

## The Advancement of Pure Local Anesthesia for Penile Surgeries: Can an Outpatient Basis Be Sustainable?

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**ABSTRACT:** Although topical anesthetic blockage for penile surgeries has been substantially reported in the medical literature, its methodology, reliability, and reproducibility have not been consistent. We report on several methods of topical blocks for local anesthesia in patients with indications for penile surgeries. From March 1993 to March 2003, a total of 1131 men, ages 19 to 87, underwent penile surgeries in which 165, 203, 708, 45, and 10 patients received penile implantation, modified Nesbit procedure, venous surgery, venous patches, and arterial revascularization respectively, under pure local anesthesia on an outpatient basis. They were categorized into the implant, Nesbit, venous, patch, and arterial groups respectively. Proximal dorsal nerve blockage, peripenile infiltration, and topical injection, although challenging, were sufficient local anesthesia for patients in the last 4 patient groups. A new method of crural blockade, however, was also required for optimal anesthesia of the cavernous nerve for implantation purposes.

The anesthetic effects and postoperative results were satisfactory. Common immediate side effects included puncture of the corpus spongiosum or the deep dorsal vein as well as the innominate vessel, subcutaneous ecchymosis, transient palpitations, and acceptable low level of pain. There were no significant late complications. In the implant group, however, 6.1% of patients (10/165) had experienced pain over the perineum for 1 to 2 weeks postoperatively. Overall there were statistical differences in scoring between the 5 groups in which the implant group stood out when a visual analog scale of 100 mm was used. Topical nerve blockades proved to be reliable, simple, and safe, with minimal complications. They offer the advantages of less morbidity, reduced effects of anesthesia, protection of privacy, and a rapid return to preoperative daily activity.

**Key words:** Proximal dorsal nerve block, peripenile infiltration, crural block.

**J Androl 2007;28:200–205**

Over the past decade, many studies have reported on the use of nerve block as local anesthesia for a variety of penile surgeries (Rowan and Howley, 1967; Kirya and Werthmann, 1978; Brown et al, 1989; Stav et al, 1995; Leach, 1996; Dunn and Harris, 1997; Ghanem and Fouad, 2000). However, the most common anesthetic method used for penile surgeries is still general or spinal anesthesia. An intracavernosal immersion of local anesthetics, as well as an adjunct intravenous injection of sedatives, is usually unavoidable if local anesthesia is used. Based on the recently modified knowledge of anatomical architecture of the human penis (Hsu et al, 1992; Hsu et al, 1994; Hsu et al, 2004a), we have developed several methods for pure local anesthesia. We found that the proximal dorsal nerve block plus peripenile infiltration are sufficient for several types of penile surgeries, such as penile vascular surgery,

curvature correction including venous patch, circumcision, and partial penectomy (Hsu et al, 2003). A crural block, however, is mandatory when a standard penile implant is performed (Hsu et al, 2004b) in order to sufficiently numb the dilatation pain. These methods are different from those previously described in which an injection of local anesthetics into the sinusoids of the corpora cavernosa is required (Light and Scott, 1985). Although the results of these methods are positive, and the benefit to the patients is obvious, some surgeons question their ease of application. We therefore report data on these local anesthetic methods, in order for them to be easily reproducible by others.

### Materials and Methods

From March 1993 to March 2003, a total of 1131 patients received penile surgeries under local anesthesia on an outpatient basis after informed consent was obtained. Of these, 165 patients received penile implants, 203 underwent modified Nesbit procedure, 708 were treated with penile venous stripping surgeries, 45 received autologous venous patches to treat their penile Peyronie deformity, and 10 were operated with arterial

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Received for publication June 3, 2005; accepted for publication September 18, 2006.

DOI: 10.2164/jandrol.106.000679

revascularization. Accordingly, they were classified as the implant, Nesbit, venous, patch, and arterial group respectively. Their ages were from 19 to 87, with a mean of  $56.4 \pm 11.4$  years. Patients were excluded from participation in undergoing local anesthesia because of psychiatric disorder or drug addiction. The patient population included some Caucasians (15), although most patients were Chinese (Asians).

A method of proximal dorsal nerve block, peripenile injection, and topical infiltration of involved tissues whenever necessary was sufficient for all patients except those in the implant group. A newly developed method of crural block, however, was required in addition for patients in the implant group in order to sufficiently anesthetize the cavernous nerve. These patients were, therefore, further stratified into crural-block and crural-sparing categories. All patients in the study were monitored with an anesthetist in attendance during surgery. Overall, only 3 patients in the implant group required 1–2 mg midazolam intravenously for an additional sedation for completion of the surgery.

*Anesthesia I: Proximal Dorsal Nerve Block and Peripenile Infiltration*

A 23 G × 1 1/4 in (3.18 cm) disposable needle connected to a 10-mL syringe was used to inject a local anesthetic of a 0.8% 50-mL lidocaine solution (400 mg total dose) prepared in an aseptic steel bowl which was prefilled with 0.1 mL of a 1:200 000 epinephrine solution. The needle, with its bevel parallel to the direction of the body axis, was inserted in between the suspensory ligament along the pubic angle, with 2

fingers holding the penile shaft (Figure 1A) away from the body axis. The solution was injected in 3 directions to cover the bilateral proximal dorsal nerves (Hsu et al, 2003). Peripenile infiltration (Figure 1B) was subsequently made with finger-guided manipulation. Ventral infiltration was performed, including a meticulous injection in the junction between the corpus spongiosum and the corpora cavernosa. The injection had to be sufficiently encircled in order to cover the entire penile shaft, precisely layer-oriented in order to be effective, and the extent proximal enough to cover the involved tissues superficial to the tunica albuginea, which is required for each procedure. Aspiration was performed immediately before any attempt at injection, so that inadvertent entry of a vessel can be avoided.

*Anesthesia II: Crural Block and Ventral Infiltration*

In the implant group, the patient was put in a supine position. By using a 23 G × 1 1/4 in (3.18 cm) disposable needle, the anesthetic solution was injected in 3 directions to cover the proximal dorsal nerve bilaterally, in the manner described in “Anesthesia I.” The penile shaft was then placed in a pendulous position while the needle was punctured into the skin at the intersection of the penopubic fold and 1 finger-breadth laterally (Hsu et al, 2004b) and then pushed downward along the pubic angle until the medial third penile crus was targeted. The needle should be withdrawn slightly upward before the local anesthetic solution is delivered to avoid inadvertent puncture into the corpus. A bloody aspiration denotes that the corpus spongiosum is entered.

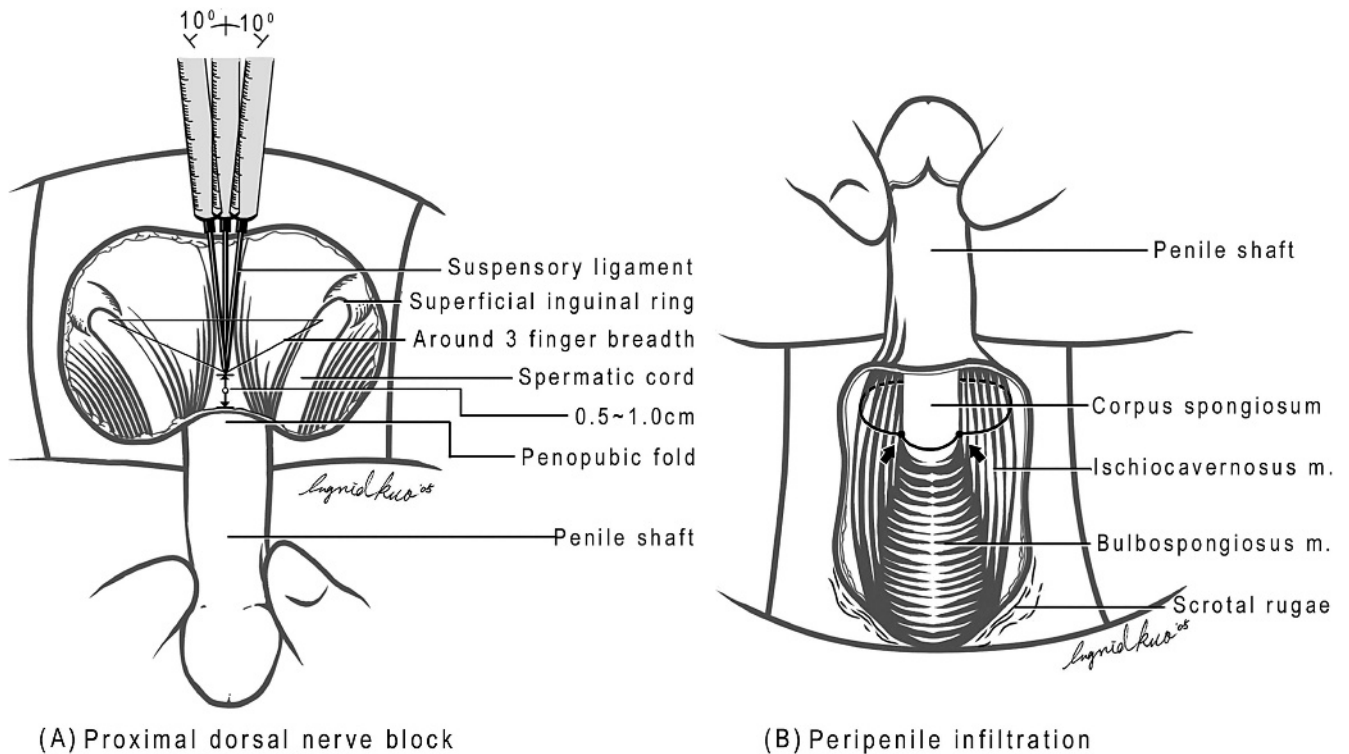


Figure 1. Illustration of Anesthesia I.

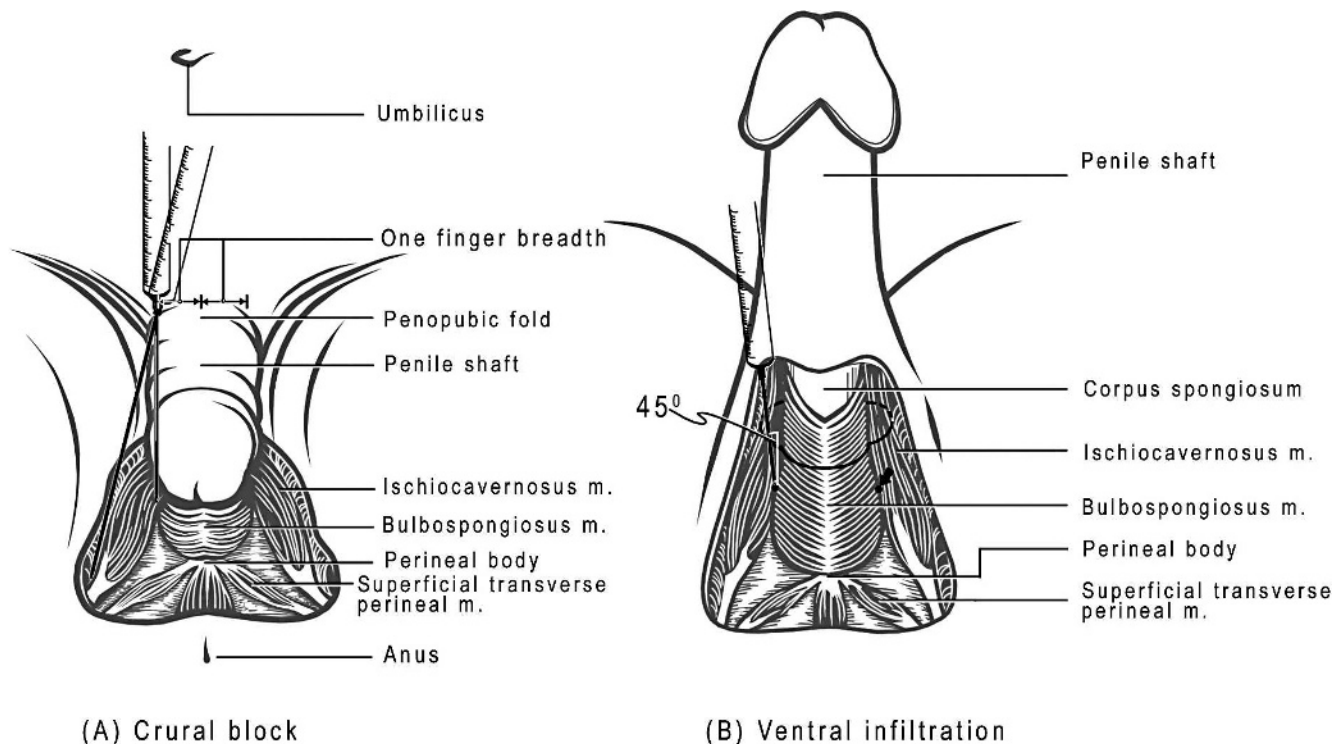


Figure 2. Illustration of Anesthesia II.

An experienced hand can feel if an inadvertent puncture through the tunica has been made, since the bony-like tunica (Hsu et al, 2005) can act as a barrier in providing an intermediate resistance. An injection of a 2–3-mL solution is sufficient to block the nervous fiber of the cavernous nerve. Under a finger guide, the needle is withdrawn sufficiently to free the engagement from being entrapped in the penile hilum. The needle is then advanced to the lateral margin down to the ischial tuberosity. A slow and even delivery of the local anesthetic is made while the needle is withdrawn superficially until the subcutaneous space is met. A similar manipulation of the contralateral side is made.

The penile shaft is then stretched upward in order to expose the ventral aspect along with the penoscrotal junction. The needle was targeted 45° oblique to the coronal plane at the junction of the corpus spongiosum and the penile crus. It is advanced in order to block the cavernous nerve. Thus, dorsally and ventrally there are 2 opportunities to perform the blockage of the cavernous nerve.

The patient's pain level was assessed with a 100-mm visual analog scale (VAS; Duncan et al, 1989) at 2, 4, 8, 12, and 24 hours postoperatively. A postanesthesia questionnaire was given, and the answers were recorded.

Cefamezine (1000 mg) and gentamycin (80 mg) were routinely used intravenously and intramuscularly 30 minutes prior to surgery, respectively, as prophylactic agents preoperatively. Pethidine 50 mg was given intramuscularly in patients who experienced a noticeable anxiety resulting from skin preparation. Oral cefadroxil monohydrate 500 mg twice daily and acetaminophen 500 mg 4 times per day were prescribed for

5 days, and oral diclofenac 50 mg was taken daily or twice daily, depending on the perception of pain. Patients were instructed to apply a clenched fist to compress the wound in the pubic region when sneezing or coughing. Daily physical activity, however, was not limited.

Comparison of the costs was made between these procedures and the same surgeries performed under traditional spinal or general anesthesia. The cost analysis took into account the surgery fee, nursing fee, related material costs, 2 days' inpatient hospitalization cost, and the anesthesiologist fee for spinal anesthesia. Operation time (in minutes) was counted from the start of the first injection of the local anesthetics to the last skin closure suture. Univariate comparisons were made using the Student's *t* test for parameters with continuous values and the chi-square test and Yates correction for continuity with discontinuous parameters. Significance was established at the level of *P* less than .05.

## Results

The Table summarizes the general data of the 1131 patients. Lidocaine dosage used ranged from 245 mg to 400 mg, with an average of  $274.3 \pm 28.7$  mg. Statistical significance ( $P < .05$ ) between the groups was found in both the arterial and patch groups. Time for adequate anesthesia provided by local anesthetic injection varied between 135 and 285 minutes. There was a tendency for shorter adequate anesthetic time in the Nesbit and patch

## Summary of 1131 patients who underwent penile surgeries in recent decade

Groups	Patients		Lidocaine Dosage, mg	Puncture of Vessel No. / %	Transient Palpitation No. / %	Booster Injection No. / %	VAS Score, mm	Cost Saving (%) <sup>*</sup>	Operation Time, min / Infection Rate No. (%)
	No.	Age, y							
Crural-block group: implant	165	67.0±9.9	277.1±23.5	23 / 13.9	9 / 5.5	25 / 15.2	21.5±11.3	45.3	91.2±31.6 / 3 (1.8)
Crural-sparin group: Nesbit	203	47.6±14.0	296.3±30.6	30 / 14.8	12 / 5.9	35 / 17.2	18.6±9.1	53.1	87.7±30.8 / 2 (1.0)
Venous	708	56.9±10.8	261.8±12.2	95 / 13.4	19 / 2.7	64 / 9.0	17.7±8.7	48.3	165.5±22.3 / 2 (0.3)
Patch	45	53.2±15.2	337.1±31.0	6 / 13.3	3 / 6.7	18 / 40.0	18.9±6.3	35.0	203.8±32.2 / 1 (2.2)
Arterial	10	38.3±9.1	385.9±9.0	2 / 20.0	1 / 10.0	8 / 80.0	18.4±3.7	41.4	287.7±41.3 / 0 (0.0)
Total	1131	56.4±11.4	274.3±28.7	156 / 13.8	44 / 3.9	150 / 13.3			8 / (0.7)
<i>P</i> value <sup>†</sup>			<.001	.965	.092	<.001	<.05		

\* This is the percentage of cost saving where comparison of the costs is made between these procedures vs the same surgeries performed under spinal or general anesthesia. The cost analysis took into account the surgery fee, nursing fee, related material costs, 2 days' inpatient hospitalization cost, and the anesthesiologist fee for spinal anesthesia.

† Univariate comparisons were performed using the Student's *t* test for parameters with continuous values and chi-square test and Yates correction for continuity with discontinuous parameters as necessary.

groups. This could be due to the washing out of the local anesthetic agents from repeated infusion of normal saline for achievement of artificial erection. In the implant group, the VAS score ranged between 13 and 57 mm, with an average of  $21.5 \pm 11.3$  mm that was significantly higher ( $P < .05$ ) than other groups.

The following side effects were observed: puncture of the vessels in 156 (13.8%) patients, of which 43.6% (68) likely involved the corpus spongiosum and 26.3% (41) the deep dorsal vein; transient palpitation in 44 (3.9%) patients; subcutaneous ecchymosis in 105 (9.3%) patients; and intraoperative pain in 150 (13.3%) cases requiring booster injection. The opportunity of requiring booster anesthesia appeared to be of substantial significance in the arterial and patch group, in which a longer operation time was required. The operation time (in minutes) was  $91.2 \pm 31.6$  for the implant group,  $87.7 \pm 30.8$  for the Nesbit group,  $165.5 \pm 22.3$  for the venous group,  $203.8 \pm 32.2$  for the patch group, and  $287.7 \pm 41.3$  for the arterial group. In the venous group, 1 patient was reoperated for evacuation of hematoma. In the implant group, 1 patient had documented infection and 3 patients sustained prosthesis extrusion. Overall, 5 cases contracted infection that could have occurred regardless of the method of anesthesia. We did not find a significant relationship between prolonged operation time and local anesthesia in this study.

A total of 121 (10.7%) patients required 1 dose of 50 mg pethidine intramuscularly and 3 patients in the implant group required 1–2 mg midazolam intravenously for completion of the surgery. All patients with family members in waiting could be released to their families immediately postoperatively; 488 (43.1%) patients came alone for their surgeries. In the crural-block

(implant) group, 2 patients who had to be hospitalized were unable to resume their work until the 11th and 13th postoperative days, respectively. All 1131 subjects successfully underwent their surgeries under local anesthesia; 3 patients, however, were hospitalized because of their surgical course. Overall, 1128 patients (99.7%) could follow the outpatient proposal, and 1119 men (98.9%) felt that this treatment modality was a worthy one to recommend to their friends. Estimated cost savings reported in percentages were 45.3%, 53.1%, 48.3%, 35.0%, and 41.4% for the implant, Nesbit, venous, patch, and arterial groups respectively. Long-term follow-up of the study patients revealed 2 patients in the venous group who died of cardiac attack and hepatoma 5 and 7 years respectively after venous surgery.

## Discussion

Some physicians may doubt the feasibility of local anesthesia for certain types of penile surgeries, particularly penile implantation, as well as a venous grafting when a spongiosis, separation of the corpus spongiosum from the corpora cavernosa, is necessary, since they appear to be the most difficult ones. In reality, however, the method of proximal dorsal nerve block plus peripenile infiltration is feasible although challenging. Crural blockade for penile implant seems to be an innovative type of local anesthesia. In our experience, good knowledge of the penile anatomical architecture is required for optimal application of local anesthesia. Recent studies have reported additional knowledge about human penile anatomy, which will benefit the surgeon in recognizing the landmarks within the penis.

This includes the tunica albuginea (Hsu et al, 1992; Hsu et al, 1994), the exact position and relationship between the skeletal muscle and smooth muscles (Hsu et al, 2004a), and the upper border as well as the lower margin of the symphysis pubis and the ischial tuberosity. In actual practice, finger-guided manipulation, using the index finger of the assistant's hand, is helpful in order to confirm the exact position of the injection throughout the anesthetic procedure, as the tissue is palpable because of the paucity of adipose tissue and the nature of the layered penile tissue. This, in turn, enables these techniques to be easily endured. Both techniques, of course, require a learning curve.

The bevel of the injection needle is preferably aimed parallel to the long axis of the body in order to avoid the possibility of needle severance of a nerve in surgeries where the goal is aimed at reconstruction, such as venous arterial reconstruction and patch surgery. This concern is not relevant if the surgery is intended for penile implantation. Needle puncture in a single site for peripenile injection is recommended in order to avoid unnecessary pain from more punctures.

We generally use lidocaine as a local anesthetic, as advocated for retention in the corpora cavernosa (Light and Scott, 1985). However, we caution against needle puncture of the sinusoid through the tunica, particularly if an implant is in situ and a booster injection is necessary when the patient registers some pain intraoperatively. Likewise, this avoids the possible complications of headache, dizziness, palpitations, nausea, and vomiting that result from epinephrine because of an overwhelming drainage of the corpora cavernosa. While application of bupivacaine, which is more durable than lidocaine, might be advocated, its potential toxicity of depressing cardiac contractility cardiac arrest, as well as central nervous system toxicity including convulsion and even coma, prevented us from using it (Covino, 1987).

It is generally agreed that adrenaline is contraindicated for use as a local anesthetic (Auletta and Grekia, 1985; Scott, 1989). However, there is a paucity of possible ischemic complications in our series. Under careful manipulation, this drug is beneficial for prolonging the anesthesia time up to 5 hours (Bernards and Kopacz, 1999). We believe that postoperative ischemia of the human penis should be ascribed to iatrogenic damage (Berens and Pontus, 1990), which may be due to electrocautery and not to the drug. We use neither Bovie nor a suction apparatus in our penile surgeries due to concern over possible resulting trauma. It is generally agreed that excessive application of electrocoagulation current can produce tissue destruction extending far beyond the actual treatment site. As a result, slow healing and tissue necrosis can lead to an unsightly or hypertrophic scar. The postoperative infection that may

result through the usage of electrocautery is one of the major concerns in any type of penile surgery. This is why we consistently recommend careful ligation of any bleeders rather than applying a Bovie (Hsu et al, 2004c).

Painful injection may be expected, but in reality a slow injection as well as a quick puncture through the skin is acceptable (Serour et al, 1998). Creating a wheal as a result of a subcutaneous injection should be avoided; otherwise, intolerable injection pain might scare the patient (Arndt et al, 1983). The penile microarchitecture is a prerequisite knowledge for the surgeon in order to have optimal application of the injection technique. Otherwise, an arbitrary application of local anesthetic not only wastes the drug but also results in ineffective anesthesia (Hsu, 1999).

It is difficult to sustain a purely local anesthesia in a certain percentage of patients undergoing penile surgery. Not surprisingly, in this study 121 (10.7%) patients required 1 dose of 50 mg pethidine each. Interestingly it was inadvertently found that acupuncture of the acupoints Hegu (LI.4), Neiguan (Pe.6), and Quchi (LI.11) (Stux et al, 1987) was able to ease the intolerable pain of a patient intraoperatively in Nesbit group in 2002. We subsequently began to introduce successfully the acupuncture technique to replace the necessity of pethidine injection for any type of penile surgeries in 2003. Further scientific study is required to clarify whether acupuncture is suitable for this kind of clinical application. Likewise, some may question whether the local anesthesia is achievable in patients with different culture traits. It is difficult for us to draw a conclusion based on inferential statistics because we only had 15 Caucasian patients in this study, although their courses were uneventful. Further scientific study would be interesting.

Local anesthesia on an outpatient basis for penile surgeries is promising. Estimated financial benefit to the patient is significant, since savings in medical expenditure of at least 35% were observed for our patients at our institution. The method of a penile proximal dorsal block associated with peripenile infiltration, as well as crural block, proved to be a reliable, simple, and safe method with minimal complications. It offers the advantages of less morbidity, increased privacy due to no hospitalization, reduced adverse effects of anesthesia, and a rapid return to activity with minimal complications. Further scientific research study on this subject should be interesting.

## **Acknowledgment**

We would like to thank Dr E. F. Einhorn, our sagacious editor, for his continuous help.

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