

# A Comparative Prospective Study between Caudal Epidural and Pudendal Nerve Block as a Choice of Anesthesia and Post-Operative Pain Relief in Perineal Surgeries

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Article History:

Submitted: 17.10.2019

Revised: 21.12.2019

Accepted: 09.01.2020

## ABSTRACT

The regional anesthesia is well tolerated and reliable type of anesthesia in perineal surgery. Patients could be potentially benefited from nerve block by avoiding the complications of general anesthesia. Both Caudal and Pudendal nerve block are very applicable, safe, affordable and effective method, because both of them are much more less complications in comparison with other types of anesthesia like neuroaxial & GA. The aim of this comparative prospective study is to compare between Pudendal Nerve Block (PNB) and Caudal Epidural Block (CEB) as a choice of regional anesthetic technique in patients proposed for perineal surgeries (Anal surgeries, episiotomy and posterior vaginal wall repair).

### Patients and Methods

This study was carried out in AlFaihaa Teaching Hospital in Basra-Iraq duration of study between the date of February to October 2019, included 70 patients in both genders; all cases are randomly allocated into two groups who underwent different perineal surgeries. The first group (A) received PNB (N=35), and second group (B) received CEB (N=35). The pain score was evaluated according to the visual analogue score from (0 to 10) ascending according to the pain severity.

### Results

The age of patients included in this study was between 17-45 years old. There was no significant statistical association between the age and

gender regarding the choice of RA approach, the heart rate and the mean arterial pressure (MAP) have no statistically significant but the pudendal nerve block showed significantly associated with less changes in blood pressure readings and to a lesser extent heart rate in comparison with caudal block. The patients who underwent pudendal nerve block had a significantly lower pain scores rather than caudal block and P-value=0.03, which was lasting two hours postoperatively therefore P-value < 0.0001, which is highly significant.

### Conclusion

In this observational comparative study that showed the Pudendal nerve block was more efficient for providing a good surgical anesthesia and post-operative pain relief than CEB based on Visual Analogue Score (VAS)

**Key words:** Regional anesthesia- pudendal nerve block, caudal block, visual analog score, perineal surgeries.

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DOI: [10.5530/srp.2020.1.20](https://doi.org/10.5530/srp.2020.1.20)

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## INTRODUCTION

Regional anesthesia (RA) is anesthesia of choice in pelvic floor operations to achieve good surgical anesthesia and post-operative pain relief, short hospital staying, encourage physical activity, good postoperative cognitive function and decrease the morbidity and mortality with more safe and less cost than GA, although GA has more successful rate than RA even in the presence of expert hands while 50% successful rate in RA [1-3]. The operations were included in the area of pelvic floor ex: anal fissure, hemorrhoidectomy, posterior vaginal wall repair and episiotomy & all of them were carried out under pudendal or caudal block.

### Caudal-epidural canal block (CEB)

During caudal anesthesia (CEA) there is a leakage of local anesthesia (LA) through the foramina explains the high quality of analgesia, attributed to diffusion of LA along the nerve roots. Spread of analgesia cannot be enhanced above T8-T9 by increasing injected LA volume. The Dural sac (i.e. the subarachnoid space) ends at the level of S3 in infants and at S2 in adults and children. Accidental puncture of dural sac during caudal canal block is possible mostly in blind technique, leading to extensive spinal block. Therefore, the needle or cannula must be cautiously advanced into the sacral canal, after crossing the sacrococcygeal ligament. The distance between the sacral hiatus and the dural sac is approximately 10 mm in neonates. It increases progressively with age > 30mm at 18 years [5].

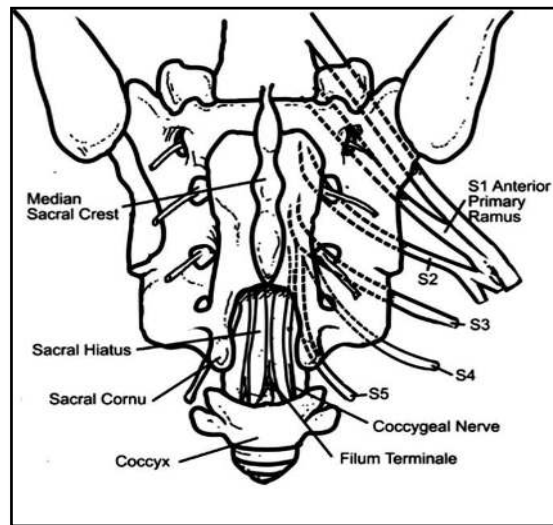


Figure 1: The posterior aspect of the sacrum and sacral hiatus

#### The indications for single shot CEA

Lower urological & orthopedic procedures at the level of sub-umbilical, pelvic and genital areas, or used as pain killer in lower limbs surgeries where postoperative pain does not require prolonged & strong analgesia. The operations are inguinal, umbilical herniorrhaphy, orchidopexy, and hypospadias. CEB is useful for daycase surgery (posteriorvaginal wall repair, anal fissure and hemorrhoidectomy) is used as well for repair a complex hypospadias with the urethra-cutaneous fistula & to optimize the CEB an adjuvant short acting systemic analgesia can be added to prevent pain resurgence and to obtain good post-operative pain relief [5-6], however, CEB is not free from complication but uncommon (0.7/1000 cases) are more frequent in infants as a result of:

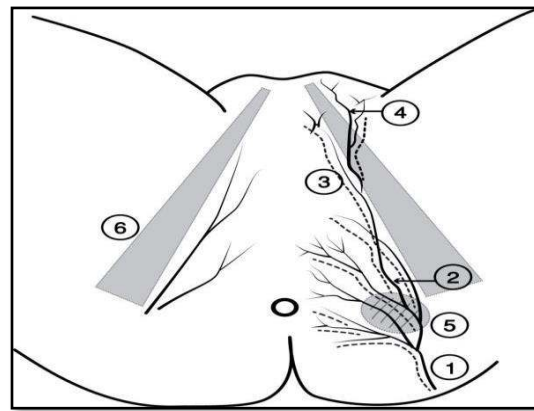
- Short postoperative analgesic time due to maldistribution of LA in caudal canal that leads to segmental preservation.
- Dural puncture: If the needle is advanced excessively in the sacral canal when subarachnoid injection of LA agent may cause extensive spinal block [5-11].
- Vascular or bone puncture can lead to intravascular injection and consequently LA systemic toxicity. Sacral

perforation can lead to pelvic organ damage (e.g. rectal puncture) [5, 7, 12-13].

- The large volume of LA that use for CEB can be related with cardiovascular, neurological and motor block complication in form of lower extremity weakness and/or numbness [12-13].
- Late presentation of respiratory depression secondary to caudally injected opioid [14].
- Delayed postoperative micturition and urinary retention as a result of prolong sacral root block [14].

#### Pudendal Nerve Block (PNB)

Pudendal nerve exit from S2-S4 nerve roots, and gives off the inferior rectal nerve supplying the external anal sphincter and the skin around anus, perineal nerve supplying the skin of scrotum or labium magus and small twigs to muscles, dorsal nerve of the penis or clitoris, the medial and lateral posterior scrotal or labial nerves and the visceral branches supplying the rectum and bladder are other branches. Some areas of the perineal and valve skin are innervated by the ilioinguinal, genitofemoral, posterior femoral cutaneous nerves and by cutaneous branches of S2-S4 [15-16].

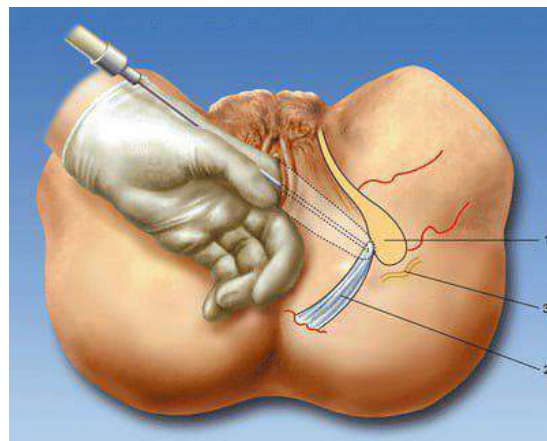


**Figure (2): Illustration showing pudendal nerve, vessels, and bony landmarks**

(1) Pudendal nerve (2) Perineal nerve (3) Posterior scrotal nerve (4) Dorsal nerve of penis (5) Injection area (local anesthesia) (6) Ischial spine [12]

The junction of the sacrospinous ligament with the Ischial spine may be taken as landmark for the site of pudendal nerve

during infiltration that must be repeated on both sides trans-vaginally or trans-perennially [16-17].



**Fig. 3: Transvaginal pudendal nerve block approach [39]**

(1) Ischial spine (2) Sacrococcygeal ligament (3) pudendal nerve

PNB routinely performed in female via a Trans-vaginal approach, and it is more technically challenging in men, requiring an alternative approach such as trans-rectal, and trans-gluteal techniques [18-19]. Objective improvements have been realized by the real time imaging of the target nerves and surrounding anatomical structures rather than the surface landmarks and the assumption of typical anatomy. These include C-arm fluoroscopy, nerve stimulators, ultrasonography (U/S) and computerized tomographic (CT) equipment; the PNB has been more successful. Although the use of this equipment made multiple injections with fewer complications but it is time challenging. Even though the ultrasound-guided PNB is widely used to provide an effective, safe, and relatively accessible RA and has a dramatic impact of PNB application in form of high patient satisfaction, less cost for both the patient and the hospital by contributing shorting of hospitalization and more expedite of the patient's daily activities [20]. In children, PNB is not less effective than CEB& is considered as an alternative option of anesthesia in

hypospadias surgery with better postoperative pain relief [21]. PNB may be superior to single dorsal penile block for circumcision and other outpatient pediatric genitourinary procedures allowing for greater percentage of narcotic sparing. The complications include unintentional sciatic nerve block, intravascular injection, retroperitoneal hematoma, retro-psoas or sub-gluteal abscess and rectal puncture [22].

#### Use in Anal surgeries

Majority of anorectal disorders are schedule for elective ambulatory surgery & RA in combination with intravenous sedation considered as anesthesia of choice for day-case surgery, more rapid recovery, less postoperative morbidity, and potentially reduced costs associated with inpatient care [23-24]. Anorectal surgery requires deep anesthesia to block the reflexogenic zone which is innervated by multiple nerves [25]. Hemorrhoidectomy associated with intense postoperative pain in the first 24 hours efficient to cause urine retention and constipation therefore the anesthetist should be

aware about these serious complications& take all efforts to prevent this complications.

### The use in labio-vaginal surgeries

The pain of Episiotomy repair has been a fairly neglected, underestimated and poorly treated, although it is a severe and can leads to significant physiological & psychological disorder that interfere with basic daily activities and adversely impact later on. On the life experiences which called Post Trauma Stress Disorder (PTSD). Local anesthetic injection into the episiotomy incision line is the usual method for pain relief during repair [27-28]. The PNB has been used as an alternative to epidural analgesia during the second stage of labor that provides good analgesia [27-29], good patients and surgeon satisfaction, shorter recovery time [30], and improves the accuracy of needle placement when using with nerve stimulator [30-31].The long-term effect of PNB on reduced the intensity of pain could be interpreted by the ability of patients to sit, move, walk at 24 and 48 hours postoperatively, and resuming the daily activities in a short period, unlike the patients who underwent the surgery under GA [29-31].

### THE AIM OF THE STUDY

The main aim of the present study is to compare the efficacy of pudendal nerve with caudal-epidural block in pelvic floor surgeries &providing good postoperative condition.

### PATIENT & METHODS

This is an observational comparative study was carried out in AL-Faihaa Teaching Hospital in Basra in a time between February to October 2019.Afterapproved by ethical of Iraqi Council of Anesthesia and Critical Care, a written informed consent was obtained from 70 patients who were enrolled in the study as they fulfill the following inclusion criteria:

- Patient's with elective operation with the American Society of Anesthesiologists grade I and grade II.
- Age range of (17-45) years.
- Patients who were scheduled for elective perineal surgeries (hemorrhoidectomy, anal fissure, posterior vaginal wall repair).
- Females who were prepared for episiotomy.

The exclusion criteria were:

- Any patient with visual analog score (VAS) more than 4.
- Any patient who refuse to participate in the study.
- Patients with infection at the possible injection sites.
- Patient who had proven hypersensitivity to amide group local anesthetic.
- Patients with any psychiatric illness.
- Any patient with a previous history of coagulopathy to avoid perineal and epidural hematoma.

Preoperatively all patients were educated about VAS for pain, where (0) point represents no pain at all, and (10) points represents the worst maximal pain the patient ever had.



Fig. 4: The visual analogue scale used by patients to quantify their pain felt after injection.

All the cases were randomly allocated in to tow groups The first group(A) contained 35 patients who underwent PNB received 10 ml of 2% lidocaine on each side for blocking the

pudendal nerve , and the second group(B) included 35 patients who received CEB were 15 ml of 2% lidocaine injected in the caudal canal for caudal canal block.

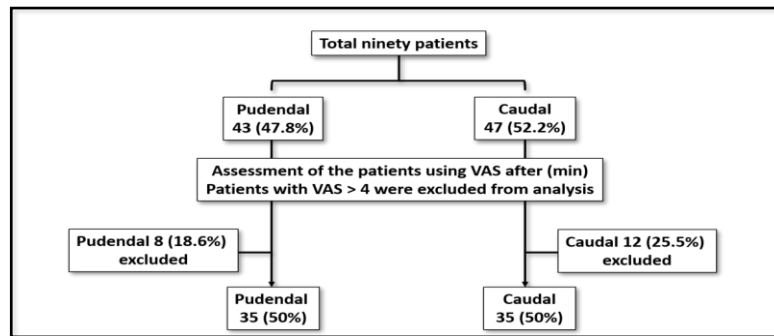


Fig. 5: Scheme of the study design

### Pre-operative Preparation

- Primary cleaning and sterilization of the required area by providence iodine.
- Preparation of appropriate sterile gloves, 20ml syringe contains local anesthetic 2% lidocaine and a 50-100mm, 21-gauge spinal needle and 18-gauge Touhy needle.
- The block performed with the patient in a lithotomy position regarding PNB, and in a lateral decubitus or prone position for CEB.
- All patients received 10 mg ketamine and 2 mg midazolam intravenous injection as a mild analgesia after obtaining an intravenous access, except episiotomy repair according to recommendation of obstetrician because they wish to do their intervention while the patient awake to preserve expulsive effort under small dose of pethidine.
- Standard monitoring of the vital signs included non-invasive blood pressure monitoring (NIBP), three leads electrocardiography (ECG), pulse oximetry (SPO<sub>2</sub>), and capnography.

### In Pudendal Nerve Block

- The patient is set in a lithotomy position; the anal mucocutaneous border is identified.
- Palpation of Ischial spine was done per rectum as a guide for needle pathway toward the pudendal nerve.
- Twenty-one-gauge spinal needle is directed to the mucocutaneous rectal tissue, the needle is introduced perpendicularly to the skin at position 9 o'clock approximately 2 to 2.5 cm from anal verge, and advanced with slight lateral deviation from superficial to deep (parallel to lateral wall of rectum). The structures traversed are the skin, subcutaneous tissue and the subcutaneous perineal tissue.

- The tip of the finger beside Ischial spine to feel the movement of the needle. In this place it is essential to be very careful to avoid puncturing the rectal mucosa or an accidental puncture of the finger.

- 10 ml of 2% lidocaine are performed after negative pressure to exclude any inadvertent vascular injection, at two a clock wise points in 3 and 9 o'clock (Ischial tuberosities), in to the submucosal tissue (posterior to Ischial spine, at the attachment of the sacrospinous ligament).

- PNB does not abolish sensation to the anterior part of the perineum, as perineum is supplied by branches of the ilioinguinal, posterior femoral cutaneous nerve and genitofemoral nerves, so simultaneous perineal wall infiltration were done to the patient.

### Caudal Block Technique

- Sterilization of the recommended area was due by povidone iodine and patient put either in lateral decubitus or prone position.

- Touhy 18-gauge needle was inserted at 45° to avoid any accidental rectal injury after palpation of sacrococcygeal clefts.

- Under negative pressure syringe to exclude any vascular or dural puncture, 15 ml of 2% lidocaine were then injected in 30-60 seconds, while monitored respiratory and hemodynamic parameter.

### Statistical Evaluation

We used the Software Statistical Packages for Social Sciences (IBM-SPSS-23). The demonstration of different variables in the study was by the use of the mean  $\pm$  standard deviation (SD). The level of significance of p-value less than 0.05 was considered as significant.



RESULTS

Table (1): Patients demography

Variable		Regional anesthesia type groups		P value
		Caudal (N=35) Mean ± SD or N (%)	Pudendal (N=35) Mean ± SD or N (%)	
Age (years)		28.5 ± 7.7	29.4 ± 8.2	0.66
Gender	Men	4 (11.4)	7 (20)	0.32
	Women	31 (88.6)	28 (80)	
Surgery				
Anal fissure		9 (25.7)	5 (14.3)	0.53
Hemorrhoids		6 (17.1)	10 (28.6)	
Episiotomy		10 (28.6)	10 (28.6)	
Posterior vaginal repair		10 (28.6)	10 (28.6)	
Co morbidities				
Diabetes mellitus		2 (5.7)	4 (11.4)	0.62
Hypertension		2 (5.7)	5 (14.2)	
Baseline vitals				
Heart rate (beats/min)		76.2 ± 10.5	78.2 ± 10.6	0.43
Systolic blood pressure (mmHg)		122.8 ± 12.7	122.3 ± 11.1	0.84
Diastolic blood pressure (mmHg)		80.0 ± 8.0	81.1 ± 9.0	0.57
Mean arterial pressure (mmHg)		94.3 ± 8.2	94.8 ± 8.8	0.78
Abbreviations: SD: Standard deviation				

Table 1 demonstrates the different characteristics of the patient in this study. Most of the patients were of young and middle age groups with an age range of (17-53) years. The mean age for patients in each group is similar (28.5 ± 7.7 years old for patients with caudal block), and (29.4 ± 8.2 years old for patients with pudendal nerve block). The age

distribution had no significant association with the choice of the type of the regional block, and this demonstrates a p-value of (0.66). Regarding the gender of the patients had no any significance in the current study (around 84% of the patients) Were female.

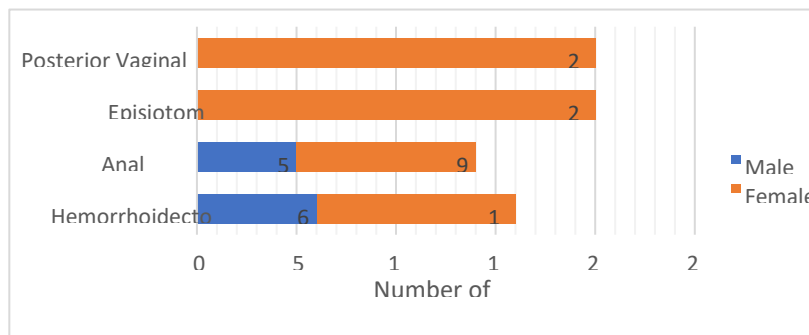
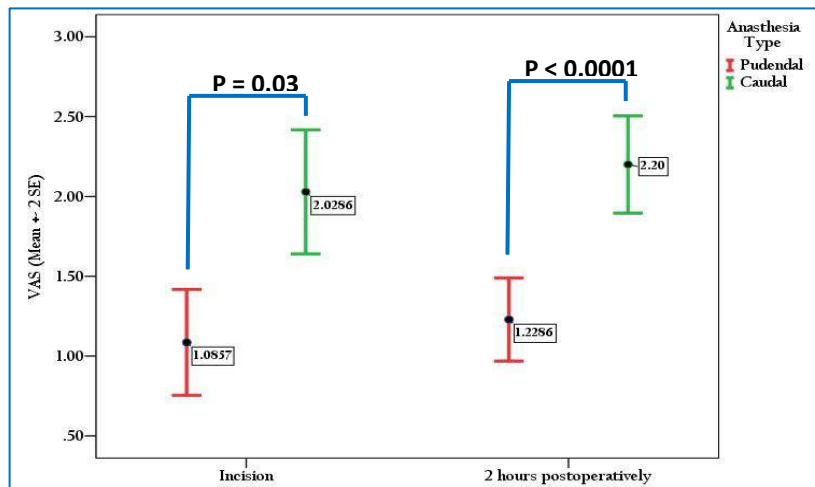


Fig. 6: Gender distribution according to the surgical interventions

The study demonstrates no significant relation between the type of the surgical procedure and the choice for the initial RA (p-value=0.53), especially in the females, in whom they were distributed nearly similarly between the two groups of the RA. The presence of co morbidities like hypertension and diabetes mellitus had no significant association with the choice of the

primary RA technique, and had a (p-value=0.62). The study demonstrated no significant relationship between the different vital signs (HR and MAP) to the choice of RA whether CEB or PNB, as they have a p-value > 0.05.



**Fig. 7: The effect of regional anesthesia types on visual analog score (VAS) of the patients at the time of skin incision and at two hours postoperatively VAS: Visual analog score, SE: Standard error**

Figure 7 demonstrates the VAS of the patients in the current study at the time of skin incision and at two hours postoperatively. At the time of skin incision, it was obvious that the patients who underwent the PNB had lower mean VAS than the patients who underwent the CEB±SD (1.0857 versus 2.0286), and described a significant association with the

use of PNB with (p-value=0.03). The VAS at two hours postoperatively was lower for patients who underwent the PNB when compared to the patients who underwent the CEB ±SD (1.2286 vs. 2.20), with a significant relation with the use of PNB and the p-value <0.0001 which is highly significant.

**Table 2: The impact of regional anesthesia on hemodynamic parameters during skin incision**

Regional anesthesia type groups			
Vital signs	Caudal (N=35) Mean ± SD	Pudendal (N=35) Mean ± SD	P value
Heart rate (beats/min)	81.6 ± 10.4	82.2 ± 11.5	0.81
Systolic blood pressure (mmHg)	129.8 ± 11.1	125.7 ± 11.6	0.13
Diastolic blood pressure (mmHg)	85.2 ± 7.6	82.8 ± 9.8	0.25
Mean arterial pressure (mmHg)	100.1 ± 7.2	97.1 ± 9.5	0.14
Δ Heart rate (beats/min)	5.3 ± 4.8	3.9 ± 4.4	0.23
Δ Systolic blood pressure (mmHg)	7.0 ± 8.5	3.4 ± 5.2	0.03
Δ Diastolic blood pressure (mmHg)	5.2 ± 5.6	1.7 ± 4.1	0.004
Δ Mean arterial pressure (mmHg)	5.8 ± 5.7	2.2 ± 4.1	0.004

Abbreviations: SD: Standard deviation

Table 2: The patients who underwent different RA techniques had nearly similar of mean vital signs regarding the baseline reading and at the time of skin incision with no significant association between the two choices of RA. But, when considered the difference between the means of the vital signs at the skin incision and those at the base line reading wise, found that there is significantly less changes in SBP and DBP, and the MAP when use the PNB rather than the CB. The PNB is associated with a less change in the HR in comparison to the CB, but this association is not significant. RA in the perineal surgeries considered as anesthesia of choice in pediatric age group, but they are debated in other age group. No significant association in age distribution of the patients and the type of

RA whether PNB or CEB. As in study was published by Aissaoui et al. studied the effect of PNB in pain relief in 40 women who had vaginal delivery with episiotomy, and found no significant association between the age distribution and the type of neither regional anesthesia nor the post-episiotomy pain [27]. Alkhalidi et al compared the postoperative outcome between PNB and CEB after lateral open internal sphincterotomy regardless the gender and age of the patients [15]. Both of previous studies were matching to the current study. Around 84% of the enrolled patients were females with different perineal interventions. Figure 4 demonstrates the gender distribution according to the surgical interventions. The gender has no significant statistical association with the

choice of the RA required with a p-value of 0.32. Two surgical interventions are exclusively for women (episiotomy and posterior vaginal repair); which made the statistical evaluation for association between gender and the type of intervention statistically inappropriate. Sirikurnpiboon et al assured such non-significant association between the gender and the choice of the RA in a cohort of 91 patients (51 women and 40 men) with a (p-value=0.993) [33]. Borges et al ascertain this non-significant relation between gender and the choice of RA in a cohort of 40 patients with hemorrhoidectomy (19 women and 21 men) with a (p-value=0.07) [34]. Imbelloni et al evaluated the postoperative analgesia for hemorrhoidectomy with bilateral pudendal blockade in 100 patients (52 women and 48 men) with a no significant (p value) of 0.57 [17]. This study evaluates the choice of PNB and CEB in four surgical interventions only, where no significant association is shown with the choice of RA. Different studies have evaluated (single perineal surgery) using PNB versus CEB in different age groups. There are no significant differences in patients with chronic disease like HT and DM. Aslan et al revealed also no significant association with the patients with chronic disease like HT and DM, they manage 11 older patients with diabetes out of a cohort of 48 patients to perform a prostatic biopsy by using the PNB [35]. The protocol of elective surgeries done on the patients had ensured euglycemia, normal BP readings, and a normal ECG, to proceed with the elective procedure. This no significant association was reflected on the normal ranges of the baseline preoperative measures of HR and MAP, which in turn had no significant association to the choice of the RA compared with pre and intra operative vital sign reading. Li et al study demonstrated similar results regarding the no significant association between both the HR and the MAP with the choice of RA techniques in patients with different anorectic procedures, although all patients were older (age range of 24-65 years) with a mean age of 40 years [25]. Naja et al demonstrated higher HR and lower MAP during evaluation of pediatric patients who underwent PNB and CEB for hypospadias surgery [12]. There was a negligible change in the HR and MAP, were still in the normal range and carried no significant association to the choice of the RA, especially in PNB rather than the CEB. The mean differences of the values of the HR and MAP in preoperative shown a significant association with the type of RA in favor of the PNB. Khalil et al evaluated 57 women who underwent posterior vaginal repair using the PNB, and found that the MAP variability from non-significant association preoperatively, to be significantly associated with the RA study and this was true at the intraoperative and postoperative period. The change in the MAP was also significant. Xiaoqiang et al demonstrate significantly lower HR and BP reading postoperatively when compared to the baseline measures during evaluation of 182 male patients had PNB for a regional urological intervention, with a significantly lower VAS up to 24 hours postoperatively [36]. Kim et al had one patient with postoperative tachycardia, and one patient with hypotension out of 53 patients underwent different perineal surgeries using the PNB [19]. Imbelloni et al described no change in the blood pressure and heart rate of 35 patients underwent PNB for different perineal interventions [37].

Although an equal number of patients underwent the PNB or CEB, they demonstrated a significantly lower VAS with the PNB rather than the CEB as illustrated in figure 7, with a (p-value<0.05), when compared at the time of skin incision and at two hours postoperatively. Naja et al evaluated the PNB as RA in comparison to the GA in young and middle-aged patients with hemorrhoidectomy and found it has a significantly lower VAS in another study had demonstrated a statistically significant better postoperative satisfaction with the PNB when compared to the CEB in children, with a corresponding higher dose of analgesia in the CEB group [31]. Aissaoui et al revealed a lower VAS in PNB women with episiotomy when compared to the control group, using an equivalent dose of the ropivacaine, and stay lower even 24 hours postoperatively [27]. Khalil et al compared the VAS score pre and postoperatively for the women with posterior vaginal repair, using the PNB in comparison to the GA, and found a significantly lower VAS score and better satisfaction for the PNB group in comparison to the GA group [29]. Although Kendigelen et al and Tutuncu et al used a different pain score than VAS; they concluded that the PNB led to a significantly lower pain score than the CEB up to 24 hours postoperatively in children with urological interventions. Alkhalidi et al demonstrated that young and middle-aged patients with lateral open internal sphincterotomy had a significantly better VAS if they use PNB in comparison to CEB, although the two procedures did not differ in the postoperative stay and postoperative analgesia [15]. The rate of successful caudal blockade depends on sacral anatomical abnormalities in the adult population and the anesthesiologist's experience [38], even though the degree of blockade by either technique may be affected by the diversity of the neural innervations of the perineal area [8], spectrum of this study that would be made a clinical oriented comparison of the two anesthetic techniques in ordinary clinical practice setting.

#### **Limitations**

There are few limitations that present in this study as following:

- The VAS is a subjective tool for evaluation of pain in different person with different thresholds for pain, and different blockade levels that are why to minimize the degree of bias by give the sedation.
- The study enrolled patients with an initial VAS score  $\leq 4$ , which made us unable to verify the efficacy of both techniques in patients with higher pain score.
- The direction of the needles was done according to the anatomical landmarks, that might be subjected to variation in the adult patients could be reasonable in practice.

Whether PNB or CEB, both of them can be used for carried out different perineal surgeries associated with minimal limitations as they provide acceptable post-operative pain control. The study approved that the PNB more efficient option of anesthesia than CEB when VAS is considered.

#### **CONCLUSION**

All parameters of the current research approved that the PNB is more convenient type of anesthesia provide a good surgical



anesthesia & post-operative analgesia in different perineal surgeries with good surgeon and patient satisfaction.

## RECOMMENDATIONS

- 1- To optimize the result of the current research & to minimize the possibility of failure of block it's prefer to do a good preparations for all patient & to do CEB guided by ultrasound to ensure the appropriate placement of local anesthesia in the caudal canal.
- 2- To increase the number of cases to give more strong statistical result.
- 3- Keep the patients under monitoring at postoperative longer than the time was mentioned to check the duration of the analgesic effect of each technique in association with vital sign.

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