HISTOPATHOLOGICAL SPECTRUM OF TERATOMAS IN PAEDIATRIC AGE GROUP

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ABSTRACT: INTRODUCTION: Teratomas are the most common germ cell tumours in paediatric age group and accounts for 3% of all the malignancies in childhood. The term teratoma is derived from the Greek word called teraton which means a monster. They are biologically heterogeneous group of tumours that may be benign, potentially malignant or malignant based on their evolutionary features and site of origin. **AIMS AND OBJECTIVES:** The present study reviews the classification, gross morphology, histopathological findings and grading of teratomas in paediatric age group. **MATERIAL AND METHODS:** We analysed 44 patients with teratomas presenting at Department of Pathology, Paediatric Referral Hospital from June 2005 to May 2010. Detailed gross and microscopic examination of all the specimens were done and cases were evaluated and graded according to the amount of immature tissues present. **RESULTS**: We reviewed 44 patients with teratomas. Majority of the cases (72%) were seen in the age group between 0-1 years. Sex incidence showed female preponderance with Male: Female ratio of 1: 1.4. Our study included 28 female children and 16 male. There were 37 cases of mature and 7 cases of immature teratoma. The most common site of origin of teratomas was sacrococcygeal region. **CONCLUSION:** Teratomas are relatively common in paediatric age group. Single most important prognostic factor is the histopathological grading of the tumour as the degree of immaturity correlates with the ultimate prognosis of children. Histopathological examination has a major role in the final diagnosis and prognosis particularly in cases where teratomas are malignant.

KEYWORDS: Germ cell tumours, Teratoma, Sacrococcygeal region, mature teratoma, immature teratoma.

INTRODUCTION: Teratomas are the most common germ cell tumours in paediatric age group [1].They are biologically heterogeneous group of tumours that may be benign, potentially malignant or malignant based on their evolutionary features and site of origin [2]. These tumours account for 3% of all the malignancies in childhood [3].

The term teratoma is derived from the Greek word called teraton which means a monster. In 1869, this term was applied to a tumour arising in the sacrococcygeal region [4].Teratomas are derived from all the three germinal layers [5].

Three theories have been postulated concerning the aetiology of teratomas. First theory hypothesises that teratomas arise from totipotent primordial germ cells, while second theory postulates that teratomas arise from remnants of the primitive node. The third theory suggests incomplete twinning as an aetiology [4].Clinically majority of teratomas present as a mass lesion with clinical manifestations attributed to specific location and resultant compression of adjacent organs

and tissues. The age at diagnosis and anatomical location of the tumour helps in clinico-pathological correlation and prognosis [6].Teratomas arise in para-axial or midline location from brain to sacral area as well as in the gonads. They may arise from other rare sites which include placenta, fourth ventricle, posterior fossa, orbit and epignathus [3].

Teratomas are classified into mature, immature and malignant types. Mature teratomas are composed of differentiated tissues and are generally considered benign, while immature teratoma is characterized by having immature non-malignant tissue and have greater tendency to recur. These tumours are considered malignant if there are features of yolk sac tumour, choriocarcinoma or embryonal carcinoma among the differentiated tissues. Teratomas are graded according to the amount of immature tissue present in them. Immature tissues may include varying amounts of neuroectodermal tissue or blastemal tissue. Grading of teratomas was introduced in 1976 and modified in 1982[1].

The present study reviews the classification, gross morphology, histopathological findings and grading of teratomas in paediatric age group.

MATERIAL AND METHODS: The present study was undertaken at Department of Pathology, Paediatric Referral Hospital. This retrospective study was conducted from June 2005 to May2010. During this period , a total of 5376 pediatric surgical specimens were received, of which 44 cases were diagnosed as teratomas. Detailed clinical history, physical examination, routine laboratory and radiological investigations which included Ultrasound examination and Computed Tomography scan were done in all cases. Detailed gross and microscopic examination of all the specimens were done and were graded according to the amount of immature tissue present [7].

RESULTS: In the present series a total of 44 cases of teratomas were reviewed. Teratomas commonly occurred in the age group of 0 -1 year. There were 28 female children and 16 male (Table 2).Sex incidence showed female preponderance with Male: Female ratio of 1: 1.4.Figure 1 depicts the age and sex incidence of teratomas.

The most common site of origin of teratomas encountered in our study was Sacrococcygeal region (17/44 - 38.6%) followed by ovaries (7/44 - 15.9%). Other sites included retroperitoneum(5/44 - 11.3%), gastric(3/44-6.8%), extra-renal(2/44-4.5%), right side of neck(1/44-2.2%), testis(1/44-2.2%), presternal(1/44-2.2%), lesser sac(1/44-2.2%), between stomach and pancreas (1/44-2.2%), adherent to transverse colon (1/44-2.2%), presacral(1/44-2.2%), mediastinal(1/44-2.2%), gluteal(1/44-2.2%), scalp (1/44-2.2%).(Table 1)

Majority of sacrococcygeal teratomas presented with mass at sacrococcyx. While teratomas in other areas like abdomen presented with mass abdomen and in pelvis with urinary retention and constipation. Teratomas in testis and neck presented with mass lesions. Mediastinal teratoma presented with respiratory symptoms.

Grossly, mature teratomas were predominantly cystic (81%) (Figure 2B), while few cases had solid to cystic component (13%). Example: Gastric teratoma (Figure 7A, 7B). One mature teratoma was predominantly solid (3%) (Figure 6A) while another mature teratoma designated as fetus in fetu showed limb like structures in one area (3%) (Figure 8A). Immature teratomas (Figure 4A) were predominantly solid (71%). Example: Retroperitoneal teratoma (Figure 2A), Teratoma right side of neck (Figure 6A), solid with few cystic areas (29%) in some (Figure 4B). (Table 4)

Histopathologically, mature teratomas (Figure 3A, 3B) revealed evidence of all three germ cell layers with complete differentiation, while immature teratomas showed immature non-malignant neuroepithelial tissue (Figure 5A, 5B).In our study majority of cases were mature teratomas (MT)constituting 84.09 % (37/44) followed by immature teratomas (IMT) with 15.91 %(7/44)(Table 2). One case of fetiform teratoma was considered as mature teratoma with site of origin being retroperitoneum (Figure 8B). No cases of malignancy were reported in our study.

Site wise tumour maturity showed sacrococcygeal region (N: 17, MT: 14, IMT: 3), ovaries (N-7, MT-5, IMT-2), retroperitoneum (N-5, MT-4, IMT-1), gastric (N-3, MT-3)(Figure 7C), extra-renal (N-2, MT-2), right side of neck (N-1, IMT-1)(Figure 6B), testis (N-1, MT-1), presternal (N-1, MT-1), lesser sac (N-1, MT-1), between stomach and pancreas(N-1, MT-1), adherent to transverse colon (N-1, MT-1), presacral (N-1, MT-1), mediastinal (N-1, MT-1), gluteal (N-1, MT-1)and scalp (N-1, MT-1).(Table 3)

Grading of 44 cases of teratomas was done. All the 37 cases of mature teratoma were benign and classified as Grade 0. While all the 7 cases of immature teratoma were classified under Grade 1 (Table 5).

DISCUSSION: Teratomas are termed congenital tumours as these are believed to be present since birth or even before it. Majority of them are diagnosed usually in late childhood. Larger tumours are diagnosed early. Sacrococcygeal and cervical teratomas are often detected by a prenatal ultrasound and in some cases by magnetic resonance imaging. Beyond the newborn period; the clinical manifestations of teratoma depend on its location and organ of origin. Ovarian teratomas usually presented with abdominal or pelvic pain. Testicular teratomas present as a palpable mass in testis. Mediastinal teratomas may present with chest pain and respiratory symptoms.

Grading of teratomas is essential for determining prognosis. Grade 0 is mature and regarded as benign, Grade 1 is immature with less than 10% microscopic foci containing immature tissues, Grade 2 is immature with 10–50% of immature tissue, Grade 3 is immature with 50% of immature tissue [1].Grade 0, 1 and 2 pure teratomas have the potential to become malignant (grade 3), and malignant pure teratomas have the potential to metastasize [7].

According to a series, sacrococcygeal teratomas presented at birth or infancy, ovarian between 5-15 years, testicular before 5 years of age, thoracic tumors occurred throughout infancy and childhood while teratomas at other sites occurred mainly during infancy [5]. Similar results were documented in the present study.

In our study, high proportion of female patients were due to ovarian teratomas and increased female preponderance in sacrococcygeal teratomas leading to overall surge in sex incidence of females in teratomas. Studies by other authors showed similar results [8, 9, 10, 11, 12].

Sacrococcygeal region was commonest site of origin of teratomas followed by ovaries in our study. Similar findings were detailed in the other studies [1, 6].

Available literature shows many authors describing isolated cases of mature gastric teratoma in their case reports [13, 14, 15, 16]. We had 3 rare cases of mature gastric teratomas all occurring in male children. We likewise reported a rare case of fetus in fetu originating from retroperitoneum in our study. Authors have similarly reported a case of fetus in fetu each in their case reports [17, 18, 19].

Grossly, mature teratomas were predominantly cystic, while immature teratomas were mostly solid as similarly reported by a study [6].Another study highlighted that mature sacrococcygeal teratomas were predominantly cystic while immature teratomas were partly solid and partly cystic [20].

In the present study, majority of teratomas were classified as mature teratomas based on histopathological examination. Our findings were consistent with other studies [1, 6, 21, 22, 23].

According to a study where 254 cases of teratomas were evaluated, site wise tumour maturity showed sacrococcygeal region (N-102, MT-82, IMT-20), ovary(N-94, M-78, IM-16), testis(N-8, MT-6, IMT-2), mediastinum (N-11, MT-9, IMT-2), retroperitoneum (N-12, MT-7, IMT-5), head and neck(N-14, MT-8, IMT-6), brain and spinal cord (N-9 MT-7,IMT-2), Liver (N-2, MT-2), abdominal wall(N-1, MT-1) and scapula(N-1, MT-1)[6].

Another study reviewed 183 cases of teratomas. Site wise tumour maturity showed sacrococcygeal region (N-64, MT-45, IMT-19), ovary (N-52, MT-35, IMT-17), testis(N-34, MT-23, IMT-11), thorax (N-14, MT-11, IMT-3), retroperitoneum(N-9, MT-7, IMT-2), neck (N-3, MT-1, IMT-2), 1 MT each of liver, eye, salivary gland, tongue and 1 IMT each of rhino-pharynx and diaphragmatic region[1].

All the 37 cases of mature teratoma in our study were classified as Grade 0. While all the 7 cases of immature teratoma were classified into Grade 1. Similar findings were found in another study which showed that mature teratomas with Grade 0 were more frequent (54.5 %) than immature teratomas with Grade 1-Grade 3 (45.5 %) [7].

CONCLUSION: Teratomas are relatively common in paediatric age group, we have found 44 cases in the past 5 years, and of which majority were sacrococcygeal teratomas. There is a clear female preponderance. The age at diagnosis and anatomical site of the teratoma helps in prognosis. Single most important prognostic factor is the histopathological grading of the tumor as the degree of immaturity correlates with the ultimate prognosis of children. All the teratomas should be completely excised to prevent their recurrence and poor outcome in patients. Hence we conclude that histopathological examination has a major role in the final diagnosis and prognosis particularly in cases where teratomas are malignant.

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Table 1: Site and Distribution of Teratomas in our study.

SITE	NO. OF CASES(N=44)	PERCENTAGE
Sacrococcyx	17	38.60%
Ovaries	7	15.90%
Retroperitoneum	5	11.30%
Gastric	3	6.80%
Extra renal	2	4.50%
Right side neck	1	2.20%
Testis	1	2.20%
Pre sternal	1	2.20%
Lesser sac	1	2.20%
Between stomach and pancreas	1	2.20%
Adherent to transverse colon	1	2.20%
Presacral	1	2.20%
Mediastinal	1	2.20%
Gluteal	1	2.20%
Scalp	1	2.20%

Table 2: Sex Incidence of Mature and Immature teratomas.

TERATOMAS	No. OF CASES	FEMALES	MALES
MATURE TERATOMAS	37	22	15
IMMATURE TERATOMAS	07	06	01
TOTAL	44	28	16

Table 3: Site wise tabulation of tumour maturity.

SITE	NO. OF CASES(N=44)	MATURE	IMMATURE
Sacrococcyx	17	14	3
Ovaries	7	5	2
Retroperitoneum	5	4	1
Gastric	3	3	-
Extra renal	2	2	-
Right side neck	1	-	1
Testis	1	1	-
Pre sternal	1	1	-
Lesser sac	1	1	-
Between stomach and pancreas	1	1	-
Adherent to transverse colon	1	1	-
Presacral	1	1	-
Mediastinal	1	1	-
Gluteal	1	1	-
Scalp	1	1	-

Table 4: Gross features of Teratomas in our study.

GROSS FEATURE	MATURE TERATOMAS	IMMATURE TERATOMAS
Predominantly cystic	30 (81%)	-
Solid to cystic	5 (13%)	2(29%)
Predominantly solid	1 (3%)	5 (71%)
Limb like structures	1 (3%)	-

Table 5: Grading of Teratomas using Gonzalez-Crussi classification in our study.

MATURITY	GRADE 0	GRADE 1	GRADE 2	GRADE 3
Mature teratomas	37	-	-	-
Immature teratomas	0	7	-	-

FIGURES:

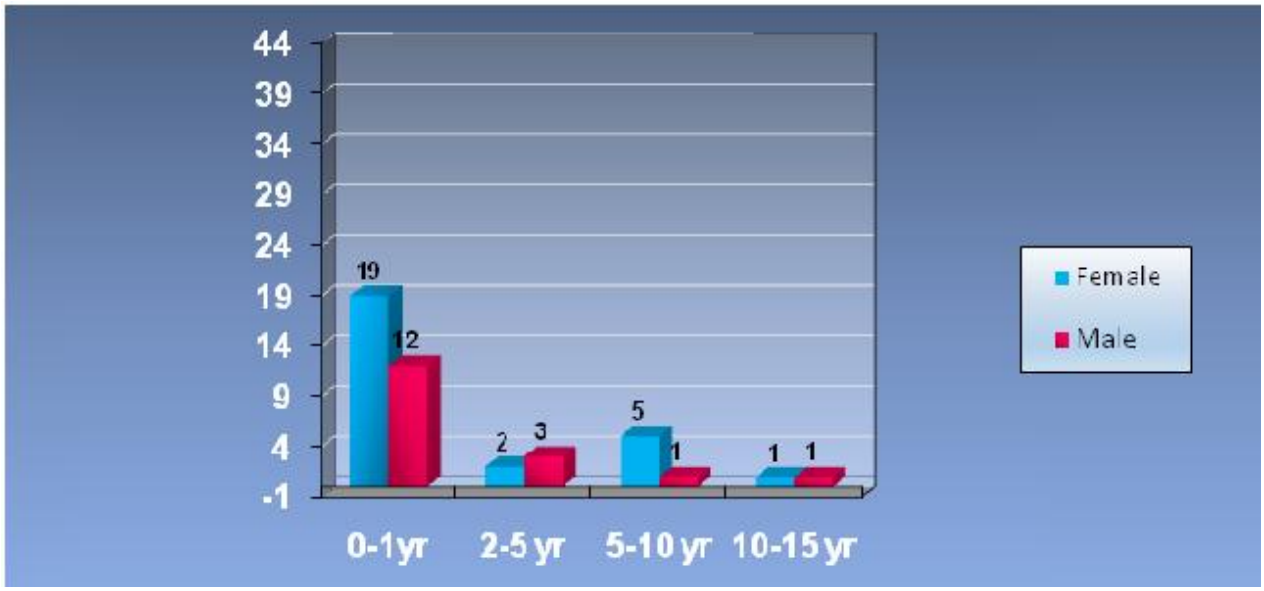

Figure 1: Age incidence and Sex distribution

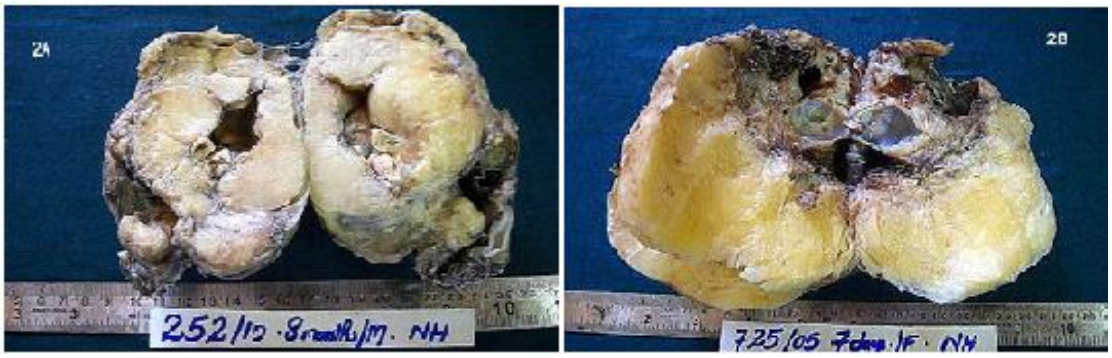

Figure 2: Morphology of Teratoma (A) Gross specimen of retroperitoneal tumour (B) Gross specimen of left supra renal tumour.

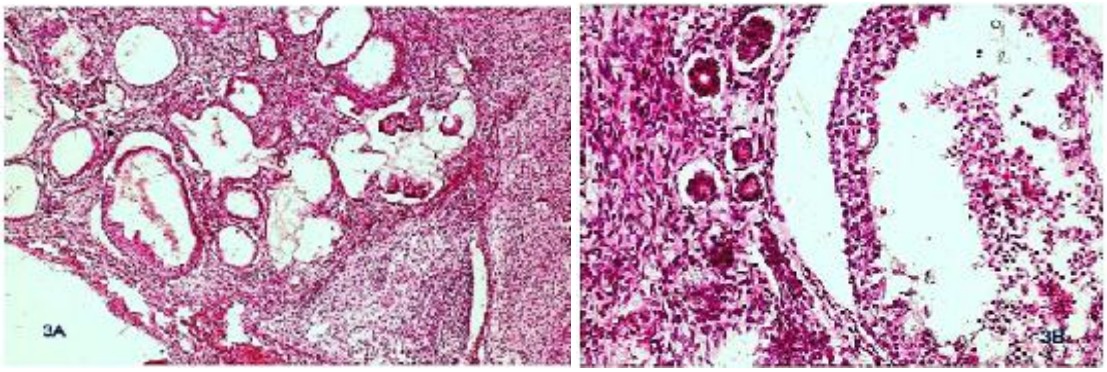

Figure 3: (A) Photomicrograph of Mature teratoma (Haematoxylin and Eosin, 10X) (B) Photomicrograph of Mature teratoma (Haematoxylin and Eosin, 40X).

Figure 4: Morphology of Sacrococcygeal Teratoma (A) Gross specimen of Sacrococcygeal Teratoma. (B) Cut section shows predominantly solid with few cystic areas.

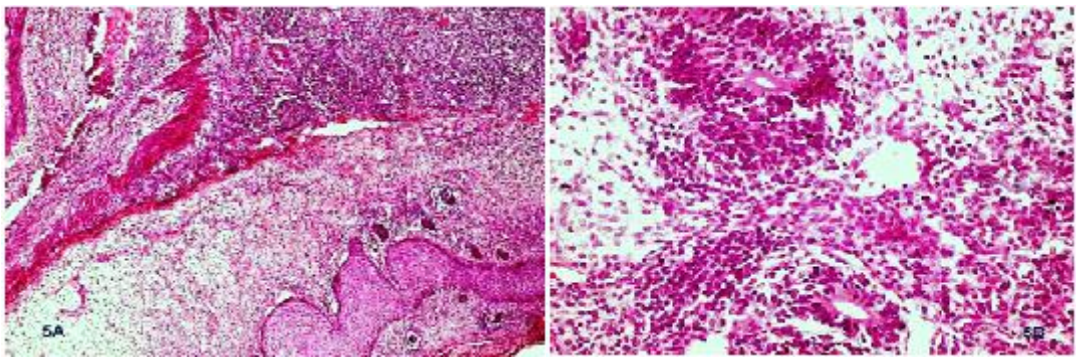

Figure 5: (A) Photomicrograph showing Immature teratoma. (Haematoxylin and Eosin, 10X) (B)Photomicrograph showing Immature teratoma with neuroepithelial Rosettes (Haematoxylin and Eosin, 40x)

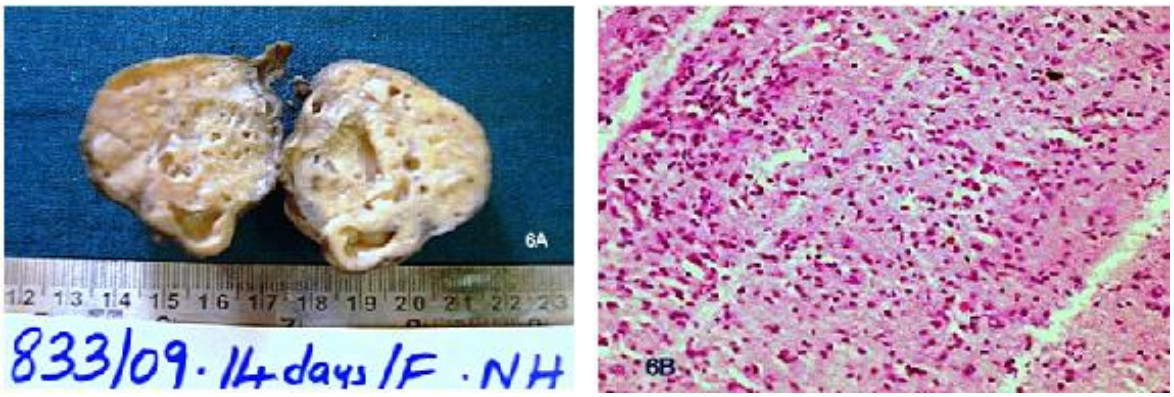

Figure 6: Morphology of Teratoma Right side of neck (A)Gross specimen of Teratoma on the right side of neck. (B) Photomicrograph showing Immature teratoma on the right side of neck. (Haematoxylin and Eosin, 40X)

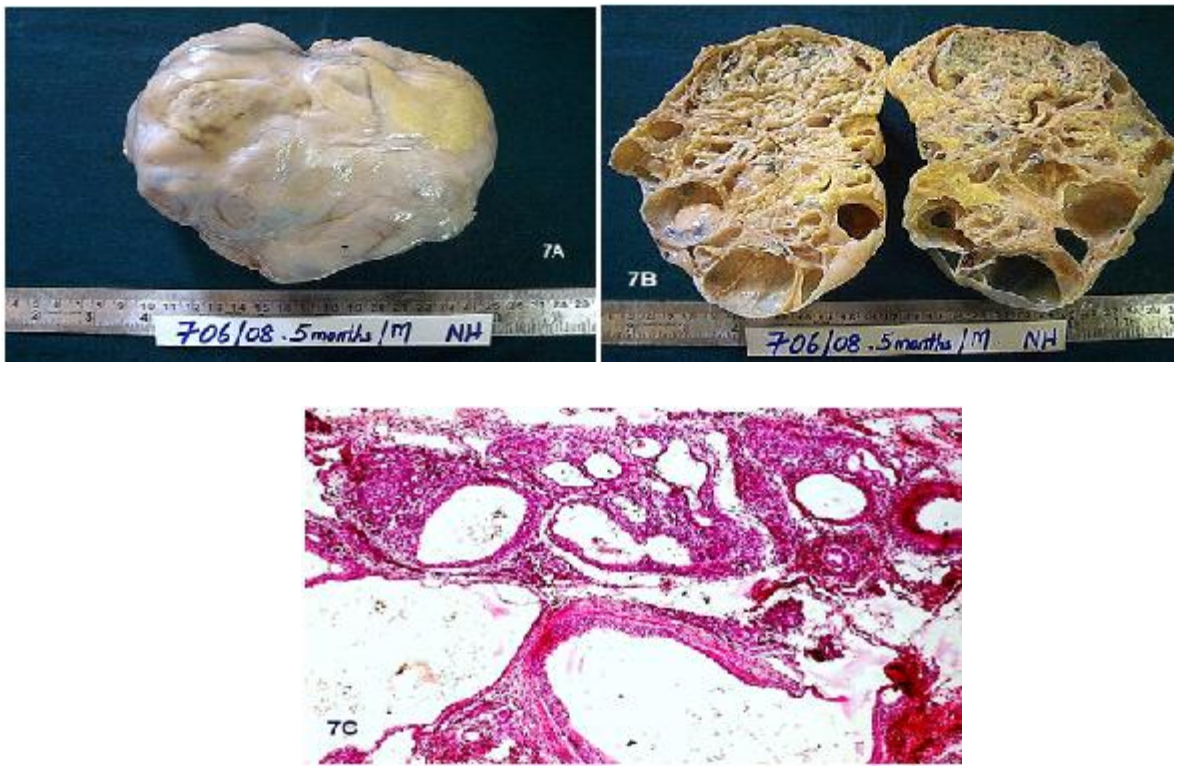

Figure 7: Morphology of Gastric teratoma (A) Gross specimen of Gastric teratoma. (B) Cut section showed solid and cystic areas. (C) Photomicrograph of Mature Gastric teratoma (Haematoxylin and Eosin, 10X)

Figure 8: Morphology of Fetiform teratoma (A) Cut section of Fetiform teratoma showing limb like structures in one area. (B)Photomicrograph of Fetiform teratoma (Haematoxylin and Eosin 40X).

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