

ORIGINAL RESEARCH

Autologous blood transfusion in ruptured ectopic pregnancy and its comparison with homologous blood transfusion

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ABSTRACT

Background: There are very few studies on the autologous blood transfusion in ruptured ectopic pregnancy and its comparison with homologous blood transfusion. Therefore, the present study is conducted to evaluate the safety of autologous blood transfusion in ruptured ectopic pregnancy and comparison of autologous blood transfusion with homologous blood transfusion.

Materials and method: Ectopic pregnancy was diagnosed on the basis of detailed history (amenorrhoea, pain, bleeding PV), clinical examination, urine pregnancy test and imaging. CBC, blood group, HIV, HBs Ag was done in all patients. In autologous group CBC and prothrombin time was done in preoperative, postoperative period and in peritoneal blood. Blood sent for cross match.

Isotonic fluid started in all patients. Informed consent for laparotomy, autologous and homologous blood transfusion was obtained from patients and legal guardian.

Patients were divided into two groups according to their transfusion

1. Homologous blood transfusion - 50 patients
2. Autologous blood transfusion - 50 patients

All patients were prepared for laparotomy, general anaesthesia was given to all patients. Manual method was used for cell salvage for autologous blood transfusion in 50 patients.

Urine pregnancy test was found positive in all 86 patients, weakly positive in 12 and negative in 2 patients.

Results: Both the groups were compared in terms of gravida wise distribution which was statistically insignificant ($p > 0.05$). Majority of the patients were multigravida (91%) as compared to Primigravida (9%). Mean systolic blood pressure was significantly higher post operatively as compared to pre operative findings in homologous group (116.58mmHg vs 96.02) and Autologous group (114.98mmHg vs 92.16mmHg) with p value of 0.001. This shows that rupture ectopic patient's status improved after blood transfusion. Mean diastolic blood pressure was significantly higher post operatively as compared to pre operative findings in homologous group (77.64mmHg vs 58.80) and Autologous group (76.66mmHg vs 58.78mmHg) with p value of less than 0.05. Mean pulse rate was significantly lower post operatively as compared to pre operative findings in homologous group (88.26 vs 121.14) and Autologous group (85.58 vs 122.12) with p value of 0.001. As normal pulse rate is an indicator of improvement in patients Pre operative mean hemoglobin level was same in both groups no statistically difference was found between both the groups ($p > 0.05$). However, post operative mean hemoglobin was significantly higher in autologous group (8.88gm/dl) as compared to homologous group (8.06gm/dl) as revealed by significant p value of 0.01. A significant haemoconcentration was found in peritoneal blood was responsible for more hemoglobin rise autologous blood transfusion. Pre operative mean total leukocyte count was not found statistically different between both the groups ($p > 0.05$). However, post operative mean TLC was significantly lower in autologous group (9575) as compared to homologous group (11393) as revealed by significant p value of 0.001. This low TLC count after autologous transfusion group patients suggest low chances of sepsis in patients hence autologous blood is safe for transfusion however many unexplained reactionary changes occurred in homologous transfusion group that results in its high TLC count Pre and post operative mean platelet counts was not found statistically significant ($p > 0.05$).

Conclusion: Autologous blood transfusion provides with good clinical outcomes compared to homologous transfusion in patients with ruptured ectopic pregnancy and severe blood loss.

Keywords: Autologous blood transfusion, amenorrhoea, ruptured ectopic pregnancy

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INTRODUCTION

Ectopic pregnancy is an acute abdominal condition. It has got variable presentation, from mild abdominal pain to severe cramp in abdomen with amenorrhoea. Classic triad of amenorrhoea, pain and bleeding per vagina is not seen in all patients. Most of the women diagnosed early and managed medically or by laparoscopy. Some of the patients who were asymptomatic and diagnosed early but due to some reason delay in seeking treatment, land up in to ruptured ectopic pregnancy with large hemoperitoneum. Some patients in rural area do not visit for early antenatal examination and they present in critical condition. Such patient suffer from massive haemorrhage and even death. Timely surgery with rapid blood transfusion is the key for successful outcome. These patients require 2 – 4 units or more allogenic blood, which is really challenging to get in existing blood banks, it is more difficult if patient blood group is Rh negative. Allogenic blood can lead to spread of HIV, hepatitis and other infections. Blood transfusion reaction is also a threat to allogenic blood transfusion. To address this issue autologous blood transfusion is recommended. A risk-free homologous blood transfusion is an unattainable ideal. HIV infection continues to occur at a rate of one infection per 100,000 transfusions. ABO and Rh were the only red cell antigens known, but in the past 30 years, 400 antigens have been identified, adding to the risk associated with homologous transfusion. Around 40 new cases of hepatitis are still caused by virus transmission during blood transfusions as, in the early stage of the illness, HBSAg disappears from the blood stream. Autologous blood transfusion allows us to re-transfuse the patient own blood. There are three techniques of autologous transfusion (1) Pre-operative donation – patient blood is collected and stored before surgery, (2) Acute normovolumic haemodilution – patient blood is collected immediately before surgery and reinfused during surgery, (3) Intra-operative cell salvage (ICS) – blood is collected during surgery, filtered, washed and transfused back. ICS can be done with the help of cell saver device or manually in case of ruptured ectopic pregnancy.¹ There are very few studies on the autologous blood transfusion in ruptured ectopic pregnancy and its comparison with homologous blood transfusion. Therefore, the present study is conducted to evaluate the safety of autologous blood transfusion in ruptured ectopic pregnancy and comparison of autologous blood transfusion with homologous blood transfusion.

MATERIAL AND METHOD

Prospective study was done in Shyam Shah Medical College, Rewa during October 2020- September 2022. Ethical committee approval was taken.

INCLUSION CRITERIA

- All ruptured tubal ectopic pregnancy cases admitted in the department having large

hemoperitoneum in imaging

- Patient who presents within 24hours of rupture
- Exclusion criteria-
- women with unruptured pregnancy
 - women with scar ectopic pregnancy, ovarian ectopic pregnancy.
 - Patients with chronic ruptured ectopic pregnancy
 - Patients who refused to participate in the study
 - Patients require CPR due to severe haemorrhage

Ectopic pregnancy was diagnosed on the basis of detailed history (amenorrhoea, pain, bleeding PV), clinical examination, urine pregnancy test and imaging. CBC, blood group, HIV, HBsAg was done in all patients. In autologous group CBC and prothrombin time was done in preoperative, postoperative period and in peritoneal blood. Blood sent for cross match. Isotonic fluid started in all patients. Informed consent for laparotomy, autologous and homologous blood transfusion was obtained from patients and legal guardian.

Patients were divided in to two groups according to their transfusion

1. Homologous blood transfusion - 50 patients
2. Autologous blood transfusion - 50 patients

All patients were prepared for laparotomy, general anaesthesia was given to all patients. Manual method was used for cell salvage for autologous blood transfusion in 50 patients. For autotransfusion sterilized equipment, comprising one small bowl to take out blood from peritoneal cavity; one large bowl to sieve the blood; and one kidney tray to collect the filtered blood was kept ready on trolley. Eight layers of sterilized gauze were put one on another over large bowl, to be used as filter. Upon opening the abdomen, Intraperitoneal blood appearing fresh was collected from the small bowl. After removing most of the fresh blood, the haemostatic clamp applied on mesosalpinx and salpingectomy done. The collected blood was filtered through a sieve composed of eight layers of sterile gauze and collected into a sterile bowl. The filtered blood was transferred from the bowl to infusion bags containing anticoagulants with the help of 20 cc syringe. Same blood was then reinfused into the patient during surgery. Calcium gluconate was given to patients who received transfusion of four bags of blood. Homologous group patients received allogenic blood along with laparotomy. Maximum five unit of blood transfused in this group. Calcium gluconate was given to patients after receiving four units of blood. In addition to blood transfusion, patients with post operative haemoglobin 6 – 8 gm received intravenous iron therapy

OBSERVATION INDICATOR

The hemodynamic indices of systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) were recorded before and 30 min after blood transfusion in the 2 groups. Blood routine consisting haemoglobin (Hb), total leucocyte count (TLC),

platelets (PLT), was recorded after 48- h postoperative period in both the groups. In addition, peritoneal blood's CBC and PT+INR was also compared with in the autologous group. Normal data were expressed as mean and chi square test used to compare the data. Statistically significant difference is said when the p value was <0.05.

RESULTS

Urine pregnancy test was found positive in all 86 patients, weakly positive in 12 and negative in 2 patients. All the patients included in this study were in hypovolemic shock. Cervical excitation tenderness was absent in collapsed patients with massive hemoperitoneum.

Table: 1

Age distribution between groups						
		Group			Total	P value
		Autologous	Homologous			
Age; Years	21-25	Count	9	12	21	0.433
		%	18.0%	24.0%	21.0%	
	26-30	Count	16	20	36	
		%	32.0%	40.0%	36.0%	
	31-35	Count	18	15	33	
		%	36.0%	30.0%	33.0%	
	>35	Count	7	3	10	
		%	14.0%	6.0%	10.0%	

Gravida wise distribution between groups						
		Group			Total	P value
		Autologous	Homologous			
Gravida	Multi	Count	45	46	91	0.727
		%	90.0%	92.0%	91.0%	
	Primi	Count	5	4	9	
		%	10.0%	8.0%	9.0%	

Group N		N	Mean SBP	SD	P value
Homologous	Pre	50	96.02	10.423	0.001
	Post	50	116.58	8.207	
Autologous	Pre	50	92.16	11.340	0.001
	Post	50	114.98	9.533	

Table: 2 Comparing mean DBP between groups

Group N		N	Mean DBP	SD	P value
Homologous	Pre	50	58.80	5.761	0.021
	Post	50	77.64	6.190	
Autologous	Pre	50	58.78	8.479	0.011
	Post	50	76.66	7.975	

Comparing mean pulse rates between groups

Group N		N	Mean pulse rate	SD	P value
Homologous	Pre	50	121.14	11.370	0.001
	Post	50	88.26	7.001	
Autologous	Pre	50	122.12	11.898	0.008
	Post	50	85.58	11.325	

Comparing mean hemoglobin between groups

Hemoglobin	Group N	N	Mean	SD	P value
Pre	Homologous	50	7.322	1.5455	0.220
	Autologous	50	7.246	1.5517	
Post	Homologous	50	8.066	1.5230	0.011
	Autologous	50	8.886	1.6557	

Table: 3 Comparing mean total leukocyte count between groups

TLC	Group N	N	Mean	SD	P value
Pre	Homologous	50	13213.50	3091.925	0.372
	Autologous	50	13722.66	2558.407	
Post	Homologous	50	11393.60	2853.071	<0.001

	Autologous	50	9575.52	1546.580	
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Comparing mean platelet count between groups

Platelets	Group N	N	Mean	SD	P value
Pre	Homologous	50	3.418	.6356	0.357
	Autologous	50	3.290	.7427	
Post	Homologous	50	3.270	.6048	0.813
	Autologous	50	3.238	.7390	

Table: 4 Comparing complications between groups

Complications		Autologous	Homologous	Total	P value
Sepsis	Count	7	18	25	0.011
	%	28.0%	72.0%	100.0%	
ARDS	Count	4	10	14	0.001
	%	28.6%	71.4%	100.0%	
Fever	Count	6	24	30	<0.001
	%	20.0%	80.0%	100.0%	
Transfusion related reaction	Count	0	31	41	<0.001
	%	0%	75.6%	100.0%	

Comparing hospitalization days between groups

	Group N	N	Mean	Std. Deviation	P value
Hospital days	Homologous	50	9.7000	2.31455	<0.001
	Autologous	50	5.9800	2.28116	

Table n5

Comparing variables within autologous				
		Mean	Std. Deviation	P value
Hemoglobin	Pre-op	8.04	1.551	<0.001
	Peritoneal blood	14.09	0.973	
	Post-op	8.886	1.6557	
TLC	Pre-op	13722.66	2558.407	<0.001
	Peritoneal blood	9316.48	1427.553	
	Post-op	9575.52	1546.580	
Platelets	Pre-op	3.29	0.742	<0.001
	Peritoneal blood	0.122	0.438	
	Post-op	3.238	0.739	
Prothrombin time	Pre	12.21	0.499	<0.001
	Peritoneal blood	33.01	5.312	
	Autologous post	12.40	1.232	
INR	Pre	1.038	0.108	<0.001
	Peritoneal blood	5.84	1.242	
	Autologous post	1.0	0.023	

Majority of the patient in study population belongs to age group of 26-30 years (36%) followed by 31-35 years (33%), 21-25 years (21%) and 10% of the patients had age above 35 years. There was no significant difference between two groups in age distribution ($p > 0.05$). Both the groups were compared in terms of gravida wise distribution which was statistically insignificant ($p > 0.05$). Majority of the patients were multigravida (91%) as compared to Primi gravida (9%). Mean systolic blood pressure was significantly higher post operatively as compared to pre operative findings in homologous group (116.58mmHg vs 96.02) and Autologous group (114.98mmHg vs 92.16mmHg) with p value of 0.001. This shows that rupture ectopic patient's status improved after blood transfusion. Mean diastolic blood pressure was significantly higher post

operatively as compared to pre operative findings in homologous group (77.64mmHg vs 58.80) and Autologous group (76.66mmHg vs 58.78mmHg) with p value of less than 0.05. Mean pulse rate was significantly lower post operatively as compared to pre operative findings in homologous group (88.26 vs 121.14) and Autologous group (85.58 vs 122.12) with p value of 0.001. As normal pulse rate is an indicator of improvement in patients Pre operative mean hemoglobin level was same in both groups no statistically difference was found between both the groups ($p > 0.05$). However, post operative mean hemoglobin was significantly higher in autologous group (8.88gm/dl) as compared to homologous group (8.06gm/dl) as revealed by significant p value of 0.01. A significant haemoconcentration was found in

peritoneal blood was responsible for more hemoglobin rise autologous blood transfusion. Pre operative mean total leukocyte count was not found statistically different between both the groups ($p > 0.05$). However, post operative mean TLC was significantly lower in autologous group (9575) as compared to homologous group (11393) as revealed by significant p value of 0.001. This low TLC count after autologous transfusion group patients suggest low chances of sepsis in patients hence autologous blood is safe for transfusion however many unexplained reactionary changes occurred in homologous transfusion group that results in its high TLC count Pre and post operative mean platelet counts was not found statistically significant ($p > 0.05$).

DISCUSSION

In addition to the surgical arrest of hemorrhage, adequate replacement of lost blood is crucial to the patient's survival and well-being in the management of a ruptured ectopic pregnancy. Autotransfusion is useful alternative for blood replacement and augmentation of blood oxygen-carrying capacity. Unfortunately, in resource-poor countries, where women present late and with hemoperitoneum donor blood is scarce and transfusion services are inadequate. This study demonstrates that in such situations, simple salvage autotransfusion is a safe and effective alternative. In industrialized regions where machine-based autotransfusion is practiced, it is becoming evident that salvage autotransfusion is clinically acceptable, with important economic implications. Furthermore, another randomized controlled trial showed that salvage autotransfusion was associated with higher postoperative hemoglobin concentrations, with no adverse clinical or coagulopathic effects and no significant increase in cost compared with controls. Ectopic pregnancy is a common emergency abdominal condition in obstetrics and gynecology but is an emergency with an acute condition and a lot of bleeding, with an incidence of about 2% to 3%.⁴⁶ It refers to the implantation of a fertilized egg outside the uterine cavity, which, if not treated promptly, can lead to hemorrhagic shock, accounting for about 9% to 13% of pregnancy related deaths, and requiring surgical hemostasis and blood volume replenishment in the first instance. Blood transfusion is an effective means of treatment for this condition.⁴⁷ The first who demonstrated the possibility of autologous blood transfusion in operative medicine was the Halle surgeon Richard von Volkmann in 1868.⁴⁸ The first originally sourced autologous blood transfusion, was performed by the Kiel surgeon Friedrich von Esmarch, in a case of exarticulation of the thigh at the hip joint, collected the blood that had been shed during the operation in a washbowl, defibrinated it, and reinjected it into the severed femoral vein. The available blood sources are allogeneic blood and autologous blood. The transfusion of homologous blood requires many steps such as matching and transport, this lead to miss the golden period of rescue. The homologous blood poses risks that are difficult to eliminate, such as immunosuppression, transfusion-transmitted diseases, hemolytic reactions to

transfusion, and technical errors that may occur during operations blood matching, histocompatibility, and disease testing when blood sources are tight and cannot be supplied in sufficient quantities in a timely manner. Autologous blood transfusion has become an important step in the treatment of ruptured ectopic pregnancy. 1. AGE Majority of the patient in study population belongs to age group of 26-30 years (36%) followed by 31-35 years (33%), 21-25 years (21%) and 10% of the patients had age above 35 years. There was no significant difference between two groups in terms of age distribution ($p > 0.05$). Similar to our findings the study in Shukla et al, 2014, the mean age of patients was 27 ± 8.7 years (range: 29.5–27.8 years), and maximum patients were between the age group of 19 and 34 years. 2. GRAVIDA Majority of the patients were multigravida (91%) as compared to primigravida (9%). There was no significant difference between two groups in terms of gravida ($p > 0.05$) in our study. In contrast to our finding Dayal and Srivastava³⁸, 2019 reported third or fourth gravid to be most affected and parous women found more with ectopic pregnancy. In another study SeloOjeme found that primi gravid were highest affected. This spectrum shows probably no parity is safe from ectopic pregnancy. 3. Mean Systolic and Diastolic Blood Pressure, Heart Rate Mean systolic and diastolic blood pressure was significantly higher post operatively as compared to pre operative findings in homologous group (116.58mmHg vs 96.02) and autologous group (114.98mmHg vs 92.16mmHg) with p value of 0.001. Mean pulse rate was significantly less post operatively as compared to pre operative findings in homologous group (88.26 vs 121.14) and autologous group (85.58 vs 122.12) with p value of 0.001. Similarly study done by Li et al² . found that at 30 min after blood transfusion, SBP, DBP, and SpO₂ were higher in all the groups than before blood transfusion ($p > 0.05$). 4. Hemoglobin Level Pre operative mean hemoglobin level was not statistically different between both the groups ($p > 0.05$). However, post operative mean hemoglobin was significantly higher in autologous group (8.88gm/dl) as compared to homologous group (8.06gm/dl). As it could be due to the large hemoconcentration found in the peritoneal blood (mean hemoglobin (14.09)). Li et al. study, at the 24- h postoperative period, no statistical difference was reported on hemoglobin and RBC level among the three groups ($p > 0.05$).² Shukla et.al, 2014 study mean pre operative Haemoglobin was 4.95 ± 1.5 , and post operative haemoglobin was 6.85 ± 1.3 , the mean rise of hemoglobin was 1.9gm. 5. Total Leukocyte Counts Pre operative mean total leukocyte count was not found statistically different between both the groups ($p > 0.05$). However, post operative mean TLC was significantly lower in autologous group (9575) as compared to homologous group (11393). This rise found in homologous blood transfusion in TLC may be due to the reactionary blood changes in post allogenic blood transfusion which are not found in autologous blood transfusion. Our findings are in line with study by Lee et al.² The National Institute for Clinical Excellence (in Britain) had recommended using leukocyte depletion

filter in autologous blood transfusion. Many previous studies had confirmed that the application of leukocyte depletion filter could further reduce the level of amniotic fluid components in the recycled blood. Platelet counts Pre and post operative mean platelet counts did not found statistically significant different between both the groups ($p > 0.05$). Similarly in Li et al2 . study, at the 24- h postoperative period, no statistical difference was noted during the comparison of HCT, Hb, PLT, and RBC among the three groups ($p > 0.05$).² On comparing hematologic parameters within autologous group it was found that the mean hemoglobin, TLC, Platelet counts, prothrombin time and INR at pre operative, peritoneal blood and in post operative autologous blood were found significantly different as revealed by significant p value of 0.001. 7. Complications Incidence of the complications rate was significantly higher in homologous as compared to autologous group ($p < 400$ ml) and N4 (blood loss ≥ 1200 ml).(2017). The data from Farrer et al³⁹. study showed that the length of hospital stay of patients receiving an autologous blood transfusion intraoperatively was reduced by a mean of 3 days and the risk of postoperative complications such as a systemic inflammatory response or sepsis, was reduced by more than 50%. 9. Mortality In current study, number of the death reported did not found significant difference between both the groups ($p > 0.05$). Two patients died who received homologous blood transfusion whereas in autologous group none of the patient died. No maternal death from ectopic pregnancy was recorded during the study period in any group. 32 In our study one patient had 3500 ml of haemoperitoneum with rare blood group so there was delay in homologous blood arrangement and transfusion, Another patient died due to ARDS with haemoperitoneum about 4000ml. 10. Autologous and peritoneal hematological parameters On comparing hematologic parameters within autologous group it was found that the mean hemoglobin, TLC, Platelet counts, prothrombin time and INR at pre operative blood, peritoneal blood and in post operative autologous blood were found significantly different as revealed by significant p value of 0.001. Mean hemoglobin level was significantly higher in peritoneal blood as compared to pre and Autologous blood. The main concern with salvage autotransfusion is the reinfusion of activated clotting factors. Because of rapid clotting followed by fibrinolysis, intraperitoneal blood is deficient in fibrinogen and factors V, VII, and X, and contains an increased level of split fibrin products. The prothrombin and partial thromboplastin times are prolonged, and this blood is no longer coagulable. Although a theoretical risk of coagulopathy exists, it has not been born out in practice. The systemic hematologic changes that accompany the autotransfusion of fresh intraperitoneal blood usually revert to normal by the first or second postoperative day. On comparing hematologic parameters within autologous group, it was found that the mean hemoglobin, TLC, Platelet counts, prothrombin time and INR at pre operative blood, peritoneal blood and in post operative autologous blood

were found significantly different as revealed by significant p value of 0.001. Mean hemoglobin level was significantly higher in peritoneal blood as compared to pre and post Autologous blood ($p < 0.05$). Pre operative TLC counts were significantly higher as compared to peritoneal and autologous blood. There was no such significant change seen in platelet in between pre and post autologous group. Although, the coagulation profile (thrombin time and INR) of peritoneal blood was much higher as compared to pre and post autologous blood of the patients therefore this blood was unable to coagulate of its own due to lack of platelets and feasible for transfusion and no drastic change seen in coagulation of post operative patients with autologous blood transfusion. Incidence of the complications rate was significantly higher in homologous as compared to autologous group ($p < 0.05$). The complications reported in present study include sepsis, ARDS, fever and transfusion related reaction were higher in homologous group (72%, 71.4%, 80% and 75% respectively) as compared autologous group (28%, 28.6%, 20% and 0% respectively). Autologous blood transfusion found to be safer as compared to homologous transfusion in our study. Mean hospitalization days found significantly lower in autologous group (5.9days) as compared to homologous group (9.7days) revealed by significant p value of 0.001.

The maximum volume of blood transfused in present study in autologous group was 1200ml. and in homologous blood transfusion was 1000ml.

CONCLUSION

Autologous blood transfusion provides with good clinical outcomes compared to homologous transfusion in patients with ruptured ectopic pregnancy and severe blood loss. Autologous transfusion was associated with significant rise in hemoglobin level, low complication rate and shorter hospital stay. These results provide some evidence for the management of blood transfusion in patients with ectopic pregnancy and severe blood loss. Hence, autologous transfusion is a life-saving infusion method compatible with RBCs' platelets and other blood components too, but to what extent remains yet to be explored.

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