The differential diagnosis of a fractured clavicle includes acute traumatic fracture, stress fracture, pathologic fracture secondary to radiation exposure, neoplasm, infection, or metabolic bone disease, and fracture-like conditions such as infection and bony dysplasias. An appropriate workup should identify most of these underlying conditions. We report a case of concurrent bilateral nontraumatic fractures of the clavicle occurring in a healthy young man in the absence of repetitive trauma. Workup revealed no underlying explanation for the fractures. To our knowledge, this has not been reported. Our case suggests the differential diagnosis of a fractured clavicle should be expanded to include idiopathic nontraumatic fractures.

The clavicle is one of the most commonly fractured bones in the human body. It is the most commonly fractured bone at birth. The most common presentation of a clavicle fracture is an acute fracture caused by proximate trauma. Secondary fractures of the clavicle can occur in the presence of bone cysts, benign and malignant tumors, arteriovenous malformation, and metabolic bone disease. Spontaneous fractures and nonunions are rare. Stress fractures of the clavicle rarely have been reported. Isolated cases of unilateral stress fractures of the clavicle have been described in a healthy child, as a late complication after radical neck dissection, in athletes, in a manual laborer, and secondary to a nervous tic. One case of bilateral stress fractures occurring 3 years apart has been reported.

Other conditions may occur in the clavicle and often need to be included in the differential diagnosis of a fracture of the clavicle, particularly when the presentation is more chronic and subtle. The clavicle frequently is involved with generalized bony dysplasias, but focal anomalies are relatively uncommon. An exception is congenital pseudarthrosis of the clavicle, which most commonly occurs unilaterally on the right side. In cleidocranial dysplasia the clavicle is hypoplastic or even absent, but frequently has two separate hypoplastic segments. Acute, subacute, and chronic infections and other inflammatory conditions can present with osteitis, simulating the periosteal response to a stress fracture.

Imaging studies generally allow recognition of most of these processes. After trauma or birth, radiographs often show an acute fracture; later studies may show nonunion. Pathologic fractures often show signs of the underlying process, such as bone destruction or sclerosis, cortical expansion, or subacute or chronic periosteal reaction. A careful history, physical examination, and appropriate laboratory studies generally will rule out most bony dysplasias and fractures secondary to metabolic bone disease or repetitive trauma.

A multilingual literature search provided no previous report of concurrent bilateral nontraumatic fractures of the clavicle in the absence of discernible disease.

Case Report
A healthy 20-year-old man presented with a 3-month history of bilateral clavicular pain. He had pain with activity,
but denied significant pain at rest. He was able to perform activities of daily living but had difficulty with lifting. The patient had no history of trauma or repetitive stress and had not been involved with athletics. He is the older of two children; his younger sister was healthy. He was the product of a normal spontaneous vaginal delivery at term with no perinatal complications. Childhood development was normal. His medical history was unremarkable. Family history revealed no evidence of bony disorders; specifically, no family members were known to have any clavicular problems. Physical examination revealed mild swelling of the medial clavicle bilaterally with tenderness on palpation, left greater than right. He was of normal stature for his age. No other shoulder abnormalities were identified, and the scapula and trapezius were normal. The skull, sternum, spine, and pelvis were normal. No teeth abnormalities were seen. The fingernails were normal. He had no skin lesions. Sclerae were not blue or icteric. Laboratory studies including complete blood count with differential, erythrocyte sedimentation rate, C-reactive protein, alkaline phosphatase, vitamin D, serum calcium and phosphorous, and urinalysis were normal. Radiographs were unremarkable. No prior radiographs of the clavicle had been taken. Magnetic resonance imaging (MRI) of the more symptomatic left clavicle was done. It revealed a linear signal abnormality consistent with nondisplaced fracture (Fig 1). The patient was treated nonoperatively with activity limitation and nonsteroidal antiinflammatory medication. No immobilization was used. Four weeks later, the patient had increased pain and swelling bilaterally. Physical examination revealed significant fusiform swelling of the medial clavicle bilaterally (Fig 2). An open biopsy was performed to rule out associated infection or neoplasm. Pathologic analysis was consistent with fracture callus. Cultures were negative. Conservative treatment was continued; however, pain persisted and swelling increased.

Three months after presentation, radiographs showed hypertrophic callus formation with persistent fracture lines bilaterally (Fig 3). Swelling had increased (Fig 4). Pain in the left clavicle was persistent and disabling, and pain in the right clavicle was mild. We performed open reduction and internal fixation (ORIF) of the left clavicle fracture with plate and screw fixation. Four months postoperatively, successful bony union of the left clavicle was achieved, the right clavicle achieved union spontaneously (Fig 5), and the associated soft tissue swelling had markedly diminished (Fig 6). At the latest followup, 20 months after presentation, the patient was asymptomatic and had returned to normal function.

DISCUSSION

We think this case is the first reported presentation of concurrent bilateral idiopathic fractures of the clavicle.

The differential diagnosis included acute traumatic fracture, pathologic fracture (secondary to cyst, neoplasm, or metabolic bone disease), stress fracture, and fracture-like conditions such as bone dysplasia, infection, or inflammatory disorders. The results of the patient’s extended history (including family history), physical examination, imaging studies, and laboratory tests including open biopsy failed to elucidate any underlying cause for the fractures in this otherwise healthy individual.
Acute traumatic fractures and fractures secondary to cysts or neoplasms generally are apparent on imaging studies. In this case, no acute fracture or pathologic process was evident on the initial radiographs.

Fractures may occur in the presence of metabolic bone disease. Conditions such as osteogenesis imperfecta or osteopetrosis generally have typical clinical and radiographic findings suggestive of these disorders. A clavicle fracture with underlying metabolic bone disease may not show obvious disease on radiographs or MRI. This is illustrated in two separate case reports with an incidental diagnosis of nutritional rickets after clavicle fracture and a case of a patient with a clavicle fracture in the presence of osteomalacia with anorexia nervosa. Although imaging studies may be normal in metabolic bone disease, abnormalities should be detected with laboratory analysis of the serum calcium, phosphorous, vitamin D, and urinalysis.

Infectious and inflammatory disorders may not be differentiated from a stress fracture on imaging studies but generally there are constitutional symptoms and elevated white blood count, erythrocyte sedimentation rate, and/or C-reactive protein. In rare cases, constitutional symptoms may be absent and laboratory studies normal, but pathologic analysis after an open biopsy will show infection or inflammation.

Stress fractures of the clavicle rarely have been reported. Kaye et al reported a fatigue fracture of the medial clavicle in a 12-year-old boy that healed with conservative treatment. Ord and Langdon reported a stress fracture of the clavicle as a late complication of radical neck dissection. The fracture was thought to be pathologic and the medial clavicle was excised. Pathologic analysis revealed fracture and avascular necrosis. Hao and Chang also reported a stress fracture of the clavicle after radical neck dissection. This patient had a nonunion 6 months after presentation (at the time the report was submitted) that was asymptomatic.
Stress fractures of the clavicle have been reported in a javelin thrower, a collegiate diver, a rower, a young gymnast, and an athlete involved in creating human towers. All of these fractures healed with conservative treatment. There was also a case of a distal clavicular stress fracture in a female weight lifter. This patient had a nonunion develop that required distal clavicle excision.

A stress fracture of the medial clavicle has been reported in a cable maker. This fracture healed with conservative treatment, but persistent radiographic evidence of a nonunion was observed at the time the report was published.

Stress fracture of the medial clavicle secondary to a nervous tic also has been reported. This fracture healed with conservative treatment. Calvo et al reported a stress fracture of the clavicle in a young female who performed repetitive nervous circumduction of the shoulders. The fractured medial clavicle was excised and replaced with an autogenous fibular graft. Three years later, a similar fracture developed in the contralateral clavicle. This fracture also was treated with resection.

Our patient had no history of repetitive trauma, nervous tic, radiation exposure, or athletic participation.

Rarely, radiographic manifestations of bony dysplasia can be similar to that of a clavicle fracture with nonunion. Congenital pseudarthrosis may have the radiographic appearance of a fracture nonunion but the bone edges typically are more rounded and little callous formation is evident. This entity typically involves only the right clavicle, although occasionally it can be bilateral. In leidocranial dysplasia, the clavilla may consist of two hypoplastic segments that may appear radiographically similar to a nonunited fracture. In general, however, the segments will appear quite distinct. In addition, these patients generally will have typical bony changes in the skull, spine, and pelvis.

To our knowledge, there have been no reported cases of concurrent bilateral nontraumatic fractures of the clavicle. Our case is particularly unusual, not only because of the concurrent and bilateral nature of the fractures, but also because of its idiopathic nature. Adding to the unusual nature is the fact that one of the fractures failed to unite with conservative measures in a timely fashion. An extensive PubMed literature search of all languages was performed (“Clavicle/abnormalities”[MeSH] OR “Clavicle/analysis”[MeSH] OR “Clavicle/anatomy and histology”[MeSH] OR “Clavicle/growth and development”[MeSH] OR “Clavicle/injuries”[MeSH] OR “Clavicle/pathology”[MeSH] OR “Clavicle/radiation effects”[MeSH] OR “Clavicle/radiography”[MeSH] OR “Clavicle/radionuclide imaging”[MeSH] OR “Clavicle/surgery”[MeSH]). We failed to find any cases of idiopathic, nontraumatic fractures of the clavicle. We also identified no cases of stress fracture of the clavicle that required operative treatment to achieve bone union. It may be that the fracture of the left clavicle would have healed with continued conservative management, particularly given that the right clavicle fracture did heal, but the clinical and radiographic appearances after 3 months of nonoperative treatment were not encouraging. The patient and his family were increasingly distressed about the symptoms and clinical appearance, and surgery was offered as an alternative.

References