Outcomes after total and partial salpingectomy at the time of Cesarean delivery

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INTRODUCTION

- Fallopian tube removal, total salpingectomy, has emerged as an approach for preventing ovarian cancer in the absence of an effective screening strategy for the deadly disease[1].
- Total salpingectomy offers near 100% contraceptive efficacy, while also reducing the risk of ectopic pregnancies after tubal sterilization[2]. In contrast, partial salpingectomy has a ten-year cumulative failure rate of 7.5 pregnancies per 1000 procedures[3].
- Studies show safety and increasing utilization of total salpingectomy during hysterectomy or laparoscopic interval sterilization[4-8]. However, postpartum total salpingectomy is less common and limited data exist describing failed procedures[9,10].
- Postpartum sterilization occurs after 8-9% of hospital deliveries[11] and about 75% of procedures take place during Cesarean delivery, creating the potential to affect over 300,000 women per year[12].

Objective: To evaluate the ability to successfully complete total versus partial salpingectomy at the time of cesarean delivery and compare safety outcomes between attempted and completed procedures.

METHODS

- This is a retrospective cohort study of all women who had a sterilization procedure during Cesarean delivery at University of California, Davis Medical Center from November 2015 through April 2017.
- All charts of women who had a Cesarean delivery were reviewed to identify those who underwent concomitant sterilization, including both completed and attempted procedures.
- Demographic, medical, and obstetric characteristics as well as surgical outcomes were compared between those who had a planned and completed partial salpingectomy, planned and completed total salpingectomy, and planned total salpingectomy with an alternate procedure completed (i.e. partial or mixed total and partial salpingectomy).
- Chi-square and Fisher's exact tests were used to compare categorical variables, and the Kruskal-Wallis test to compare continuous variables without a normal distribution. SPSS was used for statistical analysis and considered p <0.05 to be statistically significant.

REFERENCES

1. Dilley SE, Straughn JM Jr, Leath CA 3rd. The evolution and evidence for opportunistic salpingectomy. Obstet Gynecol 2017;130:814-24.
2. Castellano T, Zerden M, Marsh L, Boggess K. Risks and benefits of salpingectomy at the time of sterilization. Obstet Gynecol Surv 2017;72:663-8.
3. Peterson HB, Xia Z, Hughes JM, Wilcox LS, Tylor LR, Trussell J. The risk of pregnancy after tubal sterilization: findings from the U.S. Collaborative Review of Sterilization. Am J Obstet Gynecol 1996;174:1161-8.
4. McAlpine JN, Hanley GE, Woo MM, Tone AA, Rozenberg N, Swenerton KD, et al. Opportunistic salpingectomy: uptake, risks, and complications of a regional initiative for ovarian cancer prevention. Am J Obstet Gynecol 2014;210:471.e1-11.
5. Garcia C, Martin M, Tucker LY, Lyon L, Armstrong MA, McBride-Allen S, et al. Experience with opportunistic salpingectomy in a large, community-based health system in the United States. Obstet Gynecol 2016;128:277-83.
6. Hanley GE, McAlpine JN, Pearce CL, Miller D. The performance and safety of bilateral salpingectomy for ovarian cancer prevention in the United States. Am J Obstet Gynecol 2017;216:270.e1-270.e9.
7. Mikhail E, Salemi JL, Mogos MF, Hart S, Salihu HM, Imudia AN. National trends of adnexal surgeries at the time of hysterectomy for benign indication, United States, 1998-2011. Am J Obstet Gynecol 2015;213:713.e1-13.
8. Powell CB, Alabaster A, Simmons S, Garcia C, Martin M, McBride-Allen S, et al. Salpingectomy for sterilization: change in practice in a large integrated health care system, 2011-2016. Obstet Gynecol 2017;130:961-7.
9. Duncan JR, Schenone MH, Mari G. Technique for bilateral salpingectomy at the time of Cesarean delivery: a case series. Contraception 2017;95:509-11.
10. Ganer Herman H, Gluck O, Keidar R, Kerner R, Kovo M, Levran D, et al. Ovarian reserve following cesarean section with salpingectomy vs tubal ligation: a randomized trial. Am J Obstet Gynecol 2017;217:472.e1-472.e6.
11. Chan LM, Westhoff CL. Tubal sterilization trends in the United States. Fertil Steril 2010;94:1-6.
12. Moniz MH, Chang T, Heisler H, Admon L, Gebremariam A, Dalton VK, et al. Inpatient postpartum long-acting reversible contraception and sterilization in the United States. Obstet Gynecol 2017;129:1078-85.
13. Shinar S, Blecher Y, Alpern S, Many A, Ashwal E, Amikam U, et al. Total bilateral salpingectomy versus partial bilateral salpingectomy for permanent sterilization during cesarean delivery. Arch Gynecol Obstet 2017;295:1185-9.
14. American College of Obstetricians and Gynecologists. Salpingectomy for ovarian cancer prevention. Committee Opinion No. 620. Obstet Gynecol 2015;125:279-81.
15. Creinin MD, Zite N. Female tubal sterilization: the time has come to routinely consider removal. Obstet Gynecol 2014;124:596-9

Table 1. Demographic, obstetric, and medical characteristics by planned and completed surgical procedure in women desiring sterilization at Cesarean delivery

Characteristic	Planned and completed partial salpingectomy (n=32)	Planned and completed total salpingectomy (n=73)	Planned total salpingectomy and completed partial, mixed, or no procedure (n=17)	p value
Age (years)	33 (26.5-37)	34 (32-38)	32 (29-36)	0.28
BMI (kg/m²) at time of delivery	33.1 (29.0-39.6)	33.4 (28.7-38.9)	34.2 (30.0-36.6)	0.89
Obese (BMI ≥ 30)	20 (62.5)	52 (71.2)	13 (76.5)	0.59
Race/ethnicity				
White	10 (31.3)	33 (45.2)	5 (29.4)	
Hispanic	11 (34.4)	30 (41.1)	7 (41.2)	
African American	3 (9.4)	5 (6.8)	3 (17.6)	0.21
Asian and Pacific Islander	6 (18.8)	4 (5.5)	2 (11.8)	
Other or missing	2 (6.3)	1 (1.4)	0	
Publicly Insured	20 (62.5)	37 (50.7)	12 (70.6)	0.26
Gravidity	4 (2.5-6)	4 (3-5)	4 (3-5)	0.94
Parity	2 (1-3)	2 (1-3)	2 (1-3)	0.84
Number of prior Cesarean deliveries				
0	9 (28.1)	20 (27.4)	1 (5.9)	
1	12 (37.5)	27 (37.0)	8 (47.1)	0.20
2	7 (21.9)	20 (27.4)	3 (17.6)	
3 or more	4 (12.5)	6 (8.2)	5 (29.4)	
Other abdominal surgery	7 (22.6)	16 (21.9)	1 (5.9)	0.33
Medical co-morbidities				
Autoimmune disease	0	1 (1.4)	1 (5.9)	0.12
Chronic hypertension and hypertensive disorders in pregnancy	10 (31.3)	16 (21.9)	4 (23.5)	
Drug use	0	2 (2.7)	0	
Gestational diabetes	10 (31.3)	20 (27.4)	5 (29.5)	
Pre-gestational diabetes	3 (9.4)	8 (11.0)	2 (11.8)	
Pre-existing infection	1 (3.1)	1 (1.4)	1 (5.9)	
Pulmonary disease	7 (21.9)	9 (12.3)	3 (17.6)	
Renal disease	1 (3.1)	1 (1.4)	0	
Structural heart disease and/or heart failure	2 (6.3)	4 (5.5)	1 (5.9)	
Structural uterine diagnoses	4 (12.5)	4 (5.5)	1 (5.9)	
Vascular disease +/- anticoagulation	1 (3.1)	3 (4.1)	0	
None	12 (37.5)	43 (58.9)	8 (47.1)	
Multiple gestation	3 (9.4)	5 (6.8)	0	0.59
Smoking during pregnancy	3 (9.4)	1 (1.4)	1 (5.9)	0.09
Gestational age at delivery	38.6 (36.7-39.0)	39.0 (37.0-39.1)	38.1 (37.3-39.0)	0.75
Scheduled delivery	17 (53.1)	51 (69.9)	12 (70.6)	0.25
Low transverse cesarean delivery	32 (100.0)	71 (97.3)	16 (94.1)	0.50

Figure 1. Planned total vs partial salpingectomy over time

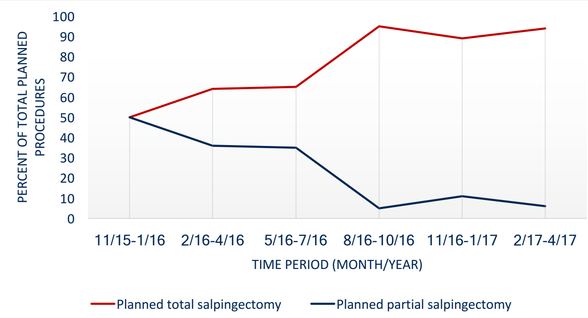

Figure 2. Intention and completion of partial and total salpingectomy for permanent contraception at time of Cesarean delivery

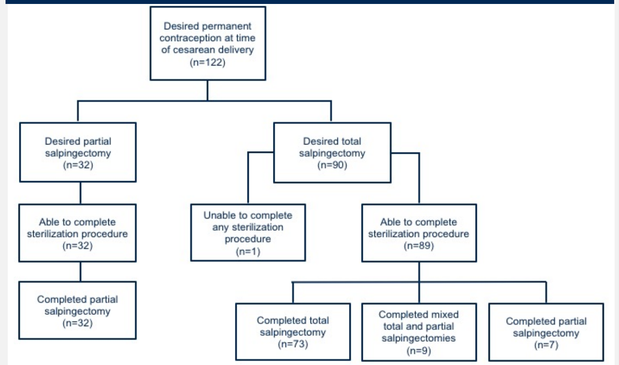

Table 2. Surgical outcomes by planned and completed sterilization procedure at the time of Cesarean delivery

Outcome	Planned and completed partial salpingectomy (n=32)	Planned and completed total salpingectomy (n=73)	Planned total salpingectomy and completed partial or mixed procedure (n=16)	p value
Surgical time (mins)	75.5 (62-91.5)	85 (71-99)	86.5 (80.5-93)	0.16
EBL (mL)	600 (500-925)	700 (500-800)	700 (500-875)	0.94
EBL > 1000 mL	4 (12.5)	5 (6.8)	2 (12.5)	0.53
Blood transfusion	2 (6.3)	1 (1.4)	1 (6.3)	0.21
Prolonged hospitalization (Discharge >POD4)	1 (3.1)	2 (2.7)	4 (25.0)	<0.01
Surgical site infection	2 (6.3)	2 (2.7)	1 (6.3)	0.51
Hospital readmission	1 (3.1)	2 (2.7)	0	<1.0

RESULTS

- 122 (28.0%) out of 435 women who underwent Cesarean delivery had a planned concurrent sterilization procedure.
- Planned total salpingectomy procedures increased from 50.0% in the first three months of the study to 94.1% in the last three months (p<0.01) (Fig 1).
  - 32 residents with 20 attending physicians performed the procedures.
- No differences existed in demographic, obstetric, and medical characteristics between planned and completed procedure (Table 1).
- 32 (26.2%) patients desired and received partial salpingectomy (Fig 2).
- 90 (73.8%) women planned for total salpingectomy, but 17 (18.9%) of these patients could not have the procedure performed bilaterally (Fig 2).
  - 9 patients had mixed total and partial procedures due to adhesive disease (n=4), large vessels in mesosalpinx (n=3), or both (n=2)
  - 7 patients had bilateral partial salpingectomy due to adhesive disease (n=4), engorged vasculature (n=1), or unspecified reasons (n=2).
  - 1 patient had significant adhesive disease preventing sterilization.
- Women who desired total salpingectomy but had an alternative procedure were more likely to have a prolonged delivery hospitalization than those whose procedure proceeded as planned (p<0.01). However, no hospital days were directly related to the sterilization procedures (Table 2).
- No differences were found in surgical time, estimated blood loss, need for blood transfusion, or hospital readmission by intended and completed procedure (Table 2).

DISCUSSION

- Overall safety of total salpingectomy at Cesarean delivery has been demonstrated in previous literature[8-10, 13]. Our findings support this evidence even in our medically complex patient population.
- Adhesive disease and engorged mesosalpinx vessels precluded planned bilateral total salpingectomy in about 20% of Cesarean deliveries, a higher conversion rate than previously reported[9,10].
  - The multiple physicians and training hospital setting likely contributed to the differences in completion rates.
  - No patient characteristics were associated with the inability to complete the intended procedure.
  - Conversion from total salpingectomy to an alternative method also does not appear to increase surgical complications related to the sterilization procedure.
- Clinicians quickly adopted total salpingectomy--likely due to clinician education and standardized patient counseling--suggesting that education may increase acceptance among physicians and patients.
- Strength: accurate representation of the ability to complete a bilateral total salpingectomy procedure at time of Cesarean delivery
- Limitations: inability to assess surgical difficulties and complications not recorded in our electronic charts.

Conclusions: While bilateral total salpingectomy cannot be completed as planned in all surgeries, an increase in complications does not occur even when an alternative procedure is required. With mounting evidence of overall safety of the procedure, clinicians should consider total salpingectomy during Cesarean delivery for both ovarian cancer prevention and its greater contraceptive efficacy compared to partial salpingectomy[14,15].