitability
- Sedentary lifestyle may increase the risk
- EMG has it’s own limitation and may be insufficient to confirm or exclude the diagnosis.
- Only few cases have been reported describing respiratory muscle weakness sufficient to cause significant respiratory insufficiency \(^2,3\).
- Unlike our patient none of them had diaphragmatic failure.

**Management and post-operative:**
- Following successful adrenalectomy her symptoms and objective parameters of respiratory function, respiratory muscle strength and diaphragmatic movement demonstrated significant improvement.

**Take home points:**
- This case highlights the need to consider this unusual manifestation of Cushing’s syndrome in an appropriate context.

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