ORIGINAL ARTICLE

Practice of Blood Transfusion during Percutaneous Nephrolithotomy of kidney stones in a Tertiary Care Hospital

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ABSTRACT

Background: PCNL is a very useful surgery for removing large stones from the kidney with minimal problems in trained hands. However as with all blind access procedures it has significant possible complications. Bleeding is the most common and dreaded consequence of per cutaneous nephrolithotomy (PCNL). Injudicious transfusion should be avoided, as it has many possible complications. This study aimed to highlight the prophetic factors of hemorrhage during the PCNL operation and assess the perioperative transfusion needs and to identify predictive factors of patients and procedures which would require transfusion..

Methods: This prospective study was performed at Shalamar Hospital between July 2012 and December 2017. 205 cases of PCNL were performed by a single surgeon. All of the cases were included for analysis. Data was recorded on a formatted form. Results were analyzed using SPSS.

Results: Out of 205 patients blood transfusion was given in 9 patients. 4.39% of patients needed transfusion after the procedure.

Conclusion: PCNL is a safe and better option to conventional pyelolithotomy

INTRODUCTION

Renal calculi is one of the common urinary tract disease due to its raised incidence and prevalence in the world. Its incidence in America is 160 out of 100,000 individuals[1] while German population have high incidence of 720 out of 100,000 individuals[2]. Incidence of stone disease in Asia is also on its rise and accounts for 114.3 out of 100,000 individuals in Japan and 145.1 out of 100,000 individuals in Iran[3]. A worldwide increase in renal calculus have been observed in patients of all ages, gender and origins[4].

Percutaneous renal puncture is the key step during the percutaneous nephrolithotomy[5]. PCNL is frequently used nowadays in order to remove the renal stone that are complex and resistant to other form of treatment option[6]. PCNL is the preferred treatment option for stones in renal calyx and pelvis sized more than 20 mm according to European guidelines[2,7]. PCNL has clearance rate of 78-95% for renal stones more than 20 mm[8].

Hemorrhage is one of the most dreadful complication of PCNL. Gaining access to renal collecting system through percutaneous means results in damage to vessels including the interlobar and segmental arteries. Kidney is richly vascularized and receive 20% of cardiac output, and infrequently leads to hemorrhage during PCNL[9]. Excessive loss of blood and therefore the need of transfusion during the PCNL, may results in incorrect management of hemorrhage.

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The need of blood transfusion depends on the burden of the stone disease that is removed with PCNL. It is 1-11% in patients who underwent PCNL and raises to 2-53% in patients with staghorn stones[9]. There are also other risk factors involved that can predict the risk of bleeding including the age[10], urinary tract infection[10], multiple access, diabetes mellitus, prolonged surgery time and stone composition[11]. Several of the cases with bleeding during PCNL might be treated conservatively but 0.8 % patients needed some form of intervention to control the bleeding[12].

To date there are is no precise data available to determine the blood transfusion requirement at some stage in PCNL. In our hospital, bloods are requested pre-operatively in keeping with scientific estimation but, this does not usually in accordance to the intra-operative blood loss. This study became aimed at predicting the amount of blood loss in the course of PCNL via figuring out the pre-operative elements that might likely lead to a decrease morbidity.

MATERIALS AND METHODS

This study consists of patients who underwent percutaneous nephrolithotomy in our instituition from July 2012 to December 2017. Patients with pelvic stones >20 mm, inferior calyx stones >10mm or staghorn stones who agreed to sign up by way of written informed consent were included in this study. Patients with coagulation disorders, taking anti-coagulant drugs or who were converted to open surgery were excluded.

Patients were admitted one day prior to surgery. The PCNL was done under general anesthesia by single urology surgeon. The patient was put in prone position and percutaneous access gained to pelvicalyceal system with fluoroscopic guidance, followed by dilatation using a metal and fascial dilators before insertion of sheath. Pneumatic lithotripsy was used to fragment the stone which was subsequently removed by forceps or grasper. The procedure was completed when the patient was stone-free and any arising complications alleviated.

Full blood counts were taken prior to procedure and thereafter at 24 hours post-operatively. Total blood loss was calculated considering initial hematocrit level and 24-hour post-operative hematocrit level.

RESULTS

Out of 205 patients blood transfusion was given in only 9 patients. It means that only 4.39% of patients needed transfusion after the procedure.

The factors which were predictive of patients who would need transfusion were identified as, a stone size more than 5 cm, operative time more than 120 minutes, a starting Hb of less than 11 gm/dl and amplatz sheath size more than 26 fr.

DISCUSSION

Renal stones are a very common pathology presenting to our clinics as we live in the stone belt region of the world, moreover poor sanitation, high temperatures during summers and poor quality of drinking water play a very important role in stone formation. The conventional open surgery is associated with significant morbidity and loss of useful man working hours, this also produces loss of quality and capability of manual work as there is significant pain and reduction of dexterity of the patient.

PCNL in this situation provides a very valuable alternative as it has all the benefits of minimally invasive surgery i.e., reduced pain, reduced injury to muscles and surrounding structures, decreased length of perioperative morbidity, early resumption of work. However as this is a blind procedure in the sense that we do not know what structures our needle and dilators are going through, it is associated with potential significant morbidity out of which bleeding at the time of surgery and postoperative is a very significant problem.

Kidneys are extremely vascular organs and are supplied by 20% of the cardiac output. PCNL involves handling through the pelvicalyceal system with impending trauma to the segmental and inter-lobar renal vessels and thus results in haemorrhage. The stones could be infected, the renal function compromised and large stone bulk could prolong the operative time and consequently blood loss. Although technological refinements and increased surgical expertise have ensured the procedure's successful execution, Renal haemorrhage is one of the most common and worrisome complications of percutaneous renal surgery beside other complications including collecting system injuries, adjacent structure injuries, intraoperative technical complications and even mortality can still occur.

Previous studies have shown the incidence of 2-45% of significant haemorrhage requiring blood transfusion after PCNL. Frequently known factors that cause bleeding after PCNL include multiple punctures, hypertension, diabetes, presence of chronic renal failure, number of tracts, stone type , whereas atrophic parenchyma, , previous nephrostomy tube placement and tract dilatation with balloon dilatation was shown to cause less bleeding in PCNL.. The largest series looking at variables affecting haemorrhage has revealed stone size as the single most important factor predicting bleeding after surgery requiring transfusion and intervention.

In this study we did not not use traditional methods including visible expected blood loss to assess hemorrhage due to excessive bias[13,14,15,16,17]. Laboratory values were obtained and recorded after 24 hours after the surgery. Hematocrit level was used as the reference to guide the blood transfusion[18]. Hematocrit level depicts the total blood volume[19]. One of the studies in Turkey also applied hematocrit as a guide for blood transfusion. In this case hematocrit level of less than 30 was taken as a cut point for blood transfusion.

Transfusion rate in our study was less than a study done in Pakistan that showed transfusion rate of 14.2%[20]. All of our cases presented with hemorrhage were managed conservatively. We determined the predictive factors from the cases in which transfusion was required post operatively. We found that patients who had a low starting Hb less than 11 were at a higher risk of requiring transfusion, this may be due to solely a low Hb or other factors as well. Moreover patients who had a very large stone with a large bulk of stone were at a higher risk of bleeding and hence risk of transfusion, this may be due to injury to the collecting system during the procedure or due to the maneuvering of the sheath during the procedure. Another factor was prolonged surgery the cut off seems to be 120 minutes this is obviously correlated to a larger stone size or complex anatomy. Another very important factor that we came across was the size of the amplatz sheath we noticed that in all cases which required transfusion had their

surgery done by either a 28 or a 30 fr amplatz sheath, this is most likely due to a greater diameter of renal laceration and associated intrarenal vasculature.

An accurate evaluation of surgical blood loss is required in order to avoid the over transfusion in the patients treated with PCNL.

CONCLUSIONS

We conclude that careful selection of patients for PCNL , usage of smaller amplatz sheath and keeping a higher threshold for transfusion reduces the rate of transfusion. Gaining expertise for this procedure also significantly reduces the possibility of complications.

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