Rupture in a Mitral Papillary Muscle following Blunt Chest Trauma

The successful surgical repair of an uncommon case of blunt chest trauma is described. A 28-year-old man was involved in a motorcycle accident during which the victim struck a pole at high speed. Extracorporeal membrane oxygenation was required with a tentative diagnosis of traumatic respiratory distress syndrome, but he nevertheless continued to show progressive deterioration. In the preoperative evaluation, transesophageal echocardiography clearly demonstrated an injury involving of mitral regurgitation secondary to total rupture of a papillary muscle. Mitral valve replacement was performed seven days after the accident. The importance of the diagnostic process and surgical treatment are emphasised.

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In this modern era of high-speed motorcycle accidents, blunt chest trauma is encountered with increasing frequency, but a rupture in a papillary muscle is a rare complication. Symptoms of cardiac injury may be fulminant or delayed in presentation, occurring hours, days, or even years following injury. Echocardiography, especially transesophageal echocardiography, is the most important tool when cardiac involvement is suspected. The surgical options for the treatment include a variety of repair techniques or valve replacement.

Here we report a patient with a ruptured papillary muscle, which was demonstrated accurately by transesophageal echocardiography, after a motorcycle accident.

Case

In July 1998, a 28-year-old male lost control of his motorbike while riding and struck a pole at high speed. On arrival at our emergency room, he was noted to have a contusion in the left anterior chest, a superficial face laceration and a closed clavicle fracture. But he denied shortness of breath and did not appear in any acute distress. There was no heart murmur. The chest X-ray film and chest CT scan showed a mild contusion in the left lung without effusion (Fig. 1a, b). An electrocardiogram showed a normal sinus rhythm without arrhythmia. During hospitalization following the accident, he exhibited progressive deterioration in respiration. The chest X-ray showed fulminant pulmonary congestion (Fig. 2a). The laboratory data were as follows: WBC 11,100/mm³, hemoglobin 16.5 gm/dl, Na 136 mEq/l, K 4.3 mEq/l, CPK 2056 IU, BUN 14 mg/dl, Creatinine 1.2 mg/dl, and T.Bil 1.0 mg/dl. The arterial blood gas values on 101 of oxygen by mask were as follows: pH 7.52, carbon dioxide tension 43 mmHg, oxygen tension 102 mmHg, bicarbonate 21 mEq/l, and oxygen saturation 96%. Over the next 16 hours increasing resting dyspnea developed, which required mechanical ventilation.

Despite controlling the mechanical ventilation, his vital signs progressively deteriorated. He developed an irregular pulse rate of 150 beats/min, and blood pressure fell to 70/40 mmHg. The potassium level was 7.0 mEq/l because of anuria. A Swan-Ganz catheter was inserted and found pulmonary capillary wedge pressure at 28 mmHg with a large V wave, and cardiac index at 1.5 l/min/m². He required continuous hemodialysis and extracorporeal membrane oxygen-
Fig. 1. Chest X-ray film (a) and chest CT scan (b) on admission showed a mild contusion in the left lung and a fracture in the left clavicle without either effusion or enlargement in the heart.

Fig. 2. At 18 hours after the accident, a chest X-ray showed rapidly fulminant pulmonary congestion (a), and at six days following the accident, he continued to show a progressive deterioration in respiration despite extracorporeal membrane oxygenation (b).

Fibrous pericardial adhesions surrounded the heart with approximately 100 ml of bloody pericardial fluid. The right pericardium was lacerated over an area measuring 10 cm in length into the right chest cavity. After opening the left atrium, a total rupture in the anterolateral papillary muscle was observed close to the left ventricular wall. The posteromedial papillary muscle was intact. The ruptured muscle, chordae tendineae, and anterior leaflet were excised completely (Fig. 4). The mitral valve was replaced with a 29 mm BICARBON bioprosthesis. Cardiopulmonary bypass was discontinued smoothly under continuous hemo-