Introduction

Recurrent and benign extremity pains of children for which healthcare provider has no explanation are often called "growing pains". Historically, sometimes they included osteochondritis dissecans and rheumatic fever which are recently distinguished from growing pains. Recently some studies showed genetic mutations were related to episodic limb pains some of which had been diagnosed as growing pains. The concept of growing pains might be rebuilt based on current studies.

Diagnosis

There are no specific definitions of growing pains. "Seichotsu", including osteochondritis dissecans, Osgood–Shlatter disease and Sever’s disease, is used in a more broad sense of limb pains than growing pains. An inclusion and exclusion criteria of growing pains is presented on the Figure 1.

Differential diagnoses are classified in five groups: Injury related, Infection, Developmental and Congenital, Tumor, and Others (Table 1). If there are any systemic or focal inflammation signs such as fever, swelling or erythema, it is difficult misdiagnose it as growing pains. However, pains caused by primary bone tumors typically begin as intermittent pain without the above findings, with characteristics similar to growing pains. Persistency, increasing intensity of pains, localized tenderness and mass are important clues of a regional lesion such as bone tumors.

Because persistency and increasing intensity of pains must also be ruled out for the diagnosis of growing pains, follow-up is necessary for a definite diagnosis. Follow-up period is not defined from past literature, however, a decrease in frequency of pain should be confirmed to eliminate misdiagnoses. Growing pains are diagnosed clinically

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Keywords: growing pains, musculoskeletal pains, pain threshold, limb pains in childhood

Corresponding: Masatoshi Patrick TOMONARI

Department of Anesthesiology, Yosemite Clinic
B1–1F, 1388 Fang Dian Rd, Pudong District, Shanghai 201204, People’s Republic of China
E-mail: jamada123456789@yahoo.co.jp

Figure 1  Diagnostic flow chart of growing pains
(cited and revised from Refs. 1 and 6)
diagnosed by precise history and physical examination without any imaging study nor laboratory test.

## III Etiology

Recently, growing pains are considered not to be attributed to growth. Growing pains do not occur at the sites of epiphyses and do not match the rapid growth periods. The causes are not known, however, some etiologies have been proposed such as psychological origin, lower pain threshold, fatigue and bone stress. A study showed children with growing pains were found to have lower pain threshold compared with controls. In past literature, forty percent of children with recurrent headache had growing pains, and their parents had lower threshold of pain and had depressive symptoms. Okuda, et al. showed Nav1.9 mutations were related to familial episodic pain syndrome in childhood. Nav1.9, encoded by the gene SCN11A, is a kind of voltage-gated sodium channel which expressed in sensory neurons. These detail genetic analysis will clarify the cause of paroxysmal limb pains in childhood which had been unknown etiology and diagnosed as growing pains.

### Table 1 Differential diagnosis of growing pains

<table>
<thead>
<tr>
<th>Group</th>
<th>Differential diagnosis</th>
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<tbody>
<tr>
<td>Injury related</td>
<td>Inflammation of soft-tissue or bone, fracture, stress fracture, overuse syndrome, battered child syndrome, Osgood–Schlatter disease, chondromalacia patella</td>
</tr>
<tr>
<td>Infections</td>
<td>Osteomyelitis, viral myositis septic arthritis, cellulitis, soft tissue abscess, syphilis, trichinosis, poststreptococcal polymyalgia</td>
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<tr>
<td>Tumors</td>
<td>Osteoid osteoma, unicameral cyst, fibrous dysplasia, aneurismal bone cyst, giant cell tumor, histiocytosis X, osteochondroma, osteosarcoma, Ewing’s sarcoma, leukemia, lymphoma, spinal cord tumor, neuroblastoma, metastatic tumor</td>
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<tr>
<td>Developmental and</td>
<td>Slipped capital femoral epiphysis, hypermobility syndrome, limb deformities such as genu valgum, flat foot, discoid lateral meniscus, patellar subluxation, Gaucher disease</td>
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<tr>
<td>Congenital</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>Legg–Calve–Perthes disease, musculoskeletal pain syndrome, restless leg syndrome, juvenile idiopathic arthritis, osteochondritis dissecans, sickle cell crisis, amplified spinal disorders, osteonecrosis, school phobia, patellofemoral pain syndrome, somatization, hypervitaminosis A, scurvy</td>
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The suggested treatments are supportive therapies, including physiological, psychological, and pharmacological approach. Muscle stretching exercise program for quadriceps, hamstrings, and calf twice daily for ten minutes each time, showed rapid resolution of growing pains in a randomized controlled trial. This method had the psychological effect that the patient could get the attention of the parents as well. The effectiveness of analgesics such as acetaminophen or ibuprofen for growing pains is not proven. Other interventions such as local massage therapy and heat tend to be given empirically, although the effectiveness has not been proven in clinical trials. Growing pains are also considered to be affected by emotion; therefore, behavioral cognitive therapy may decrease painful episodes.

## References