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Unraveling Zinner Syndrome: Insights from a distinct case

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Abstract. *Zinner Syndrome (ZS) is a rare congenital malformation characterized by a triad of unilateral renal agenesis, ipsilateral seminal vesicle cyst, and ejaculatory duct obstruction. Typically discovered incidentally in the second to fourth decades of life, it presents with varied symptoms, including lower urinary tract symptoms, painful ejaculation, hemospermia, perineal pain, and infertility in 45% of cases.*

This article describes the case of ZS, highlighting the diagnostic and management approaches. Diagnosis relies on imaging techniques: ultrasound for initial assessment, computed tomography (CT) for detailed anatomical information and magnetic resonance imaging (MRI) as the gold standard for its superior soft-tissue contrast. Treatment depends on symptom severity and cyst size, ranging from conservative management for asymptomatic patients to surgical intervention for symptomatic cases. The primary surgical treatment involves the removal of the seminal vesicle cysts, which can effectively relieve symptoms such as pain, urinary discomfort, and ejaculatory dysfunction, thereby significantly enhancing the patient's quality of life. Minimally invasive laparoscopic or robotic surgery is preferred for its reduced morbidity and shorter recovery time. Infertility management includes surgical relief of ejaculatory duct obstruction and assisted reproductive technologies when necessary. Regular follow-up is essential for monitoring recurrences. Future research should focus on long-term outcomes and standardized management protocols to improve patient quality of life.

Keywords: *Zinner syndrome, renal agenesis, seminal vesicle cyst, ejaculatory duct obstruction, infertility.*

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Розгадка синдрому Ціннера: аналіз унікального клінічного спостереження

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Резюме. *Синдром Ціннера (СЗ) – це рідкісна вроджена вада розвитку, яка характеризується тріадою односторонньої агенезії нирок, кістою сім'яного пухирця та обструкції сім'явивідної протоки. СЗ, як правило, діагностується випадково на другому-четвертому десятиліттях життя та проявляється різноманітними симптомами, такими як біль під час еякуляції, гемоспермія, біль у промежині та безпліддя у 45% випадків.*

Ця робота описує випадок ЗС, висвітлюючи підходи до діагностики та лікування. Діагностика ґрунтується на методах візуалізації: ультразвукове дослідження для ініціальної оцінки, комп'ютерна томографія (КТ) для детальної інформації та магнітно-резонансна томографія (МРТ) у якості золотого стандарту діагносики. Лікування залежить від тяжкості симптомів і розміру кісти, починаючи від консервативного лікування безсимптомних пацієнтів і закінчуючи хірургічним втручанням у симптоматичних випадках. Первинне хірургічне лікування передбачає видалення кісти сім'яного пухирця, що може ефективно полегшити такі симптоми, як біль, дискомфорт під час сечовипусканні та дисфункцію еякуляції та значно покращує якість життя пацієнта. Перевага віддається мінімально інвазивній лапароскопічній або роботизованій хірургії завдяки короткому часу відновлення. Лікування безпліддя включає хірургічне усунення обструкції сім'явивідної протоки та допоміжні репродуктивні технології за необхідності. Для моніторингу рецидивів необхідне регулярне спостереження. Майбутні дослідження повинні зосередитися на довгострокових результатах і стандартизованих протоколах лікування для покращення якості життя пацієнтів з СЗ.

Ключові слова: *синдром Ціннера, агенезія нирок, кіста сім'яного пухирця, обструкція сім'явивідної протоки, безпліддя.*

Introduction. ZS is a rare condition associated with an embryological anomaly that develops in the distal portion of the mesonephric (Wolffian) duct between the 4th and 13th week of gestation. It is characterized by a triad that includes unilateral renal agenesis with obstruction of the ejaculatory duct and ipsilateral seminal vesicle cyst.

The clinical presentation is varied and often nonspecific, which contributes to its frequent misdiagnosis. Common symptoms include lower urinary tract symptoms, hematuria, hemospermia, perineal pain, recurrent infections and pain during ejaculation. Infertility is a significant concern in ZS, affecting approximately 45% of patients. This is primarily due to the obstruction of the ejaculatory duct, which leads to azoospermia and reduced semen volume [1]. ZS is usually discovered incidentally between the second and fourth decades of life, a period of greater sexual and reproductive activity.

In terms of prevalence, fewer than 200 cases of this malformation have been documented in the literature, underscoring its rarity and the importance of awareness among clinicians to avoid misdiagnosis [2, 3].

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This case report aims to provide a detailed account of a patient with ZS, contributing to the limited literature on this condition and offering insights into management and long-term follow-up.

Clinical case. A 29-year-old man, followed in Nephrology consultation for chronic kidney disease due to renal agenesis, was referred to the Urology consultation in 2021 due to perineal pain for a few months, aggravated by ejaculation. He also reported polyuria and a feeling of incomplete bladder emptying. On physical examination, a tense prostate with discomfort to the touch was noted, without other significant changes. Laboratory tests revealed a serum creatinine of 1.4 mg/dL and an estimated glomerular filtration rate (eGFR) of 45 mL/min/1.73 m^2, consistent with stage 3 chronic kidney disease, with no other abnormalities noted. An ultrasound was requested which revealed a cystic structure next to the bladder floor, suggesting a diverticulum vs seminal vesicle cyst.

He then underwent an MRI where it stands out: "Right kidney not visualized due to agenesis. Cystic dilation of the right seminal vesicle. Concomitantly, dilation of the right vas deferens is verified. Spontaneous T1 hyperintensity content is observed at the level of the right vas deferens (up to the epididymis region) and seminal vesicle (including cyst) due to probable high protein content. Normal-sized prostate (14 cc), with peripheral signal heterogeneity highlighting a diffuse T2 hypointensity area on the right with arterial hyper-

enhancement, without apparent washout, of probable inflammatory nature" (Fig. 1 and 2). Subsequently, a spermogram was requested with evidence of azoospermia.

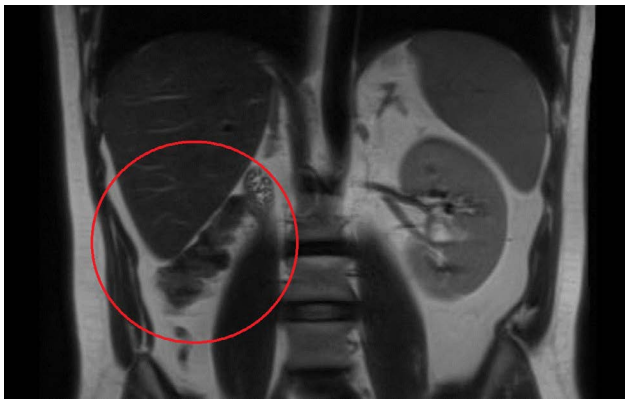

Fig. 1. Coronal T2-weighted MRI Demonstrating absent right kidney. This coronal T2-weighted MRI scan shows the absence of the right kidney (indicated by the red circle), a key feature of Zinner syndrome. The left kidney appears normal. The absence of the right kidney and associated findings provide critical information for diagnosing this rare congenital anomaly.

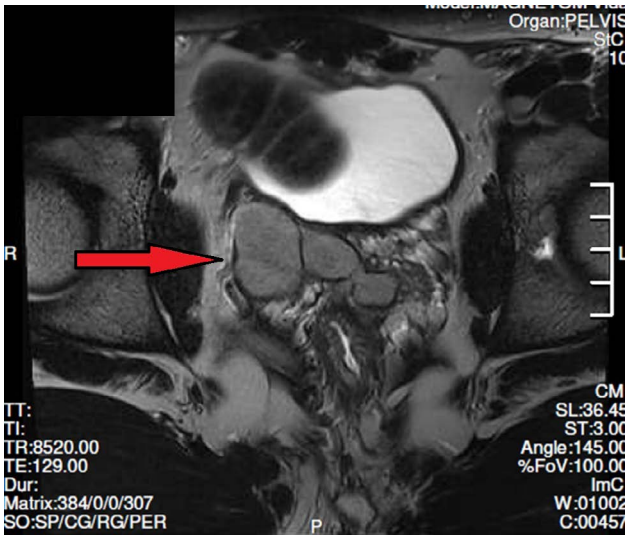

Fig. 2. Coronal T2-weighted MRI demonstrating cystic dilation of the right seminal vesicle. This coronal T2-weighted MRI scan shows a hyperintense cystic dilation of the right seminal vesicle (indicated by the red arrow). The high signal intensity of the cyst is characteristic of fluid-filled structures, confirming the diagnosis of Zinner Syndrome.

Then, the patient underwent a robotic seminal vesicle excision at our center, performed using a da Vinci XI surgical system via a transperitoneal approach (Fig. 3).

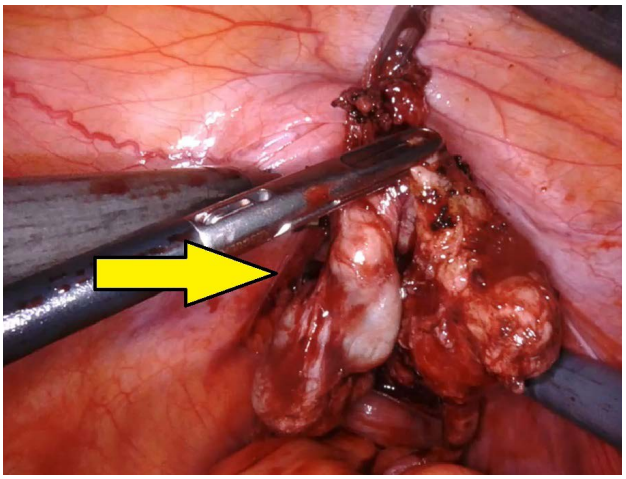

Fig. 3. Intraoperative image of resected seminal vesicle. This intraoperative image, taken during a robotic-assisted laparoscopic surgery using the da Vinci XI surgical system, shows the resected right seminal vesicle. The procedure allowed for precise dissection and removal with minimal invasiveness, highlighting the effectiveness of robotic-assisted surgery in managing complex urogenital anomalies.

This technique provides enhanced precision and control and it's particularly useful for delicate dissections in the deep pelvic region where the seminal vesicles are located.

The postoperative period was uneventful and since the surgery, he has been completely asymptomatic. The patient is scheduled for regular follow-ups every six months. These visits include clinical evaluation, kidney function tests, and imaging with ultrasound to monitor for potential recurrences or complications.

Discussion. ZS is a rare congenital malformation that involves a triad of unilateral renal agenesis, ipsilateral seminal vesicle cyst and ejaculatory duct obstruction. This condition arises from an embryological anomaly occurring between the 4th and 13th weeks of gestation when the mesonephric (Wolffian) duct fails to develop properly. During this critical period, the mesonephric ducts, initially paired structures running along the embryo's length, begin to differentiate into the reproductive and urinary structures, but in ZS there is a failure in the migration of the distal portion of the mesonephric duct, impeding the proper formation of the ureteric bud. As a consequence, the role of the ureteric bud in differentiating the metanephric blastema is disturbed, which leads to unilateral renal agenesis and atresia of the ipsilateral ejaculatory duct. The gonad continues to develop and insufficient drainage of the seminal fluid results in the cystic structure of the seminal vesicle. Although initially asymptomatic, ZS typically manifests clinically during the second to fourth decades of life, coinciding with peak sexual and reproductive activity [1, 3, 4].

Patients with ZS are often asymptomatic until adulthood. When symptomatic, they present with a variety of genitourinary complaints, which can significantly impact their quality of life. The most prevalent symptoms include lower urinary tract symptoms such as dysuria, pollakiuria and urgency. These symptoms are attributed to the obstructive nature of the seminal vesicle cysts and their effect on adjacent structures [5, 6]. Additionally, patients may experience perineal pain, often exacerbated by ejaculation, which can radiate to

the scrotum and is usually due to cystic expansion and pressure on surrounding tissues [5, 7]. Painful ejaculation and hematospermia are indicative of ejaculatory duct obstruction and seminal vesicle involvement [1, 7]. A significant concern for patients with ZS is infertility, affecting approximately 45% of patients, primarily due to ejaculatory duct obstruction leading to azoospermia. This issue often becomes apparent during the reproductive years, underscoring the syndrome's impact on fertility [3, 8].

The diagnosis of ZS relies heavily on imaging techniques that provide detailed anatomical visualization. The preferred imaging modalities include ultrasound, CT and MRI. Ultrasound is often the initial imaging modality used, capable of revealing the absence of a kidney and identifying cystic structures in the pelvis, typically showing a well-defined anechoic (fluid-filled) structure adjacent to the bladder [4, 6]. CT scans offer more detailed anatomical information compared to ultrasound, confirming renal agenesis and delineating the size and extent of seminal vesicle cysts. CT is particularly useful in distinguishing these cysts from other pelvic masses [2, 7]. MRI is considered the gold standard for diagnosing ZS due to its superior soft-tissue contrast and multiplanar imaging capabilities. Typical MRI findings include hyperintense signals on T1-weighted images and hypointense signals on T2-weighted images, indicative of the cystic nature of the seminal vesicle lesions. MRI also provides excellent visualization of the relationship between the cysts and surrounding pelvic structures [3, 5, 7].

The management of ZS is guided by the severity of symptoms and the size of the seminal vesicle cysts. Treatment options range from conservative management for asymptomatic or mildly symptomatic patients to surgical interventions for those with significant symptoms. For asymptomatic patients or those with small cysts (less than 2.5 cm), conservative management with regular monitoring and periodic follow-ups is recommended. Antibiotic therapy may be prescribed to manage infections, and alpha-blockers can be used to alleviate lower urinary tract symptoms [6, 9]. Symptomatic patients or those with larger cysts (greater than 3 cm) often require surgical intervention. Surgical options include transrectal or transperineal cyst aspiration and drainage, which are minimally invasive procedures that can provide temporary relief by reducing the size of the cysts. However, these methods are associated with a high risk of recurrence and potential complications such as infection [4, 9]. Laparoscopic or robotic surgery, specifically vesiculectomy, is often preferred due to its minimally invasive nature, reduced morbidity and shorter hospital stays. These procedures effectively relieve symptoms and prevent recurrence [7, 9]. Open surgical resection is reserved for cases where laparoscopic methods are not feasible. Although open surgery provides definitive treatment, it comes with higher risks of complications and longer recovery times [3, 6].

Infertility is a significant concern for patients with ZS, with nearly half of the patients affected. The obstruction of the ejaculatory duct leads to issues such as azoospermia, oligospermia and reduced semen volume. The underlying pathogenesis of azoospermia is not yet fully understood, but two possible scenarios are described in the literature: one conceivable assumption is that unilateral testicular obstruction may cause antisperm antibody production, resulting in infertility despite the unobstructed contralateral testis; another theory proposed is that, due to long-lasting obstruction, reactive oxygen species may mediate reproductive toxicity, thus reducing the sperm count by germ cell apoptosis. Despite that, the management strategies for infertility include surgical intervention, such as transurethral unroofing of seminal vesicle cysts, which can relieve the obstruction and improve semen quality. In some cases, re-unroofing may be necessary to ensure patency of the ejaculatory ducts. For patients who do not achieve satisfactory results with surgical intervention, assisted reproductive technologies, including in vitro fertilization and intracytoplasmic sperm injection can be considered. These techniques bypass the obstructive lesions and facilitate conception [3].

Though rare, ZS presents distinct clinical and imaging features that facilitate its diagnosis. The management ranges from conservative approaches to surgical interventions based on symptom severity and cyst size. Regular follow-up is essential for monitoring and managing potential recurrences. Future research should focus on long-term outcomes of various treatment modalities and the development of standardized management protocols to enhance patient quality of life.

Conclusions. ZS, although rare, can be detected in adult men who present nonspecific symptoms such as dysuria, infertility, perineal pain and complaints related to ejaculation. Imaging methods play a crucial role in diagnosis, with MRI being the gold standard in characterizing the changes that congregate in this triad.

Future research efforts should aim at understanding the long-term prognosis of ZS and developing standardized treatment protocols to enhance the quality of life for affected individuals.

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The authors' contributions.

João Ferreira Guerra: Concept and design, the data acquisition, analysis and interpretation, critical review of the manuscript;

João Magalhães Pina: The data acquisition, analysis and interpretation, supervision;

Vanessa Andrade: Concept and design, critical review of the manuscript;

Miguel Brito Lança: Acquisition, analysis, or interpretation of data;

Luís Campos Pinheiro: The data acquisition, analysis and interpretation, critical review of the manuscript, and supervision.

References:

1. *Di Paola V, Gigli R, Totaro A, Manfredi R.* Zinner syndrome: two cases and review of the literature. BMJ Case Rep. 2021;14(6):e243002. doi: 10.1136/bcr-2021-243002.
2. *Cleva M, Montaldo L, Graziani G, Bruschi E, Valentino M.* Zinner's Syndrome: Case report of a Developmental Anomaly of the Mesonephric Duct. J Radiol Case Rep. 2023;17(8):57-64. doi: 10.3941/jrcr.v17i8.5055.
3. *Hofmann A, Vauth F, Roesch WH.* Zinner syndrome and infertility—a literature review based on a clinical case. Int J Impot Res. 2021 ;33(2):191-195. doi: 10.1038/s41443-020-00360-0.
4. *Tan Z, Li B, Zhang L, Han P, Huang H, Taylor A, et al.* Classifying seminal vesicle cysts in the diagnosis and treatment of Zinner syndrome: A report of six cases and review of available literature. Andrologia. 2020 ;52(1):e13397. doi: 10.1111/and.13397.
5. *Zhong H, Han LZ, Yue CJ, Liu ZZ.* A symptomatic case of Zinner syndrome: Laparoscopic seminal vesiculectomy and ipsilateral nephroureterectomy. Asian J Surg. 2023;46(10):4527-4529. doi: 10.1016/j.asjsur.2023.04.140.
6. *Liu Z, Miao C, Zhuang X, Xing J.* Zinner syndrome: Cases report and review of the literature. Asian J Surg. 2021 Feb;44(2):523-524. doi: 10.1016/j.asjsur.2020.12.004.
7. *Karki P, Manandhar S, Kharel A.* A rare case of Zinner syndrome: Triad of unilateral renal agenesis, ipsilateral seminal vesicle cyst, and ejaculatory duct obstruction. Radiol Case Rep. 2021;16(11):3380-3382. doi: 10.1016/j.radcr.2021.08.012.
8. *Abakar D, Badi FE, Sabiri M, El Manjra S, Lezar S, Essodegui F.* Zinner syndrome. Eur J Case Rep Intern Med. 2021;8(7):002628. doi: 10.12890/2021_002628.
9. *Liu T, Li X, Huang L, Li H, Cai K, Jiang J, et al.* Zinner syndrome: An updated pooled analysis based on 214 cases from1999 to 2020: systematic review. Ann Palliat Med. 2021;10(2):2271-2282. doi: 10.21037/apm-20-1997.