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Case report

Ectopic ocular tissue in testicular teratoma: A case report and review of the literature

Arwa Z. Alromaih [a], Amany A. Fathaddin [b], Abdullah I. Almater [a,c], Hind M. Alkatan [a,b,c,*]

[a] Department of Ophthalmology, College of Medicine, King Saud University, Riyadh, Saudi Arabia
[b] Department of Pathology and Laboratory Medicine, College of Medicine, King Saud University, Riyadh, Saudi Arabia
[c] King Saud University Medical City, King Saud University, Riyadh, Saudi Arabia

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ABSTRACT

Introduction and importance: Teratoma is a common neoplasm in prepubertal and post-pubertal periods. It consists of various types of tissues arising from different germinal layers, endoderm, mesoderm, and ectoderm. Ectopic ocular tissue is a rare phenomenon, with only few reported cases in other locations.
Case presentation: This is a 10-month-old boy who presented with a painless scrotal mass. Following orchidectomy, the excised mass confirmed the presence of uveal and retinal tissues originating in a benign testicular teratoma by histopathological examination.
Discussion: Choroidal and retinal tissue are the most frequently encountered ectopic ocular tissue, while the least observed tissue is the lens. Most of the reported cases of ectopic ocular tissue present in ovarian teratomas. The only 2 previously reported cases of ocular-like tissue in testicular teratoma lack well-defined medullary epithelium, uveal, and retinal tissue as in our case.
Conclusion: To our knowledge, developing ocular tissue in a testicular teratoma is extremely rare. Herein we report a unique case with mature defined ocular tissue within a testicular teratoma in an infant, which should not be overlooked.

1. Introduction

Teratoma is a neoplasm derived from a non-germ cell neoplasia in situ (GCNIS) a sub-set of germ-cell origin [1]. The tumor is composed of various types of tissue representing distinct germinal layers (endoderm, mesoderm, ectoderm) [2]. The teratoma can be either mature (well-differentiated) or immature (primitive) tissue [3]. Most bodily tissues are typically described in teratoma, including skin, bone, cartilage, connective tissue elements, epithelium of the respiratory and gastrointestinal tracts, smooth and striated muscle, and glial and nerve tissues. However, gonadal tissues, liver and ocular structures are very rarely seen [4]. Teratomas may appear anywhere in the body but are commonly seen in the gonads [4]. Among prepubertal testicular tumors, teratoma is the second most common to arise following yolk sac tumor and occurs with ranging frequency between 13% and 60% [3]. In contrast to post-pubertal teratomas, pre-pubertal teratomas are benign and metastasis has not been reported [3]. This case reveals the first-reported, isolated well-recognized uveal and retinal tissues in a mature prepubertal testicular teratoma in the English-written literature. This case report has been prepared and reported in accordance with the SCARE criteria [5].

2. Presentation of case

A full-term healthy 10-month-old boy, presented with an incidental finding of left scrotal painless hard mass. The mass was initially noticed by the parents 7 months prior to presentation. They asked for medical advice when they noted gradual increase in the size of the mass over the last month. The medical history, pregnancy, and delivery were normal and there was no family history of genetic disorders. External examination demonstrated left scrotal non-tender hard mass measuring 4 × 3 cm in size, with no change in skin color, and negative transillumination test. The right scrotum was normal. Ultrasonography of left scrotum showed a 3.4 × 2.7 cm well-circumscribed, oval shaped mass with mixed echogenicity, The mass contained both cystic and solid component, with no clear visualization of the left testicle. Color Doppler revealed mild

* Corresponding author at: Ophthalmology & Pathology Departments, Chief of Ophthalmic Pathology Division, Director of KSU Residency, Training Program in Ophthalmology, College of Medicine, King Saud University, Riyadh, Saudi Arabia.
E-mail address: hkatan@ksu.edu.sa (H.M. Alkatan).

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internal vascularity. Pan-computed tomography (CT) scan showed a complex mass occupying the left testicular area with cystic, solid, and fat components and chunky calcification. Tumor markers were negative including Testicular Lactate Dehydrogenase (LDH), beta-human chorionic gonadotropin (β-hCG), and Alpha Fetoprotein (AFP). These features were suggestive of left testicular teratoma, with no evidence of metastasis. The treating pediatric urologist discussed the findings with the guardians, who agreed on the decision for excisional biopsy considering that the suspected teratoma might harbor immature tissue and for confirmation of the diagnosis. The parents agreed and an informed consent was obtained after discussing all possible complications. The patient underwent left scrotal exploration with high inguinal orchidectomy. The procedure was performed under general anesthesia by the consulted surgeon and was well-tolerated. The patient recovery and post-operative period were smooth and uneventful. Gross examination of the orchiectomy specimen revealed a mass that is partially solid and partially cystic with hair and focal bony hard areas. The mass was limited to the testis and measured 3 cm in maximum dimension. It was entirely submitted for microscopic examination. Microscopic examination of the hematoxylin and eosin (H& E) stained tissue sections from the testicular mass reveled mixture of mature, benign tissues including squamous epithelium, sebaceous glands, hair follicles, brain tissue, bone, and glandular epithelium (Fig. 1). In addition, there was a focal area of uveal tissue, medullary epithelium, and retinal tissue, which sows evidence of dysplasia with rosettes formation (Fig. 2). Features suggestive of malignancy like mitoses or necrosis were not present. Immunohistochemical staining with Ki67 showed moderate proliferative index. The brain-like tissue expressed reactive staining to Neuron specific enolase (NSE), while it did not express reaction to Alpha feto protein (AFP) and Glypican 3. There was no evidence of germ cell neoplasia in-situ or any types of germ cell tumors.

The clinical, histological, and immunohistochemical findings were consistent with the diagnosis of prepubertal teratoma with ectopic ocular tissue and no malignant features. Thus, chemotherapy was not required for treatment, and regular follow up was planned.

3. Discussion

Developing ectopic ocular tissue in extra-orbital sites is uncommon [4]. Nonetheless, only few reports have described teratomas containing ocular structures, which are summarized in Table 1. The most frequently encountered ectopic ocular tissues are the choroid and retina. Occasionally, the eyelids, cornea, sclera, and vitreous can be seen. However, the lens is rarely observed [4,6]. Most of the ectopic ocular tissues arise within ovarian or sacrococcygeal teratomas. Ocular tissues originating from testicular or extragonadal sites are mostly of immature neuroectodermal tissue without structural organization, such as retina-like, choroid-like, or ciliary body-like tissues. In prepubertal children, mature teratomas are more common and are usually benign. However, it carries high risk of metastasis if present in adults [3]. Till date, there are no reported cases of well-organized ectopic ocular tissue developing in a testicular teratoma in the English-written literature.

The earliest report of ocular structures in teratomas was published in the French-literature by Verneuil in 1855 [6]. He described a teratoma of the testis with a cyst containing pigment epithelium with characteristics of the pigment epithelium of the eye. He cited Saint-Donat (1696), who described a massive teratoma of the testis containing a bony mass with two orbit-like cavities enclosing black vesicles lined with a uveal structure and containing a “flowing lymph”, which he referred to as aqueous humor. For diagnostic purposes, morphology of testicular teratoma can be easily recognized. Immunohistochemically, NSE is helpful in identifying glial and neural tissue in teratomas. Unlike yolk sac tumors, teratomas do not stain positively for AFP, and elevated serum AFP levels are not reported in patients with these tumors. Ki67 proliferation fraction shows the proliferative activity of the cells.

Sharpe and co-authors [8], were the first to report isolated corneal and conjunctival tissue with developing lenticular structures in an adult woman with mature ovarian teratoma. The rare occurrence of the lens in teratoma was justified by Mann in 1950, who demonstrated that the development of lens occurred in response to the presence of an optic cup as an inducer structure for the development in the lens, which requires proximity of surface ectoderm [9].

Breinin et al. [4] and Mercur et al. [9], reported cases of teenage girls who presented with malignant ovarian teratoma containing a well-formed optic cup, normal developing embryonic retina, and undifferentiated tissue, closely resembling neuroepithelioma retinae.

Interestingly, the development of primary malignant melanoma arising from uveal tissue differentiation in a mature ovarian cystic teratoma has been reported in 2 adult women, which ultimately resulted in widespread metastasis necessitating systemic therapy [10,11]. The occurrence of primary ovarian malignant melanomas was exceptionally rare, because the ovary does not contain melanocytes, and it can only arise as part of a teratoid lesion such as nevus, meningeal or uveal tissue [9,10].

Sergi et al. [12] and Takamatsu et al. [13] reported a fetal sacrococcygeal teratomas with the development of a completely formed eye in the former, and retina-like structure with immature neural components of true rosettes and primitive neural tubes in the latter. They pointed the importance of blood supply and high oxygen concentration for the formation of rods and cones based on their hypothesis that these factors are important in the differentiation of the cells. Dubinski et al., described a rare case of an intracranial teratoma with immature neuroectodermal tissue in a malformed eye anlage [14].

4. Conclusion

To the authors’ best knowledge, this is the first case of ectopic well-developed identified ocular tissue in testicular teratoma of an infant in the English-written literature. This is an interesting histopathological finding with rare occurrence. It is important for this tissue not to be overlooked since immature components with malignant potential might be found in this ectopic tissue. In addition, we have reviewed and

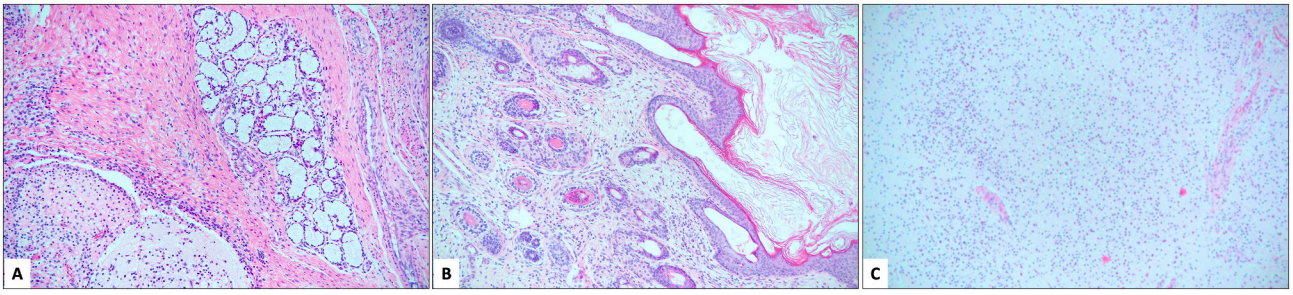

Fig. 1. Histopathological photos of sections from the teratoma showing mixture of benign mature tissue consisting of mucinous glands, skin with skin appendages, and brain tissue in 1a, 1b, and 1c respectively (Original magnification x100 Hematoxylin and eosin).

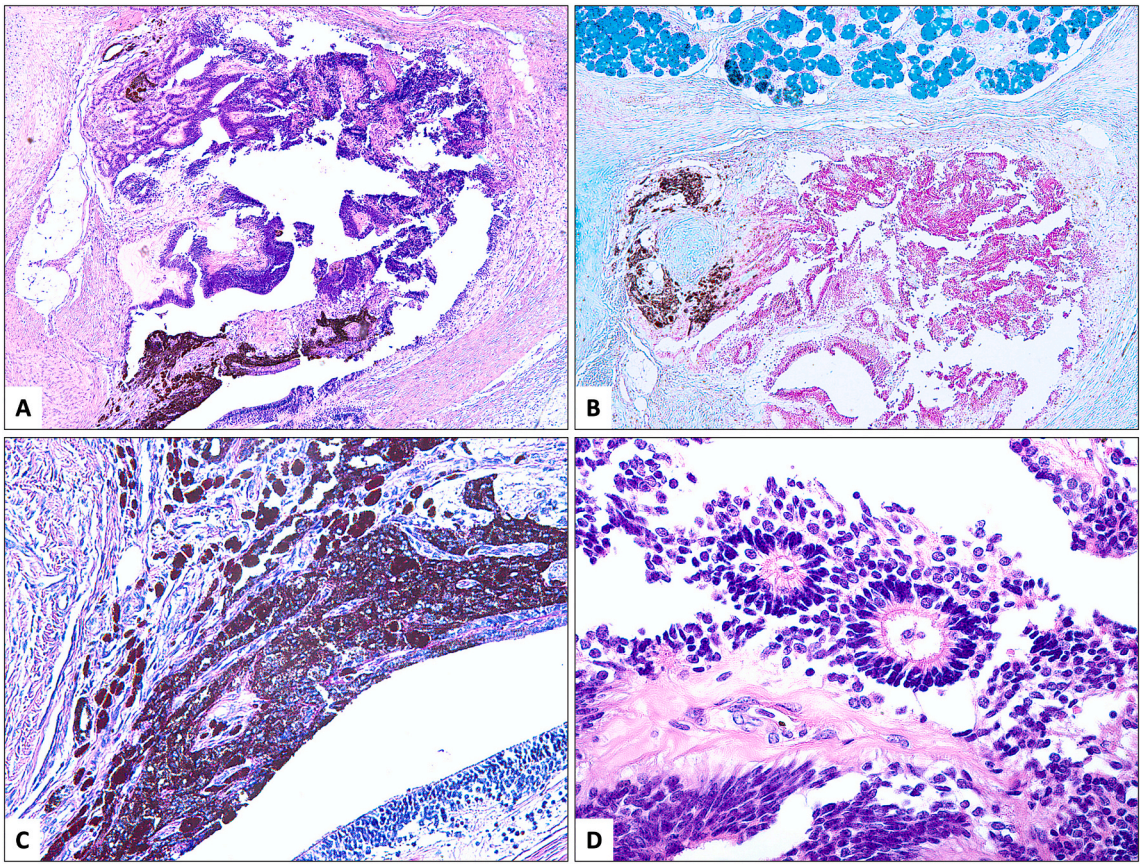

Fig. 2. A & B: Ectopic ocular structures consisting of medullary epithelium, uveal tissue, and retina with evidence of dysplasia and rosette formation (Original magnification x50 Hematoxylin and eosin in A and Alcian blue in B). C: Higher power appearance of the pigmented uveal tissue (Original magnification ×200 Periodic acid-Schiff). D: Higher power appearance of the rosettes (Original magnification ×400 Hematoxylin and eosin). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Table 1
Summary of the reported cases of ocular tissue found in a teratoma.

Study	Year	Age	Gender	Site of teratoma	Type of teratoma	Ocular tissue
Breinin et al. [4]	1950	19 years	Female	Ovarian	Malignant, mature	Well-formed optic cup, embryonic retina, and undifferentiated neuroepithelioma retinae
Sharpe et al. [7]	2018	42 years	Female	Ovarian	Benign, mature	Corneal and conjunctival tissue with developing lenticular structures
Lengyel et al. [9]	2020	39 years	Female	Ovarian	Malignant, cystic	Uveal tissue
Takamatsu et al. [12]	2012	29-week fetus	Female	Sacrococcygeal	Benign, mature, cystic	Retina-like structure
Sergi et al. [11]	1999	29-week fetus	Female	Sacrococcygeal	Benign, mature	Completely formed eye
Mercur et al. [5]	1976	14 years	Female	Ovarian	Malignant, mature	Well-formed optic cup and embryonic retina
Verneuil [6]	1855	Not available	Male	Testicular	Not available	Pigmented epithelium similar to that of the eye
Dubinski [13]	2016	3 years	Male	Intracranial	Benign, mature	Malformed eye anlage
Moehrle et al. [10]	2001	56 years	Female	Ovarian	Malignant, cystic	Uveal tissue
Saint-Donat et al	1696	Not available	Male	Testicular	Not available	Black vesicles lined by uveal-like tissue and filled by fluid

summarized the reported cases of ectopic ocular tissue in teratomas found in other locations.

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Ethical approval

IRB is not required for case reports. However, information was obtained and reported in a manner that was compliant with the standards set forth by the Health Insurance Portability and Accountability Act, and the Declaration of Helsinki as amended in 2013.

Consent

General informed written consent was obtained from the patient's guardians including permission for anonymous use of photos and for

reporting.

Research registration

Not applicable.

Guarantor

Hind M. Alkatan

CRediT authorship contribution statement

Arwa Z. Alromaih: Review of chart for data collection, literature review and first draft of the case report.

Amany A. Fathaddini: Histopathological review of slides and images.

Abdullah I. Almater: Literature review and first draft of the case report.

Hind M. Alkatan: Study design, histopathological examination, and final tissue diagnosis, taking images, and overall review for editing of the manuscript as the corresponding author.

Declaration of competing interest

None.

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