EAS Journal of Radiology and Imaging Technology
Abbreviated Key Title: EAS J Radiol Imaging Technol
ISSN: 2663-1008 (Print) & ISSN: 2663-7340 (Online)
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-7 | Issue-5 | Sep-Oct-2025 | DOI: https://doi.org/10.36349/easjrit.2025.v07i05.002

Original Research Article

Correlation of Imaging (X-ray and USG) with Histopathological Findings in Sacrococcygeal Teratoma among Infants and Toddlers in a Tertiary Pediatric Hospital

Dr. Mahmuda Monowara[1]*, Dr. Mashud Pervej[2], Dr. Md. Mahbub Hossain[3], Dr. Shakila Jannat[4], Dr. Shammi Ara Shahida[5]

[1]Associate Professor, Department of Radiology and Imaging, Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh
[2]Professor, Department of Histopathology, Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh
[3]Associate Professor, Department of Radiology and Imaging, Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh
[4]Assistant Professor, Department of Histopathology, Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh
[5]Assistant Professor, Department of Radiology and Imaging, Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh

Article History
Received: 04.07.2025
Accepted: 06.09.2025
Published: 10.09.2025

Journal homepage:
https://www.easpublisher.com

Quick Response Code

Abstract: ***Background*:** Sacrococcygeal teratoma (SCT) is the most common congenital tumor in infants, with early diagnosis and accurate preoperative characterization being crucial for optimal management. Imaging modalities, particularly X-ray and ultrasonography (USG), play a key role in identifying tumor features and guiding surgical planning. This study aimed to correlate imaging findings with histopathological outcomes in infants and toddlers with SCT. ***Methods*:** This cross-sectional observational study was conducted at the Department of Radiology and Imaging, Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh, from December 2020 to March 2025. A total of 40 infants and toddlers with SCT who underwent surgical excision were included consecutively. X-ray and USG evaluations were performed preoperatively, assessing features such as soft tissue mass, calcifications, cystic and solid components, mixed echogenicity and vascularity. Histopathology was considered the gold standard, classifying tumors as mature or immature. Imaging findings were correlated with histopathological diagnosis. ***Results*:** Among the 40 patients, 55% were aged 6–12 months and 65% were female. Histopathology revealed 38 (95%) mature and 2 (5%) immature teratomas. X-ray showed a soft tissue mass in 75% of cases, calcifications in 30% and bony involvement in 10%. USG demonstrated cystic components in 70%, solid components in 40%, mixed echogenicity in 35%, calcifications in 25% and vascularity in 15%. Imaging correctly identified 38 mature tumors as benign, while 2 were immature tumors. ***Conclusion*:** Conventional X-ray and USG demonstrate high concordance with histopathology and effectively identify mature SCTs, while highlighting features suggestive of immaturity. These modalities remain valuable tools for preoperative assessment, especially in resource-limited settings.

Keywords: Sacrococcygeal Teratoma, Infant, Ultrasonography, X-ray, Histopathology, Imaging Correlation.

INTRODUCTION

Sacrococcygeal teratoma (SCT) is the most common congenital tumor in neonates and infants, arising from pluripotent cells at the caudal end of the embryo. Its incidence is estimated at 1 in 35,000 to 40,000 live births, with a female predominance reported in most series [1]. The tumor varies in size, composition and anatomical extension and can present with both cystic and solid components. Early diagnosis and accurate characterization are essential because the prognosis depends largely on timely surgical excision, histopathological nature of the lesion and the presence or absence of malignant elements [2].

Imaging plays a central role in the preoperative evaluation of SCT. Plain radiography (X-ray) is often the initial modality, useful for detecting soft tissue masses, calcification and bony involvement [3]. However, ultrasonography (USG) is more frequently employed in pediatric patients due to its non-invasiveness, absence of ionizing radiation and ability to distinguish between

***Corresponding Author:** Dr. Mahmuda Monowara
Associate Professor, Department of Radiology and Imaging, Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh

cystic and solid elements. Doppler assessment further adds value by identifying internal vascularity, which may be suggestive of a more aggressive lesion [4]. Despite these advantages, imaging cannot always reliably differentiate between mature and immature teratomas, which have different clinical implications [5]. Mature teratomas are generally benign, whereas immature teratomas may carry a risk of malignant transformation and recurrence, necessitating closer follow-up and sometimes adjuvant therapy [6].

Histopathological examination remains the gold standard for definitive diagnosis and classification of SCT. It provides critical information about the maturity of the tumor, the presence of immature neuroectodermal tissue and any malignant transformation [7]. While radiological findings can guide clinical suspicion, correlation with histopathology is essential for accurate diagnosis and treatment planning [8]. Several studies across the world have attempted to evaluate the diagnostic accuracy of imaging in predicting histopathological outcomes in SCT [9, 10].

In a resource-limited setting, where advanced cross-sectional modalities such as magnetic resonance imaging (MRI) are not always accessible, reliance on conventional X-ray and ultrasonography is common [11]. Therefore, understanding the diagnostic utility of these widely available modalities in correlation with histopathological findings is crucial. Such evidence will not only strengthen clinical decision-making but also reduce unnecessary investigations, optimize resource utilization and improve patient care [12].

The present study was undertaken to evaluate the imaging characteristics of sacrococcygeal teratoma on X-ray and ultrasonography and to correlate these findings with histopathological outcomes in infants and toddlers managed at a tertiary pediatric hospital in Bangladesh. By analyzing both modalities against the histopathological gold standard, this study aimed to assess the diagnostic value of conventional imaging and determine its role in predicting tumor maturity.

METHODOLOGY & MATERIALS

This cross-sectional observational study was conducted in the Department of Radiology and Imaging, Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh, over a period of four years and three months, from December 2020 to March 2025. A total of 40 infants and toddlers diagnosed with sacrococcygeal teratoma (SCT) and subsequently managed surgically were included in the study. Patients were selected consecutively and those with incomplete records or inadequate histopathological confirmation were excluded. All enrolled patients underwent initial imaging evaluation with plain radiography (X-ray) and ultrasonography (USG) prior to surgery. X-ray studies were performed in standard anteroposterior and lateral projections and features such as the presence of a soft tissue mass, calcification and bony involvement were assessed. Ultrasonography was performed using high-frequency linear and convex probes and findings including cystic components, solid elements, mixed echogenicity, calcification and vascularity on Doppler were recorded. Imaging interpretations were made by experienced pediatric radiologists who were blinded to the histopathological outcomes. Following surgical excision of the tumor, all specimens were submitted for histopathological examination in the pathology department. Histopathological diagnosis was considered the gold standard and was classified as mature or immature teratoma based on established microscopic criteria. Data on demographic characteristics, imaging findings and histopathology were collected in a structured proforma. The correlation between imaging impressions and histopathological diagnosis was analyzed and diagnostic performance of imaging in predicting immature lesions was calculated in terms of sensitivity, specificity, positive predictive value and negative predictive value. All data were entered into Microsoft Excel and analyzed using SPSS version 25. Descriptive statistics were presented as frequency and percentage, while chi-square or Fisher's exact test was applied where appropriate to assess associations between imaging features and histopathological types.

RESULTS

Table 1: Demographic Characteristics of Patients (n = 40)

Variable	Frequency (n)	Percentage (%)
Age group		
6–12 months	22	55
13-18 months	18	45
Sex		
Male	14	35
Female	26	65

Table 1 Demographic characteristics of 40 infants and toddlers with sacrococcygeal teratoma. More than half of the patients (55%) were between 6–12 months of age, while 45% were between 13–18 months. A female predominance was observed, with 65% of the cases occurring in girls compared to 35% in boys.

Table 2: Histopathological Diagnosis of Sacrococcygeal Teratoma (n = 40)

Histopathological Type	Frequency (n)	Percentage (%)
Mature Teratoma	38	95
Immature Teratoma	2	5

Table 2 shows the histopathological diagnosis of sacrococcygeal teratoma among the study population. Mature teratoma was the predominant type, observed in 38 cases (95%), while immature teratoma was identified in only 2 cases (5%).

Table 3: X-ray Findings in Sacrococcygeal Teratoma (n = 40)

X-ray Features	Present n (%)	Absent n (%)
Soft tissue mass	30 (75.0)	10 (25.0)
Calcification	12 (30.0)	28 (70.0)
Bony involvement	4 (10.0)	36 (90.0)

Table 3 shows the X-ray findings of sacrococcygeal teratoma in the study cohort. A soft tissue mass was the most frequent feature, present in 30 patients (75%). Calcification was detected in 12 cases (30%), while bony involvement was relatively uncommon, noted in only 4 patients (10%).

Table 4: Ultrasonography Findings in Sacrococcygeal Teratoma (n = 40)

USG Features	Present n (%)	Absent n (%)
Cystic component	28 (70.0)	12 (30.0)
Solid component	16 (40.0)	24 (60.0)
Mixed echogenicity	14 (35.0)	26 (65.0)
Calcification (echogenic foci)	10 (25.0)	30 (75.0)
Vascularity (on Doppler)	6 (15.0)	34 (85.0)

Table 4 shows the ultrasonography (USG) findings in infants and toddlers with sacrococcygeal teratoma. A cystic component was observed in the majority of cases (28, 70%), while a solid component was present in 16 patients (40%). Mixed echogenicity was noted in 14 cases (35%), calcification in 10 cases (25%) and internal vascularity on Doppler imaging was relatively uncommon, detected in 6 patients (15%).

Table 5: Correlation of Imaging Findings with Histopathology (n = 40)

Imaging Impression	Histopathological Impression		Total
	Mature	Immature	
Benign	38	2	40
Total	**38**	**2**	**40**

Table 5 shows the correlation between imaging impressions and histopathological findings in sacrococcygeal teratoma. Of the 38 cases interpreted as benign or likely mature on imaging, while 2 were immature tumors.

DISCUSSION

Sacrococcygeal teratoma (SCT) is the most common congenital tumor in neonates and infants, with a higher incidence in females, which aligns with our finding of 65% female predominance in the study cohort. Saha *et al*., and Brillantino *et al*., similarly reported female preponderance and emphasized the importance of early diagnosis for optimal outcomes [13, 14]. Our study demonstrated that the majority of SCTs were mature (95%), consistent with previous reports indicating that mature teratomas constitute the predominant histopathological type in infants [15, 16]. Immature teratomas were rare (5%) in our series, reflecting their lower prevalence in this age group.

Imaging plays a pivotal role in the preoperative evaluation of SCT. In our study, X-ray identified a soft tissue mass in 75% of patients, with calcifications in 30% and bony involvement in 10%. These findings are consistent with the literature, as Rossini *et al*., highlighted the utility of plain radiography in detecting soft tissue masses and calcified elements in pediatric sacrococcygeal lesions [17]. Although X-ray provides basic structural information, it may underestimate internal tumor complexity, especially in differentiating mature from immature components.

Ultrasonography proved more informative, revealing cystic components in 70% of cases, solid elements in 40%, mixed echogenicity in 35%, calcifications in 25% and vascularity on Doppler in 15%. This distribution aligns with the observations of Zhou *et al*., and Yadav *et al*., who reported that USG effectively delineates cystic and solid components, thereby assisting in preoperative planning [18, 19]. The presence of vascularity and mixed echogenicity in some lesions may

indicate a higher likelihood of immaturity or potential malignancy, a finding echoed in Sunil Kumar *et al*., [20].

The correlation between imaging and histopathology in our study demonstrated high concordance. Among the 40 cases 38 cases interpreted as benign on imaging, all were confirmed as mature on histopathology. Of the two cases were confirmed as immature. This underscores the diagnostic value of conventional imaging, although a small subset of mature lesions may appear immature on USG, as reported by Choden *et al*., and Lu *et al*., [15-21]. Thus, while imaging provides critical guidance, histopathological confirmation remains the gold standard.

Our findings highlight that in a resource-limited setting, conventional imaging modalities such as X-ray and USG can provide valuable preoperative information. Abbas *et al*., emphasized that when advanced modalities like MRI are unavailable, USG combined with plain radiography can effectively guide surgical decision-making [22]. Similarly, Cass and Brillantino *et al*., noted that early imaging helps in assessing tumor size, cystic versus solid composition and potential involvement of adjacent structures, which is crucial for minimizing surgical complications [14-23]. Furthermore, our study supports previous reports that the vast majority of SCTs in infancy are mature and have favorable outcomes after complete excision [13-16].

Limitations of the Study

Limitations of our study include the small sample size and the low number of immature teratomas, which limited detailed statistical analysis of diagnostic performance for these lesions. Despite these limitations, our findings provide locally relevant evidence supporting the use of X-ray and USG in the preoperative evaluation of SCT in infants and toddlers. Future multicenter studies with larger sample sizes and inclusion of advanced imaging modalities could further refine diagnostic accuracy and risk stratification in this population.

CONCLUSION

In conclusion, this study demonstrates that conventional imaging, particularly ultrasonography, correlates well with histopathological findings in SCT. X-ray provides complementary structural information, while USG effectively delineates cystic and solid components and identifies features suggestive of immaturity. These findings support the continued use of X-ray and USG as accessible, reliable tools for preoperative assessment, especially in resource-constrained settings.

Financial Support and Sponsorship: No funding sources.

Conflicts of Interest: There are no conflicts of interest.

REFERENCES

1. Mosleh MM, Heo TG, Shin HB, Sohn MJ. Sacrococcygeal teratomas: a case-based review from the perspective of individual multidisciplinary experts. Child's Nervous System. 2023 Jan;39(1):57-64.
2. Yousif SS, Ahmad AH. The Outcome of Sacrococcygeal Teratoma: A Multicenter Study in Iraq. Al-Anbar Medical Journal. 2021 Jan 1;17(1).
3. Snehit S. A Study on Pelvic Masses in Female Patients-Ultrasonography and Doppler Findings and its Clinical and Histopathological Correlation Wherever Necessary (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India)).2013.
4. Kwasniewicz P, Wieczorek-Pastusiak J, Romaniuk-Doroszewska A, Bekiesinska-Figatowska M. Congenital Tumors—Magnetic Resonance Imaging Findings with Focus on Rare Tumors. Cancers. 2023 Dec 20;16(1):43.
5. Krekora M, Zych-Krekora K, Blitek M, Kęsiak M, Piaseczna-Piotrowska A, Łukaszek S, Krasomski G, Słodki M, Szaflik K, Respondek-Liberska M. Difficulties in prenatal diagnosis of tumour in the fetal sacrococcygeal area. Ultrasound. 2016 May;24(2):119-24.
6. Halleran DR, Vilanova-Sanchez A, Reck CA, Maloof T, Weaver L, Stanek J, Levitt MA, Wood RJ, Aldrink JH. Presacral masses and sacrococcygeal teratomas in patients with and without anorectal malformations: a single institution comparative study. Journal of Pediatric Surgery. 2019 Jul 1;54(7):1372-8.
7. Zhou P, Liu S, Yang H, Jiang Y, Liu X, Liu D. Signet ring cell carcinoma arising from sacrococcygeal teratoma: a case report and review of the literature. Journal of International Medical Research. 2019 May;47(5):2234-9.
8. Shelmerdine SC, Sebire NJ, Arthurs OJ. Perinatal post-mortem ultrasound (PMUS): radiological-pathological correlation. Insights into imaging. 2019 Aug 21;10(1):81.
9. Falcone Jr RA, Knott AW, Rafferty JF, Warner BW. Sacrococcygeal teratoma and teratocarcinoma. InSeminars in Colon and Rectal Surgery 2004 Mar 1 (Vol. 15, No. 1, pp. 19-25). WB Saunders.
10. Siggaard LW, Ellebæk MB, Christensen LG, Brok J, Sperling L, Jørgensen PH, Johansen LS, Schomerus E, Nissen KB, Rathe M. Sacrococcygeal teratomas in children and adolescents–a Danish 26-year retrospective cohort study. Journal of Pediatric Surgery. 2025 Jun 11:162412.
11. Kaiser L, Vizer M, Arany A, Veszprémi B. Correlation of prenatal clinical findings with those observed in fetal autopsies: pathological approach. Prenatal diagnosis. 2000 Dec;20(12):970-5.
12. Vimercati A, Grasso S, Abruzzese M, Chincoli A, de Gennaro A, Miccolis A, Serio G, Selvaggi L, Fascilla FD. Correlation between ultrasound diagnosis and autopsy findings of fetal

malformations. Journal of prenatal medicine. 2012 Apr;6(2):13.
13. Saha L, Wahbi OH, Ramos EA, Abozenah Y, Ghorabah M, Corbally M. Case report of a rapidly growing sacrococcygeal teratoma: a planned preterm cesarean delivery may improve fetal outcome. J. Bahrain Med. Soc. 2022 Jun 30;34:57-61.
14. Brillantino C, Errico ME, Minelli R, Gaglione G, Pirisi P, Rossi A, Menna BF, Santarsiere M, Rumolo M, Rossi E. Giant malignant sacrococcygeal germ cell tumor in a newborn: A rare case report. Radiology Case Reports. 2022 Jul 1;17(7):2416-23.
15. Choden D, Dorji KS, Choden S. Radio-pathological correlation of a retroperitoneal teratoma in a 2-year-old girl: a case report. Bhutan Health Journal. 2021 Nov 18;7(2):28-31.
16. Palo S, Mangla M, Gabbeta S, Motwani R. Demystifying Fetus-in-fetu: a systematic review of its clinical and pathological attributes. Journal of Indian Association of Pediatric Surgeons. 2024 Sep 1;29(5):406-16.
17. Rossini B, Carnevale A, Parenti GC, Zago S, Sigolo G, Feletti F. The Role of Plain Radiography in Assessing Aborted Foetal Musculoskeletal Anomalies in Everyday Practice. Journal of Imaging. 2024 Sep 27;10(10):242.
18. Zhou L, Pan R, Zhang X, He L. The ultrasound diagnosis of fetal gastric teratoma. The Chinese-German Journal of Clinical Oncology. 2010 Nov;9(11):666-8.
19. Yadav A, Yadav BS, Jain S. ULTRASONOGRAPHY..... A DIAGNOSTIC TOOL FOR SUPERFICIAL SOFT. Head and neck. 2017 Jul 14;11:22.
20. Sunil Kumar P, Ragidi R, Bingi S, Fatima S. A PROSPECTIVE OBSERVATIONAL STUDY ON ROLE OF MULTIDETECTOR COMPUTED TOMOGRAPHY IN THE DIAGNOSIS OF ABDOMINAL TUMORS WITH HISTOPATHOLOGICAL CORRELATION IN PEDIATRIC AGE GROUP IN A TERTIARY CARE HOSPITAL. International Journal of Medicine & Public Health. 2025 Jul 1;15(3).
21. Lu T, Ma J, Yang X. A rare case of fetus in fetu in the sacrococcygeal region: CT and MRI findings. BMC pediatrics. 2021 Dec 15;21(1):575.
22. Abbas HM, Hamed ST, Gaafar HM, Amer MM, Sayed SB. Additive value of fetal MRI to different ultrasound modalities in diagnosis of fetal GIT and abdominal wall anomalies. Egyptian Journal of Radiology and Nuclear Medicine. 2023 Mar 24;54(1):59.
23. Cass DL. Fetal abdominal tumors and cysts. Translational Pediatrics. 2021 May;10(5):1530.

Cite This Article: Mahmuda Monowara, Mashud Pervej, Md. Mahbub Hossain, Shakila Jannat, Shammi Ara Shahida (2025). Correlation of Imaging (X-ray and USG) with Histopathological Findings in Sacrococcygeal Teratoma among Infants and Toddlers in a Tertiary Pediatric Hospital. *EAS J Radiol Imaging Technol, 7*(5), 109-113.