

Original Research

Proper Use of the International Index of Erectile Function 5 (IIEF-5) Questionnaire in Patients Undergoing Transurethral Resection of the Prostate (TURP)

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Abstract

Background: Our goal was to show how the interpretation of the IIEF-5 questionnaire can lead to a significantly different outcome and propose a modification of the possible responses of the IIEF-5 questionnaire to assess erectile function after transurethral resection of the prostate (TURP). Methods: The results of patients treated with TURP in a randomized clinical trial were analyzed under four scenarios characterized by what patients to include and how to codify the answers for statistical interpretation: scenario (A) only patients who reported sexual intercourse; scenario (B) all patients, recording zero response for patients without sexual activity as one more grade of the scoring scale; scenario (C) same as B but coding 0 as "99" (missing value); and scenario (D) all patients are included, but the zero response remains as 0 for patients who reported not having had sexual intercourse due to the "Inability to penetrate (enter) the partner due to penile flaccidity", whereas zero response is coded as "99" in those patients reporting "Inability to penetrate (enter) the partner due to other causes". Results: Eighty-four patients qualified for the analysis. The proportion of patients in each ED category was very similar among the four scenarios, except for the "Severe ED" category. At baseline, scenario B had 36.9% of patients categorized as "Severe ED", scenario D 18.5%, and scenarios A and C 17.2% (p < 0.01). This relative order remained constant in all postoperative visits. The differences in "Severe ED" rates were directly correlated with the inclusion of patients without sexual activity (higher "Severe ED" rate) and the codification of zero responses (when left as zero, they increase "Severe ED" rate, whereas when coded as 99 they are not included in the analysis and "Severe ED" rates decrease). Taking scenario D as a reference, we found a significant overestimation of "Severe ED" in scenario B up to 21.4% and a slight underestimation in scenarios A and B up to -15.7%. Conclusions: Using the IIEF-5 questionnaire with options 0 and 99 (scenario D) may improve the accuracy of detecting patients with "Severe ED" in the postoperative period of TURP. Clinical Trial Registration: NCT03936244 (https://clinicaltrials.gov/ct2/show/NCT03936244).

Keywords: International Index of Erectile Function 5 (IIEF-5); questionnaire; transurethral resection of the prostate

1. Introduction

Among the questionnaires available to assess erectile function after transurethral resection of the prostate (TURP), the International Index of Erectile Function 5 (IIEF-5) is one of the most frequently used. The IIEF-5 [1] is an abbreviated five-item version of the IIEF-15 [2– 4], commonly known as the Sexual Health Inventory for Men (SHIM).

Items 1–4 of the IIEF-5 ask about erectile function, and item 5 is related to intercourse satisfaction [1]. Item 1 in the IIEF-5 is a hypothetical question about the patient's confidence in achieving and maintaining an erection and is scored on a Likert-type scale from 1 to 5. The rest of the items in the IIEF-5 (items 2 to 5) ask about the patient's experience in the previous weeks and can be scored from 1 to 5 (if the target population is limited to patients who report having had recent sexual intercourse) or from 0 to 5 (if all patients are included, leaving the answer 0 for those not having had recent sexual intercourse) [1,5]. Whether to include patients without recent sexual intercourse in the questionnaire and how to codify the answer 0 for the statistical analysis is controversial. However, these decisions can profoundly affect the IIEF-5 questionnaire's accuracy in detecting changes in erectile function and may overestimate the proportion of patients with "Severe erectile dysfunction (ED)" in populations of non-sexually active men, which is expected behavior in the postoperative period of prostate surgery [6].

The objective of this study was to showcase how the interpretation of the IIEF-5 questionnaire can lead to a significantly different outcome and determine the best way to use the IIEF-5 questionnaire to assess erectile function af-



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Scenario A Scenario B Scenario C Scenario D YES YES YES Patients with sexual activity YES YES YES Patients without sexual activity due to "Inability to YES NO penetrate (enter) the partner due to penile flaccidity" Answer 0 coded as 0 Answer 0 coded as 99 Answer 0 coded as 0 YES YES YES Patients without sexual activity due to "Other causes" NO Answer 0 coded as 0 Answer 0 coded as 99 Answer 0 coded as 99

Table 1. Patients included in each scenario and codification of answer 0.

ter transurethral resection of the prostate (TURP). First, we took IIEF-5 scores obtained in a population treated with TURP. Then, we analyzed them under four scenarios (characterized by the different types of patients to include —all or only those sexually active—and the codification of the answers for statistical interpretation).

2. Materials and Methods

The study population was retrieved from NCT03936244 randomized clinical trial (RCT), which included men diagnosed with lower urinary tract symptoms (LUTS) in a tertiary-care public institution who required surgical treatment and were randomly allocated to monopolar or plasmakinetic TURP. Additional details on the trial are available in the original publication [7,8].

IIEF-5 questionnaire scores (**Supplementary Table 1**) were recorded for all patients at baseline and 1, 3, 6, and 12 months postoperatively [7]. Two additional questions were included at every period: one to capture sexual activity as self-reported by patients (a yes/no question); and another one to capture the reason for sexual inactivity as reported by the patients [possible answers were either "Inability to penetrate (enter) the partner due to penile flaccidity" or "Other causes (e.g., lack of sexual desire, lack of a sexual partner, etc.)"]. The severity of ED was established in five categories: "Severe ED" (1–7 points), "Moderate ED" (8–11 points), "Mild to moderate ED" (12–16 points), "Mild ED" (17–21 points), and "Without of ED" (22–25 points).

For the purposes of this analysis, all patients from the RCT were jointly analyzed, regardless of the surgical technique used. We created four different analytical scenarios, named from A to D, that differ on the patients included (all or only those sexually active), the inclusion of answer 0 in IIEF-5 items 2–5 for patients without sexual activity, and the statistical coding of the response 0 (Table 1 and **Supplementary Table 2**).

• Scenario A: includes only patients who reported sexual intercourse. The scoring scale for IIEF-5 items 1–5 ranges between 1 and 5 points.

• Scenario B: includes all patients. IIEF-5 item 1 scored between 1 and 5 points; items 2–5 between 0 and 5 points. Zero response is reserved for patients who did not have sexual intercourse, and it has been included in the statistical analysis to determine the proportion of patients with "Severe ED".

• Scenario C: includes all patients. The scoring scale

is the same as in scenario B, but responses of 0 in items 2–5 were coded as "99" (missing value), meaning that patients without sexual intercourse are excluded from the statistical analysis to establish the proportion of patients in each ED category.

• Scenario D: includes all patients. The scoring scale is the same as in scenario B. However, the responses of 0 in items 2–5 were coded as "99" (missing value) only in the patients without sexual intercourse due to a cause other than the "Inability to penetrate (enter) the partner due to penile flaccidity"; hence, for patients without sexual activity due to the "Inability to penetrate (enter) the partner due to penile flaccidity" the answer 0 is maintained and taken into account to determine the proportion of patients in each ED category.

Total IIEF-5 score and ED categories were only calculated for patients with no missing values (ergo, missing values were coded as "99") in the four scenarios.

In summary, only patients with sexual activity are included in scenario A, and in scenarios B, C, and D, all patients are included. Additionally, in scenarios B, C, and D, the codification of items 2–5 follows Table 1 (Supplementary Table 2).

Nominal variables were described with absolute numbers and percentages. Quantitative variables with the mean and standard deviation. Severity grades of ED were plotted with clustered bar graphs. Comparisons were conducted using the chi-square test. Statistical significance was established at p < 0.05. Statistical analysis was performed using IBM SPSS Statistics v23 (IBM Corp., Armonk, NY, USA).

3. Results

Eighty-four patients were counted in the analysis. Table 2 shows the proportion of men sexually active on each clinical visit. It is patent that there was a significant decrease in the proportion of patients who manifested having sexual intercourse at one month compared to the baseline (53.6% vs. 76.2%), reaching almost pre-surgical values at three months and remaining stable afterward (71.4%, 70.2%, and 70.2% at 3, 6, and 12 months, respectively). Furthermore, we observe that the increase in patients without sexual activity in the first month corresponds to "Other causes (e.g., lack of sexual desire, lack of a sexual partner, etc.)", whereas the percentage of patients who did not have sexual activity due to the "Inability to penetrate the partner" remained stable over time (between 11.9% and 15.5%). Fi-



Table 2. Evolution of sexual activity and the reason for its absence during follow-up after TURP. The table shows the proportion of patients who report having sexual intercourse at baseline and in each follow-up visit and the reason for the lack of sexual activity.

Fig. 1. Severe erectile disfunction throughout follow-up. The chart represents the percentage of patients allocated to the "severe erectile dysfunction (ED)" category based on the total IIEF-5 score in each postulated scenario.

nally, it is essential to note that the study protocol did not prescribe sexual abstinence, which means that the decrease in the proportion of patients who had sexual activity during the first postoperative month corresponds exclusively to the patients' own decisions.

Regarding the four aforementioned scenarios, the score of IIEF-5 item 1 at baseline was equal in scenarios B, C, and D and lower than scenario A (2.2 vs. 2.4 points, respectively) (Table 3); This difference remained constant in all postoperative visits. The score of IIEF-5 items 2–5 is the same in scenarios A and C, lower in scenario D, and even lower in scenario B; this is true for baseline and the consecutive clinical visits (Table 3). The same applies to the total IIEF-5 score, which was 14.2, 11.2, and 10.1 points at baseline for scenarios A and C, D, and B, respectively (Table 3).

Except for the "Severe ED" category, the proportion of patients allocated in each of the remaining ED categories was the same in scenarios A and C, lower in scenario D, and even lower in scenario B: both at baseline and in the consecutive clinical visits (Table 4, Fig. 1). The proportion of patients with "Severe ED" in each scenario behaves in the opposite way than the rest of the categories. As an example, in the first postoperative month, the proportions of patients categorized as "Mild ED" in scenarios A and C, D and B were 29.7%, 25.7%, and 22.6%, whereas the proportions of patients categorized as "Severe ED" in the same scenarios were 20.0%, 35.7%, and 57.1%, respectively. As expected, differences between the scenarios are only statistically significant in the "Severe ED" category for all clinical visits.

4. Discussion

Urologists well know the IIEF-5 questionnaire, and its use is widespread worldwide. However, its interpretation is neither easy nor standardized. In this regard, the interpretation of the IIEF-5 questionnaire scores to assess erectile function after TURP may significantly impact the determination of the proportion of "Severe ED". Creating these four scenarios helps understand how each interpretation influences the results and what scenario provides the most accurate evaluation.

Table 3. IIEF-5 score during follow-up.	The table shows the			
IIEF-5 score in four scenarios.				

	Scenario A	Scenario B	Scenario C	Scenario D	
IIEF-5 score	Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD	
Baseline					
Item 1, points	2.4 ± 1.2	2.2 ± 1.2	2.2 ± 1.2	2.2 ± 1.2	
Item 2, points	2.8 ± 1.4	2.1 ± 1.7	2.8 ± 1.4	2.2 ± 1.2	
Item 3, points	2.6 ± 1.5	2 ± 1.7	2.6 ± 1.5	2.4 ± 1.6	
Item 4, points	3.1 ± 1.5	2.3 ± 1.9	3.1 ± 1.5	2.3 ± 1.6	
Item 5, points	3.2 ± 1.4	2.4 ± 1.8	3.2 ± 1.4	2.7 ± 1.8	
Total, points	14.2 ± 6.0	11.2 ± 7.5	14.2 ± 6.0	10.1 ± 6.2	
1 mo					
Item 1, points	2.6 ± 1.2	2.4 ± 1.3	2.4 ± 1.3	2.4 ± 1.3	
Item 2, points	3.1 ± 1.4	1.7 ± 1.8	3.1 ± 1.4	2.3 ± 1.3	
Item 3, points	2.8 ± 1.3	1.5 ± 1.7	2.8 ± 1.3	2.5 ± 1.7	
Item 4, points	3.3 ± 1.5	1.8 ± 2	3.3 ± 1.5 2.2 ± 1		
Item 5, points	3.3 ± 1.4	1.8 ± 2	3.3 ± 1.4	2.6 ± 1.9	
Total, points	15.1 ± 6.1	9 ± 8.0	15.1 ± 6.1	10 ± 6.8	
3 mo					
Item 1, points	2.5 ± 1.2	2.2 ± 1.2	2.2 ± 1.2	2.2 ± 1.2	
Item 2, points	2.8 ± 1.7	2 ± 1.9	2.8 ± 1.7	2.3 ± 1.2	
Item 3, points	2.5 ± 1.6	1.8 ± 1.8	2.5 ± 1.6	2.4 ± 1.9	
Item 4, points	2.9 ± 1.7	2.1 ± 2	2.9 ± 1.7	2.1 ± 1.8	
Item 5, points	3.1 ± 1.7	2.2 ± 2	3.1 ± 1.7 2.5 ± 1		
Total, points	13.8 ± 7.0	10.3 ± 8.1	13.8 ± 7.0	9.6 ± 7.0	
6 mo					
Item 1, points	2.7 ± 1.2	2.4 ± 1.3	2.4 ± 1.3	2.4 ± 1.3	
Item 2, points	3.2 ± 1.4	2.2 ± 1.9	3.2 ± 1.4 2.4 ± 1.3		
Item 3, points	3.1 ± 1.5	2.1 ± 1.9	3.1 ± 1.5	2.6 ± 1.8	
Item 4, points	3.4 ± 1.6	2.4 ± 2.0	3.4 ± 1.6	2.5 ± 1.8	
Item 5, points	3.5 ± 1.6	2.4 ± 2.1	3.5 ± 1.6	2.8 ± 1.9	
Total, points	15.8 ± 6.3	11.5 ± 8.4	15.8 ± 6.3	10.9 ± 7.1	
12 mo					
Item 1, points	2.6 ± 1.3	2.2 ± 1.3	2.2 ± 1.3	2.2 ± 1.3	
Item 2, points	2.9 ± 1.6	2 ± 1.9	2.9 ± 1.6	2.4 ± 1.8	
Item 3, points	2.8 ± 1.5	1.9 ± 1.8	2.8 ± 1.5	2.3 ± 1.7	
Item 4, points	3 ± 1.7	2.1 ± 2.0	3 ± 1.7	2.5 ± 1.9	
Item 5, points	3 ± 1.6	2.1 ± 1.9	3 ± 1.6	2.5 ± 1.8	
Total, points	14.3 ± 7.0	10.4 ± 8.4	14.3 ± 7.0	12.2 ± 8.0	

Abbreviations: IIEF, International Index of Erectile Function; mo, month; SD, standard deviation.

Some authors recommend removing the zero-category in all IIEF-5 items and using the questionnaire exclusively in patients who report sexual intercourse (like in our scenario A) to improve the accuracy in estimating the prevalence of ED [9]. We concur that this is a good step to avoid the "false positives" of patients tagged as suffering "Severe ED" when all lack of sexual activity is coded as zero (like in our scenario B). This is reasonable because, apart from suffering from ED, there are many other reasons why a man might not be engaging in sexual activity.

However, we consider that in the TURP postoperative population, it leads to a significant "Severe ED" underesti-

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Table 4. Erectile dysfunction categories during follow-up. The table compares the erectile dysfunction (ED) categories based on the IIEF-5 score in four scenarios.

IIFE-5 categories	Scenario A Scenario B Scenario C Scenario D <i>p</i> -value				
IILI -5 categories	n (%)	n (%)	n (%)	n (%)	n (%)
Baseline					
Without ED	7 (10.9)	7 (8.3)	7 (10.9)	7 (9.5)	0.940
Mild ED	19 (29.7)	19 (22.6)	19 (29.7)	19 (25.7)	0.720
Mild-moderate ED	11 (17.2)	11 (13.1)	11 (17.2)	11 (14.9)	0.879
Moderate ED	16 (25.0)	16 (19.0)	16 (25.0)	16 (21.6)	0.785
Severe ED	11 (17.2)	31 (36.9)	11 (17.2)	21 (28.4)	0.014
1 mo					
Without ED	6 (13.3)	6 (7.1)	6 (13.3)	6 (10.7)	0.618
Mild ED	17 (37.8)	17 (20.2)	17 (37.8)	17 (30.4)	0.092
Mild-moderate ED	8 (17.8)	8 (9.5)	8 (17.8)	8 (14.3)	0.479
Moderate ED	5 (11.1)	5 (6.0)	5 (11.1)	5 (8.9)	0.691
Severe ED	9 (20.0)	48 (57.1)	9 (20.0)	20 (35.7)	< 0.001
3 mo					
Without ED	14 (23.3)	14 (16.7)	14 (23.3)	14 (20.0)	0.715
Mild ED	8 (13.3)	8 (9.5)	8 (13.3)	8 (11.4)	0.873
Mild-moderate ED	14 (23.3)	14 (16.7)	14 (23.3)	14 (20.0)	0.715
Moderate ED	7 (11.7)	7 (8.3)	7 (11.7)	7 (10.0)	0.896
Severe ED	17 (28.3)	41 (48.8)	17 (28.3)	27 (38.6)	0.030
6 mo					
Without ED	14 (23.7)	14 (16.7)	14 (23.7)	14 (20.0)	0.678
Mild ED	16 (27.1)	16 (19.0)	16 (27.1)	16 (22.9)	0.615
Mild-moderate ED	10 (16.9)	10 (11.9)	10 (16.9)	10 (14.3)	0.799
Moderate ED	12 (20.3)	12 (14.3)	12 (20.3)	12 (17.1)	0.740
Severe ED	7 (11.9)	32 (38.1)	7 (11.9)	18 (25.7)	< 0.001
12 mo					
Without ED	12 (20.3)	12 (14.3)	12 (20.3)	12 (17.1)	0.74
Mild ED	15 (25.4)	15 (17.9)	15 (25.4)	15 (21.4)	0.647
Mild-moderate ED	9 (15.3)	9 (10.7)	9 (15.3)	9 (12.9)	0.827
Moderate ED	7 (11.9)	7 (8.3)	7 (11.9)	7 (10.0)	0.880
Severe ED	16 (27.1)	41 (48.8)	16 (27.1)	27 (38.6)	0.018

Abbreviations: ED, erectile dysfunction; IIEF, International Index of Erectile Function; mo, month; n, number of patients.

mation bias because it does not allow the analysis of erectile function in patients without sexual intercourse, a commonplace event in this population. In our study, we asked the patients to determine the reason for the lack of sexual activity. As shown in Table 3, it was distributed approximately halfway between the "Inability to penetrate the partner" and "Other causes", except for the first postoperative month. In the first postoperative month, the reasons unrelated to ED increased significantly (71.8% *vs.* 28.2%), driven by the patient's own decision.

When 0 response in items 2–5 is included but coded as a missing value (scenario C), it is possible to get complete information in patients with sexual intercourse (IIEF-5 items 1–5) and partial information in patients without sexual intercourse (IIEF-5 item 1). This scenario is a minor improvement from scenario A because it avoids the "false



Fig. 2. Differences in the proportion of patients with "severe erectile dysfunction". Taking Scenario D as a reference, the chart represents the difference in the rate of "severe erectile dysfunction (ED)" obtained in the other scenarios. Positive differences indicate a potential overestimation of "Severe ED", and negative differences a potential underestimation.

positives" of patients tagged as suffering "Severe ED" and helps further characterize the sexual function of patients without sexual activity via the answer to item 1. However, scenario C does not improve the statistical calculation of the "Severe ED" rate.

We consider that scenario D is a further improvement from scenario C because it allows including in the statistical analysis the patients who self-reported not having had sexual activity due to the "Inability to penetrate (enter) the partner due to penile flaccidity". Although we are aware that the "Inability to penetrate (enter) the partner due to penile flaccidity" is not a confirmed diagnosis of "Severe ED", we believe that it provides the best accuracy in evaluating the effect on the erectile function of a surgical technique. In conclusion, according to these results, scenario D should be the most appropriate for patients undergoing TURP.

Another way to gather the information necessary to execute scenario D, instead of having a separate question to determine the cause of the lack of sexual activity, would be to provide two additional possible answers (option 0 and 99) in items 2 to 5 of the IIEF-5. As an example, the possible answers to item 2 of the IIEF-5 questionnaire would be:

- 5, Almost always/always
- 4, Most time (much more than half the time)
- 3, Sometimes (about half the time)
- 2, A few times (much less than half the time)
- 1, Almost never/never

• 0, No sexual activity because of the inability to penetrate (enter) the partner due to penile flaccidity

• 99, No sexual activity because of other causes (e.g., lack of sexual desire, lack of a sexual partner, etc.)

Assuming that scenario D is the one that best estimates the proportion of patients with severe ED, we found an underestimation of "Severe ED" from 10.3% to 15.7% in scenarios A and C during follow-up and an overestimation from 8.5 to 21.4% in scenario B (Fig. 2).

The present manuscript is a proposal for modifying the possible responses of the IIEF-5 questionnaire in the postoperative period of patients undergoing TURP and, by extension, in all surgeries where a decrease in sexual activity is expected for a cause other than severe ED. Nonetheless, prospective studies and adequate psychometric validation are necessary before widespread use.

5. Conclusions

The different options on how to interpret IIEF-5 questionnaire scores to assess erectile function after TURP may have a significant impact on determining the degree of "Severe ED". Questionnaires without response 0 should be used exclusively in patients with sexual activity. When using questionnaires with option 0, an adequate statistical interpretation is necessary to avoid overestimating "Severe ED". Using questionnaires with options 0 and 99 (as defined in scenario D) may improve the accuracy of detecting patients with "Severe ED" in the postoperative period of TURP.

Abbreviations

ED, erectile dysfunction; IIEF-5, international index of erectile function 5; LUTS, lower urinary tract symptoms; NA, not applicable; RCT, randomized clinical trial; SD, standard deviation; SHIM, sexual health inventory for men; TURP, transurethral resection of the prostate.

Author Contributions

Study Design: HOA. Data Collection: HOA, AECC. Data Analysis: HOA, CNT, FJOM. Writing Original Draft: HOA. Manuscript Review and Editing: HOA, AECC, CNT, FJOM. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

Ethical approval of the institutional review board (IRB) (APR-14-72) was granted, and informed consent was obtained from all subjects. Clinical Trial Registration: NCT03936244 (https://clinicaltrials.gov/ct2/show/N CT03936244).

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Conflict of Interest

The authors declare no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10. 31083/j.jomh1808174.

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