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Review Article

Colpolithiasis: A mini review

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ABSTRACT

Objective: Vaginal calculus is an unusual finding. In this study we describe a case of primary vaginal calculus in a rather rare urogenital anomaly- Obstructed hemivagina with ipsilateral renal agenesis (OHVIRA) syndrome. This syndrome is shrouded in controversies. Here we present a mini review about vaginal calculus and theory of embryological development of female genital tract as related to OHVIRA syndrome.

Case: A 50 years-old unmarried lady with primary amenorrhoea presented with pain abdomen. She was found to have calculus in the pelvis by x-ray which was thought to be bladder calculus initially. On local examination the vaginal opening was absent. Imaging studies such as NCCT and MRI confirmed that it is a vaginal calculus, located below the uterine cervix, with absent right kidney. She was diagnosed with OHVIRA syndrome with colpolithiasis. On laparotomy she was detected to have unicornuate uterus with absence of right Mullerian structures. The calculus occupied the whole of upper part of vagina, which was a blind pouch. The patient underwent total abdominal hysterectomy, left salpingo-ophorectomy with removal of calculus after opening the vaginal vault. Postoperative recovery was uneventful. Chemical analysis of the calculus revealed calcium magnesium oxalate which is of hematic origin.

1. Introduction

Colpolithiasis or vaginal calculi are a rare and unusual finding. They are classified as either primary or secondary vaginal stones, depending on the absence or presence of a foreign body in the vagina, which acts as anidus for the formation of the secondary calculi. Most of the primary vaginal calculi are believed to originate from the stasis of urine in the vagina, whereas secondary vaginal calculi are the result of crystallization of urinary constituents around a foreign body in the vagina.[1–3]

Normally the anatomy and physiology of the vagina does not allow the stasis of urine or the formation of stones. Hence colpolithiasis is frequently associated with Mullerian duct or urogenital tract abnormalities, specifically vaginal outlet obstruction.[3,4]

Most authors credit Halban for reporting the first case of vaginal calculi in literature, in 1900, occurring in a case with large vaginal cystocoele.[5,6] The overall incidence of colpolithiasis is not known, as vaginal calculi have been reported generally as case reports in the literature.

In cidence of Mullerian duct anomalies in the general population range from 0.8% to 4%. A rare congenital anomaly is the obstructed hemivagina with ipsilateral renal anomaly(OHVIRA) syndrome. It was first reported in 1922. The incidence of this syndrome is estimated to be around 0.1-3.5% of all Mullerian anomalies.[7]

An extremely rare combination of OHVIRA syndrome associated with primary vaginal calculus, presented to our out-patient department, with pain in lower abdomen. The arguments and discussion generated around this patient prompted us to write this mini review. We believe that this is possibly the first reported case of primary vaginal calculus associated with OHVIRA syndrome.

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2. Case

A 50 years-old unmarried (nulligravida) lady, with primary amenorrhoea, presented in our out-patient clinic with mild pain in the lower abdomen of one week duration which was initially associated with enteritis. She had been treated with a course of antibiotics in a private clinic. Radiological investigations done in the private clinic revealed a calculus in the pelvis which was misdiagnosed as bladder calculus (Figure 1). In view of persistent lower abdominal pain, the patient was referred for gynecological opinion.

She was a farmer by occupation, moderately built and nourished, with normal secondary sexual characteristics. On local examination, the clitoris, urethral opening, labia majora and minora were normal, but the vaginal opening was absent (Figure 2). On rectal examination a stony-hard globular mass of size around 6x5 cm was felt anterior to the rectum, it was fixed and non-tender.

A computerized tomography scan showed colpolithiasis- a laminated oval calcified mass of size 5.1x4.8x3.1cm, located in the pelvis, posterior to the urinary bladder and inferior to the uterus, possibly in the vagina. Vagina was not visualized below the calculus. It also revealed that the right kidney was absent. Left kidney and ureter were normal. She had a unicornuate uterus with normal left ovary and fallopian tube ; right ovary was small in size. Correlative MRI showed the same findings (Figures 3 and 4).

She was diagnosed as a case of OHVIRA syndrome with colpolithiasis. Considering the age of the patient, she was counselled for total abdominal hysterectomy along with the removal of the calculus. Intra-operative findings revealed left unicornuate uterus with normal left tube and ovary. The right Wolffian duct and Mullerian duct components, that is right kidney and ureter, right horn of uterus, fallopian tube and round ligament were absent (Figure 5) Total abdominal hysterectomy along with left salpingo-oopherectomy was performed. The vault of vagina was distended with the stony hard mass. The vault was opened and a calcified dark brown colored, vaginal stone of 6x5cms was enucleated from the upper vagina and removed (Figures 6 and 7). The upper vagina (approximate length 4 cm) was well developed and ended as a blind pouch. There were no fistulous openings identified in the vagina. Right ovary could not be visualized, though MRI showed it was present and small in size.

Upper vagina was obliterated with three purse string sutures, vault was closed, and rest of the abdomen was closed in layers. Post-operative period was uneventful. On first follow-up visit after four weeks she remained asymptomatic.

Histopathology of the specimen showed endometrium in proliferative phase, cervix had features of polypoidal endocervicitis and normal left ovary. Myometrium and left fallopian tube were unremarkable. The stone weighed 54.0229gms. Chemical analysis of the calculus showed calcium-magnesium oxalate which is of hematic origin.

3. Discussion and Review of Literature

Vaginal calculi are rare findings. Primary vaginal stones form mostly as a result of pooling of urine in the vagina, due to an anatomic abnormality. Hence, they are commonly composed of urinary salts. Crystallization of urinary constituents around a foreign body in the vagina lead to the formation of secondary vaginal stones. Primary vaginal calculi are more common than secondary stones.[8,9]

The stone formation in the vagina is prevented by the normal anatomy and mechanisms that happen in the vagina. Urogenital tract abnormalities such as vesicovaginal/urethrovaginal fistulas, ectopic vaginal ureter, or vaginal obstructions can be associated with the calculus formation. Congenital anatomical abnormalities resulting in vaginal outlet obstruction like imperforate hymen and transverse vaginal septum, may be associated with colpolithiasis. Dexeus and Dalmau reported an unusual case of primary vaginal calculus in 1946, following traumatic amputation of the distal one-third of the urethra associated with cicatricial narrowing of the vaginal orifice.[6,10] Ranawaka reported primary vaginal calculus in a 3-year-old girl with urogenital sinus anomaly in 2012.[11] Colpolithiasis has also been reported following urinary incontinence due to neuropathic urethro-vesical dysfunction. Among all the causes urethrovaginal/vesicovaginal fistulas seem to be the most frequent cause. They have been discovered in different age groups of women, but primary stones are most commonly seen among children and young women.[1–3,12]

Stagnation of urine in the vagina seems to be a prerequisite for the precipitation of urinary salts and the formation of vaginal stones. Many of these cases have associated comorbidities like mental and physical disabilities such as mental retardation or cerebral palsy with associated neuropathic bladder, myelodysplasia and bladder exstrophy. Patients with these comorbidities stay in recumbent position for prolonged periods, leading to urinary incontinence and stasis of urine in the vagina. Stasis leads to infection with urease producing bacteria like proteus mirabilis, klebsiella species, or escherichia coli that can change the normally acidic pH of the vagina to alkaline, predisposing the precipitation of triple phosphate (struvite) calculi, which is the most common type of primary calculus.[8,13] A relative lack of oestrogens in young girls and postmenopausal women, results in lack of lactic acid production by the vaginal microflora leading to alkaline vaginal pH contributing to the stone formation.[8,14]

Patients with comorbidities and who are immobile for prolonged period, may also have difficulty in expressing their symptoms contributing to misdiagnosis. Such delay in reaching the correct diagnosis allows the calculus to grow to a fairly large size, that may require surgical intervention at a later date.

As reported by Navani and Tessier in 1970, literature on vaginal stones was reviewed by Stanfield in 1942 and

LeCocq in 1960 most of which were due to vesicovaginal fistula.[5]

Table 1 summarises the review of literature with details of cases of primary vaginal calculi.

Our patient was an active lady, with no known comorbidity. She presented with a primary vaginal calculus, which was detected at 50 years of age. Coincidently, she was also detected to have a rare urogenital anomaly, designated as OHVIRA syndrome. Her predisposing factor for this vaginal calculus was the complete vaginal outlet obstruction, presumably due to agenesis of lower two-third of vagina. Urine had no access to the upper vagina, as there were no fistulous tracts present. This vaginal stone was completely of hematic origin.

Lodh reported a case of primary vaginal calculi of hematic origin with imperforate hymen in 1994.[15] Similar stone has been reported by Savel in 1964, in an unmarried 33 years old woman with a congenital vaginal septum.[16] George Hahn, in 1949, reported hematinic stone in a patient with small hymenal opening an d congenital vaginal stenosis.[17]

Secondary vaginal stones are less common compared to primary stones.[1,2] They are typically formed around foreign bodies which may be of iatrogenic origin or retained foreign objects. Forgotten objects such as pessaries, threads of intrauterine devices, medical gauzes, mesh, suture, etc may become the nidus for secondary vaginal calculi.[1,2,18,19] These foreign bodies can lea d to chronic inflammation and may lead to urogenital fistulas that result in the formation of vaginal stone.

The vaginal stones may be solitary or multiple and of vary ing sizes. The formation of calculi is slow and hence diagnosis can be difficult as it may not cause any specific symptom. A few cases of vaginal calculi were associated with bladder calculus. A careful genitourinary examination should be performed. Imaging studies including ultrasound, CT, MRI, intravenous pyelography, cystourethrography may be useful in diagnosing this rare condition. Vaginoscopy and cystoscopy is also advocated because urinary and Mullerian duct anomalies are frequently coexistent.[2]

Navani and Tessier, mention a case of secondary calculus reported by Esau in 1932, where the bladder stone ulcerated through the vesico-vaginal septum to reach the vagina and present as a secondary calculus.[5]

Table 2 summarises the review of literature with details of cases of secondary vaginal calculi.

Simple extraction of the calculus was done in most cases using surgical instruments like ring forceps or Kocher's or lithotripsy forceps; extraction was made possible through hymenal incision and vaginal dilation or using an episiotomy incision. Friable stones, such as the struvite, can be crushed in situ with the help of a Kocher's forceps or a lithotriptor. In few cases surgical method included transabdominal suprapubic approach. A transperitoneal approach to open the anterior vaginal wall/cuff has also been mentioned. This approach confirmed the integrity of the genital organs and maintained the integrity of hymen. This was considered important for cultures where integrity of hymen in young girls has social significance. Pre-operative estrogen therapy has been found useful to strengthen the vaginal epithelium before the removal of large stones in young girls because the hymen can better withstand iatrogenic stretching without tearing. Some authors have described the removal of calculus from the vagina using a nephroscope in combination with an ultrasonic device, pneumatic lithoclast, or intracorporeal shock wave lithotripsy.[11,14,20,21]

Uterovaginal dupli cation with an obstructed hemi-vagina is a rare disorder that is often associated with ipsilateral renal agenesis. This association was reported as Herlyn-Werner syndrome in 1971. Additional association of renal aplasia was reported by Wunderlich in 1976, and this has been referred to as Herlyn-Werner-Wunderlich syndrome in various articles since then.[22–24]

The acronym OHVIRA (obstructed hemivagina-ipsilateral renal anomaly) was suggested much later by Smith and Laufer in 2007. Since two of the three components i.e. obstructed hemivagina and ipsilateral renal anomaly of the triad are included in the acronym, this enables inclusion of any type of uterine anomalies in the OHVIRA syndrome, as opposed to only uterine didelphys in the Herlyn-Werner-Wunderlich syndrome.[7,25] Hence, uterus didelphys, septate uterus or unicornuate uterus would be included in OHVIRA syndrome. This syndrome is included in the second group i.e 2.1 of Acein's proposed Embryological-clinical classification for female genito-urinary malformations.[26]

Table 3 summarizes the findings reported in some case reports of OHVIRA syndrome.

Table 1: Case reports- primary vaginal calculus

Author	Year	Age of patient	Cause of calculus	Comorbidity	Composition
Castellan P et al.[1]	2017	34	Urinary incontinence (stasis) and intact hymen	Quadriplegia	Struvite
AlBasri SF et al.[27]	2017	11	Continuous urinary incontinence	Laparotomy for abdominal distension on her first day of life, followed by transvaginal drainage of fluid. (No medical report existed to clarify the condition)	Calcium oxalate
Kassem TW et al.[28]	2016	63	Vesico-vaginal Fistula	Repetitive unsuccessful attempts of surgical repair	-
Raikwar P et al.[29] (both vaginal & bladder calculi)	2016	15	Vesico-vaginal Fistula	bilateral hydronephrosis	-
Avsar AF et al.[2]	2013	22	Urinary incontinence and stasis with UTI	Paraplegia	Struvite
Ambreen AS et al.[30]	2013	18	Vesicovaginal fistula	Obstructed labor	-
Ranawaka RS et al.[11]	2012	3	Urogenital sinus anomaly with common outlet channel	Horseshoe kidney with bilateral grade II reflux	-
Ikeda Y et al.[31]	2012	42	Urinary incontinence and immobility	Cerebral palsy and congenital scoliosis	Struvite
Chen S et al.[32]	2011	12	Vesico-vaginal fistula with partial vaginal outlet obstruction	Perineal trauma and surgery	Ammonium magnesium phosphate
Jaspers JW et al.[14]	2010	5	Urinary and fecal incontinence; immobility	Infantile encephalopathy, psychomotor retardation and epilepsy due to postnatal intracerebral hemorrhage; Spastic tetraplegia, hip dysplasia and severe scoliosis	Struvite
Oguzkurt P et al.[33]	2009	6	Urethrovaginal fistula with Imperforate hymen	-	Struvite
Liu B et al.[34]	2008	14	Urethrovaginal fistula with vaginal stenosis	Pelvic trauma with subsequent urethral and anterior colporrhaphy without success	Struvite
Ho TC et al.[4]	2008	24	Transverse vaginal septum with small central perforation; hypospadias	Surgery for imperforate anus shortly after her birth; double uterus, bilateral hydrosalpinx	Carbonate apatite

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Table 1 continued

Malik R et al.[35]	2006	Case-1: 15	A tight vaginal stenosis due to earlier vaginal disruption; urethral sphincter laxity, urethrovaginal fistula; secondary urinary stasis and infection in vagina	Pelvic trauma for which supra-pubic cystostomy with urethroplasty was done	-
Lin CJ et al.[36]	2005	43	Bedridden with urinary and fecal incontinence	Cerebral palsy due to tuberculosis meningitis	-
Malhotra N et al.[3]	2004	21	Traumatic outlet obstruction	Perineal trauma at 5 years of age	Struvite
Cetinkursun S et al.[12]	2001	13	Urinary and fecal incontinence since birth.	Cerebral palsy	Struvite(85%) with microcrystalline carbonate apatite (15%)
Yoshimura T et al.[37]	2000	11	Complete recumbent position with urinary incontinence	Cerebral infarction leading to Spastic quadriperesis	Struvite
Bar-Moshe O et al.[20]	2000	26	Obstructed vagina by a midline perineal scar, and a neo-meatus at the internal face of the right leg; urinary incontinence	Perineal trauma and fractured pelvis; ileourethrocystoplasy was performed	-
Plaire JC et al.[38]	2000	Case-1: 4	Complete urinary incontinence; anterior, vertically oriented vaginal introitus.	Bladder exstrophy(operated)	Struvite
		Case-2: 13	Narrow introitus, recurrent cystitis	Vaginoplasty in infancy (underlying condition for vaginoplasty is unknown.)	Calcium phosphate
Dhall JC et al.[39]	1997	56	Urinary incontinence	Abdomino-perineal resection for adeno carcinoma of the rectum.	Calcium, magnesium and ammonium phosphates.
Venet C et al.[21]	1994	11	Mild urinary incontinence; hypospadias, vaginal stenosis	Bladder exstrophy (operated)	Struvite
Homberg HVD et al.[9]	1993	45	Vesico-vaginal fistula which might have healed spontaneously or temporary stress incontinence after her last delivery	-	Calcium oxalate, with a trace of magnesium phosphate.

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Table 1 continued

Sant GR et al.[8]	1983	9	Urinary incontinence, recurrent urinary tract infections; clitoral hypertrophy and partial fusion of the inferior aspect of the labia majora	Myelodysplasia; neurogenic bladder	Struvite (55 %) and apatite (45 %)
Bissada NK et al.[40]	1983	12	Urinary incontinence	Meningomyelocele	Magnesium ammonium phosphate.
Raghavaiah NV et al.[41]	1980	Case-1: 21	Vesicovaginal fistula following difficult vaginal delivery.	Failed attempts at repair of the fistula	Struvite
		Case-2: 35		Colpocleisis and hysterectomy; fistulous communication between the ”vaginal pouch” and the bladder.	Struvite
Navani S et al.[5]	1970	72	Protracted incontinence and prolonged recumbency; a tight fibrous ring in the lower third of the vagina	Multiple sclerosis	-
Savel LE[16]	1964	33	Partial outlet obstruction (transverse vaginal septum with small opening)	-	Triple phosphate and cholesterol (hemin crystal)
Dalal DS[42]	1962	7	Urethro-vaginal fistula	-	Phosphates with external deposit of uric acid
Bruce Eton[6]	1956	7	Left duplex kidney with ectopic ureter draining into vagina	Lumbarization of the first sacral segment with spina bifida of the first, second and third sacral segments	Phosphate with ammonium molybdate-nitric acid
Youngblood VH[43]	1953	6	Urinary incontinence due to neurogenic bladder	Infected meningocele; spina bifida(operated); mild hydrocephalus	-
Hahn GA[17]	1949	34	congenitally small hymenal opening and congenital vaginal stenosis.	-	fibrin, hemoglobin, calcium carbonate, phosphate

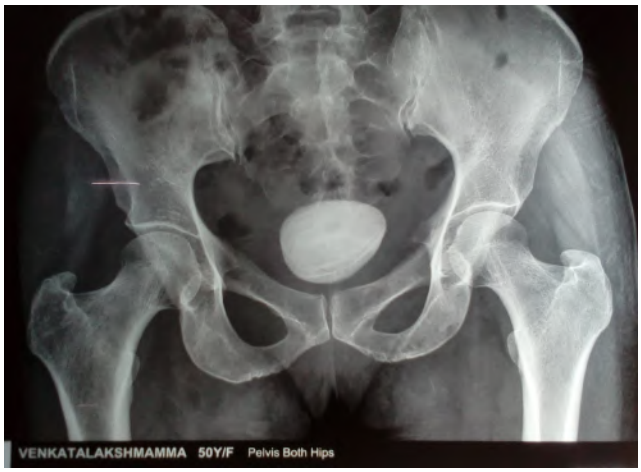

Fig. 1: X-ray showing pelvic calculus

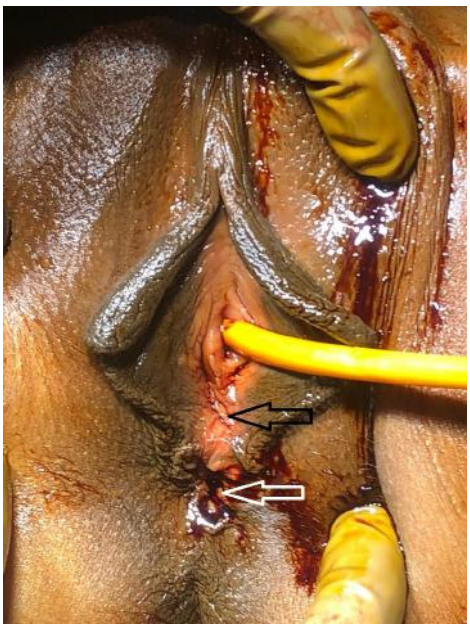

Fig. 2: Absent vaginal opening (black arrow), white arrow showing anal opening

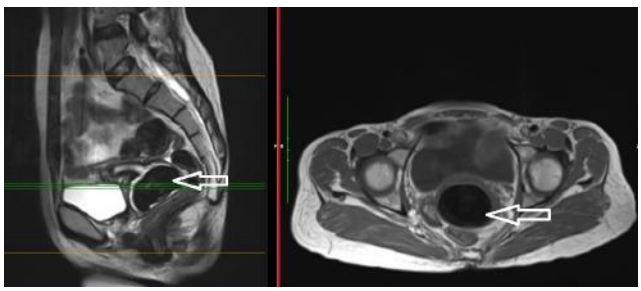

Fig. 3: MRI images showing vaginal calculus

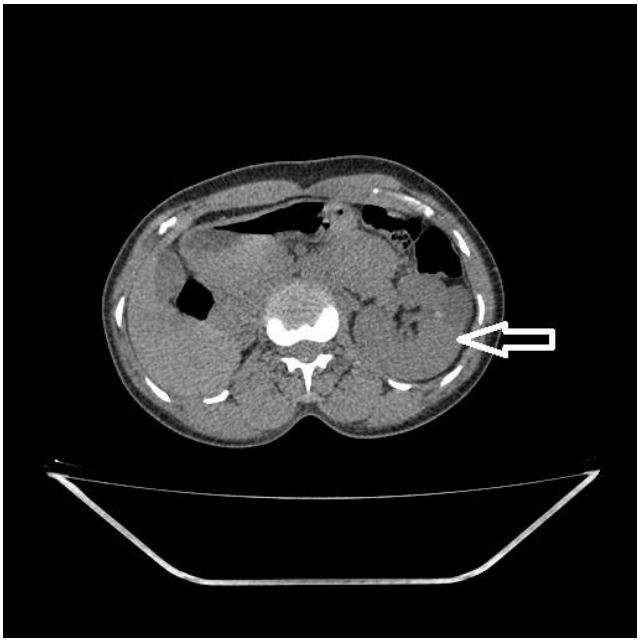

Fig. 4: Absent right kidney, arrow showing left kidney

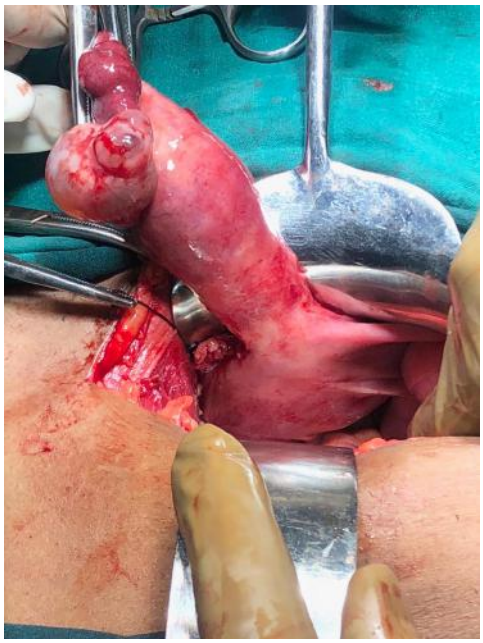

Fig. 5: Left unicornuate uterus with absent right mullerian structures

Table 2: Case reports-secondary vaginal calculus

Author	Year	Age of patient	Cause of calculus (nidus)	Comorbidity	Composition
Dewen Yan et al.[44] (both vaginal & bladder calculi)	2018	46	Migrated Chinese stainless steel ring intrauterine device (IUD) with bladder penetration	Vesicovaginal fistula	-
Griffith K et al.[45]	2017	68	Pelvic organ prolapse treated with polypropylene mesh	Mixed urinary incontinence	70% struvite and 30% dahllite
Iyasere C et al[46]	2017	61	Migrated intrauterine device	Previous strokes resulting in residual hemiparesis and consequent limited mobility	Magnesium ammonium phosphate hexahydrate (Struvite) with calcium phosphate as a minor component.
Surya M et al.[47]	2016	12	Calcification around plastic cap of a nail colour	Pelvic trauma, post-traumatic vesicovaginal fistula	-
Winkelman WD et al.[48]	2016	72	Vaginal mesh exposure	Mixed urinary incontinence; Apogee posterior and enterocele repair with mesh	80% ammonium-magnesium phosphate hexahydrate (struvite) and 20% carbonate apatite (dahllite)
Tavakkoli M et al.[18] (both vaginal & bladder calculi)	2013	26	Metallic wire used during the reconstruction of bladder, anterior abdominal wall and pubic symphysis	Bladder exstrophy, end stage renal disease	-
Kowser K[49]	2013	45	Threads of a contraceptive -intrauterine device,	Urinary incontinence, high BMI, relative immobility due to muscular dystrophy	-
Shailaja C et al.[50]	2009	56	Neglected vaginal pessary inserted for genital prolapse	Vesicovaginal fistula	-
Malik R et al.[35]	2006	Case 2: 35	Calcification around retained surgical sponge	Vesicovaginal fistula as a complication of cesarean section.	-
Patankar. S et al.[51]	2006	52	Retained gauze	Vesicovaginal fistula	-
Baser A[52]	2002	67	Suture material hanging from lower third of anterior vaginal wall	Anterior colporraphy	
Beedham T et al.[53]	2001	63	Lippes Loop IUCD	Encephalitis & urinary incontinence	Calcium carbonate and phosphate
Dalela D et al.[19]	1994	13	Cylindrical tin container	Vesicovaginal fistula	-

Table 3: Case reports- Ohvira syndrome

Author	Year	Age	Uterine abnormality
Yilmaz S et al.[54]	2017	13 & 15	Two cases with uterine didelphys
Mishra N et al.[55]	2014	13	Uterine didelphys
Jaiprakash T et al.[7]	2013	14	Septate uterus
Youssef MAFM[56]	2013	23	Uterine didelphys
Ugurlucan F et al.[24]	2013	13	Uterine didelphys
Mandava A et al.[23]	2012	14	Uterine didelphys
Shah DK et al.[57]	2011	12	Septate uterus with two cervices
Park NH et al.[22]	2010	12	Uterine didelphys

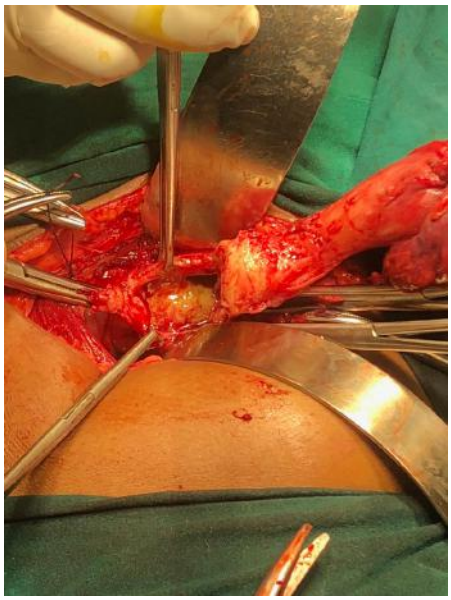

Fig. 6: Vaginal stone visualized on opening the vault

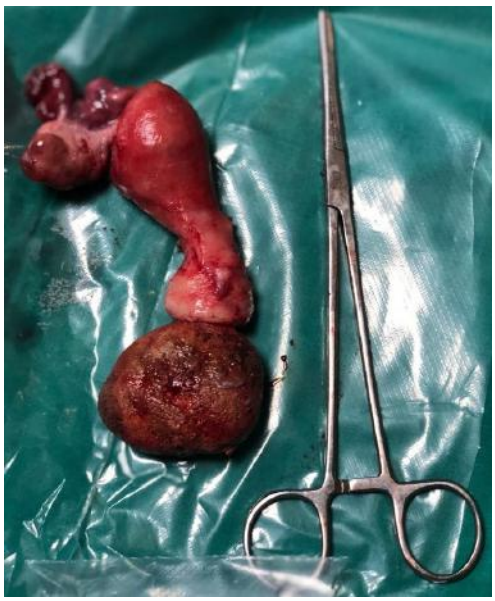

Fig. 7: Specimen of unicornuate uterus with vaginal stone

Our patient had a unicornuate uterus which has not been reported till now to the best of our knowledge.

The pathogenesis of this syndrome is related to anomalous development of the paramesonephric (Mullerian) and the mesonephric (Wolffian) duct. Acein proposed that the normal uterus, cervix and upper vagina is formed by the fusion of the two Müllerian ducts and subsequent reabsorption of the separating wall between the two. The Wolffian ducts located parallel to the Mullerian ducts, besides giving rise to kidneys and ureters, act as a guiding element to induce the appropriate development, fusion and reabsorption of the separating wall between both the Müller ducts. The inducing mesonephric ducts regress cranially, but enlarge caudally from the level of cervical os, to form the sino-vaginal bulbs and gives rise to the vaginal plate. Cavitation of the vaginal plate results in formation of vagina. Since the ureteral bud sprouts from the wolffian duct near its opening into the urogenital sinus, the distal injury to one of these ducts, or its absence, will give rise to unilateral renal agenesis. The missing or defective guiding element (Wolffian duct) results in the ipsilateral blind or atretic hemivagina, associated with variable uterine anomalies.[58] In case of typical OVHIRA syndrome, the Mullerian duct on the side where Wolffian duct is absent, is displaced laterally and cannot fuse with the contralateral duct resulting in didelphys uterus. Since it is displaced, it cannot come in contact with urogenital sinus centrally, and forms a blind sac leading to obstructed hemivagina.[24,58]

In our case there was complete agenesis of right Mullerian duct and right Wolffian duct structures resulting in the absence of right fallopian tube, right horn of the uterus and the absence of right kidney and ureter. Development of normal left sided Mullerian duct structures resulted in the formation of normal left fallopian tube and left unicornuate uterus and upper one-third of vagina. Agenesis of the lower two third of the vagina resulted in the blind vaginal pouch. The presentation in this syndrome is usually at puberty, shortly after menarche due to cyclic lower abdomen pain secondary to hematocolpos, unlike in our case who presented late. On direct questioning our patient could not recollect having cyclic lower abdominal pain in childhood.

We postulate in our case that the upper part of vagina which developed from the left Mullerian duct which formed a blind pouch, collected the menstrual blood from the functional endometrium of the unicornuate uterus. Over the period of her reproductive life this collected menstrual blood eventually led to the formation of this primary vaginal stone, which was completely of hematic origin.

4. Conclusion

Colpolithiasis and OHVIRA syndrome are rare clinical entities. Early detection of Mullerian anomalies is important for counselling and planning of proper management that helps to prevent complications and preserve future fertility. Greater awareness of these conditions amongst the treating physicians will result in early diagnosis and treatment. Hence a high index of suspicion and detailed evaluation, including imaging studies like ultrasound or magnetic resonance are needed for early recognition of these rare conditions.

5. Source of funding

None.

6. Conflict of interest

None.

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