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Research Article

Infrapubic Approach for Inflatable Penile Prosthesis: Perioperative and Mid-Term Outcomes

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Abstract

Introduction: Erectile Dysfunction (ED) impacts nearly 150 million men worldwide and 3.5 million men in France. Inflatable Penile Prosthesis (IPP) placement is considered a third-line treatment after oral pharmacological treatments and intracavernous injections. This surgery is often performed through a penoscrotal approach due to the theoretical risk of nerve damage associated with infrapubic approach. However, the latter seems to allow faster activation of the prosthesis, with similar complication and satisfaction rates. The objective of this study was to evaluate the perioperative and mid-term outcomes following IPP implantation using the infrapubic approach.

Method: The medical datas of all patients who underwent infla penile implant placement via the infrapubic approach between 2010 and 2022 at two centers (one public and one private) were reviewed retrospectively. Preoperative data (etiology of erectile dysfunction, previous treatments) and intraoperative data (type of implant used, operative time, complications such as misplacement) were collected. Postoperative complications occurring within 30 days after implantation (infection, hematoma, pain) were also recorded. Device survival without explantation or reoperation was assessed from the date of implantation to the last follow-up visit, using the Kaplan-Meier method. Sexual function and satisfaction were assessed at the end of the follow-up period.

Results: We included 116 patients in the study. The median age was 63 years. The main ED etiologies were prostatectomy (44.8%, n= 52), vascular (20.7%, n= 24), and diabetes (16.4%, n=19). The median operative time was 75 minutes. The median follow-up time was 81.5 months. We observed a 3.4% (4 patients) device infection rate, with one early and three late infections. Eleven patients (9.5%) required late reoperation: three patients for migration, one patient for implant lengthening, one patient for implant dysfunction, and two patients for unknown reasons. Four patients (3.4%) required late device explantation : two for late infections, one for chronic pain and one for unknown reasons. The median Patient Global Improvement Index score at the end of follow-up was 2/7 (better). Thirty-one patients (26.7%) reported glans hypoesthesia.

Conclusion: The infrapubic approach is a reliable and reproducible technique. Comparative prospective studies could help clarify its causal link to glans hypoesthesia and guide surgeons in selecting the most appropriate surgical approach

INTRODUCTION

Erectile dysfunction currently affects 150 million men worldwide and 3.5 million men in [1]. Penile implant placement is currently considered a third-line option after failure of oral pharmacological treatments and intracavernous injections [2,3]. This procedure is increasingly common in many countries, with a growing number of new implants placed each year according to data from major manufacturers. This intervention is generally successful, with satisfaction rates ranging from 75% to 100% across various studies [4].

Since the first description of the use of a three-piece infla prosthesis by Scott et al. in 1973, several surgical approaches have been described [5]. While the suprapubic and perineal approaches are now considered historical techniques, the International Consultation on Sexual Medicine (ICSM) guidelines continue to include the infrapubic, penoscrotal, and subcoronal approaches [2]. Although the latter is anecdotal, the infrapubic and penoscrotal approaches are currently the most commonly used techniques [6].

The infrapubic technique for penile implant placement has been refined and simplified over the years since its description by Barrett and Furlow in 1985, evolving into a less invasive procedure [7,8]. Its main advantages over the penoscrotal approach include shorter operative time, direct visualization of the external inguinal orifice during

reservoir insertion, and faster IPP use by the patient due to reduced postoperative scrotal oedema. The disadvantages are a greater difficulty in pump placement, less optimal exposure of the corpora cavernosa, and a theoretically higher risk of sensory injury [6,7] given the proximity of the dorsal neurovascular bundle during dissection of the corpora cavernosa. However, patient satisfaction, infection rates, and sensory loss appear to be similar between the two techniques [6-9]. Although no study has shown the superiority of one approach over another, penile implant placement is more often performed through penoscrotal approach [2-10]. In North America, approximately one-third of penile implants are placed using the infrapubic approach [11]. In France, the penoscrotal approach is widely favored, except in the western regions. In a multicenter evaluation of practices conducted in 2007 using database from the group of IPP implanters from the French Urology Association, the penoscrotal approach was used in 96.8% of cases, while the infrapubic approach was used in only 3.2% [12].

The objective of this study was to evaluate our perioperative outcomes IPP placement using the infrapubic approach.

METHODS

Patients

We retrospectively collected data from patients who underwent infrapubic IPP placement in two centers (a university hospital and a private hospital) between 2010 and 2022. Preoperative data (etiology of erectile dysfunction, prior treatments) and intraoperative data (type of implant used, operative duration, complications such as misplacement) were collected. Immediate postoperative complications (infection, hematoma, pain) were assessed at one-month post-surgery. Patients were asked to complete self-assessment questionnaires (International Index of Erectile Function (IIEF) to evaluate erectile function and sexual satisfaction over the six months preceding the consultation). All patients were contacted by phone in 2022 and 2023 to gather information on their sexual activity, the ability to use the pump, and presence of glans dysesthesia. (The question were asked as follows "Do you feel that the glans has become less sensitive since the implantation of the prosthesis?"). Patients were asked to complete a Patient Global Improvement Index (PGII) score to subjectively evaluate symptom improvement.

Technique

Penile prosthesis implantation through infrapubic approach was performed as previously described by Perito [8]. The reservoir's placement (intraperitoneal or in the space of Retzius) was left to the surgeon's discretion. All patients underwent surgery under general anesthesia in the supine position. The use of a bladder catheter was left to surgeon's discretion. The procedure began with the creation of an artificial erection by injecting saline into the Corpora Cavernosa (CC) to reveal any curvature requiring correction and to facilitate dilation and identification of the dorsal neurovascular bundle. A 3 cm infrapubic skin incision was made, followed by a 1.5 cm incision on each CC. The proximal and distal portions of the CC were then dilated and measured using the Furlow insertion guide. The reservoir was positioned intraperitoneally via a counter-incision in the left iliac fossa or in the lateral vesical space through the superficial inguinal ring and the transversalis fascia. The cylinders were then inserted into the CC. The pump was placed in the lowest part of the scrotum through the creation of a dartos pouch. After completing hydraulic tests, the corporotomies and skin incisions were closed. Perioperative antibiotic prophylaxis was systematically administered. If a urethral catheter was placed during surgery, it was removed at the end of the procedure. Implant was activated 4 weeks after surgery.

Statistical Analysis

A descriptive analysis was conducted. Qualitative variables were described as counts and percentages. Device survival without explantation or reoperation was evaluated from the date of implantation to the last follow-up visit using the Kaplan-Meier method with R software.

RESULTS

Patients' characteristics

Out of 130 patient records for IPP placements since 2010 at our two centers, 116 were performed via the infrapubic approach. The median follow-up duration was 81.5 months. summarizes patients' characteristics and intra-operative datas.

The main ED etiologies were prostatectomy (44.8%, n= 52), vasculogenic (20.7%, n= 24), and diabetes (16.4%, n=19).

Intra-operative outcomes

One hundred and ten patients (94.8%) were operated under general anesthesia, while six patients (5.1%) were operated on spinal anesthesia. All patients received a three-piece infla implant. Two patients had an artificial urinary sphincter in place.

In our population, ninety-seven patients (83.6 %) had

their reservoir placed intraperitoneally, while nineteen patients (16.4%) had it placed subperitoneally, most of them in the last few years of data collection.

Ten patients required intraoperative modelling for penile curvature. The median operative time was 75 minutes. There were only two crossovers and in each case the corpora was re-dilated and the penile implant correctly inserted. No drains were left.

Early and late complications

Early and late complications are summarized in . Within 30 days postoperatively, eleven patients (9.5%) experienced complications. Of all complications, six patients (5.2%) developed hematomas, one of which required surgical drainage. Three patients (2.6%) experienced urinary tract infections with fever, while one patient (0.9%) reported pain requiring readmission. Additionally, one patient (0.9%) developed a surgical site infection due to colonic perforation during reservoir placement, requiring device explantation.

Eleven patients (9.5%) required revision surgery: three patients for migration, one patient for implant lengthening, one patient for implant mechanical dysfunction, and two patients for unknown reasons. Four patients (3.4%) required late device explantation : two for late- infections(>30 days after surgery), one for chronic pain and one for unknown reasons. Over the entire follow-up two patients had persistent penile chronic pain. One patient had a late device infection dad did not require device explantation. Over the follow-up period, we observed a 3.4% (4 patients) device infection rate.

Figures display the survival curves for prosthesis explantation-free and reoperation-free statuses, respectively. By the end of the follow-up period, the reoperation rate was 11.2%, while the device removal rate reached 4.3%.

Outcomes at end of follow-up

At the end of follow-up, several data points were missing as some patients could not be reached by phone or were not able to answer the questions. Due to the high volume of missing data, changes in the IIEF-5 score were not considered. 3 summarizes the outcomes observed at the end of follow-up and the number of missing datas.

Of all patients who completed the PGII score, fourty eight (70.1%) reported a major. improvement in their sexual life (PGII = 1 or 2), fifty-seven (84%) reported an improvement in their sexual life (PGII=1, 2 or 3). Eight patients (11.8%) reported no change in their sexual life. A worsened sexual life (PGII =5,6 or 7) was reported by only three patients (4.5%) following IPP implantation. The median PGII score at the end of follow-up was 2 (much improved). Sixty patients (51.7%) reported having regular sexual intercourse (with or without penetration). Glans hypoesthesia was reported by 31 patients (26.7%).

Additionally, 20 patients (17.2%) reported difficulties activating the pump, primarily due to lack of dexterity, insufficient understanding of the device, or retraction of the pump to the base of the scrotum. Finally, five patients (4.3%) went at another center by the end of follow-up, either due to relocation or for a second opinion.

DISCUSSION

IPP is the treatment of choice for erectile dysfunction (ED) resistant to pharmacological treatments. This surgery has been performed worldwide for nearly 40 years. While most surgeons are used to the penoscrotal approach, a significant proportion also use the infrapubic approach [9].

According to the existing literature, infrapubic approach is expected to shorten operative time by offering direct access to the corpora cavernosa, however we observed a median operative time of 75 minutes. This could be explained by the varying surgeon experience in our cohort, which included both high-volume and low-volume surgeons.[9] Furthermore, in ninety-seven patients, the reservoir was placed intra-peritoneally through a counter incision, which may increase operative time.

The device infection rate was 3.4%, with only one early case, in which a colonic perforation was discovered during reoperation, and two late device infections. Similar rates of prosthesis-related infections have been reported in recent literature when comparing the penoscrotal and infrapubic surgical approaches for IPP implantation [9,13,14].

Due to a high proportion of incomplete IIEF-5 questionnaires, we were unable to objectively assess changes in patients' sexual and erectile function during follow-up.

However, the median PGII score at 2/7 (much improved) at the end of follow-up highlights a marked improvement in patients' perceived symptoms over time. At the end of follow-up, only sixty patients reported to have regular sexual intercourse, although this figure may be underestimated since some patients were unreachable.

Notably, a significant number of patients reported difficulties in manipulating the pump at follow-up. While specific causes were not consistently identifiable, several cases of pump retraction at the scrotal base were

documented. Literature on the rate of pump retraction or malpositioning with the infrapubic approach is limited. The infrapubic approach may complicate the creation of an optimal intrascrotal pouch for pump placement compared to the penoscrotal approach which allows direct access to the scrotal pouch.[6]

Additionally, a high rate of glans hypoesthesia was observed. Glans sensitivity disorders have been inconsistently reported in the literature. To date, no comparative studies reported higher penile sensory loss for infra pubic IPP placement. While Candela have described similar rates of glans hypoesthesia between the infrapubic and penoscrotal approaches (23 vs 17%), Volstedt have reported no sensory loss following 6000 infrapubic IPP placement. [7-15] One hypothesis is that glans hypoesthesia may result from increased exposure of the neurovascular bundles during infrapubic access to the corpora cavernosa. Conversely, one could argue that IPP surgery-regardless of the approach-may induce glans hypoesthesia due to compression of the small nerves on the tunica albuginea.[16] Furthermore, the absence of glans tumescence during IPP activation, unlike with intracorporeal PGE1 injection, might be perceived by patients as glans hypoesthesia.Comparative studies incorporating accurate questionnaires on glans sensory disorders before and after IPP implantation could help determine whether the infrapubic approach is more likely to induce penile sensory loss than the penoscrotal approach.

In the immediate postoperative period, only one patient required rehospitalization for pain management, while two patients reported chronic pain. The infrapubic approach, which avoids Dartos layer dissection, may reduce postoperative pain in the external genitalia, potentially enabling earlier prosthesis activation. The delay before IPP activation is rarely reported in the literature, but infrapubic placement appears to allow for a shorter activation delay (four weeks) compared to penoscrotal placement. [13] In our centers, infra-pubic IPPs were typically activated 3 to 4 weeks after surgery, whereas peno-scrotal IPPs were activated after 6 weeks One patient in our study required implant removal due to persistent pain at six months. Chronic pain following IPP placement is a recognized complication but does not appear to be associated with a specific surgical approach. [17] To date, this study represents one of the largest cohorts of infrapubic penile prosthesis cases, features a long median follow-up, and includes patients treated across two centers. However, our study has several limitations, including heterogeneous surgeon experience, retrospective data collection, the absence of a control group, and missing datas at the end of follow-up. Nevertheless, our findings align with recent literature suggesting that the infrapubic approach is a reliable and reproducible technique with high patient satisfaction, although it may predispose to glans hypoesthesia.

High-volume surgeons appear to employ both approaches interchangeably, with specific patient profiles favoring one approach over the other [18]. Complex cases, such as patients with severe obesity, advanced Peyronie's disease, or fibrotic cavernosa, may necessitate a penoscrotal approach. [19,20] Both techniques likely yield comparable satisfaction outcomes, emphasizing the importance of tailoring the surgical approach to individual patient characteristics. Future studies focusing on specific patient profiles could help refine the selection of the most appropriate surgical approach based on a patient's medical history.

CONCLUSION

The infrapubic approach for IPP placement appears to be a reliable, reproductible, technique with good satisfaction rates. However, its causal link to glans hypoesthesia has yet to be established. The choice of approach should depend on the case's complexity as well as the preferences or experience of the implanting surgeon.

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