

# Penis ligaments: their use in “increasing” the size of the penis in penile augmentation procedures.

## Anatomical description in human cadavers and clinical results of a phalloplasty series



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**Penis ligaments: their use in “increasing” the size of the penis in penile augmentation procedures. Anatomical description in human cadavers and clinical results of a phalloplasty series**

*AIM: To present in human cadavers the anatomical basis of penis lengthening operations and reproduce this technique in a group of patients.*

*MATERIALS OF STUDY: Penis ligaments in ten human cadavers were identified and dissected releasing the penis from its fixation to pubic arch. The same technique was applied to a group of forty patients that demanded a penis lengthening operation.*

*RESULTS: The dissection of penis ligaments increases the distance pubic bone- tip of the penis for 3.1+/-0.6 cm. In patients, the increase in length 12 months post-operatively was 3.5 ±1.3 cm (2.3-5.1 cm) flaccid and 1.8 ± 1.4 cm (1.4–3.2 cm) erect. There was a statistically significant difference (p < 0.005) between preoperative and postoperative status. The overall satisfaction rate was 67.5%.*

*DISCUSSION: Cadavers study shows that this technique offers significant mobilization of the penis with a 3 cm gain, while on living tissue it has similar results. Anatomical parameters that might influence the final outcome of the operation are the length (antero-posterior dimension) of the pubic arch (corresponds to the length of the ligament), its angle with the horizontal level, the amount of the fatty tissue in the pubic area and the angle of the repositioning of the penis.*

*CONCLUSIONS: Division of ligaments of the penis increases its apparent length. Significant anatomical parameters are the length of the pubic arch, its angle with the horizontal level, the amount of the fatty tissue in the pubic area and the angle of the repositioning of the penis.*

**KEY WORDS:** Anatomy, Penis ligaments, Penile augmentation, Phalloplasty, .

### Introduction

Penis' size can be very important in male self esteem and like women who demand bigger breasts, many men the last decade decided to perform penile augmentation procedures to increase the size of their penis. Although

the 'normal' size of the penis varies <sup>1</sup>, men are often not capable of evaluating the proportion of their genitalia and have a tendency of underestimating the size of their phallus <sup>2</sup>, a psychological disorder called dysmorphophobia. Sex education has been found very effective in the treatment of men complaining of a short penis <sup>3</sup>, but still some men look for a surgical treatment of their 'problem'. Among the several procedures used, division of penis ligaments is the one with the less complication rates but with questionable results <sup>4-11</sup>.

In this paper we present the anatomical basis of this operation and we applied the same technique in a group of patients that demanded a penis elongation operation.

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## Materials and Methods

Penis ligaments were identified in ten cadavers and the anatomy of the area underneath the pubic arch was studied. Penis ligaments were divided and the gain in the length of the distance between pubic symphysis and tip of the penis was measured. The same technique was applied to a series of 40 patients between February and July 2005 with additional liposuction over the pubic bone in selected patients. Mean patient age was 28.3 years (range 22–45 years) and all of them had normal erectile function assessed with Rigiscan and Doppler. The length was measured from the base of the penis (over the pubic bone) to the tip of the glans. The postoperative result was measured 12 months after the operation. In the fourth post-operative week the patient was instructed to use the Andro-Penis® (penis-extender, Andromedical ©, Spain), 30 min daily for 6 weeks and then for another 6 weeks with increasing force in order to avoid contraction of the penis. Paired t test was used for statistical analysis. A simple 4-question questionnaire (Table I) was also used 12 months post-operatively to assess the satisfaction rate of the patients regarding the outcome of the operation.

### HUMAN CADAVER STUDY

The anatomical study was performed in a human cadaver at the Department of Anatomy of Athens University. After removal of the skin and the fat from the area between the symphysis and the penis, the fundiform ligament can be identified as a continuation of the linea alba (Fig. 1). As one dissects deeper, this ligament continues as the triangular ligament of the penis (Fig. 2). The dissection of these ligaments mobilizes the penis allowing it to be pulled out once you apply a slight traction. The further the ligament is dissected the more the penis is freed. In



Fig. 1: Dissection of the fundiform ligament of the penis.



Fig. 2: Fundiform ligament dissected. Triangular ligament appearing.

TABLE I - Satisfaction rates 12 months following the operation

	Yes / No
1. Do you consider the increase of your penis significant?	31 (77.5%) / 9 (22.5%)
2. Does it satisfy the image you had in mind pre-operatively, regarding the result of the operation?	23 (57.5%) / 17 (42.5%)
3. Did you notice any change in the quality of your erections?	0 / 40 (100%)
4. Overall, are you pleased with the result of the operation?	27 (67.5%) / 13 (32.5%)

TABLE II - Changes in penis dimension

	Pre-operative / Post-operative increase	/ p
Flaccid length, cm	9.5 ± 2.2 (8.1-13.5) / 3.5 ± 1.3 (2.3-5.1)	/0.0022
Erect length, cm	11.8 ± 1.9 (10.9-17.2) / 1.8 ± 1.4 (1.4-3.2)	/0.0035

a deeper plane, the ligament is divided into left and right branches which attach each crux to the pubic rami (figgs. 3, 4). While dissection continues (Figs. 5, 6) the inferior border of the pubic arch, which is the limit where one should stop dissecting, lays deeper, behind this separation. At this stage the penis can be pulled out or in fact placed in a lower position (Fig. 7). By stopping the dissection at this stage, we do not risk creating a 'loose' penis even if in reality we are dealing with a penis that is now hanging a little bit lower than it used to be. It is important to note that, during the dissection one does not meet any vessel. Consequently the risk of bleeding during real operations is minimal.



Fig. 5: Dissection of the triangular ligament. The inferior border of the pubic arch appeared.



Fig. 3: The two branches of the triangular ligament appeared.



Fig. 6: Completion of dissection of ligaments.

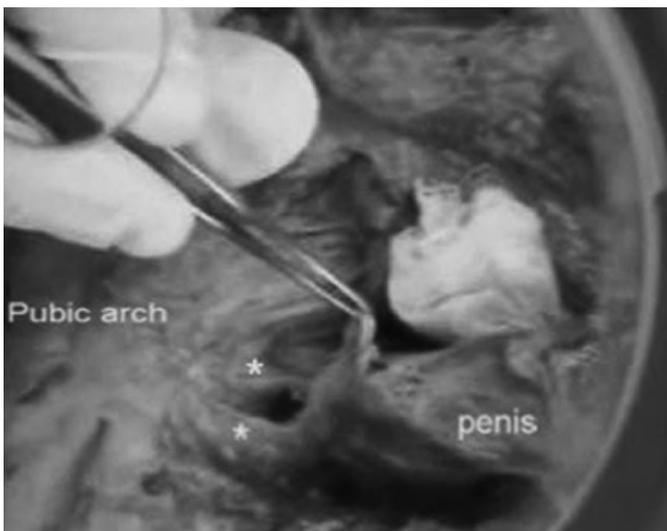


Fig. 4: The fundiform ligament after having been dissected and the 2 branches of the triangular ligaments (marked with \*) that attach the crura to the pubic rami.



Fig. 7: Length gain in cadaver.



Fig. 8: Description of the movement of the penis after the division of the ligament. l= length of the ligament, a= the angle that the penis moves from its original position, x=the actual gain length.

#### OPERATIVE TECHNIQUE: LENGTHENING OF THE PENIS

The lengthening of the penis was done by dividing the suspensory ligaments (both midline and lateral branches: fundiform and triangle). Through a 2-cm incision performed at the base of the penis superficial veins were ligated and the suspensory ligament was identified and palpated with the index finger. Dissection was performed with scissors near the pubic bone. Due to the small size of the incision that obscured vision at the time of the dissection, the index finger was used as a guide as well as protection of the penis. Traction of the penis was applied at the same time so that the ligaments could be easily identified and dissected with sharp or blunt dissection as necessary. Landmark for the end of the dissection was the inferior part of the pubic bone. At the end of the dissection in order to fill the gap between the penis and the pubic bone, pubic adipose tissues on either side were approximated to each other to avoid the use of filler or any kind of silicon material. In selected patients (fat patients or after their demand, if that was feasible), fat over the pubic bone was removed with liposuction to enhance the result of the operation.

#### Results

In human cadavers study the mean increase in the length between the pubic symphysis and tip of the penis was  $3.1 \pm 0.6$  cm. Regarding the phalloplasty operation procedure, the duration was 66 min (55–80 min) and all patients were discharged the same day. The mean flaccid length pre-operatively was  $9.5 \pm 2.2$  cm and the erect length was  $11.8 \pm 1.9$  cm. Twelve months post-operatively the measurements of the penis were: mean increase in the flaccid length of the penis was  $3.5 \pm 1.3$

cm (2.3–5.1 cm) while the increase in the erect penis was  $1.8 \pm 1.4$  cm (1.4–3.2 cm) (Table II). The difference in the measurements post-operatively was statistically significant ( $p < 0.005$ ) compared with the pre-operative status.

There were no significant complications noted except in one patient who developed a small hematoma in the area of the incision that did not need any additional treatment and healed on its own.

According to the questionnaire, 31 (77.5%) patients considered the increase of their penis significant and 23 (57.5%) stated that it fulfilled their expectations. Overall, 27 (67.5%) patients were pleased with the operation (Table II). There were no cases of erectile dysfunction.

#### Discussion and Commentary

In a recent study, 375 sexually active women were asked about the significance the attribute to the size of the penis of their partners<sup>12</sup>. Less than one-fourth (21%) stated 'size does matter'. Probably, the best way to interpret this result is that sex does matter and size might play a role but definitely is not the cornerstone of love-making or of a healthy relationship. Nevertheless, the demand for a bigger penis is something that men still seek help for from an andrologist or a plastic surgeon. The rationale for this surgical intervention is founded to some basic anatomical notions concerning the position and support of the penis in the pelvis that are summarized as follows.

The root is the part of the penis that is firmly attached to the ischiopubic rami by the posterior part of its corpora cavernosa, named crura. Each crux is covered by the ischiocavernosus muscle and converges anteriorly towards its fellow to ultimately form the upper part of the body of the penis. The lower part of the body and of the root of the penis is formed by its corpus spongiosum. The latter comprises two characteristic structures; the bulb (posterior part) and the glans (anterior part). The part of the corpus spongiosum that belongs to the root is firmly attached to the inferior aspect of the perineal membrane and covered by the bulbospongiosus muscle.

The body of the penis comprises a smaller central part, hidden in the soft tissues of the pubical region and a bigger peripheral free and visible part that is pending downwards in the flaccid state.

Beyond the above described firm attachment of the root of the penis in the hard and soft tissues of the urogenital triangle, the hidden part of the penile body possesses an additional suspensory ligament, which consists of a more superficial part, the fundiform or falciform ligament, and a deeper part, the triangular or arcuate ligament.

The fundiform ligament stems from the lower part of

the linea alba, splits into two lamellae which surround the penis and unite below with the scrotal septum. The triangular ligament is attached above to the front of the pubic symphysis and blends below with each side of the fascia penis.

The distance between the point in which the skin of the pubical region goes into the (upper part of) the skin covering the penis itself and the tip of the glans is usually defined as the length of the penis. This length presents some individual as well as ethnic variation with a mean value of 12 cm

In our cadaver anatomical description, the dissection of the ligament moved the penis approximately 3 cm from its original position (Fig. 7). Individual anatomical differences might produce different results but as we demonstrated in the cadaver, the dissection of the ligament can definitely offer immediate positive results in cadaver. Safety of the procedure and good results are the two principles that should be fulfilled. Maintaining the anatomy and the function of the penis together with avoiding damaging other structures in the area are the key factors regarding safety. In our cadaver dissection we demonstrated that there were no big vessels or other structures in this area providing that the dissection of the ligament does not go deeper to the inferior border of the pubic arch. The integrity of cavernosal bodies, vessels (dorsal arteries and vein) and nerves (dorsal) can be preserved by keeping the dissection in proximity to the bone. Stability of the penis after the procedure is an important issue since patients after these operations sometimes report that their penis is loose. Extensive release of the penis might cause the penis to lose its stability and perhaps lose upwards orientation, making intercourse problematic and needing manual assistance for penetration. This can be avoided by stopping the dissection before the inferior border of the pubic arch. Keeping in mind the above, the final gain in the length of the penis depends on the depth (antero-posterior dimension) of the pubic arch and the angle between the preoperative and the postoperative position of the penis. Since the release of the ligaments allows the penis to move to a lower position it also moves towards the outside of the body as one can see in the Fig. 8, where the actual gain length ( $x$ ) depends on the length of the ligament ( $l$ ) and the angle ( $a$ ) the penis moves from its original position. Additional factors like the amount of fatty tissue over and around the pubic area can influence the final outcome. Therefore, it is logical to assume that if one would like to predict preoperatively the outcome of the procedure, the anatomic factors that should be taken in consideration are these: the length (depth) of the pubic arch (corresponds to the length of the hidden part of the crura of the penis and the length of the ligament that is attached to it), the angle that forms the pubic rami with the horizontal level) and the amount of the fatty tissue in the pubic area. These important parameters might be evaluated by the use of a MRI scan.

Postoperatively, the angle of repositioning of the penis is probably the determining factor. The bigger the length of the ligament and the more vertical the positioning of the pubic arch, the bigger would be the expected increase in length. The fatty tissue of the pubic area although has a negative outcome to the operation if left as it is, the performance of a liposuction can offer additional length to the apparent length gain of the penis. All these estimation were not studied in the present paper but an additional study is preparing from our department to verify them.

One should take in consideration that although the repositioning of the penis is easily done in a cadaver, in a living tissue it is more challenging since the tissues around the penis interfere and minimize this movement. Although good mobilization of the penis is necessary, the penis has a tendency of returning in its original position. Instead of the placement of a silicon buffer between the penis and the pubic arch, the pubic adipose tissue was approximated to fill the gap to minimize this problem.

One of the problems regarding the operation is the long term results. During healing, scarring might retract the penis to its original position or even deeper underneath the pubic arch. Making a small incision and causing the minimal tissue damage one might avoid this complication. Also the use of penis extender by our patients contributes further to our good results. One must keep always in mind that since the division of the ligament does not change the total length of the corpora bodies, the lengthened penis is actually a penis pulled out from its original position. This is the reason why the gain in the flaccid state might decrease or even disappear in the erect state, when the erect penis proximate the pubic bone towards its original position. Real increase in the length of the penis is not possible unless the corpora bodies are dissected and grafts are used or if the disassembly technique with the additional use of various tissues, like cartilage is used <sup>6,8</sup>.

Over half of the patients (57.5%) stated that the postoperative result is what they had in mind before the operation. This further contributes to the idea that many men who seek penis lengthening operations do not have logical expectations and a lot of the patients kept on dreaming for a 'megapenis'. Nevertheless, the majority of our patients (77.5%) consider the increase in the size of their penis significant, giving an overall satisfaction rate of 67.5%. All patients maintain their erectile capacity intact.

## Conclusions

Dissection of the ligaments of the penis can offer an apparent increase in the size of the penis without causing significant complications providing that one has good knowledge of the anatomy of the area and the principles that we described are followed.

## Riassunto

La dissezione dei ligamenti del pene è un intervento utilizzato per il suo porlungamento. In questo lavoro descriviamo la tecnica e il quadro anatomico del suddetto intervento, al quale abbiamo sottoposto una serie di 40 pazienti.

I ligamenti penieni sono composti da 2 parti: il lig. Fundiforme, più superficiale, che è il proseguimento della linea alba, ed il lig. Triangolare che sta più profondo. La dissezione inizia dal fundiforme, prosegue col triangolare e termina sul bordo interno della sinfisi pubica. Il risultato è la mobilizzazione del pene in una posizione più bassa e più esterna. Abbiamo eseguito questo intervento attraverso una breccia chirurgica di 2 cm. Il prolungamento penieno così ottenuto è stato dell'ordine di 3.1 +/- 0.6cm sui cadaveri, mentre sui pazienti è stato di 3.5 +/- 1.3cm ed in particolare 2,3-5.1cm in pene flacido e 1.8 +/- 1.4cm (1,4-3.2cm) in erezione. Condizioni anatomiche che possono influenzare il risultato sono: la lunghezza (profondità) della sinfisi pubica (che corrisponde alla lunghezza della parte nascosta dei corpi cavernosi e alla lunghezza del ligamento ad essi attaccato), l'angolo che si forma dalla branca pubica ed il piano orizzontale ed infine la quantità del grasso a livello della superficie pubica.

La percentuale di soddisfazione dei pazienti sottoposti da noi in questo intervento, risulta del 67.5%, il che vuol dire che rispettando rigorosamente i parametri anatomici, l'intervento di dissezione dei ligamenti penieni è un metodo sicuro mediante cui si ottiene un importante aumento della lunghezza della parte esterna del pene.

## References

- 1) Wessells H, Lue TF, McAninch JW: *Penile length in the flaccid and erect states: Guidelines for penile augmentation*. J Urol, 1996; 156:995-97.
- 2) Mondaini N, Ponchietti R, Gontero P, Muir GH, Natali A, Calderera E, Biscioni S, Rizzo M: *Penile length is normal in most men seeking penile lengthening procedures*. Int J Impot Res, 2002; 14:283-86.
- 3) Shamloul R: *Treatment of men complaining of short penis*. Urology, 2005; 65:1183-185.
- 4) Austoni E, Guarneri A, Cazzaniga A: *A new technique for augmentation phalloplasty: Albugineal surgery with bilateral saphenous grafts-three years of experience*. Eur Urol, 2002; 42:245-53.
- 5) Spyropoulos E, Christoforidis C, Borousas D, Mavrikos S, Bourounis M, Athanasiadis S: *Augmentation phalloplasty surgery for penile dysmorphism in young adults: Considerations regarding patient's selections, outcome selection, outcome evaluation and technique applied*. Eur Urol, 2005; 48:121-28.
- 6) Lue TF, El-Sakka AI: *Lengthening shortened penis caused by Peyronie's disease using circular venous grafting and daily stretching with a vacuum erection device*. J Urol, 1999; 161:1141-144.
- 7) van Driel MF, Schultz WC, van de Wiel HB, Mensink HJ: *Surgical lengthening of the penis*. Br J Urol, 1998; 82:81-85.
- 8) Perovic SV, Djordjevic ML: *Penile lengthening*. BJU Intern, 2000; 86:1028-33.
- 9) Austoni E, Guarneri A, Gatti G: *Penile elongation and thickening-a myth? Is there a cosmetic or medical indication?* Andrologia, 1999; 31(suppl 1):45-51.
- 10) Perovic S, Djordjevic M, Djakovic N: *Real penile enlargement*. Br J Urol, 1997; 80(suppl 2):308.
- 11) Reed HM: *Augmentation phalloplasty with girth enhancement employing autologous fat transplantation: A preliminary report*. Am J Cosmet Surg, 1994; 11:85-89.
- 12) Francken AB, van de Wiel HB, van Driel MF, Schultz WC: *What importance do women attribute to the size of penis?* Eur Urol, 2002; 42:426-31.