Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Mediastinal Mature Teratoma Complicated with Complex Rupture into the Lung: A Case Report and Literature Review

Ines Mallek

ines.mallek95@gmail.com

Department of Pathology, Abderrahmen Mami Hospital, Ariana

Rahma Ayadi

Department of Pathology, Abderrahmen Mami Hospital, Ariana

Rahma Yaiche

Department of Pathology, Abderrahmen Mami Hospital, Ariana

Yasmine Dhouibi

Department of Pathology, Abderrahmen Mami Hospital, Ariana

Mahdi Abdennadher

Department of Thoracic Surgery, Abderrahmen Mami Hospital, Ariana, Tunisia

Emna Braham

Department of Pathology, Abderrahmen Mami Hospital, Ariana

Olfa Ismail

Department of Pathology, Abderrahmen Mami Hospital, Ariana

Nadia Ben Jamaa

Tunis El Manar University

Aida Ayadi

Department of Pathology, Abderrahmen Mami Hospital, Ariana

Case Report

Keywords: Mediastinal teratoma, Mature teratoma, Hemoptysis, Germ cell tumor, Lung invasion, Case report

Posted Date: June 29th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10094289/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Additional Declarations: No competing interests reported.

Abstract

Introduction: Mediastinal teratomas are the most common extragonadal germ cell tumors and are typically located in the anterior mediastinum. They are usually benign and asymptomatic. However, rupture into adjacent structures such as the lung or bronchial tree is an uncommon but clinically significant complication that may mimic malignancy or infection, leading to diagnostic challenges.

Case presentation: We report a case managed at Abderrahman Mami University Hospital of a 38-year-old man presenting with a two-year history of chronic cough and recurrent hemoptysis. Thoracic computed tomography revealed a large heterogeneous anterior mediastinal mass containing fat, cystic, calcified, and soft tissue components, extending into the right upper lobe. The presence of intralesional air and surrounding inflammatory changes suggested rupture. Intraoperatively, a direct communication between the cystic lesion and the pulmonary parenchyma was identified, confirming rupture into the lung. Surgical resection was performed, requiring right upper lobectomy due to vascular and parenchymal involvement. Gross examination showed a cystic lesion containing sebaceous material and hair, extending into the lung tissue. Histopathological analysis confirmed a mature cystic teratoma composed of well-differentiated tissues derived from multiple germ layers, without evidence of immature or malignant components. Surgical margins were free of tumor, and the postoperative course was uneventful.

Discussion: Rupture of mediastinal teratomas most frequently involves the lung or pleural cavity and presents with nonspecific respiratory symptoms such as hemoptysis, cough, or infection-like features. Imaging findings may be misleading, often simulating malignancy due to irregular borders, intralesional air, and inflammatory changes. In our case, rupture was confirmed intraoperatively by direct bronchopulmonary communication. A 20-year literature review identified nine similar cases, with pulmonary involvement representing the most common site of rupture. All reported cases were managed surgically, with favorable outcomes despite technical challenges related to inflammation and adhesions.

Conclusion: Ruptured mature mediastinal teratomas represent a rare but important clinical entity. Their atypical presentation requires a high index of suspicion to avoid misdiagnosis and inappropriate management. Recognition of rupture, particularly when confirmed intraoperatively, is essential to guide appropriate surgical management and achieve optimal outcomes**.**

INTRODUCTION

Germ cell tumors (GCTs) are the most common neoplasms in adolescents and young adults, accounting for approximately 15% of all solid tumors in individuals aged 15–29 years [1]. They arise in both gonadal sites, such as the testes and ovaries, and in extragonadal locations, including the mediastinum, central nervous system, and sacrococcygeal region, and are classified as benign, malignant, or of uncertain malignant potential [2].

Mediastinal teratomas, a subset of extragonadal GCTs, are most frequently located in the anterior mediastinum. They are usually benign and asymptomatic, with up to 53% detected incidentally on imaging performed for unrelated reasons. Clinical manifestations typically occur when the tumor enlarges or involves adjacent structures such as the lung, pleura, or bronchial tree.

Rupture of a mediastinal cystic teratoma is an uncommon but clinically significant event that is invariably symptomatic. Although reported rupture rates range from 36.0% to 41.0%, these figures are based on limited case

series and should be interpreted with caution [3,4].

We report a case of a ruptured mature mediastinal teratoma with pulmonary involvement, presenting with hemoptysis and radiological findings suggestive of malignancy, managed at Abderrahman Mami University Hospital. A 20-year literature review identified nine similar cases. The aim of this study is to highlight the diagnostic challenges, radiological features, and surgical management of this rare but clinically significant entity.

CASE PRESENTATION

A 38-year-old male with a history of smoking (recently ceased) presented with a two-year history of persistent dry cough. Over the months preceding admission, his clinical course was marked by recurrent episodes of hemoptysis occurring approximately every two weeks, without associated systemic symptoms such as fever or weight loss. On physical examination, the patient was hemodynamically stable, with normal respiratory parameters and no palpable lymphadenopathy. Laboratory investigations were within normal limits. Thoracic computed tomography (CT) revealed a large anterior mediastino-pulmonary mass located in the right hemithorax, measuring approximately 93 × 67 × 62 mm. The lesion exhibited heterogeneous density with a combination of fatty, cystic, calcified, and soft tissue components. It extended into the parenchyma of the right upper lobe, with involvement of segmental bronchi and associated ground-glass opacities consistent with alveolar hemorrhage. Serial imaging demonstrated a volumetric increase of approximately 28%. No pleural or pericardial effusion was observed, and no distant lesions were identified. Given these radiological findings, the lesion was highly suggestive of a germ cell tumor, with concern for malignancy due to its progressive growth and local invasion. The case was discussed in a multidisciplinary tumor board, and surgical management was recommended. The patient initially underwent tumorectomy via video-assisted thoracic surgery; however, intraoperative assessment revealed deep tumor infiltration into the right upper lobe, particularly at the level of segmental vascular structures and the superior pulmonary vein. Consequently, a right upper lobectomy was performed via lateral thoracotomy to ensure complete resection with clear margins.

Gross examination of the surgical specimen consisted of a right upper lobectomy measuring 14 × 9 × 4.5 cm, containing a well-defined cystic lesion measuring approximately 10 cm in greatest dimension **(figure 1)** . On sectioning, the lesion was unilocular with a thick wall and contained abundant pasty, sebaceous material, associated with multiple tufts of hair **(figure 2)** . The inner surface showed irregular whitish nodular areas. Histopathological examination of multiple sampled sections demonstrated a cyst wall lined by keratinizing stratified squamous epithelium associated with well-developed pilosebaceous adnexal structures. In addition, a variety of mature tissues derived from different germ layers were identified, including respiratory-type epithelium, mature adipose tissue, bundles of smooth muscle, and pancreatic tissue. The adjacent pulmonary parenchyma showed congestive and inflammatory changes without evidence of tumor infiltration beyond the resected margins. Bronchial and vascular margins were free of tumor involvement. A peribronchial lymph node measuring 1.5 cm in greatest dimension was entirely submitted for histological evaluation and showed reactive features without evidence of malignancy. A separate bronchial resection specimen measuring 2 cm demonstrated inflammatory bronchial mucosa without dysplasia or tumor involvement. Importantly, no cytological atypia, mitotic activity, necrosis, or immature or malignant component was identified across all examined sections **(Figure 3) .**

The overall histopathological findings were consistent with a mature cystic teratoma (pluritissular) of the anterior mediastinum with extension into the lung parenchyma.

The postoperative course was uneventful, with satisfactory clinical recovery.

Review of Literature

A total of nine cases of ruptured mature mediastinal teratomas reported over a 20-year period were identified. Patients ranged in age from 3 to 29 years (median age, approximately 16 years), with no clear sex predominance (five females and four males). The lung was the most frequent site of rupture, followed by the pleural cavity. A summary of the reported cases and their clinicopathological characteristics is provided in Table 1

Pulmonary involvement was observed in several reported cases, including those described by Anderson et al.[6] , Badar et al.[10], Dharma et al.[8], Pikin et al.[12], Yu et al., and Serraj et al [9].

Bronchopulmonary involvement commonly presented with respiratory symptoms such as hemoptysis, cough, fever, or recurrent pulmonary infections, and in rare instances, expectoration of hair or sebaceous material was described. Pleural extension was associated with pleural effusion, empyema, or acute respiratory distress. Occasional cases showed complex, multi-compartment rupture involving combinations of lung, bronchus, pleura, and chest wall.

Clinical presentation was often heterogeneous and misleading, frequently mimicking infectious conditions such as pneumonia or tuberculosis, or suggesting malignancy due to aggressive imaging features. Radiologically, lesions typically appeared as heterogeneous anterior mediastinal masses with mixed cystic and solid components, extending into adjacent lung parenchyma or the bronchial tree. Findings such as irregular margins, cavitation, air–fluid levels, and surrounding inflammatory changes were commonly observed. In some cases, fistulous communication with the bronchial tree was identified.

All patients underwent surgical resection. Despite technical challenges related to inflammation and adhesions, outcomes were uniformly favorable, with good postoperative recovery and no reported mortality.

DISCUSSION

Mature mediastinal teratomas are benign germ cell tumors composed of well-differentiated tissues derived from the three embryonic germ layers. Despite their benign nature, they are resistant to both chemotherapy and radiotherapy, making complete surgical excision the treatment of choice [2]. They may exhibit marked histological heterogeneity, including the coexistence of multiple germ cell components within a single lesion (mixed germ cell tumors) [14]. Rarely, somatic malignant transformation may occur, requiring more aggressive multimodal management [15]. The mediastinum is the most common extragonadal site of germ cell tumors, with teratomas representing the predominant subtype, typically arising in the anterior compartment [16]. They occur at any age but are more frequently observed in young adults, without a clear sex predilection [16]. Histologically, they are classified as mature (benign) or immature (malignant) based on the presence of immature tissue elements [17]. Although usually slow-growing, they may extend into adjacent structures as they enlarge or rupture, involving the lung, bronchial tree, pleural cavity, pericardium, or great vessels [18]. Communication with the tracheobronchial tree may result in hemoptysis or trichoptysis, whereas intrapulmonary extension more often presents with chest pain, dyspnea, cough, and fever [19]. These manifestations frequently mimic infectious or malignant conditions, particularly pulmonary tuberculosis in endemic regions.

Epidemiology and Clinical Features of Rupture: Rupture of anterior mediastinal teratomas is an uncommon yet well-recognized complication, with fewer than 60 cases reported in the literature [20]. It has also been referred to as pulmonary parenchymal teratoma fistula [8]. Reported patient ages range from 3 to 58 years, with a median of 24 years [21]. The vast majority of cases involve mature teratomas (approximately 96%), and nearly half of patients undergo surgical management within one week of symptom onset [21].

Clinical presentation is heterogeneous. The most frequently reported symptoms are chest pain (63%) and dyspnea (38%), followed by cough and fever (18% each) [21]. Additional manifestations include hemoptysis, mediastinitis, pneumothorax, and hemothorax [22]. Rupture most commonly affects the lung (29%) and pleural cavity (27%), with less frequent extension to the pericardium [3].

In rare instances, more complex patterns of spread may occur, involving multiple compartments simultaneously. Exceptional cases have described extension into the lung, like our case , or bronchial tree, and even the skin, resulting in cutaneous fistula formation with discharge of sebaceous material and hair, a presentation analogous to trichoptysis.

Pathophysiology of Rupture : The mechanisms underlying rupture remain incompletely understood and are likely multifactorial. Proposed contributing factors include ischemia, infection, inflammation, and enzymatic autodigestion [3]. The confined anatomy of the mediastinum may predispose these tumors to rupture as they enlarge, in contrast to the more distensible abdominal or pelvic cavities.

Cystic teratomas may contain ectopic pancreatic or salivary tissue capable of secreting proteolytic enzymes, leading to progressive autolysis of the cyst wall. This process induces chronic inflammation, structural weakening, and ultimately rupture or fistula formation [4]. Enzymatic degradation of adjacent tissues may further facilitate local extension.

In addition, secondary infection, possibly related to bronchial compression or obstruction, can exacerbate inflammation and contribute to rupture, while rupture itself may promote infectious complications. Importantly, tumor size and cyst wall thickness do not appear to significantly influence the risk of rupture [3].

In the our case, ectopic pancreatic tissue was identified, supporting the role of enzymatic mechanisms in the pathogenesis of rupture.

Imaging Features and Diagnostic Challenges : Computed tomography (CT) is the imaging modality of choice for evaluating mediastinal teratomas and identifying associated complications. These tumors typically appear as well-circumscribed, heterogeneous masses containing varying proportions of fat, soft tissue, fluid, and calcifications, a combination highly suggestive of the diagnosis [16]. In the setting of rupture, imaging findings may become atypical and misleading. Features suggestive of rupture include marked internal heterogeneity, ill-defined margins, disruption of fatty components, and inflammatory changes in adjacent structures such as the lung, pleura, or pericardium [19]. Additional findings may include bronchial communication, intralesional air, and increased attenuation of mediastinal fat. The radiological appearance may mimic malignancy due to irregular borders and invasion-like patterns, or infection when associated with consolidation, effusion, or abscess formation. The absence of a well-defined cystic component was likely secondary to rupture. Beyond diagnosis, CT also plays a crucial role in preoperative planning by assessing adhesions and involvement of vital mediastinal structures. On imaging, mediastinal teratomas appear as heterogeneous masses containing fat, calcifications,

and soft tissue components. Atypical features may occasionally mimic malignancy, leading to diagnostic uncertainty.

In our case, the aggressive radiological features, including progressive growth and apparent local invasion, initially raised concern for malignancy. The clinical presentation with cough and recurrent hemoptysis further expanded the differential diagnosis to include infectious or inflammatory processes. Definitive histopathological examination, however, excluded malignancy and confirmed a benign mature teratoma.

Management and Surgical Considerations : Surgical resection remains the cornerstone of treatment and is typically curative. However, rupture considerably increases operative complexity due to dense adhesions and inflammatory involvement of adjacent structures, including the phrenic nerve, aorta, vena cava, and pulmonary vessels [23]. These conditions may compromise complete excision and increase the risk of intraoperative complications.

Early diagnosis is therefore crucial, not only to confirm the benign nature of the lesion and rule out malignant transformation, but also to prevent serious complications such as hemoptysis, acute respiratory distress, or cardiac tamponade [23].

In our case, the postoperative period was uneventful, with satisfactory clinical recovery.

CONCLUSION

Although mature mediastinal teratomas are benign and typically associated with an excellent prognosis, rupture represents a significant complication that markedly alters both clinical presentation and management strategies [3]. Accurate radiological evaluation, together with definitive histopathological confirmation, is essential to establish the diagnosis and guide appropriate treatment decisions [24].

Ruptured mediastinal teratomas should be considered a distinct clinical entity, characterized by variable and often misleading features. Their presentation frequently mimics infectious or malignant conditions, which may result in diagnostic delays or inappropriate initial management [21]. A high index of suspicion is therefore required, particularly in patients presenting with atypical thoracic symptoms and anterior mediastinal masses [21].

Pulmonary involvement represents the most common pattern of rupture, reflecting the close anatomical relationship between the anterior mediastinum and the lung parenchyma [25]. Communication with the airway may lead to hemoptysis or, more rarely, expectoration of hair or sebaceous material, whereas pleural extension typically presents with effusion or empyema [22].

This case illustrates an uncommon presentation of a mature mediastinal teratoma with pulmonary involvement mimicking malignancy. Awareness of this entity is essential to avoid overtreatment and to ensure timely and appropriate surgical intervention. Early management remains critical to prevent complications and optimize clinical outcomes [23].

Declarations

Participant consent to publish: Written informed consent was obtained from the patient for participation and publication of this clinical case report and any accompanying images.

Acknowledgments: The authors have no acknowledgments to declare.

Disclosure Statement: The authors declare no conflicts of interest.

Ethics Statement and Patient Consent

This retrospective study was conducted in accordance with the ethical standards of the institutional and national research committees and with the principles of the Declaration of Helsinki. Ethical approval was obtained from the appropriate Institutional Review Board/Ethics Committee.

Due to the retrospective nature of the study and the use of anonymized patient data, the requirement for informed patient consent was waived by the Ethics Committee. All patient information was handled confidentially and de-identified prior to analysis.

Funding

No funding was received for this study.

Conflict of Interest

The authors declare that they have no competing interests.

Author Contribution

Ines Mallek conceived the study, collected and analyzed the pathological data, performed the literature review, and drafted the manuscript. Rahma Ayadi, Rahma Yaiche, and Yasmine Dhouibi contributed to data collection, literature review, and manuscript revision. Mahdi Abdennadher managed the patient surgically and provided clinical data. Emna Braham, Olfa Ismail, and Nadia Ben Jamaa contributed to pathological interpretation and critical revision of the manuscript. Aida Ayadi supervised the study, contributed to data interpretation, and critically revised the manuscript for important intellectual content. All authors reviewed, approved, and agreed to the final version of the manuscript.

Data Availability

The data supporting the findings of this study are included within the article. Additional anonymized data are available from the corresponding author upon reasonable request.

References

1. Frazier AL, Amatruda J. Pediatric germ cell tumors. In: Orkin SH, Fisher DE, Look TA, Lux SE, editors. Oncology of infancy and childhood. Philadelphia: Saunders Elsevier; 2009. pp. 911–62.
2. Pierce JL, Frazier AL, Amatruda JF. Pediatric germ cell tumors: a developmental perspective. Adv Urol. 2018;2018:9059382.
3. Choi SJ, Lee JS, Song KS, Lim TH. Mediastinal teratoma: CT differentiation of ruptured and unruptured tumors. AJR Am J Roentgenol. 1998;171(3):591–4.

4. Sasaka K, Kurihara Y, Nakajima Y, Seto Y, Endo I, Ishikawa T, et al. Spontaneous rupture of benign mature mediastinal teratomas. AJR Am J Roentgenol. 1998;170(2):323–8.
5. Coelho FL, Correia MR, Carvalho F. Mature mediastinal teratoma complicated with spontaneous rupture into the pleural cavity: a report of a pediatric case. J Belg Soc Radiol. 2025;109(1):5.
6. Anderson JE, Taylor MR, Romberg EK, Riehle KJ, Kapur R, Crocker ME, et al. Mature mediastinal teratoma with tumor rupture into airway. J Pediatr Surg Case Rep. 2022;81:102270.
7. Alalawi F, Alsinan R, Alzahir B, Dawood FA, Almarhon A, Alqumbar H. A large ruptured mediastinal teratoma. Int J Case Rep Images. 2022;13(2):31–4.
8. Ram D, Sharma DK, Darlong LM, Rajappa SK, Bhakuni YS. Mediastinal teratoma with pulmonary parenchyma fistula: a rare diagnostic endeavor. J Clin Diagn Res. 2017;11(8):XD03–4.
9. Serraj M, Lakranbi M, Ghalimi J, Ouadnouni Y, Smahi M. Mediastinal mature teratoma with complex rupture into the lung, bronchus and skin: a case report. World J Surg Oncol. 2013;11:125.
10. Badar F, Yasmeen S, Afroz N, Khan N, Azfar SF. Benign mediastinal teratoma with intrapulmonary and bronchial rupture presenting with recurrent hemoptysis. Iran J Radiol. 2013;10(2):86–9.
11. Miyazawa M, Yoshida K, Komatsu K, Kobayashi N, Haba Y. Mediastinal mature teratoma with rupture into pleural cavity due to blunt trauma. Ann Thorac Surg. 2012;93(3):990–2.
12. Pikin O, Kolbanov K, Kazakevich V, Korolev A. Mediastinal mature cystic teratoma perforating into the lung. Interact Cardiovasc Thorac Surg. 2010;11(6):827–9.
13. Yu CW, Hsieh MJ, Hwang KP, Huang CC, Ng SH, Ko SF. Mediastinal mature teratoma with complex rupture into the pleura, lung, and bronchus complicated with mycoplasma pneumonia. J Thorac Cardiovasc Surg. 2007;133(4):1114–5.
14. APSA. APSA handbook for children with germ cell tumors. 2018.
15. Terenziani M, D'Angelo P, Bisogno G, et al. Teratoma with a malignant somatic component in pediatric patients: the AIEOP experience. Pediatr Blood Cancer. 2010;54(4):532–7.
16. Strollo DC, Rosado-de-Christenson ML, Jett JR. Primary mediastinal tumors. Part 1: tumors of the anterior mediastinum. Chest. 1997;112(2):511–22.
17. Sarkar A, Roy PP, Dey SK, Dwari AK, Bandyopadhyay R, Chakraborty K, et al. Mediastinal teratoma mimicking massive pleural effusion. J Assoc Physicians India. 2010;58:453–5.
18. Ikui K, Takeuchi A, Irie Y, Suzuki S. Two cases of teratoid tumor of the mediastinum. Jpn J Thorac Surg. 1958;11:880–4.
19. Bachh AA, Haq I, Gupta R, Boinapally RM, Sudhakar S. Benign mediastinal teratoma with intrapulmonary extension presenting with trichoptysis. Respir Med CME. 2010;3(3):189–91.
20. Escalon JG, Arkin J, Chaump M, Harkin TJ, Wolf AS, Legasto A. Ruptured anterior mediastinal teratoma with radiologic, pathologic, and bronchoscopic correlation. Clin Imaging. 2015;39(4):689–91.
21. Nakajima E, Kudo Y, Maehara S, et al. Ruptured mediastinal mature teratoma causing severe mediastinitis. Surg Case Rep. 2021;7(1):48.
22. Suzuki H, Koh E, Hoshino I, Kishi H, Saitoh Y. Mediastinal teratoma complicated with acute mediastinitis. Gen Thorac Cardiovasc Surg. 2010;58(2):105–8.
23. Smahi M, Achir A, Chafik A, Al Aziz AS, El Messlout A, Benosman A. Tératome mature du médiastin. Annales de Chirurgie [Internet]. 2001;125(10):965–71. Available from:

https://www.sciencedirect.com/science/article/abs/pii/S0003394400004107

Table

Table 1. Summary of reported cases of ruptured mature mediastinal teratomas published over the last 20 years, including patient demographics, site of rupture, clinical presentation, treatment, and outcome.

Author	Year	Age/Sex	Clinical Presentation	Rupture Site	Imaging Findings	Treatment	Outcome
Coelho et al. [5]	2025	3/M	Respiratory distress, pleural effusion	Pleural cavity	Large mass with lung collapse	Stabilization + surgery	Good outcome
Anderson et al. [6]	2022	16/F	Hemoptysis, infection	Lung, bronchi	Heterogeneous mass, invasive appearance mimicking malignancy	Surgical resection	Good recovery
Alalawi et al. [7]	2022	29/M	Dyspnea, pleural infection	Pleural cavity	Mass with empyema	Surgery + antibiotics	Good recovery
Dharma et al. [8]	2017	27/F	Chest pain, cough	Lung parenchyma	Mass with air-fluid level	Surgery	Good outcome
Serraj et al. [9]	2013	16/F	Chest wall fistula, discharge (hair/sebum)	Lung, bronchus, skin	Complex mass with extension to chest wall	Surgery	Favorable
Badar et al. [10]	2013	20/F	Hemoptysis, TB-like symptoms	Lung, bronchus	Cavitary lesion mimicking TB/malignancy	Surgery	Favorable
Miyazawa et al. [11]	2012	15/M	Post-trauma chest symptoms	Pleural cavity	Ruptured mass after trauma	Surgery	Good recovery
Pikin et al. [12]	2010	27/F	Pneumonia-like symptoms	Lung	Cystic mass with fistula to lung	Surgery	Favorable
Yu et al. [13]	2007	13/M	Fever, pneumonia	Lung, pleura, bronchus	Complex ruptured mass with infection	Surgery	Favorable

Figures



Figure 1

Gross specimen of a ruptured mature mediastinal teratoma demonstrating a cystic cavity filled with sebaceous and keratinous material.



Figure 2

Sectioned specimen showing direct extension of the cystic lesion into adjacent lung parenchyma, consistent with intrapulmonary rupture.

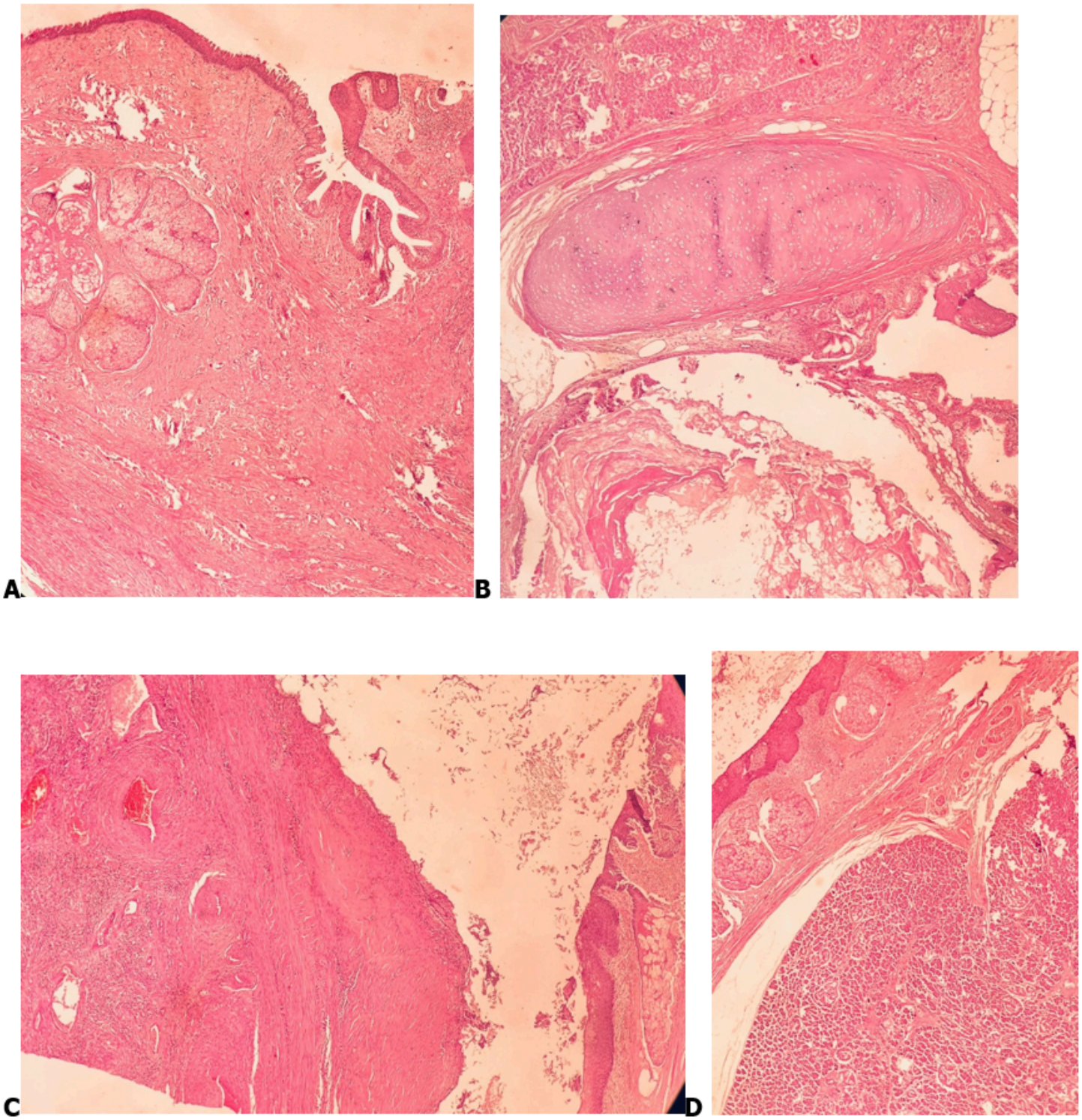


Figure 3

Histopathological examination showing mature tissues derived from different germ layers, including keratinizing stratified squamous epithelium with pilosebaceous adnexal structures (A), respiratory-type epithelium (C), mature hyaline cartilage (B), and mature pancreatic tissue (D), consistent with a mature cystic teratoma. No immature or malignant component was identified.