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Comparison of Traditional Multipuncture Technique and Atraumatic Cannula Technique for the Penile Girth Enlargement using Hyaluronic Acid

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Abstract

Objective

To compare the traditional multipuncture technique (TMT) and the atraumatic cannula technique (ACT) for the penile girth enlargement (PGE) procedure using hyaluronic acid (HA).

Methods

Patients who underwent PGE with HA fillers between January 2022 and May 2025 were enrolled into the study. Patients' preoperative characteristics were recorded. Thickness increase, IIEF score, patient satisfaction scores according to Likert scale were noted 3 months, 6 months and 1 year after the procedure. Also, complications were saved. Preoperative data of participants, operative parameters, post-operative thickness increase, patient satisfaction, and complications of two groups were compared in detail.

Results

In total, 280 cases in the ACT group and 178 cases in the TMT group completed the one-year follow-up schedule. The increases in thickness were not significantly different between the ACT group and TMT group at 3rd month, 6th month and 1st year follow-ups ($p = 0.205$, $p = 0.285$, and $p = 0.746$). Patient satisfaction according to the Likert scale was 4.5 for the ACT group and 3.3 for the TMT group, and the difference was significantly better in favour of the ACT group ($p = 0.001$) at first-year follow-up. Hematoma was observed in 5 (1.78%) patients in the ACT group and 11 (6.18%) patients in the TMT group ($p = 0.001$), and nodules were seen in 4 (1.42%) patients in the ACT group and 12 (6.74%) patients in the TMT group ($p = 0.001$), respectively. Migration was diagnosed in 3 (1.07%) patients in the ACT group and 15 (8.42%) patients in the TMT group ($p = 0.001$).

Conclusion

Present study findings demonstrated that TMT and ACT achieved similar success rates for PGE. However, patient visual satisfaction was significantly better, and complications were detected in significantly fewer numbers in favour of ACT.

Introduction

Penile girth enlargement (PGE) procedures were primarily described for correction of penile anatomical disorders, which result in inability to engage in sexual intercourse and erectile dysfunction (1). Penis size is considered an important parameter for masculinity by many men, and a study conducted by Lever and colleagues including more than 50,000 men stated that almost half of the study population were

dissatisfied with their penile size (2). Although small penile size is not a fatal disease, its relationship to lack of self-confidence, depression, and difficulty forming relationships is well-defined. Evolving aesthetic standards and increased social awareness have dramatically increased the demand for elective PGE procedures among men who experience "small penis syndrome", even if they have clinically normal penis size (3). Numerous penile filters are used for PGE including autologous fat transfer, polymethyl methacrylate, polylactic acid (PLA) and hyaluronic acid (HA) (4).

HA was approved in 2023 by the U.S. Food and Drug Administration, and has become a one of the most preferred dermal filler agents in clinical use due to high effectivity of the molecule, slow degradation of the HA filler which increases its longevity without decreasing biocompatibility and low complication rate (5). Ahn and colleagues compared the efficiency and safety of PAL and HA for PGE in 64 patients, and concluded that both PAL and HA ensured significant increases in penile girth, satisfaction with penile size appearance and sexual life (6). In another study by Boiko et al. with 132 cases, the use of HA for PGE significantly improved the confidence, self-esteem, and sexual relationship satisfaction of men (7).

Although a limited number of studies investigated the role of HA filter for PGE, to our knowledge, none of the studies compared the importance of PGE technique with HA on PGE procedure outcomes. In the present study, we compared the traditional multipuncture technique (TMT) and the atraumatic cannula technique (ACT) for the PGE procedure using HA.

Material and Methods

This study was conducted by retrospectively reviewing the medical records of 595 consecutive patients who were admitted to the outpatient urology clinic with subjective complaints of small penis size and underwent PGE with HA fillers between January 2022 and May 2025. Ethics committee approval was obtained from the Haseki Training and Research Hospital Non-Interventional Clinical Research Ethics Committee (Reference Number: 134–2026), and the study was completed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

Patients were divided into two groups according to the HA injection technique: TMT group and ACT group. Inclusion criteria for the study were: being over 18 years of age, having normal endocrine and erectile function, and completing the full 1-year post-procedure follow-up. Patients with previous penile surgery, permanent filler injections, Peyronie's disease, active urogenital infection, or severe body dysmorphic disorder were excluded from the study.

Before the procedure, all patients underwent detailed urogenital and general physical examination, and intensive medical anamnesis was taken for each patient. Also, patients were informed in detail about acceptable penile size of the general population, pros and cons of PGE procedures, safety and possible complications of HA use during PGE, other alternative PGE procedures, operation techniques (TMT and ACT), and the follow-up scheme. Written informed consent for participation in the study and for the procedure was obtained from all individual participants at least 24 hours before surgery. All procedures were performed by a single experienced andrologist (ASG). Before the procedure, patient demographic

characteristics, including age, body mass index (BMI), hypertension, diabetes mellitus (DM), and baseline International Index of Erectile Function (IIEF) score, were recorded.

Traditional Multipuncture Technique (TMT) and Atraumatic Cannula Technique (ACT)

In both groups, cross-linked HA filler material with high viscoelasticity specifically formulated for body contouring was used. Prior to the procedure, local anaesthesia was provided with topical anaesthetic cream and dorsal penile nerve block (Lidocaine 2%, 20 ml and Mepivacaine/ Carbocaine 2%, 10 ml). In the TMT group, filler injection was performed using fine-tipped sharp needles with numerous puncture points along the penis shaft from proximal to distal. Aspiration was performed at each entry point to avoid intravascular injection, and homogenization was attempted with manual massage after the procedure. In the ACT group, a single entry point was made at the base of the penis at the 3 or 9 o'clock position, and an 18G/22G atraumatic blunt-tipped microcannula was inserted. The cannula was placed in the loose areolar plane between the sub-Dartos fascia and the Buck fascia, and the filler was integrated around the penis in a cylindrical and even layer using a back-and-forth technique (similar to the Cylindrical Dartos-Buck Smooth technique). Operative data including procedure duration, volume of HA used during procedure, and any undesirable events were noted.

Thickness increase was calculated by analysing the basal circumference length taken from the mid-shaft level when the penis was flaccid and circumference thickness measurements (cm) taken exactly 3 months, 6 months and 1 year after the procedure. Also, IIEF score was recorded at the 3rd month, 6th month and 1st year follow-up. Patient satisfaction scores were evaluated at the 3 month, 6 month and 1-year follow-up using a 5-category Likert scale (very satisfied, satisfied, somewhat satisfied, not satisfied, not satisfied at all). Complications were classified as follows: macroscopic bleeding/swelling developing within the first 72 hours after the procedure was defined as hematoma; lumps palpable and causing asymmetry were defined as nodules; displacement of filler into the pubic area or prepuce was defined as migration; and conditions characterized by purulent discharge, severe oedema, or abscess were defined as infection and recorded as independent variables.

To determine and analyse the efficiency and safety of TMT and ACT with HA for the PGE procedure, preoperative data of participants, operative parameters, post-operative thickness increase, patient satisfaction, and complications were compared in detail.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA). The normality of continuous variables was assessed using the Kolmogorov–Smirnov test and visual methods (histograms and Q–Q plots). Continuous variables are presented as mean ± standard deviation (SD), while categorical variables are expressed as frequencies and percentages. Comparisons between the ACT and TMT groups were performed using the independent samples t-test for normally distributed continuous variables and the Mann–Whitney U test for non-normally distributed

variables. The chi-square test or Fisher's exact test was used for comparison of categorical variables, as appropriate. Changes in penile girth measurements (baseline vs. 1-year follow-up) were analysed using the paired samples t-test or Wilcoxon signed-rank test, depending on data distribution. A p-value of < 0.05 was considered statistically significant.

Results

In total, ACT was performed in 342 patients, and TMT was done in 253 patients during the study period, and 280 cases in the ACT group and 178 cases in the TMT group completed the one-year follow up schedule. Mean age was 39.9 years in the ACT group and 40.4 years in the TMT group (p= 0.525), and BMI was 27.9 kg/m2 in the ACT group and 27.8 in the TMT group (p= 0.924). In addition, patients with DM and hypertension were comparable between the groups (p= 0.456 and p= 0.539). Also, preoperative IIEF scores in the groups were similar (23.4 vs 23.4, p= 0.767). Preoperative characteristics of groups are summarised in Table 1.

The amount of HA filter used during the PGE procedure was similar between the groups (p= 0.368). Baseline penile girth was 11.4 cm for the ACT group and 11.4 cm for the TMT group (p= 0.849), and penile girth at the first year follow up was 13.7 cm for the ACT group and 13.7 cm for the TMT group (p= 0.826). The increases in thickness were not significantly different between the ACT group and TMT group at 3rd month, 6th month and 1st year follow-ups (p= 0.205, p= 0.285, and p= 0.746). Patient satisfaction according to the Likert scale was 4.5 for the ACT group and 3.3 for the TMT group, and the difference was significantly better in favour of the ACT group (p= 0.001) at first-year follow-up. Comparison of operative parameters and penile girth outcomes between ACT and TMT groups are presented in Table 2.

Complications in the ACT group and TMT group are listed in Table 3. Hematoma was observed in 5 (1.78%) patients in the ACT group and 11 (6.18%) patients in the TMT group (p= 0.001), and nodules were seen in 4 (1.42%) patients in the ACT group and 12 (6.74%) patients in the TMT group (p= 0.001), respectively. Migration was diagnosed in only 3 (1.07%) patients in the ACT group and 15 (8.42%) patients in the TMT group, and the difference was significantly better in favour of the ACT group (p= 0.001). Lastly, infection was detected in only 2 patients, and both patients underwent the PGE procedure with the TMT technique.

Discussion

Penile girth enlargement procedures for cosmetic purposes have become very popular in recent decades, and numerous men seek medical support to gain larger penis size. The effectivity and safety of HA in aesthetic soft-tissue augmentation was proven particularly in ophthalmology and orthopaedics, and HA is a preferred agent during PGE procedures in urology practice (8). Despite HA being used very frequently during PGE, there are no studies comparing the HA application techniques. Thus, we conducted this study to compare the efficiency and safety of TMT and ACT using HA for the PGE

procedure for the first time. Our study demonstrates that success of TMT and ACT in PGE were not significantly different, but visual patient satisfaction was significantly higher after ACT in comparison with TMT. Moreover, we faced with significantly less complications after using ACT for PGE procedures.

The main purpose of PGE procedures is to increase the size of the penis. Studies investigating the use of penile filter during PGE have focused on postprocedural penile girth increments. Kwak and colleagues used HA to increase penile girth size in 50 patients, and the authors found that 7.48 cm preoperative penile girth size increased to 11.41 cm at the postoperative first-month follow-up (9). In another study, Park et al. applied HA for the PGE procedure for 20 patients, 12 had history of PGE with HA, while 8 were treatment-naïve. They stated that 89.8 mm mean penile grith size increased to 111 mm in first four weeks, and 115 mm at 48th week follow-up (10). However, the aforementioned studies included relatively small patient numbers and did not focus on different techniques which were used during PGE. In present study, we analysed outcomes of 458 patients with one-year follow-up results, and our findings revealed that ACT and TMT techniques provided significant and similar increases in penile grith size ate 3rd month, 6th month and 1st year follow-up in comparison with preoperative penile girth size.

Patient satisfaction is crucial following PGE procedures, and numerous questionnaires were developed to evaluate patient-reported outcome measures. Cheng and colleagues applied silicone pearl implantation and fat grafting for PGE, and the authors used a treatment satisfaction scale for assessment of patient satisfaction. The authors found significant improvements in patient satisfaction score following both silicone pearl implantation and fat grafting (11). In another study, Boiko et al., who chose HA for PGE, used the self-esteem and relationship questionnaire to evaluate postoperative patient satisfaction, and found significant improvements with regards to sexual relationship satisfaction, confidence, and overall relationship satisfaction (7). However, no study compared the impact of ACT and TMT on patient satisfaction following PGE. Our findings revealed that patients who underwent ACT had significantly higher patient satisfaction score according to a Likert scale. We think that the use of the cannula with fewer punctures minimises tissue trauma, and achieves more homogeneous distribution with less irregularity and conceptual framing of ACT as a less invasive and atraumatic approach may provide higher patient satisfaction.

Most complications seen after the PGE procedure are not serious and resolve spontaneously without requiring any treatment (12). Littara and colleagues used fat for PGE, and the authors encountered long-standing haematomas, seroma, fat loss and fat migration, delayed wound healing, hypertrophic wound scarring and disfiguring advancement of suprapubic hairy skin. However, the authors stated that none of the complications were life-threatening (13). In another study, Quan et al. found 2.2% of patients had subcutaneous nodule, 1.3% of patients had subcutaneous bleeding, and almost 1% of patients had soft tissue infection following HA applications for PGE (14). However, Kusumaputra et al. stated that complication rates following PGE could have a wide range due to lack of standardisation in how they are defined, diagnosed, and reported (15). In the present study, we achieved significantly lower complication rate with ACT. The use of a blunt-tip cannula may decrease tissue trauma by reducing microvascular

injury, thereby leading to less bleeding and hematoma. ACT allows for more homogeneous distribution of HA through fewer points, which may result in significantly less nodules, migration and infections.

Although the present research is the first to evaluate TMT and ACT in PGE, the retrospective analysis of data and lack of long-term results could be accepted as limitations. However, all patient data was saved prospectively in the electronic data system. Also, we believe that the long-term outcomes of TMT and ACT in PGE could be the subject of another study. In addition, this study presents data from only one experienced surgeon, and we think that studies including multiple surgeons from different centres will more strongly demonstrate the impact of ACT and TMT in PGE. However, studies involving a single surgeon eliminate biases such as patient selection and the effect of surgeon experience on procedure success. Lastly, the impact of TMT and/or ACT in PGE on partner sexual satisfaction was not analysed in the present study, and the correlation between TMT and ACT for PGE on partner sexual satisfaction may be discussed in future studies.

In conclusion, the present study findings demonstrated that TMT and ACT achieved similar success rates for PGE. However, patient visual satisfaction was significantly better, and complications were detected in significantly fewer numbers in favour of ACT. Our findings indicate that patients who undergo the PGE procedure should be informed especially about visual satisfaction rate and migration rate after TMT and ACT for PGE.

Abbreviation

PGE: Penile girth enlargement

PLA: Polylactic acid

HA: Hyaluronic acid

TMT: Traditional multipuncture technique

ACT: Atraumatic cannula technique

BMI: Body mass index

DM: Diabetes mellitus

IIEF: International Index of Erectile Function

Declarations

Ethics approval and consent to participate: This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Haseki Training and Research Hospital Non-Interventional Clinical Research Ethics Committee (Reference Number: 134-2026). Informed consent was obtained from all individual participants included in the study.

Consent for publication: Not applicable. (The manuscript does not contain any individual person's data, identifiable clinical images, or personal details.)

Availability of data and materials: The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

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Tables

Table 1. Baseline demographic and clinical characteristics of patients in the ACT and TMT groups

	Atraumatic Cannula Technique	Traditional Multipuncture Technique	P value
Number of patients	280	178	
Age (years)*	39.9 ± 8.6	40.4 ± 8.7	0.525
Body mass index (kg/m^2)*	27.8 ± 6.1	27.9 ± 6.0	0.924
Hypertension, n (%)	15 (5.4%)	12 (6.7%)	0.539
Diabetes mellitus, n (%)	17 (6.1%)	14 (7.9%)	0.456
Baseline IIEF score*	23.4 ± 1.2	23.4 ± 1.0	0.767

*mean ± standard deviation

IIEF: International Index of Erectile Function

Table 2. Comparison of operative parameters and penile girth outcomes between ACT and TMT groups

	Atraumatic Cannula Technique	Traditional Multipuncture Technique	P value
Amount of filler (cc)*	18.3 ± 0.6	18.3 ± 0.4	0.368
Penile girth (cm)			
Baseline	11.4 ± 0.5	11.4 ± 0.5	0.849
At 3 moths	13.8 ± 0.6	13.9 ± 0.5	0.976
At 6 months	13.8 ± 0.5	13.8 ± 0.5	0.984
At 12 months	13.7 ± 0.5	13.7 ± 0.5	0.826
Increase in thickness (cm)*			
At 3 moths	2.4 ± 0.1	2.5 ± 0.1	0.205
At 6 months	2.4 ± 0.1	2.4 ± 0.1	0.285
At 12 months	2.3 ± 0.1	2.3 ± 0.1	0.746
Satisfaction score			
At 3 moths	4.8 ± 0.6	3.8 ± 1.1	***0.001***
At 6 months	4.7 ± 0.5	3.5 ± 0.9	***0.001***
At 12 months	4.5 ± 0.5	3.3 ± 1.0	***0.001***

*mean ± standard deviation

Table 3. Comparison of complication rates between ACT and TMT groups

	Atraumatic Cannula Technique	Traditional Multipuncture Technique	P value
Hematoma, n (%)	5 (1.78%)	11 (6.18%)	***0.001***
Nodules, n (%)	4 (1.42%)	12 (6.74%)	***0.001***
Migration, n (%)	3 (1.07%)	15 (8.42%)	***0.001***
Infection, n (%)	0	2 (1.12%)	NA