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COMPARISON OF SADDLE VERSUS CAUDAL EPIDURAL ANESTHESIA IN THE MANAGEMENT OF PATIENTS UNDERGOING AMBULATORY PERIANAL SURGERY

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ABSTRACT

Background: Choosing the right anesthesia is vital for optimal patient comfort and surgical outcomes in anorectal surgery. Saddle and caudal epidural blocks, while both managing pain, vary in effectiveness, safety, and impact on perioperative factors. **Aim of the study:** The study aims to compare between the caudal block and saddle block regarding the onset of action, duration and hemodynamic changes, also assessing postoperative pain levels and patient satisfaction in patients undergoing anorectal surgery. **Patients and methods:** This prospective randomized clinical trial was conducted from August, 2022 to September, 2023 at Baghdad Teaching Hospital and Al-Imamain Al-Kadhimain Medical City, involving sixty adult patients who were scheduled for perianal surgery. Thirty patients received spinal saddle anesthesia and the other 30 received caudal epidural block. Data collection involved demographics, anthropometrics, operation time, onset of sensory block. In addition, the modified Bromage scale, heart rate, mean arterial pressure were recorded at distinct time points. Post-operative pain, patient and surgeon satisfaction were also recorded. **Results:** Study baseline characteristics (age, sex, BMI, and ASA) were similar between the two study groups. Caudal epidural group exhibited a delayed sensory block onset time compared to the saddle block (13.5 ± 3.0 versus 3.8 ± 1.8 min, P-value < 0.001). Heart rate and mean arterial pressure were comparable between the groups. Caudal epidural group was better at preserving motor function intra-and postoperatively. Although the saddle block group reported higher pain scores at the 12-hour mark (3.8 ± 1.3 versus 2.5 ± 1.3, P-value < 0.001), overall patient satisfaction was significantly better in saddle block group compared to the caudal epidural group (P-value < 0.001); while surgeon satisfaction was similar between both groups. **Conclusion:** Both anesthesia groups maintained similar hemodynamic stability. Caudal epidural demonstrated delayed sensory block onset, nonetheless better in preserving motor function. Although caudal block provided superior pain control, overall patient satisfaction was higher with saddle block anesthesia.

KEYWORDS: Ultrasound guided caudal epidural; Saddle block; Perianal surgery.

INTRODUCTION

Advances in anesthetic and surgical techniques led to an increase in outpatient surgical procedures. Performing several surgeries in outpatient setting not only reduces healthcare costs but also increases patients' satisfaction due to same day discharge after the procedure.[1]

Regional intravenous anesthesia, spinal and epidural block, peripheral nerve block, topical and local anesthesia are commonly utilized in anesthesia of outpatient surgical procedures.[2]

Perianal surgery which can be performed in outpatient setting is often performed for perianal abscess, perianal fistula, hemorrhoids, and anal fissures. General anesthesia, local anesthesia, and regional anesthesia techniques have traditionally been used in anesthesia management of patients undergoing perianal surgery.[3]

General anesthesia has been reported to prolong hospital stay and patient discharge as a consequence of postoperative nausea and vomiting and postoperative pain compared to local and regional anesthesia.[4]

On the other hand, perianal surgery with local anesthetic infiltration requires concomitant sedation which can reduce patient comfort.[5]

Regional anesthesia is preferred for anorectal surgeries to avoid the risks of general anesthesia. Besides providing effective post-operative analgesia, regional techniques reduce the opioid use. Despite the apparent advantages regarding patient safety, there is a lack of direct comparison for different regional techniques. Therefore, it still remains controversial whether to perform the ideal anesthesia method for anorectal surgeries.[6]

AIM OF THE STUDY

In this prospective, comparative randomized study, we aimed to.

- To compare the effects of caudal block and saddle block in patients undergoing anorectal surgery in terms onset of action, duration and intraoperative hemodynamic changes.
- To study postoperative pain and patients' satisfaction in subjects undergoing perianal surgery in outpatient setting.

PATIENTS AND METHODS

This prospective randomized clinical trial has been conducted at Baghdad Teaching Hospital and Al-Imamain Al-Kadhimain Medical City, general surgery operating room; from August 2022 to September 2023.

Ethical and scientific approval for the research was obtained from the Scientific Committee at the Department of Anesthesia and Critical care, Iraqi board for medical specialization. Informed consent was obtained from all patients before starting data collection and after explaining the details of the study and assuring confidentiality.

Sixty patients who underwent anorectal surgery in the study hospitals were randomly assigned to one of two groups, Caudal epidural anesthesia (Group C, n=30) or Spinal Saddle Block anesthesia (Group S, n=30).

Inclusion criteria

- Age > 18 years old.
- American Society of Anesthesiologists (ASA) score of I, and II.
- Scheduled for perianal surgery for perianal abscess, perianal fistula, hemorrhoids, and anal fissures.

Exclusion criteria

- Patient refusal.
- Known hypersensitivity to the drug used in the study (Bupivacaine).
- Severe vertebral column deformities.
- Local infection in the intervention site.
- Any contraindication to the spinal or epidural anesthesia.
- BMI >35 Kg/m2.
- Extremely short stature.

Demographics, including age and gender, were recorded for all participants as well as the weight and height, the Body Mass Index (BMI) was calculated using the formula (BMI = Weight (Kg) / (Height in meters)2). The American Society of Anesthesiologist (ASA) score was assessed and recorded.

In the perioperative phase, the patient optimization started with cannula insertion (18-G) on the dorsum of the hand. Vital signs including heart rate, peripheral oxygen saturation (SpO2), Non-invasive blood pressure measurements, and continuous ECG monitoring were implemented. Baseline values were established. To address hypotension, defined as a drop >20% in MAP from the baseline or a systolic blood pressure drop below 90 mmHg, an intravenous ephedrine dose of 5-10 mg was administered. Bradycardia, defined as a heart rate <60 bpm, was managed with a 0.6 mg intravenous atropine injection.

In Group S, spinal saddle anesthesia was administered at the L4-L5 intervertebral space, with the patient in a sitting position and a midline approach. Under aseptic technique, a 25-G Quincke-type spinal needle was employed, and 7.5 mg of hyperbaric bupivacaine (1.5 ml volume, 0.5% concentration) was slowly injected into the intrathecal space. The patient remained in squatting position for 10 minutes to achieve an adequate block before being positioned supine with a 30- degree head elevation.

Group C received a caudal epidural block while in the prone position. Skin sterilization and local infiltration were performed. The sacral horns were palpated, and the sacral hiatus and epidural space were located at the S5 level using ultrasound guidance with a linear probe. A 22 G echogenic needle was inserted in plane technique from the skin to the sacral hiatus through the sacrococcygeal ligament, and 20 ml (100 mg) of 0.5% bupivacaine (Marcaine) was injected into the epidural space. Adequate spread of the local anesthetic was confirmed. The time taken to complete the block was about 10 minutes then the patient was then placed in the supine position with a 30-degree head elevation and waited for another about 15-20 minute before starting the surgery.

In addition to the operative time, Heart rate (HR) and mean arterial pressure (MAP) were recorded at distinct time points: pre-operatively (baseline reading); 5, 10, 15, 30 min post caudal/saddle block, and at 1-, and 15-min post-operatively.

The onset time of sensory block was assessed using pinprick at the midclavicular line starting caudally at lowest point to maximum cephalad spread of sensory block. In addition, motor block was evaluated using the modified Bromage scale at the following intervals: 5, 10, 15, 30 min post caudal/saddle block, and at 1-, and 15-min post-surgery (table 1).[7]

Table 1: Modified Bromage Scale.

SCORE	CRITERIA
0	The patient is able to move hip, knee, and ankle.
1	Patient is unable to move hip but able to move knee and ankle.
2	Patient is unable to move hip and knee but able to move ankle.
3	Patient is unable to move hip, knee, and ankle.

Post-operatively, both surgeon and patient satisfaction were assessed using a 4-point Likert scale[8] (1 indicating low satisfaction, 2 indicating moderate satisfaction, 3 indicating good satisfaction, and 4 indicating perfect satisfaction).

The postoperative pain was assessed using the Visual Analogue Scale (VAS) (where 0 indicates no pain at all and 10 indicates the most severe pain ever experienced by the patient).[9] VAS score was recorded at 15 min, 2, 6, and 12 hours post-operatively. Rescue analgesia was administered to patients with a VAS score >5.

Continuous variables were expressed as means and standard deviations or medians with range. Categorical variables were expressed as frequency and percentages. The Welch's t-test was performed to test the differences in means between the study group. The difference between categorical variables was investigated using either the $\chi 2$ test with yates' correction or Fisher's exact test, depending on the context. A P-value less than 0.05 was considered statistically significant. R software packages (dplyr, gt_summery and ggplot) were used for data processing, visualization, and statistical analysis ("R version 4.3.0, R Foundation for Statistical Computing, Vienna, Austria").

RESULTS

In this comparative study involving 30 patients who received Caudal Epidural anesthesia and 30 patients who underwent Saddle Block anesthesia, the mean age of patients in the Caudal Epidural group was 30.4 ± 5.3 years, while the Saddle Block group had a slightly higher mean age of 33.6 ± 11.7 years (p=0.13). Gender, BMI and ASA types were similar between the two groups. Operation time also was similar, with Caudal Epidural at 29.8 ± 5.3 minutes and Saddle Block at 30.9 ± 7.8 minutes (p=0.5) , apart from the time taken to complete the blocks(which takes about 10 minutes in caudal group in comparison to less than 5 minutes in saddle block group). Notably, the onset of sensory block differed significantly, with Caudal Epidural patients experiencing a longer onset time of 13.5 ± 3.0 minutes compared to 3.8 ± 1.8 minutes in the Saddle Block group (p<0.001). Additionally, the sensory block level demonstrated variation, notably in the L1 dermatome (p=0.009).

Table 2: Description of study baseline characteristics.

Characteristic	Caudal Epidural, N = 30[1]	Saddle Block, N = 30[1]	P-value[2]
Age (years)	30.4 ± 5.3	33.6 ± 11.7	0.13
Gender			0.6
Male	19 (63.3%)	17 (57.5%)	
Female	11 (36.7%)	13 (42.5%)	
BMI (kg/m^2)	26.6 ± 2.0	27.8 ± 3.1	0.7
ASA score			0.5
I	25 (83.3%)	32 (77.5%)	
II	5 (16.7%)	7 (22.5%)	
Operation time (min)	29.8 ± 5.3	30.9 ± 7.8	0.5
Onset of sensory block (min)	13.5 ± 3.0	3.8 ± 1.8	**<0.001**
Sensory block dermatome			**0.009**
L1	0 (0.0%)	6 (20.0%)	

[1]**Mean ± SD; n (%);**
[2]**Welch Two Sample t-test; Pearson's Chi-squared test**

There were no statistically significant differences in heart rate between the two groups at various time intervals, including baseline, 5 minutes, 10 minutes, 15 minutes, 30 minutes, 1-minute post-op, and 15 minutes post-op (p>0.05 for all). Similarly, mean arterial pressure showed no significant differences between the two groups at these same time points (p>0.05 for all). These findings suggest that heart rate and mean arterial pressure were comparable between patients receiving Caudal Epidural and those receiving Saddle Block anesthesia throughout the observed time intervals.

Table 3: Comparison of vital signs between both groups.

Characteristic	Caudal Epidural, N = 30[1]	Saddle Block, N = 30[1]	P-value[2]
Heart rate (beats/min)			
Baseline	87.9 ± 10.7	84.5 ± 13.9	0.3
After 5 min	87.9 ± 10.2	85.0 ± 14.5	0.3
After 10 min	86.5 ± 10.2	83.6 ± 14.3	0.3
After 15 min	84.9 ± 9.2	82.8 ± 14.6	0.5
After 30 min	86.1 ± 8.2	82.0 ± 11.6	0.088
1 min post-op	85.1 ± 8.4	82.5 ± 11.4	0.3
15 min post-op	83.8 ± 8.7	82.2 ± 10.7	0.5
Mean arterial pressure (mmHg)			
Baseline	95.6 ± 17.2	99.4 ± 16.7	0.4
After 5 min	93.9 ± 15.8	100.1 ± 18.1	0.13
After 10 min	94.1 ± 15.7	95.9 ± 14.7	0.6
After 15 min	92.2 ± 14.6	93.6 ± 16.0	0.7
After 30 min	91.1 ± 15.6	95.4 ± 14.6	0.2
1 min post-op	90.2 ± 12.9	94.2 ± 12.0	0.2
15 min post-op	90.1 ± 12.8	94.6 ± 12.2	0.14

[1]Mean ± SD
[2]Welch Two Sample t-test

The study compared motor block outcomes using the Modified Bromage scale in patients who received either Caudal Epidural (N=30) or Saddle Block (N=30) anesthesia After 5 minutes of onset, a significant difference was observed (p=0.034), with 100.0% of Caudal Epidural patients showing no motor block, while 85.0% of Saddle Block patients had no motor block. At subsequent time points (10 minutes, 15 minutes, 30 minutes, 1-minute post-op, and 15 minutes post-op), highly significant differences were noted (p<0.001), with Caudal Epidural consistently outperforming Saddle Block in preserving motor function, as evidenced by a higher percentage of patients with no motor block.

Table 4: Comparison of motor block (modified Bromage scale) between both groups.

Modified Bromage scale	Caudal Epidural, N = 30[1]	Saddle Block, N = 30[1]	P-value[2]
After 5 min			**0.034**
0	30 (100.0%)	25 (85.0%)	
1	0 (0.0%)	5 (15.0%)	
After 10 min			**<0.001**
0	30 (100.0%)	21 (70.0%)	
1	0 (0.0%)	9 (30.0%)	
After 15 min			**<0.001**
0	30 (100.0%)	12 (40.0%)	
1	0 (0.0%)	18 (60.0%)	
After 30 min			**<0.001**
0	30 (100.0%)	9 (30.0%)	
1	0 (0.0%)	21 (70.0%)	
1 min post-op			**<0.001**
0	29 (96.7%)	10 (32.5%)	
1	1 (3.3%)	20 (67.5%)	
15 min post-op			**<0.001**
0	29 (96.7%)	8 (27.5%)	
1	1 (3.3%)	22 (72.5%)	

[1]n (%)
[2]Fisher's exact test; Pearson's Chi-squared test

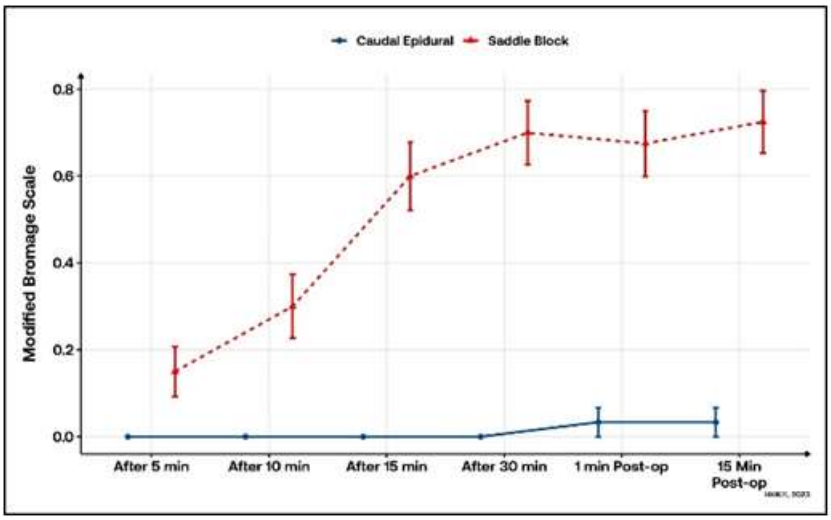

Figure 1: Mean Modified Bromage scale overtime stratified by the study groups.

The VAS scores were comparable between the two groups at 15 minute, 2-hour, and 6-hour postoperative marks with no significant differences (p-value > 0.05). However, at the 12-hour postoperative assessment, significant differences in VAS scores were observed between the two anesthesia techniques. The Caudal Epidural group had an average VAS score of 2.5 ± 1.3, whereas the Saddle Block group had a significantly higher average VAS score of 3.8 ± 1.3, with a p-value of less than 0.001.

Table 5: Postoperative visual analogue scale (VAS).

Characteristic	Caudal Epidural, N = 30[1]	Saddle Block, N = 30[1]	P-value[2]
15 min	1.5 ± 0.9	1.5 ± 1.0	0.9
2 hours	2.6 ± 1.7	2.5 ± 1.3	>0.9
6 hours	2.3 ± 0.7	2.9 ± 1.1	0.2
12 hours	2.5 ± 1.3	3.8 ± 1.3	**<0.001**
[1]**Mean ± SD** [2]**Welch Two Sample t-test**			

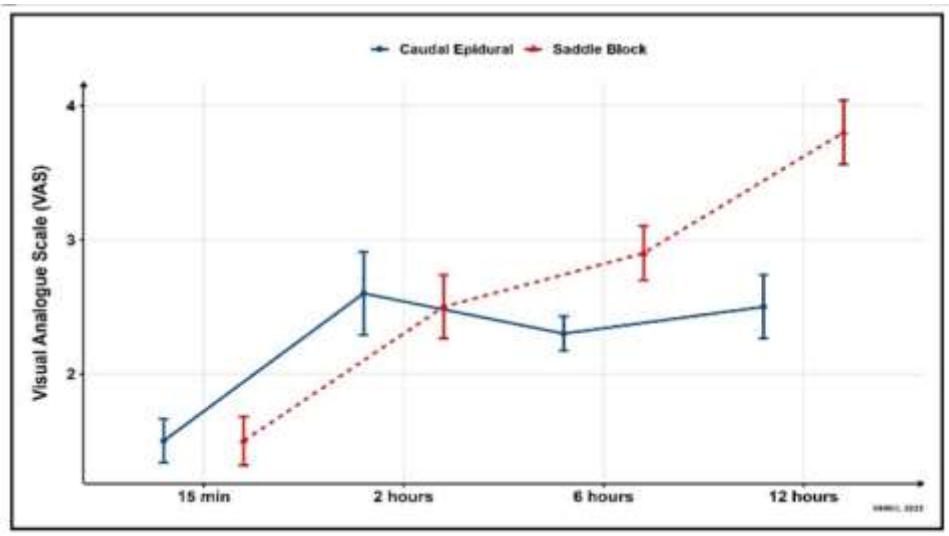

Figure2: Mean post-op VAS pain score stratified by the study groups.

Regarding patient and surgeon satisfaction, the Saddle block group had a significantly better patient satisfaction compared to the Caudal Epidural group (mean Likert score of 3 and 3.9 for the Saddle block Caudal Epidural group, respectively, P-value < 0.001). On the other hand, surgeon satisfaction was comparable between both groups.

Table 6: Patient and Surgeon satisfaction in the study groups.

Characteristic	Caudal Epidural, N = 30[1]	Saddle Block, N = 30[1]	P-value[2]
Patient satisfaction	3.0 ± 1.0	3.9 ± 0.3	**<0.001**
Surgeon satisfaction	4.0 ± 0.0	4.0 ± 0.0	>0.9
[1]Mean ± SD [2]Welch Two Sample t-test			

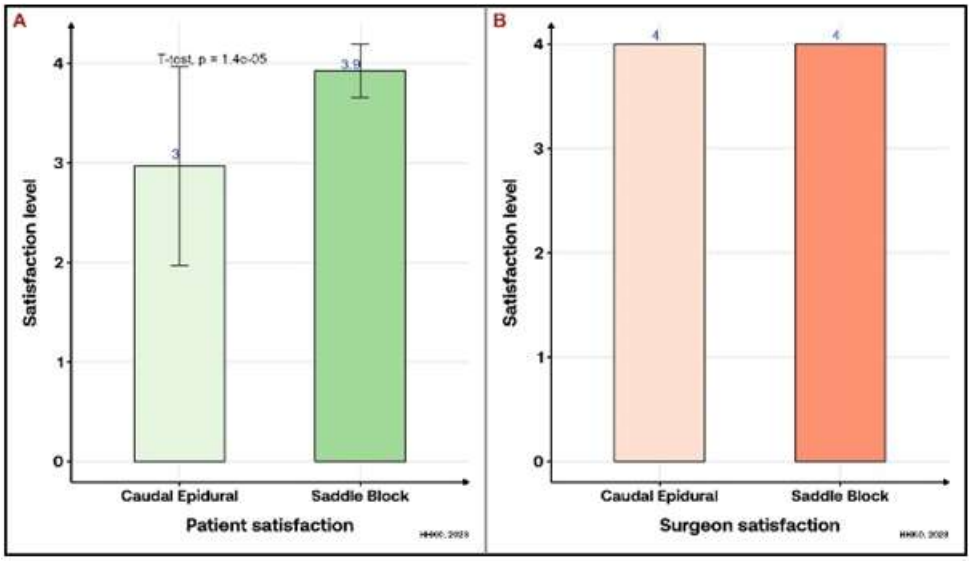

Figure 3: Patient and Surgeon satisfaction.

DISCUSSION

The management of patients undergoing perianal surgery is a critical aspect of perioperative care, and the choice of anesthesia plays a vital role in ensuring optimal patient comfort and surgical outcomes.[10] Saddle anesthesia or regional caudal block may be used for the anesthetic management of the perianal surgery.[11] These two techniques, while sharing the common goal of providing pain relief, differ in their efficacy, safety, and impact on perioperative variables.[12] This study specifically aims to examine how caudal block and saddle block affect the hemodynamic changes that occur during anorectal surgery. It also seeks to assess postoperative pain levels and patient satisfaction in those undergoing perianal surgery.

In this study 30 patients received Caudal epidural anesthesia and 30 patients undergone Saddle Block anesthesia. Caudal epidural group had a longer sensory block onset time and a significant variation in level of sensory block compared to saddle anesthesia. Heart rate and mean arterial pressure remained comparable between the two groups. Caudal epidural was better saddle block group in preserving motor function. VAS scores were similar except at the 12-hour mark, where saddle block group had higher pain scores. Patient satisfaction was significantly better in the saddle block group, while surgeon satisfaction was similar.

There was no significant difference in age or sex between the two groups. The time it took to complete the surgery was similar between the two groups, both in current study and in the study by Chen et al.[13]

The onset of sensory block was significantly delayed in the caudal epidural group (13.5 minutes) compared to the spinal anesthesia group (3.8 minutes). This difference was also noticed by Kamal et al. Singh et al. and Bozkurt et al.[14-16]

The level of sensory block also differed significantly between the two groups, with the spinal anesthesia group having a more extensive block mainly in L1 dermatome while none of those received the caudal epidural anesthesia had an L1 level sensory block.

No significant difference in heart rate between the two groups was found during the follow-up period. This finding agrees with the findings of other studies, such as those by Kamal et al. Ali et al. and Bozkurt et al.[15-17] However, Seyedhejazi et al.[18] found that heart rate was significantly lower in the caudal epidural group at several time points, including 10 and 20 minutes after the block, the beginning of recovery, 10 and 20 minutes after recovery, and at the end of recovery. This is further confirmed by Atya et al.[19] who found that heart rate was significantly different between the two groups at most time points. Variations in demographics of the included participants might contribute to the observed divergence in results. In the present study we noticed no significant differences in the mean arterial pressure among the two groups. Similar to what Kamal et al. Bozkurt et al., Ali et al. and Atya et al.[15-17,19] found in their study.

The current research revealed a noteworthy contrast in preserving motor function between the two groups, with the caudal epidural group consistently better than the saddle block in this aspect. Bozkurt et al.[15] investigation showed similar outcomes, highlighting an intense motor block in the spinal anesthesia group, while the caudal epidural anesthesia group exhibited no motor block. Conversely, Hoelzle et al.[20] identified motor block occurrence in both groups but with a significant divergence in the duration of motor block. This might be attributed to the difference in the dosage of the anesthetic formulation utilized in the previously-mentioned study.
As the results showed, this study disclosed substantial disparities in VAS scores between the two anesthesia techniques at the 12-hour postoperative evaluation with the caudal epidural block having a much better pain control than the Saddle block group. Correspondingly, Bozkurt et al.[15] observed this distinction at the 12-hour postoperative mark as well.

Although caudal epidural block has provided a better pain control, especially at the 12-hour mark, a marked enhancement in patient satisfaction within the spinal group was noticed, compared to the caudal epidural group. On the other hand, Chen et al.[13] reported a significantly lower satisfaction rate among spinal group patients compared to the caudal group. Surgeon satisfaction, on the other hand, was comparable between the two groups, aligning with findings from Chen et al. and Bozkurt et al.[13,15]

CONCLUSION

- Both saddle and caudal epidural block maintained hemodynamic stability during the procedures.
- Caudal Epidural anesthesia consumed more time to complete the block in addition to a delayed sensory block onset time which made patients prefer saddle anesthesia recently.
- Caudal Epidural block was consistently superior to saddle block anesthesia in preserving motor function and pain control especially at the 12 hours postoperatively.
- In the future, teaching doctors more about using ultrasound for caudal epidurals and educating patients about the procedure would increase patient overall satisfaction and offers less analgesia requirements in such surgeries.

RECOMMENDATION

The following recommendations might be proposed.

- It's recommended to use both anesthetic techniques in managing anorectal surgeries according to the patient's preference and anesthetists experience.
- Due to its preservation of motor function and superior postoperative pain management, it is recommended that anesthesiologists and surgeons consider incorporating the caudal epidural block in surgical procedures where regional anesthesia is used.
- Additional studies with larger sample size to enhance the study's overall statistical power are encouraged.
- Future studies should aim to control potential confounding variables such as comorbidities, concurrent medications, and patient characteristics that may influence outcomes.

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