COMBINED CAUDAL EPIDURAL WITH GENERAL ANESTHESIA FOR LUMBAR DISCECTOMY

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ABSTRACT:

Background: *Lumbar Discectomy can be effectively performed using various anesthetic techniques. General anesthesia is more frequently used for these surgeries, though regional anesthesia when combined with general anesthesia is proven to be safe in few studies.*

Aim of the Work: *To compare the intra operative and short term post-operative outcome variable in patients undergoing primary single level lumbar discectomy under combined caudal epidural with general anesthesia versus general anesthesia alone.*

Patients and Methods: *This study included 100 patients aging 25 – 40 years old, admitted to operating room in Ain Shams University hospitals for single-level lumbar discectomy. The patients were divided into two groups of 50 each: Group A received general anesthesia, Group B, in addition to GA, received caudal epidural using 20 ml Bupivacaine 0.25% injected in the caudal region.*

Results: *Intra operative HR, MAP, narcotic consumption, blood loss were lower in the Caudal Epidural with GA group. Post-operative 1st analgesia needed was less in the GA group. Post-operative VAS score and PONV were higher in the GA group when compared to combined caudal epidural with GA. There was no motor affection in both groups and sensory affection was with a median at T10 in the group receiving Caudal epidural with GA.*

Conclusion: *Epidural caudal anesthesia can safely be combined with GA for single leveled lumbar discectomy. It reduces intraoperative tachycardia and hypertension, blood loss, intra-operative and postoperative IV analgesic requirements and PONV.*

Keywords: *Lumbar discectomy, Caudal epidural anesthesia, Bupivacaine*

INTRODUCTION:

The surgical management of a prolapsed lumbar disc was first described by Mixter and Barr[(1)] in 1934. Less invasive procedures are nowadays commonly performed, leading to reduced recovery time and early discharge home from the hospital, which also leads to financial considerations in terms of cost savings[(2)]**.** Micro-discectomy for herniated lumbar intervertebral disc has been proven to be clinically superior to more conventional methods when performed as an outpatient procedure[(3)]**.**

Both general and regional anesthesia have been used for elective lumbar disc surgical procedures; however, general anesthesia is the more frequently used method[(4)]**.** The main reasons leading to a tendency towards the use of general anesthesia are associated with a higher

acceptance by patients and the ability to perform longer operations with a secured airway in the prone position[5].

Both spinal and epidural anesthesia have been performed for Lumbar spinal surgeries. In contrast with general anesthesia, spinal anesthesia reduces blood loss, shows less thromboembolic complication and short-term mortality, improves the view in the operating field by decreasing venous blood pressure and can lead to a decrease in the length of inpatient stays and overall costs[5]. Although anaesthesiologists are interested in spinal anaesthesia as a more reliable method, experience shows the prolonged operations performed in the prone position under spinal anaesthesia increases anaesthesiologist's stress. Especially, the managing of an apnoeic patient, providing an airway access and placing an endotracheal tube in the prone position are difficult[6].

In epidural anaesthesia, there were fewer fluctuations in heart rate and blood pressure that needed any intervention from the anaesthesiologists. Patients experienced less nausea and vomiting. The total blood loss due to surgery was also significantly less. In addition to reporting less peak pain postoperatively, patient satisfaction was better in the epidural group[7].

Caudal anesthesia has a couple of distinct advantages over lumbar epidurals and spinal anesthesia. Unlike an epidural block, a caudal block provides more reliable perineal anesthesia. As mentioned earlier, the number of instances in which a lumbar epidural is unable to block the S1 dermatome level is extremely high (6.7-21%). In addition, the likelihood of a Dural puncture is less with a caudal block than with an epidural block[8].

When compared to a spinal block, the advantages of a caudal are many. The duration of a single dose caudal is longer than a single-dose spinal. In addition, the incidence of post-dural puncture headache is extremely low with a caudal block[8].

Hence, we conducted a randomized study comparing the intraoperative variables, postoperative complications, efficacy of caudal Epidural anesthesia with General anesthesia for elective single leveled lumbar discectomy procedures.

AIM OF THE WORK:

The aim of this study is to compare the intra operative and short term post-operative outcome variable in patients undergoing primary single level lumbar discectomy under combined caudal epidural with general anesthesia versus general anesthesia alone.

PATIENTS AND METHODS:

This randomized study has been carried out in Ain Shams University Hospitals. After obtaining the approval of the local medical ethical committee and obtaining informed patient consent, 100 patients were allocated into two groups randomly using a toss picked by the patient: Group A (n=50) and Group B (n=50)

Inclusion Criteria for this study included patients of both sexes, ASA I-II, aging 25-45 and undergoing single-level lumbar discectomy.

Exclusion criteria included Infection at the site of injection, Coagulopathy (acquired, induced, genetic), Severe hypo-volemia, Increased intra-cranial pressure (i.e. brain tumor or recent head injury), Severe aortic stenosis, Severe mitral stenosis, Ischemic hypertrophic sub aortic stenosis, Severe uncorrected anaemia and an allergy to local anaesthetics. In case we failed to perform the block, we replaced the patient with another one according to the randomized protocol.

Patients complying with all the inclusion and exclusion criteria were randomly assigned into two equal groups 50 patients in each.

Group A (50 patients): patients received general anaesthesia.

Group B (50 patients): patients received general anaesthesia combined with caudal epidural anaesthesia with 20 ml of Bupivacaine concentration of 0.25%.

Study Procedure:

Routine preoperative assessment was done to all patients including history, clinical examination and routine investigations including complete blood count (CBC), random blood sugar (RBS), liver function test (LFT), kidney function test (KFT), prothrombin time (PT) and partial thromboplastin time (PTT) were checked.

All patients were informed about the study design and objectives as well as tools and techniques. Informed consent was signed by every patient prior to inclusion in the study.

The American Society of Anesthiology recommendations of basic monitoring including Electrocardiogram (ECG), pulse-oximetry (SPO_2), non-invasive blood pressure (NIBP) and capnography were applied to all patients, starting before anesthesia till end of surgery and then at the postoperative period.

In both Group A and Group B, Anaesthesia was induced with fentanyl 1 mic/kg and propofol 2.5 mg/kg. Endotracheal intubation was facilitated by the use of atracurium 0.5 mg/kg. Anaesthesia was maintained with isoflurane 1-1.5% in 40% oxygen to ensure sufficient depth of anaesthesia. Additional dose of fentanyl might be required according to the need.

In Group B, after induction of anaesthesia as mentioned above, patients were located in the prone position. Sterile skin preparation and draping of the entire region are completed in the standard fashion. First of all, the posterior superior iliac spines were palpated via anatomical landmarks, the line between both spines (Tuffier's line) representing the base of an equilateral triangle the tip of which indicates the position of the sacral hiatus. The sacrococcygeal ligament could be palpated between the two sacral cornua, which was where the needle should infiltrate the skin at an approximate 45-degree angle. Once the ligament had been passed, a flatter angle was adjusted by descending the needle before it could be advanced to the correct final position. Before the local anaesthetic could be applied, careful aspiration or passive drainage was essential to exclude an unintentional intravascular or spinal needle location. Using 18- through 20-gauge Tuohy needle, 20 ml volume and concentration of 0.25% of Bupivacaine was injected in the caudal region in order to perform sensory block and spare motor.

Intraoperative hemodynamic parameters, intra-operative narcotic consumption, surgical duration, blood loss which is blood loss in suction canister, surgical field and in blood-soaked towels. (Maximum capacity of small swab (10 x 10 cm) is 60 ml, medium swab (30x30cm) is 140 ml and large swab (45x45cm) is 350ml. Calculating blood loss in theatre was by weighing a dry swab and then weighing blood soaked swabs as soon as they were discarded and subtract their dry weight (1ml of blood weighs approximately 1gm). This is besides estimating blood loss into surgical drapes, together with the pooled blood beneath the patient and onto the floor, noting the volume of irrigation fluids. Subtract this volume from the measured blood loss to estimate the final blood loss.

Postoperatively, the parameters assessed were the incidence of nausea and vomiting, Visual analogue scale for pain, time to first

postoperative analgesia needed, and assessment of motor and sensory level.

Statistical Analysis:

Data were analyzed using Statistical package for Social Science (SPSS) version 22.0., Quantitative data were expressed as mean± standard deviation (SD) or Median (IQR) when indicated. Qualitative data were expressed as frequency and percentage. The following tests were used: Independent-samples t-test of significance was used when comparing between two means, Chi-square (X^2) test of significance was used in order to compare proportions between two qualitative parameters, Mann Whitney U test: for two-group comparisons in non-parametric data, the confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value (Probability) was considered significant as the following: P-value <0.05 was considered significant, P-value <0.001 was considered as highly significant, P-value >0.05 was considered non-significant.

Sample size was calculated using PASS 11th release program, setting power at 90%, the alpha error at 5%. Result from previous study **(**Kara et al., 2011**) (11)** showed that the mean pain score postoperatively was 49.2 ± 4.7 in Spinal group cases compared to 52.6 ± 6.9 in group GA cases. Based on these results, a sample size of 48 patients in each group will be needed. The study included 50 cases per group (total 100) to take in account for dropout cases.

RESULTS:

The results of the present study are demonstrated in the following tables and figures.

A. Demographics:

There was no statistically significant difference between groups regarding demographic data (in terms of age, sex, BMI and ASA) (p-value > 0.05). (Table 1).

Table (1): Comparison between groups as regard demographic data.

Demographic data		A group (n=50)	B group (n=50)	t/x2	p-value
Age (years)		36.50±6.9	35.00±7.5	1.0 t	0.30
BMI (Kg/m^2)		26.46±3.1	26.22±3.0	0.4 t	0.69
Surgical Duration		139.80±26.8	148.80±21.8	1.8 t	0.07
ASA	I	22 (44%)	25 (50%)	0.36 x2	0.55
	II	28 (56%)	25 (50%)		
Sex	Male	26 (52%)	25 (50%)	0.04 x2	0.8
	Female	24 (48%)	25 (50%)		

p-value > 0.05 Non significant, * p-value <0.05 significant, **p-value <0.001 Highly significant

B. Baseline vital data

There was no statistically significant difference between groups as regard baseline vital data (in terms of mean arterial blood pressure, heart rate and oxygen saturation) (p-value > 0.05). (Table 2).

Table (2): Comparison between groups as regard base line vital data.

Baseline	A group (n=50)	B group (n=50)	t	p-value
HR	76.44±6.0	75.92±6.0	0.4	0.67
Mean Bl. Pr.	69.56±3.9	70.52±3.6	1.3	0.21
SpO2	97.92±0.8	98.04±0.8	-0.7	0.46

p-value > 0.05 Non significant, * p-value <0.05 significant, ** p-value <0.001 Highly significant

C. Intraoperative vital data

There was statistically highly significant decrease of MAP (67.72±2.9) and HR (73.48±3.7) in group B compared to MAP (72.88±4.9) and HR (78.16±5.5) in group A (p-value < 0.001), while there was no statistically significant difference between them regarding SpO_2 (p-value > 0.05) (Table 3).

Table (3): Comparison between groups as regard intraoperative vital data.

intraoperative	A group (n=50)	B group (n=50)	t	p-value
HR	78.16±5.5	73.48±3.7	**5.0	<0.001
Mean Bl. Pr	72.88±4.9	67.72±2.9	**6.4	<0.001
SpO2	95.00±19.4	98.96±0.8	1.4	0.15

p-value > 0.05 Non significant, * p-value <0.05 significant, **p-value <0.001 Highly significant

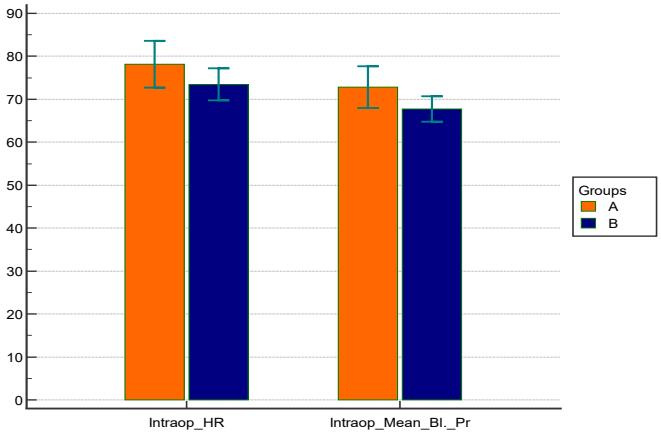

Diagram (1): Bar chart between groups as regard intraoperative vital data

D. Intraoperative narcotic consumption

There was statistically highly significant increase regarding intraoperative narcotic consumption in Group A compared to group B (Table 4).

Table (4): Comparison between groups as regard intraoperative narcotic consumption.

intraoperative	A group (n=50)	B group (n=50)	t	p-value
Narcotics	186.50±21.6	106.00±16.4	**21.0	<0.001

p-value > 0.05 Non significant, * p-value <0.05 significant, **p-value <0.001 Highly significant

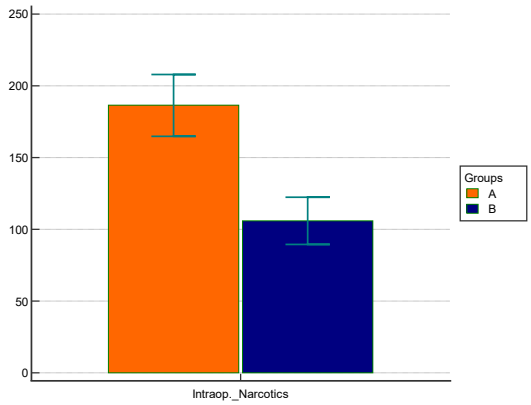

Diagram (2): Bar chart between groups as regard intraoperative narcotic consumption

E. Intraoperative blood loss

There was statistically significant decrease regarding intraoperative blood loss in group B (270.00±59.8 ml) compared to group A (300.00±83.9 ml). (p-value <0.05) (Table 5).

Table (5): Comparison between groups as regard intraoperative blood loss.

intraoperative	A group (n=50)	B group (n=50)	t	p-value
Blood loss (ml)	300.00±83.9	270.00±59.8	*2.1	0.04

p-value > 0.05 Non significant, * p-value <0.05 significant, **p-value <0.001 Highly significant

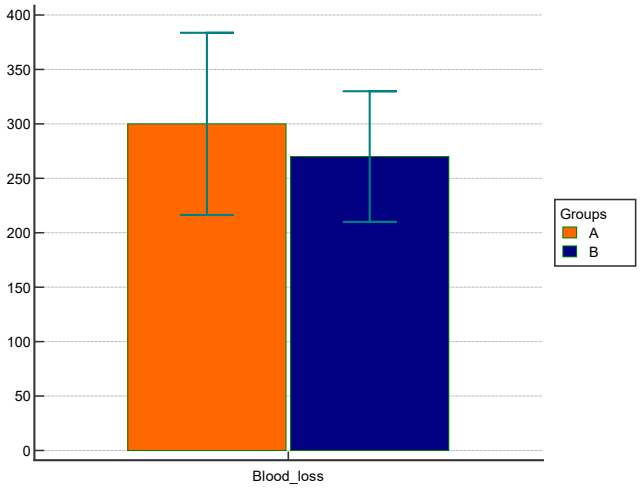

Diagram (3): Bar chart between groups as regard intraoperative blood loss

F. Postoperative pain

There was statistically highly significant decrease in group A compared to group B in term of post-operative time for first time rescue analgesia, where it was significantly lower in Group A (15.80±7.0 min) compared to group B (87.60±23.0 min). (p-value <0.001). (Table 6)

Table (6): Comparison between groups as regard time of 1st rescue analgesia time.

intraoperative	A group (n=50)	B group (n=50)	t	p-value
Time to 1st analgesia needed (min)	15.80±7.0	87.60±23.0	**21.2	<0.001

p-value > 0.05 Non significant, * p-value <0.05 significant, **p-value <0.001 Highly significant

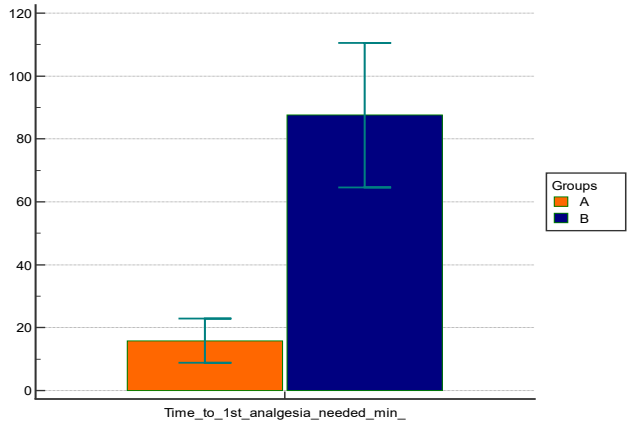

Diagram (4): Bar chart between groups as regard Time to 1st analgesia needed (min)

There was statistically highly significant decrease regarding post-operative VAS score in Group B (range 2-3) compared to Group A (range 4-7) (p-value <0.001) (Table 7).

Table (7): Comparison between groups as regard VAS score.

VAS Score	A group (n=50)			B group (n=50)			Z	p-value
	Range	Median	IQR	Range	Median	IQR		
VAS	4-7	5.5	5-6	2-3	3	2-3	*8.8	<0.001

z = Mann-Whitney test. p-value > 0.05 Non significant, * p-value <0.05 significant, **p-value <0.001 Highly significant

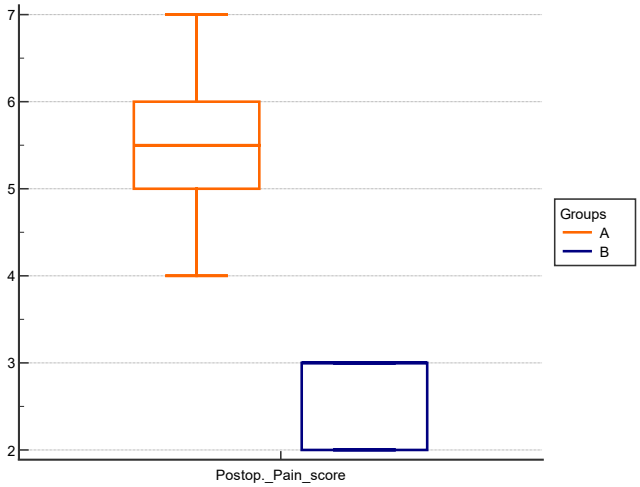

Diagram (5): box and whisker comparison graph between groups as regard VAS score

G. Postoperative nausea and vomiting:

There was statistically significant increase in Group A (25 patients out of 50) compared to Group B (10 patients out of 50) regarding postoperative nausea and vomiting (PONV). (P-value <0.05) (Table 8).

Table (8): Comparison between groups as regard PONV.

	A group (n=50)	**B group (n=50)**	**X^2**	**p-value**
PONV	25 (50%)	10 (20%)	*9.8	**0.002**

x2= Chi square test, p-value > 0.05 Non significant, * p-value <0.05 significant, **p-value <0.001 Highly significant

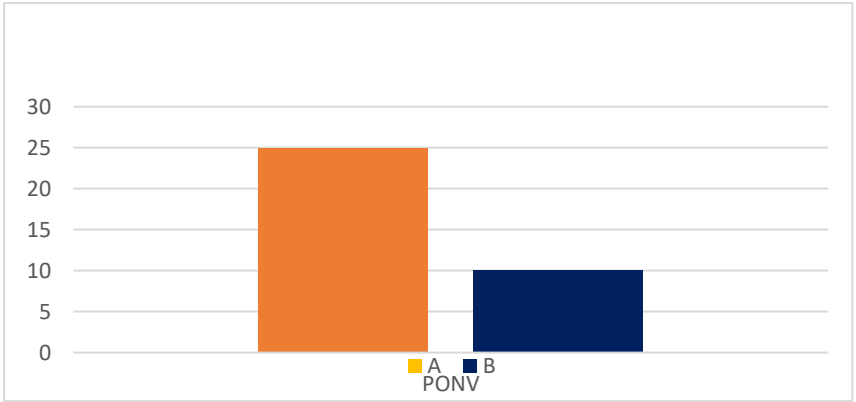

Diagram (6): Bar chart between groups as regard PONV

H. Sensory and motor affection:

There was no motor affection noticed in both groups and sensory level at caudal group was reach T10 (10-12) {7-12} median (IQR) {range}

DISCUSSION:

Our study is a randomized clinical trial comparing using combined caudal epidural with general anesthesia versus using general anesthesia alone for single-leveled lumbar discectomy.

The main findings of the present study were that there was statistically highly significant decrease of MAP, HR, postoperative VAS score and statistically significant decrease of PONV in group B compared to group A. There was statistically highly decrease in group A compared to group B in term of post-operative time for first time rescue analgesia. These results are consistent with **Meng et al**, who completed a systematic meta-analysis of eight randomized, controlled trials of SA vs GA in lumbar spine surgery. They found those patients receiving Spinal anesthesia had a decrease in intraoperative hypertension and tachycardia, reduced PACU pain scores, and reduced nausea and vomiting ***(9)***.

Findings in the current study also correlates with **McLain et al**, who reported a case-controlled study of 400 consecutive patients undergoing lumbar spine surgery in which SA was as safe and effective as GA and offered additional benefits, including less postoperative nausea, less need for analgesia, and better perioperative hemodynamics ***(10)*****.**

Another study is one conducted by **Kara et al**.***(11)*****.** The study compared Spinal anesthesia with general anesthesia in lumbar disc surgery. The study found out that the incidence of tachycardia and hypertension were more frequent in GA. However, unlike this study, it found out that the requirement of postoperative analgesic medication and pain score were the same in the two groups. This is explained that the GA group received higher doses of intraoperative narcotics.

The current study concluded that there was statistically significant decrease regarding intraoperative blood loss in group B compared to group A. A study conducted by **Geetha et al.*(12)*,** which compared epidural anesthesia and general anesthesia with general anesthesia with caudal epidural for minimally invasive lumbosacral spine surgeries. This study concluded that there was less blood loss in the epidural group. This is consistent with our study, however, unlike our study, it concluded that there was no significant difference in PONV. This may be explained that hypotension caused by epidural block caused PONV no difference than GA.

Another study that has not found a difference between the two methods. **Sadrolsadat et al**, for example, did not find a significant difference regarding intra-operative blood loss between the two, and suggested that operative blood loss is confounded by shorter operative time***(6).*** This is not in agreement with the current study which found less blood loss in the combined Caudal general group.

There was statistically highly significant increase regarding intraoperative narcotic consumption in Group A compared to group B. This is seen in a study by **Serkan et al**.**(13),** which compared SA with GA for single level lumbar disc surgery. Its results were consistent with the current study in that analgesic consumption and PONV in general anesthesia group was significantly higher than regional anesthesia group.

The strength of the conclusions from this data set is limited by a number of factors. The decision to administer regional with GA or GA alone is at the choice of the anesthesiologist, and finally the patient, which introduces potential selection bias.

Another challenge was performing caudal epidural in adults using the landmark-based blind technique as a result of variations in sacral anatomy. Different factors that may contribute to multiple punctures are difficult to palpate sacral hiatus, anatomical variations like the location of sacral hiatus apex. The failure rate of performing caudal epidural in adults is relatively high at about 10 – 15%[14]. If there was a failure in performing caudal epidural block, this candidate got excluded from the study.

Limitations of the study:

The only limitation was performing caudal epidural in adults using the landmark-based blind technique as a result of variations in sacral anatomy.

Conclusion:

This study concluded that Combined Caudal epidural with general anesthesia is better than general anesthesia alone for single-level lumbar discectomy and it is recommended.

Conflicts of Interest: The authors state that the publishing of this paper is free of any conflicts of interest.

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الجمع بين التخدير فوق الجافية العجزى والتخدير الكلى فى حـالات استئصال القرص القطنـى

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قسم التخدير والرعاية المركزة وعلاج الألم - كلية الطب - جامعة عين شمس

المقدمه: يُستخدم التخدير الشوكى وفوق الجافية فى جراحات القرص القطنى. على عكس غرار التخدير العام، يساعد التخدير الشوكى فى تقليل فقدان الدم ومضاعفات الإنصمام التخثرى ومعدلات الوفاة على المدى القصير، وتحسين الرؤية داخل نطاق إجراء العمليات الجراحية عن طريق تقليل ضغط الدم الوريدى وقد يؤدى إلى تقليل طول إقامة المريض فى المستشفى وتقليل التكاليف بصفة عامة.

الهدف من الدراسه: تهدف هذه الدراسة إلى مقارنة متغيرات نتائج أثناء الجراحة وعلى المدى القصير بعد الجراحة لدى المرضى الخاضعين لجراحات استئصال القرص القطنى الرئيسية وحيدة المستوى مع الجمع بين التخدير فوق الجافية العجزى والتخدير العام فى مقابل التخدير العام فقط.

طريقه البحث: تم تجميع الحالات بعد الحصول على موافقة لجنة أخلاقيات البحث العلمى وأخذ الموافقة المستنيرة من المرضى المشاركين فى الدراسة. تشمل الدراسة ١٠٠ مريضاً من الخاضعين لجراحة استئصال القرص القطنى وحيدة المستوى. وتم تقسيم المرضى إلى مجموعتين وتشمل ٥٠ مريضاً في كل مجموعه. كل المرضى سيخضعون للتخدير العام و اما **المجموعة (ب)** سيخضعون للتخدير فوق الجافية بالبُوبيفاكايين تركيز ٠,٢٥٪, ٢٠ ملل

النتائج: اظهرت الدراسه الحاليه انخفاضا بدلاله احصائيه كبيره في استهلاك المواد الافيونيه داخل العمليه لدي مرضى المجموعه التي خضعت الى الجمع بين التخدير فوق الجافية العجزى والتخدير الكلى فى حـالات استئصال القرص القطنـى مع درجه الم اقل مقارنه بمجموعه التخدير الكلي فقط.

الخاتمه: اظهرت الدراسه الحاليه ان الجمع بين التخدير فوق الجافية العجزى والتخدير الكلى فى حـالات استئصال القرص القطنـى كانت تقنيه فعاله حيث قد احتاج المرضى الى مسكنات اقل اثناء و بعد العمليه الجراحيه مقارنه بمجموعه التخدير الكلي فقط.