



Temporary Loop Occlusion using Vessel Loops on Bilateral Common iliac Arteries to Reduce Blood Loss in Total Abdominal Hysterectomy on Adherent Placenta Patient at Sanglah General Hospital, Bali-Indonesia

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Abstract

Background: In pregnancy, there may be an invasion of the placenta into uterine wall, causing post-partum haemorrhage. This Hemorrhage may cause maternal death. Therefore a total abdominal hysterectomy (TAH) needs to be done to stop the bleeding. Temporary loop occlusion (TLO) is an additional procedure to reduce blood loss when doing TAH. This study aims to determine the intraoperative outputs of TLO when doing TAH on adherent placenta patient. **Material & Method:** This research is a retrospective study conducted at Sanglah Hospital from January 1st to 31st December 2019. There were two groups consist of four patients each, namely TLO intervention and non-intervention. Each group was analyzed based on the estimated blood loss, the number of packed red cell (PRC) transfusion, operating time, length of intensive care unit (ICU) and ward stay. **Result:** Intraoperative blood loss revealed a statistically significant difference in results ($p=0.037$), with mean 2125 ± 853.9 ml in TLO intervention and 3750 ± 866 ml in non-intervention. Comparison between both groups on other variables such as PRC transfusion were 694.75 ± 394.18 ml and 1298.5 ± 716.19 ($p=0.384$), operating time were $220,05 \pm 39,5$ minutes and $264,5 \pm 69,84$ minutes ($p=0.468$), length of ICU stay were 2.75 ± 0.95 days and 3.25 ± 0.96 days ($p=0.488$), length of ward stay were 2.25 ± 0.5 days and 2.75 ± 1.5 days ($p=0.85$). **Conclusion:** TLO is an additional procedure that can be performed on TAH because it provides good output.

Keywords: *Temporary loop occlusion, Hysterectomy, Adherent placenta, Haemorrhage, outcome.*

Introduction

In pregnancy, there may be an invasion of the placenta into uterine wall, causing severe post-partum haemorrhage. This bleeding may produce large numbers of blood loss and cause maternal death. This attachment is called adherent placenta or accreta-syndrome [1].

Classification according to the International Federation of Gynecology and Obstetrics (FIGO) in 2019 categorized the adherent placenta based on clinical and histological criteria into three, the first is placenta accreta with clinical criteria that placenta is not being separated from the uterine after oxytocin administration and controlled cord traction, the second is the placenta increta and the third is the placenta percreta which is ranked into three levels which are determined based on the attachment

relationship with the tissue around the uterus [2]. Based on histological criteria, these three types of abnormalities have things in common that is implantation of villous villi are deeper than normal, where in the placenta accreta the villi implantation reaches the myometrium, in the placenta increta the villi penetrates the myometrium, and in the placenta percreta the villi penetrates the myometrium until it reaches the serous layer [1-6].

The incidence of adherent placenta in Indonesia is not clearly known. In recent decades, as an increase in birth rates with cesarean section, it also has an impact on the increase in the incidence of placental adhesive [7-8]. Research reported by Wu in the United States with a total birth of 64,359 at the University of Chicago hospital from

1982-2002 found the increase of placenta accreta incident, in 1982 were 12.5 % compared to 2002 increased to 23.5% while overall the average incidence of placenta accreta was 1 out of 533 [7]. This figure is higher than in the 1970s that was 1 out of 4027 and in the 1980s that was 1 out of 2510.

Another study reported by Silver in the United States was conducted over four years (1999-2002) at 19 educational centres with a total sample of 30.132 with the result that there was an increase in the incidence of placenta accreta in women underwent first, second, third, fourth, fifth, sixth cesarean section in consecutive 15 (0.24%), 49 (0.31%), 36 (0.57%), 31 (2.13%), 6 (2.33%) and 6 (6.74%). In addition to the increase of placenta accreta incident, hysterectomy rates, cystotomy, intestinal damage, urethral damage, the use of post-operative ventilators, blood transfusion more than 4 bags, length of operation, and length of ICU and ward stay also increased [8].

Two important risk factors play a role in the cause of adherent placenta, namely, placenta previa and history of cesarean section [1-4, 9]. These two risk factors are also related because patients with history of cesarean section increase the possibility of placenta previa. However, the highest risk occurs when placenta previa is formed over a mark of cesarean section [8].

Also, actions or manipulations that damage the endometrium such as uterine curettage, myomectomy, endometrial ablation, uterine artery embolization, and removal of the remaining placenta manually are also risk factors for accreta syndrome [6, 10]. The diagnosis of adherent placenta can be confirmed by ultrasonography during pregnancy.

Early diagnosis during antenatal examination needs to be done to prepare for delivery so that it can provide better outcomes [11-13]. Various techniques such as greyscale, color doppler and three-dimensional doppler increase the sensitivity of ultrasound [14]. The use of magnetic resonance imaging (MRI) also helps in diagnosing adherent placenta especially in the placenta percreta with attachment into another organ. The operation of MRI does not depend on the expertise of the operator but

the high cost and the lack of availability in primary health care facilities makes MRI can be not used as an initial screening for placenta accreta. More attention needs to be given when handling pregnancies with adherent placenta by considering when and where the action will be performed [1]. Some literature states that 34-37 weeks is a recommendation for delivery [1, 6, 15].

Treatment for pregnancies with adherent placenta is through surgery. This surgical procedure performed to deliver the baby and placenta with caesarean section. However, in some cases hysterectomy needs to be done because of the difficulty in removing the placenta from the uterus and preventing severe haemorrhage.

In a study conducted by Fitzpatrick in the United Kingdom, a trial to remove the placenta manually showed an increase in the amount of bleeding when compared to direct hysterectomy [13]. Hysterectomy itself is a procedure that causes a lot of blood loss because it is one of the essential organs also because in the third trimester of pregnancy there is an increase in blood flow through the uterine arteries reaches 12% of cardiac output [16].

For that reason, performing a hysterectomy there are several types of additional procedure that can be done simultaneously such as temporary occlusion of the bilateral common iliac artery, ligation of the internal iliac artery or the use of endovascular procedure such as balloon insertion and embolization.

All of these actions have the same goal which is to provide good intraoperative output such as blood loss reduced, number of blood transfusion, operating time and length of stay. The temporary occlusion of the bilateral iliac artery is the simplest but has the same function as the other procedures.

Material and Method

This research is a retrospective study conducted at Sanglah Hospital in Bali in the period of January 1st 2019 to 31st December 2019. This study used patient medical record. The patients taken were patients with a suspected diagnosis of adherent placenta and who underwent total abdominal hysterectomy (TAH) with or without temporary loop occlusion (TLO).

The number of patients taken was same each group and was taken consecutively. Every patient with suspected adherent placenta was performed an ultrasound examination and calculation of placenta accrete index (PAI) score by the Obstetrician. Furthermore, patients underwent cesarean section and TAH when the gestational age was sufficient or when there were signs of an emergency.

The TLO procedure was performed by a thoracic, cardiac, and vascular surgeon after the baby was born and before TAH was performed. TLO was released after all operative procedure and treatment of complications had been completed. Furthermore, anatomic pathology examination was performed to establish a histological diagnosis of adherent placenta. Data was taken from medical records such as patient characteristics, intraoperative procedure and pre and post-operative laboratory examination. Characteristic data such as the maternal age, gestational age and PAI score are mean \pm standard deviation (SD) result.

While other characteristic data such as gravid, history of cesarean section and pathology anatomy (PA) results are grouped

and disclosed in a table. Data from the operative procedure such as the estimated blood loss, the number of PRC transfusions, operating time, the length of ICU stay and ward stay are mean \pm SD. For laboratory examination, the data taken were complete blood count such as haemoglobin, hematocrit, platelet and white blood cell.

The difference between pre and post-operation are described with mean \pm SD. Any numerical data will be tested by statistical analysis to compare between both groups. The data were tested for the distribution using Shapiro-Wilk. Statistical analysis test uses T-Test for normal distribution data and Mann Whitney for abnormal distribution data. All value considered significant when $p < 0.05$.

Result

In this study, there were eight patients with adherent placenta who underwent TAH procedure between January 1st 2019 to December 31st 2019. Patients were divided into equal numbers each group, the TLO intervention group and the non-intervention group. The characteristics of each group are shown in Table 1.

Table 1: Characteristics of each group

Characteristics	TLO intervention	Non Intervention	p-value
Maternal Age (years)	30.25 \pm 5.74	37 \pm 4.32	p=0.109
Gestational Age	36.96 \pm 2.05	33.64 \pm 2.22	p=0.070
Gravid			
3	2	1	
4	2	2	
5	0	1	
Prior Cesarean Section			
1	1	3	
2	3	1	
PAI Score	6.93 \pm 1.64	5.5 \pm 2.48	p=0.371
Pathology Anatomy Result			
Placenta Accreta	1	1	
Placenta Increta	2	2	
Placenta Percreta	1	1	

The first group underwent TLO intervention while the second group did not (Table 2). In the intraoperative blood loss variable, statistically significant results were obtained ($p=0.037$), where the TLO intervention group has estimated blood loss of 2125 \pm 853.9 ml and 3750 \pm 866 ml in the non-intervention group. In the administration of PRC transfusion variable obtained 694.75 \pm 394.18 ml in the TLO intervention group and in the non-intervention group was 1298.5 \pm 716.19

ml ($p=0.384$). The operating time in the TLO intervention group was 220.05 \pm 39.5 minutes and in the non-intervention group was 264.5 \pm 69.84 minutes ($p=0.468$). The length of ICU stay in the TLO intervention group was 2.75 \pm 0.95 days and in the non-intervention group was 3.25 \pm 0.96 days ($p=0.488$). The length of ward stay in the TLO intervention group was 2.25 \pm 0.5 days and 2.75 \pm 1.5 days in the non-intervention group ($p=0.85$). Variables such as PRC

transfusion, operating time, length of ICU and ward stay, do not reveal significant differences in statistical result.

Table 2: Output in TAH procedure in both groups

Output	TLO Intervention	Non Intervention	p-value
Blood loss	2125 ± 853.9	3750 ± 866	0.037
PRC transfusion	694.75 ± 394.18	1298.5 ± 716.19	0.384
Operating time	220.05 ± 39.5	264.5 ± 69.84	0.468
Length of ICU stay	2.75 ± 0.95	3.25 ± 0.96	0.488
Length of ward stay	2.25 ± 0.5	2.75 ± 1.5	0.50

From the results of a complete blood count done twice, there were preoperative and postoperative in each patient (Table 3). The mean decrease in haemoglobin (Hb) in the TLO intervention group was 1.37 ± 0.97 g/dL and in the non-intervention group was 3.99 ± 3.37 g/dL ($p=0.149$). The mean decrease in hematocrit (HCT) in the TLO intervention group was 3.23 ± 3.05 % and in the non-intervention group was 12.84 ± 10.29 % ($p=0.124$). The mean decrease in platelet

(PLT) in the TLO intervention group was 43.3 ± 19.01 $10^3/\mu\text{L}$ and in the non-intervention group was 28.05 ± 85.15 $10^3/\mu\text{L}$ ($p=0.739$). The mean white blood cell (WBC) increase in the TLO intervention group was 9.8 ± 7.77 $10^3/\mu\text{L}$ and in the non-intervention group was 18.23 ± 6.37 $10^3/\mu\text{L}$ ($p=0.145$). There was not significant difference in the statistical result of the variables on complete blood count test.

Table 3: Mean difference in complete blood count result pre and post-operative both groups

Output	TLO Intervention	Non Intervention	p-value
Decrease Hb	1.37 ± 0.97	3.99 ± 3.37	0.149
Increase HCT	3.23 ± 3.05	12.84 ± 10.29	0.124
Decrease PLT	43.3 ± 19.01	28.05 ± 85.15	0.739
Increase WBC	9.8 ± 7.77	18.23 ± 6.37	0.145

Discussion

Characteristics data indicates that the TLO intervention group had a lower mean age than the non-intervention group and the mean gestational age of the TLO intervention group was at term while the non-intervention group was at preterm. However, patient who had twice history in cesarean section is higher in TLO intervention group and also higher mean PAI score.

For anatomic pathology results each group has the same proportion for placenta accreta, increta and percreta. In a report by Wright it was found that there was no significant relationship between gestational age, gravid, history of childbirth, history of cesarean section and degree of placental invasion with severe bleeding and massive transfusions [17].

Cesarean section was performed first to deliver the baby. This procedure used midline incision to provide an adequate field of view in conducting TLO and TAH. Next, the Thoracic, Cardiac, Vascular and Endovascular Surgeons took over the operation and look for both common iliac arteries that are superior lateral from the

uterus and create the temporary occlusion by making two loops in the highway and then clamping.

The process of finding and occluding both bilateral common iliac arteries took around 10-15 minutes. This temporary occlusion used vessel loops while in several other studies used catheters of size 14 [18-19]. With this occlusion, blood flow in the lower extremities would also cease. Some literature says that 60 minutes is a safe time to get good output when occlusion is done for lower extremities and if surgery is more than 60 minutes therefore revascularization is expected to be carried out every 10-15 minutes [18].

In this study no revascularization was performed until hysterectomy and complications management was completed, but no ischemic signs of the lower extremities and other complications were found. The examined variables were the estimated blood loss, the number of PRC transfusions, operating time, length of ICU and ward stay. Although each variable showed better results in the TLO intervention group, only the mean blood loss variable had a significant difference or $p < 0.05$.

Those can be caused by a small number of samples so it is not enough to get a significant p-value. In this study the TLO intervention group had less operating time compared to the non-intervention group, this was related to easier bleeding control and a clearer operative field of view.

All patients underwent TLO did not find any signs of complications from bilateral occlusion of the iliac arteries such as thrombosis, ischemic necrosis, reperfusion injury or neurological disorders. From the results of the pre-operative and post-operative complete blood count test obtained mean differences in Hb, HCT, PLT and WBC which were compared between both groups.

All result shows smaller mean differences in the TLO intervention group except for PLT, it is because in some patients from the non-intervention group there was a transfusion of thrombocyte concentrate. A more significant decrease in Hb indicates the risk of post-operative anaemia in the non-intervention group. In addition, the intervention group also found a greater increase in WBC hence it has a higher risk of systemic inflammatory response syndrome (SIRS) or Sepsis.

Although there are differences that indicate that the TLO intervention group has a component of better complete blood count test variables, but the small number of samples causes the p-value to not get <0.05 . The development of the management of adherent placenta is very diverse at this time. All treatments aim to increase the output of the patient such as reduced amount of bleeding, number of transfusion requirements, operating time, length of stay, complications, and death.

Various procedures were done to get better output in handling adherent placenta such as embolization of the artery, the use of a balloon, and ligation of the artery [1, 18-24, 28-29]. Each of these procedures is beneficial when the fetus has been born and then bleeding will be easier to control when attempting to detach the placenta or hysterectomy.

Uterine artery embolization (UAE) is an interventional radiological procedure that uses a catheter to deliver particles or substances that will block the blood circulation to the uterus (Figure 1). Preoperative embolization will cause hypoxia

in the fetus so this is not possible when the fetus is still in the uterus, besides exposure to x-ray and fluoroscopy is also considered this action. Meanwhile, if embolization is done after the baby is born, bleeding from the uterus occurs first before the hemostatic state is reached by embolization. Comparison of UAE use before hysterectomy and Non-UAE in a report by Wang obtained a smaller mean blood loss in UAE use [21]. In another report by Li obtained good results where 10 out of 12 patient's uterus could be preserved by UAE prophylactic action, with the mean estimated blood loss was 1381 ml, time of operation was 2 hours 19 minutes without any complications [22].

Furthermore when compared to TLO measures, uterine artery embolization has disadvantages such as the need for more advance tools such as c-arm or radiology devices to assist proper catheter placement, higher costs and the requirements of experts from an interventional radiologist. Balloon occlusion is an endovascular procedure that aims to reduce blood flow in an artery. The use of balloon in the adherent placenta can be used in the lower abdominal aorta, both common iliac artery and both internal iliac artery.

The use of balloon is the same as uterine artery embolization which requires x-ray and fluoroscopy, but hemostasis is more quickly achieved using balloon when compared to the embolization process. In a report by Chen with the use of balloon in bilateral internal iliac artery compared with not using before hysterectomy showed differences in mean bleeding of 3 litres and 3.7 litres, mean operating time of 158 minutes and 139 minutes, mean transfusion of 8 bags and 10 bags [23].

In another study reported by Chou in which a balloon was placed in bilateral common iliac artery before hysterectomy, mean bleeding of 1902 ml was obtained with complications in two patients, thrombosis in external iliac artery and popliteal artery [24]. Thrombosis can occur due to balloon pressure in the endothelium blood vessel that can damage and elicit thrombosis and inflammatory responses [25].

More attention needs to be given to this action because in pregnancy the mother tends to be in a state of hypercoagulation [26, 30].

In addition Greenberg reports that the use of femoral sheaths of more than 6 Fr and patients with delayed release of sheaths have a higher risk of thromboembolism [27]. The need of more sophisticated equipment and expert medical staff and high costs are disadvantages these actions compared to temporary loop occlusion in bilateral common iliac artery.

Ligation of internal iliac arteries causes the cessation of blood flow to the organs flowed by the internal iliac arteries. In a retrospective report carried out in Japan by Iwata from 1987 to 2007 in the case of adherent placenta underwent ligation of the internal iliac arteries and not before performing a hysterectomy, the mean blood loss difference was 3721 ml and 4991 ml but this difference was not statistically significant [28].

Results from other study by Ono showed different things where the mean hysterectomy blood loss with internal iliac artery ligation was higher than without ligation, which was 4175 ml and 3786 ml [29].

Iwata et al stated that although ligation had been done on internal iliac arteries, other collateral such as rectal branch of the inferior mesenteric artery, superior gluteal artery, and inferior epigastric artery still provided blood flow [28]. If it is compared with other procedures to achieve hemostasis in TAH in the case of adherent placenta, the advantage of using TLO is the procedure can be done in any center without the need for sophisticated equipment or certain specialist.

Vascular surgeons and general surgeons can also do this procedure. Besides this procedure does not require high costs and has a small risk of damage to blood vessels. In this study no attempt was made to preserve the uterus. One would hope that after reporting better differences in output from the TLO intervention group, further research can be done to preserve the uterus.

The weakness of this study is the small number of samples. Researchers aspire with this research, other studies will emerge to compare the action of temporary loop occlusion with another advanced vascular actions with large samples so that it can have an impact on further knowledge.

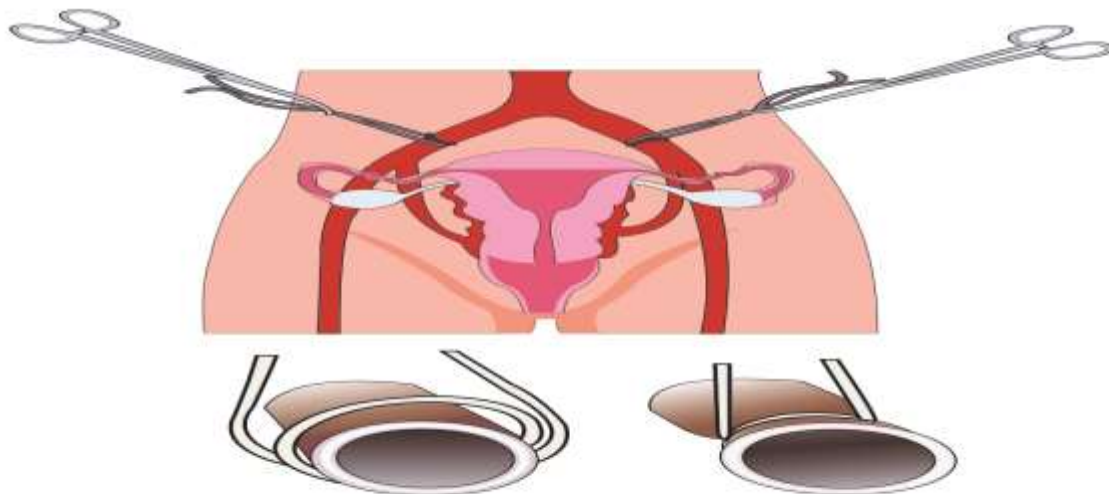


Figure 1: Location and mechanism of TLO

Conclusion

Temporary loop occlusion reduced the mean intraoperative blood loss in the total abdominal hysterectomy of patients with adherent placenta and the differences were 2125 ± 853.9 ml in the TLO intervention group and 3750 ± 866 ml in the nonintervention group ($p=0.037$). In other

variables such as the number of PRC transfusions, operating time, length of ICU and ward stay was also better in the TLO intervention group but were not statistically significant ($p>0.05$). TLO is one of the additional procedures that can be performed on TAH procedure because it is the easiest procedure and induced good result.

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