

## A COMPARISON OF EPIDURAL AND GENERAL ANAESTHESIA TECHNIQUE FOR RENAL SURGERIES

Dr. Jalad Kapoor<sup>1</sup>, Dr Abeezer Hussain<sup>2\*</sup>

1.2. Assistant Professor, , Department of Anaesthesia, Pacific Medical College and Hospital, Udaipur

\*Corresponding author - **Dr Abeezer Hussain**

Email id – [abeezar\\_hussain@hotmail.com](mailto:abeezar_hussain@hotmail.com)

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### ABSTRACT

**Background:** Hemodialysis is compared inferior to renal transplantation as the 5 year survival rate in patients is 30% as compared to 70% in patients with transplanted kidneys. Now a day renal surgeries are more commonly done by epidural or neuraxial anaesthesia as compared to general anaesthesia. **Methods:** Sixty adult patients according to American Society of Anaesthesiologists (ASA) physical status-I and II of both male and female in the age group of 20-49 years were randomly assigned, undergoing renal surgeries, into 30 patients in each group i.e. Group A and Group B. Group A patients were delivered with conventional general anaesthesia (GA) while Group B had received epidural anaesthesia (EA) with 3 mg/kg of ropivacaine and 0.5 µg/kg of dexmedetomidine. Various parameters were measured such as cardio-respiratory parameters, patient's satisfaction, doctors's satisfaction and the side effect associated with the medications. P Value of < 0.05 was considered as statistically significant. **Results:** Cardio-respiratory parameters, patient's satisfaction status, surgeon's satisfaction scores, side effect associated with the medications, demographic profile, and duration of anaesthesia, surgical time, haemodynamic parameters, and blood transfusion requirements were compared in both groups. During the post-operative period, in Group B patient's satisfaction score was more as the post operative complication were less compared General Anaesthesia. Side effect such as headache, nausea, vomiting and shivering was more in Group A (P < 0.001) while the incidence of dry mouth was higher in Group B (P < 0.001). **Conclusion:** On the basis of more patient satisfaction and decreased side effects, Epidural anaesthesia with ropivacaine and dexmedetomidine can be efficiently used in patients undergoing renal surgeries.

**Key words:** Renal surgery, General Anaesthesia, Epidural Anaesthesia, Ropivacaine, Dexmedetomidine.

### INTRODUCTION

Choosing for the best anesthetic technique for renal transplantation with the aim of decreased mortality is a controversial issue as it is associated with increased complications during and discharges from hospital. Anesthesia can be given into two major ways: General anesthesia (GA) causes central neurological depression along with gaseous or intravenous drugs and neuraxial anesthesia (NA) in which a local anesthetic agent is used next to the spinal cord.

Anaesthetic injection given in subarachnoid space called as spinal anesthesia and if given in the epidural space called as epidural anesthesia. Decrease postoperative mortality, postoperative analgesia for duration of 24 hours is found in neuraxial anaesthesia as compared with general anesthesia.

In renal surgeries many techniques were used with success. Due to discomfited body position during prolonged renal surgeries, anaesthesiologists and

surgeons recommended general anaesthesia as to avoid use of sedative agents along with NA, however superior muscle relaxation and controlled diaphragmatic motion during the surgery is a better point in favor of GA. (1)

Recent studies have shown that NA can be safely used for renal surgeries including donor nephrectomy, renal transplantation etc. (1,2) as more haemodynamic stability was recorded in various studies along with minimal blood loss, very less chances of blood transfusion, lower toxicity from anaesthetic agents, good post-operative pain relief and fewer post-operative complications. (3)

Dexmedetomidine, the  $\alpha_2$ -adrenoceptor agonist, can be used as premedication, also act as an anaesthetic adjuvant for GA and NA, as well as for post-operative sedation and analgesia (4 – 8) in the clinical practice. It is used as an epidural adjuvant along with cardio respiratory stability and more sedation compared to clonidine. (6, 7)

Dexmedetomidine used recently for awake fiberoptic intubation in infections or anatomical distortions of upper airway, having no effect on reflexes of airway therefore chances of aspiration are minimal in nature. (9, 10, 11)

It is used as adjuncts to local anaesthetics in neuraxial anaesthesia, improves the quality of the block. (6, 7) It is free of the side-effects associated with the use of opioids in neuraxial anaesthesia such as pruritis, nausea, vomiting, urinary retention, respiratory depression etc. (4) Its metabolism occurs through direct glucuronidation and by cytochrome P450 in the liver while in urine and feces minimal drug excreted unchanged. (8) Keeping in view of the above a prospective, randomized, comparative study was undertaken to see the effect of under GA or epidural anaesthesia with ropivacaine and dexmedetomidine in patients undergoing elective renal surgeries.

The aim of the study was to compare patient's satisfaction status, surgeon's satisfaction scores, demographic profile, duration of anaesthesia, surgical time, and requirement of blood transfusion in both groups. The secondary outcome was to compare the haemodynamic parameters and the side-effects associated with the two anaesthesia techniques.

## MATERIAL AND METHODS

After taking permission from the Institutional Ethical Committee (IEC), Sixty adult patients according to American Society of Anaesthesiologists (ASA) physical status-I and II of both male and female in the age group of 20-49 years undergoing renal surgeries (pyelo-lithotomy, ureterolithotomy, and nephrectomy) were randomly assigned to two groups i.e. Group A and Group B of 30 patients each, were included in the study.

Exclusion criteria included patients with diabetes mellitus, uncontrolled hypertension, advanced heart block and with ventricular dysfunction, obesity, severe pulmonary disease, hepatic impairment, deranged coagulation profile, cerebrovascular disorder, pregnant women and refusal for epidural anaesthesia.

All the cases were premedicated with oral alprazolam 0.25 mg and oral ranitidine 150 mg a night before and two hour prior on the morning of surgery. Cases were counseled thoroughly and explained about the nature of study in the pre-operative evaluation before taking the written consent.

In group A patients conventional general anaesthesia (GA) was used while in group B epidural anaesthesia (EA) with 3 mg/kg of ropivacaine and 1  $\mu$ g/kg of dexmedetomidine was used. ECG recording, blood pressure monitoring, urine output, respiratory rate along with pulse oximetry was also done.

In Group A, induction of anaesthesia was facilitated with the use of Propofol 2mg/kg, Butorphanol 0.02 mg/kg, isoflurane, oxygen and vecuronium 0.1 mg/kg to achieve endotracheal intubation with desired size tube. Lateral kidney position was targeted with usual precautions. Anaesthesia should be maintained with isoflurane (1 MAC), nitrous oxide with oxygen (60:40 ratio) and vecuronium as and when required. Before the end of surgery, tapering of isoflurane and nitrous oxide were done and on skin closure these drugs were stopped. For post-operative analgesia IV infusion of diclofenac sodium was given. Neostigmine and glycopyrrolate were given for residual muscle blockade. Endotracheal tube was removed and patient was shifted to recovery room for 4 – 6 hours, side

effect and vital parameter were measured along with postoperative pain management.

In Group B, epidural space was identified in L2-L3 or L3-L4 intervertebral space, in sitting position with 18G Touhy needle with loss of resistance to air technique. 2% lignocaine quantity 3ml along with adrenaline was taken and inserted in epidural space, epidural catheter secured 3 – 5 cm in epidural space, and finally patient was placed in supine position. 3 mg/kg of ropivacaine (max. 150 mg) and 0.5 µg/kg of dexmedetomidine was injected in epidural space. For assessment of sensory level bilateral pin prick method and for motor assessment modified Bromage scale was used (0 = no block, 1 = inability to raise extended leg, 2 = inability to flex the knee and 3 = inability to flex ankle and foot).

Rectus abdominis muscle (RAM) score was used to assess 10, 20, and 30 min after the injection as criteria for surgery of which minimum score of 3 was required.

**Table -1:** RAM score for abdominal muscles

Muscle power %	RAM Score	Criteria
100	0	Able to rise from supine to sitting position with hands behind head
80	1	Can sit only with arms extended
60	2	Can lift only head and scapulae off bed
40	3	Can lift only shoulders off bed
20	4	An increase in abdominal muscle tension can be felt during effort; no other response
0	5	Full abdominal muscle relaxation

The criteria for surgeon's satisfaction included the surgical field bleeding, post operative analgesia, muscle relaxation and immobility of patient. Patient

**Table – 2:** The demographic variables in the Group A and B

satisfaction criteria included any pain or discomfort during surgery and in the post-operative period. These scores were measured by the questionnaires prepared during the planning stage of the study.

Side effects were measured in intra operative as well as post operative period such as respiratory depression, shivering, headache, nausea and vomiting, and dry mouth

At the end of the study, all the data were subjected to statistical evaluation by Statistical Package for Social Sciences (SPSS) version 17 and data were expressed as mean and standard deviation.  $P < 0.05$  was considered statistically significant while  $P < 0.001$  as highly significant.

## RESULTS

Demographic characteristics such as gender, age, BMI, ASA physical status, surgery duration, time of anaesthesia were compared in 60 patients divided in two groups and no significant difference was observed [Table 2].

The surgical conditions were excellent to fair in the majority of the patients in both groups. In 10% in Group A and 3.33% in Group B, adequate muscle relaxation was not achieved and the surgeon was not satisfied [Table 3].

Besides intra-operative evaluation exclusively in Group B, post-operative satisfaction scores were also recorded in both groups. Most of patients were satisfied with anaesthesia administered. The patient satisfactory scores were significantly higher in Group B as compared with Group A on overall statistical evaluation ( $P = 0.029$ ).

Fewer side effects were observed in Group B as compared with Group A [Table 4]. Respiratory depression and headache was comparable in the post-operative period in both groups ( $P = 0.53$ ). The other side-effects such as, nausea and vomiting, and shivering were observed more frequently in Group A patients. However, the incidence of dry mouth was much higher in Group B patients (30%) as compared with Group A patients (10%) which were highly significant on statistical analysis ( $P < 0.001$ ).

Demographic variables	Mean $\pm$ SD (n = 30)		P value
	Group A	Group B	
Age (in years)	41.9 $\pm$ 7.3	43.8 $\pm$ 8.6	0.53
Gender (male/female)	18/12	21/9	0.63
ASA(American Society for Anaesthesiologist)-physical status (I/II)	17/13	19/11	0.54
BMI (Body mass index)	25.7 $\pm$ 1.6	25.3 $\pm$ 1.2	0.79
Duration of surgery	106 $\pm$ 34	98 $\pm$ 38	0.56
Total anaesthesia time	118 $\pm$ 49	123 $\pm$ 43	0.24

**Table – 3:** Surgeons satisfaction score and patient satisfaction score

Satisfaction score	Grade of Satisfaction	N = 30		P value
		Group A	Group B	
Surgeon satisfaction score	Excellent	22	21	0.51
	Good	4	6	<0.001
	Fair	1	2	<0.001
	Poor	3	1	0.03
Patient satisfaction score	Extremely satisfied	24	23	0.68
	Satisfied	2	4	0.029
	Not satisfied	4	3	0.43

**Table – 4:** Side effect profile of patients in Group A and Group B

Side effect	n = 30		P value
	Group A	Group B	
Shivering	9	2	<0.001
Nausea and vomiting	6	3	<0.001
Headache	2	2	0.53
Dry mouth	3	9	<0.001
Respiratory depression	1	1	0.53

## DISCUSSION

The main criteria for choosing an anesthetic technique for any type of surgical procedure are better post – operative analgesia, easy and fast recovery leading to ambulation, minimal intra-operative loss of blood, hemodynamic parameter stability along with less chance of side effects such as respiratory depression, cough, headache, nausea and vomiting, shivering etc. (13)

Due to discomfited position used for renal surgery which can be prolonged in nature also, in such condition general anesthesia (GA) is the most popular technique used in such circumstances. Regional Anesthesia supplemented with good sedation has been advocated recently because it is devoid of side effects compared to general anesthesia. (1)

Kazimirov VG et al has documented that in patients with disturbed/ deranged renal function test, epidural anesthesia was the main stay of anesthesia compared

to GA. (14) Such type of studies are more beneficial in patients undergoing renal surgeries caused due to trauma etc. (15) GA is most commonly associated with some minor side effects such as nausea and vomiting leading to a very unpleasant experience undergoing renal surgeries. (16) It also carries some major and life threatening complication such as need of analgesia in post-operative period, over sedation, stress, airway difficulty both during extubation and intubation, cardiac complication, restlessness, agitation, awareness during surgical procedures, added contribution for other co morbid conditions etc.

Patient comfort and effective neuraxial anaesthesia during the surgical procedure can be produced with the addition of dexmedetomidine to ropivacaine. Surgical conditions and patient satisfaction scores were comparable in both groups. Two different doses of dexmedetomidine (0.5µg/kg and 1 µg/kg) were used to see the hemodynamic changes occurred in case of tracheal intubation and effectiveness. (17)

There were no statistically significant change in the heart rate, blood pressure, respiratory rate and oxygen saturation during the surgery as compared to baseline with the exception that of difficulty in extubation and intubation during GA in patients with same demographic profile along with hemodynamic stability. Previous studies have reported that RA is effective and safe in donor nephrectomy and transplantation of kidney when they compared it with the combined spinal epidural anaesthesia and GA except the only disadvantage of sensory blockade level which can be unpredictable and hemodynamic instability. (1, 2) As in case of ropivacaine good hemodynamic stability is the advantage and in case of dexmedetomidine there is excellent property of sedation.

Dexmedetomidine used as an adjuvant to epidural local anesthetics as compared to clonidine and fentanyl, has shown to shorten the duration and onset of sensory block as well as motor block, also associated with postoperative sensory analgesia of prolonged duration with reduced demand of local analgesics and anesthetics when used as an alternative to anesthetic agent. (18, 19) In studies comparing neuraxial and general anesthesia, during post

operative period no significant change was observed in case of Surgeon's satisfaction score. (20)

In both groups no typical headache along with any inconvenience in cranial region (6.67% in Group A vs. 6.67% in Group B) was included in the side-effect profile and was clubbed under headache. The only statistically and clinically significant side-effect observed in Group B patients as compared to Group A patients was a higher incidence of dry mouth (30%) during later part of intra-operative and early part of the post-operative period. The typical side effect of  $\alpha$ -2 agonist is dry mouth as observed by various authors in their studies after the use of Dexmedetomidine as well as clonidine can be relieved by wetting of lips with water.

Dexmedetomidine provided excellent sedation, less use of other local anaesthetics, post operative analgesia, fast onset and sleeping nature of patient intra operatively. (6, 7) Pain (38%), nausea and vomiting (16%) and shivering (22%) was found in Group A patients postoperatively while in case of shivering it was even high when it was used with butorphanol also. The lower incidence of shivering in Group B patients can probably be explained on the basis of anti-shivering properties of dexmedetomidine in patients undergoing laproscopic surgeries. (21)

As Dexmedetomidine eliminated by hepatic metabolism and found unchanged in urine so it can be used in patients with compromised renal function and abnormalities as renal blood flow and renal clearance have no role in its metabolism but cannot be used in patients with hepatic dysfunction. (22) In various studies it was found that Dexmedetomidine is with no respiratory depression so useful in patients with respiratory insufficiencies. (23, 24, 25)

## CONCLUSION

Use of Ropivacaine and Dexmedetomidine in patient undergoing renal surgeries is effective and safe in reference to sedation and epidural analgesia. It can be used in perioperative care and relieving chronic pain therefore it can be very helpful agent for an anaesthesiologist due to wide applications in which it can be used.

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