Open quiz solution

Case report 440

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Radiological studies

![Images of radiographs showing marked soft tissue fullness and bony hypertrophy with macrodactyly.]

Clinical information

This 2 1/2-year-old girl presented with gross hypertrophy of the soft tissue of the right lower extremity (Fig. 1A and B). At birth the infant was found to have a port-wine nevus of the right thigh and the region of the calf, as well as slight enlargement of the right lower extremity. As the infant grew, the nevus also appeared to grow, extending into the perineal region and to the back of the child. The hypertrophy of the right leg became more exaggerated and the child was unable to learn to walk. By the age of 2 years the child had developed problems with the right lower extremity consisting of breakdown of soft tissue bleeding and cellulitis at the site of the skin lesions. A difference of 10 cm

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in the width of each calf existed. Venous varicosities of the right leg required stripping of the vein, when support hose failed to reduce the swelling. A CT scan performed to evaluate the extent of the disease prior to the surgical procedure that was planned (Fig. 2A and B) showed the extent of the vascular tumor mass extending from the ankle to the perineal region. A biopsy was performed at the age of 15 months and a surgical excision was carried out at the age of 2 1/2 years.
Diagnosis: Klippel – Trenaunay syndrome of right lower extremity

The biopsy and the surgical specimen from the right lower extremity demonstrated a soft tissue tumor that was consistent with a hemangioma lymphangioma (Fig. 3). The triad of cutaneous hemangiomas, venous varicosities, and hypertrophy of the soft tissues and bone constitutes the Klippel – Trenaunay syndrome. This entity also is associated with lymphangiomas of the soft tissue.

In the surgical operation at 2 1/2 years a debulking procedure was performed. At the age of 3 years amputation of the toes of the right foot was considered necessary. At the same time excision of bleeding venous lakes also was accomplished, in addition to further debulking followed by a skin grafting procedure. At the age of 3 1/2 years excision of venous lakes again was accomplished.

Discussion

The original description by the French physicians Klippel and Trenaunay in 1900 cited a triad of unilateral cutaneous capillary hemangiomas, varicose veins, and overgrowth locally of soft tissue and bone [5]. In 1907 Parkes-Weber described a similar triad with the added occurrence of arteriovenous fistulae [7]. For a while, the entity became known as the Klippel-Trenaunay-Parkes-Weber syndrome. However, in recent decades, the separation between Klippel-Trenaunay syndrome (KTS) and Parkes-Weber syndrome (PWS) has been accepted, because of the poor prognosis for salvage of the limb in the latter entity [6]. KTS is a more benign disorder with relief of symptoms being the basis of the type of treatment.

The disease usually occurs sporadically with only rare reports of cases within families [6, 8]. No sexual predilection exists and often one or more components of the triad is present at birth. The earliest manifestation is usually the classical, flat, port-wine hemangioma (nevus) [2, 3, 6]. This pinkish-purple lesion of the skin often occurs in a dermatomal distribution on the affected limb, although it may occur on the trunk. The lesion usually does not cross the midline and may fade in the second to third decades of life [11]. Rarely, the nevus may occur contralateral to the hypertrophied limb and may be bilateral in a small percentage of cases.

As the infant assumes the upright position with walking, the varicose veins and hypertrophy of the affected limb become more prominent, usually ipsilateral to the hemangioma. The varices are usually noted on the lateral aspect of the involved limb, sweeping medially to the groin [3, 9, 11]. The lower limb is affected between 10-15 times more commonly than the upper extremity; however, involvement of both upper and lower extremities and bilateral disease may be observed in less than 5%.

Pathological studies

Fig. 3A, B. A Sections from the area of skin and soft tissue obtained from the right lower extremity demonstrate numerous vascular channels filled with red blood cells. The number and size of these erythrocyte-filled spaces suggest hemangiomas on the pathological sections (HE, ×70). B In another section from the same specimen, dilated vascular channels without smooth muscle and without red blood cells are demonstrated. This section is more characteristic of the presence of a lymphangioma (HE, ×10)
of cases [3, 6, 9]. Some reports have noted an increased incidence of involvement of the upper extremity in females [11]. With the "growth spurt" in a growing child, the hypertrophy of the limb accelerates and becomes more of a problem. Most children are brought for medical attention in the teen years when discrepancy in leg-length may measure as much as 10 cm.

Numerous theories have been proposed to explain the manifestations of KTS. Deep venous occlusion or atresia causing varicose veins and hypertrophy of the limb has been documented in some cases [6, 9]. These two features of KTS can be created by ligating the major veins of a limb in animals as well as in humans [9]. Another theory proposes that a mesodermal abnormality during fetal development may lead to maintenance of the primordial microscopic arteriovenous connections in the limb buds. Others believe that a loss of sympathetic nervous system regulation on end-capillary blood flow during the third to sixth months of gestation causes KTS [11]. Still other authorities believe that the disorder is part of the neural crest phakomatoses with somatic abnormalities [11].

Radiographs of the extremities of patients with KTS demonstrate overgrowth of soft tissue and bones in the entire affected limb. Most often, increase in size of metatarsals, metacarpals, and phalanges is associated with cortical thickening. Other anomalies of the limb also may be present (e.g., syndactyly, clinodactyly, congenital dislocation of the hip, polydactyly) [1, 3, 8].

Deep venous atresia, absent valves in deep veins, and deep venous obstruction by fibrous cords or aberrant arteries have been reported in cases of KTS, with the most common feature being that of a valveless, lateral, venous channel in the leg [1, 2, 6, 8, 9]. Servelle found compression of the popliteal vein and/or femoral vein in most of his patients, which led to his recommending surgical treatment consisting of the excision of fibrous obstructing bands or revascularization of the limb [9]. These findings have not been corroborated by others. Angiograms also may demonstrate hemangiomas of the colon and bladder in 3–10% of patients with KTS [8, 10, 11] which often lead to symptoms of hematuria or rectal bleeding. Plain films of the abdomen may show the phleboliths characteristic of a hemangiomia. Spinal hemangiomas and arterial abnormalities (AVMs) also have been reported with KTS. CT has been shown to be helpful in detecting involvement of the bowel by hemangiomia, demonstrating punctate calcifications in the thickened walls of the affected bowel [4]. Punctate calcifications in the liver and spleen, suggestive of hemangiomas also have been demonstrated by computed tomography (CT) and ultrasound in patients with KTS [4]. Lymphangiomias of the limb, as in this case, may be demonstrated as well.

Treatment of the disorder in its mild forms consists of the use of elastic support hose, shoe lifts, and occasional diuretics [2, 3]. The options in surgical management include: (1) releasing the obstructing fibrous bands; (2) re-vascularizing the venous system; (3) ligation of the contralateral deep venous system to effect equal growth of limbs; (4) excision of soft tissues; (5) tibial osteotomy; (6) epiphysodesis; (7) amputation; and (8) stripping of veins [2, 3, 6, 8, 9, 11]. Medical treatment for complications of cellulitis, deep venous thrombosis and superficial thrombophlebitis may be required [3].

The differential diagnosis of focal gigantism of a limb should include neurofibromatosis, macrodystrophia lipomatosata, Beckwith-Weidemann syndrome, and the Maffucci syndrome [8]. Cafe au lait spots, axillary freckling, and cutaneous neurofibromas should be apparent in Von Recklinghausen disease (neurofibromatosis) in which the degree of hypertrophy is usually less than with KTS. The growth plate may be fused early in neurofibromatosis, so that overgrowth of soft tissues with smaller bones may be present [8]. Wavy periosteal reaction of tubular bones may be observed in neurofibromatosis and bilaterality also is common in this last-named disorder.

In macrodystrophia lipomatosata the soft tissues often but not necessarily show the hyperlucency of fat. The distal phalanges are most common and severely affected, and the muscle planes are indistinguishable. Overgrowth of the affected phalanges ceases with puberty and is usually limited to the digits.

The Beckwith-Weidemann syndrome is associated with aniridia, macroglossia, cryptorchidism, and Wilm tumor. Broad metaphyses, thickened cortex of long bones, advanced bone age and, periosteal new bone formation are common. An entire side of the body may be enlarged. The Maffucci syndrome may be confused with KTS. The presence of cavernous hemangiomas with hypertrophy of soft tissues and phleboliths may simulate the involved limb of KTS. Multiple enchondromas noted on skeletal survey in patients with the Maffucci syndrome easily distinguish the two entities. The triad of cutaneous hemangiomas, varicose veins, and hypertrophy of the affected limb should lead to the correct diagnosis of Klippel-Trenaunay syndrome.
In summary, the case has been presented of a 2 1/2-year-old girl who was observed to have hypertrophy of the right lower extremity with a port-wine nevus. As the child grew, the hypertrophy became more exaggerated and the port-wine nevus also grew. Considerable discrepancy in the size of the normal extremity, as compared with the affected extremity, was noted (as much as a 10 cm difference in the width of each calf). A surgical procedure and pathological studies demonstrated the presence of cutaneous hemangioma-lymphangioma, venous varicosities, hypertrophy of soft tissue and bone, all constituting the Klippel-Trenaunay syndrome (KTS). The clinical, radiological and pathological details of the KTS and its comparison with the Parkes-Weber syndrome were discussed. The major findings on the KTS syndrome were described in depth and the literature on the subject surveyed. The radiological features were emphasized. The differential diagnosis, including principally neurofibromatosis, macrodystrophia lipomatosa, Beckwith-Weidemann syndrome and the Maffucci syndrome, was considered; and the features in these four entities compared with KTS. The methods of treatment were described briefly.

References

Case report 440: Quiz

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