

# MRI of Tailgut Cyst – Case Report and Review of Literature

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## ABSTRACT

A tailgut cyst (TGC) is a rare congenital cystic developmental anomaly believed to arise from remnants of the embryonic tailgut. Most TGCs present as multicystic masses in the retrorectal space, with the potential for malignant transformation and spread into the ischioanal fossa. A significant number of cases are discovered incidentally during imaging. In contrast, others present with symptoms such as rectal bleeding, local mass effects on the rectum and bladder, abdominal pain, or constipation. Differential diagnoses include other cystic lesions such as dermoid cysts, epidermoid cysts, and sacrococcygeal teratomas. Diagnosis is primarily based on imaging, with MRI playing a critical role in distinguishing these lesions. Although numerous case reports describe imaging characteristics, very few emphasize the role of diffusion imaging in identifying tailgut cysts. Herein, we present a case of a tailgut cyst in a 43-year-old female, highlighting unique MRI features that aid in identifying the cyst and differentiating it from other cystic lesions.

## CASE REPORT

### CASE REPORT

A 43-year-old woman presented to the out-patient surgical department of our institute with the complaints of lower abdominal pain and discomfort for 3 months. She was apparently asymptomatic 3 months back. There were no complaints of fever, nausea, vomiting, burning micturition. She did not have any history of trauma or any past surgeries. On examination, abdomen was soft and demonstrated mild tenderness in right and left iliac fossa and hypogastric region. There was no evidence of guarding, rigidity and palpable mass.

Digital rectal examination demonstrated the presence of approximately 4 cm × 3 cm soft, cystic, non-tender, non-mobile swelling palpated at 6 o'clock position. There was no active bleeding or pus discharge at that time. Perianal examination demonstrated a normal resting tone, with skin tag at 12 o'clock position and no perineal descent or prolapse, fissure, fistula or haemorrhoids were present.

Hematological and biochemical examination revealed all parameters within normal limits.

The patient was uncooperative for trans rectal ultrasound. Trans abdominal ultrasound demonstrated a well defined cystic lesion measuring approximately 6.5x3.1cms posterior to the rectum with internal septations and few solid components.

On computed tomography a well defined hypodense cystic lesion was noted posterior to the rectum in the pre sacral space. On contrast no significant enhancement was noted. The lesion was separate from the rectum with preservation of the fat

planes (Figure 1a,1b). Incidental horse shoe kidney was noted (arrow in Figure 1c).

On Magnetic Resonance Imaging (MRI) examination a well defined hypointense lesion was noted on T1W images in the presectral space. On contrast heterogeneous enhancement was noted with enhancing septations within the lesion. Few enhancing nodular solid components were noted within the lesion (Figure 2a,2b). On T2W the cyst was hyperintense with few specks of differential hypointensities suggestive of components with high cellularity (Figure 3a-3c). On Dixon in and out of phase imaging few specks of hypointensity were noted in the out of phase images possibly implying presence of intracellular fat component (Figure 4a,4b). On Diffusion weighted images (1000 sec/mm<sup>2</sup>) areas of uniform diffusion restriction was noted within the lesion with corresponding reduction in ADC (0.8x10<sup>-3</sup> mm<sup>2</sup>/sec). The lesion demonstrated few specks of further reduced ADC (0.3x10<sup>-3</sup>mm<sup>2</sup>/sec) the lesion possibly due to high cellularity (Figure 5a,5b). Laproscopic excision of the lesion was attempted however due to high tensile nature, rupture of the cyst occurred. Exploratory laparotomy was performed and peritoneal lavage with excision of the cyst via open surgical opening was performed and cyst excised.

On macroscopic pathological specimen the lesion demonstrated solid components and loculations. On Histopathological examination by eosin and hematoxylin staining lesion demonstrated cyst wall with keratinized and non keratinized squamous epithelium with smooth muscle layer and multiple loculations (Figure 6a-6c). No neural plexus seen and no evidence of malignant foci seen.

## DISCUSSION

### Etiology & Demographics

Tailgut cysts arise in the retrorectal/presacral space and are believed to originate from vestiges of the embryonic tailgut [1]. This space, also known as the retrorectal space, is bounded by the rectum anteriorly, the presacral fascia, sacrum, and coccyx posteriorly, the peritoneal reflection superiorly, the levator ani and coccygeus muscles inferiorly, and the iliac vessels and ureters laterally [2]. During the fourth week of gestation, the embryo folds inward, enclosing the future gut. The caudal portion distal to the hindgut, called the tailgut, is typically regressed by the sixth week of gestation. Failure of these remnants to regress leads to the formation of a tailgut cyst [3]. Alternatively, tailgut cysts may represent the neurenteric canal's vestiges, which connect the amnion and yolk sac and obliterate during notochord formation.

Tailgut cysts can occur at any age but are most commonly seen in women between the ages of 30 and 60, with a female-to-male ratio of 3-4:1 [4]. Pathologically, tailgut cysts are typically multiloculated cystic lesions lined with various epithelial cell types, including stratified squamous epithelium (the most common), columnar, transitional, cuboidal, and mucinous epithelium. While initially believed to be benign, the risk of malignant transformation is higher than previously thought, ranging from 8% to 26%. In a study by Nicoll et al., neoplastic transformation occurred at a rate of 26.6%, with adenocarcinomas and neuroendocrine tumors comprising more than 80% of malignancies [5].

### Clinical and Imaging Findings

The clinical presentation of tailgut cysts is nonspecific. Approximately half of the patients are asymptomatic, with the cysts incidentally detected during radiological imaging. Symptomatic patients may present with lower back pain, painful rectal bleeding, tenesmus, fullness in the rectal area, frequent urination, altered stool caliber, discomfort while sitting, urinary obstruction, compression of the sacral plexus, or recurrent presacral and gluteal abscesses. A small percentage of cases may involve fistula formation, leading to skin drainage or rectum drainage [6].

Due to the risk of complications from biopsy, including infection and the spread of potential dysplastic cells, imaging plays a crucial role in diagnosing tailgut cysts. On sonography, TGCs appear as multiloculated cystic masses in the retrorectal space, with internal echoes due to gelatinous material or inflammatory debris. CT scans typically show well-defined, presacral masses with water or soft-tissue density, depending on the cyst's contents. If infection or malignant transformation is present [7], CT may reveal loss of distinct margins and involvement of adjacent structures. Small cysts within the lesion may contain keratinous or inflammatory debris, giving a solid appearance on imaging.

On MRI, tailgut cysts typically present as unilocular or multilocular cystic lesions. They generally display low signal intensity on T1-weighted images, but hemorrhage, high protein content, or mucinous materials may result in high signal intensity. On T2-weighted imaging, the signal intensity is variably hyperintense, depending on the cyst contents. Diffusion-weighted imaging (DWI) often shows restricted diffusion with low apparent diffusion coefficient (ADC) values and further foci of reduced ADC values within the cyst helps to differentiate tailgut cyst from epidermoid cyst. Foci of signal loss in out-of-phase imaging, indicating intracellular fat, help distinguish tailgut cysts from dermoid cysts, which mainly contain extracellular fat. S.shetty et al demonstrated diffusion restriction of the lesion (ADC- 0.9) with focus of more marked restriction (ADC-0.3) [8]. Malignant transformation presents irregular wall thickening with intermediate signal intensity on T1- and T2-weighted images and enhancement following gadolinium injection [9].

Tailgut cysts carry a long-term risk of malignant transformation. Delayed recognition increases this risk, necessitating early identification and surgical excision. Infection and hemorrhage are other documented complications, with about 2% to 13% of tailgut cysts undergoing malignant transformation. Adenocarcinoma is the most common malignancy, followed by neuroendocrine tumors, sarcomas, and carcinomas [10]. Mathis et al. reported 31 tailgut cysts, with 4 showing malignant features (3 adenocarcinomas and one neuroendocrine tumor) [11].

### Treatment and Prognosis

Given the risk of malignant transformation and other complications, surgical excision is recommended for both symptomatic and asymptomatic cases. Two surgical techniques are available: laparoscopic minimally invasive surgery and open surgery. Lesions above the S3 vertebra can be removed using an anterior or abdominal approach, while those below S3 can be accessed using a posterior (Kraske) approach. The prognosis largely depends on the presence or absence of malignant transformation. Regular follow-up is essential for detecting recurrence. Carbohydrate antigen 19-9 (CA 19-9) or carcinoembryonic antigen (CEA) levels, if elevated preoperatively, can be surrogate markers for recurrence post-surgery [12].

### Differential diagnosis

The differential diagnosis of tailgut included in table 1.

## TEACHING POINT

In conclusion, early recognition and excision of tailgut cysts are essential to prevent malignant transformation and other complications. MRI, particularly diffusion-weighted imaging, is critical in diagnosing and differentiating tailgut cysts from other cystic lesions in the retrorectal space.

Summary included in table 2.

### QUESTIONS

**Question 1:** What is the lining epithelium of tailgut cyst?

Answer choice 1: Squamous epithelium

Answer choice 2: Cuboidal epithelium

Answer choice 3: Transitional epithelium

Answer choice 4: All of the above

Correct answer: 4

**Explanation:** [Multiple types of cyst lining have been described such as stratified squamous, columnar, Transitional, Mucinous and Cuboidal epithelia]

**Question 2:** What is the gender predilection for tailgut cyst?

Answer choice 1: Female

Answer choice 2: Male

Answer choice 3: Both

Answer choice 4: No gender predilection

Correct answer: 1

**Explanation:** [There is strong female predilection]

**Question 3:** Which of the following are complications of tailgut cyst?

Answer choice 1: Infection

Answer choice 2: Hemorrhage

Answer choice 3: Malignant transformation

Answer choice 4: All of the above

Correct answer: 4

**Explanation:** [Infection or inflammation, Hemorrhage and malignant change are all the complications of tailgut cyst]

**Question 4:** What is the most common type of malignant transformation?

Answer choice 1: Neuroendocrine tumor

Answer choice 2: Adenocarcinoma

Answer choice 3: Sarcomas

Answer choice 4: Squamous cell carcinoma

Correct answer: 2

**Explanation:** [Adenocarcinoma is the most common type of malignant transformation]

**Question 5:** Which of the following lesions show diffusion restriction ?

Answer choice 1: Tailgut cyst

Answer choice 2: Epidermoid cyst

Answer choice 3: Dermoid cyst

Answer choice 4: Both 1 & 2

Correct answer: 4

**Explanation:** [Both tailgut cyst and epidermoid cyst show diffusion restriction]

### CONSENT

Written informed consent is taken from the patient.

### HUMAN AND ANIMAL RIGHTS

We confirm that this report is consistent with ethical guideline

### AUTHORS CONTRIBUTIONS

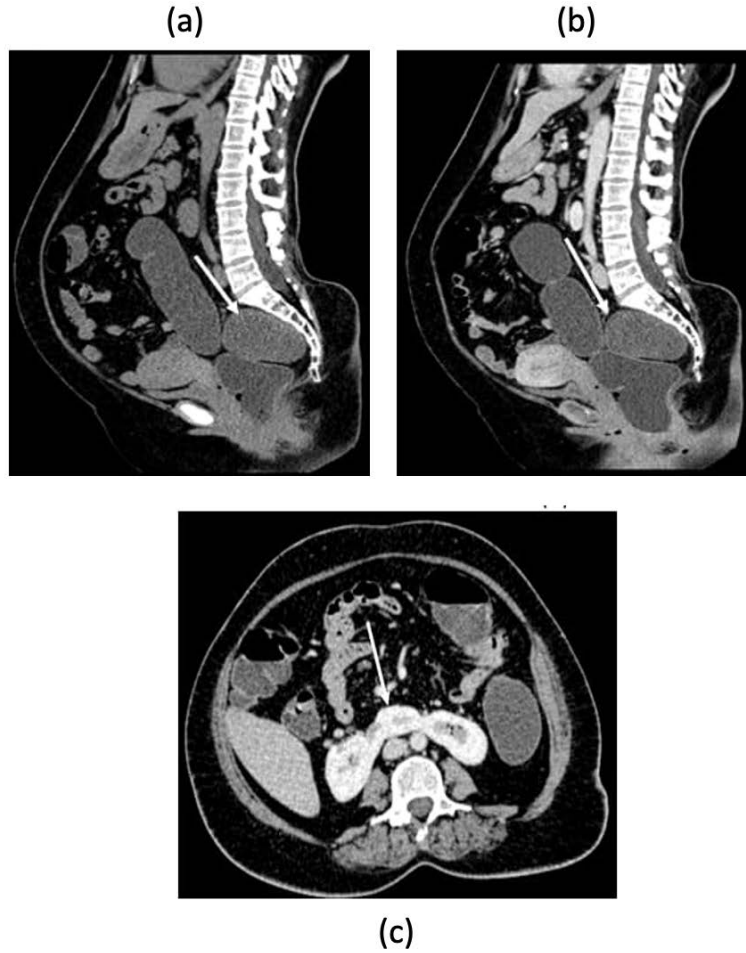
All the authors contributed equally to the journal

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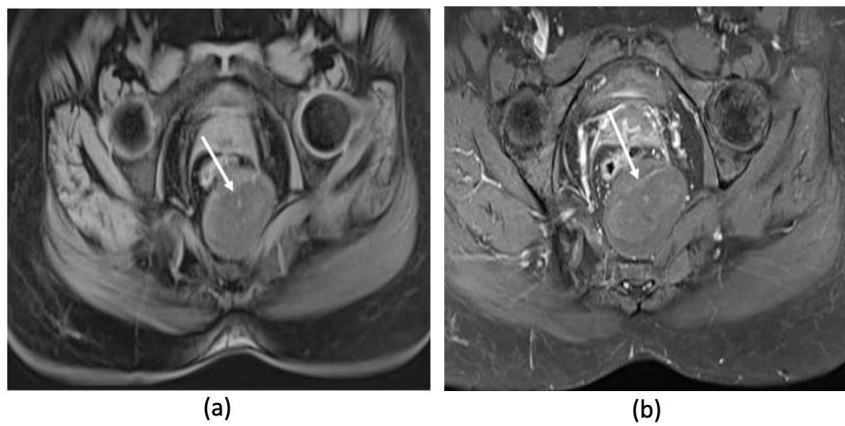
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FIGURES

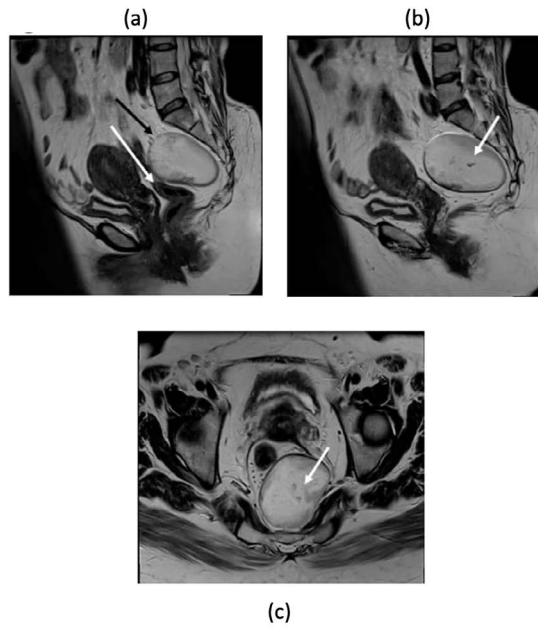


**Figure 1 (a-c):** Computed tomography images of 43 year old woman with abdominal pain and discomfort. Sagittal pre contrast (a) and post contrast (b) images demonstrating relatively non enhancing cyst in the pre sacral space (white arrows). Axial post contrast image (c) demonstrating an incidental horse shoe kidney (white arrow).

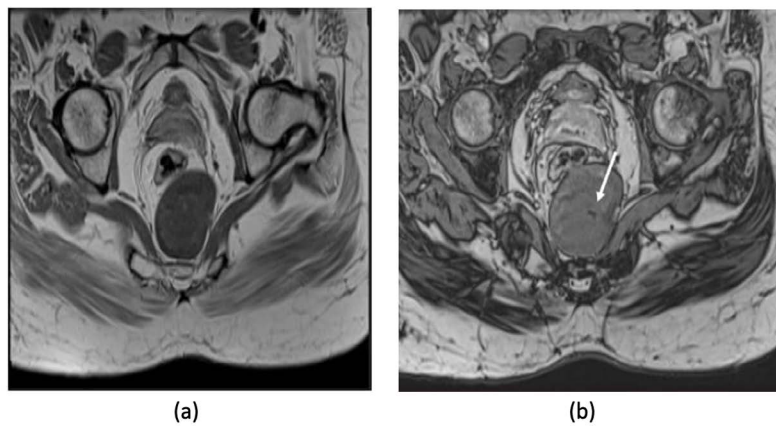


**Figure 2 (a,b) :** Pre (a) and Post contrast (b) T1W Magnetic Resonance Images of 43 year old woman with abdominal pain and discomfort demonstrating a well-defined hypointense lesion in the presacral space (White arrow). On contrast heterogenous enhancement of septa and nodular enhancement noted.

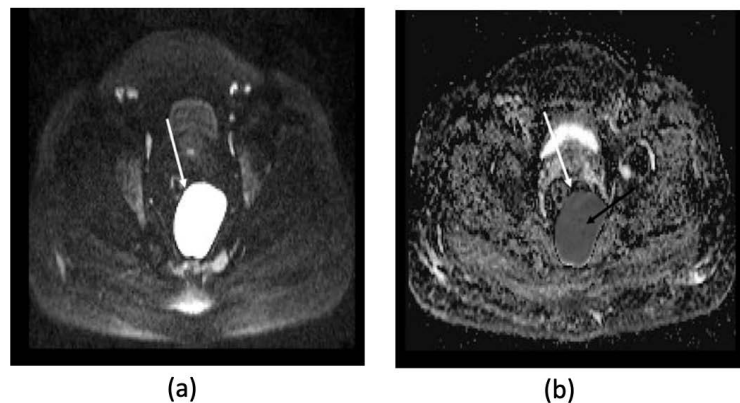




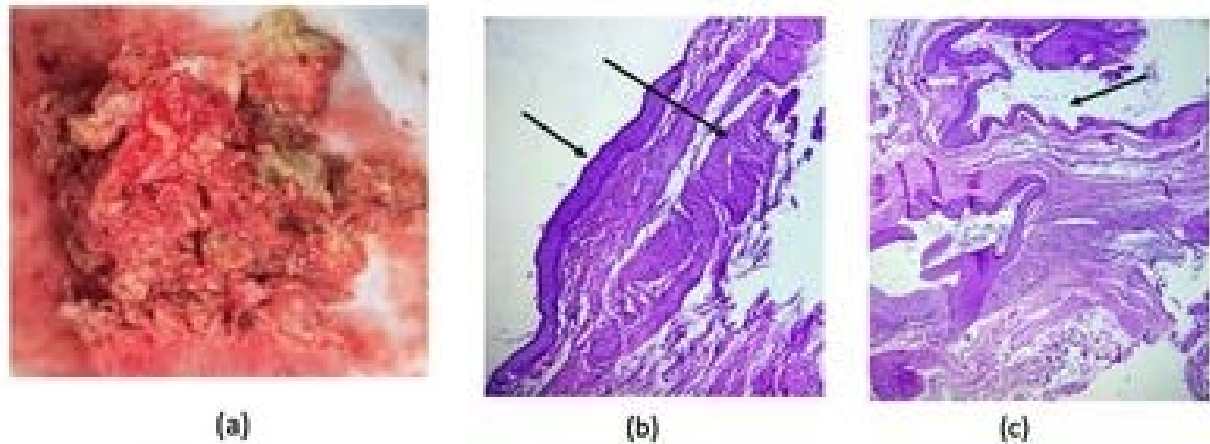
**Figure 3 (a,b,c) :** T2W Magnetic Resonance Images of 43 year old woman with abdominal pain and discomfort demonstrating a well-defined hyperintense lesion (arrows) with hypointense nodular specks within, in the presacral space.



**Figure 4 (a,b):** Axial in phase and out of phase MRI images of 43 year old woman with abdominal pain and discomfort demonstrating a well-defined cystic lesion of water signal in presacral space with few specks of signal loss within on out of phase images suggestive of presence of intracellular fat



**Figure 5 (a,b):** Axial DWI and ADC images of 43 year old woman with abdominal pain and discomfort demonstration diffusion restriction within the cyst with reduced ADC (white arrows) and few components within the cyst demonstrating even reduced ADC (black arrow) possibly due to hypercellularity.



**Figure 6 (a,b,c):** Gross specimen and hematoxylin – eosin microscopic images of 43 year old woman with abdominal pain and discomfort demonstrating the multilocular appearance of the cyst. On microscopy the lining of the cyst with squamous epithelium (Short arrow) and muscular layer (Long arrow) is noted. Multiple loculations noted within cyst (Arrow in image c).

**Table 1:** Differential diagnosis of tailgut

Lesion	Imaging features	Histological features
Sacrococcygeal teratoma	Heterogenous mass containing calcium, bone and mixed solid cystic tissue lesion. Seen in newborns and fetuses [13]	Composed of cells that are derivatives of 3 germ layers. Immature and /or mature tissue elements are seen.
Anterior sacral meningocele	Large cystic lesion in pre sacral region with posterior communication to the dural sac through the sacral defect. Associated with spina bifida, spinal dysraphism, bicornuate uterus and imperforate anus [14]	Cyst is composed of 2 layers with outer dural and inner arachnoid membranes. It contains cerebrospinal fluid with no neural elements.
Dermoid cyst	Uniloculated cystic lesion with macroscopic fat content identified in fat saturated (STIR) images.	Cyst wall lined by keratinising squamous epithelium and it shows skin adnexal structures with lumen containing keratinous debris and oily material. There is no smooth muscle within the cyst wall.
Epidermoid cyst	Diffusion restriction Uniloculated fond like cystic lesion with no enhancement	Cyst wall lined by keratinising squamous epithelium with lumen containing keratinous debris. There is no smooth muscle and adnexal structures within the cyst wall.
Rectal duplication cyst	Uniloculated cystic lesion in continuity with the rectum [15]	Cyst wall containing rectal mucosa and well-developed smooth muscle corresponding to muscular propria with mucin as its content. It shows continuity with rectum.
Abscess	Peripheral rim enhancing cystic lesion with adjacent inflammatory changes and diffusion restriction	Cavity containing inflammatory infiltrate with neutrophils and necrotic debris

**Table 2:** Summary table

Etiology	Developmental cystic anomaly that arises from vestiges of embryonic tailgut
Incidence	Estimated at 1 per 40,000 hospital admissions
Gender ratio	3-4: 1 with female preponderance
Age predilection	30 - 60 years
Treatment	Surgical excision
Prognosis	Depends on presence or absence of malignant transformation
Imaging findings	Multiloculated cystic lesion noted in pre sacral region with soft tissue density depending on the content of the cyst on CT, typically low signal on T1 Weighted & high signal on T2 Weighted images on MRI.

**KEYWORDS**

Tailgut cyst; Retrorectal space; Malignant transformation; Diffusion weighted imaging; Magnetic resonance imaging.

**ABBREVIATIONS**

TGC = Tailgut Cyst  
USG = Ultrasonography  
MRI = Magnetic Resonance Imaging  
CT = Computed Tomography  
DWI = Diffusion Weighted Imaging  
ADC = Apparent Diffusion Coefficient

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