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Management of Diaphragmatic Palsy in a Patient with Past History of Cerebrovascular Accident– Case Report

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Abstract: ***A 50 - year - old, non diabetic, non hypertensive, non smoker male presented in outpatient in Jan 2022 in CTVS department with history of increasing shortness of breath along with a past history of cerebrovascular accident one year back. On general examination, patient was haemodynamically stable. Respiratory examination revealed bilateral symmetrical expansion of chest wall with decrease breath sounds in left hemithorax. Chest roentgenogram showed elevated left dome of diaphragm. A Computed Tomography scan thorax and abdomen was done to rule out any additional pathology. Patient subsequently underwent plication of diaphragm via left posterolateral thoracotomy under general anaesthesia. Patient had uneventful recovery and showed no recurrence of symptoms on follow ups at 2 - weeks, 6 - weeks, 6 months and one year post - operatively. Patient resumed his occupation with no difficulty.***

Keywords: Acute stroke, clinical implication, Respiratory insufficiency, diaphragmatic palsy

1. Introduction

Acute ischemic strokes are commonly encountered in medical practice. The commonest clinical presentation of acute stroke in the middle cerebral artery territory is contralateral hemiplegia. Diaphragmatic palsy post cerebrovascular accident is not common and its pathophysiology is less documented in literature [1, 2, 3]. We are reporting a case of cerebrovascular accident associated with unilateral diaphragmatic eventration.

2. Case Report

A 50 - year - old male, non diabetic, hypertensive, manual labourer by occupation, presented in Jan 2022 in the Out Patient Department of our hospital with chief complaints of gradually progressive shortness of breath along with a past history of cerebrovascular accident one years back. On examination, patient was hemodynamically stable. Pulse rate was 90/minute and regular. His blood pressure was 140/90mmHg in left arm in supine position. Bilateral carotids were normal. Respiratory examination revealed bilateral symmetrical expansion of chest wall with decrease breath sounds in left hemithorax. Rest other organ systems were found to be unremarkable. There was no evidence of any residual neurological damage from previous cerebrovascular event. Laboratory investigations including haematological and biochemical parameters, were unremarkable. Electrocardiogram, echocardiogram and carotid Doppler studies were normal. Chest roentgenogram was done, which suggestive of elevation of left dome of diaphragm with right side mediastinum / tracheal shift (Figure1). Non contrast Computer Tomography of the brain demonstrated irregular focal areas of hypodensity in right middle and inferior frontal region, right post central gyrus involving right perisylvian region - suggestive of chronic infarct with gliosis in right middle cerebral artery territory (Figure 2). Peripheral nerve conduction study was not done. Pulmonary function tests and arterial blood gas analysis were within normal parameters. A Computer Tomography scan of abdomen and thorax was done to rule out any associated pathologies.

Patient was subsequently planned for plication of diaphragm under general anaesthesia. Left posterolateral thoracotomy was performed and thoracic cavity was entered via 4th intercostal space. Shortening of the dome of diaphragm in anteroposterior direction was done using a series of multiple pledgeted U stitches with Ethibond 2 - 0, taking care to avoid damaging intra abdominal structures. Redundant tissue was flattened both anteriorly and posteriorly to the plicature with running Ethibond sutures. End point was firm and tense diaphragm. Two intercostal drains were kept as per institutional protocol. Chest wall was closed in layers. Patient was extubated on table.

Post operatively, he was treated with aggressive chest physiotherapy and incentive spirometry along with intra venous prophylactic antibiotics, analgesics and nebulisations. Chest roentgenogram showed complete expansion of the lung along with reduced level of diaphragm as compared to pre operative imaging (Figure 3). Post - operative recovery of the patient was uneventful and drains were removed by 3rd post operative day. He was subsequently discharged in stable condition at the end of one week.

Patient was followed up in the Out Patient Department at 2 - week, 6 - week, 6 month and one year post - operatively. He showed no recurrence of symptoms and eventually resumed his occupation with no difficulty.

3. Discussion

Acute ischemic strokes are commonly encountered in medical practice. The commonest clinical presentation of acute stroke in the middle cerebral artery territory is contralateral hemiplegia. Diaphragmatic palsy in acute hemiplegic stroke is not so well known and there is very little published data [1, 2, 3, 4]. We report a case of left hemiplegic stroke associated with diaphragmatic palsy.

Stroke due to infarct in the internal capsule was the cause of diaphragmatic paralysis. Internal capsule is the most prone area for cerebro - vascular accidents as most of the perforating arteries supply the region, have narrow diameter, thereby predisposing the capsule for occlusion. Thus, any stroke in the posterior limb of internal capsule results in contralateral hemi diaphragmatic paralysis [4, 5]. The more pronounced is the CNS lesion, the greater the chance of respiratory dysfunction. Hence, decreased cough reflex and altered sensorium predisposes the patient to greater risk of developing pneumonia [6].

As diaphragm being the primary muscle of respiration ([7], it contributes to 60 - 70% of total ventilation. Diaphragmatic palsy can cause worsening dyspnoea and recurrent pneumonia [6], which requires invasive and non - invasive ventilation under supervision in Respiratory Intensive Care Unit. Although any mechanical and neurological injury of the phrenic nerve can cause diaphragmatic palsy [8], prognosis is relatively good in cases of neuromuscular disease [7].

Patients with hemi diaphragmatic palsy (weakness) are often clinically asymptomatic, however few can still develop mild to moderate respiratory symptoms on lying down [9, 10]. Subsequently, these symptomatic patients are at an increased risk of developing recurrent pneumonia, LRTI along with generalised weakness and fatigue due to hypoxia. In severe cases, it may also lead to type 2 respiratory failure and right heart failure [11].

Although both diaphragmatic palsy and diaphragmatic eventration are different subset, but patients have similar therapeutic management. For academic purposes the differentiation is required but for clinical purpose, it has limited value as the fate being the same [12]. DeVries et al stated that phrenic nerve injury leads to chronic diaphragmatic paralysis leading to eventration [12].

Demyelinating disorders, trauma, compression of phrenic nerves are the most common causes of diaphragmatic palsy [8]. The diaphragm is the primary muscle of respiration. Any neurological damage to this structure can lead to severe respiratory dysfunction. Patients with bilateral diaphragmatic palsy have poor outcomes while those with unilateral disease almost always recover. Such type of patients need active surgical intervention as decreased muco - ciliary activity causes accumulation of mucus causing pneumonia and persistent atelectasis leading to repeated ICU admissions. As per the literature, in patients with acute stroke, mortality associated with pneumonia is three times more as compared to those without it.

The management is depending upon the severity of symptoms. There are two schools of thoughts on management of diaphragmatic palsy patients. One group intervenes early with surgical management and the other group opines for conservative management which includes non - invasive ventilatory support which makes the patient less mobile. For plication of diaphragm, several techniques have been reported. Hemidiaphragm over sewn with prolene mesh fixed in the form of VATS guided surgical repair of diaphragm has also shown promising results [13]. Open thoracotomy approach for plication of diaphragm with U sutures has also been described in literature. VATS technique does offer various advantages being smaller incision, less hospital stay along with faster recovery. However its use is limited by surgical expertise and lack of facilities in developing countries, where open procedure is still preferred.

4. Conclusion

Diaphragmatic palsy in post CVA patients is uncommon but can lead to significant respiratory compromise. Such patients may present with gradually worsening dyspnoea with course of time and are at higher risk of developing recurrent respiratory tract infections. High suspicion for diaphragmatic palsy in patients with prior history of stroke may lead the path to early surgical intervention thereby reducing the incidence of potential life - threatening complications.

Images:

Figure 1: Preoperative chest x - ray showing eventration of diaphragm

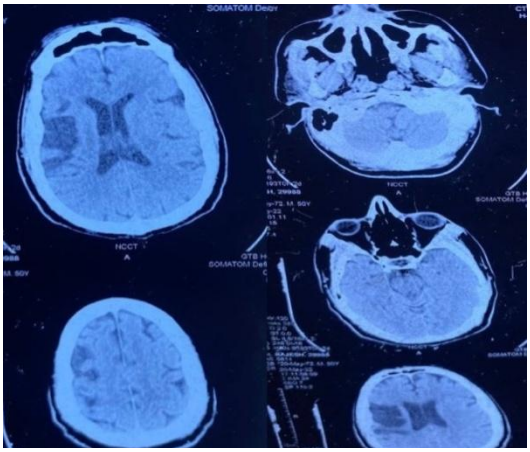

Figure 2: Non Contrast Computed Tomography showing irregular focal areas of hypodensity in right middle and inferior frontal region, right post central gyrus involving right perisylvian region - suggestive of chronic infarct with gliosis in right middle cerebral artery territory

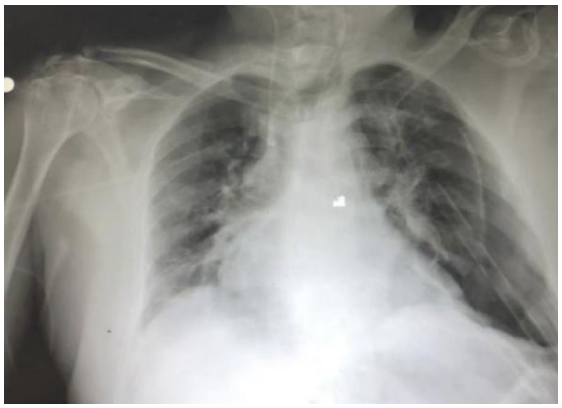

Figure 3: Post operative chest Xray of left side diaphragmatic eventration repair

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Ethical Approval:
Since this is a case report, ethical approval was not required by the Institutional Ethics Committee.

Consent:
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Declaration of Conflicting Interests:
The author (s) declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this case report.

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Revising and critical review: V K Gupta, Shaleen Prasad

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