



Contents lists available at ScienceDirect

Taiwanese Journal of Obstetrics & Gynecology

journal homepage: www.tjog-online.com

Original Article

What is new in peripartum hysterectomy? A seventeen year experience in a tertiary hospital



Gonca Yetkin Yildirim^a, Nadiye Koroglu^{a, *}, Aysu Akca^a, Merve Talmac^a, Selin Dikmen^a, Gokhan Yildirim^b, Ibrahim Polat^a, Ismail Ozdemir^a

^a Istanbul Health Sciences University Kanuni Sultan Suleyman Training and Research Hospital, Department of Obstetrics and Gynecology, Istanbul, Turkey

^b Medipol University Faculty of Medicine, Department of Obstetrics and Gynecology, Istanbul, Turkey

ARTICLE INFO

Article history:

Accepted 11 May 2020

Keywords:

Peripartum hysterectomy

Cesarean section

Placenta accreta spectrum

ABSTRACT

Objective: To identify changing trends in peripartum hysterectomy (PH), both elective, cesarean hysterectomy and emergency cesarean hysterectomy, at a single training and research hospital over the last 17 years in Istanbul, Turkey.

Materials and methods: A retrospective cohort study was performed between January 2001 and September 2017. The records of all patients who had PH at Kanuni Sultan Süleyman Training and Research Hospital were analyzed.

Results: There were 243 cases of PH during the study period. A total of 266,386 births occurred, of which 60.1% were vaginal deliveries and 39.8% were cesarean sections. The incidence of PH increased from 0.67 per 1000 deliveries to 1.14 per 1000 deliveries during 2001–2008 and 2009–2017, respectively, with an overall incidence of 0.91 per 1000 deliveries during the 17 years. The main indication for PH changed significantly during this time from uterine atony (57.1%) to placenta accreta spectrum (85%). About 37% of women who underwent PH had at least one previous cesarean delivery during 2001–2008, whereas that percentage increased to 95.4% during 2009–2017.

Conclusion: Placenta accreta spectrum was the leading cause of PH and was associated with significant maternal morbidity and mortality.

© 2021 Taiwan Association of Obstetrics & Gynecology. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Peripartum hysterectomy (PH) is a near-miss maternal event that is performed to prevent maternal death [1–3]. PH includes both cesarean hysterectomies performed after cesarean delivery and postpartum hysterectomies performed after vaginal delivery [4]. The incidence of PH is < 1 per 1000 deliveries in developed countries [3,5–8], whereas the incidence rises to 11 per 1000 deliveries in developing countries [9].

Hemorrhage from placenta accreta spectrum, formerly known as morbidly adherent placenta and including placenta increta,

percreta, and accreta, carries a higher risk of hysterectomy than surgical trauma/tears or uterine atony [8]. The most common risk factor for placenta accreta spectrum is a previous cesarean delivery, and the incidence rises with the number of prior cesarean deliveries [10,11]. In many countries, the indication for hysterectomy due to the placenta accrete spectrum increases concomitantly with an increase in the rate of cesarean section [3,7,10,12,13].

The purpose of this study was to review PH cases at a tertiary hospital for over 17 years and to compare the incidence, indications, and outcomes of PH across two time periods.

Materials and Methods

In this retrospective descriptive study, all cases of PH performed in the Department of Obstetrics and Gynecology between January 2001 and September 2017 at the Health Sciences University, Istanbul Kanuni Sultan Süleyman Training and Research Hospital, were included. Our hospital is the largest tertiary center on the European side of Istanbul, providing care for referred complicated obstetric patients and handling approximately 15,600 births per

* Corresponding author. Kanuni Sultan Suleyman Training and Research Hospital, Atakent Mh. Turgut Özal Cd. No:1 34303 Altınşehir, Küçükçekmece, İstanbul, Turkey. Fax: +90 212 5714790.

E-mail addresses: goncayetkinyildirim@gmail.com (G.Y. Yildirim), nadiye_dugan@hotmail.com (N. Koroglu), aysuakca122@hotmail.com (A. Akca), drmrve@hotmail.com (M. Talmac), selindikmen1@hotmail.com (S. Dikmen), gokhan73yildirim@gmail.com (G. Yildirim), dripolat@yahoo.com (I. Polat), drismailozdemir@gmail.com (I. Ozdemir).

year, with a total cesarean delivery rate of 39.8% and a primary cesarean rate of 17.2%. An increasing trend in cesarean delivery rates was observed during the second period (14% vs. 20%). This study was approved by the local ethics committee. Informed consent was obtained from all participants according to the Declaration of Helsinki. All demographic and clinical characteristics were obtained from patient medical records. Maternal age, parity, gestational age at delivery, fetal birth weight, previous cesarean section, and mode of delivery were recorded. The indication for surgery, type of hysterectomy, operating time, preoperative and postoperative hemoglobin values, need for blood transfusion, postoperative complications, postoperative hospitalization days, and maternal mortality were analyzed.

All hysterectomies were undertaken when medical (fundal massage and bimanual uterine compression or oxytocin, ergometrine, or prostaglandin administration) or minor surgical procedures (uterine or hypogastric artery ligation, B-Lynch, or Hayman sutures) failed to correct intractable hemorrhage within 24 h of vaginal or abdominal delivery. Patients with a gestational age <24 weeks were excluded. All cases of placenta accreta spectrum were diagnosed by a perinatologist, particularly during the second period because of the ultrasonographic awareness of this spectrum and confirmation by pathological reports of hysterectomy specimens.

In total, 91 PH cases from the first period (2001–2008) had been previously analyzed [14]; 152 PH cases from the second period (2009–2017) were also analyzed so that the periods could be compared.

The Med Calc 18.11.3 program was used for the statistical analysis. The normal distribution of continuous variables was assessed according to the Kolmogorov–Smirnov test. A chi-square analysis was used for categorical variables. Student's *t*-test was used for normally distributed variables in the analysis of continuous variables, and the Mann–Whitney U test was used for abnormally distributed variables. A *p*-value < 0.05 was considered significant.

Results

A total of 243 PHs were performed during the 17 years. There were 266,389 deliveries, of which 60.1% were vaginal deliveries and 39.8% were cesarean sections. Of those, 17.2% were primary cesarean sections. The incidence of PH rose from 0.67 (2001–2008) to 1.14 (2009–2017), with an overall incidence of 0.91 (2001–2017) per 1000 deliveries.

The demographic and clinical characteristics of the PH cases are shown in Table 1. The mean maternal age was significantly higher during the first period (32.8 ± 5.29) than the second period (31.08 ± 5.08) ($p = 0.0135$). The rate of patients who had at least one prior cesarean delivery (37.6% vs. 94.7%, $p = 0.0001$) or prior dilatation and curettage (24.1% vs. 38.1%, $p = 0.024$) was higher during the second period than the first period. Gestational age

Table 1
Demographic and clinical characteristics of the peripartum hysterectomy cases.

	2001–2008 (First period) n = 91	2009–2017 (Second period) n = 152	P-value
Age	31.08 ± 5.08	32.8 ± 5.29	0.0135
Gravidity	3.48 ± 1.99	3.78 ± 1.49	0.182
Parity	1.87 ± 1.39	2.14 ± 1.05	0.087
Prior cesarean delivery	34 (37.6)	144 (94.7)	0.0001
Prior dilatation and curettage	22 (24.1)	58 (38.1)	0.024
Gestational age (weeks)	37.90 ± 2.69	35.50 ± 3.08	0.0001
Operating time	93.31 ± 27.97	76.30 ± 57.21	0.0085
Hospitalization days	6.58 ± 2.83	5.60 ± 3.31	0.015
Preoperative Hemoglobin	9.49 ± 2.23	10.68 ± 1.80	0.0001
Postoperative Hemoglobin	8.52 ± 1.08	8.02 ± 1.60	0.0088

The data are the mean ± SD or n (%).

p value < .05 is considered statistically significant and is indicated by bold.

(37.90 ± 2.69 [2001–2008]; 35.50 ± 3.08 years [2009–2017]; $p = 0.0001$), mean operating time (93.31 ± 27.97 [2001–2008]; 76.30 ± 57.21 min [2009–2017]; $p = 0.0085$), and mean duration of hospitalization (6.58 ± 2.83 [2001–2008]; 5.60 ± 3.31 days [2009–2017]; $p = 0.015$) were all greater during the earlier period than the late period. All women who underwent PH received a blood transfusion. The mean preoperative hemoglobin concentration was significantly higher during the second period than the first ($p = 0.0001$), while mean postoperative hemoglobin was significantly higher during the first period than the second period ($p = 0.0088$).

The indications for hysterectomy are shown in Table 2. The most common indication during the first period was uterine atony (51.6%), while the most common indication during the second period was placenta accreta spectrum with placenta previa (83.5%). The indications changed dramatically from uterine atony to placenta accreta spectrum, with a cesarean rate of 94.7% during the second period.

The preferred hysterectomy type and medical/surgical interventions before hysterectomy are shown in Table 3. Sub-total hysterectomy was performed in 68.1% of patients during the first period, while total hysterectomy was preferred during the second period (85.5%). Medical or surgical interventions were significantly preferred during the first period (fundal massage/misoprostol [$p = 0.0001$], suture of placental bed [$p = 0.019$], B-Lynch/Hayman suture [$p = 0.019$], uterine artery ligation [$p = 0.0001$], internal iliac artery ligation [$p = 0.0019$], and uterine packing [$p = 0.0001$]).

Maternal complications are shown in Table 4. Bladder injuries increased significantly during the second period ($p = 0.0024$) and intensive care unit admissions were also higher during the second period than the first ($p = 0.0016$). Three maternal deaths occurred during the second period.

Discussion

PH is generally performed in response to a life-threatening hemorrhage that failed to respond to more conservative treatment. PH can be performed at any time, from delivery to discharge from the hospital [8,15,16].

The overall incidence of PH at Kanuni Sultan Süleyman Training and Research Hospital is 0.91 per 1000 deliveries (2001–2017). The higher incidence rate during the second period (1.14) was most likely related to differences in the overall cesarean section rate. In western and eastern regions of Turkey, the incidence of PH changes substantially; in western Turkey, it ranges from 0.25 to 0.67 [6,12,14,16–19], whereas in Eastern and Southeastern Turkey the incidence is 5.09 and 5.38, respectively [20,21]. This high incidence could be explained by high delivery rates, high rates of home birth, insufficient antenatal care, and a geographic structure that prevents patients from getting to health care facilities in the eastern part of the country.

Table 2
Indications for peripartum hysterectomy.

	2001–2008 (First period) n = 91 (%)	2009–2017 (Second period) n = 152 (%)	P-value
Uterine atony	47 (51.6)	6 (3.9)	0.0001
Placenta previa	2 (2.1)	14 (9.2)	0.0306
Placenta accreta spectrum	7 (7.6)	2 (1.3)	0.0115
Placenta previa + Placenta accreta spectrum	20 (21.9)	127 (83.5)	0.0001
Abruptio placenta	5 (5.5)	1 (0.6)	0.0167
Uterine rupture	9 (9.8)	2 (1.3)	0.0033
Myoma uteri	1 (1.0)	0	0.2177

p value < .05 is considered statistically significant and is indicated by bold.

Table 3
Preferred hysterectomy type and medical/surgical interventions before hysterectomy.

	2001–2008 n = 91 (%)	2009–2017 n = 152 (%)	P-value
Sub-total hysterectomy	62 (68.1)	22 (14.4)	0.0001
Total hysterectomy	29 (31.8)	130 (85.5)	0.0001
Fundal massage/misoprostol	57 (62)	6 (3.9)	0.0001
Suture of placental bed	18 (19.7)	14 (9.2)	0.019
B-Lynch/Hayman suture	24 (26.3)	4 (2.6)	0.019
Bakri balloon	0	8 (5.2)	0.0305
Uterine artery ligation	21 (23)	5 (3.2)	0.0001
^a Internal iliac artery ligation	15 (16.4)	7 (4.6)	0.0019
Uterine packing	32 (35.1)	0	0.0001

p value < .05 is considered statistically significant and is indicated by bold.

^a Internal iliac artery ligation was performed either pre- or post-hysterectomy.

Table 4
Maternal complications.

	n = 91 (%)	n = 152 (%)	P-value
Bladder injury	2 (2.1)	21 (13.9)	0.0024
Disseminated intravascular coagulation	3 (3.2)	7 (4.6)	0.5940
Wound infection	6 (6.5)	5 (3.3)	0.2451
Paralytic ileus	3 (3.2)	1 (0.6)	0.1157
Ureteral injury	0	2 (1.3)	0.2758
Relaparotomy	2 (2.1)	11 (7.2)	0.0863
Intensive care unit admission	8 (8.7)	38 (25.1)	0.0016
Maternal Death	2 (2.1)	3 (0.6)	0.0907

p value < .05 is considered statistically significant and is indicated by bold.

The English in this document has been checked by at least two professional editors, both native speakers of English. For a certificate, please see: <http://www.textcheck.com/certificate/cnOBlj>.

The most common indication for PH during 2001–2008 was uterine atony (51.6%). This trend changed from 2009 to 2017, with placenta accreta spectrum replacing uterine atony as the leading cause of PH (83.5%).

There was an approximately three-fold increase in the indication of placenta accreta spectrum, with the increase in cesarean section rates playing a key role in driving this trend. The incidence of uterine atony decreased due to wide use of preventive medical and surgical approaches (uterotonics, Bakri-balloon, and B–Lynch/Hayman suture) and an increase in antenatal care. Other factors that led to a decrease in atony-related hysterectomies include the emergency obstetric care education given to all obstetricians by the government and the coordinated care for hemorrhagic incidents at highly experienced maternity centers.

The association between (previous) cesarean delivery and hysterectomy is consistent across many studies [10,11]. Countries with a high cesarean delivery rate have a higher incidence of hysterectomy [2,22–24]. Turkey had the highest rate of cesarean delivery among OECD countries in 2015. The cesarean rate was 7% in 1993, it increased to 53.1% in 2016, with an accompanying primary cesarean rate of 26.4%.

The constant increase in cesarean delivery rates might be due to medicolegal issues in nature to prevent normal labor complications. Additionally, health policies changed in 2005 and women could

afford deliveries in private hospitals such that cesarean deliveries became preferred in private hospitals at the mother's request (women's fear of labor pains, vaginal esthetic anxiety, thinking that cesarean birth is best for the baby and mother, and planning the date of birth). The cooperation of midwives with both state and private hospitals decreased. Advanced maternal age with the use of assisted reproduction techniques and maternal obesity could also be contributing factors to the increased cesarean delivery rate.

Three maternal deaths were observed during the study. One was due to consumptive coagulopathy following total hysterectomy, which was performed due to placenta accreta spectrum with placenta previa. The second death was due to hypovolemic shock following cesarean delivery and a total hysterectomy due to uterine atony. The third death was due to hypovolemic shock following normal labor and was referred from a private hospital.

The limitations of our study include the absence of risk factors leading to PH and neonatal outcomes in the medical records of the patients. Additionally, long-term follow-up of the PH patients could not be considered due to the retrospective nature of the data. These results from one region of the country do not necessarily reflect outcomes across the country as a whole.

In conclusion, placenta accreta spectrum was the leading cause of PH and was associated with significant maternal morbidity and mortality. Based on the findings of this retrospective study of 266,386 births over 17 years, a primary objective to improve maternal care should be to decrease the caesarean section rate (not higher than 15%) and women at high risk of PH should be identified using better diagnostic modalities, provided antenatal management, and delivered in highly experienced maternity centers that have a coordinated care team.

Grant support & financial disclosures

None.

Conflict of interest

The authors report no conflicts of interest.

References

- [1] Knight M, Callaghan WM, Berg C, Alexander S, Bouvier-Colle MH, Ford JB, et al. Trends in postpartum hemorrhage in high resource countries: a review and recommendations from the International Postpartum Hemorrhage Collaborative Group. *BMC Pregnancy Childbirth* 2009;9:55. <https://doi.org/10.1186/1471-2393-9-55>. Epub 2009/12/01 PubMed PMID: 19943928; PubMed Central PMCID: PMC2790440.
- [2] van den Akker T, Brobbel C, Dekkers OM, Bloemenkamp KW. Prevalence, indications, risk indicators, and outcomes of emergency peripartum hysterectomy worldwide: a systematic review and meta-analysis. *Obstet Gynecol* 2016;128(6):1281–94. <https://doi.org/10.1097/AOG.0000000000001736>. Epub 2016/11/09 PubMed PMID: 27824773.
- [3] Campbell SM, Corcoran P, Manning E, Greene RA, Irish Maternal Morbidity Advisory G. Peripartum hysterectomy incidence, risk factors and clinical characteristics in Ireland. *Eur J Obstet Gynecol Reprod Biol* 2016;207:56–61. <https://doi.org/10.1016/j.ejogrb.2016.10.008>. Epub 2016/11/09 PubMed PMID: 27825028.
- [4] Rossi AC, Lee RH, Chmait RH. Emergency postpartum hysterectomy for uncontrolled postpartum bleeding: a systematic review. *Obstet Gynecol* 2010;115(3):637–44. <https://doi.org/10.1097/AOG.0b013e3181cf007>. Epub 2010/02/24 PubMed PMID: 20177297.
- [5] Sakse A, Weber T, Nickelsen C, Secher NJ. Peripartum hysterectomy in Denmark 1995-2004. *Acta Obstet Gynecol Scand* 2007;86(12):1472–5. <https://doi.org/10.1080/00016340701692651>. Epub 2007/11/21 PubMed PMID: 18027114.
- [6] Temizkan O, Angin D, Karakus R, Sanverdi I, Polat M, Karateke A. Changing trends in emergency peripartum hysterectomy in a tertiary obstetric center in Turkey during 2000-2013. *J Turk Ger Gynecol Assoc* 2016;17(1):26–34. <https://doi.org/10.5152/jtgg.2015.16239>. Epub 2016/03/31 PubMed PMID: 27026776; PubMed Central PMCID: PMC4794289.
- [7] Awan N, Bennett MJ, Walters WA. Emergency peripartum hysterectomy: a 10-year review at the royal hospital for women, sydney. *Aust N Z J Obstet Gynaecol* 2011;51(3):210–5. <https://doi.org/10.1111/j.1479-828X.2010.01278.x>. Epub 2011/06/03 PubMed PMID: 21631438.
- [8] Huque S, Roberts I, Fawole B, Chaudhri R, Arulkumaran S, Shakur-Still H. Risk factors for peripartum hysterectomy among women with postpartum haemorrhage: analysis of data from the WOMAN trial. *BMC Pregnancy Childbirth* 2018;18(1):186. <https://doi.org/10.1186/s12884-018-1829-7>. Epub 2018/05/31 PubMed PMID: 29843627; PubMed Central PMCID: PMC5975404.
- [9] Khan B, Khan B, Sultana R, Bashir R, Deeba F. A ten year review of emergency peripartum hysterectomy in a tertiary care hospital. *J Ayub Med Coll Abbotabad* 2012;24(1):14–7. Epub 2012/01/01. PubMed PMID: 23855085.
- [10] Society of Gynecologic O, American College of O, Gynecologists, the Society for Maternal-Fetal, Cahill AG, Beigi R, Heine RP, Silver R, Wax JR. Placenta accreta spectrum. *Am J Obstet Gynecol* 2018;219(6):B2–16. <https://doi.org/10.1016/j.ajog.2018.09.042>. Epub 2018/11/26 PubMed PMID: 30471891.
- [11] Eshkoli T, Weintraub AY, Sergienko R, Sheiner E. Placenta accreta: risk factors, perinatal outcomes, and consequences for subsequent births. *Am J Obstet Gynecol* 2013;208(3). <https://doi.org/10.1016/j.ajog.2012.12.037>. 219 e1–7. Epub 2013/01/15 PubMed PMID: 23313722.
- [12] Sahin S, Guzin K, Eroglu M, Kayabasoglu F, Yasartekin MS. Emergency peripartum hysterectomy: our 12-year experience. *Arch Gynecol Obstet* 2014;289(5):953–8. <https://doi.org/10.1007/s00404-013-3079-2>. Epub 2013/11/12 PubMed PMID: 24213098.
- [13] Bodelon C, Bernabe-Ortiz A, Schiff MA, Reed SD. Factors associated with peripartum hysterectomy. *Obstet Gynecol* 2009;114(1):115–23. <https://doi.org/10.1097/AOG.0b013e3181a81cdd>. Epub 2009/06/24 PubMed PMID: 19546767; PubMed Central PMCID: PMC2714706.
- [14] Gungorduk K, Yildirim G, Dugan N, Polat I, Sudolmus S, Ark C. Peripartum hysterectomy in Turkey: a case-control study. *J Obstet Gynaecol* 2009;29(8):722–8. <https://doi.org/10.3109/01443610903168358>. Epub 2009/10/14 PubMed PMID: 19821666.
- [15] Pattinson RC, Hall M. Near misses: a useful adjunct to maternal death enquiries. *Br Med Bull* 2003;67:231–43. Epub 2004/01/09. PubMed PMID: 14711767.
- [16] Zorlu CG, Turan C, Isik AZ, Danisman N, Mungan T, Gokmen O. Emergency hysterectomy in modern obstetric practice. Changing clinical perspective in time. *Acta Obstet Gynecol Scand* 1998;77(2):186–90. Epub 1998/03/25. PubMed PMID: 9512325.
- [17] Yucler O, Ozdemir I, Yucler N, Somunkiran A. Emergency peripartum hysterectomy: a 9-year review. *Arch Gynecol Obstet* 2006;274(2):84–7. <https://doi.org/10.1007/s00404-006-0124-4>. Epub 2006/02/08 PubMed PMID: 16463166.
- [18] Ozden S, Yildirim G, Basaran T, Gurbuz B, Dayicioğlu V. Analysis of 59 cases of emergent peripartum hysterectomies during a 13-year period. *Arch Gynecol Obstet* 2005;271(4):363–7. <https://doi.org/10.1007/s00404-004-0647-5>. Epub 2004/06/19 PubMed PMID: 15205986.
- [19] Demirci O, Tugrul AS, Yilmaz E, Tosun O, Demirci E, Eren YS. Emergency peripartum hysterectomy in a tertiary obstetric center: nine years evaluation. *J Obstet Gynaecol Res* 2011;37(8):1054–60. <https://doi.org/10.1111/j.1447-0756.2010.01484.x>. Epub 2011/04/13 PubMed PMID: 21481094.
- [20] Zeteroglu S, Ustun Y, Engin-Ustun Y, Sahin G, Kamaci M. Peripartum hysterectomy in a teaching hospital in the eastern region of Turkey. *Eur J Obstet Gynecol Reprod Biol* 2005;120(1):57–62. <https://doi.org/10.1016/j.ejogrb.2004.08.011>. Epub 2005/05/04 PubMed PMID: 15866087.
- [21] Yalinkaya A, Guzel AI, Kangal K. Emergency peripartum hysterectomy: 16-year experience of a medical hospital. *J Chin Med Assoc* 2010;73(7):360–3. [https://doi.org/10.1016/S1726-4901\(10\)70078-2](https://doi.org/10.1016/S1726-4901(10)70078-2). Epub 2010/08/07 PubMed PMID: 20688301.
- [22] Whiteman MK, Kuklina E, Hillis SD, Jamieson DJ, Meikle SF, Posner SF, et al. Incidence and determinants of peripartum hysterectomy. *Obstet Gynecol* 2006;108(6):1486–92. <https://doi.org/10.1097/01.AOG.0000245445.36116.c6>. Epub 2006/12/02 PubMed PMID: 17138784.
- [23] Bai SW, Lee HJ, Cho JS, Park YW, Kim SK, Park KH. Peripartum hysterectomy and associated factors. *J Reprod Med* 2003;48(3):148–52. Epub 2003/04/18. PubMed PMID: 12698770.
- [24] Kacmar J, Bhimani L, Boyd M, Shah-Hosseini R, Peipert J. Route of delivery as a risk factor for emergent peripartum hysterectomy: a case-control study. *Obstet Gynecol* 2003;102(1):141–5. Epub 2003/07/10. PubMed PMID: 12850620.