**Introduction**

Postoperative management of pain in pediatric population is of major concern as it reduces the incidence of complications and leads to earlier hospital discharge **(Kulshrestha and Bajwa, 2014)** . Regional anesthesia is accepted as the cornerstone of post-operative pain relief in the pediatrics , it has the advantage of providing good post-operative analgesia as well as decreasing parenteral opioids requirements **(Gehdoo,2004)**.

Inguinal hernia (IH) in children is a congenital lesion resulting from a persistent patent processus vaginalis (PPV) . The reported incidence of IH varies from 3% to 5% in full-term newborns, 13% among newborns born of less than 33 weeks of gestational age , and 30% in infants of less than 1000 g birth weight. Males have a much more incidence to develop IH with a male/female ratio of 3:1 and 10:1 . IH has a higher familiar incidence and it has been observed with increasing frequency in twins and siblings of patients . A number of associated disorders including undescended testis, cystic fibrosis, bladderextrophy, increased abdominal pressure (meconium ileus, necrotizing enterocolitis gastroschisis /omphalocele), increased peritoneal fluid (ascites, peritoneal dialysis and the presence of a ventriculo-peritoneal shunt) and connective tissue disorders (Ehlers-Danlos syndrome, Hunter-Hurler syndrome, Marfan syndrome and mucopolysaccharidosis) may contribute in the presence of an IH . Although there are not definite data, IH is commonly repaired shortly after diagnosis has been established because of the high risk of incarceration particularly in young infants . The standard treatment of choice is still the open herniotomy and is credited with being easy to perform, having a high success rate and low rate of complications . However, the introduction of laparoscopy has gained popularity and a variety of laparoscopic techniques for IH repair in children have been reported in the literature. **(Saka et al., 2014** **).**

More than 80% of patients undergoing surgical procedures experience acute postoperative pain and most of them report the severity as moderate, severe, or extreme **(Gan et al., 2014)**.Evidence suggests that less than half of patients report adequate postoperative pain relief. Inadequately controlled pain negatively affects the quality of life, function, and functional recovery, the risk of post-surgical complications, and persistent postsurgical pain **(Kehlet et al., 2006)**.

Surgical pain is due to inflammation from tissue trauma(i.e., surgical incision, dissection, burns) or direct nerve injury (i.e., nerve transaction, stretching, or compression). The patient senses pain through the afferent pain pathway which can be altered by various pharmacologic agents **(Kelly et al., 2001)**.

Effective control of postoperative pain remains one of the most important and pressing issues in the field of anesthesia and has a significant impact on our health care system. In many patients, pain is treated inadequately, causing them needless suffering, and they can develop complications as an indirect conse­quence of pain. Analgesic modalities, if properly applied, can prevent or at least minimize this needless suffering and these complications **(Pankaj Surange et al., 2012)**.

Data on postoperative pain after surgery consistently shows moderate-to-severe pain in the first 24 hours after surgery with traditional systemic analgesic techniques, such as intravenous or intramuscular opioids, patient-controlled opioid analgesia, and multimodal analgesia with opioids combined with acetaminophen, NSAIDs, neuropathic agents, and ketamine **(Marandola et al., 2008)**.

Despite opioid use, moderate-to-severe pain with coughing and mobilization continues to remain high in the first 72 hours after surgery, though with significant improvement after 24 hours. In addition, use of opioids may result in significant side effects such as hypoventilation, sedation, gastric dysmotility, nausea and vomiting, which can worsen patient recovery (**Minkowitz et al., 2007)**.

.During the last two decades, the loco-regional anesthesia became part of the multimodal approach to pain control evenin the pediatric population. Its implementation showed asuperior pain control and fewer side effects than the use of systemic therapies such as parenteral opioids,beside these, regional anesthesia-analgesia showed specific features as reduced hormonal response, perioperative blood loss, gastrointestinal and host-defense dysfunction, as recently reviewed **(Wolf, 2012)**.

Regional anesthesia and analgesia can be used to significantly reduce postoperative pain scores and spare the use of systemic opioids. Regional anesthesia can be performed at the neuraxis (epidural), the nerve root (paravertebral), and the peripheral nerve (transversus abdominis plane) level. Local anesthetic deposition at these sites will selectively block nerve conduction and result in different analgesic and side effect profiles **(Linda Le-Wendling et al., 2015)**.

Open inguinal hernia surgery is one of the commonly performed surgical procedures which is associated with substantial postoperative pain and distress. The reported incidence of pain after inguinal hernia repair varies from 0% to 37% **(Bay‑Nielsen et al., 2001)**.These procedures can be performed under regional anesthesia or general anesthesia and postoperative analgesia can be provided by various analgesic modalities. A multimodal approach includes nonsteroidal anti‑inflammatory drugs, paracetamol , **(Nienhuijs et al., 2007)**.and regional anesthetic techniques such as local infiltration or nerve blocks. The use of local anesthetic for blocks/infiltration is associated with a shorter intra‑hospital recovery, lesser morbidity, and overall costs **(Ding and White,** **1995)**.

 Peripheral nerve blocks such as transversus abdominis plane (TAP) block, abdominal field blocks, and ilioinguinal/iliohypogastric (IIIH) nerve blocks have been described in the literature as means to alleviate pain due to abdominal wall incision **(Ding and White, 1995)**. The anterolateral abdominal wall is innervated by thoracolumbar nerves T7 to L1 which emanates from the anterior rami of the spinal nerves and thereby traversing through the plane between the layers of the transversus abdominis and internal oblique muscles of the abdomen. This plane is known as TAP **(Netter, 1989)**. The iliohypogastric nerve (L1) divides between the internal oblique and transversus abdominis near the iliac crest supplying part of the skin over the inguinal region, gluteal region, and hypogastric region. The ilioinguinal nerve (L1) supplies the upper and medial part of the thigh and also part of the skin covering the genitalia. TAP block and IIIH nerve blocks are regional anesthetic techniques in which local anesthetics are deposited to block the sensory nerves supplying the anterior abdominal wall **(Rafi, 2001).**

The transversus abdominis plane block is a peripheral nerve block designed to anesthetize the nerves supplying the anterior abdominal wall (T6 to L1). It was first described as a traditional conventional landmark technique using the lumbar triangle of Petit. Local anesthetic is then injected between the internal oblique and transversus abdominis muscles just deep the fascial plane between them (the plane through which the nerves pass) **(Petersen et al., 2010)**.The TAP block was shown to reduce the need for postoperative opioid use, increase the time to first request for further analgesia, and provide more effective pain relief, while decreasing opioid related side effects such as sedation, postoperative nausea and vomiting **(Siddiqui et al., 2011)**.

The introduction of ultrasound has allowed providers to identify the appropriate tissue plane and perform this block with greater accuracy under direct visualization.The TAP block is a simple procedure that can be used as an adjunct for postoperative pain control in abdominal, gynecologic, or urologic surgeries involving the T6 to L1 distribution **(Aveline et al., 2011)**[Next Section: Indications](http://emedicine.medscape.com/article/2000944-overview#aw2aab6b2b2)  .

Ilioinguinal/iliohypogastric nerve blocks provide ipsilateral analgesia in the inguinal area. This block technique has been used effectively incombination with general anesthesia for inguinal hernia, orchidopexy, and varicocele surgery. Notwithstanding its attractiveness, ilioinguinal/iliohypogastric nerve blocks are not resoundingly successful. Whereas some authors describe this technique as useful as caudal blocks **(Markham et al.,1986)**.

In the past, ultrasonographic-guided ilioinguinal/ iliohypogastric nerve block has been proven to be considerably more effective than the traditional landmark- based technique concerning the quality of intraand postoperative analgesia **(Willschke et al., 2006)**.

Using real-time imaging, the exact position of the needle tip between the ilioinguinal and iliohypogastric nerves within the correct fascial plane is possible. In addition, ultrasonographic guidance enables the visualization of the spread of local anesthetic around the targeted nerves. Numerous studies demonstrated that ultrasound guidance in regional anesthesia allows a significant reduction in the volume of local anesthetic compared with conventional guidance techniques **(Marhofer et al., 2010)**.

Wound infiltration with local anesthetic is frequently used as a part of multimodal analgesia following abdominal surgery. It produces safe and reliable analgesia with reduction in pain scores and opioid requirements **(Ventham et al.,2013)**. Infiltration of local anesthetic also improves acute postoperative pain management by decreasing postoperative pain, opioid demand with its resultant complications such as nausea, vomiting, and respiratory depression. It also delays the time to rescue analgesic administration **(White and Kehlet, 2010)**.

Alpha-2adrenergic receptor agonists have been the focus of interest for their sedative ,analgesic ,peri- operative sympatholytic ,and cardiovascular stabilizing effects with reduced anesthetic requirements. Furthermore,various methods of administration,such as epidural,intra- thecal and peripheral injections, have been tried either alone or in combination with another drug to prolong and intensify the anesthesia **(Swami et al., 2012)**.

Dexmedetomidine(DEX),a highly selective α2-adrenoceptors agonist has been introduced in anesthesia practice.It is currently being used for continuous intravenous sedation in the intensive care setting and procedural sedation in nonintubated patients. Its potential benefit as an adjuvant to local anesthetics in periphera lnerve blocks has been emphasized in few experimental studies **(Grewal, 2011)**.there have been four proposed mechanisms of action of α2-adrenoceptors agonists in peripheral nerve blocks.These mechanisms include: Direct action on the peripheral nerve,Centrally mediated analgesia,α-2B-AR2 mediated vasoconstrictive effects,and Attenuation of the inflammatory response **(Brummett et al., 2009)**.Despite the fact that there is no α2-adrenoceptors representation on peripheral nerves,there is prolongation of action by perineural administration ofα2- adrenoceptors agonist as an adjuvant to local anesthetics.They prolong the duration of analgesia by blocking the so-called hyperpolarization- activated cation current(Ihcurrent).This is the mos twell-defined mechanism of α2-adrenoceptors agonist.After an action potential has occurred the nerve will have to repolarize to be able to produce new action potential.The early repolarization phase will result in a hyperpolarized state that will make the generation of new action potential virtually impossible,and the nerve is,during this period,judged to be refractory to stimulationThus,blocking the Ihcurrent will result in prolonged hyperpolarization of the nerve,which inturn will result in an analgesic action.Blocking the Ihcurrent may also have the potential to produce as elective sensory effect as this effect appearsto bemore pronounced in C fibers(pain)than in A alpha fibers(motor) dexmedetomidine has more pronounced effect on inhibition of nerve fibers than clonidine **( Lönnqvist, 2012)**.

Centrally,α2-adrenoreceptor agonists cause analgesia and sedation by inhibition of substance P release in the nociceptive pathway at the level of the dorsal root neuron and by activation of α2-adrenoreceptor in the locus coeruleus.Suppression of activity in the descending noradrenergic pathway which modulates nociceptive neuro transmission terminates propagation of pain signals leading toAnalgesia **(Grewal, 2011)**. Apart from above mechanisms, clonidine may reduce systemic

uptake of the perineurally deposited local anesthetic clonidine mixture by meansof,α1-receptor mediated vasoconstriction.As dexmedetomidine has a very limited effect on α1-receptor,it is unlikely that a nerve block by a local anesthetic-dexmedetomidine mixture may prolong the block duration by this mechanism despite being able to cause time limited vasoconstriction by stimulation of α2-receptor **(Lönnqvist, 2012)**.

The upcoming anti-inflammatory effects of α2-adrenoreceptor agonists has been high lighted by a series of animal studies by Brummett and colleagues who reported that large doses of dexmedetomidine or clonidine prolonged the duration of sciatic nerve block when added to local anesthetics like bupivacaine or ropivacaine in rats.In addition, histopathological examinations of sciatic nerves at 24 hours and 14 days showed that the nerve axon and myelin were un affected after perineural application of dexmedetomidine. There was decrease in proinflammatory products from immune cells recruited to the site of injury and an increase in anti inflammatory cytokines.Hence, there was decreasein perineural inflammation as compared to soleuse of local anesthetic.These findings reinforce the neuroprotective role of dexmedetomidine.because of the safety profile of dexmedetomidine,It is now being used intrathecally without apparent toxicity **(Brummett et al., 2008)**.Other usefuleffects of activation of α2-adrenoreceptors include decreased salivation, increased glomerular filtration decreased intraocular pressure and increased seizure threshold **(Grewal, 2011)**.

The greater α2-adrenoreceptors selectivity of dexmedetomidine enhances the therapeutic window of dexmedetomidine in the treatment of pain.Its opiate sparing effect has important implications for the management of acute postoperative pain and chronic pain states, including disorders involving spasticity or myofascial pain neuropathic pain,sympathetically maintained pain such as complex regional pain syndrome and chronic daily headaches.It is evolving as an adjuvant analgesic,both as intravenous and intrathecal infusion in cancer pain refractory to multiple treatment modalities **(Grosu et al., 2010)**.

Dexmedetomidine,apotent α2 adrenocepto ragonist,is approximately eight-times more selective to wards the α2 adrenoceptor than clonidine.In previous clinical studies,intravenous dexmedetomidine resulted insignificant opioid sparing effects as well as a decrease in inhalational anaesthetic requirements. In various animal studies,dexmedetomidine has been reported to enhance sensory and motor blockade along with increased duration of analgesia **(keniya et al., 2011)**.

Dexmedetomidine has recently been described with regional blocks in both adults and children. In adults, a meta-analysis of 16 randomized controlled trials including 1092 adults compared outcomes between DEX (intrathecal, epidural, or caudal) and bupivacaine or ropivacaine. Dexmedetomidine was found to decrease the pain and prolong the analgesia. Although there was an increased incidence of bradycardia in the DEX group, it was not associated with hypotension and did not warrant treatment. Likewise, the combination of caudal DEX and bupivacaine (1 μg kg−1 and 2.5 mg kg−1, respectively) in children has been shown to decrease the sevoflurane requirements, incidence of emergence agitation, and requirement for adjuvant postoperative analgesics and to increase the duration of postoperative pain relief compared with bupivacaine alone. The addition of caudal DEX to bupivacaine did not affect the haemodynamic response. Epidural DEX and clonidine produced similar analgesia, duration of action, and haemodynamic profile when used with bupivacaine (2.5 mg kg−1) for lower abdominal surgery in children. A recent meta-analysis concluded that the addition of DEX to a caudal anaesthetic provided an extended duration of postoperative pain relief in paediatric patients. There was no statistically significant effect on haemodynamics and adverse events with the addition of DEX to the local anaesthetic. Subgroup analysis showed no advantage of caudal DEX at 2 μg kg−1 compared with 1 μg kg−1 in terms of analgesia.65 **(Tong** **et al., 2014)**