



Original article

Opportunistic salpingectomy during postpartum contraception procedures at elective and unscheduled cesarean delivery



Federico Ferrari ^{a,*}, Sara Forte ^b, Federico Prefumo ^a, Enrico Sartori ^b, Franco Odicino ^b

^a Department of Obstetrics and Gynecology, Spedali Civili Brescia, Italy

^b Department of Obstetrics and Gynecology, University of Brescia, Italy

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ABSTRACT

Objective: To compare intra- and postoperative surgical complications of opportunistic bilateral total salpingectomy during postpartum permanent contraception procedures in elective and unscheduled cesarean delivery.

Study design: We conducted a retrospective cohort study (2010–2017) of women who had postpartum permanent contraception procedures during cesarean delivery, and we collected baseline characteristics, scheduling of delivery (elective versus unscheduled), operative time, estimated blood loss (EBL) and surgical complications (bleeding, iatrogenic injury, infection, anemia and relaparotomy). We classified patients according to contraceptive technique: bilateral total salpingectomy, bilateral partial salpingectomy with or without fimbriae, and other methods.

Results: Five hundred twenty-eight women underwent postpartum permanent contraception procedures, 245 (46.4%) had bilateral total salpingectomy, 239 (45.3%) had bilateral partial salpingectomy, and 48 (8.3%) underwent other methods. We did not find differences in baseline characteristics, operative time and EBL among postpartum permanent contraception groups. Unscheduled cesarean delivery did not influence the choice of postpartum permanent contraception technique ($p=.22$). Postpartum permanent contraception-related intraoperative bleeding occurred in 1 (0.4%) and 2 (0.9%) patients, respectively, in bilateral total and partial salpingectomy group ($p=.23$). Postoperative complications were 13 (5.3%) and 6 (2.5%), respectively, in bilateral total and partial salpingectomy groups ($p=.11$). Subgroup analysis confirmed no differences for intra- and postoperative complications during unscheduled cesarean delivery. We noted a 4.3-min increase in operative time for total salpingectomy after multivariate analysis ($p<.01$).

Conclusion: At maternal request for postpartum permanent contraception during cesarean delivery, bilateral total salpingectomy can be a safe and feasible method even in case of unscheduled cesarean delivery.

Implications statement: Our results suggest that bilateral total salpingectomy during any cesarean delivery may be an acceptable choice for its higher contraceptive efficacy and risk-reduction effect for ovarian cancer, at the price of a small increase in operative time.

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1. Introduction

Postpartum permanent contraception procedures are an effective option for women, usually performed during cesarean section or through a minilaparotomy following vaginal delivery. At our institution, postpartum permanent contraception procedures during cesarean delivery are mostly performed either by removing the tube entirely, including its fimbriated part, or with a partial tubal resection (using Pomeroy or Parkland techniques or fimbriectomy), while other techniques, such as tubal ligation, clips or electrocauterization, are less commonly used. Currently, accumulated evidence suggests that fallopian

tube is the site of origin for a large part of high-grade serous ovarian or peritoneal cancers. Accordingly, a change in surgical practice was recommended, shifting toward the concept of opportunistic bilateral total salpingectomy in women who concluded their reproductive life at the time of benign surgery, thus including cesarean delivery [1].

In this retrospective study, we analyzed and compared intra- and postoperative surgical complications of various postpartum permanent contraception techniques during elective versus unscheduled cesarean delivery. In this study, we aim to evaluate the feasibility and safety of bilateral total salpingectomy even in case of unscheduled cesarean delivery (urgent or emergent). Many studies demonstrated the feasibility of total salpingectomy for postpartum permanent contraception during cesarean delivery, but none of them considered unscheduled timing as a factor that could potentially increase surgical complications [2–4].

* Corresponding author. Tel.: +39 0303995341; fax: +39 0303996018.
E-mail address: f.ferrari.obgyn@gmail.com (F. Ferrari).

Table 1
Baseline characteristics of women having a permanent contraception procedure at cesarean delivery at Spedali Civili of Brescia, Italy (January 2010–December 2017)

	Bilateral total salpingectomy n=245	Bilateral partial salpingectomy n=239	Other permanent contraception surgery ^a n=48	p value
Maternal age (years)	39.4 (27–49)	40.02 (29–52)	39.2 (29–48)	.40 ^b
Maternal age ≥35 years	208 (85%)	208 (87%)	40 (83.3%)	.71 ^c
Parity	2 (2–7)	2 (2–5)	2 (2–3)	.45 ^b
Number of previous CD	1 (0–3)	1 (0–4)	1 (0–3)	.89 ^b
BMI (kg/m ²) at delivery	28 (19–59)	28 (17–47)	39 (19–50)	.10 ^b
GA (weeks)	38 (29–40)	38 (27–40)	38 (27–41)	.49 ^b
Multiple pregnancy	19 (7.8%)	23 (9.6%)	1 (2.1%)	.33 ^c
Birth weight (g)	3000 (2230–3764)	3100 (2430–3770)	2850 (2175–3650)	.48 ^b
General anesthesia	100 (40.8%)	102 (42.9%)	8 (16.3%)	.18 ^c

Data presented as n (%) or median (interquartile range).

CD, cesarean deliveries; GA, gestational age.

^a Including clips (n=34) and electrocauterization (n=14).

^b Kruskal–Wallis test.

^c Pearson's chi-squared test.

2. Material and methods

We conducted a retrospective analysis of women who underwent cesarean delivery from January 2010 to December 2017 at Spedali Civili of Brescia, a tertiary university hospital in northeastern Italy, using a surgical electronic database. Women who received postpartum permanent contraception served as the study cohort. The Institutional Review Board of our institution reviewed this retrospective study and considered it exempt (reference number NP3361). All permanent contraception procedures were performed according to maternal request after a signed informed consent was obtained.

We collected baseline characteristics using electronic medical records, such as age, parity, number of previous cesarean sections, multiple pregnancy, maternal body mass index at delivery (BMI), gestational age, scheduling of cesarean delivery (elective versus unscheduled), total operative time and estimated blood loss (EBL) and neonatal birth weight. EBL was noted in the electronic medical record of the patient, and it was calculated by weighing of dry and wet surgical swabs before and at the end of surgery, with the difference being the blood absorbed by the swabs. Amniotic fluid was excluded from the count by prompt suction at the time of uterine incision. The Lucas classification of cesarean delivery is a four-grade system of urgency adopted by the Royal College of Obstetricians and Gynaecologists, and it is based upon clinical

definitions derived from agreement between anesthetists and obstetricians [5]. We defined as “elective” those cesarean deliveries performed at a time scheduled to suit the woman and maternity team (class 4 of Lucas' classification), and considered all other cesarean deliveries as “unscheduled” (either urgent or emergent; Lucas classes 1–3).

We defined intraoperative complications related to postpartum permanent contraception as those resulting from the tubal procedure and mainly consisting of bleeding or iatrogenic injury to other anatomical structures such as ovary, bowel, bladder or uterus. Unrelated intraoperative complications were defined as any iatrogenic injury or bleeding that occurred before postpartum permanent contraception was performed. We defined postoperative complications as any deviation from the normal postoperative course related to surgery, such as anemia (with hemoglobin decline ≥ 3 g/dL), surgical site infection and relaparotomy. We excluded bleeding due to uterine atony since surgeons systematically reported bleeding source in the operative note. Furthermore, we considered surgical site infection according to the three levels defined by Center for Disease Control and Prevention, and we included in our analysis levels two and three (respectively, deep incision and organ or space surgical site infection) [6]. Postpartum permanent contraception procedures were performed after closure of the uterine incision and classified as bilateral total salpingectomy, with complete transection of the tube to the corpus uteri; bilateral partial

Table 2
Intra- and postoperative outcomes by permanent contraception procedure performed during cesarean delivery at Spedali Civili of Brescia, Italy (January 2010–December 2017).

	Bilateral total salpingectomy n=245	Bilateral partial salpingectomy n=239	Other permanent contraception surgery ^a n=48	p value
Elective CD	194 (79.2%)	179 (74.9%)	36 (75%)	.22 ^c
Unscheduled CD	50 (20.8%)	60 (24.1%)	12 (25%)	
Operative time (min)	64 (27–115)	59 (29–123)	63 (31–108)	.01 ^b
Intraoperative complications	13 (5.3%)	7 (2.9%)		
PPC related	1 (0.4%)	2 (0.9%)		
Bleeding	1 (0.4%)	2 (0.9%)		
PPC not related	12 (4.9%)	5 (2%)	NA	.23 ^d
Bleeding	10 (4.1%)	4 (1.6%)		
Iatrogenic injury	2 (0.8%)	1 (0.4%)		
Postoperative complications	13 (5.3%)	6 (2.5%)		
Relaparotomy	4 (1.6%)	1 (0.4%)		
Hgb decline ≥ 3 g/dL	4 (1.6%)	5 (2.1%)	NA	.11 ^d
SSI	5 (2.1%)	0 (0%)		
EBL (mL)	920 (870–970)	910 (865–955)	910 (880–940)	.34 ^b
Blood transfusion	6 (2.8%)	4 (1.7%)	3 (5.6%)	.68 ^b
Hospitalization (days)	3 (2–15)	3 (2–14)	3 (2–8)	.67 ^b

Data presented as n (%) or median (interquartile range).

Hgb, hemoglobin; PPC, postpartum permanent contraception; SSI, surgical site infection.

^a Including clips (n=34) and electrocauterization (n=14).

^b Kruskal–Wallis test.

^c Pearson's chi-squared test.

^d Fisher's Exact Test.

Table 3

Intra- and postoperative complications by permanent contraception procedure performed at cesarean delivery and according to cesarean delivery scheduling at Spedali Civili of Brescia, Italy (January 2010–December 2017)

Surgical complications	Bilateral total salpingectomy n=245	Bilateral partial salpingectomy n=239	p value
Intraoperative			
Elective	7 (2.9%)	4 (1.7%)	.73 ^a
Unscheduled	6 (2.5%)	3 (1.3%)	
Postoperative			
Elective	6 (2.5%)	4 (1.7%)	.71 ^a
Unscheduled	7 (2.9%)	2 (0.8%)	

Data presented as n (%).

^a Fisher's Exact Test.

salpingectomy, with either segmental resection of the midtube, or the middle and end with fimbriectomy; and other methods, including clips and electrocauterization. All procedures requiring partial or total salpingectomy were performed exclusively by suture ligation and identification of the vessels of the mesosalpinx. The rationale for this subdivision resides in an increasing spectrum of surgical complexity, in which total salpingectomy is considered to be the most complicated procedure.

The primary outcome was the incidence of intra- and postoperative surgical complications during elective and unscheduled cesarean delivery according to the different methods of postpartum permanent contraception procedure adopted. Furthermore, as a secondary outcome, we assessed the impact of the different postpartum permanent contraception procedures on total operative time in both elective and unscheduled cesarean deliveries.

We compared baseline characteristics, intra- and postoperative complications between different postpartum permanent contraception groups using univariate analysis. We used Pearson's chi-squared, Fisher's and Kruskal–Wallis tests, as appropriate. To further investigate the differences in total operative time, we performed a multivariate linear regression model based on postpartum permanent contraception groups and scheduling of cesarean delivery and by including a priori recognized factors that increase the total operative time such as the number of previous cesarean sections, BMI and EBL. We considered the number of previous cesarean sections since it is established that they are associated with an increased adhesion development and a longer time to delivery with each subsequent cesarean delivery [7]; furthermore, we considered maternal BMI at delivery as it is a known factor for increased incision-to-delivery interval and total operative time at cesarean delivery, and finally, we considered EBL for its correlation with a higher rate of blood transfusion and a subsequently increased operative time [8,9].

We performed statistical testing using IBM SPSS Statistics for Windows, Version 23, and considered a p value <.05 as statistically significant.

Table 4

Details of postpartum permanent contraception procedures performed at cesarean delivery at Spedali Civili of Brescia, Italy (January 2010–December 2017)

PPC technique	Bilateral total salpingectomy n=245	Bilateral partial salpingectomy n=239	Other permanent contraception surgery n=48
Total salpingectomy ^a	245 (100%)	0 (0%)	0 (0%)
Fimbriectomy ^a	0 (0%)	186 (77.9%)	0 (0%)
Pomeroy ^a	0 (0%)	13 (5.4%)	0 (0%)
Parkland ^a	0 (0%)	40 (16.7%)	0 (0%)
Clips ^a	0 (0%)	0 (0%)	34 (71%)
Electrocautery ^a	0 (0%)	0 (0%)	13 (27%)

Data presented as n (%).

^a Kruskal–Wallis test with p<.00.

3. Results

During the 7-year study period, 4341 women had a cesarean delivery, of whom 528 (12%) had a postpartum permanent contraception procedure. Surgeons performed a bilateral total salpingectomy, bilateral partial salpingectomy or other procedures in 245 (46.4%), 239 (45.3%) and 48 (8.3%) women, respectively. The other procedures included titanium clips (n=34) and electrocauterization (n=14). Patient characteristics are presented in Table 1.

The proportion of postpartum permanent contraception procedures was similar whether the cesarean delivery was elective or unscheduled (p=.22), as can be seen in Table 2. We found similar rates of intra- and postoperative outcomes and complications among the different types of postpartum permanent procedures. Intraoperative complications, related to postpartum contraceptive procedure, exclusively consisted of surgical bleeding. The only different outcome was total operative time, which was a median of 5 min shorter for partial salpingectomy than for total salpingectomy or other procedures (Table 2). The prevalence of intraoperative complications and postoperative complications was similar between bilateral total and partial salpingectomy groups (Table 2). These findings remained similar after a subgroup analysis was conducted by elective and unscheduled cesarean delivery in bilateral total and partial salpingectomy groups, as can be seen in Table 3.

Median total operative time in minutes was 64 (95% CI 64–66), 59 (95% CI 57.9–62.1) and 64 (95% CI 58.8–68.9), respectively, in the three groups (p=.01). In Table 4 we have further detailed the type of contraceptive procedures in the three aforementioned groups. To assess the impact of postpartum permanent contraception on total operative time, further analyses were conducted excluding the group of other postpartum contraceptive methods. After multivariate linear regression, the total operative time was 4.3 min longer for bilateral total salpingectomy (95% CI 1.58–7.17; p<.01); it increased by 3.8 min for each previous cesarean section (95% CI 2.28–5.47; p<.01), 0.3 min per BMI unit (95% CI 0.029–0.562; p=.03) and 0.01 min per milliliter of estimated blood loss (95% CI 0.005–0.014; p<.01).

4. Discussion

Opportunistic bilateral total salpingectomy during a postpartum permanent contraceptive procedure may be safe in both elective and unscheduled cesarean delivery. We did not find a statistically significant difference in surgical complications between total salpingectomy and other approaches. Bilateral total salpingectomy increased the total operative time of 4.3 min.

In a U.S. study, the majority of women, counseled among the various postpartum permanent contraception techniques, expressed a preference for total salpingectomy, mainly for its higher contraceptive efficacy [10]. Over the past decade in U.S. and Europe, almost 75% of hysterectomies for benign disease incorporated opportunistic bilateral total salpingectomy, and current evidence confirms this trend also in case of postpartum permanent contraception [11–13]. In a recent study, mean EBL and complication rates were similar in bilateral total salpingectomy and tubal ligation in patients undergoing postpartum permanent contraception after vaginal delivery, while total operative time was increased [2]. In summary, the available evidence on the feasibility and safety of total bilateral salpingectomy during cesarean delivery is limited to small trials and retrospective cohort studies, and none of them focused on unscheduled cesarean delivery [3,4] [11,14]. In our study, we found similar complication rates across the operative techniques and between the elective versus unscheduled cesarean section groups; thus, we believe that bilateral total salpingectomy can always be an acceptable option. In fact, since most serous tubal intraepithelial carcinomas arise from the fimbriated portion and, although more rarely, from the nonfimbriated part of the tube, total salpingectomy has a clear advantage [12]. Given the cost-effectiveness of opportunistic salpingectomy as a risk-reduction strategy for ovarian cancer, no

contraindications emerged for its routinary adoption during cesarean delivery as postpartum permanent contraception [13]. Finally, it seems that the price for this type of postpartum permanent contraception is a small increase in total operative time, and this is consistent with the typical surgical technique [15].

Our retrospective study has strengths and limitations. Among strengths, our cohort is larger than previous studies and explores the complications rates of bilateral total salpingectomy in both elective and unscheduled cesarean deliveries.

Among limitations, this is a single-center study and lacks any randomization process; in fact, the postpartum contraceptive method was based on the surgeon's preference, and results would not be easily reproducible in other populations. The complication rates are very low, and the study could be underpowered to detect differences; moreover, the low rates of Pomeroy and Parkland procedures amplify the latter limitation as well as the inclusion of fimbriectomy in the partial salpingectomy group. Lastly, surgeons reported complications in a non-systematic and standardized way.

Our results suggest that, during any cesarean delivery, bilateral total salpingectomy is a feasible and a safe permanent contraceptive option for women interested in risk-reduction intervention for ovarian cancer at the price of a small increase in total operative time.

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Conflicts of interest

All authors have no conflicts of interest or financial ties to disclose.

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