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CASE REPORT

An Adolescent with Progressive Enlargement of Digits

Case report and proposed diagnostic criteria for macrodystrophia lipomatosa

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بنت مراهقة مصابة بتضخم مترق في الأصابع

تقرير حالة ومعايير تشخيصية مقترحة لفرط النمو اللامتناسب الورمي الشحمي

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ABSTRACT: Macrodystrophia lipomatosa (ML) is a rare congenital non-hereditary condition caused by an increase in all mesenchymal elements. We report a 14-year-old girl who presented to the Medical Outpatient Department, Kunhitharuvai Memorial Charitable Trust Medical College, Kozhikode, India, in 2017 with progressive enlargement of digits. An X-ray and T1-weighted magnetic resonance imaging scan showed enlargement of the phalanges of the middle and index finger of the left hand with an overgrowth of soft tissues. The patient was subsequently diagnosed with ML. As the condition is benign and usually asymptomatic, no medical treatment was deemed necessary. This report describes a case of ML and proposes a set of diagnostic criteria to aid clinicians in the differential diagnosis of the condition.

Keywords: Congenital Disorders; Gigantism; Macrodactyly of the Hand; Differential Diagnosis; Case Report; India.

الملخص: يعد فرط النمو اللامتناسب الورمي الشحمي واحداً من الأمراض الخلقية غير الوراثية النادرة. المرض نتيجة لزيادة في كل عناصر اللحمة المتوسطة. ونقدم هنا تقريرا بحالة فتاة سنها عاما حضرت لقسم الطب الخارجي لمستشفى كونهتهاريوفاي الوقفي الخيري لكلية الطب التذكارية في كوزيكود بالهند في عام 2017م، وهي مصابة بتضخم متطور في الأصابع. وأظهرت نتيجة فحص الأشعة السينية وصورة الرنين المغنطيسي (T1-weighted) تضخما في سلاميات الأصبع الأوسط والسبابة، مع نمو مفرط في الأنسجة الرخوة. وبناء على ذلك تم تشخيص حالة تلك الفتاة على أنها فَرْطُ النُّمُوِّ اللاَّمُتَنَاسِبُ الوَرَمِيُّ الشَّحْمِيُّ. وبما أن الحالة حميدة وغير مصحوبة بأعراض، رأينا أنه ليس هنالك داع لأي علاج طبي للحالة. نقدم في هذا التقرير حالة لفَرْطُ النُّمُوِّ اللاَّمُتَنَاسِبُ الوَرَمِيُّ الشَّحْمِيُّ و ونقترح أيضا عددا من المعايير التشخيصية لمساعدة الأطباء السريريين في التشخيص التفريقي لها.

الكلمات المفتاحية: الأمراض الخلقية؛ عملقة؛ ضخامة الأصابع/اليد؛ التشخيص التفريقي؛ تقرير حالة؛ الهند.

First described in 1926, macrodystrophia lipomatosa (ML) is a rare congenital non-hereditary condition characterised by the progressive enlargement of one or more digits of the extremities, resulting in unilateral localised gigantism.[1,2] The condition is usually present at birth and stops at puberty.[3–5] A variety of terms are often used to describe ML cases, such as macromelia, digital or limited gigantism, megalo- or macrodactyly, partial acromegaly, dactylomegaly, macroceir and club finger.[3,4,6]

The hallmark of ML is an increase in all mesenchymal elements of the affected digits, particularly the fibro-fatty tissue.[4] In addition to the subcutaneous tissue, this condition can also affect the nerve sheath, muscle, *periosteum* and bone marrow.[7] Usually, ML affects the median nerve distribution area of the upper limbs and the medial plantar nerve distribution area of the lower limbs.[3–5] Most commonly, it affects the middle and index fingers; in the lower limbs, it usually causes enlargement of the first-to-third toes.[2–5]

Like Proteus syndrome, ML is a form of true macrodactyly where there is progressive hypertrophy of all mesenchymal elements, whereas an increase in a single mesenchymal element results in pseudo-macrodactyly, such as in neurofibromatosis type 1, fibrolipomatous hamartoma (FLH) of the median or ulnar nerves and certain vascular malformations and acquired conditions (i.e. chronic hyperaemia).[3–5] Although the exact pathogenesis of ML is unknown, proposed mechanisms include lipomatous degeneration, disturbed fetal circulation, an imbalance in growth-inhibiting factors, the trophic influence of a tumefied nerve and errors in segmentation.[6,8,9] This report describes a case of ML and proposes a set of diagnostic criteria to aid clinicians in the differential diagnosis of this condition.

Case Report

A 14-year-old girl presented to the Medical Outpatient Department, Kunhitharuvai Memorial Charitable Trust Medical College, Kozhikode, India, in 2017 with progressive enlargement of her left middle and index fingers over the previous three years [Figure 1]. No systemic symptoms were reported. At birth, her parents had

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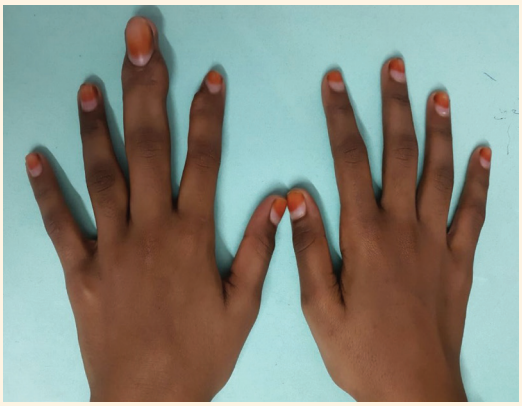

Figure 1: Photograph of the hands of a 14-year-old girl showing enlargement of the left middle and index fingers.

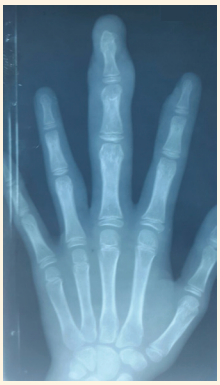

Figure 2: X-ray of the left hand of a 14-year-old girl showing enlargement of the phalanges of the middle and index fingers, with bony and soft tissue overgrowth.

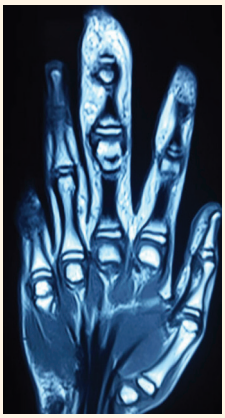

Figure 3: T1-weighted magnetic resonance imaging scan of the left hand of a 14-year-old girl showing enlargement of the phalanges of the middle and index fingers, with excess fibro-fatty tissue around the affected digits.

noticed a slight enlargement of her left middle finger. However, there was no family history of similar conditions or a personal history of any significant illnesses. An examination of her left hand showed diffuse overgrowth of the middle and index fingers. The affected fingers had the same consistency as her other fingers, with no evidence of any tenderness or cutaneous changes. The rest of the systemic examination was normal and the results of routine blood examinations were within normal limits.

An X-ray of the left hand showed enlargement of the phalanges of the middle and index fingers with overgrowth of soft tissues [Figure 2]. A T1-weighted magnetic resonance imaging (MRI) scan showed enlarged phalanges with increased thickness of the subcutaneous fat planes [Figure 3]. Sagittal short-tau inversion recovery images confirmed the increased subcutaneous fat by signal suppression. These findings were consistent with a diagnosis of ML. The benign nature of the condition was explained to the patient and her parents. No cosmetic treatment was requested.

Discussion

The differential diagnosis of ML includes FLH, neurofibromatosis (e.g. plexiform neurofibroma), haemangiomatosis, lymphangiomatosis, Ollier disease and Proteus, Beckwith-Wiedemann, Maffucci and Klippel-Trénaunay-Weber syndromes.[4,5] Overall, FLH can be differentiated from ML as the former usually produces isolated nerve lesions associated with intramuscular fat deposition, whereas fat deposition in the latter occurs in the nerve sheath as well as the subcutaneous and muscle compartments.[4,5] In ML, there is also periosteal involvement resulting in bony changes like hypertrophy, exostosis and ankylosis in the interphalangeal joint and fatty invasion of the medullary cavity.[4,5] In contrast, macrodactyly secondary to hyperaemia due to haemangiomatous or lymphangiomatous overgrowth produces only soft tissue hypertrophy. In addition, the absence of cutaneous and vascular abnormalities help to eliminate the possibility of Klippel-Trénaunay-Weber syndrome, while the absence of enchondromas precludes Ollier disease.[4,5]

In plexiform neurofibromatosis, overgrowth is often bilateral and either continues after puberty or stops prior to this stage due to the premature fusion of the growth plate as a result of haemangiomatous elements; in comparison, ML cases are rarely bilateral and growth ceases at puberty.[4] Moreover, ML predominantly affects the distal phalanges. In neurofibromatosis, the enlarged osseous structures have a wavy cortex and an elongated sinuous appearance contrasting with that of ML cases; additionally, soft-tissue lucencies due to the neurocutaneous manifestations of neurofibromatosis are absent in ML.[10]

The authors propose a set of diagnostic criteria to help clinicians in the differential diagnosis of ML cases [Table 1]. The presence of essential clinical criteria along

Table 1: Proposed diagnostic criteria for cases of macrodystrophia lipomatosa

Type of criteria	Diagnostic necessity/certainty	Description
Clinical	Essential	• Unilateral localised gigantism, most commonly involving the median nerve area (first three fingers) in the upper limbs or the medial planter nerve area (first three toes) in the lower limbs • Lack of family history of similar conditions • No cutaneous changes • No systemic symptoms • Cessation of digit enlargement at puberty
	Optional	• Presence of digit enlargement at birth • Presence of related issues (i.e. syndactyly, polydactyly, clinodactyly, brachydactyly, etc.)
Histopathological	Confirmatory	• Evidence of an increase in all mesenchymal elements • Evidence of increased adipose tissue scattered in a fine mesh-like fibrous tissue • Evidence of both soft tissue and bony elements, with predominant fibro-fatty tissue hypertrophy
Radiological	Possible	• X-ray evidence of overgrowth of both soft tissue and bony elements
	Probable	• CT evidence of bony overgrowth, excessive fatty proliferation and separation of the muscle fibres
	Confirmatory	• MRI evidence of fatty infiltration of the muscles, cortical thickening and bony overgrowth of the affected area • MRI evidence of increased thickness of the subcutaneous fat planes with linear hypointense fibrous bands in the adipose tissue without encapsulation • MRI evidence of fat within the nerve sheath

CT = computed tomography; MRI = magnetic resonance imaging.

with either histopathological or radiological criteria is required for the diagnosis of ML. The histopathological analysis of ML cases generally reveals an increase in adipose tissue scattered in fine mesh-like fibrous tissue.[4,11] Plain X-rays show an overgrowth of soft tissue and bony elements, along with radiolucent areas due to the presence of adipose tissue. Soft tissue overgrowth is usually seen more in the volar aspect, resulting in dorsal deviation, while bony overgrowth increases the width and length of the affected phalanges with distal splaying, resulting in a mushroom-like appearance.[7] Secondary osteoarthritis changes—like joint space narrowing, subchondral cysts and osteophytes—may also be seen in adult patients.[12] Ultrasonography typically shows diffuse echogenicity consistent with increased fat accumulation in the subcutaneous and muscle tissues; this results in a loss of soft tissue detail and a decrease in grayscale reflectivity between soft tissue structures.[13] Computed tomography reveals bony overgrowth, excessive fat proliferation and, with muscle involvement, separation of the muscle fibres due to fatty infiltration.[14]

Typically, MRI scans show fatty infiltration of the muscles, cortical thickening and bony overgrowth.[14] They may also show abundant fat tissue in the affected area, with the same low signal intensity as that of normal subcutaneous fat on T1- and T2-weighted MRI sequences. Linear hypointense bands in redundant adipose tissue represent fibrous strands.[5] The absence of encapsulation helps to differentiate ML from a lipoma, while the appearance of fat within a nerve sheath excludes the possibility of neurofibromatosis.[5] In addition, neurofibromas demonstrate marked hyperintensity close to the nerves in T2-weighted images; in FLH, MRI scans show enlargement of the fusiform nerve due to thickened nerve fibre embedded in fatty tissue.[15]

Patients with ML are usually asymptomatic, although some can develop mechanical problems resulting from secondary degenerative changes in the joint and the compression of the neurovascular structure (i.e. carpel or tarsal tunnel syndromes).[4] Patients may also have functional issues, such as difficulty in grasping objects or, rarely, abnormal gait due to overgrowth of the affected region.[4,6,16] Other problems seen in ML cases include lipomatous growths in the intestines as well as other tissues, *naevus* pigmentation, calvarial abnormalities, pulmonary cysts, syndactyly, polydactyly, clinodactyly, brachydactyly and symphalangism.[4]

As ML is usually benign, medical attention is generally only necessary for cosmetic or aesthetic reasons.[4] For those requiring surgical treatment, multiple debulking procedures, epiphysiodesis and osteotomies can be performed; however, such procedures can be challenging as there is a 33–60% risk of recurrence and a 30–50% risk of nerve injury due to overzealous debulking.[2,17] For patients with severe ML-related functional and aesthetic concerns, amputation is an option.[2] In children, the rate of growth of the affected digit can be slowed by destroying, stapling or wiring the epiphyseal plate.[18]

Conclusion

In summary, ML is a rare congenital non-hereditary condition resulting in localised gigantism. The condition is usually asymptomatic and treatment is for cosmetic reasons. This report describes a case of ML and proposes a set of diagnostic criteria to aid clinicians in accurately differentiating ML from other conditions with similar presentations.

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