



Multimodal pain management strategies in penile implant recipients

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Abstract: Penile prosthesis insertion can cause significant pain and discomfort. Traditional methods of pain control using narcotics alone have been shown to contribute to drug abuse and/or potential lethal overdose. Multimodal therapies are often used to reduce both pain and narcotic usage following surgery but until recently have been poorly characterized in prosthetic urology. Common medications used as part of an enhanced recovery after surgery are discussed. A prior novel investigation on multimodal therapy that spans the entire peri-operative and post-operative recovery period following penile implantation is also reviewed. Additionally, techniques for performing penile blocks are described with video demonstration of pudendal and penile nerve blocks.

Keywords: Penile prosthesis; pain management; multimodal analgesia

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Introduction

Penile surgeries, especially the insertion of a penile prosthesis can be associated with exquisite peri-operative discomfort and pain. Most commonly, opioids were used and prescribed to alleviate perioperative pain. However, narcotics have a well-demonstrated addictive potential and can lead to undesirable side effects such as constipation, drowsiness and urinary retention. Many contend that the recent opioid crisis in the United States has been fueled in part by the over-prescription of narcotics by medical professionals (1,2).

It is well recognized that there are multiple different pathways for the treatment of pain and multimodal analgesic (MMA) protocols have been suggested to alleviate pain and discomfort for a variety of surgical procedures (3). Although MMA protocols have been discussed elsewhere, there remains a paucity of data regarding its effect on pain reduction in urologic surgery recipients. In fact,

MMA protocols have most clearly been assessed in radical cystectomy recipients but the focus of these investigations often centers on hospital length of stay and not pain reduction (4-12). As such, aside from opioids, other classes of medications such as non-steroid anti-inflammatory (NSAIDs), acetaminophen and gabapentinoids are often used as a part of MMA/enhanced recovery after surgery (ERAS) protocols. Additionally, as it relates to genital procedures, various types of penile blocks have been suggested used as well.

At our institution, a novel multi-modal analgesic protocol was developed (*Figure 1*) and utilized in penile implant recipients demonstrating dramatic reduction in pain following surgery. This multi-agent protocol spans the entire surgical time period, including the pre-, intra- and postoperative period. The results were published previously (13) and a multi-institutional study utilizing the same MMA protocol and rigorously assessing pain reduction is currently underway. A thorough review of

Acetaminophen 975 mg Gabapentin 300 mg Meloxicam 7.5 or 15 mg	Holding Area
Pudendal nerve block (10 cc 0.5% Bupivacaine + 10 cc 1% Lidocaine) Dorsal penile nerve block (10 cc 0.5% Bupivacaine + 10 cc 1% Lidocaine)	Intraoperative
Acetaminophen 975 mg q6h Gabapentin 300 mg TID Meloxicam 15 mg daily Oxycodone 5 mg q4h prn moderate pain Morphine 2 mg q2h or Hydromorphone 1mg q3h prn severe pain)	Postoperative
Acetaminophen 975 mg q6h Gabapentin 300 mg TID Meloxicam 15 mg daily Oxycodone 5 mg q4h prn moderate pain	Discharge

Figure 1 Multi-modal analgesic protocol at our institution. TID, three times a day.

the various agents utilized for pain reduction with penile implant recipients is discussed in this review with a focus on the recently described novel MMA protocol.

Basic principles and recommendations

MMA protocols involve various medications that target the various different components of the pain pathway and work synergistically to treat acute pain and maximize patient comfort (14,15). The following describes the basic description/information of medications commonly used as part of the ERAS/MMA pain management strategies. Some of these medications are administered preoperatively for preemptive oral analgesia with the aim to decrease production of inflammatory mediators that could sensitize nociceptors.

Commonly utilized medications

Non-steroidal anti-inflammatory drugs

NSAIDs act as potent inhibitors of prostaglandin and cyclooxygenase (COX) synthesis (16). Some examples

of commonly used NSAIDs are ibuprofen, meloxicam and toradol. This class of medications, however, can be associated with adverse effects such as renal impairment and gastrointestinal ulcers (17,18). Regardless, meta-analyses have demonstrated the utilization of NSAIDs in patients with pre-existing normal renal function to not cause future renal impairment (18). As such, NSAIDs should be used with caution in those with pre-existing kidney impairment or gastrointestinal ulcers. In the recently described novel MMA protocol for penile implant patients, patients received either 7.5 or 15 mg oral meloxicam prior to induction of anesthesia and continued on meloxicam 7.5 or 15 mg daily postoperatively (13).

Acetaminophen

While the exact mechanism of acetaminophen remains under investigation, it has been shown to selectively inhibit COX activities in the brain and thus reduce pain (19). Notably, it carries a risk of hepatotoxicity and should be used with caution in those with liver disease (20). Acetaminophen comes in both intravenous and oral formulations. As part of our MMA protocol, patients received 975 mg of oral acetaminophen prior to induction of anesthesia and continued to receive acetaminophen 975 mg 4 times a day post-operatively (13).

Gabapentinoids

Gabapentin is a gabapentinoids that modulates GABA receptors centrally to modulate nociceptors in the spinal cord and brain (21,22). In our protocol, patients received 300 mg oral gabapentin prior to induction of anesthesia. Post-operatively, patients received 300 mg oral gabapentin 3 times a day around the clock (13).

Opioids

Narcotic medications are probably one of the most commonly used medications for peri-operative pain control. Opioids relieve pain by acting as an agonist on μ , κ and/or δ receptors (23,24). As part of our protocol, patients received no narcotics pre-operatively. Post-operatively, oxycodone was prescribed 5 mg every 4 hours as needed for moderate pain. Additionally, patients were prescribed morphine 2 mg every 2 hours as needed for severe pain (13).

Many local anesthetics had also been incorporated into MMA protocols to reduce post-operative pain/discomfort. Commonly used anesthetic agents and penile nerve blocks are described below.



Figure 2 Multimodal analgesic for andrology procedures (32). Available online: <http://www.asvide.com/watch/32927>

Local anesthetics

Anesthetic agents

Lidocaine and bupivacaine are two of the commonly used anesthetic agents for penile blocks. Lidocaine works by prolonging the inactivation of the fast voltage-gated Na^+ channels in the neuronal cell membrane (25). It has a shorter onset of action that aims to provide immediate pain relief. Similar to lidocaine, bupivacaine also works on voltage-gated sodium channels and blocks sodium influx into nerve cells; it can achieve up to 3 hours of action and perhaps prevent pain sensitization. Previous studies have shown local penile blocks utilizing lidocaine alone or in combination with bupivacaine to reduce pain from penile prosthesis placement (26-30).

Penile blocks

Dorsal penile nerve block

The dorsal penile nerve is a branch of the pudendal nerve and provides sensation to penile skin. It courses just lateral to the deep dorsal arteries and vein within Buck's fascia. A dorsal penile nerve block has shown to reduce immediate post-operative pain for those undergoing penile surgeries (31). It is performed by inserting the needle in between the base of the penis and suspensory ligament. Additionally, locals were injected at the 2- and 10-o'clock position for right and left dorsal penile nerves. Intraoperatively, prior to incision, an 18 gauge $\times 1.25$ in (3.18 cm) needle connected to a 20-cc syringe was used to inject a 20-cc local anesthetic of 50/50 mixture of 1% lidocaine and 0.5% bupivacaine without epinephrine. The technique is demonstrated in *Figure 2*.

Pudendal nerve block

The pudendal nerve originates in the S2–S4 nerve root

and exits through the greater sciatic foramina. It then crosses the posterior aspect of the sacrospinous ligament at the level of the ischial spine, re-enters the pelvis through the lesser sciatic foramina, and courses through Alcock's canal. Pudendal nerve blocks have been shown to reduce postoperative pain urologic surgeries such as urethroplasty and penile prosthesis placement (28,33). For our protocol, intraoperatively, prior to incision, an 18 gauge $\times 1.25$ in (3.18 cm) needle connected to a 20-cc syringe was used to inject a 20-cc local anesthetic of 50/50 mixture of 1% lidocaine and 0.5% bupivacaine without epinephrine into the Alcock's canal. The penile nerve distribution of the pudendal nerve was targeted. This technique is also demonstrated in *Figure 2*.

Crural nerve block

Cavernous nerves are post-ganglionic parasympathetic nerves that arise from cell bodies in the inferior hypogastric plexus where they receive the pre-ganglionic pelvic splanchnic nerves (S2–S4). A block targeting this nerve was described by Hsu and colleagues as inserting a needle at a 45-degree angle oblique to the coronal plane approximately 1.5 fingerbreadths below the penoscrotal junction. When used in combination with a penile dorsal nerve block, they reported similar pain control when compared to pudendal block alone (30).

Ring block

This block was initially developed to reduce pain from circumcision, however, it has been shown previously to be adequate for pain control in a cohort of 159 patients of patient who underwent penile prosthesis (27). It is performed by injection of local agents in the infrapubic space followed by subcutaneous penile ring infiltration at the base of the penile shaft.

Conclusions

Penile prosthesis insertion is associated with significant perioperative pain and discomfort. Adequate pain control will not only alleviate patient discomfort but also aide in patient satisfaction and potentially device success. MMA protocols involving different drugs targeting various pain pathways have been shown to be effective in not only decreasing narcotics usage but also providing excellent pain reduction in the recovery period.

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