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Is there an association between postpartum hemorrhage, interventional radiology procedures, and psychological sequelae?

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Short Title: Complicated delivery and associated psychological sequelae

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Abstract

Background: Postpartum hemorrhage (PPH) may cause post-traumatic psychological sequelae.

Interventional radiology procedures (IRP) have been established in the management of PPH when conventional management fails. IRP is also used prophylactically in women who are at high risk for PPH in pregnancies with abnormally invasive placentation. We sought to determine if there is an association between PPH, IRP, and psychological sequelae.

Objectives: Seventy-three women who underwent IRP due to PPH or were at high risk for PPH.

Method: A structured questionnaire was sent to all women.

Results: Overall 49 women returned the questionnaire. Two-thirds of the women developed psychological sequelae and one-third reported lack of professional support. Nine women had symptoms of post-traumatic stress disorder. Psychological sequelae were not associated with a volume of bleeding, whether or not hysterectomy was performed, or whether the IRP was performed as an emergency procedure or prophylactically. However, women who had elective IRP and no hysterectomy performed had significantly less fear of death compared to the rest of the study population.

Conclusions: We observed a high rate of psychological sequelae associated with IRP. Lack of proper professional support may have contributed to the development of post-traumatic psychological sequelae suggesting a need for debriefing in such women.

Keywords: Postpartum hemorrhage, interventional radiology procedures, arterial embolization, balloon occlusion of iliac arteries, long-term health impact

Introduction

Postpartum hemorrhage (PPH) is one of the most severe obstetric complications contributing to maternal morbidity and mortality [1-3]. Interventional radiology procedures (IRP) are used as a standard treatment in massive PPH and often as a prophylactic procedure in women who are at high risk for PPH in pregnancies with abnormally invasive placentation. [4-8]. IRP includes prophylactic catheterization of the iliac arteries, pelvic arterial embolization, or both.

PPH causes psychological sequelae with a major negative impact on quality of life [9-22]. A review from Zaat et al. [18] suggested that there also may be an association between PPH, postpartum hysterectomy, and developing post-traumatic stress disorder (PTSD). Only a few studies have explored psychological long-term sequelae following PPH and IRP [20-22]. The results of these studies are contradictory. Sentilhes et al. [20] reported major adverse psychological outcomes despite uterine preservation, while van Stralen et al. [21,22] found no long-term effects on quality of life.

We studied the link between PPH, IRP, and the development of postpartum post-traumatic sequelae among women who underwent IRP due to massive PPH or were at high risk for PPH. We also wanted to identify specific delivery-related and pregnancy-related risk factors of psychological sequelae.

Materials and Methods

The study was approved by the Ethics Committee of the Helsinki University Hospital (number 140/13/03/03/2012).

The study population consisted 73 women who underwent emergency or elective IRP at the Helsinki University Hospital between August 2001 and April 2011. The cases were retrieved from the hospital database using a specific interventional code PC7NT (Nordic Classification of Surgical Procedures).

Our PPH management guidelines have been reported elsewhere [23]. Women who had elective IRP received extensive antenatal counseling regarding IRP and possible complications. During the study

period we had no systematic protocol for the follow up. Most of the women had a follow-up visit at a primary health care outpatient clinic.

We collected baseline characteristics including age, parity, mode of delivery, amount of bleeding, and delivery-related events from the patient records. A structured questionnaire was developed by the investigators, tested beforehand, and sent to the women to evaluate the physical and psychological recovery process. We had two versions of the questionnaire; one for the women with postpartum hysterectomy and one for the women with preserved uterus. If the questionnaire was not returned within one month, it was resent once. The mean follow-up time from the delivery to receiving the questionnaire was 72 months (range 25-127 months).

Specific questions focused on fear of death, fear of conception, fear of subsequent pregnancy, fear of childbirth, sexual problems, and problems with intimate relationships in general. Long-term psychological problems and opinions on the adequacy of the psychological support were also inquired. A long-term problem was defined as a problem persisting for more than six months following delivery. The questionnaire also included questions on fertility and outcomes of pregnancies before and after IRP. There were also open fields so that women could state any other long-term health problems possibly related to the event.

We determined the overall incidence of psychological sequelae. We also carefully evaluated the individual responses to determine what proportion of the psychological sequelae fulfilled the criteria for PTSD [24]. The role of specific characteristics among women with or without psychological problems was analysed to determine any significant correlation. A comparison between the outcomes of women with elective IRP/no hysterectomy and the rest of the women was performed.

The SPSS statistical package (SPSS Inc., Chicago, IL, USA) was used for data analysis. A test value $p < 0.05$ was considered significant.

Results

Of the 73 women, 46 (63%) had IRP as an emergency procedure for massive PPH and 27 (37%) had IRP as a prophylactic procedure because of antenatally diagnosed abnormally invasive placentation. A total of 49 women (67%) returned the questionnaire. Of these, 27 women had acute massive PPH and 22 women were at high risk for PPH. In the first group, five women (18.5%) had hysterectomy and in the latter group 13 women (59.1%) had hysterectomy.

The baseline characteristics of the study population are shown in Table 1. All women in the emergency IRP group and 20 women in the prophylactic IRP group had massive bleeding (mean 8807 ml, range 1500-16 500 ml vs. mean 4366 ml, range 100-15 000 ml). Thus, massive PPH occurred in 86% of the women overall.

Psychological sequelae were reported by 31 women (63%). These included fear of death, depression, anxiety, problems with relationships, and lack of confidence in the health care system in general. Two-thirds of the women (67%) described their deliveries as frightening, traumatic, chaotic, or painful. Nine (18%) of the 49 women reported symptoms consistent with PTSD. There were no differences in psychological sequelae between the two IRP groups (emergency IRP group and prophylactic IRP group). However, women with elective IRP and no hysterectomy had significantly less fear of death than the rest of the study group (women with emergency IRP and women with hysterectomy) (Table 2).

We did not identify any specific risk factors leading to adverse psychological outcomes. The need for hysterectomy, the nature of IRP, and the amount of bleeding was not associated with the occurrence of psychological problems (Table 3).

Fourteen women (29%) reported lack of any professional support following discharge from the hospital. Two women visited a psychologist but did not receive sufficient support. Three women reported that the follow-up visit after delivery was disappointing. The main reason was that the obstetrician who took care of the delivery was not present. Fourteen women (29%) had been in contact with their private gynecologist or general practitioner and were referred to a psychologist, physical therapist, or sexual therapist.

Nine women (18%) reported long-term physical symptoms, including dyspareunia, inguinal pain, pain in a lower limb, and chronic pelvic pain. Although women with psychological sequelae seemed to have more physical symptoms than women who had no psychological sequelae (25.8 % vs. 5.6%), the difference was not significant. Hysterectomy was a major negative experience in six (33%) of the 18 women who underwent hysterectomy.

Thirteen women with preserved uterus had a total of 16 subsequent pregnancies. All subsequent deliveries were term deliveries with normal birthweight. Six (46%) of the 13 women experienced fear and anxiety towards conception and subsequently experienced fear during pregnancy and childbirth. PPH recurred in three of the 13 women (23%). Six of the 14 remaining women had no desire for pregnancy because of fear of recurrent PPH.

Discussion

We showed that two thirds of women with acute massive PPH or women at high risk for PPH developed psychological sequelae. Psychological sequelae were consistent with PTSD in one fifth of the cases. This outcome did not depend on bleeding volume, whether or not hysterectomy was performed, or whether IRP was performed as an emergency procedure or prophylactically. The lack of systematic follow-up and counseling may have contributed to the development of these long-term psychological sequelae.

The incidence of adverse psychological outcomes was equally common in our study as in the study of Sentilhes et al. [20]. They found that 67% of 68 women had negative experiences after management of severe PPH. Women with hysterectomy were not included in their study, and only 43% of the women had massive bleeding. This strengthens the conclusion that the traumatic event in general rather than the volume of bleeding or hysterectomy explains the poor quality of life.

Van Stralen et al. [21,22] reported good quality of life in both of their studies. Their 2-year nationwide cohort study included 58 women managed for PPH [22]. The response rate of was relatively low (31%). One of their key findings was that women who underwent IRP only had a better quality of life than

women who underwent hysterectomy. This was not observed in our study. However, their conclusions are consistent with our results, suggesting that healthcare professionals should provide extensive counseling following severe PPH.

A review article concerning the relationship between PTSD and PPH was published in 2018 [18]. It showed that there might be an association between emergency postpartum hysterectomy, PPH, and PTSD, although the results were limited due to small amount of eligible studies. Our results support the findings of this review.

The counseling and support that our patients received during and after PPH was clearly inadequate. This situation has already been reported by others [11,12,16,22]. However, counseling provided beforehand to women with prophylactic IRP seems to be useful and effective, as these women had less fear of death.

Few studies have also addressed the partner perspective [12,16,22]. Partners have also reported lack of counseling as problematic, leading to a feeling of powerlessness and an inability to help their partner. Marital and sexual problems were also demonstrated in our study and in the study by Sentilhes et al. [20]. Sexual problems may be partly physical due to trauma to the birth canal. However, psychological problems may also play a role. IRP did not seem to have adverse effects on fertility or subsequent pregnancies and the recurrence rate of PPH in subsequent pregnancy was quite low. However, a PPH event may prevent couples from planning future pregnancies [19].

The strength of our study is that our target group included women whose pregnancies or deliveries had been exceptionally complicated and stressful because of PPH or abnormally invasive placentation. Such data cannot be reliably retrieved from hospital records or registers. We are also aware of limitations, one of which is the lengthy time period between the actual event and the moment at which women were approached; this potentially led to recall bias. However, one may consider this as a strength as this demonstrated that adverse sequelae do persist. Furthermore, our cohort was too small to draw more definitive conclusions. Similarly, we did not collect data on the women's psychiatric history. While the

response rate of 66% was relatively low, this was still higher than in other comparable studies. A low response rate may also reflect upon the negative experience of the event.

In conclusion, we demonstrated a high rate of adverse psychological outcomes associated with complicated deliveries. There is a need for a systematic follow up provided by the obstetrician who managed the delivery. Fertility, subsequent pregnancy outcome, and long-term physical and psychological sequelae should be essential issues when counseling such women. Such a protocol has already been implemented in our delivery unit. We also emphasize the positive effect of elective counseling for women with abnormally invasive placentation and prophylactic IRP.

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Disclosure Statement

The authors report no conflict of interest.

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Table 1. Baseline and delivery-associated characteristics of the study population.

	Emergency IRP No hysterectomy n=22 (%)	Emergency IRP Hysterectomy n=5 (%)	Elective IRP No hysterectomy n=9 (%)	Elective IRP Hysterectomy n=13 (%)
Age (years; mean)	30.3 (range 22-37)	35.0 (range 29-40)	33.9 (range 29-41)	34.4 (range 29-40)
Parity (mean)	0.55	2.6	1.6	2.8
0	15 (68.2)	0	0	0
≥1	7 (31.8)	5 (100)	9 (100)	13 (100)
Mode of delivery				
Vaginal delivery	18 (81.8)	2 (40)	0	0
Spontaneous	16	2	0	0
Vacuum extraction	2	0	0	0
Cesarean section	4 (18.2)	3 (60)	9 (100)	13 (100)
Elective	0	1	8	13
Emergency	4	2	1	0
Amount of bleeding (ml)				
Mean	7918	13 420	1105	6623
Range	1500-16 000	8000-16 500	100-4300	300-15 000
	0	0	6 (66.7)	1 (7.7)
< 1500	22 (100)	5 (100)	3 (33.3)	12 (92.3)
≥ 1500				
IRP*				
Pelvic arterial embolization	22 (100)	5 (100)	4 (44.4)*	2 (15.4)*
Temporary balloon occlusion	0	0	9 (100)	13 (100)
Complications**	14 (63.6)	3 (60.0)	3 (33.3)	11 (84.6)

*including temporary balloon occlusion

**infections (pelvic area n=9, wound n=3, sepsis n=1, urinary tract n=1, pneumonia n=1), hematomas (wound n=1, intra-abdominal n=3, inguinal n=4), ileus (n=4), urinary tract lacerations (bladder n=3, ureter n=1), pulmonary embolism (n=1), repeat bleeding (n=4), liver laceration (n=1), iatrogenic rupture of iliac artery (n=1)

IRP=interventional radiology procedure

Table 2. Long-term psychological sequelae reported by the study population.

	Women with elective IRP no hysterectomy (n = 9)	Other women¹ (n = 40)	p-value	OR (95% CI)
Fully recovered, n (%)	8 (88.9)	27 (67.5)	0.415	0.26 (0.029-2.3)
Frequency of all psychological problems, n (%)	4 (44.4)	27 (67.5)	0.259	2.6 (0.60-11)
Frequency of long-term psychological problems, n (%)	1 (11.1)	8 (20.0)	1.0	2.0 (0.22-18)
Depression, n (%)	1 (11.1)	18 (45.0)	0.127	6.5 (0.75-57)
Fear of death, n (%)	0 (0)	18 (45.0)	0.018	1.8 (1.4-2.4)
Sexual problems, n (%)	4 (44.4)	13 (32.5)	0.700	0.60 (0.14-2.6)
Marital problems, n (%)	3 (33.3)	11 (27.5)	0.702	0.76 (0.16-3.6)
Lack of aftercare, n (%)	1 (11.1)	13 (32.5)	0.415	3.9 (0.44-34)

¹Including women with emergency IRP with and without hysterectomy and women with elective IRP with hysterectomy

IRP=interventional radiology procedure, OR=odds ratio, CI=confidence interval

Table 3. Selected variables by the presence or absence of psychological sequelae.

	No psychological sequelae n = 18 (%)	Psychological sequelae n = 31 (%)	p-value	OR (95% CI)
Received counselling after complicated delivery	3 (16.7)	12 (38.7)	0.197	3.2 (0.75-13)
Physical long-term problems	1 (5.6)	8 (25.8)	0.127	5.9 (0.67-52)
Elective IRP	10 (55.6)	12 (38.7)	0.253	0.51 (0.16-1.6)
Hysterectomy	7 (38.9)	11 (35.5)	0.812	0.86 (0.26-2.9)
Bleeding ≥ 1500 ml	15 (83.3)	27 (87.1)	0.697	1.4 (0.27-6.9)
Complications related to delivery management	11 (61.1)	20 (64.5)	0.812	1.2 (0.35-3.8)
Parity ≥ 1	15 (83.3)	19 (61.3)	0.107	0.32 (0.075-1.3)
Subsequent delivery after IRP*	4 (22.2)	7 (22.6)	1.0	1.0 (0.25-4.1)
History of infertility	5 (27.8)	5 (16.1)	0.329	0.50 (0.12-2.0)
Emergency cesarean section	2 (11.1)	5 (16.1)	1.0	1.5 (0.27-8.9)

*including women with hysterectomy

IRP=interventional radiology procedure, OR=odds ratio, CI=confidence interval