Gorham disease: An intraoperative case study

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Gorham disease is a rare chronic disorder that is characterized by the abnormal proliferation of thin-walled capillaries and small lymphatic vessels that results in the massive osteolysis of adjacent bone. Clinical manifestations are determined by the area of involvement, which may include the chest and ribs. The case presented involves a 47-year-old man with Gorham disease complicated by unilateral chylothorax who was treated with thoracic duct ligation. The anesthetic implications associated with Gorham disease are discussed, and nonsurgical primary and adjunctive treatments for chylothorax are summarized.

Key words: **Chylothorax, Gorham disease, osteolysis, vanishing bone disease.**

Gorham disease, otherwise known as massive osteolysis, vanishing bone disease, or lymphangiomatosis, is an extremely rare condition with fewer than 200 cases reported in the medical literature. It is described as gradual and often complete spontaneous resorption of bone tissue. First noted in 1838, the disease was not described in detail until 1954 by Gorham and Stout.[1] The condition is nonfamilial, affects people of all ages, and is slightly more prevalent in males than females. The exact etiology of the disease is unknown, and it usually is not recognized until a fracture occurs, with subsequent improper bone healing. Vanishing bone disease is a synonym that describes the condition well. Bone loss occurs and progresses in certain areas of the body with no new bone growth. Affected areas may include the hands, arms, shoulders, ribs, spine, pelvis, femur, and jaw. In addition, nonchylous pleural effusion, or chylothorax, which is the presence of lymphatic fluid in the pleural space secondary to leakage from the thoracic duct or one of its main tributaries, may occur in association with this disease.[2]

Bone loss in Gorham disease is associated with proliferation of thin-walled vascular or lymphatic channels (lymphangiomas) in conjunction with massive osteolysis. Lymphangiomas are rare, benign neoplasms believed to be the result of abnormal development of the lymphatic system. The cavernosum type of lymphangioma affects organs in the thorax, abdomen, and bones and may affect just one bone or extend into adjacent bones, viscera, or soft tissues, resulting in local fibrosis. Clinical manifestations usually are related to the area of involvement. When the lower or upper jaw, tooth sockets, or other bones in the face, neck, or head are affected, symptoms may include pain, loose teeth, fractures, facial deformity, and recurrent meningitis. Peripheral bone involvement in the young may result in shortening or deformity of the affected bone. Rib or thoracic vertebral bone involvement may manifest as chronic pain or acute pain in cases of pathological fracture. Spinal involvement may produce vertebral collapse, which could result in neurological disability or lead to chest deformity and respiratory compromise. Nonchylous pleural effusions occur as the result of lymphangiomatosis and osteolysis of the thoracic cage. Chylothorax is associated with invasion of the thoracic duct, for which the mechanism has not been determined.[2-4]

Case summary

A 47-year-old man with Gorham disease was admitted to the hospital for thoracic duct ligation. Associated symptoms included extreme dyspnea, which was caused by right chylothorax, and an absent right clavicle, which had been completely autodigested due to the disease process.

The deposit of chyle had been a continuous process that required repeated pleural draining on the average of twice a week for the past 9 months. Three days before the surgery, 3,000 mL of chyle was drained from the right pleural cavity. The planned surgery was to excise the right thoracic duct in an attempt to eliminate the suspected source of the chyle. The patient was weak from weight loss associated with the pleural effusion–related shunting disease. The patient's weakness affected his appetite, which caused a 15-kg weight reduction.

The patient was a nonsmoker and in relatively normal health. He was not taking any medications and had no comorbid diseases. The Gorham disease

appeared after the patient fractured his right clavicle. The clavicle failed to heal after conventional therapy, and it was during this period that the recurrent chylothorax developed.

The patient weighed 85 kg on the day of surgery and had the following vital signs: heart rate, 88 beats per minute; blood pressure, 135/87 mm Hg; respiratory rate, 22 breaths per minute; and Sa_{O_2}, 91% while breathing room air and improving to 100% with oxygen at 4 L/min by nasal cannula. The patient's laboratory results were all normal.

The patient was brought to the operating room and placed supine on the operating room table, and standard monitors were applied and activated. Midazolam, 1 mg, was administered by the intravenous (IV) route through an 18-gauge left wrist IV line for anxiolysis. A left radial arterial line was placed after using a 1% lidocaine wheal. A 16-gauge left antecubital IV line was placed after using a 1% lidocaine wheal. The patient was preoxygenated with the fraction of inspired oxygen at 100% for 5 minutes. Induction of anesthesia was initiated with IV injection of 1 mg of midazolam and 100 µg of fentanyl, followed by a propofol bolus of 160 mg and a 10-mg dose of rocuronium for defasciculation. After establishing ability to ventilate via a mask through a circle system, succinylcholine, 160 mg, was administered by the IV route. The patient's trachea was intubated with a left-sided 39F double-lumen endobronchial tube. Placement of the double-lumen endobronchial tube was confirmed by fiberoptic visualization. Anesthesia was maintained using 100% oxygen and sevoflurane, 2.7%

The patient was placed into a semi–left lateral position by using a wedge under the right shoulder, and double-lumen endobronchial tube placement was confirmed again with fiberoptic visualization. Meticulous attention was given to application of padding due to the absence of the right clavicle and instability of the right acromioclavicular joint and to avoid vascular or nerve impingement.

When peripheral nerve stimulation train of four 4/4 returned, mivacurium, 8 mg, by the IV route was used to initiate muscle relaxation. An additional 50-µg IV bolus of fentanyl was given for a total of 150 µg. The patient's vital signs were maintained with the systolic blood pressure between 100 and 120 mm Hg, heart rate at approximately 70 beats per minute, and Sa_{O_2} at 100% throughout the case.

The right pleural cavity was explored, and 5,000 mL of chyle was drained. The right thoracic duct was exposed and surgically excised. After the surgical site was closed, the sevoflurane was discontinued. The patient was given neostigmine, 5 mg, and glycopyrrolate, 0.8 mg, by the IV route. The patient was evaluated for extubation. Following satisfactory assessment of ventilatory and neuromuscular parameters, the trachea was extubated. The patient was placed supine on the postanesthesia care unit stretcher with oxygen by nasal cannula at 4 L/min and transferred to the postanesthesia care unit. In the postanesthesia care unit, the patient's vital signs were stable, and the patient was able to maintain normal respirations. The patient had no complications.

Discussion

The formulation of an anesthetic plan for a patient with Gorham disease should begin by considering the potential for increased anesthetic risk caused by comorbid conditions and the surgical procedure to be performed. A weakened cervical spine prone to subluxation could increase the risk of spinal cord injury, particularly during hyperextension for intubation. Preoperative cervical spine roentgenograms would be needed to detect this problem. Manual in-line stabilization of the cervical spine during airway maneuvers could be used prophylactically in patients without radiographic abnormalities; however, patients who have abnormal findings of the head, neck, or face require awake intubation via fiberoptic bronchoscopy.[5]

Disease of the chest, such as chylothorax and pleural effusion, often causes respiratory compromise necessitating operative intervention. Chylothorax, which is associated with a 52% mortality rate, commonly is treated by ligating the thoracic duct. Open thoracotomy, lateral position, and 1-lung ventilation often are used, increasing perioperative anesthetic risk. A preoperative chest radiograph, room air Sa_{O_2} measurement, arterial blood gas measurement, spirometry, and ventilation-perfusion scanning could be used to identify potential problems with gas exchange and establish baseline values. If restrictive lung disease is found, pressure-controlled ventilation using high respiratory rates may be beneficial. Medication administration should be individualized for this patient population. Because patients with Gorham disease may exhibit chylothorax-induced hypoproteinemia, careful titration of highly protein-bound drugs may be necessary. There is no evidence of renal or hepatic dysfunction in Gorham disease, although fasciculations induced by succinylcholine could exacerbate pathologic fractures in the weakened bone.[6]

Several therapies exist in the treatment of Gorham disease. Because the disease is so rare, treatment guidelines are not well established, making objective assessment of treatment effectiveness difficult. The following discussion concentrates on cases that address pleural effusion and chylothorax.

Conservative treatment of Gorham disease–related chylothorax includes serial thoracentesis and fat-restricted diet or eliminating oral intake. These measures may provide temporary relief but are not adequate in the long-term. The majority of cases in which radiation therapy was used have resulted in favorable outcomes. One case report[6] described the administration of radiation therapy to a 21-year-old man who initially had a nonhealing fracture of the proximal right humerus. Gorham disease was diagnosed, and radiation was delivered using a direct field arrangement, with 1,500 cGy to the midplane during 3 days. Complete resolution of the bleeding and ecchymosis occurred within 3 weeks, and no further therapy was required. Seven years later, the patient again had an extensive chylous effusion. By using an anteroposterior-posteroanterior technique, 4,000 cGy was delivered in 20 treatment sessions. The effusions were insignificant after 2 weeks, and there was no reaccumulation of the fluid shown by imaging in the 6 months after therapy.

In a separate case,[6,7] a 21-year-old man had a right-sided pleural effusion. Computed tomographic scanning revealed destruction of the 11th and 12th right ribs and adjacent vertebral bodies. Gorham disease was diagnosed after 6 weeks of continued symptoms, and treatment was initiated with high-dose radiotherapy (40 Gy in 20 fractions). Four years after the completion of therapy, the patient remained well with no evidence of recurrence.

Successful use of minocycline and bleomycin in the treatment of chylothorax related to Gorham disease was described in the case of a 19-year-old woman with persistent, severe, low back pain and limited lumbar motion that progressed to paraparesis.[8] After surgical correction of the parapersis, severe chylothorax (500-1,300 mL/d) developed in the right thorax. Radiation therapy was initiated with no success, demonstrating it is not always effective. Then minocycline, which is used extensively to treat cases of chylothorax after thoracic surgery, was injected into the right pleural cavity (4 times during 10 days for a total dose of 1,200 mg). The daily chylous leakage decreased to approximately 300 mL. Pleural adhesion with bleomycin then was attempted via intrapleural injections 3 times during a 14-day period, for a total dose of 45 mg. The pleural effusion subsided 1 week after therapy was initiated. Chylothorax reappeared the next year following another surgery. Bleomycin, 15 mg, was given by intrapleural injections, and the chylothorax disappeared. Two years later, the patient was free of pain and paresis.

Successful treatment with interferon alfa and oral clodronate was described in a 19-year-old man with discomfort in his neck and left shoulder.[9] Examination revealed an absent left clavicle, first and second left ribs, and destruction of the C7, T1, and T2 vertebrae; Gorham disease was diagnosed. Radiation therapy was delivered with no success. Nine months after the initial diagnosis, chylothorax developed, and thoracentesis was necessary every 2 weeks. Treatments with oral clodronate and subcutaneous interferon alfa-2b were initiated. The chylothorax disappeared within 5 weeks. At the time of the report, the patient had lived for 19 months, free of symptoms and no signs of disease progression. The authors concluded that interferon alfa was the most important drug in this therapy because of its antiangiogenic properties and success in disorders with vessel proliferation.[10]

Early ligation of the thoracic duct before malnutrition and sepsis occur may reduce mortality related to chylothorax.[3,11] In a 2-year-old boy with a 3-day history of shortness of breath, a chest radiograph revealed a large, right-sided chylothorax. A chest tube was inserted, draining 3 L of chyle per day. This amount was reduced to 1 L/d after elimination of oral intake. After 10 days of continued chyle loss, the patient underwent thoracic duct ligation and parietal pleurectomy. Tisseel, a fibrin tissue adhesive (Baxter Healthcare Corporation, Deerfield, Ill), also was applied to the affected area. The effusion resolved, and the chest tube was removed. The pleural effusion did not recur, and the patient functioned well without obvious progression of the disease. The patient later was diagnosed with Gorham disease. Two years following the initial diagnosis, the patient died of a massive retroperitoneal hemorrhage. According to the authors, this was the first report of this complication accompanying Gorham disease.

Gorham disease is a rare condition that probably is underdiagnosed. Management of chylous or nonchylous pleural effusions is controversial. Conservative treatments, such as radiotherapy, interferon alfa, and bleomycin, seem to be effective in some patients. Although the risk of death is higher, pleurectomy with or without thoracic duct ligation has been reported as successful and may be the treatment of choice for patients in extremis.

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