Various cystic lesions in uterine cervix: MR Imaging-Anatomic-Histopathologic correlation

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Learning objectives

Cystic lesions of the uterine cervix are common and frequently detected on MR imaging. MR imaging is useful for the diagnosis of gynecologic tumors or cystic lesions of the uterine cervix. We describe the imaging features with pathological correlation of single/multilocular cystic lesions in the uterine cervix.

# Understand normal anatomy of the uterine cervix

# Describe the clinical and MR imaging features of specific benign and malignant cystic lesions of the uterine cervix.

# Discuss the differential diagnosis for various cystic lesions based on their demographic characteristics, location, and MR imaging features

Background

MR imaging is now commonly used for uterine cervix lesions and useful for the diagnosis of them. The most common benign cystic lesion of uterine cervix is nabothian cyst which usually appears as a single cyst in the cervical stroma. If multiple or multilocular cystic lesions are observed in the uterine cervix, the differential diagnoses would encompass benign to malignant because proliferation of cervical glands can show multicystic features.

1. Review of normal anatomy of the uterine cervix by using MR imaging, scheme, and histopathologic findings

2. Scheme of the pathogenesis of the uterine cervical cystic lesions

3. Review of MR imaging characteristics correlated with pathologic cut-surface specimens and histopathological findings of the following lesions: nabothian cyst, deep gland and cyst, tunnel cluster, lobular endocervical glandular hyperplasia, minimal deviation adenocarcinoma, and mucinous adenocarcinoma

1. Anatomy of Uterine Cervix (Fig. 1 on page 7)

# The cervix is lined by columnar and squamous epithelium.
#Columnar epithelium lines surface of cervical canal (endocervix) and the underlying glandular structures (endocervical glands).

#The endocervical glands represent deep, cleft-like infoldings of the surface with numerous blind, tunnel-like collaterals.

#The SCJ is defined as the border between the squamous and columnar epithelium.

#Throughout the reproductive years, the endocervical epithelium is continuously replaced by metaplastic squamous epithelium due to exposure of the ectropion to activity of the vagina and the other environmental factors.

2. Typical Cystic lesions of the Uterine Cervix

# Benign lesion

# Nabothian cyst, deep gland and cyst

# Endocervical gland hyperplasia

# Tunnel cluster

# Lobular endocervical glandular hyperplasia (LEGH)

# Malignant lesion

# Adenocarcinoma

# Minimal deviation adenocarcinoma (MDA)

# Mucinous adenocarcinoma

3. Typical MR findings and Histopathological findings Fig. 2 on page 8

Nabothian cyst, Deep gland and cyst (Fig. 2a)

# The most common type of cyst of the cervix.
# The cyst appears as a single cystic lesion or as multiple cystic lesions in the cervical stroma.

# The cysts are formed as a result of the squamous metaplasia of the lining epithelium occurs.

# The squamous epithelium proliferates, covering over and obstructing endocervical glands.

# Typical endocervical gland or their cystic counterparts (nabothian cyst) uncommonly extend into the outer third of the cervical wall.

# The cysts show low or slightly high signal intensity on T1 weighted images (T1WI) and have prominent high signal intensity on T2 weighted images (T2WI).

# The cysts are round or oval, and they have a smooth wall, which is not enhanced with intravenous gadolinium on MRI.

# The well-defined margins may be used to differentiate nabothian cyst or deep gland and cyst from malignancy.

**Tunnel cluster (Fig. 2b)**

# Tunnel clusters are benign collections of endocervical glands that are usually located close to the surface epithelium of the cervix.

# These lesions are asymptomatic and are detected as incidental findings in either hysterectomy specimens or corn biopsies obtained for unrelated reasons.

# Tunnel clusters are recognized a non cystic (type A) type and the much more common cystic (type B) type.

# Type B tunnel clusters represent multicystic dilation of the
endocervical glands and lined by a cuboidal or flattened epithelium.

#MR images show multilocular cystic lesion.

#These collections of glands have a clustered appearance with a rounded margin and do not invade into the deep cervical stroma.

**LEGH (Fig. 2c)**

#LEGH is a pseudoneoplastic proliferation endocervical glandular and a benign glandular lesion.

#Endocervical hyperplasia can sometimes be encountered and an take several different forms.

#LEGH is a rare form of endocervical hyperplasia.

#LEGH is often located higher, closer to the isthmus, and limited to the inner half of the cervical stroma.

#MR findings of LEGH is that it contains small cysts or solid parts, often surrounded by larger cysts in the cervical stroma (Cosmos pattern).

#The tumor margin was usually clear with no sign of stromal invasion.

#LEGH mimics MDA, however, multiple cysts with inner solid or small cystic area surrounded by larger cysts on MRI this is suggestive of LEGH.

**Adenocarcinoma (1) (Fig. 2d)**

#Adenocarcinoma of the cervix is a subtype of cervical carcinoma that arises from columnar epithelium of the cervical glands and account for 10-15% of all cervical carcinomas.
#Mucinous adenocarcinoma is the most common (60%), followed by endometrioid adenocarcinoma (30%). The remaining histologic subtypes include MDA, well differentiated villoglandualr, clear cell, serous and mesonephric adenocarcinoma.

#Microscopically, tumor shows that adenocarcinoma consists of mucin-producing endocervical canal rather than encocervix.

#Adenocarcinoma shows predominantly solid parts with various degrees of stromal invasion. Some cases show a mixture of solid and cystic parts.

#Adenocarcinoma appears on T2WI as a high-signal intensity solid or cystic, mixed cystic, or cystic cervical mass located in cervical canal.

**Adenocarcinoma (2), MDA (Fig. 2e)**

#MDA is extremely well-differentiated variant of cervical adenocarinoma account for only 1-3% of all cervical adenocarcinomas.

#Patient with MDA range in age from 25 to 72 years (median 42)

#Symptom; Abnormal bleeding or Mucoid vaginal discharge

#Occasionally, the tumors have occurred in women with Peutz-Jeghers syndrome.

#MDA is characterized by multicystic lesions that extend from the endocervical glands to the deep cervical stroma with solid components.

#MDA had abnormally dilated and branching glands.
The multicystic lesions show very high signal intensity on T2WI and isointensity or slightly hyperintensity on T1WI. The cysts have an irregular wall and rough and fine solid components enhanced with gadolinium.

4. Case Review

*In Normal, Nabothian cyst and Tunnel cluster cases, the pathology of the cervix were used endometrial cancer cases.

# The normal uterine cervix................................................. Fig. 3 on page 9

# Benign lesion

#Nabothian cyst, deep gland and cyst............................. Fig. 4 on page 10 Fig. 5 on page 11

#Endocervical gland hyperplasia

#Tunnel cluster........................................................... Fig. 6 on page 12 Fig. 7 on page 13

#Lobular endocervical glandular hyperplasia (LEGH)

.................................................. Fig. 8 on page 14 Fig. 9 on page 15 Fig. 10 on page 16

# Malignant lesion

#Adenocarcinoma

#Adenocarcinoma in situ............................................... Fig. 11 on page 18

#Minimal deviation adenocarcinoma (MDA)..................... Fig. 12 on page 19

#Mucinous adenocarcinoma.......................................... Fig. 13 on page 21

Images for this section:
Fig. 1: Anatomy of Uterine Cervix
Fig. 2: Schema of the Cystic lesions of Uterine cervix a) Nabothian cyst, Green arrow shows cystic lesion and red line is squamous metaplasia b) Tunnel cluster, Green arrow show cystic lesions c) LEGH, Green arrow show cystic lesions d), e) adenocarcinoma, Red circles are tumor
Fig. 3: The normal uterine cervix 54-year-old with endometrial cancer #T2 weighted images show no abnormality in the uterine cervix. #Microscopically, the single layer of mucin-secreting, columnar epithelium lines both the surface of the endocervix and the underlying glandular structures. (a,b,c)
Fig. 4: Nabothian cysts 54-year-old with endometrial cancer #MR Findings #Endometrial carcinoma extends beyond the uterine corpus into the cervix. #T2-weighted images; Multiple cysts in the cervix. #Dynamic study/Gd-T1-weighted images; The cyst walls are smooth and not enhanced #Microscopic Findings #The cysts are well-circumscribed and develop within the SCJ. (a, b) #The cysts are lined by a flattened, single layer of mucinous endocervical epithelium. (c) #Squamous metaplasia present. (d)
Fig. 5: Nabothian cysts/Deep gland and cyst 47-year-old with endometrial cancer #MR Findings #T2-weighted images; Multilocular cystic lesions within the cervix #Dynamic study/Fs-Gd-T1-weighted image; The cyst walls are smooth, not enhanced within or around the cysts #Microscopic Findings #The cysts are located higher in the cervix. (a) #Flattened, single layer of epithelium resembling, # Absent atypia and mitosis (b,c,d)
Fig. 6: Tunnel cluster 51-year-old with endometrial cancer #MR Findings #T2-weighted images; Small cervical cysts, Slightly high signal intensity around the cysts #Gd-T1-weighted image; No irregular enhancement around the cysts #Microscopic Findings # Multicystic dilation of the endocervical glands (a,b) # Flattened epithelium resembling, # Absent atypia and mitoses (c,d)
Fig. 7: Tunnel cluster 45-year-old with endometrial cancer #MR Findings #The cysts located at cervical canal and SCJ #T2-weighted images; slightly high signal intensity area around the cysts of cervical canal #Gd-T1-weighted image; The cyst walls smooth and not enhanced #Microscopic Findings; #Multicystic architecture filled with mucin, #Located close to the surface (a,b) #Cuboidal epithelium resembling, #Absent atypia and mitosis (c,d) #Nabothian cysts are seen in SCJ. (a,e) #Squamous metaplasia present. (f)
Fig. 8: LEGH 35-year-old #MR Findings #T2-weighted images; Multicystic lesion surrounding the cervical canal, The large cysts are located external side (Cosmos pattern). #Fs-Gd-T1WI; The cyst walls are smooth, Slightly enhanced around the cysts #Microscopic Findings #Proliferation of Lobular architecture of small-sized endocervical glands surrounding dialated gland(*) (a,b,c) # Atypia and mitoses are absent (d, e)
Fig. 9: LEGH 54-year-old MR Findings

T2-weighted images; Multiple cysts in the cervical canal, The cysts are located higher in the cervix, Larger cysts surround small cysts (Cosmos pattern)

Dynamic study/Gd-T1-weighted images; The cyst walls are smooth, Slightly enhanced around the cysts

Microscopic Findings

Lobular architecture (c,d) #No atypia, no mitoses (e) #Limited to the inner half of the cervical wall (a,b)
Fig. 10: LEGH 44-year-old #MR Findings #T2-weighted images; Multilocular cystic lesions in the enlarged uterine cervix, Larger cysts surround small cysts (Cosmos pattern), The margin is clear #Dynamic study/Gd-T1-weighted image;The cyst walls are slightly thickened and enhanced #Microscopic Findings #Lobular pattern with a dilated gland in the center of a proliferation of smaller glands (b,c,d) #No atypia, No mytoses (e)
**Fig. 11:** Adenocarcinoma in situ 49-year-old #MR Findings #T2-weighted images; Multilocular cystic lesions with solid component in the enlarged cervix, The cyst walls are slightly irregular #Dynamic study/Gd-T1-weighted images; Obvious enhancement of the solid area #Microscopic Findings #Irregular distribution and architecture of the cervical glands with large nuclei and pink cytoplasm (a,b,c,e) #Atypia and mitoses present, #The glands are slightly dilated, smooth-countered and lack ofstromal invasion (e)
Fig. 12: MDA 40-year-old #MR Findings #T2-weighted images; The small cystic lesions with solid component in the enlarged cervix, The cervical canal with cystic component #Dynamic study/Gd-T1-weighted images; The solid component has irregular
enhancement #Microscopic Findings #Architectural abnormalities are present including complex variably sized glands which are irregular in shape. (a,b,c) #The glands are lined by single layer of tall columnar epithelial that resemble normal endocervical glands. However, the neoplastic glands have slightly enlarged nuclei and a few mitoses. (d,e)
**Fig. 13:** Mucinous adenocarcinoma 51-year-old #MR Findings #T2-weighted images; Hyperintense solid mass in the cervix, Well-circumscribed cysts in the posterior wall #Dynamic study/Gd-T1-weighted images; The solid mass has irregular enhancement. The cyst walls are smooth and not enhanced #Microscopic Findings #The neoplastic glands containing abundant mucin invade deeply into the cervical wall. (a,b) #Nuclear atypia and mitotic are present. (c,d) #Nabothian cysts are seen deeper cervical struma. (b,e)
**Findings and procedure details**

MR imaging was performed with 1.5-T MR (Symphony; Siemens Medical Solutions, Erlangen, Germany) and 3.0-T MR (Signa HDx; GE Medical Systems, Milwaukee, WI, USA) units.

**Conclusion**

# We described the MR findings of cystic lesions of uterine cervix in close correlation with histopathological specimens.

# MR Imaging provide an excellent sensitivity in the assessment of uterine cervix pathologies although multilocular cystic lesions are sometimes difficult to diagnose benign or malignant lesion.

MR images are now the most commonly used for uterine cervix lesions.

Single/multilocular cystic lesions in the uterine cervix are vary and frequently detected on MR imaging. Although cystic lesions are sometimes difficult to differentiating benign from malignant lesions, this presentation might be helpful in assessment of uterine cervical cystic lesions on MR imaging.

Single/multilocular cystic lesions in the uterine cervix are vary and frequently detected on MR imaging. Although multilocular cystic lesions are sometimes difficult to differentiating benign from malignant lesions on MR Imaging, this presentation (to understand normal anatomy and histopathologic findings) might be helpful in assessment of uterine cervical cystic lesions.

**Personal information**

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