

Sexual Dysfunction/Infertility

# Assessment of Erectile and Ejaculatory Function after Penile Prosthesis Implantation

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**Purpose:** We investigated erectile and ejaculatory function after penile prosthesis implantation.

**Materials and Methods:** A total of 121 patients were enrolled in the surgery group (SG) and 120 patients in the nonsurgery group (NSG). All subjects were evaluated by use of the following questionnaires: the erection function and intercourse satisfaction domains of the International Index of Erectile Function (IIEF) and the ejaculation domain of the Male Sexual Health Questionnaire (MSHQ-EjD). Comparisons were made between the SG and the NSG, by prosthesis types, and of postoperative periods and complication rates for each prosthesis type.

**Results:** Differences in the erection function and intercourse satisfaction domains of the International Index of Erectile Function (IIEF-EF and IIEF-IS) between before and after treatment were significantly higher in the SG group than in the NSG group ( $p=0.02$ ,  $0.03$ , respectively). When comparing prosthesis types, differences in the erection confidence and intercourse satisfaction items between before and after surgery were significantly higher in the SG group ( $p=0.03$ ,  $0.04$ , respectively). In the comparison of each prosthesis type by postoperative period, differences in the IIEF-EF and IIEF-IS between before and after surgery were not statistically significant but the MSHQ-EjD domain after surgery was significantly lower in cases of  $>5$  years ( $p=0.02$ ,  $0.03$ , respectively).

**Conclusions:** Subjective symptoms such as erectile confidence and erectile function were improved more in the SG group than in the NSG group, especially in the inflatable group. It appeared that there was no significant difference in improvement in ejaculatory function depending on the treatment method, but that ejaculatory function decreased as time passed.

**Key Words:** Questionnaires; Penile prosthesis; Penile erection; Ejaculation

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## INTRODUCTION

Penile prosthesis implantation is performed in cases in which administration of phosphodiesterase-5 (PDE-5) inhibitor and intracavernous vasoactive drug injection have failed [1]. The surgery is accepted as a predominant method in the treatment of erectile dysfunction (ED) [2].

In the domestic literature about penile prosthesis implantation, however, not many comparative studies have been conducted to assess ejaculatory function and erectile function after the surgery. Given this background, we examined ejaculatory function and erectile function after surgery in patients with ED who underwent penile pros-

thesis implantation.

## MATERIALS AND METHODS

A total of 127 patients who underwent penile prosthesis implantation among patients who were diagnosed with organic ED from January 2000 to December 2008 were included. The patients had scores of 0 to 6 points on the erection function domain of the International Index of Erectile Function (IIEF-EF) before therapy, as determined by a retrospective chart analysis. After we excluded 2 patients (1.6%) who had a mechanical failure postoperatively but continued their daily lives without specific treatments and

4 patients (3.1%) who underwent removal of the penile prosthesis due to mechanical failure (2 patients) or infection (2 patients), 121 patients were assigned to the surgery group. The surgery group was then subdivided into the inflatable group and the malleable group. The patients' mean age was  $56.54 \pm 8.89$  years, and the mean follow-up period was  $68.24 \pm 41.04$  months (Table 1). A single operator performed the surgery in all surgery groups, for which the AMS 700 CXM<sup>®</sup> (AMS, Minneapolis, USA) was used as an inflatable prosthesis and the AMS 600<sup>®</sup> (AMS, Minneapolis, USA) was used as a malleable prosthesis.

We also enrolled patients who were diagnosed with organic ED and who were prescribed to take Viagra<sup>®</sup> (Pfizer, New York, USA) through the outpatient department of urology from January 2000 to December 2008. The nonsurgical patients had scores of 7 to 24 points on the IIEF-EF before therapy and reported having sexual intercourse more than twice during the recent 6-month period. A total of 120 of these patients were randomly selected and then assigned to the nonsurgery group.

For the first questionnaire survey tool, we used the IIEF-EF and the intercourse satisfaction domain of the IIEF (IIEF-IS) [3]. Scores for each item as well as the total score were obtained. In all patients in the surgery group, we performed a questionnaire study preoperatively and at postoperative year 1. The questionnaire was consistently performed for all patients who were assigned to the surgery group during a period from July to December 2009. In the nonsurgery group, the questionnaire was also administered before drug administration and 1 year later.

As the second tool, we used the ejaculation domain of the Male Sexual Health Questionnaire (MSHQ-EjD) [4]. With this tool, a questionnaire survey was performed preoperatively and at postoperative year 1 in 32 patients in the surgery group who underwent implantation of a penile prosthesis from January 2006 to December 2008. The questionnaire was consistently performed for these 32 patients during a period from July to December 2009. In the nonsurgery group, the questionnaire study was performed in 40 patients during the same period before drug admin-

istration and 1 year later.

After the questionnaire survey, the differences in the IIEF-EF, IIEF-IS, and MSHQ-EjD between before and after treatment were compared between the surgery group and the nonsurgery group. Then, comparisons were made within the surgery group between the inflatable group and the malleable group. Moreover, in the inflatable and malleable groups, the postoperative period was classified as  $\leq 5$  years and  $> 5$  years, and comparisons were made of differences in the IIEF-EF and IIEF-IS recorded preoperatively and from July to December 2009. Another comparison was made for the MSHQ-EjD recorded from July to December 2009.

After we excluded six patients who did not use the penile prosthesis or underwent removal of the penile prosthesis (mechanical failure: 4; infection: 2), we additionally evaluated postoperative complications in the surgery group.

### 1. Statistical analysis

For comparisons between the surgery group and the nonsurgery group, the inflatable group and the malleable group, and by the postoperative period of each inflatable and malleable group, statistical analysis was performed by use of Student's t-test with SPSS for Windows version 16.0 (SPSS Inc, Chicago, USA). A p-value  $< 0.05$  was considered statistically significant.

## RESULTS

### 1. Erectile function

Comparing the surgery group and the nonsurgery group, the mean differences in IIEF-EF and IIEF-IS between before and after treatment were  $10.92 \pm 2.47$  and  $8.03 \pm 2.95$  in the surgery group and  $6.84 \pm 1.14$  and  $5.36 \pm 1.37$  in the nonsurgery group. These differences were statistically significant ( $p < 0.05$ ) (Table 2).

The surgery group was subdivided into the inflatable group and the malleable group. The mean differences in IIEF-EF and IIEF-IS between before and after treatment were  $11.39 \pm 2.98$  and  $6.56 \pm 1.35$  in the inflatable group and

TABLE 1. Characteristics of the surgery and nonsurgery groups

	Surgery group (n=121)	Non-surgery group (n=120)
Mean age (years)	$56.54 \pm 8.89$	$53.25 \pm 10.57$
Mean postoperative follow-up period (months)	$68.24 \pm 41.04$	$60.18 \pm 45.05$
Etiologies of organic impotence		
Vasculogenic	52	51
Diabetic	31	30
Neurogenic	11	10
Peyronie's disease	27	29
Concomitant medical disease		
Hypertension	31	24
Diabetes mellitus	37	16
Hepatitis	6	2
Old pulmonary Tbc.	4	3
Chronic renal failure	1	0

**TABLE 2.** Comparison of IIEF-EF, IIEF-IS, and MSHQ-EjD between the surgery group and the nonsurgery group

		Surgery group (n=121)		Non-surgery group (n=120)		p-value
		Before Tx	After Tx	Before Tx	After Tx	
IIEF-EF	1. Erection frequency	0.41±0.15	2.14±0.34	2.37±0.88	3.75±0.29	0.03
	2. Erection firmness	0.51±0.18	2.21±0.45	2.26±1.04	3.47±0.34	0.01
	3. Penetration ability	0.79±0.22	2.24±0.48	2.72±1.13	3.76±0.37	0.02
	4. Maintenance frequency	0.85±0.13	2.52±0.59	2.31±0.95	3.51±0.46	0.03
	5. Maintenance ability	0.97±0.24	3.07±0.56	1.94±0.89	3.62±0.51	0.03
	6. Erection confidence	0.85±0.21	3.12±0.49	1.92±0.83	3.44±0.32	0.01
	Total	4.38±1.19	15.30±2.81	13.52±5.33	21.55±2.89	0.02
IIEF-IS	1. Intercourse frequency	1.14±0.21	3.31±0.43	2.75±0.64	4.39±0.48	0.02
	2. Intercourse satisfaction	0.95±0.35	3.40±0.48	2.63±0.56	4.50±0.45	0.03
	3. Intercourse enjoyment	1.02±0.17	3.24±0.41	2.83±0.33	4.68±0.59	0.02
	Total	3.11±0.83	9.95±1.46	8.21±1.37	13.57±1.38	0.03
		Surgery group <sup>a</sup> (n=32)		Non-surgery group <sup>a</sup> (n=40)		p-value
		Before Tx	After Tx	Before Tx	After Tx	
	MSHQ-EjD	18.55±2.58	22.36±3.49	20.53±4.48	24.25±4.39	0.34

Values are Mean±SD (SD: standard deviation), IIEF-EF: erectile function domain of International Index of Erectile Function (Difference of preoperative and postoperative score in erectile function domain of International Index of Erectile Function), IIEF-IS: intercourse satisfaction domain of International Index of Erectile Function (Difference of preoperative and postoperative score in intercourse satisfaction domain of International Index of Erectile Function), MSHQ-EjD: ejaculation domain in Male Sexual Health Questionnaire (Difference of preoperative and postoperative score in ejaculation domain in Male Sexual Health Questionnaire), Tx: treatment, <sup>a</sup>: the subject of group consist of patients who were treated for organic impotence from January 2006 to December 2008

**TABLE 3.** Comparison of IIEF-EF, IIEF-IS, and MSHQ-EjD according to implanted penile prosthesis type

		Inflatable (n=52)		Malleable (n=69)		p-value
		Before Tx	After Tx	Before Tx	After Tx	
IIEF-EF	1. Erection frequency	0.38±0.15	1.85±0.33	0.46±0.17	2.01±0.48	0.29
	2. Erection firmness	0.53±0.25	2.18±0.31	0.49±0.19	2.07±0.51	0.24
	3. Penetration ability	0.64±0.36	2.60±0.44	0.83±0.35	2.64±0.33	0.62
	4. Maintenance frequency	0.77±0.27	2.65±0.38	0.91±0.31	2.58±0.46	0.48
	5. Maintenance ability	0.98±0.33	3.22±0.57	0.92±0.38	3.11±0.23	0.71
	6. Erection confidence	0.77±0.28	2.96±0.24	0.98±0.27	2.76±0.35	0.03
	Total	4.07±1.58	15.46±2.39	4.59±1.57	15.17±2.11	0.83
IIEF-IS	1. Intercourse frequency	1.18±0.29	3.03±0.49	1.21±0.30	3.12±0.45	0.47
	2. Intercourse satisfaction	0.85±0.31	3.32±0.53	1.16±0.28	3.17±0.32	0.04
	3. Intercourse enjoyment	1.13±0.23	3.37±0.52	1.04±0.34	3.26±0.63	0.55
	Total	3.16±0.92	9.72±1.48	3.41±1.03	9.55±1.37	0.25
		Before Tx	After Tx	Before Tx	After Tx	p-value
	MSHQ-EjD	18.48±2.75	22.33±3.57	18.62±2.92	22.41±3.44	

Values are Mean±SD (SD: standard deviation), IIEF-EF: erectile function domain of International Index of Erectile Function (Difference of preoperative and postoperative score in erectile function domain of International Index of Erectile Function), IIEF-IS: intercourse satisfaction domain of International Index of Erectile Function (Difference of preoperative and postoperative score in intercourse satisfaction domain of International Index of Erectile Function), MSHQ-EjD: ejaculation domain in Male Sexual Health Questionnaire (Difference of preoperative and postoperative score in ejaculation domain in Male Sexual Health Questionnaire), Tx: treatment

10.58±2.61 and 6.14±1.18 in the malleable group. These differences were not statistically significant (Table 3). Comparing the items on the IIEF-EF and IIEF-IS, however, erection confidence and intercourse satisfaction were 2.19±0.48 and 2.47±0.37 in the inflatable group and 1.78±0.45 and 2.01±0.32 in the malleable group. These dif-

ferences were statistically significant ( $p < 0.05$ ) (Table 3).

In the inflatable group and the malleable group, the postoperative course was classified as  $\leq 5$  years and  $> 5$  years. Comparison was made of the mean differences in IIEF-EF and IIEF-IS between preoperatively and postoperatively. In this analysis, the mean differences in IIEF-EF and



**TABLE 5.** Comparison of complication rates according to implanted penile prosthesis

Complications	Inflatable (n=52)	Malleable (n=69)
Mechanical failure	3	0
Infection	3	1
Erosion	1	0
Pain	0	1
Total	7 (13.5%)	2 (2.9%)

In particular, regarding the satisfaction domain, improvement was found to be more significant in the latter half of the first year than in the former half [8]. Based on these studies of the differences between preoperatively and postoperatively, in patients who were depressed with their daily lives or sexual life because of ED, unless there was a mechanical failure of the prosthesis after the surgical treatment, persistent erections could occur at ordinary times. In addition to the postoperative degree of satisfaction, erectile confidence was shown to rise. This indicates that the mean differences in IIEF-EF and IIEF-IS were significantly higher in the surgery group.

The differences in IIEF-EF and IIEF-IS between before and after treatment were compared in the inflatable group and the malleable group but no significant differences were found. When we compared each item on the IIEF-EF and IIEF-IS, however, scores indicating erection confidence and intercourse satisfaction were significantly higher in the inflatable group.

In our series, the inflatable prosthesis provided the advantages of not only making the erection possible in such a way that the natural appearance of the penis was maintained but also that the erection could be directly controlled at any time by the patients themselves. In addition, compared with the malleable prosthesis, the inflatable prosthesis was relatively more expensive and its characteristics in causing a feeling of superiority in patients might affect the results accordingly.

We also classified the postoperative period as  $\leq 5$  years and  $> 5$  years and then compared the differences in IIEF-EF and IIEF-IS between preoperatively and postoperatively between the subgroups. In both the inflatable and the malleable group whose period of postoperative course exceeded 5 years, the mean values were lower but this was not statistically significant. In this regard, there have been reports about the postoperative natural history of penile prostheses suggesting that the survival rate between inflatable and malleable prostheses is significantly different [9].

According to this study, we had speculated that there might be a significant difference in outcome with the inflatable prosthesis, but this was not the case. We propose that the reason for this lack of difference may be that in the recruitment of subjects, patients who did not receive the treatment despite the presence of a mechanical failure or

those who had a prosthesis removed because of severe infection were excluded from the analysis. Factors like mechanical failure and severe infection of penile prosthesis could not affect the results since the early stage. Even in cases in which a revision surgery is performed, Kava et al showed that revision surgery for a penile prosthesis is associated with a high rate of success and high degree of satisfaction [10]. In the study by Kava et al, even in cases in which a revision surgery was performed, its course and surgical outcomes were good and there was no significant difference [10].

Meanwhile, considering the surgical technique and the anatomical structure of the penis, it is possible that a penile prosthesis compresses the urethra and that this may impede ejaculation. In one case report, the inflatable prosthesis compressed the seminal vesicles and this caused ejaculatory pain [11]. In another study, however, the implantation of a penile prosthesis did not interfere with ejaculation or orgasmic functioning [12]. This might be associated with the findings in this study of no statistical significance in the comparison of the difference in MSHQ-EjD between before and after treatment. On the other hand, according to Gan et al, the factors causing ejaculatory dysfunction include age, social impairment, and ED [13]. In patients who had a prosthesis implanted during a long-term period, the increased frequency of lower urinary tract symptoms as well as the decreased ejaculatory function due to the natural course of aging could induce ejaculatory disorder; accordingly, in cases of  $> 5$  years, MSHQ-EjD was determined to be significantly lower.

Finally, concerning complications, the inflatable prosthesis had a higher complication rate than did the malleable type. With reference to other reports, the inflatable types had a higher complication rate and a lower survival rate than did the malleable types. In our series, the complication rate was relatively higher for the inflatable prosthesis than for the malleable prosthesis. In patients with the inflatable prosthesis, there were a total of three cases (5.8%) of mechanical failure. In all three cases, a revision surgery was performed. Minervini et al compared inflatable and malleable prostheses in 482 patients who underwent penile prosthesis implantation. The rate of mechanical failure was 13.7% and 0.5%, respectively, as major complications; the postoperative infection rate was 15% and 5.1%; and the erosion rate was 7.5% and 5.1% [6]. According to this, the complication rate was also higher in the inflatable prosthesis.

## CONCLUSIONS

According to the results of the present study, subjective symptoms such as erectile confidence and erectile function were improved after penile prosthesis implantation compared with nonsurgical treatments, and these findings were marked for the inflatable prosthesis.

On the other hand, our findings suggest that there was no significant difference in ejaculatory function depending

on the treatment method, but that ejaculatory function decreased as time passed.

### Conflicts of Interest

The authors have nothing to disclose.

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