



Aesthetic Penile Augmentation Procedures: A Comprehensive and Current Perspective

Monica H. Xing¹ · Sean W. Hou¹ · Omer A. Raheem²

Accepted: 18 September 2022 / Published online: 9 November 2022

© The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2022

Abstract

Purpose of Review Some men experience small penis syndrome (SPS), a body dysmorphic disorder in which a patient believes their penis to be small even when it is clinically average. As cosmetic surgery becomes more widely accepted, management of SPS may present a challenge for urologists. We aim to provide an updated review of aesthetic penile augmentation procedures.

Recent Findings Augmentation procedures range from invasive to noninvasive. Surgical solutions include grafts and flaps, suspensory ligament release, and suprapubic lipectomy. Minimally invasive solutions include injections of fillers (hyaluronic acid, polylactic acid, and polymethyl methacrylate). Noninvasive solutions include external devices such as vacuum pumps and traction devices.

Summary In the current climate, aesthetic penile augmentation is becoming a desirable option for many patients but remains clinically controversial. Our review summarizes recent and relevant studies and demonstrates the need for further research and consensus on penile augmentation procedures.

Keywords Penile augmentation · Length · Girth · Aesthetic · Small penis syndrome

Introduction

Society has perpetuated the misconception that penis shape and size are a marker of masculinity and sexual ability. Unfortunately, many men experience small penis anxiety syndrome (SPS), a body dysmorphic disorder in which a patient believes their penis to be small even when it is clinically average in length and girth [1•]. In these situations, patients who have received proper psychological evaluation may choose to pursue clinical procedures to augment their penis. The goal of such procedures is visual satisfaction rather than functional improvement [2]. The clinical necessity for cosmetic penile augmentation and long-term outcomes remains controversial.

The increasing influence and availability of sociocultural media content is apparent in the global rise of patients seeking penile augmentation over the last two decades [3•, 4]. Studies have found that mainstream media commentary, pornography, and peer-to-peer comparison have all negatively influenced self-perception of penis size [3•]. As cosmetic surgery becomes more widely accepted, management of SPS may present a challenge for urologists.

There is a lack of consensus on current approaches for aesthetic penile augmentation in patients with small penis anxiety. Indeed, recent systematic reviews have highlighted heterogeneous outcomes with low-quality evidence [5•]. There are also no standardized guidelines on managing this patient cohort from any professional urologic societies. We aim to provide an updated review of aesthetic penile augmentation procedures from 2015 to date that are available for physicians to discuss with this unique patient population.

This article is part of the Topical Collection on *Men's Health*

✉ Monica H. Xing
monica.xing@uchospitals.edu

¹ Pritzker School of Medicine, University of Chicago, Chicago, IL, USA

² Department of Surgery, Section of Urology, University of Chicago, Chicago, IL, USA

Methods

A PubMed literature review was performed to identify articles published after 2015 on penile aesthetic augmentation procedures. Relevant prospective studies, retrospective

studies, and systematic reviews were included, while abstracts and opinion papers were excluded. Search terms included “penis,” “penile,” “augmentation,” “enhancement,” “aesthetic,” “girth,” and “length.”

Results

After thorough psychological counseling, patients with small penis syndrome may choose to undergo penile augmentation. Augmentation procedures range from invasive to noninvasive (Fig. 1). Surgical solutions include grafts and flaps, suspensory ligament release, and suprapubic lipectomy. Minimally invasive solutions include injections of fillers (hyaluronic acid, poly lactic acid, and polymethyl methacrylate). Noninvasive solutions include external devices such as vacuum pumps and traction devices. We will expand on such procedures below.

Invasive/Surgical Penile Augmentation Procedures

Aesthetic penile augmentation modalities have shifted towards minimally invasive and noninvasive mechanisms. Still, more involved procedures are occasionally performed. Within the last five years, surgical penile enhancement procedures that have been published in the scientific literature include suspensory ligament incision, lipectomy, and grafts and flaps [6]. In many cases, such procedures are performed in conjunction with other penile augmentation techniques.

Suspensory ligament release (SLR) has been used to increase the flaccid length of the penis [7–9]. However, risks include penile deformity and erectile dysfunction [8]. Contemporary case series have combined the suspensory ligament incision with fat grafts [5•]. Penile liposuction of the suprapubic fat pad can also visually lengthen the penis, particularly in cases of excess fat at the mons pubis, also

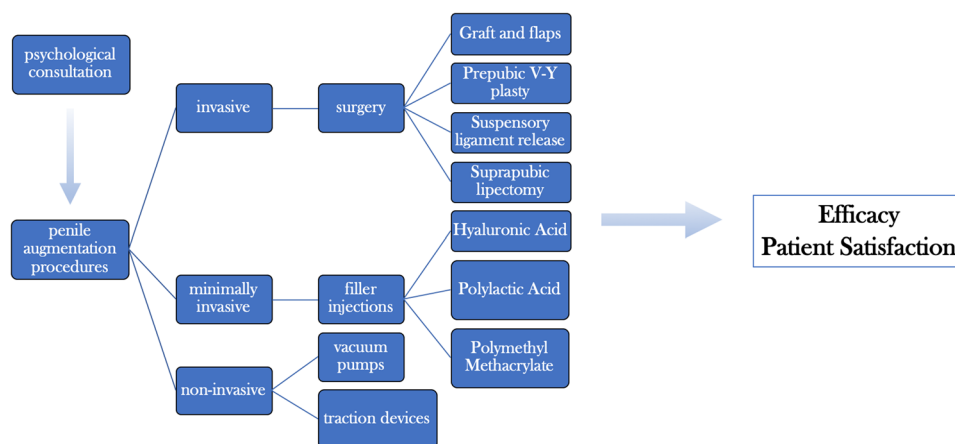
known as buried penis syndrome. Similar to SLR, these liposuctions are done in conjunction with other procedures including SLR [5•, 6].

Grafts

Tissue grafting can also be performed for surgical enhancement of penile girth and has been sporadically studied for the past two decades. While penile augmentation grafts were originally performed with autologous tissue, which consists of dermis and subcutaneous fat for vascular support and thickness, respectively, recent literature has also reported usage of ex vivo tissue (xenografts) [10, 11]. Nonetheless, there has been no consensus on the gold standard of tissue grafting material and there are conflicting results on whether this modality is safe or effective for aesthetic penile augmentation.

Recent literature has shown human acellular dermal matrix allograft as one form of grafting material for girth augmentation [12, 13]. Although this modality results in notable increases in mean penile circumference, these studies report concerning postoperative complications. In a retrospective study of 78 patients by Xu et al. who underwent girth enhancement with acellular dermal matrix, there was a concerning high complication rate of 71.79% [12]. Patients reported erectile discomfort, wound hematoma, and prepuce edema, in addition to more serious complications such as wound edema, skin necrosis, and fibrosis. Notably, seven patients had their grafts surgically removed due to severe complications. Upon follow-up, 70 patients expressed unwillingness to do the surgery again. Furthermore, while Zhang et al. similarly reported a notable increase in flaccid and erect penile girth, five of their 182 patients experienced graft retraction and minor fibrosis ranging from 0.3–0.6 cm [13]. Given the seemingly high rates of complication with acellular dermal matrix grafting, grafting does not appear to be a viable option despite successful enhancement of penile girth.

Fig. 1 Penile augmentation algorithm of treatment options



In 2016, Xu et al. completed a prospective study of 23 men with SPS who underwent girth enhancement by fat graft [2]. Fusiform-free dermal fat grafts excised from the flank were positioned into two bilateral incisions on the penile shaft above Buck's fascia. The mean flaccid circumference gain 6 months postoperatively was 1.67 ± 0.46 cm, and the mean flaccid length was increased by 2.27 ± 0.54 cm. Subjective patient perspectives on genital appearance were measured by the male genital image scale (MGIS) which includes items such as satisfaction with penile length, circumference, and general appearance. Interestingly, MGIS scores increased from 34.35 ± 5.85 to 42.00 ± 4.64 . Fat graft remained 70 to 90% of their original volume. Short-term complications included prepuce edema while long-term complications included donor site scar and unnatural hair growth [2].

Overall, although recent literature details some successful reports of tissue grafting via autologous tissue or xenografts, the high rates and heterogeneous reports of postoperative complications indicate that they may not be an ideal method for aesthetic augmentation of the penis.

Flaps

Tissue flaps can similarly be used for penis augmentation for various conditions [14–16] but have scarce outcomes reported in the literature with regards specifically to aesthetic augmentation. While a flap and graft are made of the same exact tissue type (skin, fat, etc.), the key difference is that a flap has its own blood supply while a graft does not [17]. Therefore, grafts require a vascular bed in order to survive, and thus flaps are considered superior to autologous and synthetic grafts. In 2009, Zhuo et al. reported on the usage of scrotal flap for penis lengthening [18]. Their surgical technique consisted of an incision 1.5 cm above the root of the penis, dissecting and releasing the superficial suspensory ligament and part of the deep suspensory ligament, and then covering the cavernosum with the scrotal flap [18]. Although they reported 100% patient satisfaction at 5-year follow-up, limited information is available. In 2014, Shaeer described the usage of the superficial circumflex iliac artery and vein (SCIAV) flap for penile girth augmentation in 40 participants [19]. This technique, which they termed “Shaeer's augmentation phalloplasty,” was first described as a case report in 2006 [20]. Shaeer reported that the 40 participants had a preoperative average flaccid girth (AFG) of 9.3 ± 1.1 cm and a postoperative AFG with the final follow-up (minimum 18 months) of 14.5 ± 1.1 cm, which was a significant 55.6% gain compared to baseline [19]. Notably, complications included edema which spontaneously resolved in the following 2–8 weeks (100%), dorsal shaft skin ulceration (in two overweight patients), donor site dehiscence (12%), and donor site infection (2%).

Overall, recent evidence for usage of flaps for penile aesthetic augmentation is scarce. Further study is necessary to substantiate whether this modality is safe and effective for penis enhancement.

Minimally Invasive Penile Augmentation Procedures: Injectable Fillers

For patients who are seeking minimally invasive penile augmentation, injectable penile fillers are an alternative option. Injectable fillers are predominantly used for girth augmentation and include silicone, autologous fat, and soft tissue fillers [1•, 21]. Challenges for such fillers include filler migration, hypersensitivity reactions, and rapid degradation. However, recent research has focused on hyaluronic acid (HA), polylactic acid, and polymethyl methacrylate fillers due to higher patient satisfaction and safety, and of these injectable substances, HA appears the most common [22].

Hyaluronic acid is naturally found in the human body within the extracellular matrix [23]. Though long used as facial filler, hyaluronic acid has only been utilized in the setting of penile girth augmentation since 2003 [24, 25]. In a prospective study by Zhang et al., 38 patients who underwent penile augmentation via HA injection were followed for 1-year postinjection. At 1-month postinjection, there was a significant mean increase of 3.4 and 2.5 cm in girth and length, respectively [26]. Further, psychological benefits remained at one year follow-up as evaluated by the psychological burden surveys IMGI, IIEF, and BAPs. Similar psychological improvements after HA and polylactic acid filler have been reported in shorter-term studies as well [27].

Adverse effects and complications of HA injection include pain, swelling and discoloration, subcutaneous bleeding, subcutaneous nodules, and infection [23, 25]. Still, HA complications are rare and relatively mild. Of note, HA is not a permanent solution as it degrades over the course of approximately 6 to 18 months [22].

Interestingly, in a multicenter randomized study of 77 patients who underwent penile augmentation due to SPS by Yang et al., HA and polylactic acid (PLA) filler were found to be comparable in clinical efficacy and safety [28]. Mean girth increases were maximized at 1-month postinjection at 2.5 cm and 2.3 cm for HA and polylactic acid fillers, respectively. Patients were followed for 18-month postinjection, and satisfaction scores remained significantly higher than baseline for both groups during the study follow-up period. The key difference between HA and polylactic acid is its biochemical difference. HA is a natural substance whereas PLA is synthetic. Therefore, HA is absorbed more quickly into the tissue, lasting for up to 18 months while PLA can last for up to 3 years [28].

Table 1 Studies of penile augmentation procedures since the year 2015

Procedure	Author(s)	Year published	N of patients (total)	Type of study	Mean change in length (flaccid)	Mean change in girth (flaccid)	Mean change in length (erect)	Mean change in girth (erect)	Overall postoperative complication rate	Post-procedure measurement time
Hyaluronic acid injection										
	Zhang et al.	2020 [13]	38	Retrospective	2.55 ± 0.55 cm	3.41 ± 0.95 cm	-	1.32 ± 1.02 cm	8%	1 month
	Yang et al.	2020 [28]	33	Prospective	-	2.50 ± 0.88 cm	-	-	9.10%	1 month
	Yang et al.	2020 [28]	33	Prospective	-	1.91 cm	-	-	9.10%	6 months
	Yang et al.	2020 [28]	33	Prospective	-	1.41 ± 1.48 cm	-	-	9.10%	18 months
Poly lactic acid injection										
	Yang et al.	2020 [27]	34	Prospective	-	2.30 ± 0.98 cm	-	-	5.90%	1 month
	Yang et al.	2020 [27]	34	Prospective	-	1.95 cm	-	-	5.90%	6 months
	Yang et al.	2020 [27]	34	Prospective	-	1.79 ± 1.41 cm	-	-	5.90%	18 months
Polymethylmethacrylate injection										
	Kim et al.	2015 [29]	20	Prospective	3 cm	4 cm	-	-	0%	18 months
	Casavantes et al.	2016 [30]	729	Retrospective	0.7 cm	2.4 cm	-	-	0.40%	-
Grafts										
Dermal matrix allograft	Xu et al.	2019 [12]	78	Retrospective	-	1.1 (0.5–2.1) cm	-	-	71.79%	3 months
Dermal matrix graft	Zhang et al.	2020 [13]	182	Retrospective	-	1.14 cm	-	2.2 cm	5.50%	12 months
Fat graft	Xu et al.	2016 [2]	23	Prospective	2.27 ± 0.54 cm	1.67 ± 0.46 cm	-	-	0%	6 months
Traction devices										
	Nowroozi et al.	2015 [38]	54	Prospective	1.7 ± 0.8 cm	0	1.2 ± 0.4 cm	-	-	6 months

Lastly, polymethylmethacrylate (PMMA)-based penile fillers have been studied in recent years. PMMA microspheres are relatively large, and therefore not susceptible to phagocytosis once injected into the penis [29]. It has been shown to be a biocompatible substance, with minimal complications, and has been termed to be a “living tissue” as the microspheres become embedded in collagen fibers and capillaries over time [30]. In a prospective study of 15 subjects who underwent PMMA injection by Kim et al., the average flaccid penile length increased 3 cm, and this enhancement was maintained over 18 months [29]. Further, there were no reports of filler degradation or migration. In a larger retrospective study by Casavantes et al., 729 men underwent penile augmentation with PMMA filler and demonstrated an average girth increase of 2.4 cm and high patient satisfaction rates [30]. The study also reported a 0.4% complication rate and concluded that PMMA is safe and effective for long term penile augmentation [30].

Due to the variety of tissue fillers available, and the range of clinical and biochemical characteristics associated with each, there is still no ideal injectable substance for penile augmentation [27, 28]. Of note, the literature regarding penile augmentation fillers are largely from China, Korea and Mexico. Additional comparative studies with long-term follow-up are warranted. In general, injections are relatively safe, especially compared to the comorbidities of more invasive procedures.

Noninvasive Penile Augmentation

Vacuum Devices

Vacuum erectile devices, classically used as a treatment for erectile dysfunction or Peyronie’s disease, can be utilized to temporarily increase penis size by creating negative pressure to draw blood into the corpora cavernosa [31, 32]. However, evidence for long-term aesthetic augmentation with the use of vacuum devices is lacking, especially in the past decade.

In a prospective study of 37 men with a stretched penis length of less than 10 cm in 2006, 6 months of vacuum therapy three times a week resulted in a nonsignificant increase in mean penile length from 7.6 cm to 7.9 cm ($p = 0.2$) [33]. At the study follow-up, 30% of the men indicated satisfaction with the therapy. To date, there has only been one study of the use of vacuum devices for aesthetic augmentation, demonstrating a need for additional evidence for this modality.

Traction Devices

Penile traction devices involve using mechanical traction for controlled stretching of the penis. These devices generally

consist of rings at the base of the penis and below the glans which are held by metal rods for stretching, resulting in tensile force on the penile tissue which promotes remodeling [34]. Although traction devices have typically been utilized for treatment for Peyronie’s disease [35, 36], recent literature has demonstrated their efficacy for aesthetic penile length augmentation.

Overall, a total of three studies over the past two decades have reported modest, but significant increases in penile length following usage of traction devices [37–39]. The most recent of which by Nowroozi et al. in 2015, which enrolled 54 patients who used a penile extender between 4 to 6 h per day for 6 months, resulted in significant increases for flaccid, stretched, and erect penile lengths [38]. Notably, these studies did not report any significant change in penile girth. Together, these studies show promising results for the usage of penile traction devices as a minimally invasive technique for length augmentation in patients with SPS. However, additional evidence with larger patient sample sizes and longer follow-up is warranted to assess the efficacy of these devices.

Discussion

Thorough and individualized physical and psychological evaluation is necessary in patients who complain of small penis size and is critical in the decision making for such patients. In some cases, patients may have penile anomalies including micropenis, buried penis, or excessive suprapubic fat [40]. Sexual education and psychosexual therapy can help eliminate patient concerns by dispelling patient preconceptions regarding penis size [40]. A multidisciplinary approach including therapy or counseling are effective methods to change patient desires for penile augmentation [41–43]. The Augmentation Phalloplasty Patient Selection and Satisfaction Inventory [APPSSI], MGIS, Index of Male Genital Image [IMGI], International Index of Erectile Function [IIEF], and Beliefs About Penis Size [BAPS] scales can be useful in determining a patient’s own perception of their genitalia and can help determine the need for psychological intervention.

In patients where psychological evaluation and therapy fails, and patient quality of life is suffering, management options and joint decision-making are highly individualized to the treating urologist and patient. While there are a multitude of treatment options with varying degrees of invasiveness, there is no standardized recommendation for patients who are pursuing penile enhancement. Further, many studies lack long-term follow-up data, and patients can suffer an array of complications. Urological societies such as the American Urological Association and Sexual Medicine Society of North America deem such procedures experimental and have currently concluded that these procedures have not been shown to be safe or effective [44].

Conclusions

In the current climate, aesthetic penile augmentation is becoming a desirable option for many patients but remains clinically controversial. Additional research into the long-term physical and psychological effects of such interventions are warranted. Our comprehensive review of the literature demonstrates the need for further investigation and consensus on penile augmentation procedures.

Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

References

Papers of particular interest, published recently, have been highlighted as:

- Of importance

1. • Hehemann MC, Towe M, Huynh LM, El-Khatib FM, Yafi FA. Penile girth enlargement strategies: what's the evidence? *Sex Med Rev.* 2019;7(3):535–47. <https://doi.org/10.1016/j.sxmr.2018.11.003>. **Important review of recent girth enlargement strategies.**
2. Xu L, Zhao M, Chen W, et al. Augmentation phalloplasty with autologous dermal fat graft in the treatment of “small penis.” *Ann Plast Surg.* 2016;77(Suppl 1):S60–65. <https://doi.org/10.1097/SAP.0000000000000782>.
3. • Sharp G, Oates J. Sociocultural influences on men's penis size perceptions and decisions to undergo penile augmentation: a qualitative study. *Aesthet Surg J.* 2019;39(11):1253–9. <https://doi.org/10.1093/asj/sjz154>. **Helps contextualize the trends of SPS and associated interventions within the sociocultural setting. Demonstrates the various non-clinical factors at play.**
4. Oates J, Sharp G. Nonsurgical medical penile girth augmentation: experience-based recommendations. *Aesthet Surg J.* 2017;37(9):1032–8. <https://doi.org/10.1093/asj/sjx068>.
5. • Marra G, Drury A, Tran L, Veale D, Muir GH. Systematic review of surgical and nonsurgical interventions in normal men complaining of small penis size. *Sex Med Rev.* 2020;8(1):158–80. <https://doi.org/10.1016/j.sxmr.2019.01.004>. **Recent systematic review of interventions for SPS with varying degrees of invasiveness. Comprehensive and updated.**
6. Romero-Otero J, Manfredi C, Ralph D, et al. Non-invasive and surgical penile enhancement interventions for aesthetic or therapeutic purposes: a systematic review. *BJU Int.* 2021;127(3):269–91. <https://doi.org/10.1111/bju.15145>.
7. Li CY, Kayes O, Kell PD, Christopher N, Minhas S, Ralph DJ. Penile suspensory ligament division for penile augmentation: indications and results. *Eur Urol.* 2006;49(4):729–33. <https://doi.org/10.1016/j.eururo.2006.01.020>.
8. Zhang X, Huang Z, Xiao Y, et al. Suspensory ligament release combined with acellular dermal matrix filler in infrapubic space: a new method for penile length augmentation. *Andrologia.* 2019;51(9): e13351. <https://doi.org/10.1111/and.13351>.
9. Srinivas BV, Vasani SS, Mohammed S. Penile lengthening procedure with V-Y advancement flap and an interposing silicone sheath: A novel methodology. *Indian J Urol.* 2012;28(3):340. <https://doi.org/10.4103/0970-1591.102722>.
10. Tealab AA, Maarouf AM, Habous M, Ralph DJ, Abohashem S. The use of an acellular collagen matrix in penile augmentation: a pilot study in Saudi Arabia. *Arab J Urol.* 2013;11(2):169–73. <https://doi.org/10.1016/j.aju.2013.02.001>.
11. Alei G, Letizia P, Ricottilli F, et al. Original technique for penile girth augmentation through porcine dermal acellular grafts: results in a 69-patient series. *J Sex Med.* 2012;9(7):1945–53. <https://doi.org/10.1111/j.1743-6109.2012.02744.x>.
12. Xu T, Zhang G, Bai W, et al. Complications and management of penile girth enhancement with acellular dermal matrix. *J Sex Med.* 2019;16(12):2011–7. <https://doi.org/10.1016/j.jsxm.2019.09.010>.
13. Zhang H, Jin C, Zhang P, et al. Human acellular dermal matrix augmentation phalloplasty surgery. *Plast Surg.* 2020;28(3):161–6. <https://doi.org/10.1177/2292550320928556>.
14. Moussa M, Abou Chakra M. Scrotal dartos-fascio-myocutaneous flaps for penis reconstruction after iatrogenic skin shaft sub-amputation. *J Surg Case Rep.* 2019;2019(7):rjz206. <https://doi.org/10.1093/jscr/rjz206>.
15. Han DS, Jang H, Youn CS, Yuk SM. A new surgical technique for concealed penis using an advanced musculocutaneous scrotal flap. *BMC Urol.* 2015;15(1):54. <https://doi.org/10.1186/s12894-015-0044-3>.
16. Innocenti A, Tanini S, Mori F, Melita D, Innocenti M. Scrotal dartos-fascio-myocutaneous flaps for penis elongation after catastrophic iatrogenic skin shaft sub-amputation: a case of recovery using an extremely adaptable flap. *Int J Surg Case Rep.* 2016;28:300–2. <https://doi.org/10.1016/j.ijscr.2016.10.031>.
17. Tissue Flap - an overview | ScienceDirect Topics. <https://www.sciencedirect.com/topics/medicine-and-dentistry/tissue-flap>. Accessed 1 Aug 2022
18. Zhuo Q, Li S, Wu J, Wang Z, Yang D, Tao L. Clinical application of scrotal flap on penis lengthening. *Saudi Med J.* 2009;30(3):418–21.
19. Shaeer O. Girth augmentation of the penis using flaps “Shaeer's augmentation phalloplasty”: the superficial circumflex iliac flap. *J Sex Med.* 2014;11(7):1856–62. <https://doi.org/10.1111/jsm.12537>.
20. Shaeer O, Shaeer K. Case reports: penile girth augmentation using flaps “Shaeer's augmentation phalloplasty”: a case report. *J Sex Med.* 2006;3(1):164–9. <https://doi.org/10.1111/j.1743-6109.2005.00104.x>.
21. Abo-Hedibah SA, Badawi AN, Aly SA, Ismail SRM, Elmokadem AH. Penile girth augmentation by injectable fillers: a comprehensive review of imaging features and inflammatory complications. *Abdom Radiol.* 2021;46(4):1703–17. <https://doi.org/10.1007/s00261-020-02788-w>.
22. Salloum A, Bazzi N, Haber R. Nonsurgical methods for penile augmentation: a systematic review. *Dermatol Surg Off Publ Am Soc Dermatol Surg Al.* 2021;47(3):e81–5. <https://doi.org/10.1097/DSS.0000000000002816>.
23. Quan Y, Gao ZR, Dai X, et al. Complications and management of penile augmentation with hyaluronic acid injection. *Asian J Androl.* 2021;23(4):392–5. https://doi.org/10.4103/aja.aja_78_20.
24. Moon DG, Kwak TI, Cho HY, Bae JH, Park HS, Kim JJ. Augmentation of glans penis using injectable hyaluronic acid gel. *Int J Impot Res.* 2003;15(6):456–60. <https://doi.org/10.1038/sj.ijir.3901058>.

25. Kim JJ, Kwak TI, Jeon BG, Cheon J, Moon DG. Human glans penis augmentation using injectable hyaluronic acid gel. *Int J Impot Res.* 2003;15(6):439–43. <https://doi.org/10.1038/sj.ijir.3901044>.
26. Zhang CL, Quan Y, Li H, et al. Penile augmentation with injectable hyaluronic acid gel: an alternative choice for small penis syndrome. *Asian J Androl.* Published online April 8, 2022. <https://doi.org/10.4103/aja20223>.
27. Yang DY, Jeong HC, Ahn ST, et al. A comparison between hyaluronic acid and poly lactic acid filler injections for temporary penile augmentation in patients with small penis syndrome: a multicenter, Patient/Evaluator-Blind, Comparative, Randomized Trial *J Sex Med.* 2020;17(1):133–41. <https://doi.org/10.1016/j.jsxm.2019.10.006>.
28. Yang DY, Jeong HC, Ko K, Lee SH, Lee YG, Lee WK. Comparison of clinical outcomes between hyaluronic and poly lactic acid filler injections for penile augmentation in men reporting a small penis: a multicenter, patient-blinded/evaluator-blinded, non-inferiority, randomized comparative trial with 18 months of follow-up. *J Clin Med.* 2020;9(4):1024. <https://doi.org/10.3390/jcm9041024>.
29. Kim MT, Ko K, Lee WK, Kim SC, Yang DY. Long-term safety and longevity of a mixture of polymethyl methacrylate and cross-linked dextran (Lipen-10®) after Penile Augmentation: Extension Study from Six to 18 Months of Follow-Up. *World J Mens Health.* 2015;33(3):202–8. <https://doi.org/10.5534/wjmh.2015.33.3.202>.
30. Casavantes L, Lemperle G, Morales P. Penile girth enhancement with polymethylmethacrylate-based soft tissue fillers. *J Sex Med.* 2016;13(9):1414–22. <https://doi.org/10.1016/j.jsxm.2016.06.008>.
31. Sidi AA, Lewis JH. Clinical trial of a simplified vacuum erection device for impotence treatment. *Urology.* 1992;39(6):526–8. [https://doi.org/10.1016/0090-4295\(92\)90008-k](https://doi.org/10.1016/0090-4295(92)90008-k).
32. Yuan J, Hoang AN, Romero CA, Lin H, Dai Y, Wang R. Vacuum therapy in erectile dysfunction—science and clinical evidence. *Int J Impot Res.* 2010;22(4):211–9. <https://doi.org/10.1038/ijir.2010.4>.
33. Aghamir MK, Hosseini R, Alizadeh F. A vacuum device for penile elongation: fact or fiction? *BJU Int.* 2006;97(4):777–8. <https://doi.org/10.1111/j.1464-410X.2006.05992.x>.
34. Sultana A, Grice P, Vukina J, Pearce I, Modgil V. Indications and characteristics of penile traction and vacuum erection devices. *Nat Rev Urol.* 2022;19(2):84–100. <https://doi.org/10.1038/s41585-021-00532-7>.
35. Setia SA, Levine LA. Devices for penile traction: the long and winding road to treating Peyronie’s disease. *Expert Rev Med Devices.* 2018;15(8):517–26. <https://doi.org/10.1080/17434440.2018.1502083>.
36. Avant RA, Ziegelmann M, Nehra A, Alom M, Kohler T, Trost L. Penile traction therapy and vacuum erection devices in Peyronie’s disease. *Sex Med Rev.* 2019;7(2):338–48. <https://doi.org/10.1016/j.sxmr.2018.02.005>.
37. Gontero P, Di Marco M, Giubilei G, et al. A pilot phase-II prospective study to test the ‘efficacy’ and tolerability of a penile-extender device in the treatment of ‘short penis.’ *BJU Int.* 2009;103(6):793–7. <https://doi.org/10.1111/j.1464-410X.2008.08083.x>.
38. Nowroozi MR, Amini E, Ayati M, Jamshidian H, Radkhah K, Amini S. Applying extender devices in patients with penile dysmorphism: assessment of tolerability, efficacy, and impact on erectile function. *J Sex Med.* 2015;12(5):1242–7. <https://doi.org/10.1111/jsm.12870>.
39. Nikoobakht M, Shahnazari A, Rezaeidanesh M, Mehraei A, Pourmand G. Effect of Penile-extender device in increasing penile size in men with shortened penis: preliminary results. *J Sex Med.* 2011;8(11):3188–92. <https://doi.org/10.1111/j.1743-6109.2009.01662.x>.
40. Soubra A, Natale C, Brimley S, Hellstrom WJG. Revelations on men who seek penile augmentation surgery: a review. *Sex Med Rev.* 2022;10(3):460–7. <https://doi.org/10.1016/j.sxmr.2021.10.003>.
41. Ghanem H, Shamloul R, Khodeir F, ElShafie H, Kaddah A, Ismail I. Structured management and counseling for patients with a complaint of a small penis. *J Sex Med.* 2007;4(5):1322–7. <https://doi.org/10.1111/j.1743-6109.2007.00463.x>.
42. Schifano N, Cakir OO, Castiglione F, Montorsi F, Garaffa G. Multidisciplinary approach and management of patients who seek medical advice for penile size concerns: a narrative review. *Int J Impot Res.* Published online May 27, 2021:1–18. <https://doi.org/10.1038/s41443-021-00444-5>.
43. Nabil N, Hosny H, Kadah A, Shamloul R. Evaluation of surgical outcome of penile augmentation and lengthening procedures. *Urol Int.* 2013;90(4):465–9. <https://doi.org/10.1159/000347044>.
44. Penile Augmentation Surgery - American Urological Association. <https://www.auanet.org/guidelines/guidelines/penile-augmentation-surgery>. Accessed 1 Aug, 2022

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.