

Adoption of Complete Bilateral Salpingectomy for Permanent Contraception at Time of Cesarean Delivery in Rhode Island

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ABSTRACT

OBJECTIVE: Complete bilateral salpingectomy (CBS) can decrease the risk of developing ovarian cancer, although adoption of CBS at cesarean delivery (CD) for permanent contraception has been low. The primary objective was to measure the annual rates of CBS at CD before and after an educational initiative. The secondary objective was to assess rates of providers who offer CBS at CD and their comfort level with the procedure.

METHODS: We performed an observational study of OBGYN physicians who perform CD at a single institution. We compared the annual rates of CBS among CD with permanent contraception procedures from the year before and the year after an in-person OBGYN Grand Rounds presentation on December 5, 2019 reviewing the latest research on opportunistic CBS at the time of CD. To evaluate the secondary objectives, anonymous surveys were administered to physicians in-person the month before the presentation. The statistical analysis included chi-square, Fisher's exact test, T-test, ANOVA, and the Cochran-Armitage trend test.

RESULTS: After our educational intervention, annual rates of CBS at CD increased from 5.1% [12/05/2018–12/04/2019] to 31.8% [12/5/2019–12/4/2020] ($p < 0.001$), and up to 52% in the last study quarter ($p < 0.001$). Surgical outcomes were similar between tubal ligation and CBS, except for a 5-minute increased total operative time for CBS ($p = 0.005$).

Fifty physicians completed the survey prior to the presentation (93% response rate). All physicians offered CBS at time of hysterectomy and interval sterilization, while only 36% offered CBS at time of CD. More physicians felt comfortable performing a CBS with bipolar electrocautery (90%) than suture ligation (56%).

CONCLUSION: Our presentation-based educational initiative was associated with a significant increase in performance of CBS at the time of CD.

KEYWORDS: complete bilateral salpingectomy, cesarean delivery, permanent contraception, risk reduction

INTRODUCTION

Permanent contraception procedures are commonly utilized postpartum and occur with 8–9% of all live births.¹ When performed at cesarean delivery, permanent contraception methods historically employed a tubal ligation approach which transects and removes a small mid-portion of the fallopian tube. Recent literature has found that up to 70% of serous ovarian cancer originates in the ends of the fallopian tube, which if removed, can theoretically decrease a woman's risk of ovarian cancer by 26–34% when compared to ligation alone.^{2–4} Due to this potential risk reduction, ACOG recommended in 2015 that providers counsel women on the potential benefits of a complete bilateral salpingectomy (CBS) who are planning to undergo hysterectomy, routine pelvic surgery, or desire permanent contraception.⁵ Since this publication, CBS has been rapidly adopted at time of hysterectomy, as well as interval sterilization; however, this trend has not yet been seen at time of cesarean delivery (CD) despite literature demonstrating its feasibility and safety.^{6–8} Perceived barriers to implementation include higher rates of surgical complications due to increased vascularity of the gravid uterus and a lack of equipment.^{9–11} There is a dearth of evidence about how to change providers' behavior to increase CBS at CD with only one prior study analyzing provider behaviors after an practice recommendation.¹² In this study, fewer than 10% of providers were performing CBS as the method of permanent contraception at time of CD, even after the practice recommendation.

The aim of this study was to assess physician practices in offering and performing CBS at CD before and after an educational initiative. The primary objective was to measure the annual rates of CBS at CD. The secondary objective was to assess rates of providers who offer CBS at CD and their comfort level with the procedure. Our hypothesis was that after an educational initiative, rates of CBS at CD would increase.

METHODS

We performed an observational study of obstetric and gynecologic (OBGYN) physicians who perform CD with the primary objective of assessing utilization of CBS at CD after an educational initiative. The study was performed at a high-volume hospital in Rhode Island that provides labor and delivery care to 80% of the pregnant patients in the state.

The educational initiative comprised of an OBGYN Department Grand Rounds presentation reviewing the latest research on opportunistic CBS at the time of cesarean delivery. The presentation highlighted current practices both nationally and at our home institution. The literature on feasibility, surgical outcomes, particularly on comparisons to tubal ligation, and cost effectiveness was reviewed. The different techniques to perform a CBS at CD and counseling discussion points for patients were outlined. The presentation comprised of a literature review and did not include a hospital-based position statement or policy. Handouts summarizing the presented material were made available in the physician lounge for independent review following the presentation. Otherwise, no further study-initiated interventions were performed.

Our primary objective was to compare the annual rates of CBS among CD procedures with permanent sterilization from the 12 months before and 12 months after the Grand Rounds presentation on December 5, 2019. All cases of cesarean deliveries with permanent contraception procedures, identified by procedure coding, were collected from the year before and after the presentation. The cases were reviewed and the type of permanent sterilization procedure was confirmed. Cases of cesarean hysterectomy were excluded from the analysis. Surgical techniques and operative details were abstracted from the charts. Intraoperative records were utilized to collect procedure techniques, total operative time (surgery start to end) and recorded estimated blood loss (based on discussion between surgical and anesthesia team). We described the types of sterilization methods applied during this time frame and also compared surgical outcomes between tubal ligation and CBS. Quarterly rates of CBS at CD were analyzed in the year following the intervention. Sub analysis was performed to determine annual rates of performing CBS at CD for sub-specialized maternal-fetal medicine physicians and generalist OBGYN physicians.

To examine our secondary objectives, anonymous surveys were administered to OBGYN attendings who perform CD. The paper survey was distributed in person to available physicians in the hospital one month before the educational intervention. Physicians were approached only once and no reminders were sent. The survey comprised of eight questions on patient counseling, surgical preferences, and perceived barriers.

The statistical analysis included chi-square and Fisher's exact test for categorical variables, T-test and ANOVA for continuous variables, and the Cochran-Armitage trend test. Based on our 2018 data of 388 CD with sterilization procedure (of which only 4.9% were CBS), we anticipated a sample size of at least 159 each year would allow us to detect a difference of 10% between rates of CBS at CD prior to and after the intervention with 80% power (alpha 0.05). The data was abstracted, coded and stored in REDCap and analyzed with SAS 9.4 (SAS Institute, Cary NC). STROBE guidelines for

reporting observational studies were followed.¹³ The study was approved by the Care New England Women & Infants Institutional Review Board (#1437846). Consent was obtained by the physician's willingness to complete the survey.

RESULTS

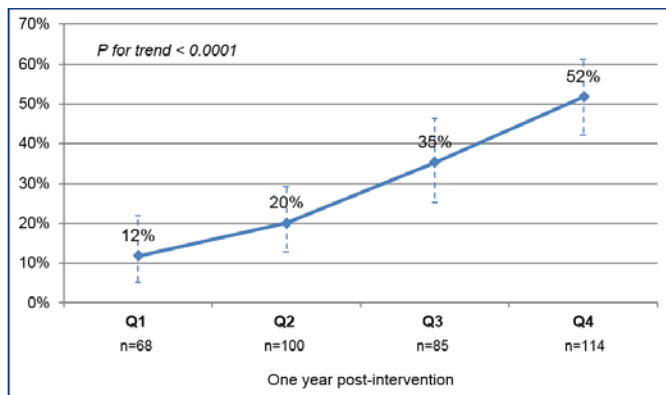
There were 370 CD with permanent contraception procedures (comprising 14% of all CD) during the year prior to our intervention, and 367 (13%) in the subsequent year (**Table 1**). Our primary objective analysis identified an increase in annual rates of CBS at CD from 5.1% [12/05/2018–12/04/2019] to 31.8% [12/5/2019–12/4/2020] ($p<0.001$). Moreover, rates of CBS increased with each quarter after the intervention (Q1: 12%, Q2: 20%, Q3: 35%, Q4: 52%; $p<0.0001$) (**Figure 1**). A rise in utilization was seen in both maternal-fetal medicine physicians (3% to 41%, $p<0.0001$) and generalist OBGYN physicians (5% to 30%, $p<0.0001$).

Data were aggregated over the two-year study period and comparisons in surgical outcomes were made between cases with tubal ligation ($n=589$) and CBS ($n=136$) (**Table 2**). There was no difference in estimated blood loss ($p=0.48$), although CD with CBS had a five minute longer total operative time (51 vs. 56min, $p=0.005$). When completing a CBS, suture ligation and bipolar electrocautery were utilized at similar rates

Table 1. Details of permanent contraception procedures performed at the time of cesarean delivery in the year prior to and following an intervention designed to increase the use of complete bilateral salpingectomy at the time of cesarean delivery

	One year pre-intervention n (%)	One year post-intervention n (%)	P-value
Cases			
Total number of cesarean deliveries	2706	2829	
Total number of cesarean deliveries with sterilization	370 (14)	367 (13)	
Complete bilateral salpingectomy	19 (5)	117 (32)	<0.0001
Tubal Ligation	351 (95)	238 (65)	
Mixed (unilateral salpingectomy)	0 (0)	12 (3)	
Type of Sterilization			
Tubal ligation method:			
Modified Pomeroy	263 (75)	198 (83)	0.05
Parkland	78 (22)	37 (16)	
Mixed	10 (3)	3 (1)	
Salpingectomy method:			
Suture ligation	8 (42)	53 (45)	0.18
Bipolar electrocautery	11 (58)	64 (55)	

Figure 1. The trend of quarterly rates of complete bilateral salpingectomy at cesarean delivery after the Grand Rounds educational presentation. Rates of complete bilateral salpingectomy at cesarean delivery increased with each quarter during the year after the educational intervention.



*quarterly rates with 95% CI error bars

Table 2. Comparison of delivery characteristics and surgical outcomes between tubal ligation and complete bilateral salpingectomy at cesarean delivery over a two-year period.

	Tubal Ligation (n=589)	Complete bilateral salpingectomy (n=136)	P-value
Delivery characteristics			
Repeat cesarean delivery, n (%)	490 (83)	105 (77)	0.11
Emergent cesarean delivery, n (%)	15 (3)	3 (2)	1.00
Total operative time (min) mean, [range]	51 [17, 140]	56 [24, 168]	0.005
Estimated blood loss (cc), mean, [range]	682 [200, 2500]	698 [300, 2400]	0.48

(45% and 55% in the year after the presentation, p=0.18). The two techniques had similar estimated blood loss (688 vs 710cc, p=0.59) and total operative time (55 vs 57min, p=0.55).

Survey data was analyzed to examine our secondary objectives. Of the 82 OBGYN physicians who performed CD at the time of survey data collection, 54 physicians were approached in person at faculty events during the month before the Grand Rounds presentation to complete the anonymous survey. Fifty physicians completed the survey prior to the presentation (93% response rate). All providers reported offering a CBS at the time of hysterectomy and interval sterilization, but only 36% providers reported offering CBS at CD (Table 3). The most common reasons providers listed for not offering a CBS at CD were increased bleeding, increased operative time, and inexperience. Seventy percent of survey respondents reported ever having completed a CBS. While

Table 3. Survey responses from OBGYN physicians regarding patient counseling, surgical preferences, and comfort level with performing opportunistic complete bilateral salpingectomy (n=50)

	Physician Responses n (%)
Patient counseling*	
Yes, I offer salpingectomy at time of hysterectomy	44 (100)
Yes, I offer salpingectomy at time of interval sterilization	43 (100)
Yes, I offer salpingectomy at time of cesarean delivery to patients who are considering permanent sterilization	18 (36)
Salpingectomy at Cesarean Delivery	
Has ever completed a salpingectomy at CD	35 (70)
Has completed a salpingectomy at CD using:	
Suture ligation	31 (89)
Bipolar electrocautery	16 (46)
Would feel comfortable completing a salpingectomy at CD using:	
Suture ligation	28 (56)
Bipolar electrocautery	45 (90)

*Percent refers to providers who perform the listed procedure and offer salpingectomy (excludes providers who do not perform the listed procedure).

90% of physicians reported that they would feel comfortable completing a CBS at CD with bipolar electrocautery, only 56% reported feeling comfortable using suture ligation.

DISCUSSION

After the educational intervention, there was a six-fold increase in rates of CBS at CD. By the last quarter of our one-year study period, over half of the sterilization procedures were CBS.

The literature on CBS at CD to date has largely revolved around feasibility, safety, technique, and only few have focused on practice changes. A 2017 study analyzed surgical patterns within a large integrated health care system after a system-wide practice recommendation was issued.¹² They found an increase in overall opportunistic CBS from 0.4% to 35%, and specifically for CBS at CD an increase from 0.1% to 9.2% over a five-year period. This study was performed shortly after the initial publication of the risk-reducing impact of CBS and explored its adoption within all sterilization procedures. Over recent years, opportunistic CBS has been implemented at varying rates, with one of the lowest seen at CD. Based on these inconsistent adoption practices, our study specifically focused on increasing opportunistic CBS at CD.

The limited published data comparing tubal ligation to CBS have found no difference in surgical outcomes including blood loss, wound infection, reoperation, or length of stay.^{6,7,12,14} We similarly found no difference in estimated blood loss; however, we did note a slightly increased total

operative time (five minutes). Current literature has contradicting findings for increased operative time with CBS at CD when compared to ligation, with estimates ranging from 0–15 min, which is unlikely clinically significant. Similarly, we found no significant differences in surgical outcomes between the two methods to perform a CBS: suture ligation and bipolar electrocautery.

Multiple providers listed “inexperience” as a deterrent to offering CBS at CD which highlights the need for expanded educational efforts. Surgical simulation has previously been shown to be beneficial in development of technical skills and provider comfort with abdominal OBGYN surgery in low-fidelity models.^{15,16} Application of simulation to CBS at CD may also improve physician comfort, continue to increase rates of CBS at CD, and possibly shorten operative time, although further research needs to be conducted.

This study illustrates the rising trend of CBS utilization at time of CD after an educational initiative and contributes to the limited data on physician performance of and patient counseling on opportunistic CBS. Although performed at a single institution, the physician survey sampled a large portion (61% [n=50/82]) of providers performing CD at a hospital that provides approximately 80% of deliveries within the state of Rhode Island.

Limitations of this study includes restricted external validity to institutions other than high-volume academic hospitals. Results were susceptible to the Hawthorne effect with physician completion of the survey thereby potentially further increasing rates of CBS at CD. The surveys were anonymous and their results cannot be cross referenced with the data abstracted from patient charts. External influences that cannot be accounted for include peer to peer discussions and journal publications that may have contributed to a larger culture shift within the hospital, as seen by the continued rise in CBS adoption throughout the year following the presentation. Data was not collected on providers motivation for behavior change which could further guide future targeted efforts.

Our observational study demonstrates the feasibility of increasing utilization of CBS at CD. Within a single year, we saw an increase in quarterly rates of CBS at CD from 5 to 52% in the first to final quarter. Targeted educational efforts can continue to increase knowledge and improve skills in performing a CBS at CD. Expansion of CBS at CD may potentially reduce future ovarian cancer diagnoses.

References

1. Chan LM, Westhoff CL. Tubal sterilization trends in the United States. *Fertil Steril*. Published online 2010. doi:10.1016/j.fertnstert.2010.03.029
2. Venkatesh KK, Clark LH, Stamilio DM. Cost-effectiveness of opportunistic salpingectomy vs tubal ligation at the time of cesarean delivery. *Am J Obstet Gynecol*. Published online 2019. doi:10.1016/j.ajog.2018.08.032
3. Lessard-Anderson CR, Handlogten KS, Molitor RJ, et al. Effect of tubal sterilization technique on risk of serous epithelial ovarian and primary peritoneal carcinoma. In: *Gynecologic Oncology*. 2014. doi:10.1016/j.ygyno.2014.10.005
4. Hanley GE, McAlpine JN, Kwon JS, Mitchell G. Opportunistic salpingectomy for ovarian cancer prevention. *Gynecol Oncol Res Pract*. Published online 2015. doi:10.1186/s40661-015-0014-1
5. ACOG. Committee Opinion No. 620: Salpingectomy for Ovarian Cancer Prevention. *Obstet Gynecol*. 2015; 125: 279–281. *Obstet Gynecol*(2015).
6. Roeckner JT, Sawangkum P, Sanchez-Ramos L, Duncan JR. Salpingectomy at the time of cesarean delivery: A systematic review and meta-analysis. *Obstetrics and Gynecology*. Published online 2020. doi:10.1097/AOG.0000000000003673
7. Mills K, Marchand G, Sainz K, et al. Salpingectomy vs tubal ligation for sterilization: a systematic review and meta-analysis. *Am J Obstet Gynecol*. Published online 2020. doi:10.1016/j.ajog.2020.09.011
8. Jones NL, Schulkin J, Urban RR, et al. Physicians' Perspectives and Practice Patterns Toward Opportunistic Salpingectomy in High- and Low-Risk Women. *Cancer Invest*. 2017;35(1):51-61. doi:10.1080/07357907.2016.1242597
9. Garcia C, Martin M, Tucker LY, et al. Experience with Opportunistic Salpingectomy in a Large, Community-Based Health System in the United States. *Obstetrics and Gynecology*. Published online 2016. doi:10.1097/AOG.0000000000001531
10. Levy D, Casey S, Zemtsov G, Whiteside JL. Salpingectomy versus Tubal Occlusion for Permanent Contraception during Cesarean Delivery: Outcomes and Physician Attitudes. *J Minim Invasive Gynecol*. Published online 2020. doi:10.1016/j.jmig.2020.07.025
11. Simmons S, Alabaster A, Martin M, et al. Complete Salpingectomy or Bilateral Tubal ligation: Change in Sterilization Practice in The United States. *Gynecol Oncol*. Published online 2017. doi:10.1016/j.ygyno.2017.07.113
12. Powell CB, Alabaster A, Simmons S, et al. Salpingectomy for sterilization: Change in practice in a large integrated health care system, 2011-2016. *Obstetrics and Gynecology*. Published online 2017. doi:10.1097/AOG.0000000000002312
13. Elm E von, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. Strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *BMJ*. 2007;335(7624):806-808. doi:10.1136/BMJ.39335.541782.AD
14. Yang M, Du Y, Hu Y. Complete salpingectomy versus tubal ligation during cesarean section: a systematic review and meta-analysis. *Journal of Maternal-Fetal and Neonatal Medicine*. Published online 2019. doi:10.1080/14767058.2019.1690446
15. Stickrath E, Alston M. A Novel Abdominal Hysterectomy Simulator and Its Impact on Obstetrics and Gynecology Residents' Surgical Confidence. *MedEdPORTAL*. Published online 2017. doi:10.15766/mep_2374-8265.10636
16. Acosta T, Sutton JM, Dotters-Katz S. Improving Learners' Comfort With Cesarean Sections Through the Use of High-Fidelity, Low-Cost Simulation. *MedEdPORTAL*. Published online 2020. doi:10.15766/mep_2374-8265.10878

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Disclosures

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Dr. Cara Mathews reports research grant funding to the institution from Moderna, Astellas, Deciphera, Tesaro/GSK, Astra Zeneca, Seattle Genetics, and Regeneron. The remaining authors report no conflicts of interest.

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