CORONARY ARTERY BYPASS GRAFTING IN A PATIENT WITH ASSOCIATED PARALYSIS OF THE DIAPHRAGM.

A Case Report

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A fifty years old gentleman was referred to the cardiac surgical out patients clinic for coronary artery bypass grafting with a two year history of chronic stable angina,. He had been experiencing retro-sternal tightness becoming increasingly severe to incapacitate him. This was often associated with sweating. There were no other complaints regarding his cardiac status. He, however, admitted to paroxysms of breathlessness and wheezing for the last ten years. These responded well to treatment by his local doctor. He had smoked heavily for about fifteen years, but had abandoned it a decade ago. There was no significant family history. He was twice afforded in-hospital treatment for chest pain. On examination, he was well built, with stable vital signs and normal general physical examination. Chest examination showed decreased air entry in the left middle zone with absent breath sounds and an equivocal percussion note in the left lower zone. Gut sounds were audible up to the middle of the left chest. The rest of the systemic examination was unremarkable.

The CXR displayed an elevated left hemi-diaphragm with multiple radiolucent shadows (fig-1). A left lateral chest x-ray endorsed the findings of the PA view (fig-2). A CT scan of the chest was then performed to confirm the radiological and clinical findings. This showed an elevated left diaphragm with a hernia containing the fundus of the stomach, loops of intestine and mesentery present into the left pleural space (fig-3). Pulmonary function tests were performed which revealed a FVC of 1.9L, FEV1 of 1.9L/sec. and MVV of 92 L/min. His coronary angiogram showed moderate left main stem disease with severe stenosis in the middle third of the LAD. The main circumflex artery showed moderate proximal stenosis. The RCA was blocked proximally. Other investigations including CBC, serum electrolytes, Urea and Creatinine, LFT's, Urinalysis, ECG, and Clotting profile were all within normal range. Echocardiography showed a good heart with normal dimensions and no wall motion abnormalities.

The patient was admitted to the cardiac surgical ward and prepared for coronary bypass surgery. A blood gas analysis was performed before induction and found to be within normal limits. Nasogastric decompression was carried out after intubation with a Ryle's tube passed into the stomach. The left saphenous vein and left internal mammary artery were harvested as conduits. The left pleural space was deliberately entered to ascertain the extent of diaphragmatic herniation. The hernia was found to be protruding three fourths of the way up into the pleural cavity (fig-4). Coronary artery bypass grafting was carried out on standard cardiopulmonary bypass with the LIMA being grafted to the LAD and saphenous vein grafts to the circumflex and right coronary systems. The hernia did not pose any technical difficulty during surgery. Once grafting was accomplished, attention was turned to the hernia while the patient was being rewarmed. Interrupted horizontal mattress prolene sutures bolstered with Teflon felt strips were placed 0.5 cms apart to plicate the diaphragm staying clear of the phrenic nerve twigs (fig-5). The patient was weaned off CPB smoothly with minimal inotropic support. In the ICU, two hourly blood gasses were done. The patient was separated from the ventilator eight hours after surgery, though the endotracheal tube was retained for another two hours. He was deliberately kept nil by mouth for 48 hours after surgery as a prophylaxis to avoid vomiting, aspiration, intestinal obstruc-

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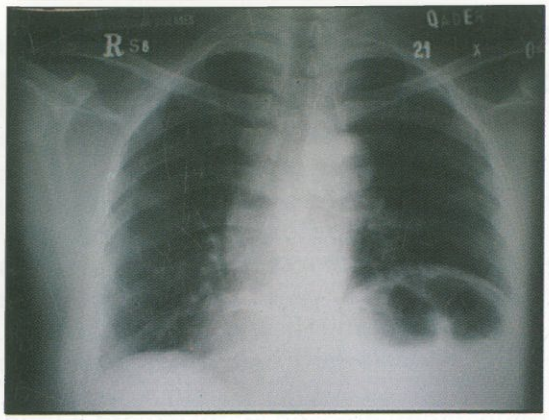

Fig 1: CXR with elevated left diaphragm

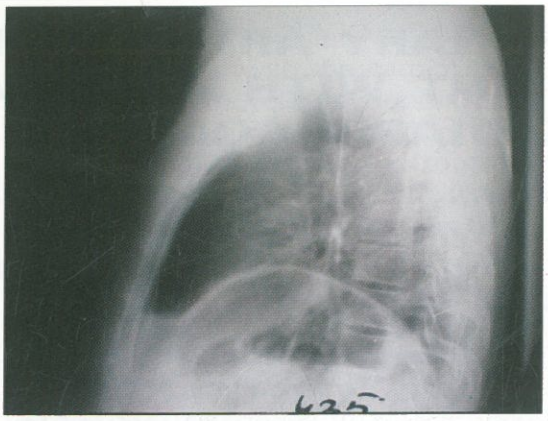

Fig 2: The lateral CXR

tion and dehiscence. The NG tube was retained even though bowel movement had commenced. Oral feeding was initiated after a further 48 hours and he was restored to full diet in the next 36 hours. A CXR in erect posture was done which showed considerable reduction in the eventration. He was nursed in the surgical ward for a further four days and was discharged on the eighth post operative day. Lung function tests were done six weeks after the operation with following results.

FVC 2.6L
FEV1 2.2L/s
MVV 108L/min.

He was clinically well with no symptoms of breathlessness, gastric distension, bloating or dyspepsia.

DISCUSSION

Eventration of diaphragm is an uncommon condition attributable to a myriad of etiological factors (1). It is considered to be a true developmental defect in newborns and infants (2). Existence of this pathology in older children and adults is ascribed to various acquired factors producing paralysis of the diaphragm. Post traumatic injury to the phrenic nerve during cardiothoracic procedures is the most common cause. Use of ice slush for topical hypothermia (3,4) internal mammary artery harvesting (5,6) Glenn and Fontan procedures (7,8) have been known to result in phrenic nerve injury leading to a flaccid diaphragm. Other traumatic causes of phrenic injury include invasive malignancy, mediastinotomy, neck and thoracic surgery, neck vein catheterization and cervical cord injury (9,10). All the

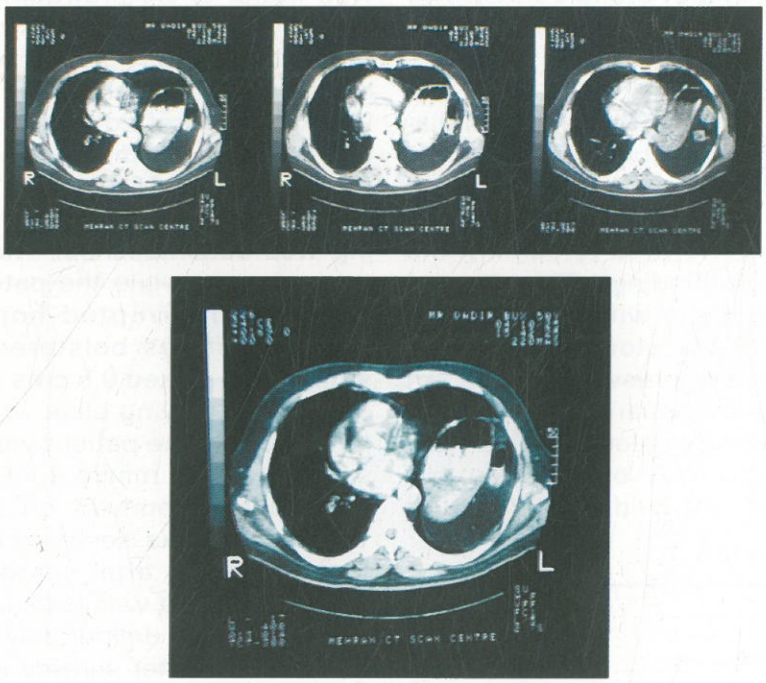

Fig 3: CT scan showing the hernial sac and its contents

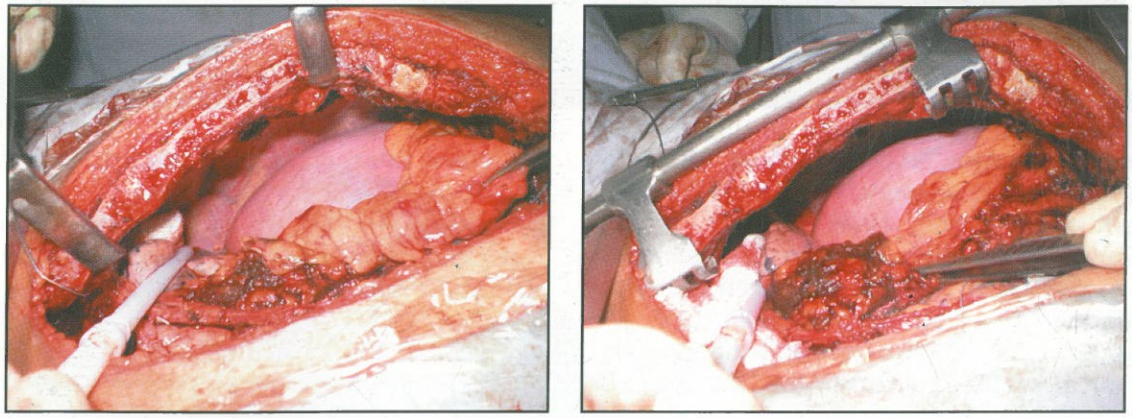

Fig 4: Operative findings

same, idiopathic diaphragmatic paralysis has also been mentioned in the literature (11). Diaphragmatic paralysis is poorly endured by children. Weak intercostal muscles, extremely mobile mediastinum permitting excessive shifting and increased predilection for recumbancy culminate in this ineffective tolerance (12). Unilateral paralysis in the adult results in little respiratory dysfunction. An early 30% reduction in vital capacity and total lung capacity is usually restored in six months. These, however, remain diminished in recumbency. This may play a very statistical part in post-operative recovery particularly in cardiothoracic surgical undertakings.

The majority of adult patients with symptomatic diaphragmatic paralysis experience some clinical improvement either due to return of diaphragmatic function or recruitment of accessory inspiratory muscles (13). Surgical intervention is necessitated in persistently distressed patients. Routine surgical techniques for repair of diaphragmatic eventration can be classified into two categories - Phrenicoplication and incision followed by double breasting (14). In either case the afflicted hemidiaphragm is approached through the eighth intercostal space. The redundant portions of diaphragm are gathered on themselves in pleats (fig-7) with interrupted horizontal mattress sutures buttressed with Teflon pledgets (15,16) . Rarely fixation of the diaphragm with a prosthetic material may be required. Port access minimally invasive procedures are catching fast in the management of diaphragmatic paralysis (17-19).

In our patient, we opted for diaphragmatic plication because of the fear of difficulty in extubating the patient postoperatively. Even after placation, we were not successful in completely reducing the hernia, because the contents would not reduce further and we thought it prudent not to proceed to laparotomy in an effort to pull down the herniated contents from below. We found the lung to be normal and capable of full inflation manually, and not hypoplastic as we thought it might be.

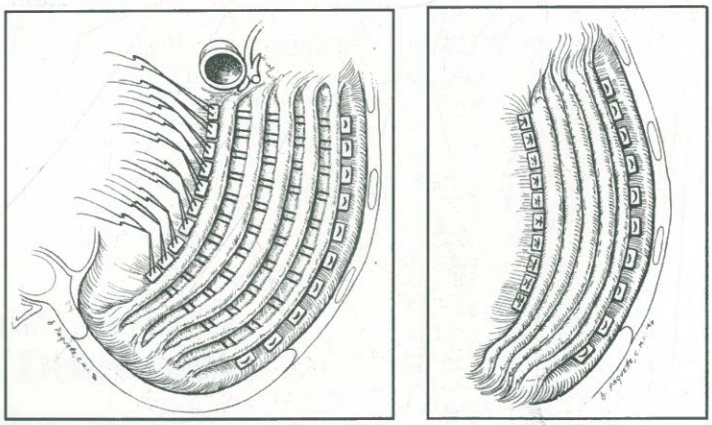

Fig 5: Diaphragmatic plication.

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