

# Fertility and pregnancy outcomes following hypogastric artery ligation for severe post-partum haemorrhage

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**BACKGROUND:** Hypogastric artery ligation is a therapeutic option for severe post-partum haemorrhage. Little is known about the outcomes of subsequent fertility and pregnancy. We studied these parameters in women who required hypogastric artery ligation for severe post-partum haemorrhage in our institution over a 13-year period. **METHODS:** All patients who required hypogastric artery ligation for severe intractable post-partum haemorrhage from January, 1989 to April, 2001 were included. Data were retrieved from medical files and telephone interviews. **RESULTS:** A total of 68 patients required hypogastric artery ligation during the study period. Seventeen patients had 21 pregnancies with 13 term deliveries, two ectopic pregnancies, three miscarriages, and three abortions. Twenty-eight patients did not want a new pregnancy and one patient refused the interview. Twenty-three (34%) patients were lost to follow up. None of the patients suffered subsequent infertility and pregnancy was achieved in <12 months once planned. Pregnancy outcomes were normal. Fifty-four percent had vaginal deliveries. Three patients suffered a threatened post-partum haemorrhage that was easily treated medically. **CONCLUSIONS:** This is the largest reported series of pregnancies following hypogastric artery ligation. Hypogastric artery ligation for post-partum bleeding >1 l appears to be a safe procedure that does not impair subsequent fertility and pregnancy outcomes.

*Key words:* fertility/hypogastric artery ligation/post-partum haemorrhage/pregnancy

## Introduction

Post-partum haemorrhage was found to be the commonest cause of maternal death in France (Bouvier-Colle *et al.*, 2001) in recent years. It was responsible for 11.4% of all maternal deaths in France from 1995 to 1997. Most post-partum haemorrhages are easily treated by manual removal of the placenta, oxytocin administration, fundal massage, and prostaglandin administration. Despite aggressive therapy, primary post-partum haemorrhage can remain refractory to medical treatment. An audit performed in our institution (Ledee *et al.*, 2001) showed that the incidence of severe intractable post-partum haemorrhage was 1.8 in 1000 pregnancies (primary and secondary referrals).

Historically, the only available treatment for these refractory haemorrhages was post-partum hysterectomy. This radical treatment leaves the patient infertile. Alternatives to this radical treatment exist. Surgical ligation of pelvic arteries was described at the end of the 19th century (Quenu and Duval, 1898). This was initially used for pelvic bleeding of non obstetric cause. Hypogastric artery ligation for post-partum haemorrhage was described in 1960 (Sagarra *et al.*, 1960; Reich and Nechtow, 1961). This technique is usually used if

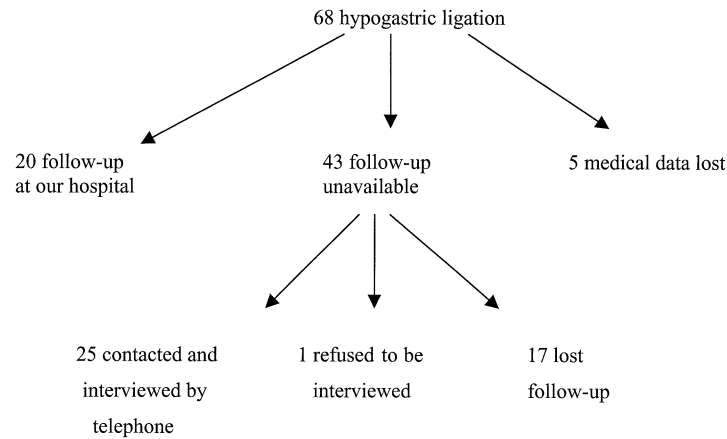
the haemorrhage occurs during or immediately after a Caesarean section.

More recently, arterial embolization has become a reliable non-surgical alternative to post-partum hysterectomy (Pelage *et al.*, 1998) and internal iliac artery ligation. Embolization is nevertheless limited by the specialized instrumentation and expertise that are required. A further requirement is a haemodynamically stable patient, especially when the embolization suite is situated at some distance from the delivery room.

Little is known about the fertility and pregnancy outcomes for patients who have undergone hypogastric artery ligation performed in severe post-partum haemorrhage. There are several case reports but no large series with long follow-up. This cohort study was therefore undertaken to evaluate the effect of hypogastric artery ligation performed in severe post-partum haemorrhage on fertility and pregnancy outcomes.

## Materials and methods

All patients who had bilateral hypogastric ligation for severe post-partum haemorrhage in our hospital from January, 1989 to April, 2001



**Figure 1.** Flow chart of study population

were included. The ligation procedure was standardized and most cases performed by a single surgeon (H.F.). The ligation was applied to the proximal 3 cm length of the hypogastric artery before the posterior branch arises. Absorbable sutures were used in all cases. For all patients included in this study, internal iliac artery ligation was successful in stopping the post-partum haemorrhage (PPH).

The following data were retrieved from medical case note records: indication for hypogastric artery ligation, obstetric outcome, fertility, and subsequent pregnancy outcome. When case note records were not available, patients were contacted by telephone. We recorded pregnancies until March, 2002.

When the patient had one or more subsequent pregnancies, we studied the time interval between the hypogastric artery ligation and the first pregnancy, the type of pregnancy (normal, miscarriage, abortion, or ectopic), the outcome of pregnancy and complications of the third stage of labour.

## Results

### Patients

During this 13-year period, sixty-eight patients underwent hypogastric artery ligation for severe PPH. Of these, 29.4% (20) were followed up at our hospital. Follow-up records were unavailable in 63.3% (43). Of these, 58.2% (25) were interviewed by telephone, 2.3% (1) refused to be interviewed and 39.5% (17) were not contactable as they had moved out of the area. In 7.3% (5) all medical data was lost because of fire damage to the case files (Figure 1).

Altogether, information was obtained for 66.2% (45) patients excluding the patient who refused the interview.

In total, 17 women had 21 pregnancies following hypogastric artery ligation. Of these 21 pregnancies, there were three abortions, two ectopic pregnancies, three early miscarriages and 13 normal pregnancies. Two patients had two pregnancies, and one patient had three pregnancies following hypogastric artery ligation. Population characteristics at the time of the hypogastric artery ligation and at the time of the first pregnancy following the artery ligation are given in Table I.

Details of the initial indications for hypogastric artery ligation are given in Table II.

**Table I.** Population characteristics: at the time of hypogastric artery ligation of patients who did not have a subsequent pregnancy (A), at the time of hypogastric artery ligation of patients who had a subsequent pregnancy (B), and at the time of the first pregnancy following the ligation (C)

	Number	Age (range) years	Gestivity (range) months	Parity (range)
A	46	32.0 (22–44)	3.9 (1–9)	2.1 (1–4)
B	17	32.8 (22–40)	3.3 (1–8)	1.9 (1–6)
C	17	35.4 (26–42)		

### Fertility

There were no cases of secondary infertility in our series. The average delay before a subsequent pregnancy following hypogastric artery ligation was 30.6 months with a range of 7–74 months. Once the patients desired a new pregnancy, it was achieved in <12 months. If there was a delay of >12 months between the ligation procedure and subsequent pregnancy, the patients said that it was their deliberate choice to delay the pregnancy.

### Uterine arteries

Information from Doppler ultrasound of the uterine artery was available for two patients with a total of three pregnancies only. The resistance and pulsatility indexes were within normal ranges at 22–24 weeks gestation and 31–34 weeks gestation, without protodiastolic notches. Patient 5 was the only patient who had a fetus with intra-uterine growth retardation (IUGR) probably due to sickle cell anaemia. This patient had IUGR involving all her pregnancies, and the IUGR in the pregnancy following the ligation was not more severe than in previous ones.

### Pregnancies

Of the 21 pregnancies, 13 were normal and there were three abortions, three miscarriages, and two ectopic pregnancies.

### Deliveries

The average term delivery was 39 weeks + 1 day (range 37 weeks + 2 days–41 weeks + 6 days). Caesarean section was the

**Table II.** Initial indications for hypogastric artery ligation in patients who subsequently had one or more pregnancies (Antoine Bécélère Hospital series)

Patient number	Type of pregnancy	Pathologies preceding pregnancies	Particulars of the pregnancy	Indication for hypogastric artery ligation	Complications
1 <sup>a</sup>	N	None	OHSS + LLP + PL	Uterine atony and sulprostone failure	1 RBCU transfused
2 <sup>a</sup>	N	PPH (Castelman's disease)	IUGR + LLP + PROM at 27 weeks gestation	disseminated intravascular coagulation, uterine atony, and sulprostone failure	3 RBCU + 7 FFPU transfused
3 <sup>c</sup>	N	None	Fetal macrosomia	Uterine atony and sulprostone failure	3 RBCU transfused
4 <sup>b</sup>	N	2 DVT without risk factors	Fetal macrosomia and fetal distress during labour	Uterine atony and sulprostone failure	none
5 <sup>a</sup>	N	Heterozygous sickle cell anaemia	IUGR + eclampsia + Abruptio placentae	DIVC	4 RBCU transfused + retina detachment
6 <sup>b</sup>	N	None	Pre-eclampsia	Vascular surgical lesions and sulprostone failure	None
7 <sup>a</sup>	N	Alcoholism, heterozygous sickle cell anaemia, and malaria	LLP + polyhydramnios	Uterine atony and sulprostone failure	4 RBCU + 2 FFPU transfused
7 <sup>a</sup>	A				
8 <sup>b</sup>	N	None	None	Uterine atony and fever	None
9 <sup>c</sup>	N	None	None	Uterine atony and sulprostone failure	10 RBCU + 8 FFPU transfused
10 <sup>b</sup>	N	PPH with blood transfusion	LLP	Uterine atony and sulprostone failure on placenta accreta	2 RBCU transfused
11 <sup>a</sup>	N	None	Fetal macrosomia + PL at 28 weeks gestation	Uterine atony, sulprostone failure, and DIVC	2 RBCU transfused
11 <sup>a</sup>	EP	None	Fetal macrosomia + PL at 28 weeks gestation	Uterine atony, sulprostone failure, and DIVC	2 RBCU transfused
11 <sup>a</sup>	A	None	Fetal macrosomia + PL at 28 weeks gestation	Uterine atony, sulprostone failure, and DIVC	2 RBCU transfused
12 <sup>b</sup>	N	Hypothyroidism	None	Uterine atony and sulprostone failure	None
12 <sup>b</sup>	N	Hypothyroidism	None	Uterine atony and sulprostone failure	None
13 <sup>b</sup>	A	PPH with blood transfusion	LLP	Uterine atony and sulprostone failure on placenta accreta	Auto-transfusion + 2 RBCU transfused
14 <sup>a</sup>	EP	Homozygous sickle cell anaemia with blood transfusion	LLP	Uterine atony on placenta accreta	3 RBCU transfused
15 <sup>a</sup>	M	None	LLP	Uterine atony and sulprostone failure with DIVC	Auto-transfusion + 2 RBCU transfused
16 <sup>a</sup>	M	PPH with blood transfusion	None	Uterine atony with bladder lesions and sulprostone failure	none
17 <sup>a</sup>	M	None	LLP with PL at 30 weeks gestation	Uterine atony and sulprostone failure on placenta accreta	3 RBCU transfused + Methotrexate

<sup>a</sup>Caesarean section.<sup>b</sup>Caesarean section after vaginal delivery failure.<sup>c</sup>Vaginal delivery.

N = normal pregnancy; EP = ectopic pregnancy; A = abortion; M = miscarriage; PPH = post-partum haemorrhage; OHSS = ovarian hyperstimulation syndrome; LLP = low-lying placenta; PL = preterm labour; RBCU = red blood cell unit(s); IUGR = intra-uterine growth retardation; PROM = premature rupture of membranes; DIVC = disseminated intravascular coagulation; FFPU = fresh frozen plasma unit(s); DVT = deep venous thrombosis.

mode of delivery in 84.6% (11/13) before the post-partum haemorrhage that lead to the hypogastric artery ligation procedure. Following the ligation, 46.2% (6/13) pregnancies were delivered by Caesarean section.

### Third stage of labour

Of the seven vaginal deliveries, five had systematic manual removal of the placenta, two had oxytocin for the third stage of labour and had also threatened post-partum haemorrhages. Both of these were easily managed by manual evacuation of the placenta and i.v. oxytocin.

All of the six patients who had Caesarean sections had systematic manual removal of the placenta. One had a post-partum haemorrhage that stopped with prostaglandin (sulprostone).

### Babies

All babies were normal. The average weight was 3650 g with the baby of patient 5 weighing 2430 g.

## Discussion

Hypogastric artery ligation for post-partum haemorrhage is probably not responsible for secondary infertility, uterine contractility disorders, placental perfusion insufficiency or fetal anomalies such as IUGR. Our series is the largest reported series in the literature with 21 pregnancies and 13 deliveries. This is the first description of ectopic pregnancies after hypogastric artery ligation.

There are other cases of pregnancies after hypogastric artery ligation for post-partum haemorrhage reported in the literature (Given *et al.*, 1964; Nechtow and Reich, 1966; Mengert *et al.*, 1969; Aguilar and Cabrera, 1976; Nelson, 1979; Wolcott *et al.*, 1988; Papp *et al.*, 1996; Wagaarachchi and Fernando, 2000; Shinagawa, 1964; Moili *et al.*, 1976). Table III summarizes the published cases and series in the literature. There are 28 pregnancies following hypogastric artery ligation described in the literature. Apart for one publication (Aguilar and Cabrera, 1976), all other

**Table III.** Summary of the pregnancies following hypogastric artery ligation for post-partum haemorrhage described in the literature compared with our series

Authors	Deliveries	Ectopic pregnancies	Miscarriages	Abortions	Total pregnancies
Shinagawa (1964)	1	0	0	0	1
Given (1964)	1	0	1	0	2
Nechtow (1966)	1	0	0	0	1
Menger (1969)	5	0	0	0	5
Moili (1976)	2	0	0	1	3
Aquilar (1976)	8	0	1	0	9
Nelson (1979)	0	0	1	0	1
Wolcott (1988)	1	0	0	0	1
Papp (1996)	1	0	0	0	1
Wagaarachchi (2000)	2	0	2	0	4
Our series	13	2	3	3	21
TOTAL	35	2	8	4	49

pregnancies are Case reports. These Case reports do not evaluate the obstetric outcome of a population after hypogastric artery ligation.

Our results are consistent with the absence of effects of hypogastric artery ligation on ovarian function and subsequent fertility.

Moreover, after embolization for fibroids, Ravina *et al.* (2000) also confirmed the absence of effects of uterine artery embolization for future pregnancy.

We did not observe infertility amongst our population. All the patients who decided to have a subsequent pregnancy were successful within a year. This is surprising considering the maternal age of our population, but there was only one patient with a history of infertility (patient 1). This patient did not experience difficulties in becoming pregnant following the hypogastric artery ligation procedure.

All the patients we contacted who did not have a pregnancy following the ligation procedure said it was by choice. However, one weakness of our study is the high rate of patients lost to follow up (23 out of 68), due to the length of the study period. Although we may have missed some subsequent pregnancies, we do not think that the patients who moved would have induced bias in our results and interpretation, since they are unlikely to have differed according to their desire for, or in outcome of, successful conception. The rate of patients wanting more children seems relatively low but we think it is most likely due to the psychological impact of acute obstetrical haemorrhage that needed intensive care, intensive treatments and hypogastric artery ligation. As far as we know, this psychological impact has never been studied.

We report the first two cases of ectopic pregnancies after hypogastric artery ligation for post-partum haemorrhage. Both patients attended the clinics late and required blood transfusion. This is indirectly related to the hypogastric artery ligation procedure because they did not expect a further pregnancy even though both patients were in their second pregnancy subsequent to the procedure. There were three miscarriages in our series (14% of pregnancies). We expected more miscarriages because the mean age of our population following hypogastric artery ligation was 35.4 years.

Labour was normal and we did not observe contraction disorders. This explains a high rate (45 %) of vaginal deliveries

following a previous Caesarean section considering the severity of underlying medical disorders. We observed one case (9%) of Caesarean for cervical dilation failure.

Vaginal deliveries were possible in more than half the cases. There have not been any complications of the third stage of labour described in the literature. We report three post-partum haemorrhages that were treated medically. These haemorrhages were probably not a consequence of hypogastric artery ligation, but of a pre-existent underlying pathology that was responsible for the previous post-partum haemorrhage.

In conclusion, our study confirms that hypogastric artery ligation is a safe, effective life-saving procedure in post-partum haemorrhage. Moreover, this procedure does not appear to affect menstruation or other related outcomes, including fecundity. However, complications of this technique with proximal ligation of the hypogastric artery i.e. buttock claudication, impotence, bladder and bowel necrosis and death, have been reported in an atherosclerotic patient who, conversely with pregnant patients, did not have good collateral circulation.

Pregnancies occur spontaneously in patients who so desire. They appear nonetheless to be rare, as many women do not want to repeat so severe a trauma and choose not to conceive again.

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