

# Efficacy and Safety of Penile Girth Enhancement by Autologous Fat Injection for Patients with Thin Penises

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## Abstract

**Background** This study aimed to investigate the efficacy and safety of autologous fat injection (AFI) for penile girth enhancement (PGE) in patients with thin penises.

**Methods** This study investigated 52 patients with a small penile circumference who underwent AFI for PGE and were followed up for more than 6 months. The patients whose proximal one third (G1) and distal one third of their penis (G2) had a mean thickness of 7.4 cm or less were selected as subjects. After fat suction using a liposuction device, fat was evenly injected into the superficial, middle, and deep layers of the Colles' fascia. Patient age and operative time were analyzed. The G1, G2, flaccid (L1), stretched length (L2), and five-item version of the International Index of Erectile Function-5 (IIEF-5) before and 6 months after the surgery were compared. Postoperative complications were surveyed.

**Results** The patient mean age was 42.15 years (range, 22–56) years, and the operative time was 44.44 min (range, 37–49 min). The injected fat volume was 38.54 ml (range, 25–49 ml). Preoperatively, G1 was  $7.01 \pm 0.39$  cm, and G2 was  $7.06 \pm 0.37$  cm. Postoperatively, G1 was  $9.29 \pm 0.82$  cm ( $P < 0.001$ ), and G2 was  $9.34 \pm 0.86$  cm ( $P < 0.001$ ) 6 months after the surgery. The difference between L1

and L2 before and after the surgery was not significant. The IIEF-5 was  $19.10 \pm 3.22$  before the surgery and  $19.90 \pm 3.05$  after the surgery ( $P = 0.001$ ). The only complication was nodular fat observed in one case (1.92 %).

**Conclusion** The use of AFI for PGE in men with thin penises was effective and safe without major complications.

**Level of Evidence III** This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors at [www.springer.com/00266](http://www.springer.com/00266)

**Keywords** Penile enhancement · Penile girth · Penis · Phalloplasty

## Introduction

The penis has drawn considerable attention regardless of era, society, or age because of its association with sexual and religious issues. The penis has been historically regarded as a symbol of masculinity, and hence, its size has become a source of anxiety for many men [1]. Today, some men seek penile enlargement to increase their self-esteem and to provide more sexual satisfaction for their partners [2].

Currently, augmentative phalloplasty is a highly controversial issue. The lack of guidelines for augmentative phalloplasty and the deficiency of evidence-based studies fuel this controversy. Penile enlargement surgery is mainly divided into penile lengthening and penile girth enhancement (PGE). Penile lengthening includes abdomino/pubo-pelvic liposuction, suspensory ligament dissection, and skin flap construction [3]. Penile girth enhancement uses graft procedures or injection of materials such as autologous fat, silicon, or hyaluronic acid gel [4].

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Penile autologous fat injection (AFI) enhances penile circumference via the injection of fat into the penile dartos layer. Panfilov [5] reported that AFI for PGE in the normalized penis was effective and safe. However, no study to date has investigated the efficacy and safety of AFI for penile enhancement of the relatively thin penis. Accordingly, this study was conducted to investigate the efficacy and safety of penile AFI for PGE in men with thin penises.

## Materials and Methods

### Patients

This study retrospectively investigated 52 men with small penile circumferences who had been followed for more than 6 months after undergoing AFI for PGE from October 2008 to May 2010. This study was conducted after acquisition of institutional review board approval. Patients whose proximal one third (G1) and distal one third of their penis (G2) was 7.4 cm or less, which is one standard deviation below the mean penile girth of Koreans as reported by Son et al. [6], were selected as subjects.

### Surgical Technique

#### *Abdominal/Thigh Fat Suction (Harvesting Autologous Fat)*

Before the surgery was performed, the patient's weight and site of fat suction were examined, and a lift test or pinch test was conducted to examine skin elasticity and thickness. The degree of fat accumulation at the surgery site was examined with the patient in the supine position, and then body mapping was conducted at the site of fat suction.

With the patient under propofol anesthesia, the bilateral inguinal area was incised approximately 0.5 to 0.7 cm, and tumescent formula (modified Klein's solution) was injected into the subcutaneous fat layer for fat suction (lower abdomen or bilateral thighs) using an infiltrator cannula (diameter, 2 mm; length, 40 cm). The tumescent formula was prepared by dissolving 40 mL of 2 % lidocaine (800 mg), 1 mL of epinephrine (1:1,000), and 20 mL of 8.4 % sodium bicarbonate (1.68 g) in 1 L of normal saline. An amount of this formula one- to twofold larger than the volume of fat suctioned then was injected. The volumes of tumescent formula injected were 400–600 mL in the lower abdomen and 200–300 mL in the thigh. The maximum amount of injected lidocaine did not exceed 35 mg/kg.

A harvesting cannula (diameter, 4 mm; length, 47 cm) was inserted into the subcutaneous fat layer via the incised window 15–20 min after injection of the tumescent formula, and then fat suction was performed in a fan-like pattern by moving the harvesting cannula back and forth

(Fig. 1a, b). Fat was suctioned using a suction pump–assisted liposuction apparatus (Dominant 50, Medela AG, Baar, Switzerland) (Fig. 1c).

### *Fat Preparation*

After fat suction, the collected fat in the collection jar of a suction pump–assisted liposuction apparatus was leached out to a fat sieve. The fat sieve is a special tool that can quickly and effectively filter the tumescent solution, blood, and free oil, which are unnecessary fluids during fat suction. We washed the filtered fat using normal saline (500 mL) to remove unnecessary components once more. After that, the filtered fat tissue was divided into 10-mL syringes using a teaspoon. The capped sampling syringes without the piston were sealed and centrifuged at 3,000 rpm for 3 min (HA 12, Hanil Science Industrial Co. Ltd., Incheon, Korea).

After centrifugation, the harvested fat was separated into three layers. The uppermost layer composed of oil was decanted, and the reddish layer at the bottom composed of blood, water, lidocaine, and fibrous tissue was drained by opening the cap of the syringe. The middle layer composed predominantly of fat was used for the injection.

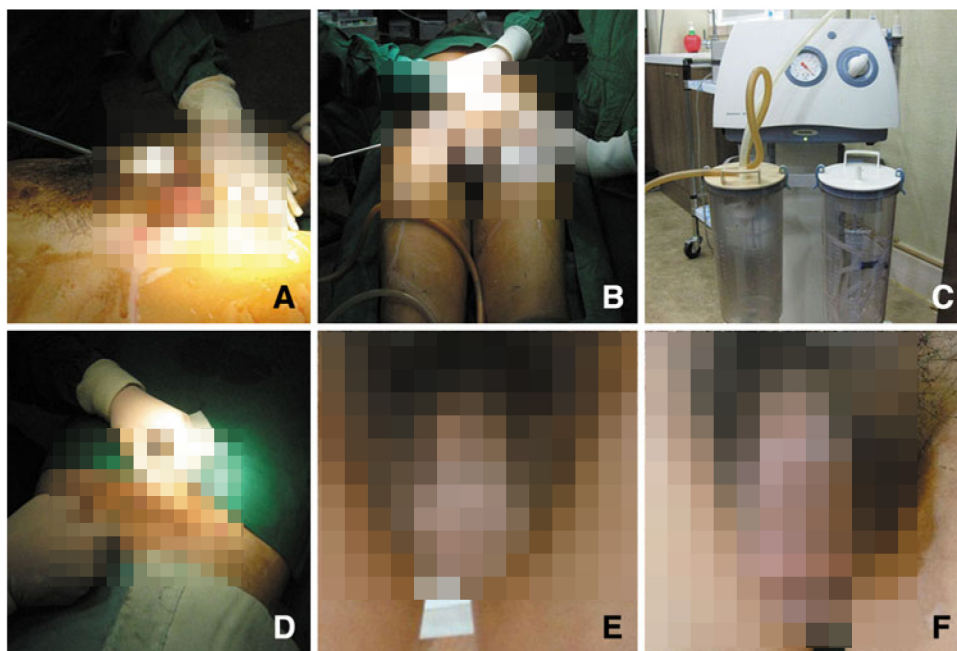
### *Penile Autologous Fat Injection*

The purified fat was transferred to a 1-mL syringe with a Luer-Lok tip (Becton Dickinson, Franklin Lakes, NJ, USA) connected to an 18-gauge blunt-tip cannula to prevent tissue injury during injection. A penile nerve block was implemented, and the penile skin then was punctured using a sharp needle. A blunt-tip cannula for fat injection was inserted into the Colles' fascia layer, and 1 mL of fat was injected slowly by moving the cannula back and forth (Fig. 1d). The fat was evenly injected by inserting the cannula into the superficial, middle, and deep layers of the Colles' fascia. To avoid fat accumulation at one site, five to seven different routes for fat injection were secured at each puncture site, and fat injection was performed in the same manner for each route. The penile skin was punctured at the 11, 1, 3, and 9 o'clock locations around the penis, and the fat was injected into the various layers and directions, with avoidance of the urethral area (5–7 o'clock). Fat was injected throughout the penis, beginning from the distal portion and proceeding to the penile root. Any remaining fat after completion of the injections was transferred to a 10-mL syringe and aseptically stored in a freezer after labeling with patient information.

### *Efficacy and Safety Assessment*

Patient age and operative time were analyzed. The G1, G2, flaccid (L1), erectile length (L2), and scores on the

**Fig. 1** Penile girth enhancement by autologous fat injection. **a** Thigh and/or **b** abdominal fat suction was performed in a fan-like pattern by moving the harvesting cannula back and forth. **c** Fat suction was performed using a suction pump–assisted liposuction apparatus (Dominant 50, Medela AG, Baar, Switzerland). **d** An 18-gauge blunt-tip cannula for fat injection was inserted into the Colles' fascia layer, and 1 mL of fat was slowly and evenly injected into the superficial, middle, and deep layers of the Colles' fascia by moving the cannula back and forth. **e** Dorsal view of the penis preoperatively. **f** Dorsal view of the penis 6 months postoperatively



five-item version of the International Index of Erectile Function (IIEF-5) before surgery and 6 months later were compared. In addition, postoperative complications and satisfaction were surveyed. Satisfaction with the surgery was divided into three categories: morphologic, functional, and overall. Patients rated their satisfaction by recording that they were very satisfied, somewhat satisfied, equally satisfied and dissatisfied, somewhat dissatisfied, or very dissatisfied. Patients were considered satisfied if they selected very satisfied or somewhat satisfied.

#### Statistical Analysis

The pre- and postoperative G1, G2, L1, L2, and IIEF-5 values were analyzed via paired *t* tests. Data analysis was conducted using Open Office.org Calc version 3.2.0 (Oracle Corp., Redwood Shores, CA, USA) and MedCalc version 11.2.1.0 (MedCalc Software, Mariakerke, Belgium). A *P* value less than 0.05 was considered statistically significant.

#### Results

The mean patient age was 42.15 years (range, 22–56 years), and the mean operative time was 44.44 min (range, 37–49 min). The site of fat suction included the abdomen alone in 6 patients (11.58 %), the thigh alone in 42 patients (80.77 %), and both the abdomen and the thigh in 4 patients (7.69 %). The mean aspirated volume of autologous fat was 76.58 mL (range, 50–110 mL), and the mean injected volume was 38.54 mL (range, 25–49 mL).

The average preoperative G1 and G2 values were  $7.01 \pm 0.39$  and  $7.06 \pm 0.37$  cm, respectively. The G1 and G2 averages were increased respectively to  $9.29 \pm 0.82$  (+32.52 %;  $P < 0.001$ ) and  $9.34 \pm 0.86$  cm (+32.29 %;  $P < 0.001$ ) 6 months after the surgery (Fig. 1e, f).

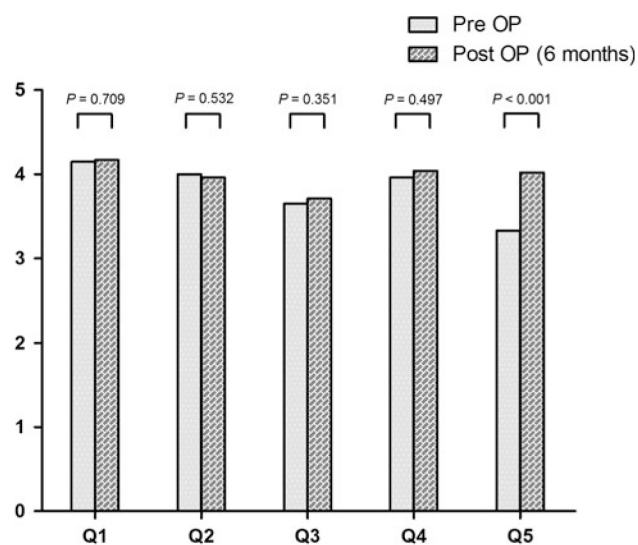
The preoperative L1 and L2 values were  $7.21 \pm 1.21$  and  $11.72 \pm 1.98$  cm, respectively. The L1 and L2 values were respectively  $7.22 \pm 1.19$  cm (+0.14 %;  $P = 0.831$ ) and  $11.65 \pm 2.12$  cm (−0.60 %;  $P = 0.521$ ) 6 months after the surgery, showing no significant changes. The mean IIEF-5 was  $19.10 \pm 3.22$  before the surgery and  $19.90 \pm 3.05$  after the surgery, showing a significant increase ( $P = 0.001$ ) (Table 1).

When the five domains were examined, no significant differences in questions 1–4 were found. However, the score on question 5 of the survey regarding intercourse satisfaction increased significantly from  $3.33 \pm 0.92$  to

**Table 1** Comparison of penile girth, length, and International Index of Erectile Function-5 (IIEF-5) preoperatively and 6 months after penile girth enhancement

	Preoperatively	At 6 months	<i>P</i> value
G1 (cm)	$7.01 \pm 0.39$	$9.29 \pm 0.82$	<0.001
G2 (cm)	$7.06 \pm 0.37$	$9.34 \pm 0.86$	<0.001
L1 (cm)	$7.21 \pm 1.21$	$7.22 \pm 1.19$	0.831
L2 (cm)	$11.72 \pm 1.98$	$11.65 \pm 2.12$	0.521
IIEF-5	$19.10 \pm 3.22$	$19.90 \pm 3.05$	0.001

G1 penile circumference at the proximal one third of the penile shaft, G2 penile circumference at the distal one third of the penile shaft, L1 flaccid penile length, L2 stretched penile length, IIEF-5 International Index of Erectile Function-5



**Fig. 2** Comparison of International Index of Erectile Function-5 (IIEF-5) domain scores preoperatively and 6 months after penile girth enhancement

**Table 2** Patient satisfaction 6 months after penile girth enhancement

	Morphologic n (%)	Functional n (%)	Overall n (%)
Patient satisfaction			
Very satisfied	15 (28.85)	9 (17.31)	12 (23.08)
Somewhat satisfied	32 (61.54)	30 (57.69)	36 (69.23)
Equally satisfied and dissatisfied	5 (9.61)	12 (23.08)	4 (7.69)
Somewhat dissatisfied	0 (0)	1 (1.92)	0 (0)
Very dissatisfied	0 (0)	0 (0)	0 (0)

$4.02 \pm 0.80$  ( $P < 0.001$ ) (Fig. 2). The only postoperative complication was the occurrence of nodular fat in one case (1.92 %). No serious adverse reactions, penile abscesses, or deformity requiring re-surgery occurred. The survey of postoperative satisfaction showed that more than 75 % of the patients were satisfied in each of the three individual categories (morphologic, functional, and overall), and 37 patients (71.15 %) indicated that they were satisfied with all three categories (Table 2).

## Discussion

In this study, penile circumference and IIEF-5 were significantly increased 6 months after penile AFI was performed for men with thin penises. The results of this study show that penile AFI is a safe surgery.

The growth of the fetal penis is affected by testosterone, which is stimulated by placental human chorionic gonadotropin and fetal pituitary luteinizing hormone.

Testosterone is first secreted from the newly formed testis at 8 weeks of gestation, reaches its peak at the middle of gestation, and then gradually decreases. It reaches its second peak 2–4 months after birth [7]. However, at 2–11 years, the testosterone level is 35 ng/dL or less, and penis size increases by only 1.5 cm compared with the size at birth.

When boys enter adolescence, the penis size suddenly increases due to a rapid increase in testosterone levels [8, 9]. A normal penis size has not been determined. However, Ponchietti et al. [10] reported averages of 9 cm for flaccid length, 12.5 cm for stretched length, and 10 cm for penile midshaft circumference in a study conducted with 3,300 Italian men ages 17–19 years. In addition, Son et al. [6] reported averages of 6.9 cm for flaccid length, 9 cm for stretched length, and 8.5 cm for penile midshaft circumference in a study conducted with Korean men. The results of previous studies on penis size are somewhat inconsistent due to differences in physique growth associated with country and ethnicity. Accordingly, the subjects of this study were classified based on the Korean data reported by Son et al. [6].

According to the Kinsey report, men think that penis size is the most important factor influencing a woman's sexual attraction and satisfaction. The desire for penis enlargement in some men is similar to the desire for breast augmentation in some women [11]. Compared with Caucasians, Asians have a shorter mean penile length and girth and have a tendency to undervalue their penis size even if they have a normal penis size. In addition, a psychiatry-based approach has been recommended for penile dysmorphism [12].

For these reasons, the results of previous studies investigating men with normal-sized penises who undergo aesthetic augmentative phalloplasty are not necessarily generalizable to men with below-average penis size. Therefore, the current study investigated men with penis sizes at least one standard deviation below the mean normal penis size.

In 2002, Austoni et al. [13] performed bilateral saphenous grafts for 39 men with hypoplasia of the penis or functional penile dysmorphism and reported that the flaccid penile circumference was unchanged but that the erect penile circumference was significantly increased 9 months after the surgery. Yacobi et al. [14] conducted PGE using liquid injectable silicone. They reported that the mean penile circumference increased by 27.37 %, from 9.5 cm before the surgery to 12.1 cm after the surgery, in a follow-up study conducted with 324 patients for an average of 20 months. In the current study, the G1 and G2 increased by 32.24 %, from a mean of 7.04 cm before the surgery to a mean of 9.31 cm after the surgery, a proportionally greater increase than in the previous study. However, due

to differences in the amount of injected material, measurement time, and ethnicity, it is difficult to compare the results of this study investigating Asians directly with those of the previous study investigating Caucasians.

In a recent study conducted by Kwak et al. [15] using hyaluronic acid gel, 41 patients were injected with an average of 20.56 mL and followed up 1 month and 18 months after the surgery. The maximum penile circumference significantly increased by 52.54 %, from 7.48 cm before the surgery to 11.41 cm 1 month after the surgery, and a 50.53 % increase in circumference was retained 18 months after the surgery (11.26 cm). In addition, due to a high reported satisfaction for both the patients and their sexual partners, they concluded that PGE using artificial filler was very effective. The postoperative penile circumference in the study by Kwak et al. [15] showed a greater increase than that achieved in our study, but a significant increase was seen in both studies. Although the type of injected material was different, the two studies were conducted with Koreans, so comparisons of the results between the two studies are meaningful.

Panfilov [5] conducted AFI for PGE, and reported that the penile circumference increased by an average of 2.6 cm when 40 to 68 mL of autologous fat was injected into the penis. In the current study, when 23–49 mL of fat was injected, the penile circumference increased by 2.71 cm, a result similar to that in the study conducted by Panfilov [5]. The difference between this study and previous studies was that the proximal one third and distal one third of the penis were used rather than the penile midshaft in the measurement of penile girth. In this study, the penile girth was measured at two points to minimize error because girth varies depending on the location.

One strength this study was that we examined the effect of PGE on IIEF-5, which was not investigated previously. Because the five items of IIEF-5 consist of four erectile function domains and one intercourse satisfaction domain, it is used primarily to assess the diagnosis or treatment of erectile dysfunction [16]. Theoretically, PGE cannot improve erectile function. However, IIEF-5 is a subjective survey, and patients feel that erectile function improves as their penis size increases. For this reason, IIEF-5 was compared before and after the surgery in this study, and the results showed an improved IIEF-5. In particular, when each domain was compared, a significant increase was found for question 5, which surveys intercourse satisfaction, indicating that penile AFI via PGE affected satisfaction rather than sexual function.

In our study, a postoperative satisfaction survey also was conducted for morphologic satisfaction (in which aesthetic features and size improvement are important), functional satisfaction (which is important during sexual intercourse), and overall satisfaction. Most patients indicated high

satisfaction for all three categories. The patients showed higher satisfaction in the morphologic category than in the functional category, which likely is attributable to the fact that the patients were more interested in the visual results of the penile AFI.

In this study, AFI for PGE was found to be safe and without major complications. Wessells et al. [17] reported that complications such as seroma, nodule, asymmetry, deformity or curvature, and penile shortening can occur in PGE. In particular, if small amounts of fat are injected at multiple sites in penile AFI, the girth increase is minimal but postoperative complications occur relatively less frequently. On the other hand, if a large amount of fat is injected at multiple sites, the risk of nodular formation increases [18]. However, we encountered only one case of fat nodules, which is a relatively mild complication.

This study had a few limitations in that it was a retrospective study, had no control group for comparison, and had a relatively short follow-up period. Due to the short follow-up period, deformity by fibrosis or penile curvature that may occur a long time after the surgery could not be assessed. In addition, partner satisfaction was not assessed in the satisfaction survey.

Despite the aforementioned disadvantages, this study is meaningful in that it was conducted with the largest number of subjects among all current studies investigating PGE via AFI and was the first to be conducted with patients who had relatively small penile girth ( $\leq 1$  standard deviation from the mean). Furthermore, in this study, the effect of PGE on each domain of the IIEF-5 was determined, and a satisfaction survey in terms of three categories was administered, which was not done previously. Through this subjective survey, the effect of PGE on individual satisfaction was investigated in detail. A further long-term follow-up study of the patients included in this study is needed to determine the long-term effects of this type of surgery. Furthermore, a prospective study conducted on a larger scale also is required to confirm the efficacy and safety of AFI.

## Conclusion

When penile AFI for PGE was performed for men with thin penises, penile circumference and IIEF-5 scores were increased after the surgery compared with those before the surgery. The patients indicated high levels of satisfaction after the surgery, and penile AFI was found to be safe without the occurrence of major intra- or postoperative complications.

## References

1. Dillon BE, Chama NB, Honig SC (2008) Penile size and penile enlargement surgery: a review. *Int J Impot Res* 20:519–529

2. Al-Ansari AA, Shamsodini A, Talib RA, Gul T, Shokeir AA (2010) Subcutaneous cod liver oil injection for penile augmentation: review of literature and report of eight cases. *Urology* 75:1181–1184
3. Colombo F, Casarico A (2008) Penile enlargement. *Curr Opin Urol* 18:583–588
4. Vardi Y, Har-Shai Y, Gil T, Gruenwald I (2008) A critical analysis of penile enhancement procedures for patients with normal penile size: aurgical techniques, success, and complications. *Eur Urol* 54:1042–1050
5. Panfilov DE (2006) Augmentative phalloplasty. *Aesthetic Plast Surg* 30:183–197
6. Son H, Lee H, Huh JS, Kim SW, Paick JS (2003) Studies on self-esteem of penile size in young Korean military men. *Asian J Androl* 5:185–189
7. Kaplan SL, Grumbach MM (1990) Clinical review 14: pathophysiology and treatment of sexual precocity. *J Clin Endocrinol Metab* 71:785–789
8. Fichman KR, Nyberg LM, Bujnovszky P, Brown TR, Walsh PC (1981) The ontogeny of the androgen receptor in human foreskin. *J Clin Endocrinol Metab* 52:919–923
9. August GP, Grumbach MM, Kaplan SL (1972) Hormonal changes in puberty: 3. Correlation of plasma testosterone, LH, FSH, testicular size, and bone age with male pubertal development. *J Clin Endocrinol Metab* 34:319–326
10. Ponchietti R, Mondaini N, Bonafe M, Di Loro F, Biscioni S, Masieri L (2001) Penile length and circumference: a study on 3,300 young Italian males. *Eur Urol* 39:183–186
11. Reinisch JM, Beasley R, Kent DE (1990) The Kinsey Institute New Report on sex: what you must know to be sexually literate. St. Martin's Press, New York, pp 43–65
12. Wylie KR, Eardley I (2007) Penile size and the “small penis syndrome.”. *BJU Int* 99:1449–1455
13. Austoni E, Guarneri A, Cazzaniga A (2002) A new technique for augmentation phalloplasty: albugineal surgery with bilateral saphenous grafts—three years of experience. *Eur Urol* 42:245–253 discussion 252–243
14. Yacobi Y, Tsivian A, Grinberg R, Kessler O (2007) Short-term results of incremental penile girth enhancement using liquid injectable silicone: words of praise for a change. *Asian J Androl* 9:408–413
15. Kwak TI, Oh M, Kim JJ, Moon DG (2010) The effects of penile girth enhancement using injectable hyaluronic acid gel, a filler. *J Sex Med* 8:3407–3413
16. Rosen RC, Cappelleri JC, Smith MD, Lipsky J, Pena BM (1999) Development and evaluation of an abridged, 5-item version of the International Index of Erectile Function (IIEF-5) as a diagnostic tool for erectile dysfunction. *Int J Impot Res* 11:319–326
17. Wessells H, Lue TF, McAninch JW (1996) Complications of penile lengthening and augmentation seen at 1 referral center. *J Urol* 155:1617–1620
18. Alter GJ, Jordan GH (2007) Penile elongation and girth enhancement. *AUA Update Series* 26:229–237