DYSPNEA DUE TO OSTEOARTHRITIS. DIAPHRAGMATIC PALSY CAUSED BY CERVICAL SPONDYLOSIS.

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ABSTRACT

A 64 year old gentleman with cervical spondylosis presented with sudden onset breathlessness associated with significant orthopnea. On clinical examination he had decreased power in his upper extremities with reduced chest excursion. Cervical spine MRI revealed severe spondylosis at multilevel with evidence of cord compression. Chest x ray showed elevated left diaphragm and sniff test confirmed diaphragmatic weakness. Spirometry showed significant decline in FVC and FEV1 when repeating the tests in supine position with reduced maximum expiratory pressures. Based on these findings left diaphragmatic palsy due to phrenic nerve compression by cervical spondylosis was diagnosed. Patient underwent cervical cord decompression with improvement in his respiratory symptoms. Although cervical spondylosis is common, diaphragmatic palsy due to phrenic nerve compression is rare, or rarely reported. With the emerging evidence that phrenic nerve derives innervation from many cervical levels, our case reiterates the possibility of respiratory failure due to osteoarthritis.

KEYWORDS: Diaphragmatic palsy, Cervical spondylitis, Phrenic nerve compression.

CASE REPORT

Our patient, 64 year old gentleman suddenly wokeup in the middle of night “chocking and gasping” for air 4 months back and, started felling breathlessness with exertion since then. He also gets more breathlessness on lying down and has to sleep on recliner. His other medical problem was back pain which has increased in the past year and starting noticing weakness of his arms and drops objects easily. On examination, weakness was noted in his upper extremities with power of 3/5. Sensation was impaired with reduced brachial reflexes on right side. Chest excursion was diminished and he got breathlessness when asked to laydown supine for examination. Chest x ray showed normal lung fields and showed new finding of elevated left diaphragm compared to old x ray[Figure 1].

Figure 1: Chest x ray showing elevated left diaphragm(A) compared to chest x ray 2 years back(B).
Table 1: Pulmonary functions tests (PFT) showed drop in lung functions on supine position.

<table>
<thead>
<tr>
<th>Spirometry values</th>
<th>Predicted. In L</th>
<th>LLN In L</th>
<th>Actual (Sitting position)</th>
<th>% Predicted</th>
<th>Actual (Supine position)</th>
<th>% Predicted</th>
<th>% change from Sitting to supine</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC</td>
<td>3.94</td>
<td>3.00</td>
<td>2.40</td>
<td>60</td>
<td>1.96</td>
<td>49</td>
<td>-18</td>
</tr>
<tr>
<td>FEV1</td>
<td>3.03</td>
<td>2.19</td>
<td>1.30</td>
<td>42</td>
<td>0.99</td>
<td>32</td>
<td>-24</td>
</tr>
<tr>
<td>FEV1/FVC (FEV1%)</td>
<td>78</td>
<td>68</td>
<td>54</td>
<td>69</td>
<td>50</td>
<td>64</td>
<td></td>
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<tr>
<td>MEP</td>
<td>204</td>
<td>104</td>
<td>104</td>
<td>51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIP</td>
<td>-104</td>
<td>-92</td>
<td>-92</td>
<td>88</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

MRI of spine showed severe spondylosis of cervical canal especially at C6/C7, C5/C6 and C4/C7 with cord compression. Fluoroscopic sniff test showed the reduced excursion of diaphragm on right side with absent movements on left side [Figure 2].

Based on these findings diaphragmatic palsy due to phrenic nerve or nerve roots compression was diagnosed. He underwent anterior decompression with significant improvement of dyspnea.

**DISCUSSION**

Cervical spondylosis (CS), the age related degenerative changes of cervical canal affects 90% of population over 65 years of age and, symptomatic in 70% of them. The desiccation of intervertebral discs and, osteophytes of the uncovertebral joints encroach upon the cervical canal from ventral side. The hypertrophied ligamentum flavum with degenerative zygapophyseal joints further compromise the space from dorsal side leading to either spinal root or cord compression. CS (CSP) is caused by compression of isolated nerve roots and cervical spondylotic myelopathy (CSM) is caused by spinal cord compression.

Diaphragm is the main muscle of respiration. Although physically located between thorax and abdomen, it is phylogenetic derived forelimb muscles and receives innervation from cervical nerves. Phrenic nerve, the sole motor supply to diaphragm is derived from C4 segment level with contributions from C3 and C5 levels. There is emerging evidence that phrenic nerve has multisegmental origin and might receive additional roots from hypoglossal nerve to lower cervical nerves. Hence, CSR or CSM at any cervical canal can lead to phrenic neuron or nerve root compression leading to diaphragmatic weakness.

Diaphragmatic palsy can be unilateral or bilateral and can be seen in many causes, traumatic being the commonest. It is seen in 2 to 4% of all cases after open-heart surgeries. Lung transplantations, esophageal and mediastinal surgeries, Space occupying lesions in the thoracic cavity like thoracic malignancy, substernal goiter, aortic aneurysm can also cause phrenic nerve damage. Other rare causes in literature include vasculitis, diabetes mellitus, pneumonia, pleurisy, herpes Zoster, multiple sclerosis, dermatomyositis, anterior horn cell disease, Lyme disease HIV and west Nile disease.

Extensive literature search in PubMed and Ovid Medline with cross refereeing the references only revealed 7 cases of diaphragmatic palsy attributed to cervical spondylosis. Yogesh N V Reddy et al[4] reported a 87 year patient with hypercapnic respiratory failure along with weakness of left deltoid and decreased bilateral biceps reflexes. On...
supine position, FVC decreased by 22% and MRI of spine showed severe bilateral foraminal narrowing at C3, C4 and C5 without any evidence of myelopathy. Carolin Weiss et al\cite{5} reported a 59 year old male with recurrent pneumonia attributed to hemidiaphragmatic paralysis caused by ventral osseous compression of cervical roots C3 and C4. Cenk Babayigot et al\cite{6} reported a 56 year patient with breathlessness and weakness of right upper extremity. Sniff test revealed paradoxical movement of right hemidiaphragm and MRI of cervical spine showed multiple level disc protrusion. Buszek MC et al\cite{7} reported a patient with left hemi diaphragm weakness caused by C3/C4 neural foramen compression which completely resolved after surgery for compression. Fregeni F et al\cite{8} described a 53 year old man with weakness and MRI of cervical spine showed spondylosis and stenosis with multilevel disc protrusion and compression. Hideki Hayashi et al\cite{9} described a 64 year old man with dyspnea and cervical radicular pain and weakness. Chest radiograms showed elevated diaphragms. H K Chen et al\cite{10} described a 70 year old man presenting with 6 weeks of dyspnea and severe weakness of shoulders with increased tone in extremities with hypercapnic respiratory failure. MRI of spine showed synostoses of C3/C4 and C5/C6/C7 vertebra consistent with Klippel Feil syndrome.

Patient with diaphragmatic weakness presents with dyspnea. On lying down, the abdominal viscera further pushes the diaphragm cranially further limiting chest excursion leading to orthopnea. Standard chest x ray shows elevated diaphragm. The dome of right hemidiaphragm lies above 5th intercostal space (ICS) at midaxillary line on the right side and on left side, diaphragm lies one ICS higher than the right side. On fluoroscopic sniff test, the paralyzed diaphragm fails to show normal orthogradal movement or shows paradoxical movement of diaphragm. The negative inspiratory pressure by the working intercostal muscles suck the diaphragm into the thoracic cavity on deep inspiration.\cite{11} FVC is reduced to 45% of predicted in unilateral paralysis and 75% predicted in bilateral paralysis.\cite{3} On repeating the tests in supine position, FVC reduces by 15 to 20% in unilateral cases and 20 to 30% in bilateral weakness. The total lung capacity, functional residual capacity and residual volume and diffusing capacity remains unchanged. Maximum inspiratory pressure will be reduced in bilateral paralysis.\cite{5} Most cases reported in literature have excellent prognosis with correction of cervical spondylotic radiculopathy and or myelopathy. Our case illustrates the possibility of dyspnea due to phrenic nerve impingement in patients with cervical spondylitis.

REFERENCES


