The Journal of Sexual Medicine, 2026, 23(10), qdag289
https://doi.org/10.1093/jsxmed/qdag289
Published: September 14, 2026
Brief Communication

Multicenter evaluation of smaller-diameter cylinders in primary inflatable penile prosthesis surgery

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Keywords diabetes mellitus, erectile dysfunction, penile prosthesis, postoperative complications, risk factors.

Inflatable penile prosthesis (IPP) implantation is an effective surgical treatment for men with refractory erectile dysfunction, providing reliable erectile function and high patient satisfaction. Successful implantation requires adequate corporal dilation to accommodate prosthetic cylinders.[1] However, corporal fibrosis resulting from diabetes mellitus, ischemic priapism, prior intracavernosal injections, pelvic surgery, or longstanding erectile dysfunction can limit corporal compliance and complicate implantation.[2] In these challenging cases, smaller-diameter cylinders, including the AMS 700 CXR (Boston Scientific, Marlborough, MA, USA) and Coloplast Narrow Base (Coloplast A/S, Humlebæk, Denmark) devices, are frequently utilized to facilitate implantation. Although these cylinders are well established in revision and salvage surgery, factors associated with their use during primary IPP implantation remain poorly characterized.

We performed a multicenter retrospective study of men undergoing primary IPP implantation at 16 high-volume prosthetic centers across the United States, Europe, and South Korea between July 2016 and July 2021. Patients undergoing revision, salvage, or malleable prosthesis implantation were excluded. The primary objective was to identify preoperative and intraoperative factors associated with smaller-diameter cylinder implantation.

Received: 29 June 2026. **Revised:** 24 August 2026. **Accepted:** 31 August 2026

Secondary analyses evaluated the association between smaller-diameter cylinder use and postoperative infectious and noninfectious complications.

Among 4389 men undergoing primary IPP implantation, 406 (9.3%) received smaller-diameter cylinders and 3983 received standard cylinders. The mean age of the cohort was 62.3 ± 10.3 years, while diabetes mellitus and hypertension were present in 34% and 49% of patients, respectively. Notably, among patients receiving smaller-diameter cylinders, two-thirds had corporal measurements exceeding 18 cm, suggesting that device selection was not solely determined by corporal length (Table S1). Smaller-diameter cylinder use was similar between the penoscrotal (170, 42.2%) and infrapubic (187, 46.4%) approaches, with lower use in the subcoronal approach (46, 11.4%); the difference was not statistically significant ($P = .543$). The mean follow-up duration was 16.19 ± 12.66 months for patients with regular-diameter cylinders and 14.03 ± 10.90 months for those with smaller-diameter cylinders.

Univariable analysis demonstrated that diabetes mellitus, history of priapism, corporal scarring, intraoperative distal perforation, intraoperative urethral injury, sequential dilation, postoperative noninfectious complications, and postoperative infection were associated with smaller-diameter cylinder utilization. Hypertension, coronary or peripheral vascular disease, and prior radical prostatectomy were associated with lower rates of narrow cylinder placement. In the first multivariable model evaluating predictors of smaller-diameter cylinder implantation, diabetes mellitus (OR 1.77, 95% CI 1.39-2.25, $P < .001$), corporal scarring (OR 3.70, 95% CI 2.87-4.77, $P < .001$), and sequential dilation (OR 3.42, 95% CI 2.63-4.45, $P < .001$) remained independently associated with narrow cylinder use. Hypertension (OR 0.60, 95% CI 0.47-0.78, $P < .001$) and prior radical prostatectomy (OR 0.63, 95% CI 0.44-0.89, $P = .008$) were independently associated with lower odds of narrow cylinder implantation (Supplementary Table S2).

To further characterize patients receiving smaller-diameter cylinders, a subgroup analysis compared men with corporal measurements ≤18 cm and >18 cm. Patients with longer corporal measurements were older and more likely to have hypertension and cardiovascular disease. However, corporal scarring remained common in both groups. While scarring was more prevalent among men with corporal measurements ≤18 cm, nearly half of men with corporal measurements >18 cm also demonstrated corporal scarring. These findings suggest that diminished corporal compliance, rather than corporal length alone, substantially influences the decision to use narrow cylinders. Sequential dilation and rear-tip extender utilization were also more common among patients with longer corporal measurements (Table S4).

A separate multivariable analysis evaluated postoperative outcomes. Approximately 11% of patients receiving smaller-diameter cylinders experienced non-infectious complications, including hematoma formation, wound complications, device malfunction, and cylinder-related abnormalities (Table S3). Of these patients, 18 (43%) required reoperation; including 14 revisions and 4 explants. Smaller-diameter cylinder implantation was independently associated with increased odds of postoperative non-infectious complications (OR 2.63, 95% CI 1.82-3.79, $P < .001$). In contrast, although postoperative infection was associated with smaller-diameter cylinder use on univariable analysis (OR 2.06, 95% CI 1.10-3.87, $P = .025$), this relationship did not remain significant after adjustment (OR 1.88, 95% CI 0.92-3.82, $P = .083$) (Table S2). There were 12 (3.0%) cases of postoperative infection among patients who received smaller-diameter cylinders; 5 underwent salvage surgery, while the remaining patients were managed conservatively.

Several important clinical observations emerge from these findings. First, diabetes mellitus appears to be a major driver of narrow cylinder utilization during primary IPP surgery. Chronic hyperglycemia contributes to microvascular dysfunction, tissue hypoxia, and progressive corporal fibrosis, resulting in reduced corporal compliance and increased technical difficulty during implantation.[3] These pathophysiologic changes likely explain the increased need for smaller-diameter cylinders among diabetic patients.

Second, sequential dilation was among the strongest predictors of smaller-diameter cylinder use. In our database, single dilation was defined as a single pass with either a dilator or Furlow passer, whereas sequential dilation indicated the need for multiple dilation passes. This association may reflect a higher prevalence or greater extent of corporal fibrosis or scarring in these patients, as sequential dilation may be required when the corporal space cannot be adequately prepared with a single dilation maneuver. In such situations, smaller-diameter cylinders may allow successful completion of implantation while minimizing the risk of corporal perforation, urethral injury, or excessive tissue trauma.[4]

Third, our findings suggest that narrow cylinder selection is not simply a function of penile size. A substantial proportion of men with corporal measurements exceeding 18 cm still required smaller-diameter cylinders and demonstrated evidence of corporal scarring. This observation highlights the importance of corporal compliance in prosthesis selection and suggests that surgeons should anticipate the potential need for narrow cylinders even in patients with adequate corporal length.

Finally, although smaller-diameter cylinder use was associated with increased non-infectious complications, this relationship likely reflects the complexity of the underlying pathology rather than a device-specific effect. Patients requiring narrow cylinders often present with more severe fibrosis and technically challenging anatomy, factors that inherently increase operative difficulty. Importantly, no independent increase in postoperative infection risk was observed, supporting the safety of these devices when used in appropriately selected patients.

This study is limited by its retrospective design, potential surgeon-selection bias, and the absence of a standardized grading system for corporal scarring. Additionally, patient-reported outcomes and long-term functional results were unavailable. Also, surgeon-specific data were removed during database aggregation and de-identification; therefore, surgeon-level practice patterns and their potential influence on smaller-diameter cylinder utilization could not be assessed. Nevertheless, the multicenter design and large sample size provide a comprehensive assessment of contemporary narrow-cylinder utilization during primary IPP implantation.

In conclusion, smaller-diameter cylinders are utilized in nearly one in ten primary IPP procedures and are independently associated with diabetes mellitus, corporal scarring, and sequential dilation. Their use is associated with increased non-infectious complications but not with postoperative infection after adjustment. These findings support the continued role of smaller-diameter cylinders as an important surgical option in technically challenging primary implant cases and may assist

surgeons in preoperative planning, inventory management, and patient counseling.

Funding

None declared.

Conflicts of interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: E.A.C., M.A.M.H., J.L., B.K.A., D.S., R.A., A.L.B., K.G., G.H., J.M.H., T.H., J.M.J., V.M., S.H.P., I.P., H.S.N., M.S., A.S., K.V.R., N.W., M.Z., D.W.B.—no disclosures; M.S.G.—consultant Coloplast; A.L.—speaker, consultant, preceptor for Boston Scientific and Coloplast; D.O.—consultant Coloplast, Intuitive Surgical, Fidelis; P.P.—consultant Coloplast. Boston Scientific, Urofill; J.S.—consultant Boston Scientific and Coloplast; F.A.Y.—consultant for Coloplast, Cynosure, Antares Pharma, Clarus Pharmaceuticals, Acerus Pharma; M.Z.—consultant Endo Pharma.

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