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Clavicular remodelling in lipoblastomatosis: thickening, cortical irregularity and bowing without bone destruction

Lixiang Yuan

649303058@qq.com

Tianjin Children's Hospital

Lu Dong

Tianjin Children's Hospital

Meirong Gao

Tianjin Children's Hospital

Case Report

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Abstract

We report a 25-day-old boy with diffuse lipoblastomatosis infiltrating the left shoulder girdle and chest wall, in whom the left clavicle was thickened relative to the contralateral side, bowed, and showed an irregular cortex, with no definite bone destruction. Skeletal involvement is rare in lipoblastoma, has not previously been described at the clavicle, and in the few reports that exist consists of pressure remodeling of the rib or long bone. The unique feature is a diffuse fatty mass producing thickening, cortical irregularity and bowing of a subcutaneous bone without destroying it. This shows that extensive infiltration with such bone remodelling can still reflect benign pressure rather than malignant invasion.

Introduction

Lipoblastoma is a benign tumor of embryonic white fat occurring almost exclusively in children under 3 years of age; its diffuse, infiltrative, non-encapsulated form is lipoblastomatosis [1]. Skeletal involvement is uncommon and, in the few published reports, consists of pressure remodeling — rib expansion [2], rib splaying [3], rib thinning and deformity [4], or long-bone bowing with non-aggressive periosteal reaction [5] — almost always in the localized variant; skeletal involvement is not addressed in large reviews [1]. In reported supraclavicular and infraclavicular lipoblastomas, the tumor abutted the clavicle with lysis explicitly absent, but clavicular shape was not described [6]. We describe a lipoblastomatosis that thickened, bowed, and irregularly remodelled the clavicle without destroying it, a change we have not found in the literature.

Case report

A 25-day-old boy was referred with a mass over the left scapular region, noted at birth and enlarging gradually. Examination showed an irregular, firm, non-tender mass with no erythematous swelling of the left scapular region, left axilla and left anterior chest wall. Findings were otherwise unremarkable; no relevant laboratory abnormality was present.

Contrast-enhanced CT (Fig. 1a-d) showed extensive, ill-defined soft-tissue masses containing areas of fat attenuation that merged with the surrounding muscle without a discernible interface, infiltrating the left shoulder, left axilla, left anterolateral upper arm, and left lateral chest wall. The masses extended cranially to the level of the left clavicle and caudally to the fourth rib, insinuating between the muscles of the shoulder girdle and chest wall without a capsule or pseudocapsule. Multiple tortuous enhancing vessels traversed the lesions.

On three-dimensional volume-rendered reconstruction and maximum intensity projection (MIP) images (Fig. 1. **e**-**f**), the left clavicle was thicker than the contralateral clavicle, bowed, and its cortical outline was irregular, with a wavy, slightly undulating outer contour along the segment enveloped by the tumor. No definite cortical break, osteolytic focus, sequestrum, or adjacent soft-tissue ossification was identified. The irregularity affected the shaft; the acromioclavicular and sternoclavicular joints were preserved, and the clavicle was neither displaced nor shortened. No calcification was present within the tumor.

Incisional biopsy was performed, and abnormal muscle tissue was removed. Microscopic examination showed degenerated skeletal muscle with interstitial adipocytes, and lipoblasts; No immunohistochemical examination was performed. The diagnosis of lipoblastomatosis was rendered on conventional histopathological grounds.

Discussion

The radiological interest of this case lies in the pattern of bone response. In the published reports of skeletal change in lipoblastoma (Table 1), the bone was expanded, splayed, thinned, or bowed — never focally destroyed — and the clavicle was not involved. In the two reports in which a lipoblastoma lay against the clavicle, the authors specifically recorded the absence of lysis but did not describe clavicular shape [6]. Our case therefore adds the clavicle as a site of such remodeling. It shows that the response may include thickening and cortical irregularity in addition to bowing — a combination not previously illustrated, and, to our knowledge, the first in the diffuse variant.

Table 1
Reported bone changes in pediatric lipoblastoma/lipoblastomatosis

Reference	Age	Location	Bone change
Cowling 1995 [2]	6 month	Chest wall	Rib expansion
Parisi 2019 [3]	3 y	Chest wall	Rib splaying
Bano 2026 [4]	11 y	Paraspinal	Rib thinning, deformity
Kamal 2014. [5]	≤ 3 y	Lower leg	Tibial/fibular bowing, periosteal reaction
Shah 2025 [6]	2 y	Infraclavicular	None
Gao 2025 [7]	2 y	Intrathoracic	Destruction
Present case	25 d	Shoulder girdle/chest wall	Clavicular bowing, no destruction

The mechanism is low-pressure remodeling. The tumor enveloped a long segment of the clavicle and insinuated itself between the shoulder girdle and chest-wall muscles, so pressure was distributed over a broad surface. Under such loading, bone adapts by slow endosteal resorption and periosteal apposition, which in our patient produced thickening with bowing and an undulating cortical outline rather than a smooth, thin cortex — the same process proposed for tibiofibular bowing in lower-leg lesions [5], but with net periosteal apposition dominating. Cortical irregularity of this kind reflects appositional remodelling along the periosteal surface and should not be mistaken for cortical destruction. The absence of a definite cortical break, osteolytic focus, sequestrum, and adjacent soft-tissue ossification argues against infiltration, despite the irregular cortex; in prior research, an intrathoracic lipoblastomatosis that contacted the second rib over a small area produced focal erosion with a sclerotic margin [7], indicating

that contact geometry, not histology, determines which pattern appears. Such pressure remodelling of bone beneath slowly growing benign soft-tissue masses is a well-recognised phenomenon.

The practical implication is that a large, fat-containing, multi-compartment mass with skeletal deformity in an infant need not be malignant. Age under 3 years, predominantly fat attenuation, thickening rather than destruction of the bone, preserved joints, and absence of aggressive periosteal reaction all favor a benign adipocytic lesion; rhabdomyosarcoma, Ewing sarcoma and myxoid liposarcoma would be expected to show cortical breakthrough, aggressive periosteal reaction, or little or no mature fat. The main imaging differential of a fat-containing infiltrative mass in an infant includes lipoma, which shows homogeneous mature fat without enhancing septa, lipoblasts, or ill-defined margins; myxoid liposarcoma, which is rare below 5 years of age and typically shows little mature fat, with a myxoid component and enhancing septa on MRI; atypical lipomatous tumour/well-differentiated liposarcoma, essentially not seen in this age group and characterised by thick septa and MDM2 amplification; and infantile fibromatosis or fibrous hamartoma of infancy, which contain fat but are predominantly non-fatty on CT. In the present patient, the young age, the presence of fat within a mass that merged with the surrounding muscle, the plexiform enhancing vessels, and the pattern of bone remodelling favoured lipoblastomatosis, which histology confirmed.

This matters because lipoblastomatosis requires wide excision with preservation of neurovascular structures rather than oncological resection, and because recurrence is more common in lipoblastomatosis after incomplete resection. Whether the thickened, irregular clavicle remodels towards a normal contour after tumor removal is unknown; we did not obtain follow-up imaging in this case.

Limitations are the single case, the retrospective design, incisional rather than complete resection, the absence of immunohistochemical or molecular confirmation, and the lack of follow-up imaging.

Declarations

Author Contribution

L.Y. and L.D. wrote the main manuscript text. L. Y. and M. G. designed the case report. L.D. prepared figures and provided critical revisions. All authors reviewed and revised the manuscript.

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Figures

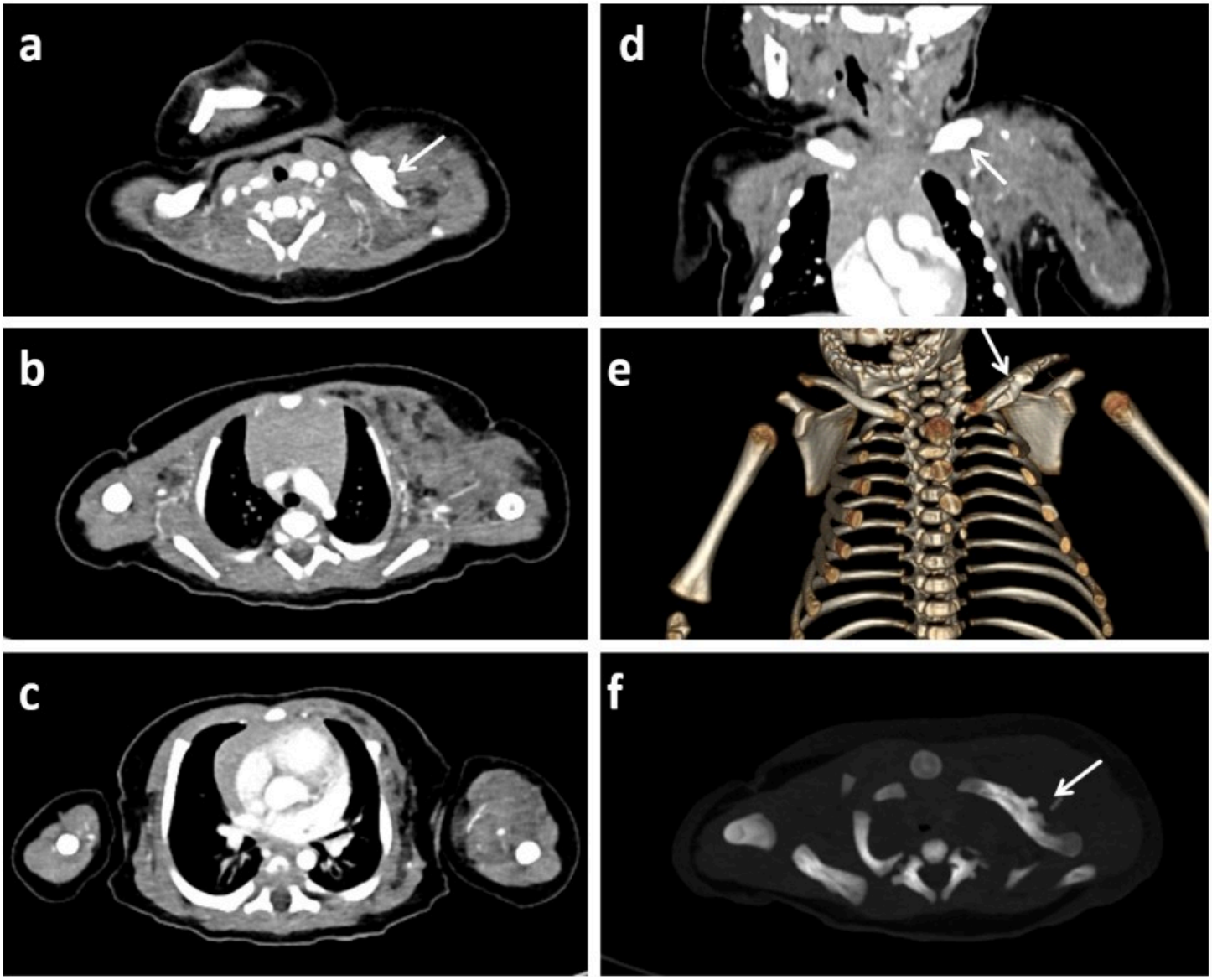


Figure 1

25-day-old boy with lipoblastomatosis. Axial contrast-enhanced CT (soft-tissue window) shows ill-defined soft-tissue masses containing fat, infiltrating the left shoulder girdle, axilla, upper arm and chest wall up to the level of the clavicle, with tortuous enhancing vessels. **e** Three-dimensional volume-rendered reconstruction and **f** maximum intensity projection (MIP) images showed the left clavicle to be thicker than the right, bowed, with an irregular, undulating cortical outline. No cortical break or osteolytic focus is seen. Arrows indicates the left clavicle.