Seminars in Colon and Rectal Surgery 30 (2019) 100701

Contents lists available at ScienceDirect

Seminars in Colon and Rectal Surgery

journal homepage: www.elsevier.com/locate/yscrs

Multimodality post proctologic surgery pain control

Afshin Iranpour, MD*, Ramakrishna Boddapati, MD

Department of Anesthesiology, Al Zahra Hospital Dubai, Dubai, United Arab Emirates

ARTICLE INFO

Keywords:
Multimodal pain control strategy
Preemptive analgesia
Postoperative pain
Acute pain management
Anorectal surgery
Proctologic surgery

ABSTRACT

A multimodal analgesia strategy is achievable and safe in patients undergoing proctologic surgery and it reduces the need for opioids use postoperatively. Pre-emptive preoperative analgesia prior to surgical incision yields better pain control compared to postoperative pain regimen alone. Recent evidence supports the use of multimodal analgesia perioperatively eliminating or reducing the need for postoperative opioids for pain control and thus reducing the undesirable narcotic-related side effects. Components of multimodal analgesia include opioids, non-steroidal anti-inflammatory drugs, acetaminophen (paracetamol), gabapentin, ketamine, dexamethasone, dexmedetomidine, and local anesthetics administered by infiltration, neuraxial, or pudendal nerve block. This approach decreases perioperative morbidity, accomplishes early hospital discharge, and enhances patient satisfaction without compromising on the safety and quality of care.

Introduction

Pain is described as an unpleasant sensory and emotional experience associated with actual or potential tissue damage.[1] The main principle of multimodal analgesia is to use a combination of medications with various mechanisms of action and routes of administration in order to achieve better pain control and to decrease the use and side effects of opioids. Enhanced knowledge of the anatomy and pathophysiology of postoperative pain has promoted the use of multimodal management for postoperative pain.[2] Postoperative pain control regimen should be individualized based on each patient's profile, the type of operative intervention, and the characteristics of anorectal wounds. Postoperative pain management is not only a humanitarian task to mitigate the patient's suffering and to enhance the patient's satisfaction, but it is an essential intervention that can potentially reduce the morbidity of proctologic surgery and results in faster recovery, shorter hospitalization, improved rehabilitation, and decrease healthcare cost.[3]

It is estimated that around 90% of anorectal procedures (interventions for anal fissure, abscess and fistula, hemorrhoids, pilonidal cyst, warts, and dysplasia) can be performed on an ambulatory basis. The implementation of a multimodal pain control strategy that includes proper patient selection, the use of evidence-based perioperative care, effective postoperative pain control, and patient education improves the delivery of proctologic care on such outpatient basis.[4] Such standardized strategy improves the patient's recovery, minimizes the morbidity of proctologic surgery, and decreases the need for readmission or additional outpatient visits. The main aim of this article is to focus on multimodal analgesia in patients undergoing anorectal surgery.

Pain pathways

Peripheral nociceptors are activated by inflammatory mediators and histamine which are released following incision or tissue manipulation. The inflammatory mediators include adenosine, prostaglandins, bradykinin, nerve growth factors, serotonin, and cytokines.[2,5] The myelinated Aδ- and unmyelinated C-fibers carry sensory data from the periphery (nociceptors) to the dorsal horn of the spinal cord. These afferent sensory neurons are responsible for transducing thermal, chemical, and mechanical information into electrical activity.[6] Axonal projections reach the dorsal horn of the spinal cord from peripheral afferent nerve endings, where they synapse with second order afferent neurons. Axonal projections of second order neurons cross to the contralateral side of the spinal cord and ascend as afferent sensory pathways to the level of the thalamus. The reticular formation and periaqueductal gray matter receive axonal projections from the divisions of these neurons along the way. The second order neurons synapse with the third order neurons in the thalamus and from there send axonal projections into the sensory cortex.[2] The affective-cognitive component of pain implies the relation between pain and mood, memory of pain, and the ability to cope and tolerate pain. This component is transferred to the somatosensory area II (the lateral parietal cortex), the inferior parietal cortex, the anterior cingulate cortex, the prefrontal cortex, and the insular

Abbreviations: ASA, American Society of Anesthesiologists; COX, Cyclooxygenase; COX-IBS, Cox-2 inhibitors; CPSP, Chronic post surgical pain; GTN, Glyceryl trinitrate; NMDA, N-Metyl-D-Aspartate; NSAID, Non steroidal anti-inflammatory drug; OSA, Obstructive sleep apnea; RACR, Rectoanal contractile reflex

*Corresponding author.
E-mail address: af6872@yahoo.com (A. Iranpour).

https://doi.org/10.1016/j.scrs.2019.100701
1043-1489/

cortex. The sensory discriminative components of pain include location, duration, intensity, quality, and temporal pattern of pain. These components are transferred to the somatosensory area of the postcentral cortical gyrus.[7]

Anatomy and innervation of the anorectum

The anatomic anal canal extends from the dentate line to the anal verge. The surgical anal canal is defined as the area between the anorectal ring and the anal verge. The anorectal ring, which can be felt as a tight ring like structure to palpation, moves anteriorly whenever the patient squeezes the anal sphincter.[8] The anorectum is richly innervated by sensory, motor, and autonomic nerves and by the enteric nervous system.[9] The autonomic nervous system supplies the region proximal to the dentate line. However, the inferior rectal nerve, renders the area below the dentate line sensitive to pain. This difference is seen due to the different embryonic origins (endoderm vs. ectoderm) of the dentate line margin.[8] The external anal sphincter is innervated by the pudendal nerve, which is a mixed sensory and motor nerve, arising from the second, third, and fourth sacral nerves. The sensation of rectal distention is most likely transmitted along the S2, S3, and S4 parasympathetic nerves. These nerve fibers traverse along the pelvic splanchnic nerves and are independent from the pudendal nerve.[9] The pelvic plexus consists of sympathetic nerve fibers (carried by the hypogastric nerve as well as the presacral sympathetic ganglia via the splanchnic sacral nerves running caudal and parallel to hypogastric nerve) and parasympathetic nerve fibers (carried by the Nervi Erigentes, originating from the sacral plexus of S2, S3, S4, running posteriorly in the lateral compartment). During anterior dissection of the distal rectum, the efferent nerves are prone to injury because the efferent nerves continue on within the neurovascular bundles along the posterolateral aspect of prostate gland in males and vagina in females.[10]

Pain assessment

Several pain assessment scales are currently used to measure pain. Such scales include the categorical intensity rating scale, the Wong-Baker face intensity scale, the numeric pain intensity rating scale, and the visual analog scale (Fig. 1). The simple description of categorical intensity scale uses words such as mild, moderate, and severe to describe the patient's pain intensity. In the Wong-Baker face intensity scale, the patient is shown facial pictures to describe the pain. Such scale is especially useful in patients who are unable to comprehend or use the other scales. The numeric pain intensity scale ranks the degree of pain on a 0 to 10 scale. The visual analog scale requires a patient to mark a point on a 10-cm horizontal or vertical line. The patient reports the pain intensity with 0 indicating no pain and 10 indicating the worst possible pain.[11]

The consequences of inadequate pain management

Acute pain which is not properly controlled negatively impacts the patient's care experience, delays postoperative recovery, leads to additional clinic or emergency room visits, and in patients with significant medical co-morbidities can increase the risk of serious complications such as cerebrovascular accidents and myocardial ischemia. This is due to increased sympathetic discharge (increased heart rate, catecholamine release, and increased systemic vascular resistance).[7] Acute postoperative pain is followed by persistent pain in 10−50% of individuals after some operations.[12] One of the causes for chronic post-surgical pain (CPSP) is nerve damage which may occur during the surgical procedure either knowingly or unintentionally. Postoperative pain which is not adequately controlled, especially days or weeks after the procedure, along with any underlying preoperative pain related to the baseline condition has been implicated as a risk factor for the development of CPSP.[7]

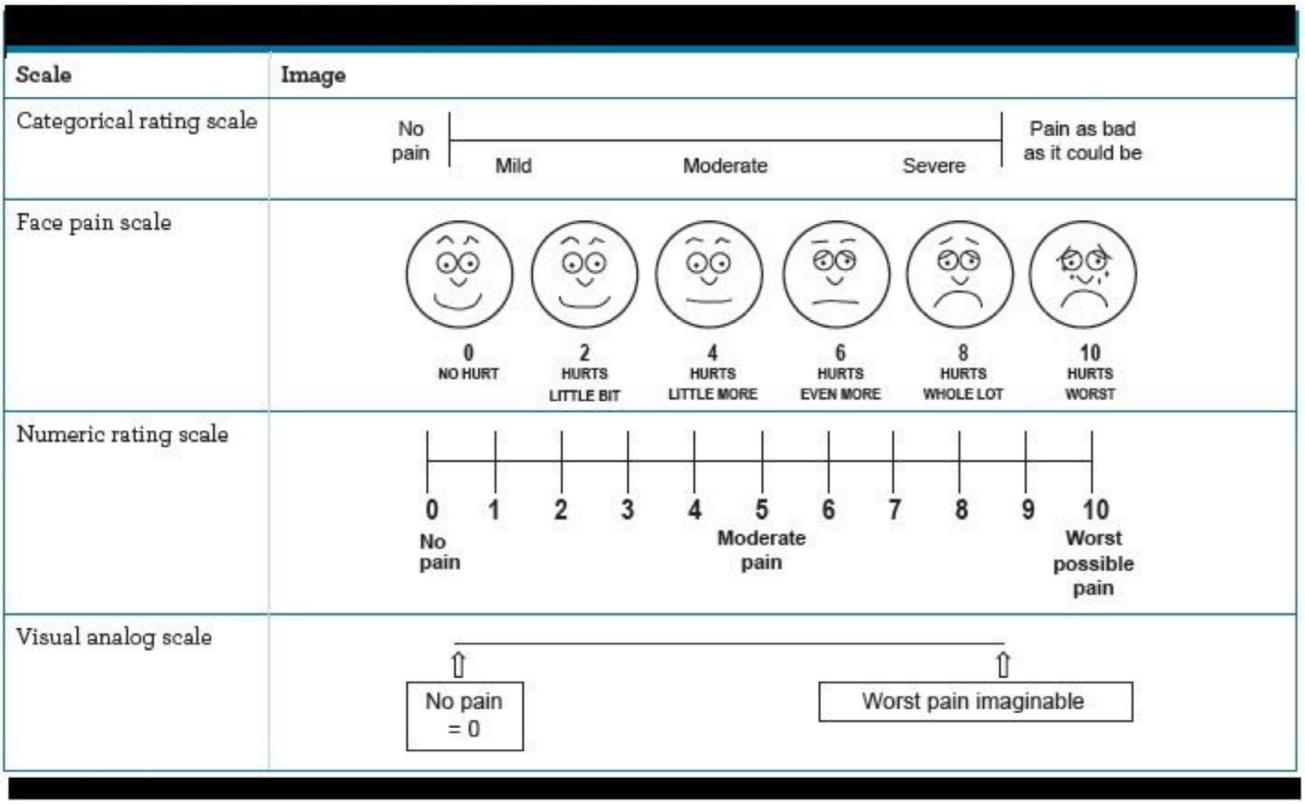

Fig. 1. Pain assessment scales.

Preemptive analgesia and multimodal pain management strategy

The aim of preemptive analgesia, that is usually administered in the form of local anesthesia infiltration of the wound prior to surgical incision or as a regional nerve block, and multimodal preoperative oral or parenteral medications, is to significantly reduce the subsequent analgesic requirements and pain intensity. Various pharmacological drugs block the nociceptor activation thereby reducing the release of pain neurotransmitters.[13] A multimodal strategy aimed at reducing and controlling the postoperative pain following proctologic surgery allows for early ambulation and faster hospital discharge. The main goal of such strategy is to decrease the perioperative stress response with the use of regional anesthesia techniques and multimodal analgesia (combination of analgesic drugs).[14]

A multimodal approach to post proctologic surgery pain control takes into consideration the latest evidence based data and current anesthesiology concepts in nociceptive neurobiology and pain management. Coupled with the implementation of less invasive surgical techniques, such combined approach leads to more efficient postoperative rehabilitation pathways compared to the traditional care programs.[14,15] The multimodal approach involves an algorithmic based approach in order to standardize the postoperative recovery and to minimize the use of opioid medications (Fig. 2).

The elements of multimodal pain control

Multimodal pain control is a multidisciplinary process of care that encompasses preoperative preparation of the patient, intraoperative administration of medications and anorectal area blocks, and the prescription of a postoperative medications regimen. A combination of oral, intravenous, and transdermal medication is recommended based on the patient's profile, type of operative intervention, and extent of the operation. This process involves the close collaboration between the anesthesiologist and the surgeon in order to achieve the best care of the patient.

Opioids

Intermittent aliquots of opioids are the mainstay of moderate to severe pain management during the operation and in the recovery room. Opioid use immediately after operative intervention in a monitored hospital setting yields rapid pain relief. Table 1 provides dosage information for the most commonly used opioids. For immediate control of pain, we prefer intravenous administration in the recovery area which yields quicker analgesia onset compared to the intramuscular route which is associated with more variability in the plasma drug level concentration.[2]

Morphine remains the most widely used opioid for the management of pain and the standard against which other opioids are compared.[7] It has a rapid onset of action with peak effect occurring within 2 to 3 h. Fentanyl and hydromorphone are synthetic derivatives of morphine with higher potency, shorter onset of action, but shorter half-life. Due to the potential side effects of opioids, their use should be limited and administered for severe pain.[13] Common adverse effects of opioids are respiratory depression, sedation, pruritus, nausea, vomiting, constipation, and urinary retention.[7] The use of these opioids should be limited as much as possible to the hospital setting and should rarely be provided for home use except for patients with severe

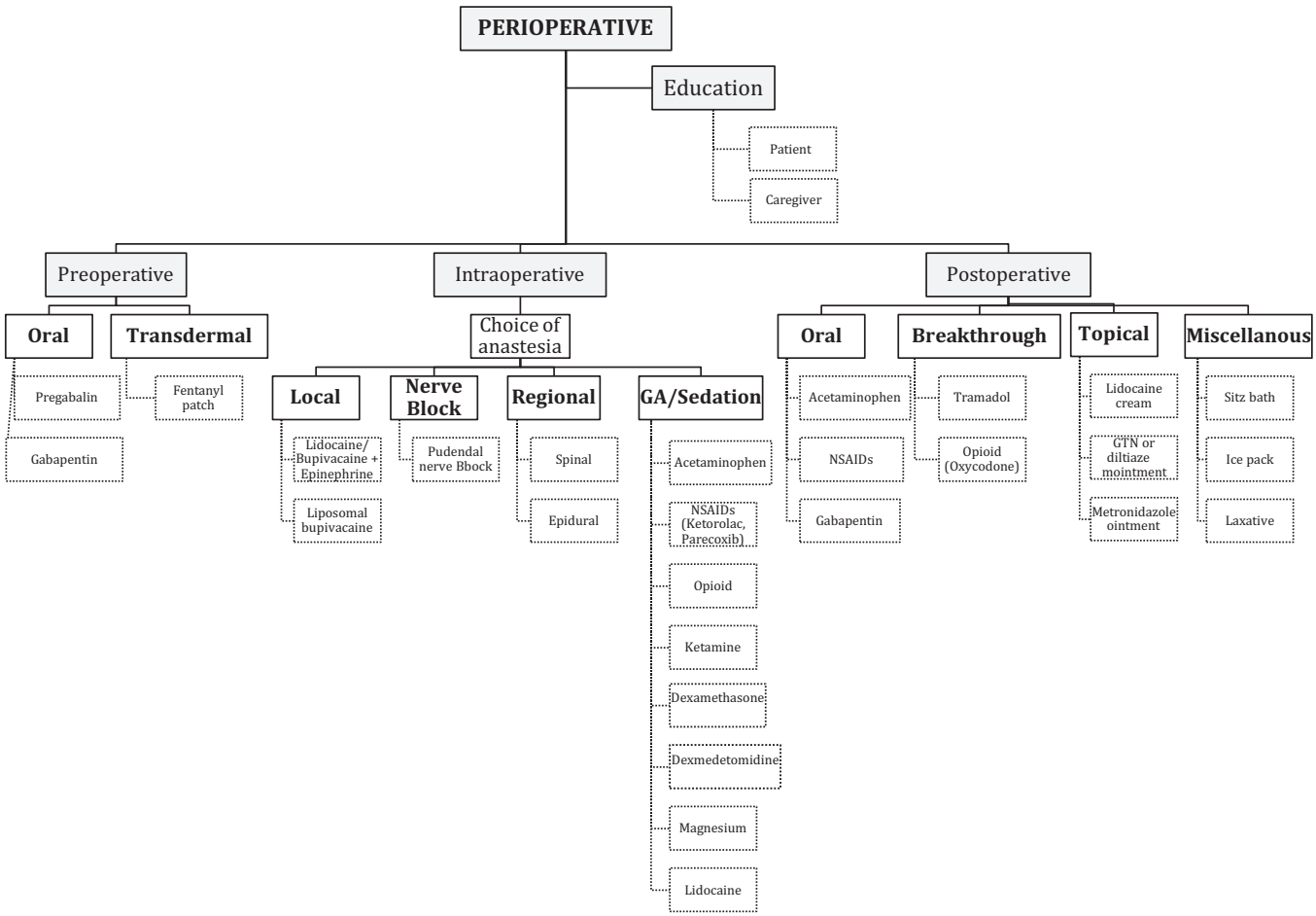

Fig. 2. Multimodality post proctologic surgery pain control.

Table 1
Oral and parenteral opioids for treatment of perioperative pain.

Agent	Route of Administration	Dose (mg)	Onset (h)	Peak Duration (h)
Morphine	Intravenous	2.5–15	0.25	2–3
	Intramuscular	10–15	0.3	3–4
	Oral	30–60	0.5–1	4
Hydromorphone	Intravenous	0.2–1.5	0.2–0.25	2–3
	Intramuscular	1–4	0.3–0.5	2–3
	Oral	1–6	0.5–1	3–4
Fentanyl	Intravenous	20–50 μg	5–10 min	1–1.5
	Transdermal	25–100 μg	12–24	72
Oxycodone	Oral	5–10	0.5	4–6
Methadone	Oral	2.5–20	0.5–1	4–8
Tramadol[†]	Oral	50–100	0.5–1	4–6

[†] Not classified by the U.S. Food and Drug Administration (FDA) as an opioid.

Table 2
Oral and parenteral nonsteroidal anti-inflammatory drugs (NSAIDs).

Drug	Dosage per day[†]	Route of administration
COX-1[††] Non-selective inhibitors		
Ketorolac	30 mg four times daily	Intravenous
	10 mg four to six times daily	Oral
Ibuprofen	400–600 mg four times daily	Oral
Ketoprofen	50 mg four times daily	Oral or Intravenous
Diclofenac	75 mg twice daily	Intravenous
	50 mg three times daily	Oral
COX-2 Selective inhibitors		
Celecoxib	200 mg once or twice daily	Oral
Parecoxib	40 mg once or twice daily	Intravenous
Etoricoxib	60–120 mg per day	Oral

[†] All doses are for a 70-kg adult patient.
[††] Cyclooxygenase.

pain. For the postoperative recovery period at home, oral opioids such as oxycodone and hydromorphone can be prescribed for patients with severe pain in combination with other medications such as acetaminophen and non-steroidal anti-inflammatory medications (NSAIDs).[4]

Fentanyl Patch has been used for severe pain relief following anorectal operations. The transdermal route avoids peaks and troughs seen with oral preparation and achieves a steady state balance.[16] Transdermal fentanyl patch needs to be applied 6 h prior to surgery (25 to 50 mcg/hour patch). Action lasts up to 72 h.[17]

Tramadol

Tramadol is a synthetic opioid and acts on opioid μ-receptors as an agonist. It also inhibits reuptake of norepinephrine and serotonin. Its main use is in mild to moderate pain.[7] Tramadol used as a sole drug cannot be considered the drug of choice for moderate to severe acute pain.[18] The combination of tramadol and morphine was infra-additive (of no added benefit) not of any added benefit) and thus not recommended for postoperative analgesia.[19] The benefits of tramadol for postoperative analgesia include a relative lack of respiratory depression, major organ toxicity, and depression of gastrointestinal motility. Furthermore, its potential for abuse is less compared to other opioids. Common side effects include nausea, vomiting, dry mouth, dizziness, drowsiness, and headache.[14] Oral tramadol can be prescribed for postoperative pain control at home for a subset of patients such as those undergoing excisional hemorrhoidectomy or those with large wounds.

Nonsteroidal anti-inflammatory drugs

Nonsteroidal anti-inflammatory drugs (NSAIDs) decrease the need for opioid use and can be used preoperatively, intraoperatively, and postoperatively. They are useful for mild to moderate levels of pain. NSAIDs inhibit the enzyme cyclooxygenase (COX), block the formation of prostaglandins, and result in an anti-inflammatory response.[13] NSAIDs can be divided into 2 types: COX-1 and COX-2 inhibitors. They are one of the integral components of multimodal and preventive analgesia (Table 2). They may not suffice as sole agents in the management of severe postoperative analgesia control. For patients with severe postoperative pain, they are used in combination with opioids or tramadol, reducing opioid dose requirement and their side effects of nausea, pruritus, respiratory depression, urinary retention, and excessive sedation.[7] The COX-2 inhibitors show a peptic ulcer rate similar to placebo and significantly lower than nonselective NSAIDs (COX-1 inhibitors) especially in high-risk patients. COX-2 inhibitors do not cause bronchospasm in patients with NSAID-exacerbated respiratory disease, a complication which can occur with nonselective NSAIDs.[3] However, although COX-2 inhibitors cause less postoperative blood loss than nonselective NSAIDs (lack in platelet inhibition effect), the general consensus in the literature is that COX-1 inhibitors are preferred over selective COX-2 inhibitors such as celecoxib, given the recent evidence of cardiovascular risks associated with COX-2 agents.[13] Patients with history of gastritis or peptic ulcer disease, and/or those who require prolong use of NSAIDS should receive anti-acid therapy with a hydrogen pump inhibitor medication.

Acetaminophen (paracetamol)

Acetaminophen (paracetamol) is a centrally acting analgesic, without peripheral anti-inflammatory effects.[13] A single dose (one gram) provides effective analgesia for about half of the patients with acute postoperative pain, for about 4 to 6 h, and is associated with minimal side effects. Paracetamol is used alone for mild pain or in combination with NSAIDs or opioids for management of moderate to severe analgesia.[7] Paracetamol does not interfere with platelet function (unlike NSAIDs) and is safe for use in patients with a history of peptic ulcers or asthma. Opioid-sparing effects can be achieved with paracetamol administered intravenously in the inpatient setting.[13] The total daily adult dose of acetaminophen should not exceed 4 gs and caution should be exerted in patients with liver disease.

Ketamine

Ketamine is an NMDA (N-Methyl-D-Aspartate) receptor antagonist. The NMDA receptor is an ionotropic receptor that allows for the transfer of electrical signals between neurons in the brain and in the spinal column. Low dose (analgesic) ketamine, when combined with opioids, has the effect of reducing the consumption of opioids.[3] Preoperative intravenous ketamine bolus dose of 0.5 mg/kg followed by an intraoperative infusion of subanesthetic dose (4–5 μg/kg/min) reduces postoperative pain.[2] Although there is a potential concern about the amnestic effects on the neuropharmacological and cognitive level of the patients with use of perioperative ketamine infusions, these effects are rarely seen with analgesic doses.[14]

Dexamethasone

Dexamethasone, a synthetic corticosteroid, exhibits its postoperative antiemetic effect by reducing surgery-induced inflammation because of its inhibition of prostaglandin synthesis.[20] Other effects include an enhancement in the quality of recovery and reduced fatigue.[3] Single dose of dexamethasone (at the time of induction, 30 min preoperatively or soon after spinal anesthesia) at doses more than 0.1 mg/kg is an effective adjunct in multimodal strategies to reduce postoperative pain and opioids consumption after anorectal surgery. Dexamethasone reduces the time to discharge home without increase in the incidence of wound complications.[15,21] The analgesic effect of dexamethasone derives from inhibition of phospholipase that is necessary for the inflammatory chain reaction along both the cyclooxygenase and lipoxygenase pathways.[20]

Dexmedetomidine

Dexmedetomidine, a selective α_2-adrenergic receptor agonist, has been used for sedation or analgesia in the intensive care unit and during surgery.[22] It acts via both peripheral and central mechanisms. Centrally, the antinociceptive effect seems to be related to agonist action on α_2-adrenoceptors. The α_2-receptors are located both at the spinal level in neurons of the dorsal horn and at a supraspinal level in the locus coeruleus. The peripheral analgesic mechanism is not fully understood.[23] Dexmedetomidine has analgesia and opioid-sparing effects when used as an adjuvant for postoperative multimodal analgesia.[22] Dexmedetomidine unlike other sedative agents, does not affect respiratory drive even at high doses.[24] The common side effects of dexmedetomidine are hypotension, bradycardia, and less commonly atrial fibrillation, fever and dry mouth.[23] The recommended loading dose of dexmedetomidine is 0.5−1 mcg/kg in adults followed by an infusion dose of 0.5 mcg/kg/hr. Onset time, distribution half-life and elimination half-life is 15 min, 6 min, and 2 h, respectively. 0.3 ropivacaine with 1 mcg/kg dexmedetomidine in caudal anesthesia shortens onset time of sensory block, prolongs the duration of sensory block, and postoperative analgesia.[25]

Lidocaine

Perioperative lidocaine infusion is beneficial for patients undergoing ambulatory surgery procedures, not only in reducing the opioid dose requirements, but also the side effects of postoperative nausea and vomiting by 10 to 20%, thus enhancing recovery and early discharge. When using lidocaine infusion, it is important to assess for any signs of central nervous and cardiovascular system toxicity which can present as tinnitus, perioral numbness, and cardiac dysrhythmias.[26] At time of induction, a dose of 1.5 mg/kg of lidocaine followed by an infusion of 2 mg/kg/hr until the end of surgery has been found to decrease pain and was associated with faster discharge.[26]

Magnesium

Intravenous magnesium administration (which acts via NMDA receptor blockade) is a safe, beneficial strategy to enhance the quality of recovery and thereby decreases postoperative pain and opioid consumption.[2,27] Magnesium sulphate 50 mg/kg in 100 mL of normal saline infusion over 15 min before anesthesia induction, followed by an infusion dose of 15 mg/kg/hr is a useful adjunct in multimodal pain control strategy.

Gabapentin and pregabalin

Gabapentin and pregabalin are anticonvulsant agents commonly used as perioperative analgesics. They bind to voltage-gated calcium channels and promote antinociceptive actions by inhibiting the release of excitatory neurotransmitters.[28] Historically these drugs were used in chronic neuropathic pain management, but they may also work to prevent and reduce acute pain, chronic postsurgical pain (CPSP), and the need for opioids requirement.[29] Gabapentin, as a component of multimodal analgesia, has been used in doses of 600 to 1200 mg, 1 to 2 h preoperatively and 600 mg postoperatively (single or multiple doses). Pregabalin in doses of 150 to 300 mg is administered preoperatively followed by the same dose 12 h later. Higher doses may be more effective but increase the sedation risk. Dizziness and sedation are some of the potential adverse effects.[29,30]

Neuraxial analgesia

Spinal and epidural analgesia are the mainstay of neuraxial analgesia. A single intrathecal injection (saddle block) technique with administration of an opioid with/without local anesthesia can provide short to intermediate term postoperative pain relief length (12 to 36 h). The intrathecal route (spinal block) achieves reliable placement of small doses of the drug close to the site of action when compared to epidural analgesia in anorectal surgeries.[2] Although the systemic opioids requirement is reduced, pruritus and respiratory depression risk may occur. Postoperative urinary retention is higher after intrathecal morphine. Hyperbar bupivacaine (0.5%) 1 ml injection at the L3-L4 interspace in the sitting position at time of injection and for 5 min following the injection is sufficient for most adults undergoing anorectal operations.[31] In general, we prefer spinal block to epidural block as the risks of epidural catheter placement (hematoma or abscess) and the impact of an indwelling catheter itself on length of stay, make it as a less desirable approach. Patient's refusal, infection at the site of puncture, uncorrected hypovolemia, local anesthetics allergy, increased intracranial pressure, and a coagulation disorder are some of the contraindications for (for neuraxial anesthesia).[5,14]

Local infiltration

Local anesthesia combined with intravenous sedation is a common technique being used in anorectal operations.[13] This can provide effective pain control and reduces the need for postoperative opioids. A total volume of 20 to 40 mL of either lidocaine 1% or bupivacaine 0.25% combined with epinephrine 1:200,000 for the purpose of vasoconstriction, is usually adequate to obtain proper analgesia.[4] Liposomal bupivacaine is approved for operative site injection following hemorrhoidectomy and provides analgesia for up to 72 h.[2]

Pudendal nerve block

The pudendal nerve block is frequently performed by surgeons and causes a loss of sensation in the perianal and genital skin and temporary relaxation of the anal sphincter muscle. It does not affect rectal sensation. Pudendal nerve block diminishes the rectoanal contractile reflex (RACR).[9] Rare risks of pudendal nerve block include unilateral sciatic nerve block, intravascular injection, retroperitoneal hematoma, retropsoas, or subgluteal abscess.[32,33] For better postoperative relief, pudendal nerve block is best performed bilaterally. When bilaterally blocked with levobupivacaine 0.25%, or 0.5%, the analgesic effect lasts for several hours without the need for rescue analgesia and resulting in lower pain when defecation occurs on day of the operation and improved levels of patient comfort.[32,33]

Topical agents

Topical anesthetics, such as lidocaine and prilocaine ointment, are frequently used as additional agents following anorectal surgery. Glyceryl trinitrate 0.3% ointment relaxes the internal sphincter muscle and yields pain reduction for 3 to 7 days after surgery with improved healing. The patient is instructed to wear a glove when applying a small amount of the ointment to minimize the risk of headache which is a common side effect and one of the limiting factors in its use. Similarly, the use of topical diltiazem 2% ointment can provide a similar effect without the headache side effect. Topical metronidazole 10% after hemorrhoid surgery is helpful as an adjunct to oral pain medication.[4]

Additional helpful measures

Avoidance of postoperative constipation is an important measure to minimize trauma to anorectal wounds by hard or impacted stools which can cause pain and delay healing. A high fiber diet, the use of fiber supplementation, laxatives, and adequate water intake can be very helpful the first month following anorectal surgery. A 10-day course of oral metronidazole can be helpful especially in hemorrhoidectomy patients.[4] The application of icepacks can provide temporary relief.[16] Sitz bath 2 to 3 times a day and following defecation can lead

to proper anal hygiene and may improve anal burning and patient's satisfaction after sphincterotomy, fistulotomy, and hemorrhoidectomy, despite various degree of actual pain relief.[34]

Postoperative analgesia in special patient subgroups

The opioid tolerant patient

One of the challenges faced commonly by physicians is the opioid tolerant patient. Such patient needs to be monitored carefully due to the increased postoperative analgesic requirements. A multimodal treatment plan should be discussed preoperatively with the patient, the surgical team, and the nursing staff. A combination of NSAIDs, low dose ketamine, gabapentin, coupled with the use of local/regional analgesia techniques, and an oral opioid regimen can be individualized for the patient.[14]

Pregnancy

In pregnancy, acetaminophen is considered safe for analgesia during all 3 trimesters. NSAIDs are usually avoided especially late during the pregnancy because of the mechanism of prostaglandin inhibition (which can result in premature closure of the ductus arteriosus). NSAIDS are not recommended in women planning to conceive or in the first trimester, as they may increase the risk of miscarriage. First trimester poses the risk of potential teratogenicity. Morphine is safe in terms of potential teratogenicity.[35] Local and regional analgesia is safe and recommended during pregnancy.

Pediatric

In order to reduce the perioperative stress in children and minimize the negative impact of adverse memory inputs, postoperative pain control is essential. One should not wait for the symptoms to appear to start the treatment. This can be accomplished by judicious use of analgesics and sedatives in proper doses. The most common route of analgesia is intravenous. Morphine is the most widely used opioid medicine for postoperative pain control. Non-opioids (paracetamol, diclofenac, ibuprofen) are commonly used in combination with opioids for postoperative pain control (either in the form of oral syrups, tablets, intravenous, or as suppository). Caudal epidural block and regional techniques performed under general anesthesia in order to avoid the stress response and sudden movements/jerks during puncture successfully reduce the perioperative analgesic requirements.[35]

Obesity and obstructive sleep apnea

Due to the potential of postoperative opioids adverse events in obese patients with obstructive sleep apnea (such as hypoventilation, respiratory arrest), non-opioids (tramadol, dexmedetomidine) are preferred. Opioid sparing technique may prevent the risk of hypoxemia and apnea. The American Society of Anesthesiologists (ASA) Task Force Members (Practice Guidelines for perioperative management of patients with OSA), recommend to consider regional analgesic techniques to reduce the need for systemic opioids in patients at increased risk from OSA.[36] If neuraxial analgesia is planned, it is important to weigh the benefits (improved analgesia, decreased need for systemic opioids) with the potential risks (respiratory depression from rostral spread of opioids) of using an opioid-local anesthetic mixture (such as fentanyl and bupivacaine) rather than a local anesthetic alone (bupivacaine). If needed, opioids are used with caution. NSAIDs and other modalities should be considered initially.[36]

Elderly

An increased sensitivity to drugs affecting the central nervous system is a concern in the geriatric patient. Coexisting diseases and polypharmacy are common in the geriatric age group. Postoperative delirium is more common than in younger population. It may be due to insufficient analgesia or secondary to the slow metabolism of some medications. Central anticholinergic syndrome with symptoms ranging from sedation, cognitive slowing, confusion to severe effects such as agitation, hallucination, and coma must be kept in mind. A lower dose of medications should be considered (e.g., half the standard dose of morphine with greater intervals of administration). Multimodal analgesia reducing opioid use (intravenous administration by careful titration) is beneficial and a strong consideration should be given for local and regional blocks.[35]

Conclusions

Nociceptive neurobiology is quite complex. Understanding the neuroscience of pain allows us to have the necessary knowledge about the underlying mechanisms of pain and how they are modified by various classes of analgesics. The use of multimodal analgesia is superior when combining analgesics with different mechanisms or sites of action, as such combinations achieve better pain control, decrease opioids consumption and their potential side effects. A multimodal strategy, directed for pain control in the early postoperative period is essential in preventing chronic post-surgical pain, allows for early discharge from hospital and enhances the ability of the patient to resume the activities of daily living.

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