

ORIGINAL ARTICLE**Assessment of effect of autologous bone plugs in unilateral total knee arthroplasty**

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ABSTRACT:

Background:Total knee arthroplasty (TKA), also known as total knee replacement, is a surgical procedure to replace the weight-bearing surfaces of the knee joint to relieve pain and disability, most commonly caused by osteoarthritis. The present study was conducted to evaluate effect of autologous bone plugs in unilateral total knee arthroplasty. **Materials & Methods:**76 patients with osteoarthritis of both genders were divided in two groups. Patients in group I underwent the TKA and did not receive the IM bone plug (unplugged), and patients in group II underwent the TKA and received the IM bone plug (plugged). Parameters such as mean blood loss, mean blood reinfused, HgB and HcT were compared in both groups. **Results:** Group I had 20 males and 18 females and group II had 109 males and 19 females. The mean body mass index in group I was 31.5 and in group II was 32.8. The mean blood loss was 1006.4 ml in group I and 962.5 ml in group II. The amount of reinfused blood in group I was 534.8 ml and in group II was 440.6 ml. The difference was significant ($P < 0.05$). The decline in HgB at 24 hours was 3.2g/dl in group I and 3.1g/dl in group II, at 48 hours was 3.4g/dl and 3.3g/dl, at 72 hours was 3.1 and 3.0 in group I and II respectively. The decline in HcT at 24 hours was 8.5g/dl in group I and 6.8g/dl in group II, at 48 hours was 9.4g/dl and 8.4g/dl and at 72 hours was 10.3g/dl and 9.1g/dl in group I and group II respectively. The difference was significant ($P < 0.05$). **Conclusion:**

Keywords: autologous bone plugs, osteoarthritis, Total knee arthroplasty

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INTRODUCTION

Total knee arthroplasty (TKA), also known as total knee replacement, is a surgical procedure to replace the weight-bearing surfaces of the knee joint to relieve pain and disability, most commonly caused by osteoarthritis. The surgery can also be performed for other knee diseases such as rheumatoid arthritis and post-traumatic arthritis.¹ Indications for TKA include persistent knee pain that interferes with daily activities and does not respond to conservative treatments such as medications, physical therapy, or injections. Significant loss of function and mobility, affecting quality of life. Knee deformities such as varus (bow-legged) or valgus (knock-kneed) alignment and effectiveness of non-surgical treatments like anti-inflammatory medications, physical therapy, and lifestyle modifications.²

In unilateral total knee arthroplasty (TKA), the use of autologous bone plugs can be a valuable technique, particularly when addressing bone defects or enhancing the stability and fixation of the implant.³ Autologous bone plugs are bone grafts taken from the patient's own body, often from the bone resected during the TKA procedure. These bone plugs are then used to fill defects or augment the bone stock in the knee.⁴ Indications for autologous bone plugs in TKA

are when there are bone defects or voids in the femur or tibia that need to be filled to provide a stable base for the implant.⁵ In cases of revision TKA where bone loss is more common, autologous bone plugs can help restore bone stock. Enhancing fixation in patients with poor bone quality due to osteoporosis or other conditions.⁶ The present study was conducted to evaluate effect of autologous bone plugs in unilateral total knee arthroplasty.

MATERIALS & METHODS

The present study was conducted on 76 patients with osteoarthritis of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. The patients were divided in two groups. Patients in group I underwent the TKA and did not receive the IM bone plug (unplugged), and patients in group II underwent the TKA and received the IM bone plug (plugged). Parameters such as mean blood loss, mean blood reinfused, HgB and HcT were compared in both groups. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II
Method	unplugged	plugged
M:F	20:18	19:19

Table I shows that group I had 20 males and 18 females and group II had 109 males and 19 females.

Table II Assessment of parameters

Parameters	Group I	Group II	P value
Body mass index (kg/m ²)	31.5	32.8	0.91
blood loss (ml)	1006.4	962.5	0.02
reinfused blood(ml)	534.8	440.6	0.05

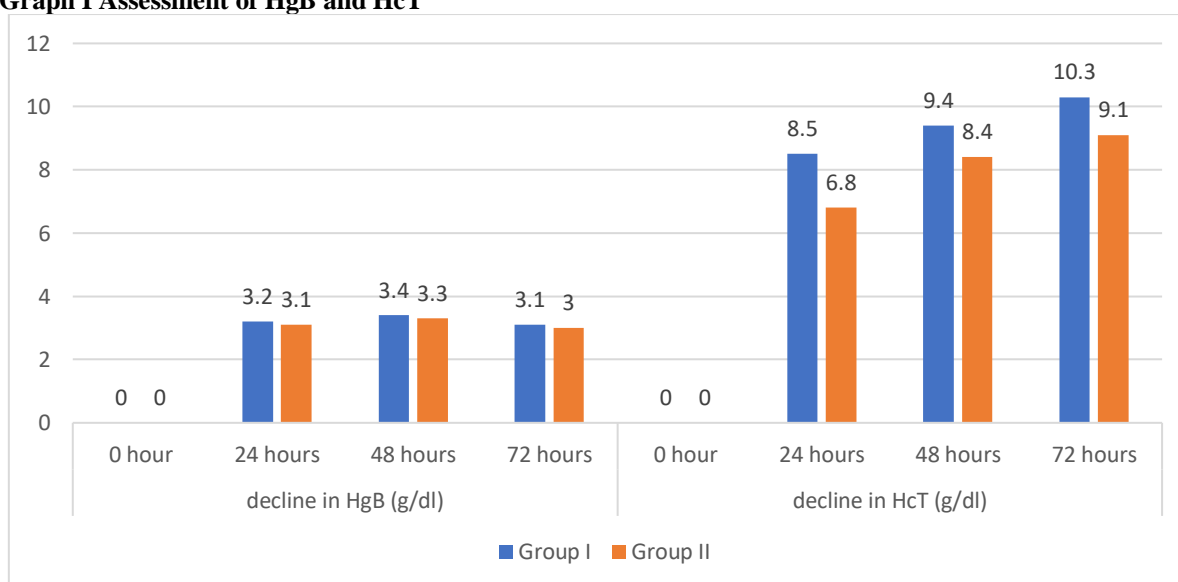
Table II shows that mean body mass index in group I was 31.5 and in group II was 32.8. The mean blood loss was 1006.4 ml in group I and 962.5 ml in group II. The amount of reinfused blood in group I was 534.8 ml and in group II was 440.6 ml. The difference was significant (P< 0.05).

Table III Assessment of HgB and HcT

Parameters	Variables	Group I	Group II	P value
decline in HgB (g/dl)	0 hour	0	0	0.97
	24 hours	3.2	3.1	
	48 hours	3.4	3.3	
	72 hours	3.1	3.0	
decline in HcT(g/dl)	0hour	0	0	0.95
	24hours	8.5	6.8	
	48hours	9.4	8.4	
	72hours	10.3	9.1	

Table III, graph I shows that decline in HgBat 24 hours was 3.2g/dl in group I and 3.1g/dl in group II, at 48 hours was 3.4g/dl and 3.3g/dl, at 72 hours was 3.1 and 3.0 in group I and II respectively. The decline in HcT at 24 hours was 8.5g/dl in group I and 6.8g/dl in group II, at 48 hours was 9.4g/dl and 8.4g/dl and at 72 hours was 10.3g/dl and 9.1g/dl in group I and group II respectively. The difference was significant (P< 0.05).

Graph I Assessment of HgB and HcT



DISCUSSION

There is a noticeable blood loss after TKA. IM rods harm the IM vasculature and cancellous bone during TKA. The medullary canal is bled into by ruptured vessels.⁷ Blood loss may increase as a result of blood flowing from the medullary canal into the joint cavity through the communication that the alignment rod

creates. Significant bleeding could require multiple transfusions of red blood cells.^{8,9}

We found that group I had 20 males and 18 females and group II had 109 males and 19 females. During total knee arthroplasty (TKA), Kumar et al¹⁰ implanted an autologous bone plug in the femoral defect to compare blood loss and transfusion needs with and without the plug. Ten patients with OA and

RA were enrolled in accordance with the previous protocol, and surgical releases were carried out where necessary. As demonstrated by the use of an acrylic cement plug to fill the IM canal, the autologous bone plug decreased total blood loss. Blood transfusions, however, were unaffected.

We observed that mean body mass index in group I was 31.5 and in group II was 32.8. The mean blood loss was 1006.4 ml in group I and 962.5 ml in group II. The amount of reinfused blood in group I was 534.8 ml and in group II was 440.6 ml. Protzman et al¹¹ in their study 55 patients diagnosed with osteoarthritis (OA) who had undergone unilateral TKA. Twenty-six patients had the femoral defect filled with an autologous bone plug and 29 did not. Lateral releases and patella replacements were not performed. Drained blood was reinfused when appropriate. Mean blood loss and mean blood reinfused were similar for the plugged (loss: 960.8 ± 417.3 ml; reinfused: 466.7 ± 435.9 mL) and unplugged groups (loss: 1065.9 ± 633.5 ml, $P = 0.38$; reinfused: 528.4 ± 464.8 ml, $P = 0.61$). Preoperative HgB (14.3 ± 1.4 g/dL, $P = 0.93$) and HcT levels ($42.2 \pm 4.6\%$, $P = 0.85$) were similar across plug conditions. HgB and HcT levels declined similarly for the plugged (2.7 ± 1.2 g/dl and $7.9 \pm 4.0\%$) and unplugged groups (3.0 ± 0.9 g/dl, $P = 0.16$ and $9.0 \pm 2.6\%$, $P = 0.16$), respectively. Of patients, one in the plugged group and none in the unplugged group required homologous transfusions ($P = 0.5$).

We observed that decline in HgBat 24 hours was 3.2g/dl in group I and 3.1g/dl in group II, at 48 hours was 3.4g/dl and 3.3g/dl, at 72 hours was 3.1 and 3.0 in group I and II respectively. The decline in HcT at 24 hours was 8.5g/dl in group I and 6.8g/dl in group II, at 48 hours was 9.4g/dl and 8.4g/dl and at 72 hours was 10.3g/dl and 9.1g/dl in group I and group II respectively. Cheng et al¹² compared the use of a blood salvage and reinfusion system with standard allogeneic blood transfusion after total knee arthroplasty--a procedure associated with significant postoperative blood loss. 60 patients undergoing total knee arthroplasty were randomly allocated into a reinfusion group ($n = 26$) or a control group ($n = 34$). Patients in the reinfusion group had their blood reinfused from drains within 6 hours of surgery. Both groups received allogeneic blood transfusions according to specified transfusion criteria if the haemoglobin level fell below 90 g/l, or in the presence of severe anaemic symptoms. Haemoglobin levels and drain output were recorded daily for 3 consecutive days after surgery. There was no significant difference between the 2 groups in demographic data, drain output, total blood loss, and mean postoperative haemoglobin levels. Significantly more allogeneic blood was required by the control group than by the reinfusion group ($p = 0.022$).

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that

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