Ilioinguinal and Iliohypogastric Nerve Block: A Brief Review

Valentina Bellini[1], Edoardo Flaviano[1], Massimo Maffezzoni[1] and Dario Bugada[2,3,4,*]

[1]*Department of Anesthesia and Pain Therapy, Parma University Hospital, Parma-Italy*

[2]*Department of Anesthesia and ICU, ASST Papa Giovanni XXIII, Bergamo-Italy*

[3]*Department of Medicine and Surgery, Parma University, Parma-Italy*

[4]*SIMPAR Group (Study In Multidisciplinary Pain Research)*

Abstract: II-IH nerve are the primary nerves involved in postoperative pain after groin surgical procedures. This review focuses on these regional blocks, analyzing anatomical variability and available techniques. Data on analgesic efficacy in different surgical setting are presented as well.

II-IH nerve blocks are effective for surgery in the groin area; they are generally safe with anecdotal complications. US-guidance is recommended because of higher precision in the deposition of local anesthetics, higher block success and, theoretically, less accidental complications. New studies are required to define the optimal mixture to be injected, and to understand the role of of II-IH nerve block comparing to other techniques for analgesia after inguinal surgery.

Keywords: Ilioinguinal nerve, iliohypogastric nerve, postoperative analgesia, hernia surgery, caesarean section.

1. INTRODUCTION

Iliohypogastric (IH) and ilioinguinal (II) nerves are responsible for cutaneous innervation of the lower portion of the abdomen, inguinal region and upper thigh. They are considered as the primary nerves involved in postoperative pain after many surgical procedures in these areas, such as inguinal hernia, caesarean section, orchi-funiculectomy, Pfannenstiel incision[1].

2. ANATOMIC CONSIDERATIONS

II and IH nerve usually derive from last thoracic and the first lumbar root (T12-L1); passing above the superior anterior iliac spine, they perforate the transversus muscle of the abdomen to rely between transversus and the internal oblique muscles. Terminal branches of IH perforate the external oblique muscle approximately 4 cm lateral to the midline and provide cutaneous sensitivity to the lower portion of the rectus abdominis and to the skin above the tensor fasciae latae through a lateral cutaneous branch. The IH nerve innervates the skin of the inguinal region. II nerve emerged from the internal oblique muscle[2]; terminal branches of II runs inferiorly, enter the inguinal canal, where they emerge to innervate the skin of the mons pubis, medial supine portion of the thigh, inguinal crease and anterior surface on the scrotum or anterior one third of the labia[1,3].

It is important to remember that these structures are associated with large anatomical variability. Analyzing one hundred adult formalin fixed cadavers, it emerged that there is a great variability on the spinal origin of these nerves (from T12 to L3 for II and from T11 to L1 for IH) and also on the site of entry into the abdominal wall measured in relation to distance with anterior superior iliac spine (ASIS)[4]. Nerves may be absent or double in some cases; they can have communicating branches or common trunks[2]. In a series of 110 hernia repairs with nerve identification and recording of their course, II and HI nerve course was found to be consistent with that in anatomical texts in only 46 of 110 explorations (41.8%)[5]. Further, many studies are made on children, but it is not correct to always translate anatomical concepts between children and adults. Some anatomic variability is also present in pediatric patients. *Van Schoor et al*, found a variable distance with the ASIS[6], while other data suggest that the anatomical position of these nerves may also change with the age of the patient[7]; a formula was also proposed for needle insertion distance depending on body weight[8].

3. TECHNIQUES

There are several techniques to block these nerves and they are conventionally divided into landmark and ultrasound (US)-guided.

Landmarks-based approach is based on loss-of-resistance, essentially due to the passage through the deep fascia of the external oblique muscle. Problems related to this approach are essentially two: on one

*Address correspondence to this author at the Department of Anesthesia and ICU, ASST Papa Giovanni XXIII°, Torre 3, Piano 2, Piazza OMS, 1 24127, Bergamo-Italy; E-mail: dariobugada@gmail.com

E-ISSN: 2310-9394/17

hand, since it is a “blind” technique”, the increased risk of complications such as accidental puncture of vessels, abdominal viscera or other nerve branches; on the other hand, the great anatomical variability could result in a considerable incidence of failed blocks, despite the greater doses of local anesthetic commonly used in a blind technique.

US-guided injection technique is based on the use of a high frequency linear probe, able to identify the anatomical structures, including the muscular planes, the vessels and the nerves themselves. The recommended area for ultrasound scanning of II and IH nerves is lateral and superior to the ASIS, allowing nerves visualization in 90% of cases and in which II e IH nerves are positioned between the muscular plane of the internal oblique and the transverse (Figure **1**). The probe is placed cranial and three fingerbreadths lateral to the ASIS perpendicular to the inguinal ligament. II nerve is closer to the iliac crest[1].

Several local anesthetics and different concentrations have been reported in the literature for this application. In pediatric patients the ideal concentration of a volume of 3 ml of ropivacaine sufficient to cover the essential neural region, was analyzed; in patients anesthetized with 2% sevoflurane, the concentration at which all patients showed complete block was 0.50%, whereas the EC50 concentration was 0.21%[9].

Also the volume of local anesthetic for an effective block can widely vary. The US technique, allowing to visualize the correct spread of the injectate, may allow a reduction in the needed volume. *Khedkar et al* showed that an average of 12.66 ml of drug was sufficient for a successful US block in adults, compared to the higher volume required with the conventional technique[10]. In pediatric patients, the use of the US-block appears to offer the opportunity of successful blocks with 0.075 mL/kg of 0.25% levobupivacaine, identified by using a modified version of the step up-step-down technique[11].

4. COMPLICATIONS

II-IH block is considered a relatively safe technique, especially when compared with central block techniques (eg caudal epidural block). Complications can be related to the execution of the block itself or to the anatomical region where the injection occurs. Complications that may occur are hematoma[12], infection, accidental puncture of viscera[13,14], local anesthetic toxicity, later femoral cutaneous or femoral

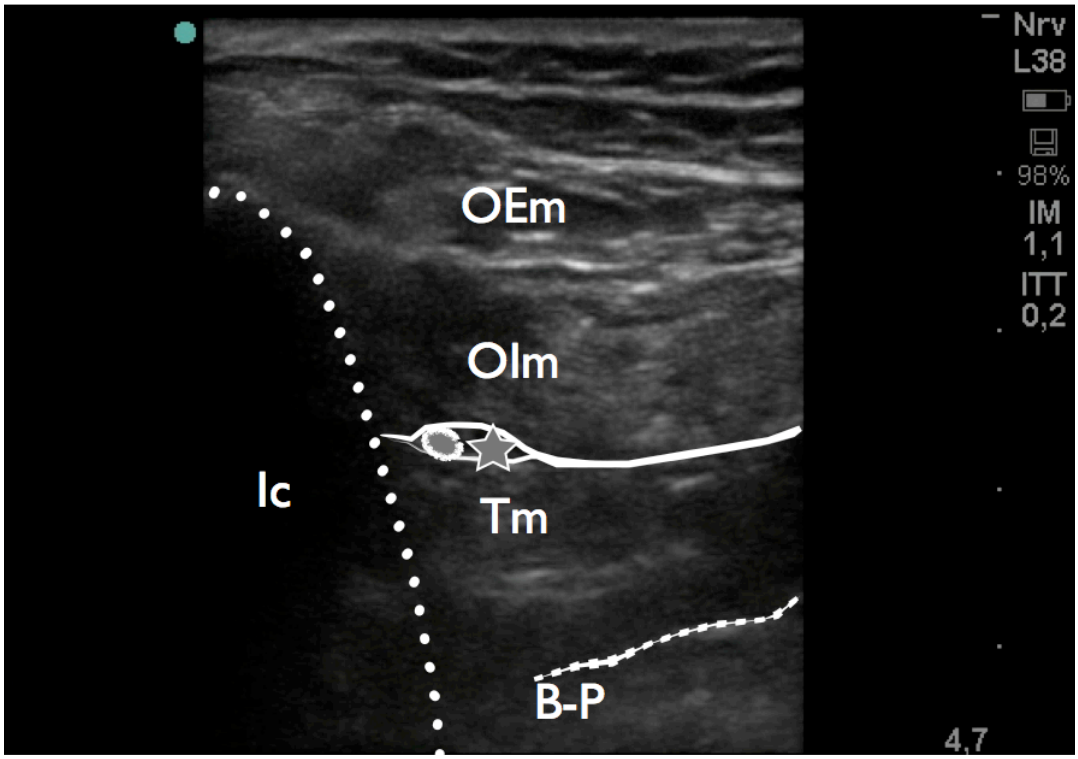

Figure 1: Sonoanatomy of he II-IH nerves. OEm: external oblique muscle; OIm: internal oblique muscle; Tm: transversus muscle. B-P: bowel-peritoneum (dotted line) below the transversalis fascia (abdominal cavity). Ic: iliac crest (bony shadow = dotted line). II and IH nerves (circle + star) are located in the fascial plane between OIm and Tm (white line).

nerve blockade. Some of them have been reported in the literature, while others have not, but should always be considered. *Walker and Orlikowski* in 2008 described an interrupted study due to the onset of neurological complications in 5 of 8 patients undergoing II-IH block with 20 ml of 0.5% ropivacaine for the first 5 patients and with reduced dose at 0.2 ml / kg to a maximum of 20 ml of 0.5% ropivacaine for the remainder[15]. In children 2 to 12 years old having surgery in the groin, receiving a blind II-IH block performed with bupivicaine 0.25%, 0.25 ml kg^{-1} body weight, an incidence of postoperative leg strength on the side of the nerve block of 8.8% has been described[16]. Ghani *et al.* have observed a slightly lower incidence, around 6%[17]. The use of the US technique appears to be able to decrease also the incidence of the transient femoral nerve palsy when compared to landmark-based one[18].

5. CLINICAL APPLICATIONS

As previously mentioned, the block of these nerves is often used in the perioperative management of surgical procedures involving the area between the abdomen and thigh.

5.1. Ultrasound *Vs* Blind-Technique

Block effectiveness, onset and duration change according to the technique,. In a randomized prospective study, II-IH block performed by conventional method was compared with US-guided block in patients undergoing unilateral elective inguinal hernia repair. In the US group, onset of sensory block occurred earlier, with a longer time to rescue analgesia than in the conventional group [10]. However, other authors did not observe any difference between the two approaches when applied in the context of chronic groin pain after hernia surgery, although the exiguity of the sample may have biased the result [19]. A systematic review and meta-analysis published in 2016, which compared ultrasound-guided or landmark-based techniques of II-IH and TAP block in adults, all performed before surgery, showed that US guidance leads to less use of additional analgesics, lower pain scores and use of rescue drugs [20].

In this regard, data are conflicting also in children; *Seyedhejazi et al.* showed no differences between the two approaches in pediatric patients undergoing surgery in the inguinal region, with a similar (and high) success rate for both techniques [21]. However, an ultrasound control after a landmark-based II-IH block, showed that the actual location of the injected local anesthetic was found to be correct in only 14% of cases, while in the remaining 86%, the local anesthetic was administered in adjacent anatomical structures [22].

5.2. II-IH Nerve Block Compared to other Techniques

5.2.1. Transversus Abdominis Plane Block (TAP block)

TAP block is an analgesic technique largely used in the acute pain management for lower abdominal surgery. Acute pain management after cesarean section (CS) is particularly important, as pain can interfere with mother's ability to take care of the newborn. There are conflicting data regarding the use II-IH block in CS comparing to TAP block. By performing these two types of block at the end of the procedure, NRS values <3 at rest and 4 during movement up to 24h were identified with both blocks, although a lower proportion of patients undergoing TAP block needed additional rescue analgesics [23]. However, *Bessmertny et al.* showed that both blocks improved postoperative analgesia, with a greater efficacy for the II-IH block [24].

As already mentioned, a large part of the application of II-IH block is represented by the use in inguinal herniorraphy. *Okur et al.*, compared ultrasound-guided II-IH block or TAP block with a control group for postoperative analgesia after inguinal hernia repair. Although at 24 h a statistically significant difference between the two techniques was observed, both of these blocks lead to a significantly longer time to first pain, lower pain scores and lower additional analgesic requirements compared to control group, without difference between type of blocks and without any complication[25]. Another interesting aspect that emerged from this study was that patients undergoing peripheral nerve blockade also showed lower pain scores even at 6 months, confirming previous results[26], on the protective role of regional techniques on postoperative chronic pain after inguinal hernia repair[25]. In another study on 149 patients undergoing elective inguinal unilateral hernia repair using Lichtenstein tension-free technique, both blocks appeared to be effective in reducing pain intensity and morphine consumption in the Post Anesthesia Care Unit (PACU), but total opioid consumption at 24 hours was significantly decreased in the II-IH group compared with the TAP and control groups. The

authors therefore concluded that both blocks should be considered effective for the management of acute pain, with a superior pain relief produced by II-IH block compared to posterior TAP during the 24 hours[27]. In a pediatric population scheduled for elective inguinal surgery (inguinal herniotomy, hydrocelectomy, orchidopexy), patients subjected to TAP block experienced greater pain and requiring more ibuprofen in the day-stay unit compared to those treated with II-IH block, both performed with US-guided technique[28]. As well as in CS, there are conflicting data about the superiority of one technique on the other also for inguinal hernia surgery. In a very recent study, TAP block has been compared to II-IH block with wound infiltration; the time for first rescue analgesia was prolonged in TAP group, although total analgesic requirement did not differ between two groups[29]. In another study, patients undergoing US-TAP block showed less pain at rest at 4, 12, and 24h than patients treated with II-IH blind technique; however, no significant difference was noted after the first 24 hours, at POD1(first postoperative day), POD2, 3 and 6 months after the surgical procedure[30].

5.2.2. Caudal Block

In a prospective study, involving 50 pediatric patients, the II-IH block group showed an average longer time to first rescue analgesia comparing to caudal block, showing a longer mean analgesic duration in the case of unilateral groin surgery[31]. However, data available in the literature do not confirm the same results. In a prospective, randomized, single-blinded study, which included pediatric patients between 1-7 years of age scheduled for elective unilateral lower abdominal surgery (herniorraphy, orchiopexy, hydrocelectomy, testicular detorsion), three analgesic technique (i.e. caudal block, US-guided TAP block, and US-guided II-IH block) have been compared. Results showed how patients undergoing II-IH block had a significantly higher analgesic consumption within 24 hours compared with the other two groups and they also declared significantly greater pain scores at 1, 4, and 8 hours[32]. Shanthanna *et al.* reported the superiority, in terms of reduced need for rescue analgesics, of the caudal block over non-caudal regional techniques (namely II-IH block, local infiltration, a combination of the two, paravertebral block) in both the short and long term. However, caudal group is associated with a significantly more common incidence of motor block and urinary retention, with an absolute risk reduction of 7.44 and 8.42, respectively [33]. Furthermore, *Somri et al.* showed that the use of caudal technique is able to determine a lower level of stress in the immediate postoperative period, evaluated in terms of plasma epinephrine and noraepinephrine, compared to II-IH block[34]. Authors, however, emphasize that, comparing to caudal epidural block, II-IH block does not need special equipment and is less invasive[35].

5.2.3. Wound Infiltration

Another possible choice for postoperative pain management in these anatomical regions is the wound infiltration with local anesthetic. This is an easy, fast and relatively safe technique. There are not many studies comparing this technique with the II-IH block. In the context of post-caesarean pain, a study showed that bilateral ilioinguinal block and wound infiltration are both able to decrease pain values and analgesic doses required, compared to a control group, without differences between them. However, if the block effect appeared to last up to 24h, the effect of wound infiltration appeared to be limited to the first 12h[36]. *Caetano et al.* compared three analgesic techniques, for pain management in elective unilateral inguinal herniorrhaphy in children: caudal epidural block, wound infiltration and II-IH block. In the first two hours the two blocks appear to be superior than wound infiltration; from the 3^{th} up to the 12^{th} postoperative hour the three techniques show no differences[35].

5.3. Continuous II-IH Block

In a case report, the use of IH and II block in continuous infusion for 3 days has been described for the management of intractable inguinal pain after cesarean delivery in a breastfeeding patient, with good effectiveness[37]. Already in 2008, *Gucev et al.* described 3 cases of pain management after cesarean delivery using a bilateral US-guided continuous II-IH block, administered for 72 h[38].

CONCLUSION

II-IH block is effective for surgery in the groin area, and generally safe with anecdotal complications. Considering the anatomical variability of these two nerves, US-guidance is recommended because of higher precision in the deposition of local anesthetics, higher block success and, theoretically, less accidental complications. New studies are required to define the optimal mixture to be injected, and to understand whether TAP block or combined II-IH nerve blocks are superior in terms of postoperative analgesia.

REFERENCES

[1] Bugada D and Peng PWH. Ilioinguinal, iliohypogastric, and genitofemoral nerve blocks. In: regional nerve blocks in anesthesia and pain therapy; 2015, pp 707-715. Editor: Philip Peng, Danilo Jankovic – Springer. https://doi.org/10.1007/978-3-319-05131-4_54

[2] Ndiaye A, Diop M, Ndoye JM, Ndiaye A, Mané L, *et al*. Emergence and distribution of the ilioinguinal nerve in the inguinal region: applications to the ilioinguinal anaesthetic block (about 100 dissections). Surg Radiol Anat 2010; 32(1): 55-62. https://doi.org/10.1007/s00276-009-0549-0

[3] Ilioinguinal and Iliohypogastric Blocks. NYSORA. https://www.nysora.com/ilioinguinal-and-iliohypogastric-blocks.

[4] Klaassen Z, Marshall E, Tubbs RS, Louis RG Jr, Wartmann CT and Loukas M. Anatomy of the ilioinguinal and iliohypogastric nerves with observations of their spinal nerve contributions. Clin Anat 2011; 24(4): 454-61. https://doi.org/10.1002/ca.21098

[5] Al-dabbagh AK. Anatomical variations of the inguinal nerves and risks of injury in 110 hernia repairs. Surg Radiol Anat 2002; 24(2): 102-7. https://doi.org/10.1007/s00276-002-0006-9

[6] Van Schoor AN, Boon JM, Bosenberg AT, Abrahams PH and Meiring JH. Anatomical considerations of the pediatric ilioinguinal/iliohypogastric nerve block. Paediatr Anaesth 2005;15(5): 371-7. https://doi.org/10.1111/j.1460-9592.2005.01464.x

[7] Hong JY, Kim WO, Koo BN, Kim YA, Jo YY and Kil HK. The relative position of ilioinguinal and iliohypogastric nerves in different age groups of pediatric patients. Acta Anaesthesiol Scand 2010; 54(5): 566-70. https://doi.org/10.1111/j.1399-6576.2010.02226.x

[8] Van Schoor AN, Bosman MC and Bosenberg AT. Revisiting the anatomy of the ilioinguinal/iliohypogastric nerve block. Paediatr Anaesth 2013; 23(5): 390-4. https://doi.org/10.1111/pan.12099

[9] Yamada K, Inomata S and Tanaka M. The ropivacaine concentration required for ultrasound-guided ilioinguinal/iliohypogastric nerve block in pediatric patients. Anesth Analg 2016; 123(1): 175-8. https://doi.org/10.1213/ANE.0000000000001329

[10] Khedkar SM, Bhalerao PM, Yemul-Golhar SR and Kelkar KV. Ultrasound-guided ilioinguinal and iliohypogastric nerve block, a comparison with the conventional technique: An observational study. Saudi J Anaesth 2015; 9(3): 293-297. https://doi.org/10.4103/1658-354X.154730

[11] Willschke H, Bösenberg A, Marhofer P, Johnston S, Kettner S, Eichenberger U, *et al*. Ultrasonographic-guided ilioinguinal/iliohypogastric nerve block in pediatric anesthesia: what is the optimal volume? Anesth Analg 2006; 102(6): 1680-4. https://doi.org/10.1213/01.ane.0000217196.34354.5a

[12] Parvaiz MA, Korwar V, McArthur D, Claxton A, Dyer J and Isgar B. Large retroperitoneal haematoma: an unexpected complication of ilioinguinal nerve block for inguinal hernia repair. Anaesthesia 2012; 67(1): 80-1. https://doi.org/10.1111/j.1365-2044.2011.06971.x

[13] Frigon C, Mai R, Valois-Gomez T and Desparmet J. Bowel hematoma following an iliohypogastric-ilioinguinal nerve block. Paediatr Anaesth 2006; 16(9): 993-6. https://doi.org/10.1111/j.1460-9592.2006.01909.x

[14] Amory C, Mariscal A, Guyot E, Chauvet P, Leon A and Poli-Merol ML. Is ilioinguinal/iliohypogastric nerve block always totally safe in children? Paediatr Anaesth 2003; 13(2): 164-6. https://doi.org/10.1046/j.1460-9592.2003.01005.x

[15] Walker S and Orlikowski C. A randomised study of ilio-inguinal nerve blocks following inguinal hernia repair: a stopped randomised controlled trial. Int J Surg 2008; 6(1): 23-7. https://doi.org/10.1016/j.ijsu.2007.10.003

[16] Lipp AK, Woodcock J, Hensman B and Wilkinson K. Leg weakness is a complication of ilio-inguinal nerve block in children. Br J Anaesth 2004; 92(2): 273-4. https://doi.org/10.1093/bja/aeh045

[17] Ghani KR, McMillan R and Paterson-Brown S. Transient femoral nerve palsy following ilio-inguinal nerve blockade for day case inguinal hernia repair. J R Coll Surg Edinb 2002; 47(4): 626-9.

[18] Tani M, Sato M, Son I, Tanabe H, Hirota K, Shirakami G, *et al*. Transient femoral nerve palsy after ilioinguinal-iliohypogastric nerve block: comparison of ultrasound-guided and landmark-based techniques in adult inguinal hernia surgery. Masui 2015; 64(6): 603-9.

[19] Trainor D, Moeschler S, Pingree M, Hoelzer B, Wang Z, *et al*. Landmark-based versus ultrasound-guided ilioinguinal/iliohypogastric nerve blocks in the treatment of chronic postherniorrhaphy groin pain: a retrospective study. J Pain Res 2015; 8: 767-770. https://doi.org/10.2147/JPR.S86777

[20] Wang Y, Wu T, Terry MJ, Eldrige JS, Tong Q, Erwin PJ, *et al*. Improved perioperative analgesia with ultrasound-guided ilioinguinal/iliohypogastric nerve or transversus abdominis plane block for open inguinal surgery: a systematic review and meta-analysis of randomized controlled trials. J Phys Ther Sci 2016; 28(3): 1055-1060. https://doi.org/10.1589/jpts.28.1055

[21] Seyedhejazi M, Daemi OR, Taheri R and Ghojazadeh M. Success rate of two different methods of ilioinguinal iliohypogastric nerve block in children inguinal surgery. Afr J Paediatr Surg 2013; 10(3): 255-8. https://doi.org/10.4103/0189-6725.120905

[22] Weintraud M, Marhofer P, Bösenberg A, Kapral S, Willschke H, *et al*. Ilioinguinal/iliohypogastric blocks in children: where do we administer the local anesthetic without direct visualization? Anesth Analg 2008; 106(1): 89-93, table of contents. https://doi.org/10.1213/01.ane.0000287679.48530.5f

[23] Kiran LV, Sivashanmugam T, Kumar VRH, Krishnaveni N and Parthasarathy S. Relative efficacy of ultrasound-guided ilioinguinal-iliohypogastric nerve block versus transverse abdominis plane block for postoperative analgesia following lower segment cesarean section: a prospective, randomized observer-blinded trial. Anesth Essays Res 2017; 11(3): 713-717. https://doi.org/10.4103/0259-1162.206855

[24] Bessmertnyj AE, Antipin EE, Uvarov DN, Sedyh SV and Nedashkovsky EV. Comparison of the effectiveness of ilioinguinal-iliohypogastric blockade and transversus abdominis plane block for analgesia after cesarean section. Anesteziol Reanimatol 2015; 60(2): 51-4.

[25] Okur O, Tekgul ZT and Erkan N. Comparison of efficacy of transversus abdominis plane block and iliohypogastric/ilioinguinal nerve block for postoperative pain management in patients undergoing inguinal herniorrhaphy with spinal anesthesia: a prospective randomized controlled open-label study. J Anesth 2017; 31(5): 678-685. https://doi.org/10.1007/s00540-017-2378-3

[26] Bugada D, Lavand'homme P, Ambrosoli AL, Cappelleri G, Saccani Jotti GM, *et al*. Effect of preoperative inflammatory status and comorbidities on pain resolution and persistent post-surgical pain after inguinal hernia repair. Mediators Inflamm 2016; 5830347.

[27] Stav A, Reytman L, Stav MY, Troitsa A, Kirshon M, Alfici R, *et al*. Transversus abdominis plane versus ilioinguinal and iliohypogastric nerve blocks for analgesia following open

inguinal herniorrhaphy. Rambam Maimonides Med J 2016; 7(3): e0021.
https://doi.org/10.5041/RMMJ.10248

[28] Fredrickson MJ, Paine C and Hamill J. Improved analgesia with the ilioinguinal block compared to the transversus abdominis plane block after pediatric inguinal surgery: a prospective randomized trial. Paediatr Anaesth 2010; 20(11): 1022-7.
https://doi.org/10.1111/j.1460-9592.2010.03432.x

[29] Sujatha C, Zachariah M, Ranjan RV, George SK, Ramachandran TR, *et al*. Transversus Abdominis Plane Block versus Ilioinguinal/Iliohypogastric Nerve Block with Wound Infiltration for Postoperative Analgesia in Inguinal Hernia Surgery: A Randomized Clinical Trial. Anesth Essays Res 2017; 11(4): 976-980.
https://doi.org/10.4103/aer.AER_33_17

[30] Aveline C, Le Hetet H, Le Roux A, Vautier P, Cognet F, Vinet E, *et al*. Comparison between ultrasound-guided transversus abdominis plane and conventional ilioinguinal/iliohypogastric nerve blocks for day-case open inguinal hernia repair. Br J Anaesth 2011; 106(3): 380-6.
https://doi.org/10.1093/bja/aeq363

[31] Abdellatif AA. Ultrasound-guided ilioinguinal/iliohypogastric nerve blocks versus caudal block for postoperative analgesia in children undergoing unilateral groin surgery. Saudi J Anaesth 2012; 6(4): 367-72.
https://doi.org/10.4103/1658-354X.105868

[32] Sahin L, Soydinc MH, Sen E, Cavus O and Sahin M. Comparison of 3 different regional block techniques in pediatric patients. A prospective randomized single-blinded study. Saudi Med J 2017; 38(9): 952-959.

[33] Shanthanna H, Singh B and Guyatt G. A systematic review and meta-analysis of caudal block as compared to noncaudal regional techniques for inguinal surgeries in children. Biomed Res Int 2014; 890626.
https://doi.org/10.1155/2014/890626

[34] Somri M, Gaitini LA, Vaida SJ, Yanovski B, Sabo E, Levy N, *et al*. Effect of ilioinguinal nerve block on the catecholamine plasma levels in orchidopexy: comparison with caudal epidural block. Paediatr Anaesth 2002; 12(9): 791-7.
https://doi.org/10.1046/j.1460-9592.2002.00916.x

[35] Caetano AM, Falbo GH and Lima LC. Comparison among three techniques of postoperative regional analgesia with ropivacaine in children. Rev Bras Anestesiol 2006; 56(6): 561-70.
https://doi.org/10.1590/S0034-70942006000600001

[36] Ganta R, Samra SK, Maddineni VR and Furness G. Comparison of the effectiveness of bilateral ilioinguinal nerve block and wound infiltration for postoperative analgesia after caesarean section. Br J Anaesth 1994; 72(2): 229-30.
https://doi.org/10.1093/bja/72.2.229

[37] Kim ES, Kim HK, Baik JS and Ji YT. Continuous ilioinguinal-iliohypogastric nerve block for groin pain in a breast-feeding patient after cesarean delivery. Korean J Pain 2016; 29(3): 193-196.
https://doi.org/10.3344/kjp.2016.29.3.193

[38] Gucev G, Yasui GM, Chang TY and Lee J. Bilateral ultrasound-guided continuous ilioinguinal-iliohypogastric block for pain relief after cesarean delivery. Anesth Analg 2008; 106(4): 1220-2.
https://doi.org/10.1213/ane.0b013e3181683821

Received on 15-12-2017 Accepted on 24-12-2017 Published on 31-12-2017

DOI: http://dx.doi.org/10.20941/2310-9394.2017.05.2