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Abstract This article focuses on small-parts US in children. The differential diagnosis of cystic neck masses primarily includes lymphangiomas, thymus, fibroblastomas, and branchial cleft cysts. Solid masses may be represented by lymphadenopathies, cervical extensions of mediastinal thymus, fibromatosis colli, rhabdomyosarcomas and neuroblastomas. Salivary gland lesions are uncommon in children. Thyroid is best evaluated by US and nuclear scintigraphy. If US shows abnormal thyroid gland, the isotopic scan may be a good complementary method to confirm the diagnosis. Normal parathyroid glands are not visualised routinely by US because of their small size. Parathyroid adenomas are unusual in paediatrics. Ultrasound can be successfully used in the differential diagnosis of the painful scrotum especially with colour flow Doppler. The hallmark of ischaemia is a completely avascular testis. In the paediatric age group, the most common application of US to the musculoskeletal system is the evaluation of the infant hip in the first 6 months of life; however, the refinement of new transducers has further improved the ability of US equipment to evaluate a variety of other musculoskeletal disorders in children, involving tendons, muscles, nerves as well as soft tissue masses. Ultrasound can be a useful screening tool in newborns suspected of having closed spinal dysraphism.

Keywords Ultrasound, Doppler, Child, Infant, Soft tissues

Introduction

The focus of this article is extra-abdominal and extra-cerebral paediatric sonography, i.e. small-parts US in children. It is known that high-resolution US, based on high-frequency broadband transducers ranging from 5 to 15 MHz and more, has greatly improved the ability of the radiologist to evaluate the superficial parts. On this subject we discuss face and neck, scrotum, musculoskeletal system and spine.

Face and neck

Soft or fluctuant masses in the face and neck consist primarily of lymphangiomas, haemangiomas, venous malformations, arteriovenous malformations, internal jugular phlebitis et lipomas [1].

Lymphangioma is believed to develop from sequestered lymphatic sacs that fail to communicate with peripheral draining channels [1]. Approximately 75% of all lymphangiomas occur in the neck, generally located in the posterior compartment (Fig. 1), and 3–10% may extend into the mediastinum [2]. The presence of loose fatty tissue in the neck allows the formation of cystic hygroma, which consists of hugely dilated cystic lymphatic spaces, but a combination of the four histological types of lymphangioma (cystic hygroma, cavernous and capillary lymphangioma, vascular malformations) can often be seen in a single lesion [2, 3]. Actually, at US, they appear as multilocular predominantly cystic masses (Fig. 1) containing septa of variable thickness...
and solid components. Correlation between sonogram and pathological specimen demonstrates that the echogenic component corresponds to a cluster of abnormal lymphatic channels, too small to be resolved with US [4]. Haemorrhagic or infected cystic spaces are also more echogenic [5]. Large lesions had ill-defined boundaries, with cystic components dissecting between normal tissue planes. Lymphangiomas are treated by surgery and MRI is the most accurate technique for evaluating the extent of the tumour and its relationships for surgical planning (Fig. 11) [6, 7, 8]. Serosizing therapy with US guidance may be an alternative for macrocystic lymphangiomas [9].

Sonographically, these tumours can usually be differentiated from other cervical masses, especially soft tissue haemangiomas and venous malformations. The differential diagnosis of a cystic neck mass includes internal jugular phlebectasia, thyreoglossal duct cyst, branchial cleft cysts, resolving haematomas, abscesses and dermoid tumours.

Haemangiomas [10, 11] are the most common tumours occurring in infancy. They usually appear in the first week of life and are located in the head and neck in almost 60% of cases. Haemangiomas are characterised by three phases: rapid postnatal endothelial proliferation (3–9 months); stable period of variable length; and spontaneous slow involution (approximately 18 months to 10 years). Histologically, in the proliferative phase they are composed by well-delimited lobular masses of endothelial cells with an increased number of mast cells. Later capillary-size lumina are often seen. During the involutive phase there is progressive perivascular deposition of fibrofatty tissue, enlargement of the vascular lumen and thinning of the endothelial lining. Diagnosis is usually made by the clinical findings and, in most instances, further investigations are not needed. Imaging [12] is indicated either in the diagnosis of deep haemangiomas with normal overlying skin to evaluate their extent or in cases of “alarming haemangiomas” [13], i.e. lesions which are dangerous to vital structures (e.g. obstruction of the airway, impairment of vision, heart failure or thrombocytopenic coagulopathy). According to Dubois and Garel [12], US is the best imaging modality for defining haemangiomas. At US [14], haemangiomas may appear homogeneously hyperechoic (multiple tiny vascular channel interfaces, proteinaceous matrix and areas of thrombosis and fibrosis), or with a typical hyperechoic lobular pattern (Fig. 2), or even like a complex mass containing vascular spaces. Colour and/or power Doppler show an increased high vessel density (defined as more than five structures per square centimetre) [15], whereas pulsed Doppler demonstrates high flow veloci-