

Unilateral Kidney Agenesis and other Kidney Anomalies in Infertile Men with Congenital Bilateral Absence of Vas deferens: A Cross-Sectional Study

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Abstract

Background: We aim to determine the prevalence of renal anomalies in patients with congenital vas deferens agenesis referred for infertility assessment.

Materials and Methods: This cross-sectional study was carried out on eligible infertile men from 2016 to 2019. Infertile men who were suspected of obstructive azoospermia were referred to the Ultrasound ward and they were examined by abdominal ultrasound for detecting the genital and kidney anomalies. An informed consent form was filled out by patients. Data was entered into SPSS software 21. Patients were divided into two groups in terms of congenital bilateral absence of vas deferens (CBAVD) or congenital unilateral absence of the vas deferens (CUAVD). Using the Chi-square test kidney anomalies between groups were compared. The $P < 0.05$ was considered significant.

Results: The mean age of participants was 33.05 ± 6.35 . The frequency of CBAVD was 66 and the frequency of left side VD and right side VD were 23 and 21, respectively. The percentage of other comorbidities was calculated. Out of 110 cases, 12 (11%) men had coexistence of vas deferens and kidney agenesis. Other studies are in agreement with our findings. Although the percentage of CBAVD and CUAVD were 9.1% and 1.8% respectively, the difference was not significant ($P=0.07$).

Conclusion: Considering the fact that kidney agenesis is a remarkable congenital anomaly that coexists with the majority of vas deferens agenesis cases and could not be detected by routine laboratory tests or transrectal ultrasound examination, it should be ruled out with transabdominal ultrasound examination after detection of vas deferens agenesis.

Keywords: Azoospermia, Congenital Absence of the Vas Deferens, Imaging, Kidney Anomalies

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Introduction

Infertility is said to affect 15% of the population of reproductive age who intends to become pregnant. In 50% of cases, infertility stems from male factors (1). Azoospermia which is responsible for 15% of all male infertility can be categorized into obstructive and non-obstructive azoospermia. In obstructive azoospermia, hormones and spermatogenesis are normal and the obstruction can be seen in different parts of the rete testis (2).

The vas deferens duct follows the epididymis and then shapes the ejaculatory duct (3). The vas deferens agenesis -congenital bilateral absence of the vas deferens (CBAVD) and congenital unilateral absence of the vas deferens (CUAVD) - is a rare anomaly that contributes to azoospermia and infertility (4).

Genital anomalies are seen along with urological anomalies (5). Congenital renal agenesis, for instance, is seen along with the vas deferens anomaly (6, 7). The direct effects, the side effects, and the repercussions of the urogenital anomalies have devastating impacts in the reproductive years, especially in men.

Different studies were carried out to estimate the prevalence of these comorbidities since their relationships and their prevalence are helpful for early detection, management, and timely treatment. No study has examined the prevalence of coexistence of the renal anomalies and vas deferens anomaly in Iran. Hence, in the present study, we aim to determine the prevalence of renal anomalies in patients with the congenital vas deferens agenesis referred for infertility assessment.

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Materials and Methods

Participants

This was a cross-sectional study that was carried out from 2016 to 2019 on infertile men patients. To be eligible for this study, men patients had to be 18-45 years of age, infertile, and suspected of obstructive azoospermia. Exclusion criteria were insufficient medical history, incomplete file, and lack of incorporation of patients. Ultimately, a total of 125 patients who met the criteria were entered into the study.

Procedures

Main medical and demographic information and history of the patients were assessed by reviewing the patient's files. The physical examination was done in patients who were suspected of obstructive azoospermia. Ultrasound examination was performed and confirmed the vas deferens agenesis. Other genital anomalies and coexisted renal anomalies (e.g., renal agenesis) were assessed using abdominal ultrasound and recorded.

Ethics approval and consent to participate

All procedures performed in the study were in accordance with the ethical standards of the institutional committee (IR.ACECR.Royan.REC.1400.036). The written informed consent form was obtained from all individual participants.

Measures

A demographic questionnaire was used for describing the sample and basic variables (e.g., age, education etc.) and was filled out by the patients. A constructed form (Yes vs. No items) was used by the medical staff; containing presence, absence, or malformations of the vas deferens, seminal vesicles, kidney, or any other kinds of urogenital anomalies.

Statistical approach

Data was entered into SPSS software (version 24, SPSS, Inc., Chicago, IL, USA). The descriptive analysis was used for detecting the central tendencies and distributions. Frequencies of the main variable, the coexistence of the vas deferens agenesis, and other anomalies were calculated. Patients were divided into two groups in terms of CBAVD or CUAVD. Using Chi-square test renal agenesis between groups was compared. The $P < 0.05$ was considered significant.

Results

All 125 cases were referred to the sonography ward after physical examination. They were suspected of vas deferens agenesis. The mean age of participants was 33.05 ± 6.35 . The other basic evaluable variables of CBAVD and CUAVD groups are seen in Table 1.

Table 1: General characteristics of the patients

Characteristics	Total	CBAVD	CUAVD	P value*
Number	125	66 (52.8)	44 (35.2)	
Age (Y)	33.05 ± 6.35	32.77 ± 5.04	32.39 ± 6.9	0.74
Duration of Marriage (Y)	4.74 ± 3.06	4.72 ± 3.29	4.46 ± 2.68	0.67
BMI (kg/m ²)	26.05 ± 3.7	25.74 ± 4.14	26.54 ± 3.17	0.29
Education				
Intermediate	55	27 (24.5)	22 (20)	0.23
Upper intermediate	70	39 (35.5)	22 (20)	

Data are presents as mean \pm SD or n (%). *: Obtained from t student/Mann-Whitney-U test for continuous variables and Chi-square test for Categorical variables, CBAVD; Congenital bilateral absence of the vas deferens, CUAVD; Congenital unilateral absence of the vas deferens, and BMI; Body mass index.

The frequency of CBAVD was 66, the frequency of left side VD Agenesis was 23 and the frequency of right side VD Agenesis was 21 (Table 2).

Table 2: VD Agenesis

Vas deferens anomalies	Frequency	Percent
VD agenesis	110	88
CBAVD	66	52.8
CUAVD	44	35.2
Left VD agenesis	23	18.4
Right VD agenesis	21	16.8

CBAVD; Congenital bilateral absence of the vas deferens and CUAVD; Congenital unilateral absence of the vas deferens.

The frequencies of Kidney Anomalies are shown in Table 3.

Table 3: Kidney anomalies

Kidney anomalies	Frequency	Percent
Kidney agenesis	20	16
Left kidney agenesis	9	7.2
Right kidney agenesis	11	8.8
Ectopic left kidney	7	5.6
Ectopic right kidney	7	5.6
Right side small ectopic kidney	1	0.8
Left side small ectopic kidney	1	0.8
Compensatory hypertrophic left kidney	11	8.8
Compensatory hypertrophic right kidney	4	3.2
Hypoplastic kidney	6	4.8
Hypoplastic left kidney	1	0.8
Hypoplastic right kidney	5	4
Ectopic hypoplastic right kidney	1	0.8
Horse shoe kidney	1	0.8

Out of 110 cases, 12 (11%) men had coexistence of vas deferens and kidney agenesis. Although the coexistence of vas deferens and kidney agenesis in the CBAVD and CUAVD groups were 9.1 and 1.8% respectively, the difference was not significant ($P=0.07$). The data of other comorbidities are figured in Table 4.

Table 4: Coexisted VD agenesis and kidney

Kidney anomalies	Total VD	CBAVD	CUAVD	P value*
Kidney agenesis	12 (11)	10 (9.1)	2 (1.8)	0.07
Left kidney agenesis	5 (4.5)	4 (3.6)	1 (0.9)	0.33
Right kidney agenesis	7 (6.4)	6 (5.5)	1 (0.9)	0.15
Ectopic left kidney	5 (4.5)	5 (4.5)	0 (0)	0.73
Ectopic right kidney	7 (6.4)	6 (5.5)	1 (0.9)	0.15
Right side small ectopic kidney	1 (0.9)	1 (0.9)	0 (0)	0.6
Left side small ectopic kidney	0 (0)	0 (0)	0 (0)	-
Compensatory hypertrophic left kidney	4 (3.6)	3 (2.7)	1 (0.9)	0.47
Compensatory hypertrophic right kidney	0 (0)	0 (0)	0 (0)	-
Hypoplastic left kidney	0 (0)	0 (0)	0 (0)	-
Hypoplastic right kidney	2 (1.8)	1 (0.9)	1 (0.9)	0.64
Ectopic hypoplastic right kidney	1 (0.9)	1 (0.9)	0 (0)	0.6
Horse shoe kidney	1 (0.9)	1 (0.9)	0 (0)	0.6

Data are presents as n (%). * Obtained from Chi-square test, CBAVD; Congenital bilateral absence of the vas deferens, and CUAVD; Congenital unilateral absence of the vas deferens.

Discussion

Studies have revealed that the prevalence of CBAVD in infertile men is about 1-2% and it increases in patients who are diagnosed with azoospermia (4). The clinical sign of CBAVD is a bilateral absence of the vas deferens and distal portion of the epididymis (8). In such cases, the size of the testis is normal, however, the sperm analysis and its volume are abnormal due to the seminal vesicle agenesis. Considering the fact that the hormonal profile is normal in these patients, sonographic assessment is recommended for ruling out the vas deferens and seminal vesicle agenesis (9).

To the best of our knowledge, the exact prevalence of CUAVD is unclear since its clinical features vary and the reproductive status of those men with one vas deferens duct might be normal. These conditions might be detected during vasectomy procedures or other urologic assessments. Therefore, the CUAVD needs clinical examination and other follow-ups (4, 10).

In the present study, the frequency of the vas deferens agenesis is calculated 88% which is much higher than its prevalence in the infertile men population. It is worth bearing in mind that these patients were referred to the sonography ward after precise physical examination by an experienced urologist specialist.

Being the main purpose of our study, the percentage of coexistence of vas deferens and kidney agenesis was calculated at 11%. A recent study has revealed that the prevalence of kidney agenesis in patients with vas deferens agenesis is 11.8% which is in agreement with our finding (11). Although the fact that the percentages of the kidney anomalies in the CBAVD group were higher than the CUAVD group, the differences were not significant statistically. It might be due to the sample size.

The coexistence of urogenital anomalies stems from the embryogenic development period in 4-12 weeks of pregnancy. The urologic and genital organs originate from the mesonephric duct. Any distortion in the development of the mesonephric duct results in congenital urogenital anomalies. Therefore kidney agenesis occurs with genital anomalies such as vas deferens agenesis (4).

Generally, urologic anomalies account for approximately 33% of congenital anomalies. Additionally, the prevalence of kidney agenesis is between 0.05 and 0.025% (5). This kind of rare anomaly is higher in infertile patients with vas deferens agenesis.

The kidney agenesis is detectable simply using transabdominal sonography, hence, the transabdominal sonography is recommended after detection of the vas deferens agenesis in infertile men (9).

Moreover, some kidney anomalies are said to be due to a kind of compensatory mechanism. Kidney hypertrophy is a notable example in patients who deal with unilateral kidney agenesis. Studies have revealed different prevalence for hyperplastic kidneys considering the origins and the population structure. There is no general agreement on whether this phenomenon is useful or not. Further study and long-term follow-ups are needed until the puberty period (4).

Anyway, one kind of the other malformations such as ectopic kidney might be seen. Nevertheless, the hypoplastic or dysplastic kidney is probable. In patients with hypoplastic or dysplastic kidney, other causes such as radiotherapy and artery stenosis should be considered (12).

In the present study, the percent of the hypoplastic kidney was calculated at 4.8%. The hypoplastic kidney is the most common cause of chronic kidney disease. Developmental imperfection (e.g., genetic problems and prematurity) are said to be the most source of the hypoplastic kidney anomaly and there is no specific percentage for the coexistence of the hypoplastic kidney with genital malformations (13).

Moreover, the prevalence of the horse kidney is between 0.01 and 0.25% in the literature (5). In this study the percent of 0.8% notes its increasing prevalence in infertile men with genital malformations. These findings suggest that the patients who suffer from the vas deferens agenesis should be monitored and clinical follow-ups for the kidney anomalies, blood pressure, and serum creatinine should be performed in specific cases. These people have a normal quality of life and should only be prohibited from strenuous exercise (7).

Considering the fact that vas deferens agenesis is seen in cystic fibrosis disease, infertile men with the vas deferens agenesis should be assessed in three domains including infertility, urinary tract malformation, and cystic fibrosis disease (5).

According to recent studies, in patients with the CBAVD and normal urinary tract, it is more likely that

the CBAVD is due to cystic fibrosis. So the probability of cystic fibrosis disease should be assessed (7). Albeit, in some cases both kidney agenesis and cystic fibrosis disease were detected in the CBAVD patients; so cystic fibrosis disease should be ruled out in the CBAVD patients. These urogenital malformations stem from different developmental imperfections and genetic factors, (14) hence, further assessments and pre-implantation counseling are helpful for prevention of transition to a future generation.

Lack of following up of genetic counseling before the implantation accounts for the limitation of our study. The patients in the present study were not followed up inasmuch as it was a retrospective study.

The urogenital anomalies impose an extra and great burden on the patients, their families, and the societies. Considering those worthy preparations could be implemented in this regard, a much more comprehensive study containing genetic assessment is needed. Further research with a larger sample size concordant with laboratory analysis is recommended for cutting the chain of transition to the next generation.

Conclusion

Considering the fact that renal agenesis is a remarkable congenital anomaly that coexists with the majority of vas deferens agenesis cases and could not be detected by routine laboratory tests or transrectal ultrasound examination, it should be ruled out with transabdominal ultrasound examination after detection of vas deferens agenesis.

Moreover, since the assisted reproductive technology (ART) outcomes in these cases are satisfactory, genetic counseling before implantation is necessary and the fetus should be followed up in terms of urogenital anomalies during pregnancy.

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Authors' Contributions

A.V.T.D., F.P.; Participated in study design, data collection, and evaluation. A.V.T.D.; Performed ultrasound examinations. H.S; Performed the physical examination of patients, detected vas deference agenesis, and participated in follow up the outcomes of the patients. F.N.; Contributed extensively in the interpretation of the data and the conclusion. F.P; Wrote the manuscript. All authors read and approved the final version of the manuscript.

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