Asian Journal of Urology 11 (2024) 642–650

Available online at www.sciencedirect.com

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journal homepage: www.elsevier.com/locate/ajur

Original Article

Long-term outcomes of erectile function in adult orchidopexy patients

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Received 19 June 2023; accepted 2 August 2023
Available online 5 February 2024

KEYWORDS
Undescended testis;
Orchidopexy;
Erectile dysfunction;
Psychological factor;
The International Index of Erectile Function-15

Abstract *Objective:* Cryptorchidism affects up to 6% of full-term male infants, and orchidopexy has been shown to reduce impaired spermatogenesis and malignant risks significantly. However, the relationship between orchidopexy and sexual function has not been investigated. Therefore, this study aimed to evaluate sexual function outcomes in adult patients who underwent orchidopexy for unilateral undescended testis in childhood.
Methods: Totally, 58 adult patients who underwent unilateral orchidopexy in childhood were enrolled in the study. Erectile dysfunction (ED) was assessed by the International Index of Erectile Function (IIEF)-15 questionnaire. All participants underwent serum (testosterone and follicular stimulating hormone levels) measurement and semen analysis. Paternity rates were evaluated to assess the patient's fertility. Additionally, anxiety, depression, and stress were measured by the self-rating anxiety scale, self-rating depression scale, and visual analogue scale, respectively.
Results: There was no statistically significant difference between IIEF-15 scores (intercourse satisfaction, orgasmic function, sexual desire, or overall satisfaction) comparing the cryptorchidism group with the control group; however, the ED was significantly higher in the cryptorchidism patients ($p=0.000$). At the median follow-up of 16.3 years, 15.5% of our patients complained of moderate to severe ED. Most patients were satisfied with their overall relationship and only 34.5% were not satisfied. Anxiety, depression, and stress were more prevalent in cryptorchidism than in healthy men (anxiety: 72.4% *vs.* 20.7%; depression: 19.0% *vs.* 5.2%; stress: 60.3% *vs.* 10.3%; $p<0.05$). Additionally, ED was negatively associated with anxiety, depression, and stress symptoms ($r=-0.518$, $p=0.000$; $r=-0.448$, $p=0.000$; $r=-0.591$, $p=0.000$, respectively). Moreover, ED had a significant correlation with advancing age, psychological factors (anxiety, depression, and stress), infertility, and low levels of testosterone ($p<0.05$).

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Peer review under responsibility of Tongji University.

https://doi.org/10.1016/j.ajur.2024.02.001

Conclusion: Low testosterone, infertility, and psychological burden (anxiety, depression, and stress) are used as factors for predicting ED outcomes after orchidopexy for undescended testis to guide physicians to evaluate the efficacy of testosterone replacement and psychological support in their management.

1. Introduction

Cryptorchidism or undescended testis (UDT) is one of the most common congenital genital disorders identified among males at birth [1]. Orchidopexy is the gold standard approach for dealing with undescended testes in children before puberty [2]. The main goal of orchidopexy is to reduce the subsequent increased risk of infertility, gonadal dysfunctional, psychological burden, and malignancy associated with UDT [3].

However, in spite of orchidopexy, cryptorchidism is often associated with abnormal semen values and reproductive hormones, which have a negative impact on male fertility and reproductivity. Furthermore, UDT patients require lifelong follow-ups because of the potential for increased incidence of sexual dysfunction and their possible association with infertility, hormonal, and psychological factors to manage these sexual issues [3—5].

Previous studies have shown that infertility and psychological disorders in human reproduction have many negative sexual consequences, such as decreased sexual satisfaction and an increased incidence of erectile dysfunction (ED) [6—10].

However, a little significant number of scientific reports have been published that discuss sexual function and the incidence of ED in patients who underwent orchidopexy. A few published reports, however, have focused on the ED outcomes for adult patients operated for UDT with posterior urethral valve and Klinefelter's syndrome in childhood. In these patients, however, sexual outcomes were dependent on whether the patients had posterior urethral valve or Klinefelter's syndrome [11—14].

To our knowledge, there is no research assessing the sexual outcome of UDT in childhood. Furthermore, longitudinal studies following orchidopexy with different procedures are still rare, and their real impact on adult sexual behavior remains uncertain. Therefore, in this study, we aimed to evaluate the long-term sexual outcome function and its possible associations with psychological problems and investigate its specific correlates in adult men with unilateral orchidopexy.

2. Patients and methods

2.1. Study populations

We retrospectively analyzed the data of a total of 413 patients with a previous history of UDT who were referred to our andrology outpatient clinic at Menoufia University Hospital, Shebin El-Kom, Egypt. From this group, 58 patients who underwent orchidopexy in childhood were selected. In addition, 58 healthy men from the general population were enrolled as a control group, with a similar age between the two groups. The control participants had no history of urological diseases (*e.g.*, urinary tract anomalies, malignancies, pelvic trauma, or surgery). The research protocol for the study was approved by the Institutional Review Board of the Menoufia Faculty of Medicine (MUME-1372-13) and conducted in accordance with the principles of the Helsinki Declaration. All the participants provided us with the written consent.

2.2. Cryptorchidism evaluation

The diagnosis of the preoperative testicular position and laterality of the UDT was based on the history of surgery, physical examination, and ultrasonography of the scrotum and groin. In addition, the testicular volume of the undescended and contralateral descended testes was measured by ultrasonography. A volume of 10 mL was arbitrarily established as the cutoff for testicular hypotrophy [15,16].

2.3. Fertility assessment

The participants were surveyed using an anonymous questionnaire that included general information about fertility assessments (primary or secondary infertility, cause of infertility, and history of semen collection for assisted reproductive technology). Infertility is defined as the inability to conceive after 12 months or more (up to 2 years) of regular, unprotected intercourse [17].

2.4. Sexual function evaluation

Erectile function and satisfaction with sexual function were assessed in the patients and in the controls by using the International Index of Erectile Function (IIEF)-15 [18], analyzing the five domains of male sexuality (erectile function, desire, intercourse satisfaction, orgasmic function, and overall satisfaction) of participants with or without ED during the last month. Patients with post-surgical orchidopexy were invited to complete the IIEF-15 questionnaires immediately after each clinical follow-up evaluation, at least 12 months after the surgical fixation. Sexual dysfunction was calculated as a score of $\leq$17 in the "erectile function" domain, a score of $<$13 in "intercourse satisfaction" domain, or a score of $<$9 in the remaining domains (orgasmic function, sexual desire, and overall satisfaction) [19].

2.5. Psychological factors evaluation

UDT can influence the patient's anxiety, depression, and stress symptoms, which reflect the degree of their psychological status. Therefore, all participants were surveyed to complete a validated instrument for the screening and assessment of the severity of anxiety, depression, and stress symptoms by using the self-rating depression scale (SDS), self-rating anxiety scale (SAS), and visual analogue scale (VAS) questionnaires, respectively [20—22]. The SAS of $\geq$50 and SDS of $\geq$53 were diagnosed as anxiety and depression, respectively. In addition, the severity of anxiety was categorized as mild (score 50 to 59), moderate (score 60 to 69), or severe (score $>$70) [23]. The ratings for depression were mild (score 53 to 62), moderate (score 63 to 72), or severe (score $>$72) [23]. Men were asked to assess their stress levels regarding sexual function during timed intercourse using 10-division VAS questionnaires, with zero representing no stress and 10 representing the worst imaginable stress [22].

2.6. Laboratory analysis

Patients were evaluated at their first visit with the age of $\geq$18 years for the serum hormone testing and semen analysis. Semen samples were collected after 3—5 days of sexual abstinence, and parameters were analyzed and compared with the World Health Organization 2010 normal values. Sperm concentration and motility were defined in accordance with World Health Organization standards for 2010 [24]. The sperm morphology was determined according to Kruger's strict criteria [25].

Hormone levels included serum follicular stimulating hormone (FSH), and total testosterone were measured with chemiluminescent immunoassay. Early morning blood samples, after an overnight fast, were collected for the measurement of sex hormones [26].

2.7. Selection criteria for participants

We included married male patients with unilateral cryptorchidism and those who had a history of orchidopexy during childhood. We excluded patients with bilateral cryptorchidism, unilateral testicular absence, recurrent orchidopexy, postoperative testicular atrophy, or prior inguinal surgery. Participants reporting no intercourse in the 4 weeks before the questionnaire were excluded from the analysis. Individuals were also excluded after a history of sudden onset of ED, psychiatric problems, or drug addiction.

Patients with a specific disorder's contraindication for the study (*e.g.*, Klinefelter's syndrome, idiopathic hypogonadotropic hypogonadism, and Down syndrome) and a history of preoperative hormonal treatment were also excluded. Men on medications that affect their erectile function and/or psychological status taken prior to the IIEF-5 questionnaires were also excluded (*e.g.*, selective serotonin reuptake inhibitors, tricyclic antidepressants, or phosphodiesterase type 5 inhibitors). Exclusion criteria were also patients with a history of major mental handicaps, genital surgery or trauma, malignancy, or chronic internal diseases (*e.g.*, diabetes mellitus, hypertension, or thyroid dysfunction).

2.8. Statistical analysis

All statistical analyses were performed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous data were analyzed using the medians and interquartile ranges (IQRs) and compared by using the Mann—Whitney *U* test. The Chi-squared test was used for comparison of categorical variables. The statistical significance of any change in the psychological burden was tested using the Spearman's rank correlation. A stepwise multivariable logistic regression analysis was used to identify the potential risk factors for ED. Statistical significance was set at a *p*-value of $<$0.05.

3. Results

Detailed patients' demographic and clinical data were summarized in Table 1. The median (IQR) ages of patients and control groups were 23.8 (22.9—27.4) years and 25.6 (24.0—27.2) years, respectively. The age range was 22—38 years in the patient group and 22—37 years in the control group.

Physical examination revealed that 49 of 58 testes were palpable in the inguinal region and nine in superficial inguinal pouch. The median age at orchidopexy was 2.1 (IQR 1.8—2.5) years. Orchidopexy was performed for 21 right and 37 left unilateral cryptorchid testes, two of which were performed laparoscopically. The paternity rate was reported in 72.4% in our patients.

During the follow-up (median 16.3 [IQR 15.8—16.6] years), total postoperative complications developed in six (10.3%) patients (four inguinal hernias and two hydroceles) on the follow-up. Complications, such as wound infection or scrotal hematoma, did not occur. Men without

Table 1 Patient's demographic and clinical data (n=58).

Characteristic	Value
Age at presentation, year	23.8 (22.9—27.4)
Follow-up, year	16.3 (15.8—16.6)
Age at operation, year	2.1 (1.8—2.5)
Location of testis	
Inguinal canal	49 (84.5)
Superficial inguinal pouch	9 (15.5)
Laterality	
Right	21 (36.2)
Left	37 (63.8)
Fertility status	
Normozoospermia	25 (43.1)
Oligozoospermia	27 (46.6)
Azoospermia	6 (10.3)
Men without children	16 (27.6)
Total postoperative complication	6 (10.3)
Inguinal hernias	4 (6.9)
Hydrocele	2 (3.4)

Note: values are presented as median (interquartile range) or *n* (%).

children (primary infertility) after orchidopexy were observed in 16 (27.6%) patients.

3.1. Sexual function evaluation

The postoperative IIEF-15 domains are shown in Table 2. Nine (15.5%) patients experienced postoperative ED (≤17) during the questionnaire screening. The median intercourse satisfaction, orgasmic function, sexual desire, or overall satisfaction was not significantly different in the orchidopexy group from that in the control group ($p=0.379$, $p=0.569$, $p=0.133$, and $p=0.638$, respectively), except for poor erectile function ($p=0.000$). In the orchidopexy group, ED had a significant correlation with the advancing age, infertility, and low levels of serum testosterone ($p=0.000$, $p=0.008$, $p=0.000$, respectively).

When erectile function was assessed, the median scores of IIEF-15 for orchidopexy and control men were 24 (IQR 19–26) and 28 (IQR 24–30), respectively ($p=0.000$). A total of nine (15.5%) orchidopexy men reported overall ED (median IIEF-15 score 12 [IQR 11–13]). Eighteen (31.0%) orchidopexy men reported mild ED and seven (12.1%) moderate ED, whereas two (3.4%) patients reported severe ED.

Table 2 Sexual outcomes and psychological disorders in men with orchidopexy versus healthy control men.

IIEF-15 domain[a]	Patient ($n=58$)	Control ($n=58$)	p-Value[b]
ED score (6–30)			0.000
Median (IQR)	24 (19–26)	28 (24–30)	
6–10 (severe)	2 (3.4)	1 (1.7)	
11–17 (moderate)	7 (12.1)	3 (5.2)	
18–25 (mild)	18 (31.0)	13 (22.4)	
26–30 (no ED, normal)	31 (53.4)	41 (70.7)	
Intercourse satisfaction score (0–15)			0.379
Median (IQR)	12 (8–13)	13 (8–13)	
0–12 (dissatisfied)	17 (29.3)	19 (32.8)	
13–15 (satisfied)	41 (70.7)	39 (67.2)	
Orgasmic function score (0–10)			0.569
Median (IQR)	9 (8–9)	9 (8–9)	
0–8 (dysfunctional)	7 (12.1)	5 (8.6)	
9–10 (normal function)	51 (87.9)	53 (91.4)	
Sexual desire score (2–10)			0.133
Median (IQR)	7.0 (6.0–8.0)	7.5 (7.0–8.0)	
2–8 (dysfunctional desire)	39 (67.2)	38 (65.5)	
9–10 (normal desire)	19 (32.8)	20 (34.5)	
Overall satisfaction score (2–10)			0.638
Median (IQR)	7 (6–9)	8 (7–9)	
2–8 (dissatisfied)	20 (34.5)	18 (31.0)	
9–10 (satisfied)	38 (65.5)	40 (69.0)	
VAS score	8 (3–9)	2 (1–2)	0.036
SAS score, median (IQR)			0.008
Median (IQR)	51 (51–61)	25 (18–41)	
<50	12 (20.7)	46 (79.3)	
50–59	29 (50.0)	10 (17.2)	
60–69	13 (22.4)	2 (3.4)	
≥70	4 (6.9)	0	
SDS score			0.000
Median (IQR)	22 (15–33)	9 (7–13)	
<53	47 (81.0)	55 (94.8)	
53–62	10 (17.2)	2 (3.4)	
63–72	1 (1.7)	1 (1.7)	
>72	0	0	

IIEF, International Index of Erectile Function; IQR, interquartile range; ED, erectile dysfunction; VAS, visual analogue scale; SAS, self-rating anxiety scale; SDS, self-rating depression scale.
Note: values are presented as median (interquartile range) or *n* (%); percentages may not sum up to 100% due to rounding.

[a] IIEF-15 containing five domains: erectile function (Q1, Q2, Q3, Q4, Q5, and Q15); intercourse satisfaction (Q6, Q7, and Q8); orgasmic function (Q9 and Q10); sexual desire (Q11 and Q12); overall satisfaction (Q13 and Q14).

[b] p-Value: the comparison between patient and control groups done by the Mann–Whitney U test.

3.2. Psychological factors and sexual evaluation

When compared with control men, orchidopexy men reported significantly higher rates of sexual dysfunction and psychological burden, including anxiety, depression, and stress symptoms ($p<0.05$) (Table 2).

According to the outcomes of the SAS, SDS, and VAS, 72.4% (42/58), 19.0% (11/58), and 60.3% (35/58) of orchidopexy men were diagnosed with anxiety and depression, respectively. The median scores of the SAS, SDS, and VAS for orchidopexy men were 51 (IQR 51—61), 22 (IQR 15—33), and 8 (IQR 3—9), respectively. Fifty percent (29/58) orchidopexy men reported mild anxiety, 22.4% (13/58) moderate anxiety, and 6.9% (4/58) severe anxiety. For the outcomes of SDS, 17.2% (10/58) reported mild depression and 1.7% (1/58) moderate depression, whereas no patients reported severe depression. However, the median SAS, SDS, and VAS scores reported by control men were 25 (IQR 18—41), 9 (IQR 7—13), and 2 (IQR 1—2), respectively. The incidences of anxiety, depression, and stress in the control group were 20.7% (12/58), 5.2% (3/58), and 10.3% (6/58), respectively, which were lower than those in the orchidopexy group ($p<0.05$). The IIEF-15 score was negatively associated with anxiety, depression, and stress symptoms ($r=-0.518$, $p=0.000$; $r=-0.448$, $p=0.000$; $r=-0.591$, $p=0.000$, respectively).

3.3. Infertility, semen analysis, and sexual evaluation

When compared with control men, orchidopexy men reported significantly higher rates of abnormal semen analysis (89.7%, 52/58) and infertility (27.6%, 16/58) ($p<0.05$). A significant association between infertility and ED in orchidopexy men was also detected ($p=0.000$). Furthermore, we observed a significant relationship between the erectile function in orchidopexy patients and the severity of semen quality impairment in 44.4% of ED patients ($p=0.000$); moreover, five of nine ED had azoospermia. The semen analysis in the postoperative period revealed that 27 had oligozoospermia and six had azoospermia.

3.4. Hormone blood level and sexual evaluation

The median levels of the testosterone and FSH for orchidopexy men were 5.13 (IQR 5.03—5.29) and 3.30 (IQR 2.30—7.70), respectively. However, the plasma levels of total testosterone significantly differed between orchidopexy cases and controls ($p=0.000$), but not for FSH levels ($p=0.194$). Orchidopexy men reported significantly lower rates of serum testosterone (19.0%, 11/58). Furthermore, we observed a significant relationship between the erectile function in orchidopexy patients and a lower level of testosterone ($p=0.000$). Moreover, a decrease in testosterone level was observed in eight of nine (88.9%) patients with ED.

3.5. Multivariable logistic regression analysis

A multivariable logistic regression model for the outcome was constructed and included all five predictors (age at the time of presentations, serum testosterone, infertility, abnormal semen values, and psychological burden, including anxiety, depression, and stress symptoms). Based on this model, serum testosterone ($p=0.001$, odds ratio = 35.5, 95% confidence interval: 4.6—289.7) was a significant predictor of ED in orchidopexy patients. In that analysis, the parameters that were not grouped were grouped, and the cut-offs for age at the time of presentation, age at the time of operation, and serum testosterone level were <23.17 years *vs.* $\geqslant 23.17$ years, <1.34 years *vs.* $\geqslant 1.34$ years, <4.37 ng/mL *vs.* $\geqslant 4.37$ ng/mL, respectively.

4. Discussion

Results from our study showed that the incidence of ED in orchidopexy men with primary unilateral cryptorchidism was 15.5%. Moreover, low levels of testosterone, infertility, advancing age, and psychological burden (anxiety, depression, and stress) were significantly associated with impaired erectile function in men with such an anomaly. However, 65.5% of the overall sexual outcomes are satisfying, considering that those patients with unilateral UDT. Furthermore, the IIEF-15 score was negatively associated with anxiety, depression, and stress symptoms. Additionally, low serum testosterone was the most useful indicator for diagnosis of ED in orchidopexy patients.

Male patients with UDT in this series show decreased serum testosterone levels, with testosterone deficiency rates as high as 88.9% in the ED patients. To our knowledge, we report the first study to show an association between the serum testosterone level and ED in men with a history of cryptorchidism. Reduced testosterone production has been established as the principal cause of ED by alteration of the corporal venoocclusive function [27]. ED is a well-recognized symptom of clinical hypogonadism [28]. In this report, it is important to recognize that the low testosterone rate (19.0%) assessed in this study represent a biochemical finding without clinical and symptomatic hypogonadism correlations [29]. In addition to the decrease in testosterone, some patients had high FSH, which was suspected to have a negative impact on erectile function in this group of men. Our results suggest that testosterone and FSH are useful markers of ED potential in men with a history of UDT. However, normal hormone levels are not certain indicators of normal erectile function in these men. In addition, orchidopexy men with evidence of biochemical hypogonadism are more likely to have an impaired emotional state and lower cognitive function [30,31]. Furthermore, within this group, impaired semen quality is closely correlated with 44.4% of ED cases in this study. It is also well known that abnormal semen values are closely correlated with testosterone levels, although testosterone levels may remain normal in 11.1% of ED cases [9,32].

There are several factors that may affect sexual function in patients with UDT. Infertility and psychological burden are common in patients with UDT and often associate with reduced sexual function. Orchidopexy is mandatory for patients with cryptorchidism to preserve post-puberty fertility and androgen production. However, clinical studies on post-puberty orchidopexy men revealed low fertility [33]. Infertility rates in men with a history of

cryptorchidism are estimated to be twice compared to those without cryptorchidism [34]. Evaluation of semen analyses and paternity in patients with unilateral cryptorchidism suggests decreased fertility potential [34—36]. In this study, the paternity rate was reported at 72.4% in the patients with UDT, in accordance with Miller et al. [37]. Paternity rates were significantly lower for men in their series with sexual dysfunction [38]. This is supported by the differences in both sexual function and abnormal semen analysis between orchidopexy and healthy control men. There may be multiple causes of infertility, including the underlying cause of testicular maldescent, preoperative anatomical position of the testis, testicular injury, and acquired disease, in addition to postoperatively recurrent epididymo-orchitis [37—39]. A link between fertility and ED is supported by evidence of biological cross-talk between the hypothalamic—pituitary—adrenal and hypothalamic—pituitary—gonadal axes [40]. Generally, for men in orchidopexy couples with ED, anxiety and depression were associated with infertility and ED as measured by the testosterone level and semen analysis [41,42]. Moreover, results from a recent meta-analysis suggest that reducing psychosocial stress in infertile couples may improve clinical pregnancy rates [43]. Correlating ED with paternity in our results could potentially allow birth rate data to help predict the likelihood of having ED in the future.

Many post-orchidopexy patients with ED have different degrees of mental and psychological problems. After investigating post-orchidopexy patients with ED, with psychologically validated instruments, we found that anxiety and depression were more prevalent in patients with lower IIEF-15 scores. In addition, our study confirms the negative relationship between psychological burden (anxiety or depression) and IIEF-15 scores. We also found that both lower fertility and anxiety and depression in the male partners were strongly associated with ED. Furthermore, lower fertility and depression were associated with low testosterone or abnormal semen parameters [8,12,44]. In general, the incidence of depression and anxiety disorders in patients with andrological diseases is significantly higher than that in the general population [45—48]. Moreover, our data demonstrate that, among orchidopexy ED men, those with depression were over 18.9%, more likely to have moderate and severe ED, which was established by other studies [49,50].

Our study analyzed the effects of psychological stress on male hormones and sexual function, noting that psychological stress reduces serum total testosterone levels and increases serum FSH levels, suggesting that stress management might be required to improve both male fertility and sexual function. These findings were confirmed and well established in other studies, which suggest that the incidences of sexual and psychological problems in ED men are higher than those in non-ED men [48,51—54].

Our study provides a framework for understanding the relationship between sexual function and psychological distress in orchidopexy men. We also believe that this is related to the fact that orchidopexy men are more liable for psychological burden, especially anxiety and stress, because of the desire of having offspring and the uncertainty of the fertility outcome. This increasing pressure may not only bring negative emotions but may also affect male sexual and reproductive functions. Anxiety and associated stress can negatively affect a man's fertility and erectile function. Stressful life events have been associated with impaired spermatogenesis and suppression of testosterone production, which is critical for erectile function [22]. Both semen quality and testosterone level have been found to be reduced in ED men reporting higher psychological stress compared to non-ED men reporting lower stress [6,9,22,44,53]. Moreover, the negative psychological factors might impair, weaken, and frighten patients' self-esteem, all of which are negative feelings that can be further exported to sexual life, impairing erectile function and causing further frustration. Psychological factors are often important factors influencing disease outcomes and communication between physicians and patients, especially for patients with sexual dysfunction [55]. Further interventional studies are advisable to confirm this hypothesis.

In this study, orchidopexy men reported a high incidence of hypoactive sexual desire (67.2%), indicating that original testicular anomalies, low testosterone, and alterations in other parts of the emotional brain have an effect on desire strength. Sexual desire is a well-known androgen-dependent symptom, even though other hormonal abnormalities (*e.g.*, high FSH), relational, and/or intra-psychic factors might be present [51]. The fact that sexual problems in UDT are associated with low testosterone suggests that testosterone replacement therapy should usually precede other therapeutic options. It is conceivable that testosterone replacement therapy would improve the reported low sexual desire observed in this study. However, orgasmic dysfunction was also detected at a low incidence (12.1%) in this study. Furthermore, when examining the general sexual satisfaction of patients, we found that except for 34.5%, all patients were satisfied with sexual performance. However, the general level of satisfaction with sexual activity among patients did not differ significantly from the control. In this study, sexual satisfaction in general was associated with both emotional and physiological aspects. It is noting that low testosterone is also an independent risk factor for the occurrence of ED in men with orchidopexy. In addition, the psychological burden (anxiety, depression, and stress) can also predict the status of ED.

The association between the patient's age and prevalence of progressive ED, specifically penile venous leakage in our ED patients, is mainly linked to the decrease in penile corporal tissue elasticity. This abnormality can be upregulated by corporal ischemia, cavernosal nerve injury, and androgen deficiency [56]. With the increase in age, the erectile function of men will gradually decline, and the degree of depression is more likely to affect the patient's sexual desire and affect erectile function [9,57,58]. The problems with achieving erections during sexual stimulation occur only in older patients. To our knowledge, the effect of the age on the ED in the orchidopexy group is much less clear at this time. Published reports comparing age with ED have been inconsistent.

4.1. Limitations of this study

There are some limitations to this study, including a relatively small number of participants, which increases the risk for selection bias. Moreover, we have no comparative

studies on the overall sexual performance and satisfaction of each type of UDT to make conclusive recommendations. Patients with testicular atrophy were excluded from statistical comparisons, which led to potential bias concerning the impossibility to correlate the impairment of erection with orchidopexy.

The study should also include female partners' sexual function and psychological status, and evaluate male and female factors together, which will be supplemented in our subsequent studies. The possibility of underdiagnosed cases of symptomatic hypogonadism syndrome should be considered. It is important to acknowledge that our study excluded men with ED associated with underlying congenital anomalies, comorbid medical conditions (*e.g.*, diabetes), or medication use that influences sexual function and psychological well-being. In addition, the cross-sectional nature of our study could not clarify the causal relationship between sexual dysfunction and psychological burden; therefore, further studies on their mechanisms are needed.

Moreover, it should be noted that different diagnostic criteria for sexual and psychological disorders exist among the various professional organizations and/or individuals. Furthermore, the cultural and religious differences between Arabic and Western patient populations concerning sensitive, private, and subjective questions related to sexual activity that patients reported during interviews should be taken into account. Concerning complications and iatrogenic damages occurred during the operative procedures, they should be considered. We also recommend proceeding with a strict andrological evaluation and blood test to detect and treat any anomalies in sex hormone levels that could affect sexual development and/or the spermatogenetic process, followed by routine semen analysis after sexual maturation. Therefore, further in-depth studies on large epidemiological populations are needed to confirm and extend these results.

5. Conclusion

This study found that erectile function parameters in orchidopexy men were significantly poor compared with those of healthy participants. Furthermore, the onset of future ED in such patients is dependent mainly on psychological distress, infertility, and a low serum testosterone level. In addition, the SAS, SDS, and VAS scores were negatively correlated with IIEF-15 scores. Furthermore, the results could help clinicians quickly and effectively identify orchidopexy patients with ED and propose management plans. Psychosexual support is also fundamental to increasing self-esteem and reducing the psychological causes of sexual dysfunction in such populations. However, further large studies with long follow-up periods are needed to confirm and validate these findings.

Author contributions

Study concept and design: Mazen Ahmed Ghanem, Essa Ahmed Adawi.
Data acquisition: Mazen Ahmed Ghanem, Ahmed Mazen Ghanem, Ahmed Asaad Ghanem.
Data analysis: Ahmed Mazen Ghanem, Ahmed Asaad Ghanem, Essa Ahmed Adawi.
Drafting of manuscript: Mazen Ahmed GhanemAhmed Mazen Ghanem, Essa Ahmed Adawi.
Critical revision of the manuscript: Mazen Ahmed Ghanem, Ahmed Mazen Ghanem.

Conflicts of interest

The authors declare no conflict of interest.

Acknowledgements

The authors would like to thank Manaji M. Ba-Baeer and Alaa Ibrahiem Mahdi in the faculty of medicine, Jazan University for their editorial and valuable assistance.

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