



# Grower or shower? Predictors of change in penile length from the flaccid to erect state

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## Abstract

In colloquial English, a “*grower*” is a man whose phallus expands significantly in length from the flaccid to the erect state; a “*shower*” is a man whose phallus does not demonstrate such expansion. We sought to investigate various factors that might predict a man being either a *grower* or a *shower*. A retrospective review of 274 patients who underwent penile duplex Doppler ultrasound (PDDU) for erectile dysfunction between 2011 and 2013 was performed. Penile length was measured, both in the flaccid state prior to intracavernosal injection (ICI) of a vasodilating agent (prostaglandin E1), and at peak erection during PDDU. The collected data included patient demographics, vascular, and anatomic parameters. The median change in penile length from flaccid to erect state was 4.0 cm (1.0–7.0), and was used as a cut-off value defining a *grower* ( $\geq 4.0$  cm) or a *shower* (4.0 cm). A total of 73 men (26%) fit the definition of a *grower* (mean change in length of 5.3 cm [SD 0.5]) and 205 (74%) were *showers* (mean change in length of 3.1 cm [SD 0.9]). There were no differences between the groups with regards to race, smoking history, co-morbidities, erectile function, flaccid penile length, degree of penile rigidity after ICI, or PDDU findings. *Growers* were significantly younger (mean age 47.5 vs. 55.9 years,  $p < 0.001$ ), single (37% vs. 23%,  $p = 0.031$ ), received less vasodilator dose (10.3 mcg vs. 11.0 mcg,  $p = 0.038$ ) and had a larger erect phallus (15.5 cm vs. 13.1 cm,  $p < 0.001$ ). On multivariate analysis, only younger age was significantly predictive of being a *grower* ( $p < 0.001$ ). These results suggest that younger age and single status could be predictors of a man being a *grower*, rather than a *shower*. Larger, multicultural and multinational studies are needed to confirm these results.

## Introduction

Men generally focus undue attention on the size and appearance of their penises, both in the flaccid and the erect state. Through the ages, the penis has symbolized masculinity, virility, fertility, power, and strength [1, 2]. Research documents that men with larger penises have better body image, genital satisfaction, and higher feelings of sexual competence [3]. Masters and Johnson hypothesized that

penis size should not influence female satisfaction as the female vagina is a potential space and will expand to fit any size penis [4, 5]. However, multiple studies aimed at assessing female preference with regard to penis size have contradicted their claims and reported that a larger penis increases male attractiveness and female perceptions of sexual satisfaction [6, 7]. This attention on penile size has led to the colloquial terms “*grower*” and “*shower*.” A “*shower*” can be loosely defined as a man who displays more penile size when flaccid and does not gain as much when erect. A “*grower*” is a man who proportionally gains more length and girth on erection.

The evolution of the *grower/shower* concept can be traced back to the work of Masters and Johnson’s analysis of the Kinsey data [8]. In 1966, they refuted the “phallic fallacy,” which suggested that larger flaccid penises gain more erectile length than smaller flaccid penises. Their research provided validity to the concept of *growers* and *showers* on two points. The first was that there was a greater discrepancy in size between large and small penis groups

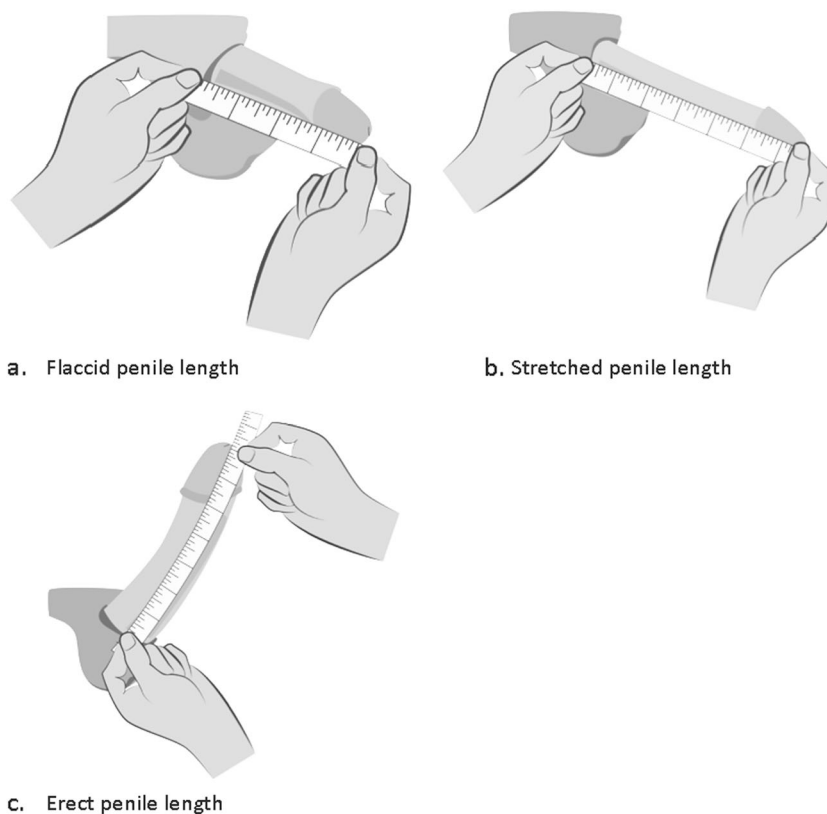
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**Fig. 1** Measurements of (a) flaccid penile length from pubo-penile junction to tip of the glans, (b) stretched penile length from pubo-penile junction to tip of the glans, (c) erect penile length from pubo-penile junction to the tip of the glans



when flaccid as compared to when erect. Second, the shorter flaccid length group experienced a relatively greater increase in both length and circumference with full erection [4]. Similarly, Wessells et al. later reported that men with short (flaccid length  $\leq 9.5$  cm) and long ( $\geq 10$  cm) penises demonstrated equivalent overall penile length increase (mean 3.98 cm vs. 4.06 cm, respectively,  $p = 0.83$ ), implying a greater relative increase in the short penis group [9].

Using a cohort of men with erectile dysfunction (ED) who underwent a penile duplex Doppler ultrasound (PDDU) for assessment, we sought first to quantify this phenomenon of “*shower*” vs. “*grower*,” and then identify variables that may be predictive of being either a “*grower*” or a “*shower*.”

## Materials and methods

### Patients

Retrospective data were collected from all ED patients who underwent PDDU between 2011 and 2013. Patients with Peyronie’s disease were excluded because of the recognized shortening effect of Peyronie’s disease. All PDDU studies tabulated penile length measurements in the flaccid, stretched, and erect states, as well as vascular parameter

measurements. The studies were performed by a single blinded ultrasonographer using a previously published standardized protocol [10]. Patients’ clinical demographics were collected and included age, race, relationship status, smoking history, International Index of Erectile Function-5 (IIEF-5) scores, and comorbidities.

### Penile duplex Doppler ultrasound

All patients undergoing PDDU in this study received an intracavernosal injection (ICI) of prostaglandin E1 (PGE1, alprostadil), in combination with audiovisual sexual simulation. As previously described, intracavernous PGE1 dosing was determined by a combination of factors such as patient’s age, IIEF-5 score, and presence of spine/back pathology, and was as follows: (1) in young patients under 35 years of age and/or with mild/moderate ED, dosing was started at 5 mcg of PGE1 and increased as needed; (2) in older patients and/or those with severe ED, dosing was started with 10 mcg and re-dosing was performed as needed; (3) repeat dosing of PGE1 was performed as necessary if there was an inadequate response as determined by penile tumescence and/or vascular PDDU parameters [11]. Degrees of tumescence and the rigidity at peak erection following ICI were subjectively assessed by both the ultrasonographer and the patient. Goal rigidity during PDDU was 70%. Patients with significant abnormal

**Table 1** Clinical and vascular parameters of *showers* and *growers*

	Group 1, ( <i>grower</i> ), N = 73 (26%)	Group 2 ( <i>shower</i> ), N = 205 (74%)	p value
Age, mean years (SD)	47.5 (14.0)	55.9 (10.6)	<0.001
Race			0.483
White	28 (55%)	89 (58%)	
Black	22 (43%)	64 (41%)	
Other	1 (2%)	2 (1%)	
Positive relationship status	46 (63%)	156 (77%)	0.031
Smoking history	7 (10%)	14 (7%)	0.671
Diabetes mellitus	8 (11%)	34 (17%)	0.249
Radical prostatectomy	22 (30%)	70 (34%)	0.312
IIEF-5 score, mean (SD)	12.5 (7.7)	13.1 (7.1)	0.603
Percent rigidity, mean (SD)	60.1 (11.2)	58.2 (11.7)	0.251
Vasodilator (PGE1) dose, mean mcg (SD)	10.3 (2.9)	11.0 (2.7)	0.038
Flaccid penile length, mean cm (SD)	10.1 (1.8)	10.0 (1.7)	0.378
Stretched penile length, mean cm (SD)	15.7 (1.9)	13.4 (1.8)	<0.001
Erect penile length, mean cm (SD)	15.5 (1.9)	13.1 (1.9)	<0.001
Change in penile length, mean cm (SD) <sup>a</sup>	5.3 (0.5)	3.1 (0.9)	<0.001
PDDU interpretations			0.061
Non-vascular	15 (21%)	55 (27%)	
Vascular	58 (79%)	150 (73%)	

SD standard deviation, IIEF-5 International Index of Erectile Function-5, PDDU penile duplex Doppler ultrasound

<sup>a</sup>Change between flaccid and erect states

vascular parameters had advanced ED, and those who did not respond to maximal ICI dosing with PGE1 were excluded.

Veno-occlusive dysfunction was diagnosed when the end diastolic velocity was >6 cm/sec in the presence of peak systolic velocity (PSV) > 25 cm/sec and/or resistive index <0.75, accompanied by rapid detumescence. Similarly, arterial insufficiency was diagnosed when the PSV was <25 cm/sec 10–20 min following ICI. A mixed vascular diagnosis was made when both of these criteria were met simultaneously. A non-vascular etiology was assigned when none of these thresholds were met.

### Penile measurements

All measurements were made by the same experienced ultrasonographer who performed the PDDU. Prior to ICI, flaccid penile length was measured from the base of the penis (pubic bone) at the pubo-penile junction to the tip of glans with the patient in supine position and the penis laying in its normal anatomical configuration. Measurement was performed using a malleable ruler that followed the natural curve of the penis without adding any external

traction on it. (Fig. 1). This was performed in a quiet, isolated, comfortable, and climate-controlled room, with only the operator present in the room. Post-injection length measurements were made after peak erection was achieved. The median change in penile length from flaccid to erect state was 4.0 cm (1.0–7.0), and was used as a cut-off value for being labeled as a *grower* (group 1, ≥4.0 cm) or a *shower* (group 2, <4.0 cm).

### Statistics

Continuous variables are expressed as means +/- standard deviation (SD). The Student's *t*-test was used to determine differences between continuous variables. Categorical variables are presented as percentages. The Pearson's Chi-square test or Fisher's exact test, as appropriate, was used to determine the differences in categorical variables. Univariate and multivariate logistic regression analyses were then performed to determine predictors of being a *grower*. All analyses were performed using SAS statistical software (version 9.3 for Windows; SAS Institute, Inc., Cary, NC, USA), and the significance level was set at 0.05.

## Results

Seventy-three men (26%) fit the definition of a *grower* (group 1, mean change in length of 5.3 cm [SD 0.5]) and 205 (74%) as a *shower* (group 2, mean change in length of 3.1 cm [SD 0.9]). There were no differences between the groups with regards to race, smoking history, co-morbidities, previous radical prostatectomy, erectile function, flaccid penile length, degree of penile rigidity after ICI, or PDDU vascular etiology (Table 1). Patients in group 1, however, were significantly younger (mean age 47.5 years vs. 55.9 years,  $p < 0.001$ ), single (37% vs. 23%,  $p = 0.031$ ), received less vasodilator dose (10.3 mcg vs. 11.0 mcg,  $p = 0.038$ ) and had a longer erect phallus (15.5 cm vs. 13.1 cm,  $p < 0.001$ ).

On multivariate regression analysis, younger age was a significant predictor of being a *grower* (OR 0.947,  $p = 0.01$ ). Relationship status, IIEF-5 score, percent rigidity, vasodilator dose, and PDDU vascular etiology were not, however, similarly predictive of post-ICI penile enlargement (Table 2).

## Discussion

To the best of our knowledge, this is the first published report attempting to quantify relative penile length expansion from flaccid to maximal erect state, with the goal of defining a cut-off value to label a man a “*shower*” or a “*grower*”. Based on our penile vascular study measurements, men whose penises expand  $\geq 4$  cm upon maximal erection are categorized as *growers*. Furthermore, our data suggest that younger age and single status may be predictors of a man being a *grower*.

Reports in the literature have shown an association between ED and smaller penile dimensions (flaccid, stretched, and erect) [12–14]. Proposed hypotheses are that men with ED have decreased distensibility of their tunica albuginea (TA) and restricted cavernosal blood flow, likely secondary to vasculogenic causes [12]. This, in turn, may lead to decreased ability to maximally stretch their penis

upon erection. Other studies have rebutted this finding and demonstrated that phallus sizes did not vary significantly between patients with and without ED [15]. Similarly, in our study, while all patients were clinically labeled as having ED and underwent PDDU for that indication, approximately 25% of the patients were deemed to have a non-vascular cause for their ED on PDDU. Notably, there was no discernable difference in penile size or penile enlargement between those diagnosed with vascular and non-vascular ED.

The literature also suggests that smokers, men with diabetes mellitus, and those who have undergone radical prostatectomy have shorter flaccid, stretched, and erect phalluses [12, 16]. It is postulated that this is secondary to either TA dysfunction, compromised penile blood flow, inflammation with subsequent collagen deposition, and/or ligament damage [12]. In our study, however, neither the rates of smoking, diabetes mellitus, nor previous radical prostatectomy, were different between “*showers*” and “*growers*,” nor were they able to significantly predict being a “*grower*” on univariate analysis. It can be argued that more thorough assessments of both the duration and extent of smoking and diabetes, as well as surgical factors related to radical prostatectomy (degree of nerve sparing, margins, extent of disease, etc.), may have yielded different results. Finally, in the aforementioned study by Wessels et al., the authors noted that men with smaller penises had significantly more relative increase in their penis size upon erection than men with larger penises [9]. In our study, however, after using the median cut-off of 4 cm for penile enlargement, there was no significant difference in initial flaccid or stretched penile length between “*showers*” and “*growers*.”

Interestingly, in this study, *growers* were significantly younger than *showers*, and younger age was a significant predictor of being a *grower*. One potential explanation for this phenomenon is that, as men get older, physiological changes associated with aging occur, such as increased inflammation and fibrosis, decreased tissue elasticity, and smooth muscle content, and compromised penile blood flow, and potentially lead to impaired penile enlargement [17–19]. Similarly, *growers* were more likely to be single as compared to “*showers*”. This finding is likely a surrogate of age since single men in this study were significantly younger than those who reported being in a stable relationship. Furthermore, on multivariate analysis, after accounting for age, relationship status did not significantly predict ability for penile enlargement. These findings could have potential implications for surgical planning when considering penile prosthesis implantation. Furthermore, these findings could help counsel patients in the pre-operative setting regarding size expectations following surgery. Corroboration with surgical findings is needed before any recommendations can be made.

**Table 2** Multivariate analysis of predictors of a man being a *grower*

	Odds ratio	Confidence interval	<i>p</i> value
Age	0.947	0.919–0.977	0.001
Positive relationship status	0.532	0.261–1.084	0.082
IIEF-5 score	0.967	0.919–1.019	0.209
Percent rigidity	0.994	0.957–1.033	0.770
Vasodilator dose	0.988	0.860–1.135	0.865
Non-vascular etiology	1.251	0.553–2.832	0.591

IIEF-5 International Index of Erectile Function-5

Some of the limitations of this study include its retrospective nature and relatively small patient number. The objective of this study, however, was to simply attempt to quantify this phenomenon of *shower* vs. *grower*, and then identify variables that may be predictive. Larger, more robust studies are certainly needed to validate our results. Another limitation is that penile measurement is not an exact science and can be confounded by multiple variables, including the degree of penile tumescence or rigidity, penile curvature, subjective variability in stretching, and operator technique. In this study, we used a single experienced ultrasonographer “to perform all measurements using a standardized PDDU technique [10]. Furthermore, there was no significant difference in degree of penile rigidity after ICI of a vasodilator between the two groups, and, paradoxically, *showers* received significantly higher doses of PGE1 as compared to *growers*. This implies that the observed penile expansion difference between the two groups was a function of internal physical properties, rather than external study factors. Finally, one may argue that a comparison of flaccid and stretched penile lengths would be a more accurate and objective assessment of length increase. While this may be true, the definitions of *shower* and *grower* rely exclusively on the premise of achieving an erection. As such, we felt that using erect penile length would allow for the most accurate assessment of this phenomenon. Furthermore, no differences between stretched and erect penile length measurements were present between the two groups in this study.

## Conclusions

Based on our penile vascular study measurements, a man whose penis expands  $\geq 4$  cm, the median change in penile length from flaccid to erect state was 4.0 cm (1.0–7.0), upon maximal erection may be considered a “*grower*.” Our results also suggest that younger age, and single status, may be predictors of being considered a *grower*, rather than a “*shower*.” Larger, multi-institutional and cross-cultural studies are needed for confirmation.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

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