



## Case Report

# Gorham-Stout disease: A multirod lumbar reconstruction with off-label suppression-remission therapy

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## ABSTRACT

**Background:** Gorham-Stout disease (GSD), a fibro-lymphovascular entity in which tissue replaces the bone leading to massive osteolysis and its sequelae, rarely leads to spinal deformity/instability and neurological deficits. Here, we report a 12-year-old female who was diagnosed and treated for GSD.

**Case Description:** A 12-year-old female presented with back pain, and the inability to walk, sit, or stand attributed to three MR/CT documented L2-L4 lumbar vertebral collapses. Closed biopsies were negative. However, an open biopsy diagnosed GSD. She underwent a dorsal-lumbar-to-pelvis fusion (i.e., T5-T12 through L5/S1/S2) using multilevel pedicle screw/rod stabilization and human leukocyte antigens (HLAs) matched allograft (i.e. from her father). Postoperatively, she was treated with “off-label” teriparatide injections, bisphosphonates, and sirolimus. Four years later, while continuing the bisphosphonate therapy, she remained stable.

**Conclusion:** Surgical multirod stabilization from T5 to S2, supplemented with HLA compatible allograft, and multiple medical “off-label” therapies (i.e., teriparatide, sirolimus, and bisphosphonates) led to a good 4-year outcome in a 12-year-old female with GSD.

**Keywords:** Gorham-Stout, Osteolysis, Paraparesis, Sirolimus, Teriparatide, Vanishing

## INTRODUCTION

Gorham-Stout disease (GSD), often called vanishing bone disease, rarely involves the spine. When the spine is involved, it typically results in spinal deformity contributing to significant neurological deficits. With GSD, fibrovascular tissue usually replaces bone resulting in bone resorption and destruction.<sup>[2,8,9]</sup> It can occur at any age and involve any sex or race.<sup>[3,4]</sup> Multiple surgical options (i.e., decompressions/fusions) and medical treatment modalities are available that include chemotherapy, radiation therapy, bisphosphonates, and other off-label therapeutic agents.<sup>[11]</sup> Here, we present a 12-year-old female who underwent an instrumented lumbar fusion from T5-T12 down to/through the L5-S2 levels supplemented with allograft and the “off-label” use of teriparatide, sirolimus, and bisphosphonates.

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## CASE DESCRIPTION

A 12-year-old female had been bedridden for the past 2 months due to low back pain; however, her neurological examination was normal. X-rays revealed a lumbar spine deformity characterized by L2-L4 vertebral lysis [Figures 1 and 2]. The MR also showed a significant T2 hyperintensity both anteriorly and posteriorly within these three vertebrae, and “spot lesions” in the clivus, ilium, and T4 vertebra. In addition, the CT/myelo-CT demonstrated dilated cysts within the L2-L4 posterior elements [Figures 3-6]. Notably, the hematological work-up was negative.



**Figure 1:** Anteroposterior radiograph of the patient depicting collapse of lumbar vertebrae and a coronal shift of around 4 cm to the left side.



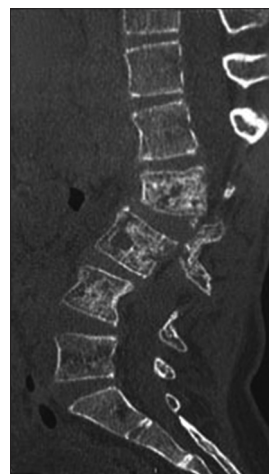
**Figure 2:** Plain lateral radiograph of the patient depicting gross lumbar kyphosis. There is a loss of multiple lumbar vertebrae architecture evident in the radiographs. The overall lumbar lordosis is around 30° but there is gross instability due to loss of multiple lumbar vertebral bodies. The sagittal vertebral axis is shifted around “-3 cm.”

## Surgery

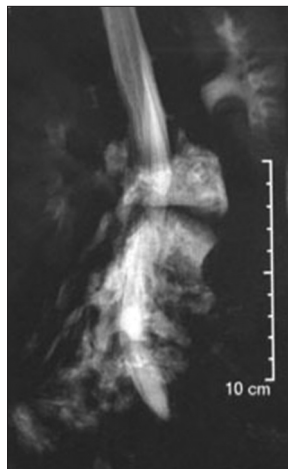
She underwent a percutaneous vertebral biopsy twice that proved inconclusive. An open biopsy finally confirmed the diagnosis of GSD. A spinopelvic fusion was performed from T5 to T12 through the L5/S2 levels using anchors to the pelvis and S2 alar/iliac screws (i.e., supplemented with a four-rod cobalt chrome construct and cross-links) [Figures 7-9]. Posterior bone grafting included corticocancellous bone chips and her father’s posterior iliac crest graft (i.e., after major human leukocyte antigen [HLA] compatibility was demonstrated). The postoperative course was uneventful and she was neurologically normal within 2 postoperative months.



**Figure 3:** A magnetic resonance imaging T2-weighted sagittal image showing hyperintense signals in the lumbar vertebrae in both anterior and posterior elements of the vertebrae. It justifies and correlates with the chylous fluid found peroperative.



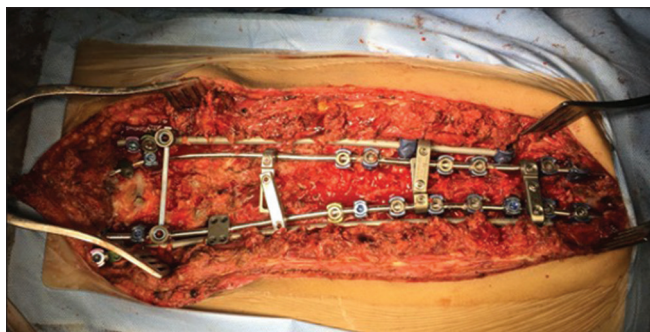
**Figure 4:** Sagittal reconstruction of computed tomographic scan of the patient showing multiple lytic defects in the body of the lumbar vertebra and the lumbar kyphosis.



**Figure 5:** Coronal magnetic resonance myelogram showing a partial myelo-block along with fluid intensity in the anterior and posterior elements of the vertebra.



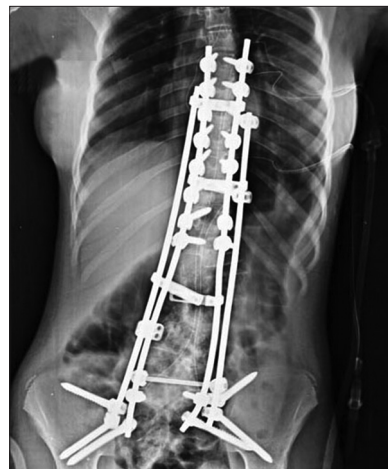
**Figure 6:** Sagittal MR myelogram suggestive of a partial myelogram block at the kyphotic apex at L2-L3.



**Figure 7:** Intraoperative photograph of the patient showing the four-rod construct with domino connectors and placement of copious quantities of bone grafts.

### Histopathology

The open biopsy confirmed the classical findings of GSD that included lymphatic and vascular tissue in the bone



**Figure 8:** Postoperative anteroposterior radiograph demonstrating that coronal tilt is well corrected to within 1 cm of the midline after posterior stabilization with multiple point anchors and multirod construct.



**Figure 9:** Postoperative lateral radiographs showing good correction of lumbar kyphosis. The sagittal vertebral axis is corrected to “+2 cm.”

with multiple dilated sinusoids, hemorrhagic changes, mononuclear/lymphocytic infiltration, fibrous tissue, and dead bone. In addition, the fluid aspirate showed chyle-like fluid. Further, the D2-40 immunohistochemistry was positive.

### Adjunctive medical management

Adjunctive postoperative medical management included the administration of calcium, Vitamin D supplementation, the “off-label” use of calcitonin nasal spray for 2 months, teriparatide injections (20 units/day) for 6 months, yearly zoledronic therapy (4 mg infusion, after 2 months), and sirolimus therapy (1 mg twice a day with blood levels monitoring introduced at 3 postoperative months by the nephrologists).

### Long-term outcome

Four years postoperatively, she continues to demonstrate no disease progression and is ambulatory. She stopped sirolimus after 3 postoperative years but has continued oral bisphosphonates. Both the CT and MR studies continue to confirm remission of GSD; the CT scan shows bony bridging/fusion/stability, while the MRI demonstrates no new vertebral bony reformation [Figures 10-12]. Quality of life was assessed by Musculoskeletal Tumor Society Score at 30.

## DISCUSSION

### Differential diagnosis of GSD

Hefez *et al.* described features that can differentiate GSD from other diseases. This typically requires evidence of; a positive GSD biopsy/positive immunologic testing with bone destruction/osteolysis, in the absence of dystrophic calcification, ulcerative lesions, visceral involvement, neoplastic, metabolic, or infectious lesions.<sup>[5]</sup> Other differential diagnoses of GSD include osteolytic metastasis, generalized lymphatic anomalies, neurogenic osteolysis, Paget's disease, Langerhans cell disease, and skeletal angiomas.<sup>[8]</sup> In most cases of GSD, laboratory values are normal.<sup>[6]</sup>

### Clinical features of GSD

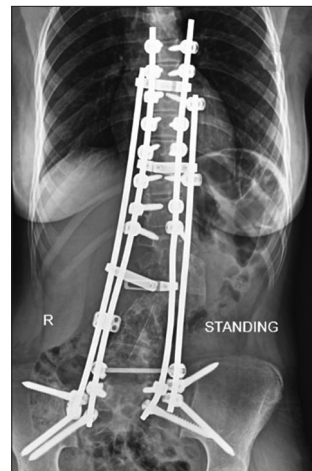
Common clinical features of spinal GSD include localized pain, fractures, and paresthesias, functional neurological impairment/deficits/paralysis, and respiratory distress.<sup>[9]</sup> A high mortality rate is seen in 13.3–20% of patients due to the development of chylothorax and cervical spine involvement.<sup>[7,11]</sup>

### Treatment of GSD

There are three major options for treating GSD: (1) surgical stabilization, (2) radiation therapy, and/or (3) medical management.<sup>[10,11]</sup> We have already discussed surgical options for treating GSD. Second, radiation is often used to maintain remission for GSD.<sup>[11]</sup> Third, at present, there is no Food and Drug Administration approved medical treatment for GSD. These medical options included bisphosphonates and/or sirolimus, while propranolol and alpha 2b interferon also offer efficacy.<sup>[7,11]</sup> To treat chylothorax, some have trialed chemotherapeutic agents and low-molecular-weight heparin.<sup>[1]</sup> Our patient with a long bridging construct with HLA-matched allograft achieved a stable union and disease remission with teriparatide, sirolimus, and bisphosphonate.

### Postoperative follow-up of GSD

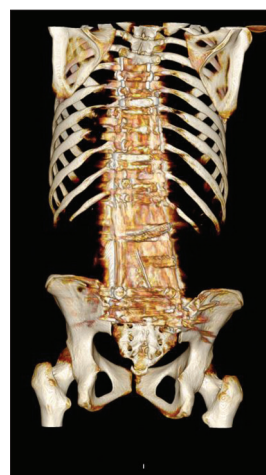
We followed the patient's postoperative course for last 4 years with sequential MR and CT studies. Vascular endothelial



**Figure 10:** Follow-up anteroposterior radiograph at 4 years depicting maintained correction and no implant failure. There is no further progression of disease to other segments.



**Figure 11:** Follow-up lateral radiograph showing maintained alignment.



**Figure 12:** 3-D computed tomographic reconstruction showing good posterior and posterolateral bony fusion along the reconstruction.



growth factor A and C are other proven marker that can confirm remission.<sup>[1,7,11]</sup> Here, we chose to perform a T5-T12 through L5/S1/S2 instrumented fusion, following which the patient remained stable for 4 years.

## CONCLUSION

A 12-year-old female with GSD sustained an excellent 4-year postoperative outcome/remission following a multirod T5-S1/S2 fusion supplemented with HLA compatible allograft and the utilization of several “off-label” medical therapies (i.e., including teriparatide, sirolimus, and bisphosphonate).

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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