Pediatric MR imaging II: Case-based review

SY12-1

Pediatric head and neck mass

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Masses of the head and neck are a common presenting complaint in children and can be a difficult diagnostic challenge. Ultrasonography is often the initial screening diagnostic tests, followed by magnetic resonance (MR) imaging or computed tomography (CT) for more detail. Knowledge of the embryologic features and anatomy and current multimodality imaging approach can be helpful in the diagnosis and management of pediatric head and neck lesions.

Congenital lesion

Thyroglossal duct cyst

Most common congenital, anterior midline neck mass

Tongue base~thyroid isthmus

Infrahyoid(20-65%)

Hyoid (15-50%)

Suprahyoid (20-25%)

Cystic mass, with thin septa or lobulation

Can be infected or hemorrhagic

Associated with thyroid malignancy (1%)

Branchial cleft anomalies

Incomplete obliteration of cervical sinus of His

A spectrum of cyst, sinus, fistula

Cyst: most common form

Sinus or fistula

Lymphangioma (lymphatic malformation)

Early sequestration of embryonic lymphatic channel

Asymptomatic, painless soft mass

Posterior triangle of the neck and axilla: most common

Imaging features

Multiseptate cystic masses

Often with intracystic hemorrhage or fluid levels

Dermoid and epidermoid cysts

Acquired lesions

Infectious lesion

Reactive nodes

Suppurative lymphadenitis

BCG lymphadenitis

* Pathologic lymph node

Enlargement, round shape

Absent or eccentric hilum

Hypoechoic parenchyma

Tendency to aggregate into a mass

Distorted branching and amputation of nodal vascularization

Benign tumor, tumor-like lesion

Hemangioma

The most common tumor of infancy

Proliferative phase à involution phase

Imaging features (proliferative phase)

US: Coarse echogenic mass with color flow, Low resistive index

CT, MR: well enhancing mass

Intermediate to high SI on T2WI

Feeding and draining vessels, flow void within mass

Fibromatosis colli

Muscular Torticollis

Firm, fusiform, discrete lateral mass in SCM

Intrauterine malposition

US: Mass along the SCM belly

Variable echogenicity

Langerhans cell histiocytosis

Skull: the most common location of osseous LCH

Other commonly involved sites: orbit, maxilla, mandible, and temporal bone

Radiography

Lytic lesion, “punched-out” lesions without reactive sclerosis or periosteal reaction

Beveled edge

MR imaging

T1WI low to intermediate, T2WI hyperintense signal intensity

Diffuse enhancement

Malignant tumor

Lymphoma

Most common head and neck malignancy of childhood (50%)

Hodgkin disease (HD): lymphadenopathy

Discretely enlarged, conglomerated soft tissue mass

Homogenous echogenicity, enhancement

Non-Hodgkin lymphomas

Extranodal involvement: Waldeyer ring..

Rhabdomyosarcoma

Most common soft tissue sarcoma of childhood

One-third of pediatric rhabdomyosarcomas occur in the head and neck

Histologic type

Embryonal rhabdomyosarcoma: 60-80%

Alveolar rhabdomyosarcoma

Pleomorphic rhabdomyosarcoma

Heterogeneous mass with lytic bone destruction /remodeling

Embryonal rhabdomyosarcoma: hemorrhage, necrosis

Metastatic neuroblastoma

3rd most common malignancy

< 5% occurs in the neck

Primary or metastatic from extracervical lesion

Tables : 삽입 여부 확인

Legend : -

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Pediatric thorax mass

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Chest CT and/or MRI are important for the evaluation of thoracic masses. Preoperative imaging of the tumor should focus on identifying the location and extent of tumor, as well as relationship with surrounding structures and intraspinal extension to determine resectability and the need for neurosurgical consultation. Although the anatomic information provided by CT and MRI comparable, MRI allows tissue characterization and identification of intraspinal involvement of posterior mediastinal tumors or neuroenteric cysts. The majority of mediastinal and chest wall tumors in children is malignant. However, lung lesions are usually benign, unless a known extrapulmonary tumor suggests pulmonary metastases. In this lecture, I will briefly review chest MRI cases about pediatric thoracic tumor including pros and cons of chest MRI in children.

Mediastinal tumor

The majority of mediastinal tumors in children is malignant including neuroblastoma and malignant lymphoma.

Differential diagnosis of mediastinal tumor

Anterior mediastinal mass: teratoma, normal thymus, lymphoma, thymoma

Middle mediastinal mass: lymphoma, bronchogenic cyst

Posterior mediastinal mass: neurogenic tumor (neuroblastoma, ganglioneuroblastoma, ganglioneuroma, neurofibroma, and schwannoma), lymphangioma, duplication cyst, neurenteric cyst

Chest wall tumor

The majority of chest wall tumors in children is malignant including Ewing sarcoma and primitive neuroectodermal tumor (PNET). MRI is more accurate for determining muscle invasion, whereas CT is superior in detection of small pulmonary metastasis.

Differential diagnosis of chest wall tumor: Ewing sarcoma, PNET, rhabdomyosarcoma, osteosarcoma, hemangioma, lymphangioma, tuberculous empyema

Lung tumor

Primary lung tumor in children is extremely rare. Almost lung lesions are usually benign in children except lung metastasis from known primary tumor such as osteosarcoma or Wilms tumor.

Differential diagnosis of lung tumor: metastasis, pleuropulmonary blastoma, pulmonary sequestration

Chest MRI vs. CT

Pros: superior contrast resolution, sensitive to blood flow, no exposure to ionizing radiation, spinal canal invasion evaluation, muscular invasion evaluation

Cons: sensitivity to respiratory and cardiac motion, longer examination time, more expensive, less sensitive for detection of calcium

Keywords : Thorax, MRI, Children, Tumor

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Case-based Review: Pediatric Gynecologic Disease

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In this case-based review, illustrative clinical cases in which MR played an important role in diagnosis, including ovarian tumor, uterus/vagina tumor, ovarian torsion, and anomaly of the genital tract will be discussed along with brief review of the diseases.

Ovarian tumor: Two-thirds of all ovarian tumors in children are of germ cell origin, most commonly mature teratoma. The remaining ovarian tumors are epithelial origin in 10-20% and stromal tumors in approximately 10%. Although CT is the preferred method for emergency situation and tumor staging in malignant ovarian tumors, MR is being increasingly used for complex pelvic mass for characterization and localization and to differentiate between benign and malignant tumors.

At MR imaging, mature cystic teratoma appears as a cystic mass with pathognomic fat component, which shows high signal intensity on T1-WI and signal loss with fat saturated technique. Although MR is inferior to CT in detecting calcification of teratoma, low signal intensity foci with blooming on gradient echo sequence suggest calcification. Immature teratomas are usually larger and demonstrate predominantly solid enhancing areas, scattered foci of fat and fewer calcifications. It is rarely reported that gliomatosis peritonei occurs in the patients with mature or immature ovarian teratomas, especially in the first two decades of life.

Ovarian torsion: Torsion occurs more frequently in the patients with predisposing lesions such as an ovarian cyst or tumor. In childhood, however, torsion of a normal ovary can be seen because of excessive ovarian mobility. With torsion, twisted vascular pedicle of ovary and/or fallopian tubes causes venous obstruction followed by edema and compromised arterial flow, leading to ischemia and hemorrhagic infarction. Typical imaging features include enlarged ovary with peripherally scattered follicles, cul-de-sac fluid, and underlying pathology such as a cyst or tumor. Torsion knot (twisted ovarian pedicle or twisted fallopian tube) as well as ovarian hemorrhage is better appreciated on MR imaging than US. Heterogeneous minimal or absent enhancement of the ovary indicates the evolution of ovarian torsion from ischemia to infarction

Massive ovarian edema, caused by recurrent torsion and detorsion of the ovary, typically affects postpubertal adolescent and young women presented with intermittent pelvic pain. It can be confused with ovarian tumor on US and CT imaging. MR is especially helpful for diagnosing massive ovarian edema by visualizing extensive edematous change of the ovarian stroma and peripherally located follicles.

Congenital anomaly: The uterus, fallopian tubes, and upper two-thirds of the vagina are formed by fusion of the two Müllerian ducts by 6 weeks of gestational age. Incomplete fusion of the distal segment of the Müllerian ducts results in various degrees of bifidity of the uterus or vagina, or both. Complete nonfusion results in a uterine didelphys, in which unilateral vaginal obstruction can be associated with ipsilateral renal anomaly such as agenesis or severe dysplasia. If the development of both Müllerian ducts fails or arrest, uterine agenesis or hypoplasia occurs. Mayer-Rokitansky-Kuster-Hauser syndrome or Müllerian agenesis is characterized by an absent or rudimentary uterus with vaginal atresia and normal ovaries.

Keywords : MR, Pediatric, Gynecologic disease