OPEN SIMPLE PROSTATECTOMY AND BLOOD TRANSFUSION IN NAIROBI

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ABSTRACT

Background: Open simple prostatectomy has long been associated with large blood losses; hence allogeneic blood transfusion in this procedure is a standard practice world over. A review of literature suggests significant association between peri-operative blood loss accompanying open simple prostatectomy and certain patient factors: The shortage of blood and blood products in our blood transfusion centres as well as the alarming risks of transfusion reactions and disease dissemination demanded a review of these factors with the aim of reducing morbidity associated with peri-operative blood loss and blood transfusion.

Objectives: To assess blood loss, determine blood transfusion rate, and define some of the factors associated with peri-operative blood loss and blood transfusion in open simple prostatectomy.

Design: A prospective cohort study.

Settings: The urology units of Kenyatta National Hospital, Kenya.

Results: Ninety five patients who underwent open simple prostatectomy for benign prostatic hyperplasia were enrolled into the study. Their median age was 70 years (Range 50 to 97). The mean decrease in haemoglobin concentration, which was the main indicator of peri-operative blood loss, was 2.1g/dl (± 1.4). The peri-operative blood transfusion rate was 36.8%. Twenty four (68.6%) of the patients who received either one or two units of blood had a pre-operative haemoglobin level above 13.5g/dl and a post-operative haemoglobin level above 11.5g/dl, while 11 (31.4%) had severe peri-operative bleeding, that necessitated immediate surgical re-intervention. A total of 68 units of blood was transfused, 42 (61.8%) allogeneic and 26 (38.2%) autologous blood. The post-operative median hospitalisation time was eight days (Range 4 to 35). There were two (2.1%) post-operative deaths and both patients had intractable intra- and post-operative bleeding, massive blood transfusion and disseminated intravascular coagulopathy. The factors that were significantly associated with peri-operative blood loss and blood transfusion in open simple prostatectomy were patient’s aged above 70 years, pre-operative use of acetyl-salicylate or warfarin sodium, pre-operative systolic blood pressure above 140mmHg, general anaesthesia, Freyer’s (transvesical) technique and the weight of resected prostatic tissue above 70 grams.

Conclusion: Open simple prostatectomy performed under spinal anaesthesia using Millin’s (retropubic) technique is associated with minimal blood loss. The peri-operative blood transfusion rate was 36.8%.
INTRODUCTION

Benign prostatic hyperplasia (BPH) is one of the most common diseases that affect men beyond middle age. Over 40% of men above the age of 60 years have symptomatic disease (1). Though its prevalence increases with age, benign prostatic hyperplasia is rarely a life threatening disease but the symptoms of frequency, nocturia and incomplete bladder emptying impact substantially on the patient’s quality of life (2). The treatment options for this disease include watchful waiting, medical and surgical management. With the emergence of trans-urethral resection of the prostate (TURP) and the development of modern optical instruments, trans-urethral resection of the prostate has replaced open simple prostatectomy as the operation of choice for benign prostatic hyperplasia world over and especially in the developed countries. Nonetheless, open simple prostatectomy, an invasive surgical approach for treatment of medically resistant or advanced lower urinary tract obstruction secondary to benign prostatic hyperplasia, remains the procedure of choice in patients with prostate larger than 75 grams or larger than the surgeon can resect reliably by trans-urethral resection of the prostate in 60 to 90 minutes (2). In those with concomitant bladder pathology complicating their outlet obstruction such as a large hard bladder calculus or symptomatic bladder diverticulum, open simple prostatectomy optimises exposure to both the entire prostate and intravesical bladder. Moreover, patients with musculoskeletal disease precluding proper patient positioning in the dorsal lithotomy position for trans-urethral resection of the prostate may benefit from open simple prostatectomy. Open simple prostatectomy is also indicated in patients with unilateral or bilateral inguinal hernias as these can be repaired preperitoneally at the same time through the same incision (3). The three approaches in open simple prostatectomy include retropubic (Millin’s), transvesical (Freyer’s) and simple perineal.

Retropubic prostatectomy is the enucleation of a hyperplastic prostatic adenoma through a direct incision of the anterior prostate capsule. The procedure dates to 1945, when Terrence Millin first reported his experience with 20 patients (4). Transvesical approach is the enucleation of the hyperplastic adenoma through an extraperitoneal incision of the lower anterior bladder wall. Eugene Fuller first performed this procedure in 1894 and by 1912, Peter Freyer, who reported his results with 1000 patients had popularized the procedure (5). Simple perineal prostatectomy for treatment of lower urinary tract obstruction secondary to benign prostatic hyperplasia illustrates the development in the approach to this common pathology. More than 2000 years ago, surgeons devised and employed a median perineal incision for the removal of bladder calculi and years later it was used for partial removal of the prostate (2).

There is a perception that open simple prostatectomy is associated with large blood losses and allogeneic blood transfusions. Bleeding in open simple prostatectomy, as in other surgical procedures, may be encountered during surgery (primary haemorrhage), within 24-48 hours after operation (reactionary haemorrhage) or be delayed for several days to weeks (secondary haemorrhage). Excessive haemorrhage during the procedure results in transfusion of allogeneic blood products that may expose the patient to undesirable adverse reactions (6). Blood should be transfused only when there is a documented need to increase oxygen delivery in patients who are unable to meet their demands through normal cardio-pulmonary mechanisms (7). The association between open simple prostatectomy and blood transfusion has been reported in many series worldwide. Serretta et al, in 2002, (8) reported a blood transfusion rate of 8.2% in a contemporary series of open prostatectomy for benign prostatic hyperplasia in southern Europe while Luttwak et al (9) reported blood transfusion rate of 57.1% for transvesical prostatectomy in Israel. Thurston et al (10) carried out a study in 1993 to investigate the effect of aspirin (acetyl – salicylate) on post-prostatectomy haemorrhage and noted that 29% of the 136 patients had significant blood loss as judged by the post-operative drop in haemoglobin of more than 2g/dl, or on the basis of receiving more than two units of blood though most of his patients had been receiving aspirin (acetyl – salicylate) on a regular basis. Kirollos et al (11) reported transfusion rate of 10.8% in total and 3.6% of more than two units, while Thorpe et al (12) reported a 2.5% transfusion rate of more than two units in trans-urethral resection of the prostate.

Excessive haemorrhage during open simple prostatectomy may result in transfusion of allogeneic blood products that may expose the patient to undesirable adverse reactions. Several efforts have therefore been instituted to reduce transfusion rates, including improved surgical techniques, use of erythropoietin, preoperative autologous blood donation and acute normovolaemic haemodilution. Nuttal et al, (13) in 2002, noted that with these measures in place,
the mean peri-operative blood loss and need for blood transfusion in patients undergoing open prostatectomy significantly reduced. Shaheen and Quinlan in 2004 (14), reported a mean peri-operative decrease in haemoglobin of 2.2g/dl and blood transfusion rate of 16% in 37 consecutive patients who underwent open simple prostatectomy with early vascular control. Hatch (15) noted that general anaesthesia resulted in twice the transfusion rate as regional anaesthesia while Madsen et al (16) showed a statistically significant advantage in blood loss for spinal over general anaesthesia (P < 0.01) in a study of 180 patients.

Pickard et al, (17) in 1998, noted that patient characteristics associated with the need for blood transfusion were large prostatic glands and age above 70 years while Luke et al (18) noted that bleeding remains one of the most important problems associated with open simple prostatectomy. Although haemostasis is usually sufficient during surgery, re-bleeding may continue for several days, requiring blood transfusion and sometimes re-operation. The risk of post-operative haemorrhage has been related to both the weight of the resected prostatic tissue and aspirin ingestion (19).

The technique of open simple prostatectomy also determines the amount of blood loss and subsequent blood transfusion. Ibrahim et al, (20) in 1995, studied the effect of age, type of surgery and co-morbidities on peri-operative complications and mortality of prostatectomy; and reported that open prostatectomy was associated with more haemorrhage, blood transfusion, post-operative pyrexia and a longer bed stay. Blood loss and transfusion rate in both the operative and post-operative periods is directly related to the weight of the gland resected, with values of 20 to 37 ml/g of blood loss being reported (21). Hill et al (22) in a research done in a rural Kenyan hospital in 2002 reported a mean prostate weight of 70.4 g and a transfusion rate of 4.7% for suprapubic - transvesical prostatectomy. Kirollos et al (11) demonstrated a strong correlation between the weight of the resected prostatic tissue and blood loss and noted that it was the most important measurable factor in relation to blood loss. Other possible variables contributing to blood loss include the age of the patient and the blood pressure, bleeding being more severe in older patients with hypertension (23). Of the drugs contributing to haemorrhage after prostatectomy, the most commonly studied is heparin administered subcutaneously as prophylaxis against venous thrombo-embolism.

Gavriluk, in 1987, reported a high incidence of haemorrhagic complications in patients given aspirin prior to open prostatectomy (24).

The need for blood and blood products has continued to exceed the amount available from transfusion services. As a result, there is a shortage of red cells and other blood products. Boral et al (25) attributed this to medical advances that resulted in diseases being treated and lives prolonged by relatively new methods such as chemotherapy and open- heart surgery. They noted that although this progress had created an increase in demand for blood, the supplies were expanding by only 1% annually, hence predicted significant blood shortages in future. Similar sentiments were echoed by Smallwood (26) in 1983 when he pointed out that a growing demand for blood and its products had exceeded the resources of his local blood bank thereby disrupting both the planning and the nature of surgical lists at Queen Alexandra Hospital, Portsmouth. In Kenya, similar trends have been observed by Omar et al (27) at the National Blood Transfusion Centre, Nairobi. While the expected blood collection for the region was 16,000 units in 2003, only 8,000 units of blood had been collected. They also reported infection rates of 6% of all the screened blood in 2003 (27). The shortage of blood and blood products coupled with the heightened awareness of transfusion reactions as well as transfusion related infections has prompted surgeons to reassess the reasons for blood transfusion, increase the use of autologous blood and modify surgical techniques to reduce blood loss. Under normal circumstances, loss of blood less than 20% of the total blood volume may be compensated for by infusing intravenous fluids alone, while a loss of less than 10% may not even require such infusion (28). Mugenya (29) in a study done in 1995 at Kenyatta National Hospital showed that 18% and 78.6% of surgical patients with blood loss less than 500ml, and between 500 - 1000ml respectively, had blood transfusion. While he indicated that blood loss was the major determinant of blood transfusion rate in surgery, other factors need to be incorporated to determine a comprehensive policy that would govern judicious and rational use of blood peri-operatively. Kirollos et al, (11) in 1997, further concluded that blood transfusion could be markedly reduced and rationalised if all the factors that determine blood loss can be defined.
MATERIALS AND METHODS

This was a prospective cohort study carried out between June 2004 and May 2005. The study end point was the discharge of the patient from the hospital or death. The study was carried out in the urology units at Kenyatta National Hospital, Nairobi. This is a teaching and referral hospital located in the capital city of Kenya.

All patients admitted to the urology units of Kenyatta National Hospital, with a clinical diagnosis of benign prostatic hyperplasia and were to undergo open simple prostatectomy by Millin’s (retropubic), Freyer’s (transvesical) approach were eligible for the study. They were all reviewed at admission and those who gave informed consent were enrolled into the study. Those who declined or were unable to give informed consent were excluded.

The investigator visited the urology units every afternoon before an elective urology theatre day. Patients who met the selection criteria were informed about the study and an informed consent was obtained. They were enrolled into the study consecutively until the desired sample size was obtained.

All the patients were reviewed pre-operatively. The patients’ age and presenting symptoms were recorded. Clinical presentation included acute and chronic urinary retention, prostatism that was determined using the International Prostate Symptom Score (IPSS), complications of urinary retention that included hydronephrosis, chronic renal failure, bladder calculus, prostatic bleeding and unilateral / bilateral inguinal hernia. International Prostate Symptom Score has a maximum score of 35 and a score of 20 or more was considered as severe obstructive urinary symptoms.

A history of bleeding disorders and use of drugs such as acetyl-salicylate, heparin sulphate and warfarin sodium was obtained. Cubital venepuncture was done and blood samples collected for haemogram, urea, electrolytes and cross-match. The other pre-operative investigations that were done when indicated included chest X-ray, ECG, trans-rectal ultrasound, abdominal ultrasound and prostatic biopsy. The pre-operative morbid state of the patients was assessed with emphasis laid on the medical conditions that determine peri-operative blood loss such as bleeding disorders and hypertension. The patients were assigned American Society of Anesthesiologists (ASA) grades using the details obtained from the clinical history, physical examination and investigative procedures.

Intra-operatively, the details of the category of the surgeon performing the operation, the technique of anaesthesia used and the technique of open simple prostatectomy were recorded. The prostatic tissue excised was weighed using a top pan balance before fixation and the weight recorded. The number of units of blood transfused intra or post-operatively – autologous or allogeneic- was also recorded.

The patients were then reviewed every morning post-operatively until discharge or death. Another blood sample was collected on the third post-operative day to determine the post-operative haemoglobin concentration. Any excessive haemorrhage that required immediate re-intervention and the duration of post-operative hospital stay were noted.

The blood samples for haemogram were analysed using the automated electronic counters and the haemoglobin concentration was automatically derived by the machine. All data generated was recorded into a work sheet and then entered into an IBM personal computer.

The data was entered into an Epi – info 6 data sheet and exported to the SPSS version 10 statistical software package for analysis. The differences in proportions and means were analysed using Pearson chi – square test of independence and P-values < 0.05 were considered as significant. Mann – Whitney U and linear correlation tests were used to analyse continuous variables where appropriate. The data was presented as mean ± standard deviation (SD) for continuous variables and percentages for categorical variables, in frequency tables, bar graphs and pie charts as appropriate.

Peri-operative blood loss was judged by the peri-operative decrease in haemoglobin concentration and hence the main study outcome was defined as the mean peri-operative decrease in haemoglobin concentration and blood transfusion rate. The mean decrease in haemoglobin concentration was derived from the pre- and post-operative haemoglobin concentration of all the enrolled patients. The post-operative haemoglobin for the patients transfused peri-operatively was corrected for the transfused volume by subtracting 1g/dl for each transfused unit of blood.

Approval to carry out the study was obtained from Kenyatta National Hospital Ethics Review Committee. The study objectives and clinical procedures were explained to the patients before enrolling them into the study. A written informed consent was obtained . Aseptic technique was used during the venepuncture. The cubital fossa was cleaned.
thoroughly with methylated spirit or iodine solution before collecting the blood sample using sterile needles and syringes. The used materials especially sharps were disposed safely into designated containers to avoid needle prick injuries.

**RESULTS**

Ninety-five patients who underwent open simple prostatectomy for benign prostatic hyperplasia were enrolled into the study between June 2004 and May 2005. Their median age was 70 years (Range 50 to 97) and 56.8% were above 70 years.

**Figures**

*Figure 1*

*Distribution of patients according to age group*

Majority of the patients were above 70 years.

*Figure 2*

*Distribution of patients according to the indications for open simple prostatectomy*
The main indications for open simple prostatectomy were chronic urinary retention with hydronephrosis in 38 (40%) patients, severe obstructive urinary symptoms (mean International Prostate Symptom Score (IPSS) of 29.4 ± 2.1) in 34 (35.8%) patients, unilateral or bilateral inguinal hernia in 16 (16.8%) patients and severe prostatic bleeding in seven (7.4%) patients. The patients’ American Society of Anesthesiologists (ASA) grades were as shown in Table 1.

Table 1
Distribution of patients according to ASA grades (n = 95)

<table>
<thead>
<tr>
<th>ASA grade</th>
<th>Number of patients</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>49</td>
<td>51.6</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>42.1</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>6.3</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

There were no patients in ASA grades 4 and 5.

Of the patients, 69 (72.6%) underwent surgery while under spinal anaesthesia and 26 (27.4%) while under general anaesthesia. Sixty one (64.2%) had open prostatectomy via Millin’s (retropubic) approach and 34 (35.8%) via Freyer’s (transvesical) approach. No patient underwent open prostatectomy via simple perineal approach. The mean weight of the resected prostatic tissue was 66.9g (Range 10 to 250, Median 60). Sixty five point three percent of the resected prostatic tissue weighed less than 75g.

The mean pre-operative haemoglobin level was 13.5g/dl (± 1.8), mean post-operative haemoglobin level was 12.0g/dl (± 1.9) and the mean corrected post-operative haemoglobin level for those who received blood transfusion was 9.9g/dl (± 1.7). The mean decrease in haemoglobin concentration, which was the main indicator of peri-operative blood loss, was 2.1g/dl (± 1.4).

The peri-operative blood transfusion rate was 36.8%. Of the 35 patients who received blood transfusion, 15 (42.9%) received one unit, 11 (31.4%) received two units, seven (20%) received three units, and two (5.7%) received five units of blood respectively. Twenty-four (68.6%) of the patients who received either one or two units of blood had a pre-operative haemoglobin level more than 13.5g/dl and a post-operative haemoglobin level more than 11.5g/dl, while 11 (31.4%) had severe peri-operative bleeding that necessitated immediate surgical re-intervention.

The mean corrected haemoglobin for the patients who received three or more units of blood was 9.1g/dl (± 1.2). A total of 68 units of blood was transfused, 42 (61.8%) allogeneic and 26 (38.2%) autologous blood.

Figure 3
Relationship between the patients’ age group and the mean decrease in haemoglobin concentration

Test of significance - Chi - square test
The post-operative median hospitalisation time was eight days (Range 4 to 35). There were two (2.1%) post-operative deaths and both patients had intractable intra- and post-operative bleeding, massive blood transfusion and disseminated intravascular coagulopathy.

There was a statistically significant association between peri-operative blood loss and patients’ age group (P = 0.024). Patients in older age groups had more blood loss.

Table 2

*Other pre-operative patient characteristics that determined peri-operative blood loss (mean decrease in haemoglobin concentration) (n=95)*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number</th>
<th>Mean decrease in Hb (g/dl) ± SD</th>
<th>P - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>49</td>
<td>1.9 (± 1.4)</td>
<td>0.140</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>2.3 (± 1.4)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>3.0 (± 1.7)</td>
<td></td>
</tr>
<tr>
<td>Pre-operative systolic BP (mmHg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;130</td>
<td>53</td>
<td>2.0 (± 1.2)</td>
<td>0.982</td>
</tr>
<tr>
<td>&gt;130</td>
<td>42</td>
<td>2.2 (± 1.7)</td>
<td></td>
</tr>
<tr>
<td>Pre-operative use of acetyl-salicylate/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>warfarin sodium*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>75</td>
<td>1.9 (± 1.3)</td>
<td>0.008</td>
</tr>
<tr>
<td>+</td>
<td>20</td>
<td>2.9 (± 1.6)</td>
<td></td>
</tr>
</tbody>
</table>

Test of significance Mann - Whitney U

* Patients who had negative history of drug use
+ Patients who had positive history of drug use

Table 3

Relationship between some of the intra-operative patient characteristics and mean decrease in haemoglobin concentration (n=95)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number</th>
<th>Mean decrease in Hb (g/dl) ± SD</th>
<th>P - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category of surgeon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultant</td>
<td>65</td>
<td>2.0 (± 1.3)</td>
<td>0.407†</td>
</tr>
<tr>
<td>Senior registrar</td>
<td>28</td>
<td>2.4 (± 1.7)</td>
<td></td>
</tr>
<tr>
<td>Registrar</td>
<td>2</td>
<td>1.8 (± 1.8)</td>
<td></td>
</tr>
<tr>
<td>Technique of anaesthesia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinal</td>
<td>69</td>
<td>1.8 (± 1.1)</td>
<td>0.003†</td>
</tr>
<tr>
<td>General</td>
<td>26</td>
<td>3.0 (± 1.8)</td>
<td></td>
</tr>
<tr>
<td>Technique of prostatectomy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millin’s (retropubic)</td>
<td>61</td>
<td>1.6 (± 0.9)</td>
<td></td>
</tr>
<tr>
<td>Freyer’s (transvesical)</td>
<td>34</td>
<td>3.0 (± 1.8)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Weight of resected prostatic tissue (g)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;30</td>
<td>14</td>
<td>1.3 (± 0.6)</td>
<td></td>
</tr>
<tr>
<td>30 - 70</td>
<td>46</td>
<td>1.9 (± 1.4)</td>
<td>&lt;0.001†</td>
</tr>
<tr>
<td>&gt;70</td>
<td>35</td>
<td>2.9 (± 1.4)</td>
<td>(r = 0.41)</td>
</tr>
</tbody>
</table>

Tests of significance * Chi - square test
† Mann - Whitney U
† Linear correlation co-efficient
Positive history of pre-operative drug use (acetylsalicylate / warfarin sodium) showed statistically significant relation to peri-operative blood loss as indicated by the mean decrease in haemoglobin ($P < 0.05$). Though statistically insignificant, comparatively more blood loss was noted in patients in higher American Society of Anesthesiologists (ASA) grades and those who had higher pre-operative systolic blood pressure.

Table 4

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patients transfused (n = 35)</th>
<th>Patients not transfused (n = 60)</th>
<th>P - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)</td>
<td>74.3 ± 8.8</td>
<td>68 ± 9.1</td>
<td>0.003*</td>
</tr>
<tr>
<td>Mean pre-operative systolic BP (mmHg)</td>
<td>139.9 ± 16.1</td>
<td>132 ± 12.2</td>
<td>0.021†</td>
</tr>
<tr>
<td>Mean decrease in HB (g/dl)</td>
<td>3.3 ± 1.6</td>
<td>1.5 ± 0.8</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Mean weight of resected prostatic tissue (g)</td>
<td>81.8 ± 54.4</td>
<td>54.4 ± 31.1</td>
<td>0.04†</td>
</tr>
</tbody>
</table>

Tests of significance
* Chi - square test
†- Mann - Whitney U
† - Linear correlation co-efficient

The techniques of anaesthesia and open prostatectomy were significantly related to blood loss with more blood loss noted in patients who had Freyer’s prostatectomy and those who underwent surgery under general anaesthesia ($P < 0.05$). Moreover, there was significant positive linear correlation between weight of resected prostatic tissue and decrease in haemoglobin ($r = 0.41; P <0.001$), as indicated by the increase in mean haemoglobin decrease with the weight of the resected prostatic tissue.

Table 5

Other patient factors that determined peri-operative blood transfusion

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patients transfused (n = 35)</th>
<th>Patients not transfused (n = 60)</th>
<th>Odds ratio</th>
<th>P - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-operative use of acetylsalicylate/warfarin sodium §</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>25 33.3</td>
<td>50 66.7</td>
<td>-</td>
<td>0.210†</td>
</tr>
<tr>
<td>+</td>
<td>10 50</td>
<td>10 50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technique of anaesthesia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinal</td>
<td>22 31.9</td>
<td>47 68.1</td>
<td>-</td>
<td>0.102†</td>
</tr>
<tr>
<td>General</td>
<td>13 50</td>
<td>13 50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technique of prostatectomy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millin’s (retropubic)</td>
<td>12 19.7</td>
<td>49 80.3</td>
<td>95% C.I</td>
<td></td>
</tr>
<tr>
<td>Freyer’s (transvesical)</td>
<td>23 67.6</td>
<td>11 32.4</td>
<td>(3.3 - 22.2)†</td>
<td>&lt;0.001*</td>
</tr>
</tbody>
</table>

Tests of significance
* - Chi - square test
† - Mann - Whitney U
† - Linear correlation co-efficient
§ - Patients who had negative history of drug use
+ Patients who had positive history of drug use
The patients who received blood transfusion had a significantly higher mean age, mean pre-operative systolic blood pressure, mean decrease in peri-operative haemoglobin concentration, and larger resected prostatic tissue compared to those who did not receive blood transfusion (P < 0.05).

The technique of prostatectomy was significantly related to the need for blood transfusion with Millin’s having an advantage over Freyer’s prostatectomy (P < 0.05, odds ratio = 8.5).

DISCUSSION

Although numerous non-operative and minimally invasive techniques are available for treating benign prostatic hyperplasia, trans-urethral resection of the prostate is considered the procedure of choice. However, open simple prostatectomy is still indicated for certain conditions such as large prostate (> 75g), concomitant bladder diverticulum or cystolithiasis, and in patients with unilateral or bilateral inguinal hernia in whom the hernia can be repaired peritoneally through the same incision. It is also indicated in those patients with other medical conditions that prevent proper placement in the dorsal lithotomy position (2). This study was designed to assess blood loss accompanying open simple prostatectomy, determine the peri-operative blood transfusion rate and evaluate some of the factors that determine the amount of the peri-operative blood loss and blood transfusion.

Ninety five patients who underwent open simple prostatectomy for benign prostatic hyperplasia were reviewed during the study period. The median age was 70 years and 56.8% were over 70 years. Majority of the patients underwent open simple prostatectomy due to chronic urinary retention with hydronephrosis (40%), and severe obstructive urinary symptoms (36%). Most of the patients were in American Society of Anaesthesiologists (ASA) grades 1 and 2. The main surgical technique for open simple prostatectomy was Millin’s (64.2%) and majority of the patients underwent surgery under spinal anaesthesia (72.6%). The mean weight of resected prostatic tissue was 66.9 grams.

Spence (7) in 1997, noted that the traditional belief of surgeons that allogeneic blood transfusion was an effective and safe therapy with minimal risks had been challenged by a heightened awareness of the problems of transfusion reactions, disease transmission and immunomodulation related to red blood cell transfusion. Subsequently, surgeons have responded to these challenges by reassessing the reasons for transfusions, increasing autologous blood use, modifying surgical techniques to minimise blood loss and employing various drugs to reduce transfusion requirements. Of primary importance is the need for the surgeon to thoughtfully plan allogeneic blood transfusion requirements for each patient. Blood should therefore be transfused only when there is a documented need to increase oxygen delivery in patients who are unable to meet their demands through normal cardio-pulmonary mechanisms. Autologous blood use, an alternative to allogeneic transfusion, is increasingly becoming a standard care for elective orthopaedic procedures and radical prostatectomy. Furthermore, limited supply of blood and blood products demands their rational use. The purpose of this study therefore was to redefine the factors that influence blood transfusion rate associated with open simple prostatectomy with the aim of minimising unnecessary blood transfusions that pose avoidable risks to these patients. The peri-operative blood loss in open simple prostatectomy has previously been judged from the peri-operative decrease in haemoglobin concentration. Most previous reports estimated the concentration of haemoglobin (16,19, 30, 31) in effluent irrigation fluid and calculated blood loss from the pre-operative value of the indicator used. These methods measured actual blood loss, albeit with certain limitations (32). They had an error margin of 4 - 5% (19) and used extra resources, which limited their use to research. As most of the blood loss usually occurs within two days of surgery (time to 50% loss of 16 hours) (19); the post-operative haemoglobin (at 48 - 72 hours) is a practical and useful way of assessing blood loss (10). The post-operative haemoglobin for the patients transfused peri-operatively was corrected for the transfused volume by subtracting 1g/dl for each transfused unit of blood (11).

Most of the peri-operative blood loss usually occurs within two days of surgery (time to 50% loss of 16 hours) hence the post-operative haemoglobin concentration at 48 to 72 hours was the most practical and useful way of assessing peri-operative blood loss (10). The mean decrease in haemoglobin concentration was 2.1g/dl and the blood transfusion rate was 36.8%. Further analysis of pre- and post-operative haemoglobin concentration confirmed that all blood transfusions of three or more units were justified to avoid significant post-operative anaemia (defined as haemoglobin level less than 10g/dl). However, it could be argued that blood transfusion
might have been avoided in 24 patients (68.6%) who were transfused either one or two units, all of whom had a pre-operative haemoglobin level of more than 13.5g/dl and a post-operative haemoglobin level of more than 11.5g/dl. Adverse reactions to transfused blood and blood products occur despite multiple laboratory tests, inspections and checks. Fortunately, the most common reactions are not life threatening. These reactions may result from immune and non-immune mechanisms. Immune-mediated reactions are often due to preformed donor or recipient antibodies though cellular elements may also be involved. Non-immune causes of reactions are due to the chemical and physical properties of the stored blood components and its additives. Although the incidence of transfusion related infections such as Human immunodeficiency virus (HIV) 1 and 2; Hepatitis B and C virus; Human T–cell leukemia virus (HTLV) 1 and 2; Malaria; Cytomegalovirus (CMV); and Epstein–Barr virus (EBV) has been reduced substantially due to improved donor screening and testing of collected blood, the fear of these complications still remains a primary concern (6). The study shows that a lot of blood transfusion could have been avoided.

The mortality rate associated with open simple prostatectomy at Kenyatta National Hospital was 2.1%. The mean decrease in haemoglobin level, which was the main indicator of peri-operative blood loss, in our study was 2.1g/dl. Shaheen and Quinlan (14), in 2003, reported a mean decrease in haemoglobin level of 2.2g/dl in patients who underwent open simple prostatectomy with early vascular control in Ireland, while Kirollos et al (11) reported a decrease in haemoglobin level of 1.5g/dl in patients who underwent trans-urethral resection of the prostate in United Kingdom.

The blood transfusion rate associated with open simple prostatectomy in our study was 36.8%. This significantly varied with those reported in other series. Serratta et al (8) in 2002, reported a blood transfusion rate of 8.2% in Southern Europe, whereas Shaheen and Quinlan (14) reported a blood transfusion rate of 16%. Luttwak et al (9) reported a blood transfusion rate of 57.1% for transvesical prostatectomy in Israel while Hill et al (22) reported a blood transfusion rate of 4.7% in a rural Kenyan hospital. This wide regional variation in blood transfusion rates associated with open simple prostatectomy demonstrates lack of unified approach to this common practice and a multi-centre study could just provide a sound explanation for this variation.

The study further defined some of the factors that determined peri-operative blood loss. Although the patients’ American Society of Anesthesiologists (ASA) grade and pre-operative systolic blood pressure were related to the peri-operative blood loss, only the patients’ age and positive history of peri-operative use of acetyl-salicylate or warfarin sodium showed a statistically significant relationship (P < 0.05). Gavriluik (24) in 1987, reported similar results. It is worth noting that these factors form an important aspect of routine pre-operative evaluation of any surgical patient. The study therefore emphasizes the value of incorporating them in any measures taken to minimise peri-operative blood loss.

The principle intra-operative factors that determined blood loss were the technique of anaesthesia, the technique of open prostatectomy and the weight of resected prostatic tissue. A statistically insignificant relationship between the category of the surgeon doing the procedure and the mean decrease in haemoglobin was demonstrated (P = 0.407). The mean decrease in haemoglobin was less for the registrar and the consultant compared to the senior registrar. This could be due to the fact that the registrar operated under the direct supervision of the consultant surgeon. Furthermore, the 65.3% of the patients whose resected prostatic tissue weighed less than 75g had no proper indication for open prostatectomy, hence trans–urethral resection of the prostate as the procedure of choice could have minimised blood loss in these patients.

While open simple prostatectomy had long been considered a blood losing surgical operation associated with allogeneic blood transfusion, it was a worthwhile attempt to redefine the factors that influence blood transfusion requirements and the reasons for blood transfusion in this procedure. This would obviously lead to reduction in unnecessary blood transfusion that poses avoidable risks to patients undergoing open simple prostatectomy (24, 33). The study showed a statistically significant advantage in blood loss for spinal (mean decrease in haemoglobin = 1.8g/dl) over general (mean decrease in haemoglobin = 3.3g/dl) anaesthesia (P < 0.05). Hatch et al (15) and Madsen et al (16) echoed similar sentiments in their studies. The technique of open simple prostatectomy was significantly related to blood loss with Millin’s (retropubic) having an advantage (mean decrease in haemoglobin = 1.6g/dl) over Freyer’s (transvesical) (mean decrease in haemoglobin = 3.0g/dl) technique (P < 0.05). Like Kirollos et al (11) and Ibrahim et al (20), our study also demonstrated a strong correlation...
between the weight of resected prostatic tissue and peri-operative blood loss, and noted that it was the most important measurable factor in relation to blood loss. Although the study was not set out to compare spinal anaesthesia with general anaesthesia the lower blood loss with the former shows that in open prostatectomy spinal anaesthesia may be the preferred anaesthesia as has been previously shown (14).

Among the factors that were significantly related to the need for blood transfusion were the age of the patient, pre-operative systolic blood pressure, the degree of blood loss and the weight of resected prostatic tissue (P < 0.05) (Tables 4 and 5). Pickard et al (17), in 1998, noted a statistically significant relation between the need for blood transfusion, and large prostatic glands and age above 70 years. This could be due to the larger weight of the prostate found in the older patient. The presence of co-morbidities might also increase the possibility of bleeding.

Despite the fact that majority (64.2%) of the patients underwent surgery via Millin’s (retropubic) technique, only 19.7% received blood transfusion (odds ratio = 8.5). This further fortifies the argument that supports Millin’s technique of open simple prostatectomy as the technique of choice if unnecessary blood transfusion was to be avoided in this kind of surgery.

The median post-operative hospitalisation time of eight days was comparable to those reported in other series (8, 14, 22). The mortality rate of 2.1% associated with open simple prostatectomy in our study was equally comparable to those reported in other studies (8, 9, 22).

CONCLUSION

The mean decrease in haemoglobin level, which was the main indicator of peri-operative blood loss in the study, was 2.1 g/dl. The peri-operative blood transfusion rate associated with open simple prostatectomy at Kenyatta National Hospital was 36.8%.

The factors that were associated with significant peri-operative blood loss and blood transfusion in open simple prostatectomy were patient’s age above 70 years, pre-operative use of acetyl-salicylate or warfarin sodium, systolic blood pressure above 140 mmHg, general anaesthesia, Freyer’s (transvesical) technique of open prostatectomy and the weight of resected prostatic tissue more than 70 grams.

REFERENCES


