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Erect penile dimensions in a cohort of 778 Middle Eastern men: establishment of
a nomogram

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Abstract

Introduction: Accurate data regarding the size of the erect penis of great importance to several disciplines working with male patients, but little high quality research exists on the subject, particularly in different ethnic groups and for erect penis size. **Aim:** To create a nomogram of erect penile dimensions in large sample of Middle Eastern men. **Methods:** A retrospective cohort study of 778 men (mean age 43.7; range 20-82) attending urological outpatient clinics in Saudi Arabia. Exclusion criteria were age under 18 years, a presenting complaint of small or short penis, Peyronie's disease or complaint of congenital curvature, clinical hypogonadism, and previous penile surgery or trauma.

Main outcome measures: three erect penile dimensions following induction of erection with injected Quadrimix.

Results: Mean patient BMI was 29.09 (SD 5.76). The mean suprapubic skin to penile tip erect length was 12.53cm (SD 1.93); the mean erect length from the symphysis pubis to the penile tip was 14.34cm (SD 1.86); and the mean erect shaft circumference was 11.50cm (SD 1.74). A nomogram was constructed and statistical analysis performed, demonstrating a weak negative correlation between BMI and erect penile length measured from the supra-pubic skin ($r=-0.283$, $P<0.000$) but not bone to tip; and a weak negative correlation between age and both erect penile length measurements (skin to tip $r=-0.177$, $P<0.0005$; bone to tip $r=-0.099$, $P=0.006$).

Conclusion: A nomogram for Middle Eastern men can be used as a standard when advising men with small penis anxiety. The importance of measuring erect size and allowing for infra-pubic fat interference in measurement is emphasized. We envisage this tool can be used to educate and reassure concerned men about the size of their penises.

Keywords: penis; erect; length; girth; circumference; nomogram

Introduction

Concern and insecurity over penis size is ubiquitous among men in numerous cultures across the globe. Men's concerns about penis size are fuelled by cultural messages equating penis size with masculinity¹. Many men may worry that their sexual partner may not be satisfied with their penis size. Men's worries about their personal inadequacies have created a large market for penis enlargement products and procedures (1). Urologists and psychotherapists often encounter patients who complain about the length of their penis, but these patients are usually well within the typical range for penis size, though many are unaware of what actually represents 'normal' size^{2,3}. Such men may have "small penis anxiety" (SPA) and be fearful of being evaluated negatively by a sexual partner. Other men may be diagnosed with Body Dysmorphic Disorder (BDD)⁴. Individuals with BDD are preoccupied with a perceived defect or flaw in their physical appearance that is not observable to others or appears only slight. To fulfil the diagnostic criteria for BDD, they should be preoccupied for at least an hour a day and must also experience clinically significant distress or impairment in social, occupational, or other important areas of functioning. Occasionally in men, the preoccupation is focussed on their genitalia or their penis size and we have defined a perceived defect as within 2 standard deviations of the mean⁵⁻⁷.

A recent systematic review found 20 studies with up to 15,521 males that had measured either flaccid length or girth or flaccid stretched length and various nomograms created⁸. Of these 20 studies only 4 measured erect length⁹⁻¹² and only 2 measured erect girth^{9,12}. One study of erect size was in Asian men⁹, one in Turkish men¹¹ and two in Caucasians^{10,12}. No studies of erect penile length or girth have been conducted in Middle Eastern men. Lastly previous studies of erect size have generally had small numbers ranging from n=80¹² to n=301⁹.

Aims: Our aim was to construct a nomogram of erect penile dimensions of a large and representative population of Middle Eastern men. A secondary aim was to determine if there was any correlation between age or BMI and penile dimensions.

Method

A network of urology outpatient clinics in Saudi Arabia assessed 778 Middle-Eastern male patients presenting for a variety of reasons including erectile dysfunction (n=348) and reassurance on normal penile size and function (n=438). In this demographic group a “pre-marital check” is frequently requested to be sure that penile size and function, as well as fertility, are normal. Thus all the patients included in this retrospective study were having the measurements collected as part of their standard clinical care in line with local protocols.

Patients with a primary complaint of small penis, with Peyronie’s disease, clinical hypogonadism, or who had undergone previous penile surgery or suffered penile injury were excluded. Males under 18 years of age were also excluded, as were men who had been using intracavernous injection for ED. The patients were examined in air-conditioned consulting rooms at a constant temperature (21°C). Intracavernosal Quadrimix (prostaglandin E1 5µg, papaverine 15mg, phentolamine 1mg, atropine 20mcg in 1ml of saline; 0.1ml given for patients without erectile dysfunction, and up to 1ml for patients with erectile dysfunction) injection was used to induce full erection in all patients. Patients who did not get a full erection were not considered for inclusion. Size data was recorded to the nearest five millimetres by a small group of experienced urologists.

Main outcome measures: Each patient had three parameters of the erect penis recorded: circumference of the penile shaft; penile length from the supra-pubic skin to distal glans (skin-to-tip); and penile length pubis to distal glans (bone-to-tip). Using a rigid plastic ruler, skin to tip measurement was conducted as follows: with the penis in full erection the base of the ruler was placed on the peno-pubic skin junction and the tip of the ruler was placed at the

level of the tip of the glans penis. Bone to tip measurement was conducted as above except the base of the ruler was pushed firmly down to the pubic bone. Penile circumference was measured with a tape at the base of the penis. Weight, height, BMI and age were also recorded.

Statistical analysis was performed using SPSS (IBM, SPSS Statistics 21). Descriptive statistics (mean, standard deviation, median and range) were performed for age, body mass index (BMI), and each of the three recorded measurements of the erect penis (skin-to-tip length, bone-to-tip length and circumference). Pearson correlation coefficients were calculated using SPSS for each of the five recorded variables. In light of a hypothesis of increasing BMI with increasing age, both of these variables were controlled for in turn. The Excel spreadsheet package (Microsoft, Excel 2010) was used in the construction of nomograms for each of the three penile measurements, and in the construction of a single reference nomogram which we anticipate may be adopted as a tool for use in clinics, visually representing each of the three erect penile dimensions on a single graph. All patients were consented to the injection and measurements. The study was approved by the clinical audit committee of the Elaj Medical Corporation, PO Box 21463, Jeddah, Kingdom of Saudi Arabia.

Results

A summary of the mean, standard deviation, median and range of the of the outcome measures in 778 men is provided in Table 1. There was a full range of age and BMI in the sample. The mean age of men in the ED group was higher than in the non-ED group (ED mean = 47.8, range 22-82; non-ED mean = 40.4, range 20-75.) There were no other significant differences between the two groups including any penile measurements. Correlations between penile measurements, age and BMI are shown in Table 2. Bone to tip had a stronger correlation with circumference than skin to tip. Age was only very weakly negatively

correlated with penile length and circumference. Skin to tip penile length was negatively correlated with BMI. Bone to tip penile length and circumference were not significantly correlated. A combined nomogram of the whole sample is shown in Figure 1. Dimensions are shown on the X-axis and the position on the percentile may then be read off the Y-axis.

Discussion

We have created the first nomogram of erect penile dimensions with the largest sample of men published and the first of Middle Eastern origin. The mean erect length (bone to tip) of 14.34cm (SD 1.86) is slightly longer than that found in the systematic review of mixed races, which had a mean, erect length of 13.12cm (SD 1.66) in 4 studies ($n = 692$)⁸. In our sample a micropenis would be defined as less than 2SD below the mean or 10.5cm bone to tip erect. However it should be noted that the term “micropenis” has never been stringently assessed and never in adults in objectively measured erect penises. The erect girth in our sample was 11.5cm (SD 1.78), which is virtually the same as that found in the systematic review 11.66cm (SD 1.10) in 2 studies ($n=381$)⁸.

Our data demonstrated the difference between measuring the length from bone to tip and skin to tip in an erect penis in relatively large number of men: this, to our knowledge, has not been reported before. Penile circumference correlates significantly with penile length, with bone-tip length having the better correlation. The correlation in our study was 0.55 for bone-to-tip to circumference which is difficult to compare against the ratio of means (0.89) found in the systematic review. The skin-to-tip measurement includes subcutaneous supra-pubic fat, which varies considerably amongst subjects, while penile circumference does not vary with adiposity, since the penis is devoid of any significant subcutaneous layer of fat. This dataset reinforces the previous association between obesity and apparent reduction in penile length, particularly when measured from the supra-pubic skin rather than the pubis.

Seven previous studies have shown no significant correlation between age and flaccid penile length, and only two studies were weakly positively correlated⁸. Therefore a weak negative correlation between age and erect length is not unexpected. In this setting, older gentlemen grew up at a time with dietary insufficiencies rife, and that nutritional status in formative years could be the weak negative correlation between age and penis length. Schneider et al (2001) found a small group of younger men (aged 18-19) to be significantly smaller in their flaccid length and erect circumference but not erect length compared to a group of men aged 40-68. One study⁹ found erect (bone to tip) length to be weakly significantly correlated with BMI ($r = 0.24$). Our study found BMI was only weakly negatively correlated with skin to tip. In any case the difference between men of 70 and 20 was less than a centimetre, which may be of no significance to an ageing man. A recent large US study was entirely reliant on self reported data¹³.

Our study has several limitations: measurements were recorded at different sites and, whilst clinical equipment and protocols are standardised across the Elaj Medical Group's sites, a number of andrologists examined the patients, introducing a degree of observer bias; whilst a strength of our population is its heterogeneity with regards to age. This is a is markedly homogeneous population as regards ethnicity, and is therefore only appropriate for application within the same ethnic setting, at least until further inter-population comparison studies have been reported.

A reliable nomogram should allow urologists to confidently reassure patients with concerns over erect penile size. Reassurance in these men has been demonstrated to be effective, with 86% of a recent population presenting with concerns over penis size successfully reassured when given evidence of comparison with their peer group¹⁴. A question is whether men with Small Penis Anxiety should be compared to a reference range including those men with micropenis, as in the paediatric study of Gabrich and colleagues¹⁵. Our feeling is that

reassurance concerned men are “larger” than a micropenis would be cold comfort to them and the use of a nomogram looking at “normal” men is more likely to be of clinical use, but this is open to research.

This nomogram may be used when consulting men of Middle-Eastern origin who require advice on penile size and “normality.” While the results may be approximated for other ethnic groups, large scale objectively measured nomograms or erect size for other geographical areas and ethnic groups are needed. Until such studies have been done in larger groups of differing ethnicities with erect measurements, we would recommend the nomogram constructed from the meta-analysis ⁸. We would argue that erect measurements are important in this respect. Measurement of penile size is of course only one aspect of assessment of men with small penis anxiety or a micropenis. Equally as important is male genital image satisfaction ¹⁶; an understanding of the beliefs and attitudes about penile size ⁷ and the need to screen for body dysmorphic disorder when it is focussed on penile size ¹⁷.

Conclusions

Men concerned over the size of their penis require expert counselling, and may benefit from reassurance and reference to where they sit on the “normal” scale ^[11]. Our data shows that BMI has a negative impact on perceived penis length and suggests bone-tip measurement is the most accurate.

A nomogram is an effective and cost-effective tool, which the urologist or other healthcare professional can use for reassurance or counselling. This nomogram is recommended for use in men of Middle-Eastern origin. We commend the methodology to be repeated in other demographics.

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Table 1 Means and median of age, BMI, and penile dimensions

	Age	BMI	Skin to tip (cm)	Bone to tip (cm)	Circumference (cm)
Mean	43.7	29.09	12.53	14.34	11.50
S.D	13.19	5.76	1.93	1.86	1.74
Median	43.0	28.79	13.00	14.50	12.00
Minimum	20	16.0	4.0	7.0	5.0
Maximum	82	59.0	18.0	20.0	16.0

Table 2: Correlations between age, BMI and erect penile measurements

	Skin to tip	Bone to tip	Circumference
Age	-.15 p = .000	-.09 p=0.009	-.07 p=.050
BMI	-.27 p = .000	-.06 p =.118	-.03 p = .364
Skin to tip		-.92 p <.000	0.46 p = .364
Bone to tip			0.55 p= .000