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Case Report and Review of Literature on Anaesthetic Management for Open Anatropic Nephrolithotomy in a Case of Horseshoe Kidney with Bilateral Staghorn Calculi

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Abstract: ***Horseshoe kidneys are usually associated with a number of complications like PUJ obstruction, recurrent infections, recurrent stone formation, carcinoma and greater propensity to get traumatized. We report a case of 45yr old female with bilateral large staghorn calculi with horseshoe kidneys. Anatrophic nephrolithotomy was performed under epidural and general anesthesia with anaesthetic challenges of massive blood loss, hypothermia, prolonged surgery, acidosis and postoperative analgesia.Anatrophic nephrolithotomy is a procedure in which parenchymal incision is made in an intersegmental plane allowing removal of large renal calculi. ANL has excellent stonefree rates but morbidity related to intraoperative and postoperative complications is a matter of concern.***

Keywords: ***Anatrophic nephrolithotomy ,*** B/l renal calculi, horseshoe kidney, massive blood loss, hypothermia, reperfusion injury, epidural analgesia.

1. Introduction

The kidney is one of the vital organs of the body. It has many functions, of which the main one is the filtration of plasma and excretion of waste products whilst maintaining water, osmolality, electrolyte and acid-base homeostasis. They secrete renin and have a role in the regulation of blood pressure and fluid balance, and also secrete erythropoietin. They are also important for calcium homeostasis. Finally, they have a major role in the metabolism and excretion of many drugs.

Horseshoe kidney is the commonest fusion anomaly of the genitourinary tract with a prevalence of 1/400-1/800[1]. It is characterized by renal malrotation, variable blood supply, and a propensity to form ureteropelvic junction (UPJ) obstruction in up to one-third of cases[2] .The most common complication of horseshoe kidney is kidney calculus.

The management of a patient who presented with horseshoe kidneys with recurrent multiple renal calculi due to bilateral ureteropelvic junction (PUJ) obstruction is described.

2. Case Report

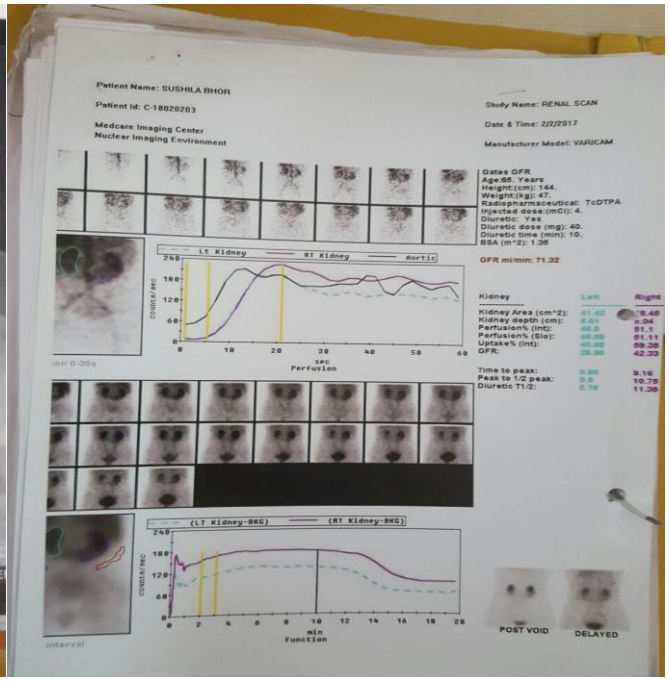
A 55-year-old female patient presented with complaints of intermittency, burning & foul smelling micturation, pain lower abdomen, fullness in both flanks, increased frequency of micturation, and dysuria off and on for 10-15days. The patient gave a history of rt-sided PCNL(percutaneous nephrolithostomy) 3 years back. The operation was uneventful, but there was no total stone clearance.pt also had h/o hysterectomy 20 yrs back. The patient was evaluated and investigated.

Pre anesthetic check up was done and all routine investigations were done complete blood count, pt-inr, total bilirubin, direct bilirubin, serum creatinine, serum electrolytes, random blood sugar, blood group, xray-chest, ecg.

All investigations were within normal range. X ray chest showed straitening of Lt heart border with cardiomegaly and ecg was normal. A 2D echo was done for the pt which showed sclerotic changes in trileaflet aortic valve , no RWMA, LVEF-60%, no diastolic dysfunction.

On oral & airway assessment pt had adequate mouth opening, no loose teeth & mallampatti scoring of 2.

Ultrasound (USG) abdomen was s/o horseshoe kidney with bilateral multiple renal calculi with mild hydronephrosis. Xray KUB (Figure 1) was s/o a horseshoe kidney with b/l staghorn calculi Lt>Rt . DTPA scan(Figure 2) was s/o hydronephrotic left moiety with mild to moderately impaired parenchymal function & non obstructed drainage pattern & hydronephrotic Right moiety with preserved parenchymal function and mildly sluggish but non obstructed drainage pattern. CT KUB s/o horseshoe kidney with b/l renal calculi largest 4.1cm(staghorn) & smallest 1.5cm & b/l mild hydronephrosis.



Preooperatively patient was prepared .Blood & bed/venti were reserved.
Preoperative bp was 130/70 and pulse rate 90/ min. General anesthesia was planned for the pt & informed consent was obtained from the pt and relatives . After shifting the pt on OT table two 18 G cannulas were taken in each limb and iv fluids were started. Standard ASA monitors were applied. The pt was premedicated with inj ranitidine 50mg, Inj metoclopromide 10 mg, inj glycopyrolate 0.2mg, inj midazolam 1mg, inj fentanyl 100mics.

Epidural analgesia was planned in view of large infracoastal abdominal incision. 16G epidural catheter was inserted through epidural needle by LOR technique at T12-L1 level and catheter fixed at 11 mark.

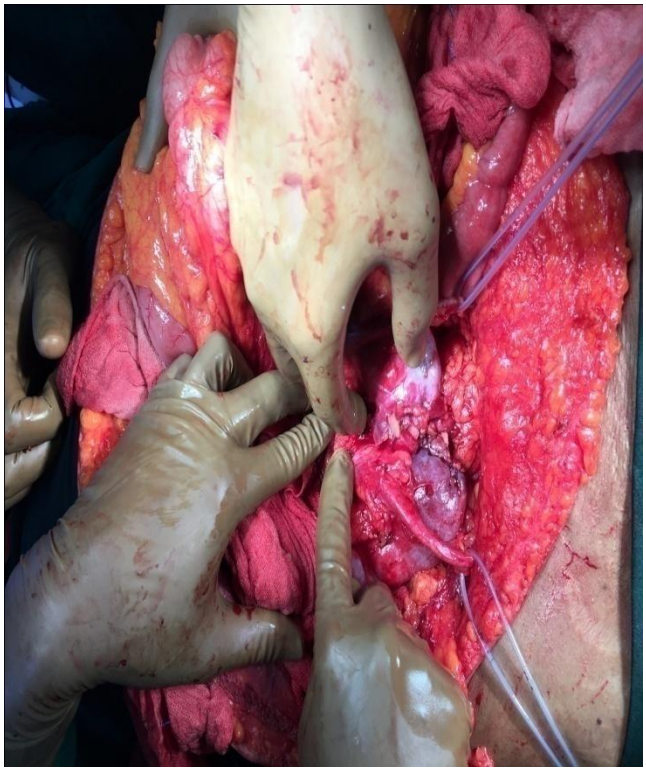
Normal intubation was carried out with Inj propofol 120 mg & inj vecuronium 5mg & pt was intubated with cuffed endotracheal tube of 7.5 mm inserted & fixed at mark 20cm after confirmation of bilateral air entry. Pt was put on CMV mode of ventilator.

Central and radial arterial line cannulation was done under all aseptic precautions with 7 fr triple lumen catheter and 20G arterial cannula respectively

Anaesthesia was maintained with titrated doses of isoflurane and titrated doses of inj atracurium with epidural infusion of Inj bupivaicaine 0.25%+ inj fentanyl 1 mic per ml @3-4ml per hour.

The surgery was performed in supine position & headlow was given & table broken in the middle to raise the loin. Padding was done on all the dependent parts of the body. A transverse incision was taken from rt 12^{th} rib bed to lt 11^{th} rib bed. On opening abdomen bulky horseshoe kidneys were seen. There was significant bleeding from IVC during separation from isthmus and aorta. Mean arterial pressure was maintained with crystalloids,colloid,blood and vasopressors(ephedrine and phenylephrine). Renal artery identified on both sides and clamped.Renal protection was given with mannitol, and iceslush hypothermia.

Parenchyma was split stepwise to approach posterior infundibulocaliceal system containing stone. All the stones were delivered from posterior and anterior pelvis. Antegrade DJ stenting done. Lt side ICD inserted along with rt side abdominal drain.



Estimated blood loss during the surgery was 3500ml.Urine output was around 700 ml. Pt received 4 units of packed cell volume and 4 units of fresh frozen plasma intraoperatively followed by 1 unit of PCV and 2 unit of FFP postoperatively. Arterial blood gas analysis(ABG) revealed metabolic acidosis with ph 7.25 with bicarbonate of 8 and correction with 100 ml(10 gm) of soda bicarbonate correction was given.Acidosis was due to bloodloss,hypothermia,prolonged surgery and transient clamping of renal arteries. Massive blood loss is defined as blood loss of greater or equal to 150ml/min or 100% blood volume in 24 hrs or 50% blood volume in 2 hrs. In our case it was 50% blood volume in 2 hrs. Pt was later started on noradrenaline 3mg in 50 ml @4ml/hr to support blood pressure. Intraoperative patient had developed arrhythmias (VPC-ventricular premature beats) due to ischemia reperfusion injury which was effectively treated with iv xylocard(1-1.5mg/kg)

Total duration of surgery was 420 minutes(7 hours) and the pt was not reversed and put on elective ventilation in SICU along with inotropic support & kept sedated and paralysed with inj atrac 200mg+inj midaz 10mg diluted in 50 ml NS started @4 ml/hr.Epidural analgesia was continued as 0.125% Bupivacaine and fentanyl . Post op ABG and Chest xray was done. Post op ABG was normal with PH of 7.34 and bicarbonate was 21.0.inj furosemide(10 mg) was given. chestxray of pt was normal.Inj noradrenaline was tapered and stopped. Coming morning after repeating ABG of the pt was extubated and kept on Hudson @4l/min. After extubation the pt maintained well .Post extubation ABG and electrolytes of the pt were within normal limits.

3. Discussion

While assessing the patient particular attention must be paid to the renal function. Plasma creatinine and urea concentrations provide good information about general kidney function. The patients condition should be optimised as far as possible prior to surgery. [3]

Induction of anaesthesia was done with intravenous & inhalational agents. Maintenance was done with isoflurane. Atracurium is the non-depolarising muscle relaxant of choice & used in our case.

The kidney is a very vascular organ and haemorrhage is real risk. Bleeding can occur from the renal artery, the inferior vena cava, or from aberrant arteries. The risk was higher in our case of horse shoe kidney with aberrant vasculature and distorted anatomy. In our patient we had put a central venous catheter also for resuscitation and CVP monitoring. Invasive blood pressure and arterial line cannulation was the mainstay monitoring in our case as it helped in beat to beat blood pressure and blood gas monitoring.

All pressure points were padded in order to avoid post operative neuropathy. “Breaking” the table or using a kidney bridge may kink or compress the inferior vena cava, particularly in the right lateral position, causing a decrease in venous return and therefore cardiac output. Observation was paid to cardiovascular parameters during patient positioning.

Attention must be paid to maintaining the patient’s temperature as far as possible. Warmed intravenous fluids, warm blankets and heated mattresses were used in our case to prevent post operative hypothermia and acidosis.

In addition to normal maintenance fluid requirements intra-operatively, evaporative losses from an open abdomen (10-30 mL/kg/h) and third space losses to bowel, omentum was taken into account. Crystalloids were used for maintenance and third space losses. Colloid and packed red blood cells

were used for blood loss. Fresh frozen plasma, was also given in view of massive blood loss.

Intra operatively and Postoperatively a urine output of 0.5-1.0 mL/kg/h was maintained[4]

Great care was taken to avoid factors which can compromise renal function. These included hypotension, acidosis, dehydration, sepsis and nephrotoxic drugs. Various methods have been used to try to protect kidney function in patients undergoing surgery. These include the administration of dopamine, diuretics, calcium channel blockers, angiotensin converting enzyme inhibitors and hydration fluids.[5] In our case we used mannitol and ice slush for renal protection.

Pneumothorax is a known complication as the kidney lies in close proximity to the lungs. Any pneumothorax may rapidly progress to a tension pneumothorax with the use of IPPV and can cause haemodynamic instability. In our patient left sided ICD was put before extubation.[6]

A low thoracic epidural catheter was used with continuous infusions of a mixture of low dose local anaesthetic and opioid to provide the best pain relief.

In our case we did an anatropic nephrolithotomy because of large size of stones and also because of surgeons preference.

4. Conclusion

Horseshoe kidneys can be detected through assess to ultrasonography and pyelography.

Anatrophic Nephrolithotomy is a major open renal surgery and if done, adopting the standard precautions and with a sound knowledge of renal vascular anatomy, can serve as an alternate to the modern methods in selected situations. Open surgery still plays a role in the treatment of staghorn stone disease & appears necessary in minimally invasive treatment failures. Such supramajor surgeries require good preoperative stabilization and postoperative care. Introperative concerns include major bloodloss,hypothermia,acidosis and analgesia. The patients pre-existing renal function and any other co-morbidities must be considered when planning anaesthesia for renal surgery. Open operations on the kidney are painful and epidural analgesia should be used where possible. Anatrophic nephrolithotomy is one of the most used option for staghorn calculi.smith et all [7] described ANL a procedure in which stone removal and correction of collecting system anomalies was possible.

PCNL has the advantage of shorter hospital stay but may require multiple procedures[7]

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