Case Report

Gorham's disease in humerus treated with autogenous vascularized fibular graft

Jeung Woo Kim, Hong Je Kang, Dong Chul Kim[1], Chang Hyun Shin

Abstract

Gorham's disease is a rare disorder of the bone characterized by progressive massive osteolysis. The pathophysiology is unknown, and diagnosis is often difficult. Most cases are often recognized retrospectively. There is no standardized treatment and management for Gorham's disease. We report a case of an 18-year-old male presenting with a pathologic fracture in the humerus shaft diagnosed with Gorham's disease. Patient was treated with autogenous vascularized fibular graft with wide excision and a 10 years followup after first surgery.

Key words: Autogenous vascularized fibular graft, Gorham's disease, humerus
MeSH terms: Hemangioma, humerus, grafting, bone, tissues osteolysis

Introduction

Gorham's disease is an extremely rare osseous disorder characterized by spontaneous and progressive massive osteolysis. At present, only 200 cases of Gorham's disease have been reported in the literature.[1] The goal of the treatment is to halt the progression of disease and reconstruction of the lost bone for functional improvement.[2] The treatment of Gorham's disease includes surgery, radiation therapy, and medicine therapy.[2-5] We report such a case presented with a pathologic fracture in the humerus treated with autogenous vascularized fibular graft with wide excision and a 10 years followup.

Case Report

An 18 year old male presented with pain in his right upper arm after trying to put out a fire in his hand in June 2005. On physical examination, tenderness, swelling, angulation, and crepitus on right upper arm were noticed. Radiographs of the arm revealed a humeral shaft fracture with intramedullary patchy signs of osteoporosis [Figure 1]. After correlating with history, physical examination and radiographs, a diagnosis of pathologic fracture shaft humerus was made. Bone scan and magnetic resonance imaging (MRI) of the right arm were then performed. Bone scan revealed mild nonspecific uptake intensity on shaft of humerus [Figure 2]. No other skeletal abnormalities were noticed on the scan. On MRI, T1-weighted image showed medium intensity at the bone marrow, and high signal intensity at the same area was shown on T2-weighted image. Findings also revealed cortical bone erosion and heterogeneity around fracture lesion with multiple bone absorption [Figure 3]. MRI findings suggested avascular tumor such as hemangioendothelioma or hemangioma. Blood parameters such as calcium, phosphate, alkaline phosphatase, osteocalcine, and calcitonin were all within normal range. Rheumatoid factor was negative. Patient then underwent the curettage with biopsy with open reduction and internal fixation using Limited Contact Dynamic Compression Plate (LC-DCP, Synthes©, Paoli, [PA], USA) on June 2005. Intra operative findings revealed a fibrotic mass located in the medullary cavity and signs of cortical thinning. Histopathological result was chronic inflammation with vascular proliferation. Therefore, he wasn't diagnosed as Gorham's disease. 7 months postsurgery, the patient consulted the emergency room complaining of right upper arm pain that occurred while trying to stand up after leaning on his right side. Radiographs showed enlarged and new developed radiolucent areas suggesting a nonunion fracture of the humerus. A periprosthetic fracture on the distal plate was also noted [Figure 4]. On January 2006, the patient underwent removal of implant and

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Access this article online

Quick Response Code:

Website: www.ijoonline.com

DOI: 10.4103/0019-5413.201707

resection of the osteolytic lesion. Dual onlay bone graft using autologous tibia and iliac cancellous bone was performed at the bone defect. And open reduction and internal fixation was performed using intramedullary nailing (AO-UHN, Synthes©, Paoli, [PA], USA) [Figure 5]. Histopathologic findings revealed numerous proliferating blood vessels with different capillary sizes anastomosed as hemangiomatosis and lymphangiomatosis are causing cortical bone destruction [Figure 6]. The patient's history, clinical symptoms, radiologic and histopathologic findings were all correlated and therefore, diagnosed as Gorham's disease. After 2 weeks postsurgery, intravenous zoledronic acid infusion was started once a month at a dose of 4 mg

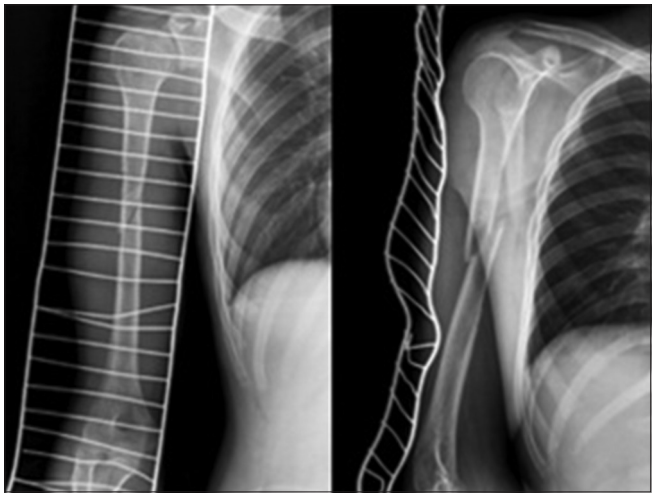

Figure 1: Preoperative anteroposterior and lateral plain radiograph of arm showing right humeral shaft fracture and intramedullary patchy osteoporosis

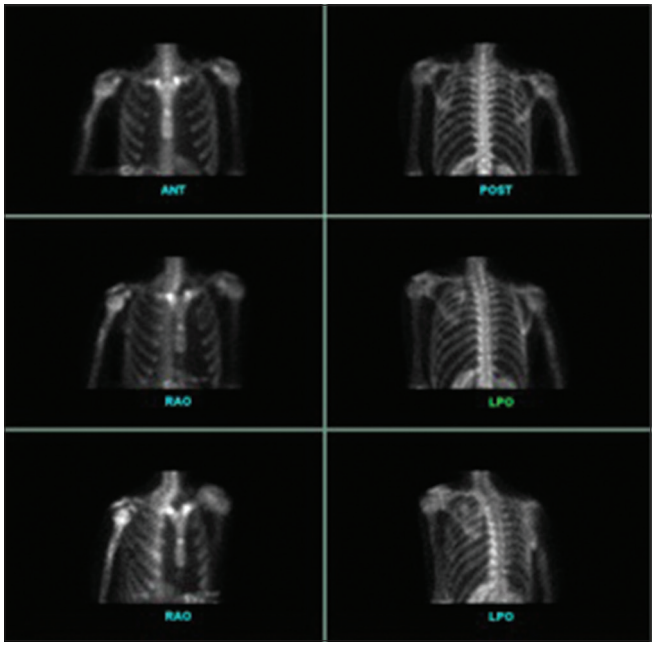

Figure 2: Preoperative bone scan showing nonspecific uptake intensity on proximal and shaft humerus

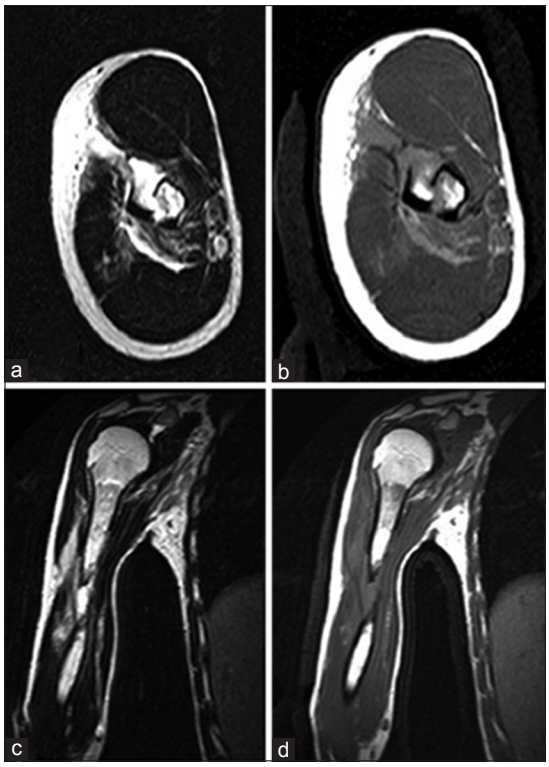

Figure 3: Preoperative magnetic resonance imaging. (a) Transverse T2-weighted image showing high signal intensity on shaft of humerus. (b) Transverse T1-weighted image showing intermediated signal intensity on shaft of humerus. (c) Coronal T2-weighted image showing heterogeneity osteolytic lesion on fracture site. (d) Coronal T1-weighted image intermediated signal intensity on fracture site

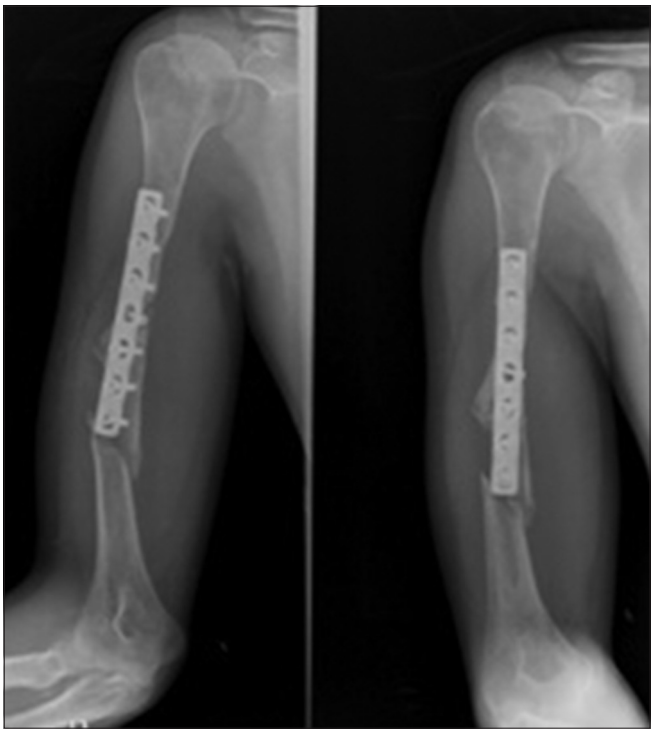

Figure 4: Anteroposterior and lateral plain radiograph of arm showing nonunion, radiolucent areas and a new fracture appeared on the right distal humerus below the plate at 7 months after first surgery

for a duration of 6 months. Followup radiographs were taken after 6 months postsurgery and showed massive osteolysis of humerus, and grafted bone resembling a "licked candy stick" deformity [Figure 7]. Wide resection and temporary cement material filling of the implant were done for the bone gap and subsequently functional range of motion started. Postoperatively, radiation therapy was started at a single dose of 2.0 Gy (20 cycles) for the duration of 4 weeks with a total dose of 40 Gy. After 1-year postsurgery, radiographs showed no evidence of osteolysis and bone resorption [Figure 8]. Removal of the intramedullary nail and cement material, and insertion of an autogenous vascularized fibular graft was performed on his fourth operation [Figure 9]. Postoperatively, zoledronic acid was started using the previously given regimens. Radiographs of the patient 7 years postsurgery and 10 years after the first surgery showed evidence of bone union and no signs of osteolysis [Figure 10].

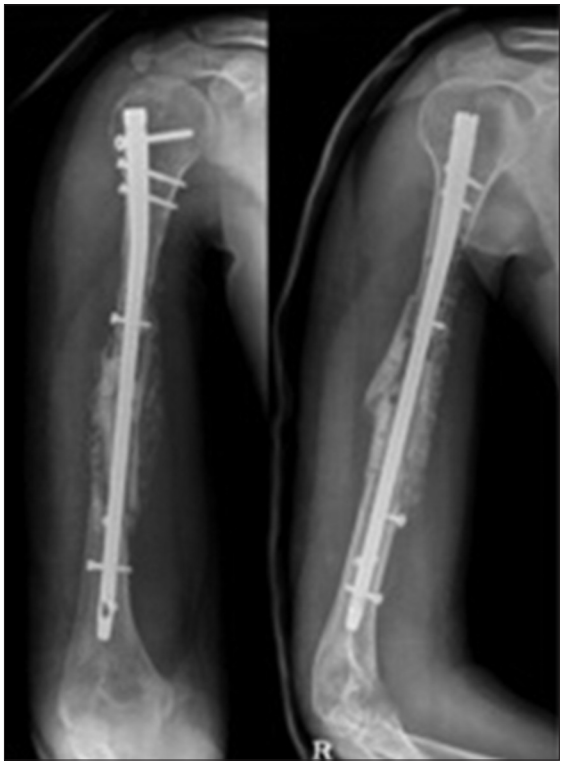

Figure 5: Postoperative anteroposterior and lateral plain radiograph of arm showing internal fixation with intramedullary nailing and dual onlay autogenous tibia bone graft

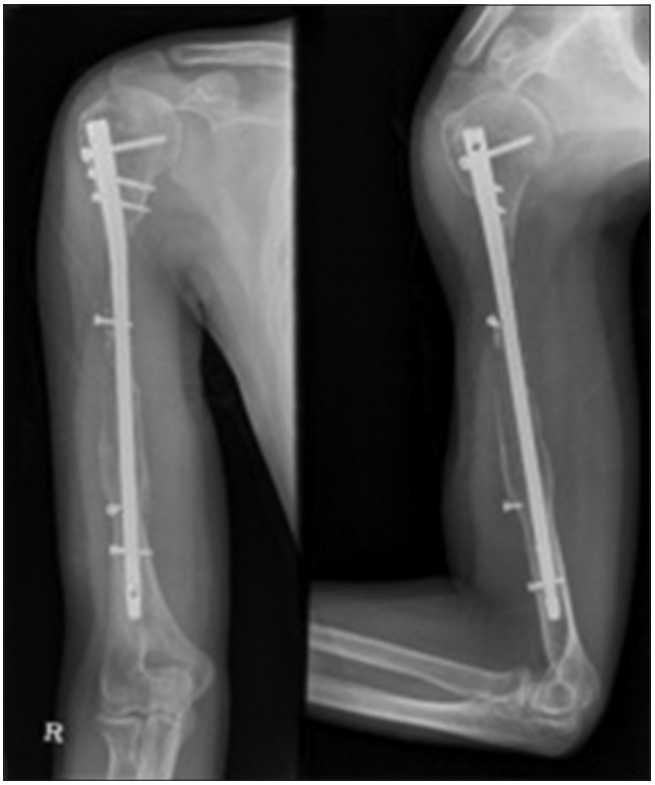

Figure 7: Postoperative anteroposterior and lateral plain radiograph of arm showing massive osteolysis looks like licked candy stick deformity of humerus after 6 months of second surgery

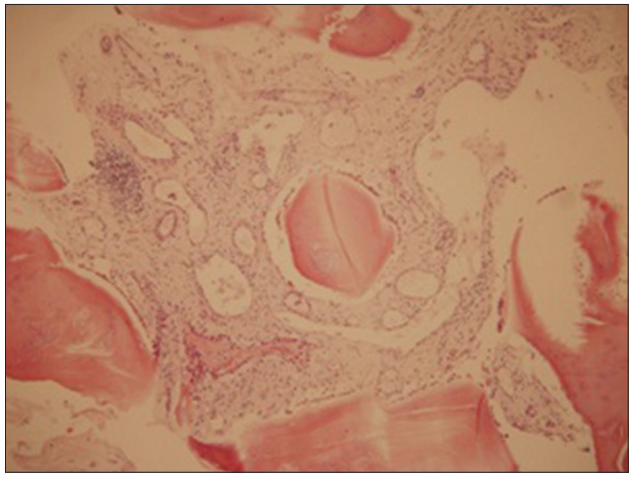

Figure 6: Photomicrograph of a biopsy specimen showing destruction of cortical bone by hemangiomatosis and lymphangiomatosis

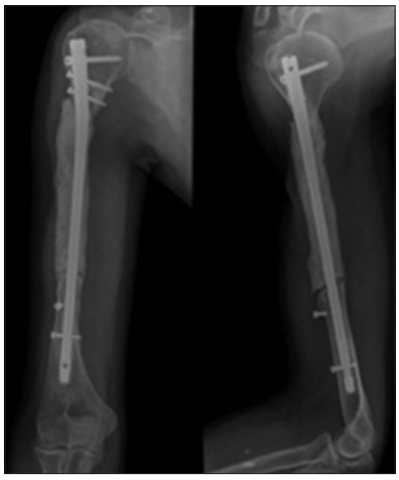

Figure 8: Postoperative anteroposterior and lateral plain radiograph of arm showing cement material filling and no evidence of osteolysis and bone resorption after 1-year followup

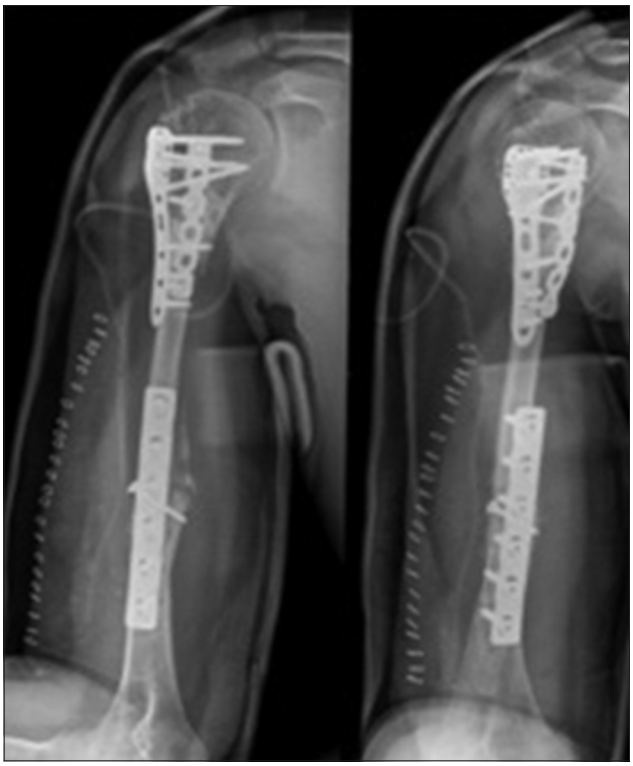

Figure 9: Postoperative anteroposterior and lateral plain radiograph of arm showing open reduction and internal fixation using an autogenous vascularized fibular graft with plate

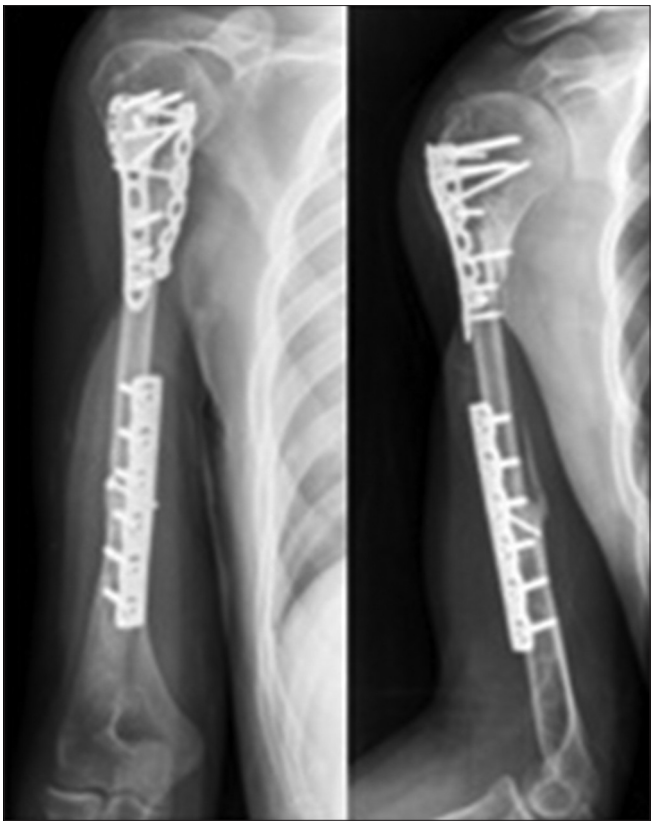

Figure 10: Postoperative anteroposterior and lateral plain radiograph of arm showing incorporation of vascularized fibular graft without osteolysis at 10 years after fourth surgery

Discussion

Gorham's disease is a rare disorder that may affect any part of the bone, but most commonly involves the skull, rib, pelvic girdle, shoulder.[6-8] Surrounding soft tissues can also be involved.[8] In most cases, a single bone is affected. However, multiple bones are infrequently involved. Most of the cases occur in adolescents and young adults. There is no gender preference and genetic heredity cause. The diagnosis is based on combined clinical, radiological and histopathology findings after excluding neoplastic, immunologic, endocrinologic, infectious, and inflammatory diseases.[6] However, the diagnosis is difficult and is often recognized retrospectively.[2,8] At first, we confused Gorham's disease with hemangioma, because of the rarity of the disease and histopathological similarity. Patients are often asymptomatic until a pathological fracture occurs.[9] Regeneration of bone is rare, and the osteolysis continues.[7] Results of biochemical and hematological test are almost normal, and helpful only to exclude other diagnoses.[9] Radiographically, four stages of the disease have been recognized.[9,10] The initial intra osseous stage is characterized by intramedullary and subcortical "patchy osteoporosis". Second, as the disease progresses, the radiolucent areas become enlarged and coalesce at the periphery of the involved region. The third stage is the extraosseous stage that is characterized by cortical erosion and soft tissue involvement. In the final stage, the remaining bone is reabsorbed and finally replaced by fibrous tissue. In the long bones, there is noted progress with concentric shrinkage and atrophy and tapering of the residual bone giving the appearance of "licked candy stick" deformity.[6] Three-phase bone scintigraphy, demonstrated slightly decreased activity in the arterial phase, slightly increased activity in the blood pool phase, and increased activity in the delayed phase with normal thallium activity.[11] MRI is useful in confirming the extension of Gorham's disease, although not diagnostic.[12] The most common MRI findings are a heterogeneous increased signal intensity on T1-weighted images and higher signal intensity on T2-weighted images.[9] However, some authors reported hypointensity on T1-weighted images and hyperintensity on T2-weighted images.[10,12] The variability of MRI is likely to be caused by the degree of neurovascular progression and fibrosis.[10] On histopathology finding, the numerous thin walled endothelial capillaries and lymphatic vessels with fibrous tissue are common which indicates the important role of hemangiomatosis or lymphangiomatosis.[9]

The pathogens of Gorham's disease remain unknown, although many hypotheses have been suggested in the literature.[13] Möller *et al*. suggested hyperactive osteoclastic bone resorption causing osteolytic changes[6] and that interleukin-6 (IL-6) may play a role stimulate osteoclast activity and increase sensitivity of osteoclast precursors.[14] However, some authors suggested that the osteoclastosis"

was not necessary and lymphangiogenesis or secondary to angiomatosis may be cause of osteolysis.[13,15]

There is no standardized treatment and results are unpredictable.[2] The treatment of Gorham's disease includes surgery, radiation therapy and medicine therapy.[2-5] The goal of the treatment is to halt the progression of disease and reconstruction of the lost bone for functional improvement.[2] Bisphosphonates reduces the activity of osteoclasts.[8] Avelar *et al*. reported the use of zoledronic acid in a 9-year-old patient with good results although with a short term followup.[8] Even though our patient was started on zoledronic acid after the autologous tibia bone graft in the second operation, the osteolysis continued. Interferon-α was successfully used because it diminishes the proliferation of blood vessels and reduce the circulatory level of IL-6.[4,8] Takahashi *et al*. reported interferon α therapy will have benefits for patients with extensive involvement with Gorham's disease.[4] If osteolysis progresses despite medical therapy, radiation therapy or resection, or even amputation has been tried. Radiation therapy may prevent disease progression effectively in Gorham's disease in 77% to 80% of cases at a total dose ranging from 30 to 45 Gy.[5] Bada *et al*. reported good results of radiation and bisphosphonate therapy in pathological fracture of the femur.[1] In patients with pathological fractures or massive bone resorption, complete resection with bone graft or prosthesis recommended for functional improvement. Incomplete resection rarely cures the disease. Bone grafts will be resorbed, and sometimes replacement with a prosthesis seems to be more effective.[13] Browne *et al*. reported successfully treated cases with resection, total hip arthroplasty and radiation therapy after failure of bone graft.[16] Picault *et al*. reported good results in patients treated with vascularized fibular bone graft in Gorham's disease of femur with pathological fracture.[17]

Our patient underwent autogenous tibial bone graft and bisphosphonate therapy after the second surgery but still had massive osteolysis on humerus after 6 months. We then performed a wide resection with temporary cemented intramedullary nailing, to improve the patient's functional range of motion and to relieve pain. Radiation therapy was done postoperatively to treat all residual disease and soft tissue involvement. We performed autogenous vascularized fibular bone graft on fourth surgery, which resulted in a good outcome.

To conclude, Gorham's disease is a very rare bone disease difficult to diagnose. No established treatment is available in the literature. This study reports a case of Gorham's disease in the humeral shaft and the current literature review in managing and treating cases of Gorham's disease. We consider that autologous vascularized fibular graft could lead to a good treatment option with bisphosphonate and radiation therapy.

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How to cite this article: Kim JW, Kang HJ, Kim DC, Shin CH. Gorham's disease in humerus treated with autogenous vascularized fibular graft. Indian J Orthop 2017;51:217-21.

Source of Support: This study was financially supported by Wonkwang University, Korea, **Conflicts of Interest:** None.