

## General

# Pathologic Fracture in Childhood: Benign or Malignant?

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A pathologic fracture is characterized as a break in the bone in an area that has been previously weakened by diseases such as pre-existing pathological bone lesions, due to which even minor falls and trauma may lead to fractures. This paper details a case of an otherwise healthy eight-year-old boy who presented to the ED with an injury to the right lower extremity which was later determined to be a pathological fracture. Imaging revealed the presence of a non-aggressive multicystic bone lesion. This case emphasizes the significance of identification and prompt diagnosis of instances of pathologic fracture, as they may arise as a result of serious underlying conditions such as malignant bone tumors.

## INTRODUCTION

A pathologic fracture is a break in the bone in an area that has been previously weakened by disease, rather than one caused by injury or trauma. They are found in areas with preexisting pathological bone lesions, due to which even a minor fall can produce bone breakage.<sup>1</sup> These fractures can also cause prodromal pain, which serves as a warning sign that there may be an underlying issue in the bone.<sup>2</sup> A pathological bone fracture must be identified through both clinical examination and radiological imaging. X-rays, MRIs, and CT scans assist in identifying the nature of the fracture.<sup>3</sup> Its underlying cause is typically confirmed by a histological analysis that helps the provider recommend an appropriate treatment.<sup>1</sup> Some of the most common areas for occurrence of such fractures are the proximal humerus and proximal femur.<sup>4</sup>

These fractures can be caused by unicameral or aneurysmal bone cysts, osteoporosis, non-ossifying fibromas, fibrous dysplasia, and in many cases, tumorous growths (osteosarcoma).<sup>5</sup> Unicameral bone cysts are a common benign bone lesion in children aged three to fourteen, and tend to be a source of pediatric pathologic fractures.<sup>6</sup> Aneurysmal bone cysts, which are benign bone tumors, are less common but more locally aggressive.<sup>7</sup> They often arise in patients under 20 years old.<sup>8</sup> Pathologic fractures can also occur when a tumor manifests itself within a bone and destroys its strength and shape. If these lesions are not treated immediately and with proper care, it can lead to loss of a limb or death.<sup>9</sup> It has been shown that 17.6% of all pediatric bone tumors are associated with pathologic fractures.<sup>10</sup>

Treatment options can vary, but generally includes simple observation, casting, and surgical interventions such as curettage and bone grafting if there is a risk of refracture.<sup>11</sup> Treatment has to ensure that it addresses both the fracture itself, as well as the underlying cause. Most benign lesions heal well with conservative management.<sup>12</sup> Patho-

logic fracture as a result of nonossifying fibroma has the best outcomes, as nonsurgical treatment is the preferred remedy. Unicameral and aneurysmal bone cysts require surgery for the affected area to heal. Malignant tumors are best treated first with initial nonoperative therapy, then neoadjuvant therapy if applicable, followed by definitive treatments.<sup>13</sup>

This paper details a case of an otherwise healthy eight-year-old boy who presented to the ED with an injury to the right lower extremity which was later determined to be a pathological fracture. Imaging revealed the presence of a non-aggressive multicystic bone lesion.

## CASE PRESENTATION

The patient is an eight year old male with no significant past medical history, who presented to the ED with complaints of right lower extremity pain after injuries sustained during a fall the previous day. He stated he was rollerblading and tripped and fell, injuring his right lower extremity; however, he denies landing on his leg. The patient's mother had used an ace wrap and applied ice to the affected area, and stated the patient would not bear weight on the right lower limb following the injury.

The patient's vital signs were temperature 98°F, respiratory rate 20, blood pressure 126/93 mmHg, pulse 112, and oxygen saturation 97% on room air.

X-rays of the right foot, right ankle, and right tib-fib were ordered. Physical examination revealed swelling and tenderness of the right lower extremity. Patient was unable to bear weight on the limb. Neurological examination including motor and sensory, and reflexes of the affected limb were normal.

X-ray of the right foot and ankle were negative for any acute abnormalities. X-ray of right tibia-fibula demonstrated a nonaggressive multicystic bone lesion within the



**Figure 1. X-ray of right tibia-fibula showing a nonaggressive multicystic bone lesion within the distal tibial metaphysis involving the cortex, with a fracture extending through the bone lesion and into the metadiaphysis**

distal tibial metaphysis involving the cortex, with a fracture extending through the bone lesion and into the metadiaphysis, not extending to the growth plate. There was also evidence of overlying soft tissue swelling. The orthopaedic department was consulted and the patient was diagnosed with an acute pathologic fracture through a nonaggressive bone lesion in the distal tibia, likely a simple or aneurysmal bone cyst.

Patient was recommended outpatient follow up with the orthopaedic department. A long leg splint was applied, and the patient was recommended non weight-bearing crutch use, along with RICE instructions. Patient was also advised to use Ibuprofen and Acetaminophen to reduce swelling and for pain relief.

## DISCUSSION

This case emphasizes the significance of identification and prompt diagnosis of instances of pathologic fracture, as they may arise as a result of serious underlying conditions such as malignant bone tumors. If left untreated, these fractures can cause permanent deformities, extreme pain, and issues with movement.<sup>14</sup>

In this case, because a slight fall led to a complete fracture, it is necessary to screen for all possible scenarios, including a cancerous tumor.<sup>15</sup> The mere impact of the fall was enough to trigger a fracture, which is an indicator of pathologic fracture, which can be caused by diseases which can be fatal. When a pathologic fracture is suspected, the initial assumption should be that it is due to a tumor, since prompt treatment is critical if malignancy is present. Although in this case the lesion was ultimately a benign cyst, it is crucial to definitively rule out cancer by ordering a full workup immediately. Once this case was shown to be a benign cyst, the larger issue at hand was treatment of the fracture itself. The patient was recommended the RICE (rest, ice, compression, elevation) treatment in order to address the fractured bone, which was determined to be the effective treatment method for the fracture in this case.

Because this case involves a pediatric patient, it is significant in the space of medicine. In children, it is particularly vital to eliminate the possibility of a pathologic fracture, as bone tumors are more common in children.<sup>16</sup> Swift recognition and evaluation of the fracture is imperative in order to ensure a prompt diagnosis and rule out potential malignancies. On the contrary, in adults, pathologic fractures are typically caused by osteoporosis. In many cases, a patient's osteoporosis goes undiagnosed until a pathologic fracture appears.<sup>17</sup>

Although tumors are always the first conjecture, cysts are another common source of pathologic fractures. For example, in the case report by Weber et al., a healthy 22-year-old male patient arrived at the emergency department with prolonged lower back pain. After discussing with a radiologist, the possibility of a tumor was eliminated, and it was confirmed to be an aneurysmal bone cyst by doing an open biopsy.<sup>18</sup>

## CONCLUSION

Pathologic fractures are caused by various underlying pathologies, but can be dangerous if not properly treated. This case underscores an important clinical challenge, which is differentiating between benign and malignant causes for pathologic fractures. It is extremely prevalent in pediatric populations, and raising awareness of the benign etiologies, as well as the cancerous ones, is extremely important. This also serves as a reminder to not overlook the possibility of malignant lesions.

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