RETROSPECTIVE STUDY OF ANAESTHESIA FOR RENAL TRANSPLANTATION DURING THE YEARS 1979 TILL 1984

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SUMMARY

In this project, a retrospective study regarding the anaesthetic techniques, complications and the relevant monitoring aids needed during the procedure, is made from analysis of the 100 available anaesthetic records of cases done during the five years at the Urology Department, General Hospital, Kuala Lumpur. The total number of cases done during 1979–1984 was 112 but 12 anaesthetic record sheets were missing.

The patients requiring renal transplant operation were representative of the end-stage chronic renal failure population of Malaysia with the usual high incidence of cardiovascular and biochemical abnormalities. Except for two cases of epidural anaesthesia, all the other patients received general anaesthesia. Induction was with intravenous barbiturate followed by muscle relaxant, neurolept or narcotic and halothane supplement for maintenance.

There were no intraoperative or postoperative deaths due to anaesthetic complications. There were five cases of anaesthetic morbidity of which three cases had inadequate reversal of neuromuscular blocking agents and required postoperative ventilation and two cases had poor respiratory effort and required naloxone supplement. Less serious complications such as allergic manifestations were seen in three cases with use of the new muscle relaxant atracurium.

The conclusion was that general anaesthesia using thiopentone for induction, pancuronium bromide for intubation and maintenance of muscle relaxation and neurolept fentanyl/droperidol and halothane supplement, all in doses tailored to the requirements of a renal failure patient, is a suitable technique of anaesthesia for renal transplant operation. Atracurium, the new muscle relaxant, seems to be a favourable alternative to pancuronium bromide. However, as only five cases in our study received atracurium, further studies would have to be done to support it.

INTRODUCTION

Chronic dialysis is the only alternative treatment other than renal transplantation for these end-stage renal disease patients.

The renal transplant programme managed jointly by the Nephrology and Urology Departments of General Hospital, Kuala Lumpur is the only one available for the whole of Malaysia. Currently, one renal transplant a week is carried out at the centre.

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With the present improved method of management of renal failure and introduction of steroids and cyclosporin A for immunosuppression and routine preoperative haemodialysis, patients present in optimal condition for surgery and anaesthetic risks are minimal.

PATIENTS AND METHODS

From 1979 to 1984, 100 anaesthetic record sheets were available. Of these, four patients received cadaveric kidneys, and 96 patients received kidneys from living related donors.

The primary cause of renal failure in these cases studied showed that chronic glomerulonephritis was the most common cause (94 cases), followed by chronic pyelonephritis (3 cases), ureteric reflux (2 cases) and obstructive uropathy (1 case).

The mean age was 29 years (S.D. 7.8; n = 100; range 15–50 years). The mean weight was 49.8 kg (S.D. 8.8; n = 100; range 25-75 kg). Other preoperative data is mentioned in Table I. All the patients were on haemodialysis. 79 patients were on antihypertensive therapy. Betaloc was the most common drug used for antihypertensive therapy, followed by minipress, methyl dopa and propranolol, either in combination or alone.

TABLE I
PREOPERATIVE LABORATORY DATA*

Laboratory data	Mean	S.D.	Range	Normal range
Haemoglobin gm%	7.3	1.6	3.7-117	12-15
Sodium mmols/l	137	6.3	117-148	135-145
Potassium mmols/l	4.1	0.6	2.9-5.9	3.5-5.0
Urea mmols/l	22.4	7.5	11.3-55.0	2.5-7.0
Creatinine umols/l	555.9	441.6	55-1481	40-110

* n = 100 patients

The majority of the patients exhibited anaemia but biochemical abnormalities were only seen with regard to raised levels of urea and creatinine. Sodium and potassium were within normal limits.

There was no protocol for anaesthesia for renal transplant operation during the years reviewed. The technique employed was selected by the anaesthesiologist who managed the day's list with particular attention being paid to the following three points: oxygen carrying capacity of their blood is lowered in the majority of the cases so that hypoxia must be avoided during and after anaesthesia; the drugs used should be carefully chosen so that drugs which are excreted solely by the kidneys are avoided; it is recognised that there is a high incidence of ventilatory inadequacy seen in renal failure patients following anaesthesia. Factors involved may be: prolonged curarisation, recurarisation, depressant effect of narcotics. Care should be taken as regards the dose of narcotics and muscle relaxants as these patients have less muscle mass.

RESULTS

100 anaesthetic records of cases carried out between 1979 – 1984 were analysed.

ANAESTHETIC TECHNIQUE

Premedication

Pethidine was the most popular premedication drug used; 66 patients received pethidine. Other premedicant drugs used range from papaveretum either singly or in combination with hyoscine or phenergan (25 patients), diazepam (five patients) and morphine in (four patients)

Induction

98 patients received general anaesthesia. Two patients were given epidural analgesia. Of the patients who received general anaesthesia, thiopentone was used in 93 patients and methohexitone in five patients. Fentanyl/droperidol/halothane supplement was used in 71 patients, while pethidine/halothane combination was administered in 27 patients.

Those patients receiving general anaesthesia were intubated with sterile portex endotracheal tubes; and disposable syringes were used and sterile techniques employed in setting up intravenous lines, central venous lines etc., to strictly ensure minimal introduction of infection in an immunosuppressed patient.

Details of muscle relaxant used are as follows. suxamethonium was used for intubation in five cases, where intubation difficulties were envisaged preoperatively. Otherwise, a non-depolarising muscle relaxant was used both for intubation and maintenance of muscle relaxation. The most popular non-depolarising muscle relaxant used was pancuronium bromide totalling 75 patients. Out of the 98, 17 patients received D – tubocurarine, one patient received alcuronium and five patients received atracurium.

Maintenance

All the 98 patients received nitrous oxide 66% and halothane 0.5 – 1%, with either pethidine or most commonly fentanyl/droperidol combination. Increments of muscle relaxants were given in one-third to one-quarter the initial dose, only when signs of recovery from the muscle relaxant effect were noticed.

Reversal

The patients receiving non-depolarising muscle relaxants were reversed with atropine 1–2mg, and neostigmine 2.5–5mg.

Duration of the procedure: an average of three hours, with the range being from 2hrs 5mins to 4hrs 40mins.

Ischaemic time: from the time of clamping the renal vessels of the donor kidney to the reestablishment of the blood supply of the transplanted kidney in the recipient, it averaged 40mins and the range was between 25mins to 1 hour 10 mins.

Blood loss: this was measured by totalling the amount contained in the suction bottle with that absorbed in abdominal packs and gauze swabs used during the operation. The abdominal packs and swabs were not weighed; rather as assumption of an average of 50mls in abdominal packs and 20mls in swabs when fully soaked. Blood loss thus measured was on an average of 350mls, with maximum loss of 800mls.

Site of Operations

Gillvernette technique: 10 cases. Here the original kidney was removed and the transplanted kidney positioned in its place.

Illiac Fossa: 90 cases. Here the right donor kidney was placed in the recipient's left illiac fossa and *vice versa* so that kinking of the ureter is prevented.

COMPLICATIONS

Allergic manifestations presenting as wheals and redness in the arm where the injection was given were noted with use of atracurium followed by thiopentone in three cases. No accompanying hypotension was seen. The wheals disappeared following chlorpheniramine injection.

There was no intraoperative or postoperative deaths in the recipients resulting from anaesthetic complications. Three cases had inadequate reversal of neuromuscular blocking agents though tests using the peripheral nerve stimulator were not done at that time: however clinical tests showed presence of muscle weakness.

Of these three patients, one patient was given alcuronium, the non-depolarising muscle relaxant, on a dose basis of 0.25mg/kg as induction dose and had 5mg topped up during the procedure which lasted 3hrs 45min. He had to be ventilated postoperatively for twelve hours and recovered uneventfully.

The second patient received pancuronium bromide, the non-depolarising muscle relaxant, on a dose basis of 0.1mg/kg and with subsequent 2 mg top ups during the procedure which lasted 3hrs 30min; a total of 8mg of pancuronium bromide was administered. The patient had to be ventilated for five hours postoperatively before he was extubated.

The third patient, who was given D-Tubocurarine on a dose basis of 0.75mg/kg, did not require subsequent top-ups for the procedure which lasted 3hrs 30 min. This patient too, due to residual muscle paralysis present, had to be ventilated for twelve hours postoperatively before full muscle power and satisfactory breathing were reestablished.

Two other cases had residual respiratory depression after reversal agents were given. Both had received 50 μg of fentanyl intraoperatively. Hence naloxone (0.2mg I.V. and 0.2mg I.M.) was given in both cases with satisfactory results. Blood gases done in ICU immediately after was normal.

DISCUSSION

The patients in this study differed from other studies,[1] in that except for four cadaveric donors, all our donors were living close relatives, either parents or siblings.

Being an elective procedure as in the case of living related donors the recipient can be optimally prepared both psychologically and physiologically. Patients were anaemic, the mean being 7.8mg%. The policy of the Transplant Unit is to give blood transfusions to anaemic patients if necessary as judged clinically. Also in one haplotype match recipient's 300mls of donor specific blood is withdrawn and put into 100ml containers and given at two weekly intervals. Studies have shown this improves graft survival.[2,3] Haemodialysis is done for four to six hours for three days a week at the centre and also on the day before the operation. General anaesthesia using I.V. barbiturates, muscle relaxants, neurolept and halothane combination was the most common technique.

Epidural analgesia is now becoming increasingly popular in some centres; in our centre, only two cases of epidural analgesia were done. Though it provided adequate conditions for surgery this technique was not favoured by the surgeons; they complained of increased venous congestion in the pelvis and increased oozing. There was also an increased chance of haematoma formation while doing the epidural since these patients had a low prothrombin time and platelet dysfunction. The advantages of epidural analgesia are: patients do not feel the discomfort of the ureteric catheter *in situ*; absence of nausea and vomitting postoperatively; avoidance of the possibility of poor reversal of neuromuscular blockade.

From this study, it is also apparent that definite monitoring aids are useful for the delivery of a safe and satisfactory anaesthesia for renal transplant operation.

Use of warming blanket for the recipient is a routine measure at the centre. There were no hypothermia and post-operative shivering, hence no increased demand for oxygen. Also there was no increased possibility of prolonged neuromuscular blockade in these patients with less muscle mass.

Continuous monitoring of Central Venous Pressure

It has been emphasised that the recipient's haemodynamic condition during anaesthesia for renal transplantation has a major influence on the early diuresis of the graft. The effect of maximal hydration had been studied in a series of 120 cases.[4] Our experience too points this out clearly. In the earlier years CVP line was inserted intraoperatively but monitoring was done in ICU postoperatively only. These patients were haemodialysed the day before and were dehydrated deliberately to keep blood pressure within normal limits.

Intraoperatively we were cautious in running in fluids as these patients in terminal renal failure had minimal urine outputs ranging from 100–200mls of urine per day. The net result is that the transplanted kidney does not put out urine immediately after the release of anastomotic clamps and the anaesthesiologist is forced to induce diuresis by giving multiple doses of frusemide. Postoperatively there is therefore massive diuresis requiring close supervision of fluid replacement,

sometimes requiring 500mls/hour of I.V. fluid infusion.

However with the introduction of continuous CVP monitoring which on the average reads around 0-5cm H_2O at the beginning of the operation, we were able to run in 1500-2000 mls to keep the CVP around 10cms H_2O. On an average 10–20mg frusemide is now sufficient to elicit a good urine output immediately after the release of the anastomotic clamps.

Continuous non invasive blood pressure monitoring using dinamap was found to be reliable and invasive arterial blood pressure monitoring was avoided in these immunosuppressed patients.

Continuous ECG monitoring using S & W oscilloscope

Our routine is that both the donor and recipient are nursed in ICU postoperatively as earlier on, we had two donors who died in the general ward; the first donor with a vague history of angina and not on treatment prior to surgery died of acute myocardial infarction five hours postoperatively, and the second donor died following acute haemorrhage postoperatively which was not detected early enough.

From previous studies, we know that d-tubocurarine has a higher percentage of excretion *via* hepatobiliary pathway when compared to pancuronium bromide.[5] From our study, we found that if pancuronium bromide is used in lower than normal doses, it does not cause prolonged muscular blockade in renal failure patients.

The new neuromuscular blocking drug atracurium which undergoes ester hydrolysis by Hoffman's Degradation does not require renal function for excretion, and therefore seems to be the drug of choice. From our experience of cases we noted that there is a more prolonged action if atracurium is used along with halothane and neurolept combination thereby requiring fewer repeat doses and thus reducing the cost of the total dose of the drug required.

To conclude, there is uniform agreement that renal transplantation has the best potential for restoring a patient with end – stage renal disease to his normal state of physical, mental, and psychosocial health. Both regional and general anaesthesia have their drawbacks in kidney transplants. By combining the practice of safe anaesthesia, improved surgical techniques and better knowledge of immunosuppressant drugs, renal transplant operation would become the choice operation for end-stage chronic renal failure patients.

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