Penile size and its correlation with other somatometric parameters

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Summary
The concept that penile size is related to various other body features is commonly encountered. In the current review, we seek evidence based results from studies investigating the correlation between the penile size and various other somatometric parameters. Parameters under investigation included penile circumference, flaccid and stretched penile lengths, age, height, weight, body mass index as well as shoe size and index finger length. The various investigated penile parameters were found to be positively correlated with somatometric parameters such as height, weight and body mass index.

Key words
Penile size, penile length, somatometric parameter

Materials and Methods
An electronic database (i.e. PubMed, E-medicine) literature search was performed by using relevant key words, such as penis, penile, size, penile length, somatometric parameter, penile enlargement, phalloplasty, microphalia, and micropenis syndrome (alone or in combination). Retrospective and prospective studies with more than one hundred male participants were analyzed. The selected journals were written in English, and the majority was published during the last decade.

The impact of penile size
There is a steady increase in the number of men who are not satisfied with their penile size and therefore seek penile enlargement². In a recently published series of 250 patients complaining of a small-sized penis, 64% of them admitted that their anxiety arose after comparing their penis to their friends during childhood⁴. Penile size related anxiety may lead to negative affect disorders and decreased self esteem⁵. In an internet-based survey among 52,301 men and women, most men rated their penis as being of average size (66%) and only 12% rated their penis as small. In the same study, 85% of the female participants felt satisfied with their partner’s penile size⁶. The results seem to be related to the subjective perception and self-esteem of the individual.

Micropenis syndrome is considered to be a subjective perception of a small penis in flaccid state, despite a normal physical examination⁷. A psychological disorder known as dysmorphophobia is associated with an altered subjective perception of normal physical characteristics as
inadequate or abnormal. In a study conducted among 112 students, a subjective perception of a small sized penis was observed in 26% of participants and similar results were reported in another study from men serving in the military. Also, it has also been postulated that most men who request penile augmentation surgery exaggerate as to the perception of what a normal penile size is. In a series of 67 men complaining for their size, none of the participants was proven to actually have an objectively small penis. In the same cohort, 19 men (28.3%) continued to investigate the possibility of a surgical augmentation despite the detailed and scientifically evidence based consultation provided. In other studies comprising of 331 volunteers, 67% was relatively satisfied with their penile size (mean: 13.6±2.3 cm) in flaccid length, although 62% believed that a larger penis would offer more satisfaction to their female partners. However, women participants claimed that larger size is not necessarily associated with sexual pleasure.

Shortening of the penile shaft can be observed after prostate cancer treatment, in erectile dysfunction cases, after treatment of the Peyronie’s disease or in congenital penile deformity. Mundinger et al evaluated changes in the penile length after retropubic radical prostatectomy 3 months after the surgery. The authors reported a decrease in 71% of patients, with 48% measuring at least 1cm less in stretched measurement. Similarly, Savoie et al reported a statistically significant reduction in 68% of the patients. Objective shortening is also reported following hormonal and external beam radiation treatment of prostate cancer. Awwad et al compared penile size lengths between normal adults and patients with erectile dysfunction. A statistically significant difference was demonstrated between the mean flaccid to the mean stretched length (9.3 cm vs. 7.7 cm and 13.5 cm vs. 11.6 cm, respectively) which was attributed to the inability of the tunica albuginea to expand. In patients with Peyronie’s disease, postoperative measurements revealed a 30-50% shortening, especially following circumferential incision of the tunica albuginea and placement of a penile implant. In cases who underwent a Nesbit operation that proportion was reported to be as high as 100%.

True microphalia may be encountere as a result of defective gonadotropin secretion from the hypothalamus, or in mixed gonadal dysgenesis. The epispadias-extrophy complex is also associated with penile shortening due to a relative reduction in length of the copora cavernosa.

**Determination of normal penile length**

In a meta-analysis by TEMPLER et al the average length of a normal range penis was identified to be 8.9cm in flaccid state and 15.2cm during erection. Although there is no standard technique for penile length measurement, some researchers prefer to measure penile dimensions from the pubic ramus to the distal tip of the glans penis on the dorsal surface. During penile measurement, care should be taken to avoid pressure against the pubic fat pad, which may alter results. Measurements are generally made during flaccid, stretched and erect states. The first study about penile length is attributed to Loeb in 1899, and the average flaccid penile length as he measured it was 9.41 cm. Ponchietti et al conducted a study in 3300 men and managed to develop a nomogram including penile dimensions in percentiles during flaccid and erect state. Several studies have shown that there is a strong correlation between stretched penile length and erect length. As shown in Table 1, for a range between 8-10cm, flaccid length is usually 3-4cm shorter than the stretched penile length and 5-6cm shorter than the erect length. It is widely accepted that true microphalia corresponds in penile lengths which are shorter than the mean length at least at 2.5 standard deviations (SD) and it refers to penile length below 4cm in the flaccid state.
and under 7cm in stretched state\textsuperscript{27}. Brondil et al\textsuperscript{30} performed a study in 905 men and recorded measurements of 10.7cm and 16.74cm during flaccid and stretched state respectively. Their conclusion was that penile compliance is significantly decreased with aging. In other studies about microphalia it was appreciated that the shortest penile length sufficient for penetration and insemination was 4cm\textsuperscript{22,23}.

**Correlation to somatometric parameters**

The variability amongst measurements of penile size reflects the ethnic diversity of populations that were studied, the different age groups as well as the different measurement techniques that were applied. Somatometric parameters that were correlated with penile size in the studies included height, weight, ratio of circumference to waist/hip, shoe size and index finger length (Table 2)\textsuperscript{12,29,31,32}. Shah et al\textsuperscript{31} reported that there was no correlation between shoe size and penile length. A study of 52 Greek males, aged 19–38, revealed that the penile length is weakly correlated inversely to age, weight, BMI and height/weight ratio, weakly correlated to height and directly statistically significant only with index finger length\textsuperscript{32}. The largest relative study conducted by Ponchietti et al\textsuperscript{32} among 3300 Italian men demonstrated that penile measurements (length and circumference at the midshaft) correlated to height but no correlation between weight and the BMI. In a series of 1500 men, Mehraban et al\textsuperscript{1} reported a significant positive correlation with age, height, index finger length, but not with waist/hip ratio or weight. In a Turkish study among 2247 men, weak positive correlations were identified between penile circumference, flaccid and stretched lengths and height and weight. Although those correlations were found between the mean circumference penile length and BMI, there were no correlations between length and BMI \textsuperscript{33}. In other words, there is enough evidence to suggest that penile size is positively correlated to the height and inversely correlated to the weight and BMI. In contrast to socially spread beliefs correlating index finger and shoe size length, such correlations are not supported by the current literature. For an accurate estimate of penile length, we recommend measurement starting at the pubopenile junction to the tip of the glans, during flaccid, stretched and erect state\textsuperscript{27}.

**Surgical augmentation techniques**

The management of patients with microphalia should be multidisciplinary, including urological and psychological consultations. There are no clear recommendations for penile augmentation in the literature\textsuperscript{1}. The respective surgical techniques are few, and the relative studies include only small numbers of patients and a short follow up. Liposuction can only provide a subjective visual lengthening effect. Skin enhancement techniques may lead to severe deformities and hypertrophic scarring\textsuperscript{34}. Dissection of the penile suspensory ligament followed by postoperative penile stretching increases penile length by 1-2cm; however it may be followed by reduced erection angle and penile instability\textsuperscript{25,35}. There are few reports on the effect of circumcision on penile size\textsuperscript{37}. A study showed a statistically important penile length difference between children submitted to circumcision compared to children who were not\textsuperscript{38}. In the same study the penile length of the corpora cavernosa measured by ultrasound was not found to be statistically different\textsuperscript{38}.

**Conclusion**

During consultation for penile augmentation procedures, it is important for the urologists to be familiar with the respective range of normal penile length for the particular age and population group. In the present review, there were a few significant correlations among penile dimensions and other somatometric parameters, especially height, weight and BMI. Further studies are required to evaluate the safety and effectiveness of surgical augmentation techniques.
Table 1. Studies evaluating penile length (mean values)

<table>
<thead>
<tr>
<th>Studies</th>
<th>Year of publication</th>
<th>Country</th>
<th>Number of participants</th>
<th>Age</th>
<th>Flaccid penile length (cm)</th>
<th>Stretched penile length (cm)</th>
<th>Penile circumference (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinsay et al.</td>
<td>1948</td>
<td>USA</td>
<td>2770</td>
<td>20-59</td>
<td>9.7</td>
<td>15.5</td>
<td>NA</td>
</tr>
<tr>
<td>Amarnath et al.</td>
<td>1985</td>
<td>INGERIA</td>
<td>320</td>
<td>17-23</td>
<td>8.16</td>
<td>NA</td>
<td>8.93</td>
</tr>
<tr>
<td>Wassel et al.</td>
<td>1996</td>
<td>USA</td>
<td>80</td>
<td>21-62</td>
<td>8.85</td>
<td>12.45</td>
<td>9.71</td>
</tr>
<tr>
<td>Chinnayal et al.</td>
<td>2000</td>
<td>ISRAEL</td>
<td>55</td>
<td>21-79</td>
<td>8.3</td>
<td>12.5</td>
<td>NA</td>
</tr>
<tr>
<td>Ponchiallet et al.</td>
<td>2001</td>
<td>ITALY</td>
<td>3300</td>
<td>17-19</td>
<td>9.0</td>
<td>12.5</td>
<td>10.0</td>
</tr>
<tr>
<td>Sengoz et al.</td>
<td>2002</td>
<td>TURKEY</td>
<td>200</td>
<td>20-22</td>
<td>6.8</td>
<td>12.7</td>
<td>NA</td>
</tr>
<tr>
<td>Syrigoulis et al.</td>
<td>2002</td>
<td>GREECE</td>
<td>52</td>
<td>19-39</td>
<td>7.76</td>
<td>12.18</td>
<td>8.68</td>
</tr>
<tr>
<td>Awadalla et al.</td>
<td>2005</td>
<td>JORDANIA</td>
<td>271</td>
<td>17-83</td>
<td>9.3</td>
<td>13.5</td>
<td>8.98</td>
</tr>
<tr>
<td>Molribdin et al.</td>
<td>2017</td>
<td>IRAN</td>
<td>1500</td>
<td>20-40</td>
<td>ΔΔ*</td>
<td>11.58</td>
<td>8.66</td>
</tr>
<tr>
<td>Promodostal et al.</td>
<td>2017</td>
<td>INDIA</td>
<td>301</td>
<td>18-60</td>
<td>8.21</td>
<td>10.88</td>
<td>9.14</td>
</tr>
<tr>
<td>Aisalata et al.</td>
<td>2010</td>
<td>TURKEY</td>
<td>1132</td>
<td>19-30</td>
<td>9.3</td>
<td>13.7</td>
<td>NA</td>
</tr>
<tr>
<td>Skyferm et al.</td>
<td>2011</td>
<td>TURKEY</td>
<td>2276</td>
<td>18-39</td>
<td>8.95</td>
<td>13.98</td>
<td>8.89</td>
</tr>
</tbody>
</table>

Average length in healthy studies: 1948-2011 UNIVERSEALLY 12 257 17-83 8.64 12.87 9.11

NA: Not Applicable

Table 2. Studies correlating penile length to somatometric parameters

<table>
<thead>
<tr>
<th>Studies</th>
<th>Country</th>
<th>Number of men</th>
<th>Flaccid penile length (cm)</th>
<th>Height (cm)</th>
<th>Weight (kg)</th>
<th>BMI</th>
<th>Index length (cm)</th>
<th>Waist/hip circumference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skyferm et al.</td>
<td>TURKEY</td>
<td>2276</td>
<td>8.95*</td>
<td>174.79</td>
<td>9.3</td>
<td>63*</td>
<td>22.93*</td>
<td>1.97</td>
</tr>
<tr>
<td>Prochiallet et al.</td>
<td>ITALY</td>
<td>3300</td>
<td>9.0***</td>
<td>170**</td>
<td>69</td>
<td>22.23***</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Syrigoulis et al.</td>
<td>GREECE</td>
<td>53</td>
<td>7.76***</td>
<td>179.4</td>
<td>82.5</td>
<td>25.7</td>
<td>9.6*</td>
<td>0.89</td>
</tr>
<tr>
<td>Mehraban et al.</td>
<td>IRAN</td>
<td>1500</td>
<td>11.58*</td>
<td>174.29</td>
<td>8.61</td>
<td>25.57</td>
<td>0.97**</td>
<td>0.91</td>
</tr>
<tr>
<td>Promodostal et al.</td>
<td>INDIA</td>
<td>301</td>
<td>8.21</td>
<td>167.27</td>
<td>63.53*</td>
<td>22.5**</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

*Positive correlation p<0.05  **Positive correlation p<0.01  ***Positive correlation p<0.001

Περίληψη

Πείκο μεγέθους και συσχέτιση με άλλες σωματομετρικές παραμέτρους

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Η αντιλήψη του συσχετισμού του μεγέθους του πέος με διάφορες άλλες σωματικές παραμέτρους απαντάται συχνά στον ανδρικό πληθυσμό.

Ο σκοπός μας είναι η ανασκόπηση της βιβλιογραφίας ώστε να διερευνηθεί η πιθανή συσχέτιση του μέσου φαλλικού μήκους και άλλων σωματομετρικών παραμέτρων. Ανασκόπησαν μελέτες σχετικές με τη περιεργεία του πέος, το μήκος κατά τη χαλαρή και τεταμένη φάση, την πλεξία, το ύψος, το βάρος, το δείκτη μάζας σώματος, το μέγεθος της άκρας ποδός και το μέγεθος του δείκτη της άκρας χειρός. Οι διάφορες πείκες διαστάσεις που εκτάστηκαν παρουσιάζουν θετική συσχέτιση με σωματομετρικά παραμέτρους, όπως το ύψος, το βάρος και το δείκτη μάζας σώματος.

Λέξεις ευρετηριασμού: Πείκο μεγέθους, πείκο μήκους, σωματομετρικό παράμετρος.
References


