

REVIEW ARTICLE



Penile length preservation in penile prosthesis placement: tips & tricks

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Penile Prosthesis (PP) is offered to patients with erectile dysfunction (ED) who prefer a definitive management, but subjective or objective penile length shortening after PP surgery is a concern. This review article aims to describe various preoperative, intraoperative and postoperative procedures and factors that may preserve or increase penile length during PP surgery. Preoperative strategies by the surgeon include vacuum erection devices (1 month), penile traction devices (2–4 months), and optimal surgical timing in priapism (early vs. delayed), and patient decisions include choosing a high-volume centre (>25 PP/year) and implant type (malleable vs. inflatable). The intraoperative manoeuvres included the subcoronal no-touch technique, cavernosal tissue-sparing dilatation, ventral phalloplasty, suspensory ligament release, suprapubic lipectomy, the sliding technique, the multiple-slit technique, and tunical expansion procedures. Simultaneous radical prostatectomy and PP surgery is gaining momentum to preserve the penile length in patients who have preexisting ED. Postoperative protocols included immediate postoperative inflation (60–80% inflated for 6 weeks), pump inflation protocol and the use of a vacuum device (without the ring, for 12 weeks). Using the above factors, the gain in penile length may range between 0.2 and 6.0 cm. The outcomes of these procedures are not universally reproducible at all centres.

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INTRODUCTION

Penile size is closely tied to self-esteem and masculinity for many men. If given a chance, many men would prefer to increase their penile size even if they have a “normal-sized” penis as per their race and comorbid conditions [1]. Most sexual medicine experts agree that intimacy and emotional connection outweigh penile size in sexual satisfaction [2, 3]. However, most men are reluctant to accept any reduction in penile size with any medical or surgical interventions.

Prosthesis (PP) is offered to patients with erectile dysfunction (ED) who prefer a definitive management, and the year 2023 witnessed the 50-year mark of the introduction of inflatable penile implants [4]. Significant advancements in the design of PP have occurred over the last few decades, resulting in patient-friendly and surgeon-friendly prostheses [5]. Jorissen et al. reported patient and partner satisfaction rates of 83.2% and 85.4%, respectively, with inflatable PP at 1 year or more [6]. Similarly, Krishnappa et al. reported that most patients who underwent semirigid PP were also satisfied with a mean Erectile Dysfunction Inventory of Treatment Satisfaction (EDITS) score of 95.67 ± 10.76 in developing countries where medical insurance does not cover PP surgery [7].

The majority of the patients and their partners are satisfied with PP surgery [6, 7]. However, there is a concern among patients and surgeons about penile length shortening after PP surgery [8], although many authors refute it [9, 10]. Deveci et al. highlighted

that 72% of patients reported subjective penile length loss after inflatable PP surgery, despite no significant differences in objective penile length assessment before and after PP surgery [8]. The majority of these unsatisfied patients had undergone prior radical prostatectomy (RP).

The penile length loss could be subjective or objective [11, 12]. The common factors for penile shortening (subjective or objective) after PP surgery include excess pubic fat/oedema, loss of glandular engorgement, Peyronie’s disease (PD) and corporal fibrosis (priapism, post-infection and pelvic cancer treatment modalities such as RP, radiation therapy and androgen deprivation therapy) [11, 12]. Hence, stretched penile length (SPL) should preferably be documented before PP surgery to address the patients’ post-operative “subjective” length loss claims [11, 12], especially in the CURSED patient group [13]. This review article aims to update the various strategies to preserve/improve penile length in PP surgery in general.

METHODS

The literature search for this narrative review was done in PubMed in November 2024 with the advanced search keywords: (((penis) OR (penile)) AND ((size) OR (length))) AND ((prosthesis) OR (implant)). The search revealed 546 articles in English involving humans without a timeframe. All 546 abstracts were screened, and the full texts of relevant articles were read to collect the necessary

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details for this review article. References of the full texts were manually reviewed to identify any relevant publications. The opinions of the experts (authors ELG and IM) were incorporated as needed. The figures used in this manuscript are from the operative pictures collection of the final author (IM), which have not been published previously. Informed consent was obtained from the patients to use their operative images for academic purposes, without revealing their identities.

RESULTS

Penile length loss after PP surgery: myth or truth?

Penile length loss is commonly seen in PD with or without surgical intervention and significantly affects the individual psychologically [14]. But penile length loss after PP surgery in cases other than PD is still debatable, as there are publications [8, 9, 11, 15, 16] to argue either way. Hence, the jury is still out.

Osterberg et al. [15], reported that 70% (14/20) of the patients who underwent inflatable PP had a median penile length reduction of 0.5 ± 1.5 cm, and this length loss was evident in 43% of the patients. The median post-operative inflated penile length ($13.5 \text{ cm} \pm 2.13$) was significantly less than the preoperative alprostadil-induced penile length ($14.25 \text{ cm} \pm 2$) and SPL ($15 \text{ cm} \pm 3$). Similarly, Wang et al. [16] followed up on 11 patients for 1 year and reported a reduction in penile length postoperatively as compared to preoperative full erections induced by trimix intracavernosal injection. Preoperative trimix-induced fully erect penile length was 13.2 ± 0.4 cm, whereas penile length post-PP implantation was 2.4 ± 0.3 cm, 12.5 ± 0.3 cm and 12.5 ± 0.4 cm at 6 weeks, 6 months and 1 year, respectively.

On the other hand, many authors [9, 10] have reported an increase in penile length following PP surgery. The preoperative SPL is a reliable tool to predict postoperative inflated penile length [11]. The various strategies to preserve or improve penile length in PP placement can be categorised into preoperative, intraoperative, and postoperative measures.

Preoperative strategies

Vacuum erection device (VED): Canguven et al. [17], conducted a randomised trial on the daily use of VED for a month before PP surgery involving 25 patients in the VED group and 26 in the non-VED group. The authors observed that patients in the VED group had gained 0.8 cm of SPL, relatively smoother corpora cavernosa dilatation (100% vs 69.2%), and less cavernotome usage (0 vs 15.4%) during PP surgery. Tsambarlis et al. [18] observed that all 13 men with corporal fibrosis (infection and priapism) who used VED for an average of 32.5 minutes daily, for a median duration of 3.5 months, underwent successful inflatable PP placement with standard-size cylinders without additional surgical manoeuvres.

However, despite these promising results, routine preoperative VED use is not yet standard practice in most centres, and more high-quality studies are needed to validate these findings.

Penile traction device (PTD): Levine and Rybak reported that 70% of the subjects in a small series of 10 patients had a penile length gain of up to 1.5 cm after using 2–4 months of FastSize® PTD (FastSize LLC, Aliso Viejo, CA, USA) for 2–4 h daily before inflatable PP surgery [19]. Moskovic et al. observed the importance of combination therapy (VED and PTD) before revision surgery in a post-PP patient with pre-existing inflatable PP and difficulty in penetration due to length concerns. Simultaneous use of VED for 12 months and FastSize® PTD for 8 months resulted in an upgradation in the size of inflatable PP (15–18 cm) and an increase in erect penile length by 4.4 cm [20].

Compliance with PTD protocol is a concern (as low as 31%) as many of these traction devices are bulky and have to be used for a longer duration (2–6 hours/day), which can be bothersome to many working individuals [21]. The newer PTD with shorter

application time (30–45 minutes/day), such as the RestoreX (PathRight Medical, Plymouth, MN, USA) developed by the researchers at Mayo Clinic [22], has shown improvements in penile length after RP but has not been studied before PP surgery.

The above studies [19, 20] have highlighted the role of pre-operative VED and PTD in preserving or improving penile length after PP surgery; however, this is not routinely practised in most centres for virgin PP surgical cases. Potentially difficult cases due to corporal fibrosis (infection, priapism, redo-surgery) may benefit from the use of VED and PTD before PP surgery. The availability of high-quality penile traction devices outside the USA and Europe remains limited, and they are not widely used.

High-volume surgeon: A high-volume surgeon performs 25 implants or more per year [23]. They also perform inflatable PP more often (88%) and have fewer complications [24]. Their meticulous technique and experience play a crucial role in selecting the correct-sized implants to preserve optimal penile size and minimise the need for revision surgeries [25, 26]. The first surgery is often the best opportunity for a patient to avoid long-term or irreversible complications.

A comparative analysis was conducted between a multiple-surgeon group (low-volume PP centre) comprising 57 patients and a single surgeon (high-volume centre of excellence) involving 57 patients. The high-volume surgeon implanted a median cylinder length of 2 cm more than the multiple-surgeon group. Hence, a high-volume surgeon is more confident in selecting the ideal implant size than undersizing an implant for fear of erosion [27].

Type of PP (Malleable vs Inflatable): Habous et al. [9] published the study outcomes from two high-volume centres in Middle-Eastern countries, where 66.2% underwent malleable PP, and the remaining 33.8% underwent inflatable PP. Significant increases in penile length (0.62 ± 0.72 cm vs 0.22 ± 0.53 cm) and girth (1.7 ± 1.0 cm vs 0.7 ± 0.87 cm) were noted in the inflatable PP group as compared to the malleable group.

The concept of the internal tissue expansion role of inflatable PP was published by Chung et al. [28], in a study that showed that 60% of patients had >0.5 cm and 40% had ≥ 1 cm increase in penile length after inflatable PP at ≥ 2 years. Moncada et al. [29], have noted that the internal tissue expansion/ intermittent stretching property of inflatable PP helps correct residual curvatures up to 45 degrees in PD by home modelling protocol, thereby leading to subjective improvements in penile length.

A single-centre, single-surgeon study [10] of 160 patients revealed that the brand and subtype of inflatable PP did not influence the postoperative penile length. The most commonly used PP were Titan (Coloplast, Minnesota, USA) ($n = 74$) and AMS 700 CX (Boston Scientific, Marlborough, MA, USA) ($n = 70$), followed by Infla10 (Rigicon, Ronkonkoma, NY, USA) ($n = 11$) and AMS LGX (Boston Scientific, Marlborough, MA, USA) ($n = 5$). The preoperative flaccid penile length and SPL were 5.24 cm and 8.62 cm, whereas the post-operative deflated and inflated penile lengths were 7.98 cm and 8.36 cm, respectively. Subtype analysis of various brands of PP did not reveal any significant difference in post-operative penile length [10].

Several studies [30, 31] have investigated the impact of the AMS 700 LGX prosthesis on penile length. Notably, a prospective study by Negro et al. [30] demonstrated a significant increase in SPL by 1.1 cm and fully inflated penile length by an average of 1.3 ± 0.4 cm by using AMS 700 LGX. Similarly, Kim et al. [31] conducted a study that revealed an average gain of 1.1 cm at 12 months postoperatively using AMS 700 LGX. These studies [30–32] prove that the AMS 700 LGX prosthesis [30, 31] or the newer Rigicon Infla10 AX [32] may preserve and potentially increase penile length post-implantation, contributing to improved patient satisfaction and outcomes. On the contrary, Wallen et al. [33] noted that only 23.1% of patients retained their



Fig. 1 Penoscrotal web. Excess scrotal skin extends onto the ventral side of the penis, creating a web-like appearance.

penile length despite using a length- and girth-expanding inflatable PP (AMS 700 LGX). Hence, choosing a device alone (a length- and girth-expansion device) is not sufficient for penile length preservation, and penile length preservation outcomes using length and girth expansion devices may not be universally reproducible [10, 33].

Timing of surgery: The AUA guidelines [34] state that the pros and cons of early vs delayed placement of PP in acute ischaemic priapism should be discussed for better long-term outcomes. Early PP placement is an option if an untreated patient with acute ischaemic priapism presents beyond 36 h. Zacharakis et al. [35] reported that early PP (median 7 days) in acute ischaemic priapism resulted in reduced infection rates (7% vs 19%), easy corporal dilatation leading to a reduction in erosion (0% vs 4%) and reduced incidence of penile shortening (3% vs 40%) as compared to delayed PP (median 5 months) insertion.

Placing a malleable PP in the acute setting and exchanging it for an inflatable one after 3–6 months is a viable option to reduce operative time and infection rates [36, 37].

Intraoperative strategies

Surgical technique related: The two most common approaches to place a PP are penoscrotal and infrapubic. Weinberg et al. [38] described a subcoronal approach using a modified no-touch technique to place inflatable PP in 200 men. The authors noted an improvement in mean penile length from preoperative 12.5 cm (range, 9–16.5 cm) to 13.1 cm (range, 9.1–17.2 cm) postoperatively. However, the reason for increased penile length with the subcoronal technique was not explicitly discussed.

Moncada et al. [39] suggested cavernous tissue-sparing corporal dilatation (group 1) during the implantation of inflatable PP (AMS 700 CX) to reduce the fibrotic tissue response when compared to

patients in whom routine corporal dilators (group 2) are used. The technique involved inserting Furlow proximally and distally only once, after corporotomy, to measure the corporal length without using any dilators. Group 1 had significantly less postoperative pain and improvement in penile length. The preoperative median penile length in group 1 was 8.9 cm (range 7–9.5 cm), and in group 2 was 9.2 cm (range 6–9.9 cm). Post-operative median penile length was significantly greater in group 1 (10.0 cm, range 9.5–12.5) compared to group 2 (8.0 cm, range 6.2–8.9) at 6 months.

A similar concept was studied by Zaazaa et al. [40] in 92 patients who underwent malleable PP. Arm 1 ($n = 46$) included the conventional corporal dilatation technique, and arm 2 ($n = 46$) included the cavernosal tissue-sparing technique. The authors reported significantly higher postoperative penile girth in arm 1 compared to arm 2 at 1 month (11.16 ± 1.1 cm vs 10.11 ± 1.15 cm).

A multicenter study [41] observed that patients who underwent sequential corporal dilatation had higher postoperative noninfectious complications (OR 5.23, with IQR 2.74–10, $P < 0.001$) compared to those who underwent single dilatation, thereby concluding that single corporal dilatation promotes device longevity without compromising cylinder length.

Scrotoplasty/ ventral phalloplasty/ scrotal Z-plasty: Miranda-Sousa et al. [42] conducted a comparative study between patients who underwent simultaneous ventral scrotoplasty (Group 1, $n = 43$) and those who did not (Group 2, $n = 37$). A significant number (83.7%) of men in group 1 were satisfied with the increased subjective penile length, while 83.8% of men in group 2 reported a shortening. The technique described was an inverted V-shaped incision. One arm of the V incision was parallel to the penile shaft, extending to the penile base, and the other arm of the V incision included the excess scrotal web to be excised. Care must be taken not to excise excess penile skin, as this can prevent its tension-free closure. The reservoir and pump were placed through the same incision. The wound was closed midline using absorbable braided polyglactin suture for deeper layers and absorbable monofilament polyglactin suture for skin closure, taking precautions to avoid dog-ear corners.

If a large redundant scrotal sac is bothering the patient, an inverted-Y scrotoplasty can be performed after the placement of the scrotal pump, followed by closure of the overlying skin, resulting in cephalad retraction of the redundant scrotum.

Patients with high scrotal insertion and ventral scrotal webbing (Fig. 1) may benefit from Z-plasty (Fig. 2) or ventral phalloscrotoplasty, which enhances cosmetic appearance by exposing more of the penile shaft [43, 44]. While these procedures do not increase actual penile length, they create the visual impression of a longer penis.

Gupta et al. [45] cautioned that diabetic patients who undergo scrotoplasty during PP surgery have a higher incidence (14.6%) of wound dehiscence between 6–10 days after the surgery.

Suspensory ligament release and suprapubic lipectomy: Many men with excess suprapubic fat (Fig. 3) have a buried penis or a relatively smaller-looking penis. Bariatric surgery is an option for obese patients to lose weight, but the suprapubic fat is the least likely to disappear after bariatric surgery [46].

Baumgarten et al. [47] described suprapubic dermo-lipectomy (Figs. 4, 5) during inflatable PP surgery in 8 obese men with near-buried penis and an average body mass index of 36.6. Seven patients had good functional and cosmetic outcomes at a mean follow-up of 256 days. The remaining 1 developed an infection requiring device explantation. The technique involved the placement of an elliptical incision starting from the anterior superior iliac spine (ASIS) on one side and ending at the ASIS on the other. The lower margin of the convex part of the incision was 1 cm above the penile base, and the upper margin was at the abdominal crease line. Entire full-thickness elliptical tissue involving skin and subcutaneous



Fig. 2 Z plasty. Z-shape incision with its longitudinal arm extending along the web and its two lateral limbs extending alongside the web is first made. Then, the simple closure of flaps is done.

tissue, including the fascia, is excised. If encountered, the superficial inferior epigastric vessels may be ligated, and the spermatic cords are carefully preserved. The suspensory ligament may be divided to gain extra penile length. After a thorough antibiotic wash of the wound, the PP was inserted through an infrapubic approach through the same wound.

Shaeer et al. [46] described suprapubic lipectomy during PP placement in 22 patients. The technique involved the removal of skin-fat tissue, similar to the early steps described by Baumgarten et al., followed by tacking the dermis of the penopubic junction to the pubic periosteum without dividing the suspensory ligament. The authors reported an average length gain of $3.72 \text{ cm} \pm 0.6$ from pubic skin to penile tip before and after suprapubic fat excision compared to SPL.

An Egyptian urology centre reported an increase in visible penile length of 2.5 cm [IQR 1–3.5] in patients who underwent simultaneous suspensory ligament release and pubic lipectomy via penopubic Z-plasty during malleable PP implantation [48]. Minimally invasive liposuction can be done instead of open lipectomy to enhance penile length. Ghanem et al. [49] reported a mean increase in the 3-month postoperative length by $1.1 \pm 0.35 \text{ cm}$ by removing mean suprapubic fat $495.5 \pm 155.3 \text{ cc}$ using a 3 mm and 6 mm liposuction cannula. However, simultaneous liposuction and PP placement outcomes have not been reported.

Tunica augmentation techniques: sliding technique, multiple slit technique (MUST), non-grafting tunical expansion procedure (TEP): Rolle et al. [50] first described the sliding



Fig. 3 Excess pubic fat.

technique during PP implantation in 3 men with short penis having PD and refractory ED. After neurovascular bundle elevation, two lateral tunical incisions were made on either side, followed by two semilunar tunical incisions joining the lateral incisions ventrally and dorsally. Gentle traction on the glans was applied to slide the distal part of the corpora cavernosa away from the proximal part to gain the extra penile length. The bridging defects in the tunica were then covered by two rectangular grafts, followed by placement of PP. The increase in penile length in these three patients was 2.5 cm, 3 cm, and 4 cm, with no major complications.

Egydio and Kuehhas [51] described a modification to Rolle's sliding technique [50]. They named it the Multiple-Slit Technique (MUST) in 138 patients who predominantly (74.6%) underwent malleable PP for severe ED and significant penile shortening with or without PD. The mean penile length gain was 3.1 cm (range 2–5 cm). One patient developed glans necrosis, requiring glans resurfacing using the urethra and a change of malleable PP to a smaller size. The technique (Fig. 6) comprised neurovascular bundle elevation, limited (1–2 cm) distal urethral mobilisation, and two lateral tunical incisions but only one semicircular incision ventrally (as against the two semicircular incisions in Rolle's sliding technique [50]). Dorsally, multiple small tunical defects were made rather than a full semicircle. Alprostadil was injected into the corpora spongiosum intraoperatively and placed intraurethral postoperatively to prevent glans ischaemia. Egydio [52], later in 2020, published a non-grafting tunical expansion procedure (TEP) in 416 patients who gained a mean penile length of 3.3 (2–6 cm) following PP surgery. The technique involved a subcoronal penile degloving incision, neurovascular bundle elevation, and placement of multiple tunical incisions, each 5–8 mm long with a 2–3 mm gap between incisions. Additionally, most (92.8%) patients underwent ventral glansopexy to prevent glans hypermobility. Haematoma (19.9%), temporary glans numbness (3.8%),



Fig. 4 Dermolipectomy before placement of penile prosthesis.

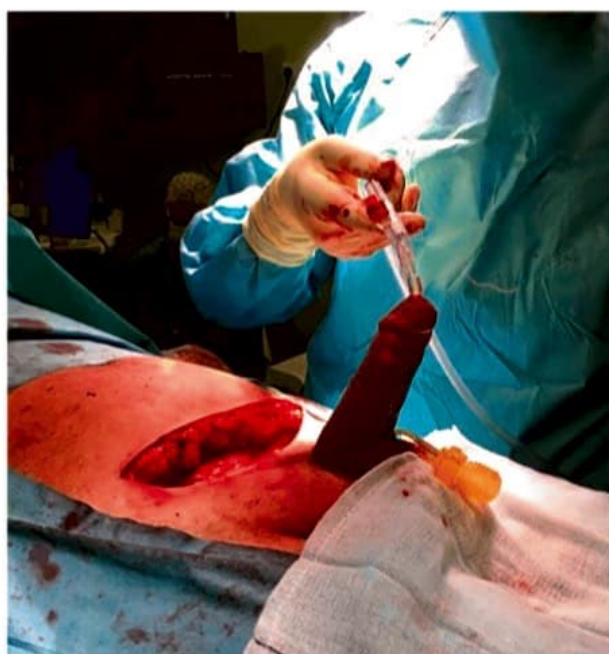


Fig. 5 Dermolipectomy and inflatable penile prosthesis.



Fig. 6 Multiple-Slit Technique (MUST) and inflatable penile prosthesis.

temporary anorgasmia (6.9%), and PP infection (0.24%) were the reported complications.

Recently, in 2024, Razdan et al. [53] described a scrotal approach in 32 patients to perform TEP by everting the penis completely and subsequently placing tunical incisions. Furlow measurements were done before and after penile eversion with

TEP, which revealed a gain in distal corporal length by 2.8 ± 0.8 cm (range 2.0–3.4 cm). This technique was proposed to be safe with no reported complications.

Simultaneous radical prostatectomy (RP) and penile prosthesis (PP): Vasconcelos et al. [54] described the natural history of penile length loss after open RP in 105 patients. The authors noted a 1 cm shortening of SPL by 12 months. Still, most patients recovered baseline length after 48 months and highlighted that the preserved erectile function after RP predicts early penile length recovery. However, this transient/ permanent penile length loss in the initial years can have a psychological impact on patients who are already dealing with the psychological burden of cancer.

Mulhall [55] described various mechanisms leading to penile length loss after RP, which included structural alterations in the penis due to cavernous nerve injury (apoptosis, fibrogenic cytokines production, collagenisation), cavernosal hypoxia-induced penile structural changes and sympathetic hyperinnervation (competitive sprouting). The loss of the prostatic urethra as the cause of penile length loss is refuted by some authors [56, 57].

Khoudary et al. [58] published their series of 50 cases of simultaneous open RP and PP surgery in 1997. There was no comment on the penile length before and after the surgery. There were no significant differences between the combination procedure and RP alone in terms of blood loss, hospital stay, or analgesic use. Most men who underwent combination procedures resumed intercourse in 12.7 weeks.

Mondaini et al. [59] evaluated 10 patients who underwent simultaneous PP surgery during laparoscopic RP. After the removal of the prostate specimen, the reservoir of inflatable PP was introduced through the same port and placed between the bladder and pubis in the extraperitoneal plane, followed by a penoscrotal approach for the placement of penile cylinders and scrotal pump. One patient required repositioning of the reservoir, and none had an infection during the follow-up. The preoperative mean penile length was 9 cm, which was preserved in the postoperative period up to 24 months. The level of sexual satisfaction of the couple was rated a median of 8 (range 7–10).

Moncada [60] presented a case series of 56 men at the World Meeting on Sexual Medicine in September 2024 in Rio de Janeiro, Brazil. Twenty-six men had undergone simultaneous inflatable PP & RP, and the remaining 30 had undergone inflatable PP 0.7–4.5 years after RP. A higher mean EDITS score and a higher mean European Organisation for Research and Treatment of Cancer (EORTC) Sexual Functioning subscale were reported in the simultaneous PP group. The penile size was statistically different in both groups, as the mean penile length (from base to tip) was 1.2 cm (± 0.4) longer in the simultaneous PP group.

Although the initial results of combined procedures are encouraging, studies with large patient numbers are required to substantiate the benefits of simultaneous PP surgery (along with RP) versus RP in terms of preserving penile length and minimising complications.

Post-operative strategies

Inflation protocol: Specific post-operative inflation protocols have increased penile length by 1 cm [60] and corrected residual curvatures of up to 45 degrees [29]. Wallen et al. [33] highlighted that even with the length and girth-expanding inflatable PP such as the AMS 700 LGX, only 23.1% of the patients could maintain the preoperative SPL. Hence, immediate postoperative inflation of the PP up to 60–80% for 6 weeks was recommended to preserve penile length.

Henry et al. [61] instructed patients postoperatively to inflate the PP daily for 1–2 h, starting from 6 weeks in 1st year. In the initial 6 months, inflation was advised to the point of some discomfort for a short period, and after 6 months, the pump was

Table 1. Various preoperative, intraoperative and postoperative strategies to preserve or improve penile length during penile prosthesis surgery.

Penile Prosthesis Surgery	Penile length preservation technique/ factors	Details	Author, Year	Increase in penile length
Preoperative	VED	Daily use for 1 month before surgery	Canguven 2017 [17]	0.8 cm
	PTD	2–4 months of FastSize® for 2–4 h daily	Levine 2011 [19]	Upto 1.5 cm
	Combined VED + PTD therapy	VED for 12 months and FastSize® PTD for 8 months	Moskovic 2011 [20]	4.4 cm
	High-volume surgeon	>25 implants / year	Henry 2009 [27]	2 cm
	Type of PP	Inflatable vs malleable	Habous 2019 [9]	0.62 ± 0.72 cm vs 0.22 ± 0.53 cm
	Model (subtype) of PP	AMS 700 LGX	Negro 2016 [30], Kim 2019 [31]	1.1–1.3 cm
Intraoperative	Timing of surgery in acute ischaemic priapism	Early (median 7 days) vs Delayed (median 5 months) PP	Zacharakis 2014 [35]	Reduced incidence of penile shortening in early PP group (3% vs 40%)
	Subcoronal approach	No-touch technique	Weinberg 2016 [38]	0.6 cm
	Cavernosal tissue sparing dilatation	No routine use of corporal dilators	Moncada 2010 [39]	Median 1.1 cm
	Scrotoplasty / ventral phalloplasty	Inverted V-shaped incision	Miranda-Sousa 2007 [42]	83.7% reported subjective increase in penile length
	Suspensory ligament release + Suprapubic lipectomy	Done via penopubic Z Plasty during malleable PP implantation.	Aboul Fotouh El Gharably M 2022 [48]	2.5 cm [IQR 1–3.5]
	Sliding technique	Two semicircular tunical incisions (dorsal and ventral) + sliding + grafting	Rolle 2012 [50]	2.5–4 cm
	MUST	Ventral semilunar tunical incision + Dorsal multiple small tunical incisions + sliding + No graft	Egydio and Kuehhas 2018 [51]	Mean 3.1 cm (range 2–5)
	TEP - subcoronal	Multiple horizontal 5–8 mm incisions along the shaft of the penis without urethral mobilization, no grafting	Egydio 2020 [52]	Mean 3.3 (2–6 cm)
	TEP- scrotal	Complete eversion of the penis through scrotal wound and staggered tunical incisions	Razdan 2024 [53]	2.8 ± 0.8 cm
	Simultaneous RP + Penile Prosthesis	[Simultaneous Inflatable PP & RP] vs [Inflatable PP after 0.7–4.5 years of RP]	Moncada 2024 [60]	1.2 ± 0.4 cm longer in simultaneous group.
Post-operative	Immediate postoperative inflation	Pump inflated at 60–80% for 6 weeks	Wallen 2019 [33]	NA
	Pump inflation protocol	Inflate the PP daily for 1–2 h, starting from 6 weeks for 1 year	Henry 2015 [61]	1.14 cm
	VED (without ring)	Pump cycling twice daily for 10–15 min for 1 year + VED 5 min twice daily with a fully inflated PP for 12 weeks	Antonini 2020 [62]	Median 3 cm

VED vacuum erection device, PTD penile traction device, PP penile prosthesis, MUST multiple-slit technique, TEP tunical expansion procedure, RP radical prostatectomy, NA not available.

inflated as hard as possible to the maximum tolerance. This resulted in an increase in penile length by 1.14 cm and penile circumference by $1.08 \text{ cm} \pm 0.82$ at 1 year due to the tissue-expanding property of inflatable PP.

Vacuum erection device (VED): Antonini et al. [62] reported significant improvements in penile length by post-operative VED (without the ring) usage in a study involving 74 patients who underwent AMS LGX 700 infrapubic inflatable PP placement. The postoperative protocol involved cycling the pump twice daily for 10–15 min, starting from a median of 8 days (range, 5–12) after surgery. VED without the constriction ring (Medis*, Vacuum Therapy Devices, Milan, Italy and Osbon ErecAid*, Vacuum Therapy System, Collierville, TN, USA) application was initiated 3 weeks after discharge for 5 minutes twice daily with a fully inflated PP for 12 weeks. At the 1-year follow-up, the median penile length and girth had significantly increased (17 cm and 11 cm) compared to the pre-operative SPL (14 cm and 9 cm).

Table 1 summarises all the various preoperative, intraoperative and postoperative factors that may preserve or increase the penile length during PP surgery.

Limitations

There is a risk of bias due to the narrative review format, and no statistical analysis was conducted. Many of these penile enhancement techniques during PP surgery have been done at high-volume centres by highly experienced implanters. A novice or a low-volume surgeon may not be able to reproduce the same results in his/her clinical practice. A realistic expectation of these outcomes should be explained in detail to all patients before attempting these length-enhancing or length-preservation procedures during PP surgery. Although the term penile enlargement looks fancy for many men, whether the 1–2 cm increase in penile length is really clinically significant and worth all the surgical risk is to be debated. The Westlaw legal database of PP surgeries performed between 1990 and 2013 revealed that the mean indemnity award was \$831,050 for verdicts favouring the plaintiff in medicolegal cases [63]. Some of these procedures can cause serious complications, such as glans necrosis, a dreaded complication leading to severely shortened fibrotic penis requiring a nephallus reconstruction using radial forearm flap [64]; therefore, learning these techniques at high-volume centres under supervision is preferable.

CONCLUSION

The penile length following PP surgery is a concern that many patients ask their surgeons these days, due to the widespread and easy availability of such information on the internet and social media platforms. Hence, surgeons should be familiar with various procedures that can preserve or increase penile length during penile prosthesis (PP) surgery. The gain in penile length ranges between 0.2 and 6.0 cm using various preoperative, intraoperative and postoperative strategies. The increase in penile length can be both subjective and objective, potentially leading to improvements in self-esteem and overall quality of life. The clinical significance and benefit of increased penile length remain debatable, and this should be discussed before embarking on these procedures.

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AUTHOR CONTRIBUTIONS

Study concept and design: PK, IM. Acquisition of data: PK, PM, AF-P, EL-G, IM. Analysis and interpretation of data: IM, PK, Zaccaro. Drafting of the manuscript: PK, IM. Critical revision of the manuscript for important intellectual content: PK, PM, AF-P, EL-G, IM. Statistical analysis: Not required. Approval of final version: PK, PM, AF-P, EL-G, IM.

COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

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