

ORIGINAL ARTICLE

Renal Transplantation: Anesthetic experience in Bangladesh

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Abstract :

The appropriate anesthesia for renal transplantation requires minimal toxicity for the patients and for the transplanted organ. General anesthesia is the most popular technique for renal transplantation. The use of regional anesthesia in chronic renal failure patients is still controversial but promising. The study was done to find impact of anesthetic management in term of outcome of graft function considering existent disease, hemodynamic status and intra- operative or early post - operative complications. Total fifty (50) Patient's records from 2010 to 2016 were revived retrospectively. Same anesthesia team as well as same surgical team performed all transplantation and surgical technique was the same for all patients either general or regional anesthesia. General anesthesia was performed in 88% of patients and for the rest of them, spinal, epidural and combined spinal and epidural was done. The age of the patients was in the range of 18 - 57years and a mean age of 35 ± 16 years. The mean of surgery duration was 2.5 ± 1.2 hours. 88% of the patients had good early renal graft function and the serum creatinine level decreased in the first 3 postoperative days. Overall optimization of the patients other co morbidities in the preoperative period, close intraoperative monitoring and optimization of fluid status and haemodynamics as well as appropriate use of anesthetic agents are key to kidney transplantation success.

Introduction:

Kidney Transplantation provides a near normal life and excellent rehabilitation compared to

dialysis and is the preferred method of treatment for end stages renal disease patients. Patients undergoing renal transplant surgery have several high risk features, like cardiovascular diseases, diabetes mellitus, and need for hemodialysis. The appropriate anesthesia for renal transplantation requires a thorough understanding of metabolic and systematic abnormality induced by the ESRD. The area of interest includes the per-operative patient status, fluid management, haemodynamic stability and anesthesia management and peri operative complications. Recent advances in surgical techniques, anesthesia management and immunosuppressive drugs have made renal transplantation safe. Pre-operative patients assessment, per operative physiological stability

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and post operative care of renal transplant patients have contributed to the success of renal transplant program in the hospital. The retrospective study was done to find impact of anesthetic management in term of outcome of graft function considering existent disease, hemodynamic status and intra- operative or early post - operative complications.

Patients and methods :

This is a retrospective study, conducted at Kidney transplantation center in Popular Medical College Hospital, Dhaka, Bangladesh. We reviewed the records of all patients who had live related kidney transplants conducted from 2010 to 2016. The records were reviewed and data collected by a consultant anesthesiologists. As per the hospital policy, clinical characteristics reviewed included age, sex, co morbidity, the cause of CKD, history of dialysis. Pre-operative investigation including blood group, HLA & tissue typing, type of anesthesia, preoperative anesthetic, surgical and post operative event and all drugs used were reviewed and manually entered into predesigned database. Preoperative preparation, as well as detailed anesthetic management was also reviewed.

Peri operative anesthesia management

Same anesthesia team as well as same surgical team performed all transplantation and surgical technique was the same for all patients either general or regional anesthesia. All live related renal transplantation were done electively early in the morning. Hemodialysis was performed in almost all recipients within 24 hours before surgery to reduce the risk of volume overload, hyperkalemia and excessive bleeding. Pre-medication consisted of H² blocker in addition

to all other medication was giving on regular basis one hour before surgery. According to our institutional protocol immunosuppressive regimen Mycophenolate Mofetil (cellcept), tacrolimus were given. Peripheral intravenous access was secured in the hand opposite to the functioning fistula. Central venous line was inserted for all patients.

Briefly, in General anesthesia, the induction of anesthesia was done with propofol (2mg.kg-1). All patients were incubated and ventilated. Anesthesia was maintained with 50% N²O in oxygen supplemented with 1-1.5% isoflurane. Neuromuscular blockade was maintained with Attracurium (0.5mg kg-1) and it was given 10mg every 25 minutes. Analgesia was maintained with fentanyl 50-70 microgram per hour.

In regional technique, spinal anaesthesia was introduces hyperbaric bupivacaine (15-20mg) plus 25 micro gram fentanyl, in lateral position according to the surgical side and the level of anesthesia was kept at T6. Epidural Catherization was done at L2-L3 or L3-L4 with Tuohy needle and the catheter was advanced upto 5-6 cm in the epidural space and bupivacaine (0.5%) 8-10 mg/h was infused during the surgery. For intra-operative sedation, mibazolam and fentanyl were administered based on the need of the patient.

Intraoperative monitoring included heart rate, non-invasive blood pressure, oxygen saturation and electrocardiogram in all patients. Most of central venous line was placed in the right subclavian vein and some was in right internal jugular vein. Most of the central venous pressure is monitored regularly. During this period intravenous fluid administered was normal saline/ base crystalloid (NS, Hartmaan's solution)

crystalloid (NS, Hartmaan's solution) and few cases crystalloid solution also used. Intra-operative blood transfusion (packed cells) by using WPC depleted filter set if needed.

Intra-operative hypertension was controlled with bolus IV injections of 5-10 mg of labetalol and nitroglycerine infusion to keep the mean arterial pressure in the range of 95-100 mmHg. Hypotension was managed with dopamine infusion.

Combination of ringer lactate and normal saline in equal amounts was administered to avoid increasing acidosis. In all cases before artery clamping, heparin 4 unit/kg was intravenously injected. The renal artery was usually grafted to common illiac artery. Per operative methylprednisolone was used 1g, to decrease the incidence of graft rejection and simultaneously Basiliximab is also used. In all patients intravenous frusemide (80-160mg) was slowly given.

At the end of operation, neuro-muscular blockade was reversed with IV injection of neostigmine (0.05mg/kg) combined with atropine (0.25mg/kg). Post operatively, most of the patients were extubated immediately without any complication.

The outcome of Graft function and peri-operative complication in term of anesthetic management was analyzed statistically.

Statistical analysis: A simple statistical analysis was undertaken of the data collected. Multivariate models were adjusted. All tests were with significance considered at $p < 0.05$. The 95% CIs were calculated for all odds ratios.

Results :

In all, 50 patients who underwent live related renal transplantation were included in the the study.

General anaesthesia was the technique of choice in most 44 (88%) of the cases. Continuous epidural anaesthesia with intermittent intravenous sedation was used in 6 (12%) cases.

All the patients underwent live related renal transplant. In this study with an age range of 18 - 57 years and a mean age of 35 ± 16 years. There were pre- dominance of male patients 46 (92%) and female 4 (8%).

The causes of end stage renal disease (ESRD) were chronic glomerulonephritis 29 (58%), Hypertensive Nephropathy 8 (16%), diabetic nephropathy 6 (12%), polycystic kidney disease 1 (2%), obstructive nephropathy 2 (4%), IGA nephropathy 3 (6%) and in 2 (4%) patients other causes were noted.

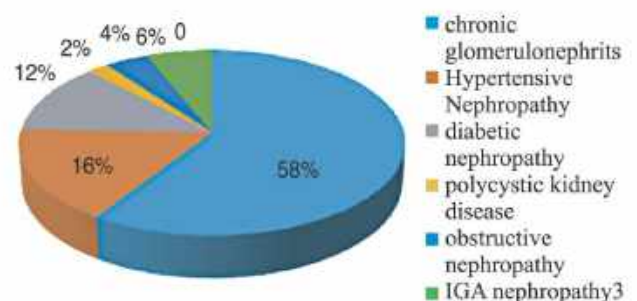


Figure-1: The distribution of cause of ESRD

Before transplantation 38 (76%) recipients got haemodialysis. None got peritoneal dialysis and only 12 (24%) were primitive transplantation cases.

Recipients having co-morbidities HTN 38 (76%), DM 6 (12%), IHD 4 (8%), Heart Failure 2 (4%), COPD 7 (14%), Pleural effusion 2 (4%), hypothyroidism 7 (14) were optimized.

Central venous line was placed in the right subclavian vein and right internal jugular vein in 47 (84%) cases and in 4 (8%) cases respectively.

36 (72%) patients were transfused only with crystalloid where the 9 (18%) patients received with combination of both crystalloid and colloid.

Intra-operative hypertension was controlled with labetalol in 2 (4%) and in 5 (10%) cases nitroglycerine. Hypotension was managed with dopamine infusion 4 (8%) cases.

The mean of surgery duration was 2.5 ± 1.2 hours. The mean blood loss during operation was 230 ± 75 ml. 5(10%) patients require intra-operative blood transfusion (packed cells).

The mean time of vessel grafting was 20 ± 8 min. The cold ischemia time was 30 ± 12 minutes and warm ischemic time was 2 ± 1.5 .

88% of the patients had good early renal graft function and the serum creatinine level decreased in the first 3 postoperative days.

Post-operative care: All the patients were transferred to post kidney transplant unit. Rescue analgesia was provided with injection pathidine and tramadol. Epidural analgesia was also used in 5 (10%) patients to relieve the post operative pain. 7 (14%) patients developed post operative atelectasis. None of the patients developed acute graft rejection but 2 (4%) patients developed delayed graft rejection. 3 (6%) patients need the dialysis. Only 1 (2%) patient needs re exploration for haematoma and thrombosis in the vessels. Rest of the patients received lifelong drugs for immunosuppression.

Discussion :

Kidney transplantation is the gold standard treatment for patients of end-stage renal disease¹. It is more cost effective than maintenance dialysis and usually provides the patient with better quality of life. Effective and safe anaesthesia for renal transplantation depends on an understanding of the pathophysiology and biochemistry of uremia and its effect on the pharmacokinetics and metabolism of drugs used². In addition, co morbid conditions represent a common problem and frequently, are very severe, leading to complications in anesthesia and surgical process^{3,4}.

In this review, the anesthetic choice was general anesthesia. Epidural and epiduro-spinal was also used in selected patients. It was assumed that post operative pain would be better controlled by this technique⁵. Anand Jain et al show only 350 cases were done using continuous epidural anaesthesia with intermittent intravenous sedation. Pre-performed epidural spinal anesthesia for a non-obese patients especially those with hyper tension or lungs or endocrine disorders to keep a minimal amount of toxicity in patients and transplanted kidney. The American Society of anesthesiologist standard monitoring recommendation is usually followed. Patients with more advance co morbid conditions, like heart failure, may require more extensive monitoring such as invasive blood pressure⁶.

Any surgical procedure, in patients with CKD has a significant increase in the perioperative morbidity and mortality⁷. Preoperative work-up and intraoperative management of patients with end-stage organ disease are certainly among the most difficult and challenging areas in

Any surgical procedure, in patients with CKD has a significant increase in the perioperative morbidity and mortality⁷. Preoperative work-up and intraoperative management of patients with end-stage organ disease are certainly among the most difficult and challenging areas in anaesthesia. Understanding the myriad alterations in physiology and function, both locally and systemically, is critical to providing safe and successful perioperative management⁸. Co-morbid disease is common and frequently severe in these patients. In this study series recipients having co-morbidities HTN 76%, DM 12%, IHD 8%, Heart Failure 4%, COPD 14%, Pleural effusion 4% hypothyroidism 14% were optimized. D. A. Logan et al also suggested, the major problems for the anaesthetist in surgery of this type are those of a patient with chronic illness, severe anaemia, hypertension and moderate metabolic acidosis⁹. Haemodialysis is effective in correcting the electrolyte and fluid disturbances but will not improve the anaemia and may not correct the hypertension.

The auto regulation of renal blood flow, which is caused by the myogenic response and tubuloglomerular feedback, enables the kidney to maintain solute and water regulations independent of arterial blood pressure¹⁰. However, in the kidney transplant recipient, in whom kidneys are already considered functionally denervated and ischemic, the auto regulation is, at the certain degree, impaired. Therefore, these issues force us to maintain normal to high blood pressure, hoping that the kidney preserves its perfusion. It is not worthy that urinary flow rate is not subject to auto regulation. Tubular water re-absorption determines urinary flow rate and is closely related to the hydrostatic pressure in the peritubular capillaries¹¹.

Care should be taken to maintain normovolemia and normotension, to evade decrease in renal perfusion⁸. Avoiding intra-operative renal insults and maintaining isovolemia, adequate cardiac output and renal perfusion pressure are the best interventions to prevent post operative kidney injuries and are more important than the choice of a specific anesthetic technique¹². In this study experience, the color, stiffness and turgidity of kidney under the hand of surgeons were the best predictors of graft function.

Fluid management remains a controversial subject in organ transplantation¹³. To keep the intra-vascular volume, crystalloid solutions are usually preferred⁹. At the beginning, normal saline and ringer lactate, a safe intra operative fluid replacement therapy. The average volume of crystalloids infused during surgery was 4 - 4.5 litres. Hydroxyethylstarch used as a plasma-volume expander in brain-dead kidney donors has been suggested to induce osmotic-nephrosis-like lesions. We have also used the colloidal solution, hydroxyethyl starch [HES] for volume replacement. Transfusion with HES300/0.40 was done. About 17 (35%) patients received a combination of crystalloids and colloids with colloids being mainly HES. Anand Jain et al[1] show majority of patients (87%) were transfused with normal saline-based crystalloids; as most anaesthesiologists would avoid potassium containing fluids during renal transplantation, with the belief that it may worsen the hyperkalemia in the event of impaired graft function.

D. A. Logan et al¹⁶ judged by the absence of signs from daily chest X-ray and frequent clinical examination, chest infection did not occur in any patient in the immediate period

after operation; but broncho-pneumonia occurred in 2 patients one month after surgery⁹. In our study show 7 (14%) patients developed post operative atelectasis. Vigorous chest physiotherapy may have played an important part in the care of these patients. Spence and Alexander have suggested that postoperative pneumonia is rare if the standards of airway care are good¹³.

It is a great challenge for the anesthesiologists to control the pain and agitation of the patients in the post operative period¹⁴. In regional technique, we observed these problems in a small portion of the patients. We had to use IV narcotics or paracetamol at the end of surgery.

Transplant anesthesia is a specialized field, possess a challenge for attending anesthesiologist. With improvement in anesthetic and surgical techniques as well as immunosuppressive drugs, many patients are being accepted for transplantation who would have considered unsuitable earlier. According to the general status of the patients, needs and individualized intra and post-operative anesthetic regimen. The type and amount of fluid replacement and optimizing hamodynamic status before and during re-perfusion of the transplanted kidney are particularly important during renal transplantation surgery.

Proper patient selection, pre operative patient preparation and intra operative physiological stability with close association between uro surgeons and nephrologist and anesthesiologist are found a valuable place in the management of our renal transplant patients.

Conclusion :

ESRD patients and kidney transplantation present significant challenge for the anesthesiologist in the perioperative period. The optimal approach to anesthetic delivery is to develop an anesthetic plan tailored to the patient's specific co morbidities. Overall optimization of the patients other co morbidities in the preoperative period, close intraoperative monitoring and optimization of fluid status and hemodynamics as well as appropriate use of anesthetic agents are key to kidney transplantation success.

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