HHS Public Access

Author manuscript

Contraception. Author manuscript; available in PMC 2023 October 01.

Published in final edited form as:

Contraception. 2023 October ; 126: 110118. doi:10.1016/j.contraception.2023.110118.

Characteristics and outcomes of patients undergoing second-trimester dilation and evacuation for intrauterine fetal demise versus induced abortion

Laura A Potter, BA[a], **Serena H Ly, BS, MPH**[a], **Xiaohe Pei, BS**[a], **Matthew D Ponzini, MPH**[b], **Machelle D Wilson, PhD**[b], **Melody Y Hou, MD, MPH**[c]

[a]University of California, Davis School of Medicine; Sacramento, CA, USA

[b]Department of Public Health Sciences, University of California, Davis Sacramento CA, USA

[c]Department of Obstetrics and Gynecology, University of California, Davis; Sacramento, CA, USA

Abstract

Objective: Patients with intrauterine fetal demise (IUFD) are at higher risk of complications when undergoing dilation and evacuation (D&E) compared to patients undergoing abortion for other indications. We aimed to compare baseline characteristics and describe outcomes, including frequencies of complications such as disseminated intravascular coagulation (DIC) and hemorrhage, in patients undergoing D&E for IUFD versus induced abortion, with a goal of identifying associated risk factors for complications.

Study Design: We conducted a retrospective matched cohort study of patients undergoing nonemergent D&Es for singleton ≥14-0/7-week IUFD 1/1/2019-5/31/2021, matched with two patients undergoing induced second-trimester D&Es by cesarean delivery history, patient age, and gestational age (GA). We collected demographics, history, GA, coagulation studies, quantitative blood loss (QBL), and complications. We calculated descriptive statistics and tested for association using Chi square, Fisher's exact, *t*, and Wilcoxon rank sum tests.

Results: Of 1390 procedures, 64 patients with IUFD met inclusion criteria and were matched with 128 patients undergoing induced D&E. Eight (12.5%) patients with IUFD and six (4.7%) undergoing induced D&E had hemorrhage (Odds Ratio [OR]=2.90, 95% Confidence Interval [0.96, 8.77]). Six (9.4%) patients with IUFD and none undergoing induced D&E had DIC (OR=28.56 [1.58, 515.38]). Median QBL was 75.0mL (50, 162.5) for patients with IUFD versus 110.0mL (50, 200) for those undergoing induced D&E (p=0.083). Twelve (18.8%) patients with

Corresponding author: Melody Y Hou, MD, MPH; Department of Obstetrics and Gynecology, University of California, Davis; 4860 Y Street, Suite 2500; Sacramento, CA 95817 myhou@ucdavis.edu; Phone 916-734-6918.

Declarations of Interest:
None.

IUFD versus seven (5.5%) undergoing induced D&E received at least one intervention due to bleeding complications (p=0.004).

Conclusions: We found a higher DIC frequency but no significant difference in hemorrhage or QBL in IUFD D&E compared to induced abortion. Our IUFD D&E complication frequency is higher than those previously published.

Implications: Our results affirm current standards of care for D&E in patients with IUFD. Large referral centers may have higher proportions of complications compared to other sites.

Keywords

Intrauterine Fetal Demise; Dilation and Evacuation; Disseminated Intravascular Coagulation; Hemorrhage

1. Introduction

Dilation and evacuation (D&E) is largely preferred to other delivery methods, such as induction of labor or hysterotomy, in patients with second-trimester intrauterine fetal demise (IUFD) in the United States [1]. Despite the relative safety and effectiveness of D&E compared to other methods of abortion, patients with IUFD are at higher risk of complications, including hemorrhage and disseminated intravascular coagulation (DIC), compared to patients undergoing D&E for other indications [2,3]. One study found that hemorrhage was more common in patients with a fetal demise of ≥4 weeks or IUFD gestational age (GA) of ≥21 weeks but was not associated with abnormal coagulation studies [4]. In addition to these risk factors, some of the same risk factors for IUFD itself – which include nulliparity, advanced patient age, obesity, preexisting diabetes or hypertension, smoking, alcohol use, multiple gestation, and prior obstetric history – may be correlated with increased risk of DIC or hemorrhage following D&E [5,6].

Our study aimed to assess and compare the patient characteristics and frequency of outcomes, including DIC and hemorrhage, between patients undergoing D&E for IUFD and those undergoing induced second-trimester abortions at our institution. Our goal was to determine any associated factors for DIC or hemorrhage among patients with IUFD at our institution that would allow either targeted or universal preoperative preparation to improve patient outcomes.

2. Methods

We conducted a single-institution retrospective matched cohort study of patients presenting for a D&E procedure for IUFD at the University of California, Davis Medical Center (UCDMC) between January 1, 2019 and May 31, 2021 as identified by departmental operating room (OR) case logs. The University of California, Davis Institutional Review Board classified this study as exempt.

We included all patients undergoing non-emergent D&E within the study period for an indication of IUFD with GA by best dating method of ≥14-0/7 weeks at time of procedure. We defined non-emergent as having an outpatient preoperative evaluation at UCDMC prior

to D&E. We determined best dating according to the American College of Obstetricians and Gynecologists May 2017 Committee Opinion criteria [7]. To comprise our matched cohort, we selected the next two consecutive patients from departmental OR case logs presenting for an induced second-trimester D&E procedure who matched each patient with IUFD by history of cesarean delivery, patient age within five years, and GA within seven days. If we could not find records meeting these criteria for a given patient with IUFD, we incrementally expanded our GA matching criterion by ±7 days until we had assigned two records for every patient with IUFD. Exclusion criteria for both patients with IUFD and patients undergoing induced D&E included not attending a scheduled preoperative office visit, GA less than 14-0/7 weeks, multiple gestation, and placental abnormalities. Only the first procedure was included for patients with IUFD with more than one D&E within the study period, and patients with more than one induced D&E within the study period were assigned as a matched record only once. The sample size was determined based on the convenience sample of all patients who met the inclusion criteria. We performed a post hoc power analysis was performed to help guide future studies.

At our institution, we complete a bleeding risk assessment as part of the routine preoperative evaluation prior to D&E [8]. Patient risk is classified as low if they have no prior cesarean delivery, one prior cesarean delivery without previa or evidence of placenta accreta spectrum, no coagulopathy, and no history of obstetric hemorrhage; moderate if they have had two or more cesarean deliveries, four or more vaginal births, multiple pregnancy, IUFD, uterine infection, coagulopathy, increasing patient age, gestational age ≥20-0/7 weeks, uterine fibroids causing significant uterine enlargement, or obesity; or high if they have a diagnosis of or concern for placenta accreta spectrum, prior cesarean delivery and placenta previa, history of obstetric hemorrhage requiring transfusion, or a moderate risk condition plus provider discretion. For low-risk patients, we order a complete blood count and a type and screen. For moderate-risk patients, we also verify blood type on day of surgery and routinely give oxytocin 30 units/500mL normal saline intraoperatively [9]. For high-risk patients, we add a preoperative coagulation panel including international normalized ratio (INR) and fibrinogen, a type and cross to reserve a minimum of two units of packed red blood cells for intraoperative use if needed, and a serum creatinine level. Postoperatively, studies including coagulation panel may be repeated at provider discretion but are not routinely ordered regardless of risk level.

We collected patient characteristics such as age, body mass index (BMI), race, ethnicity, gravidity, and parity; patient medical and surgical history including prior diagnosis of hypertension or bleeding disorder and prior obstetrical or gynecological history; GA by best dating method and size of demised fetus; GA size-date discrepancy, defined as the difference between GA by best dating method and either GA by size of demised fetus for patients with IUFD, as a possible marker for fetal demise duration, or GA by most recent ultrasound for patients undergoing induced D&E; and suspected or diagnosed fetal anomaly. We recorded pre- and post-operative coagulation studies, including hemoglobin, platelet count, INR, and fibrinogen when available; intraoperative modified quantitative blood loss (QBL); intra- and post-operative administration of uterotonics and blood products; and intra- and post-operative complications requiring intervention such as cervical laceration repair, DIC, return to OR for D&C, rehospitalization, or any other additional procedures occurring within

24 hours of D&E. We then classified patients as experiencing clinically relevant bleeding, hemorrhage, or both, as defined in Gilbert et al. [10]. Clinically relevant bleeding was thus defined as the use of two or more doses of additional uterotonics, not including routine oxytocin infusion in patients deemed moderate or higher bleeding risk; the administration of tranexamic acid or any blood products; cervical laceration requiring repair; uterine balloon tamponade; uterine artery embolization (UAE); rehospitalization; or return to the OR within 24 hours of D&E. Our definition of hemorrhage included blood product administration, uterine balloon tamponade, UAE, rehospitalization, or return to OR. We defined DIC according to physician notation of DIC in the operative or postoperative notes, and we used the International Society on Thrombosis and Haemostasis DIC Scoring Algorithm to calculate pregnancy-modified DIC scores on all patients with available laboratory data [11–14]. We captured data using Research Electronic Data Capture (REDCap) [15].

For our primary outcomes of DIC and hemorrhage as well as baseline characteristics and all other secondary outcomes, we calculated descriptive statistics and *p* values generated by Chi square or Fisher's exact test for categorical variables, *t* test for normal numeric variables, and Wilcoxon rank sum test for non-normal numeric variables. We analyzed differences in QBL between cohorts using Wilcoxon rank sum test. Association between QBL and GA size-date discrepancy in patients with IUFD was examined using Spearman's correlation. Additionally, we compared the QBL between patients with IUFD with a GA size-date discrepancy <2-weeks vs ≥2-weeks. We used SAS® software version 9.4 for Windows® and set our significance threshold at $p<0.05$ in all analyses.

3. Results

We reviewed 1390 records from OR case logs, of which 137 listed demise as indication for D&E. Of these 137, we excluded 66 for GA by best dating method of <14-0/7 weeks, three for placenta previa, one for placenta accreta, two for multiple gestation, and one for a subsequent D&E during the study period. We then matched the remaining 64 eligible patients with IUFD with a total of 128 patients undergoing induced abortion using the matching criteria specified above. There were 6 patients with IUFD for whom we could not find one or both patient(s) undergoing induced abortion who matched by GA within seven days; to these patients with IUFD, we matched nine patients undergoing induced abortion by GA within eight to 22 days. All other patients we matched by GA within seven days. Patient baseline characteristics are listed in Table 1. More patients with IUFD had fetal anomalies (26/64, 40.6% versus 33/128, 25.8%; $p=0.036$) and previous IUFD (3/64, 4.7% versus 0/128, 0%; $p=0.036$). Median GA size-date discrepancy was significantly greater in patients with IUFD than patients undergoing induced abortion (1.8 versus 0 weeks; $p0.001$), The groups' measured patient baseline characteristics otherwise did not statistically differ. Assuming a two-sided type I error rate of 5%, post hoc power analyses using the proportions in our dataset yielded 87.3%, 50.0%, and 46.4% power to detect differences in DIC, hemorrhage, and clinically relevant bleeding respectively between patients undergoing D&E for IUFD and patients undergoing D&E for induced abortion.

Preoperative bleeding risk was low in 3 (4.7%) and 56 (43.8%), moderate in 56 (87.5%) and 69 (53.9%), and high in 5 (7.8%) and 3 (2.3%) of patients with IUFD and patients

undergoing D&E for induced abortion, respectively (p<0.0001), Mean (± standard deviation) preoperative hemoglobin was greater among patients with IUFD (12.5 ± 1.3 g/dL) than in patients undergoing D&E for induced abortion (12.0 ± 1.1 g/dL; p=0.017). Mean preoperative platelet count was not significantly different between groups, at 233.2 ± 64.5 xl0^9/L in patients with IUFD compared to 248.6 ± 65.5 x10^9/L in patients undergoing D&E for induced abortion (p=0.127). Thirty-nine (60.9%) patients with IUFD had preoperative INR and 41 (64.1%) had preoperative fibrinogen results available compared to 5 (3.9%) patients undergoing D&E for induced abortion with either study (p<0.0001 and p<0.0001, respectively). Half of all high-risk patients experienced DIC, hemorrhage, or clinically significant bleeding. Of the 47 patients with available preoperative coagulation studies for the pregnancy-modified DIC score calculation, none met criteria by DIC score, including the six patients who went onto have clinically diagnosed DIC postoperatively. A total of four (one high-risk and three moderate-risk) patients had a preoperative DIC score within one point of meeting criteria for DIC, and only one of these four went onto have DIC or hemorrhage.

Hemorrhage occurred in eight (12.5%) patients undergoing D&E for IUFD versus six (4.7%) patients undergoing induced abortion (Odds Ratio [OR]=2.90, 95% Confidence Interval [CI;0.96, 8.77]), while clinically relevant bleeding occurred in 16 (25.0%) patients with IUFD versus 18 (14.1%) patients undergoing induced abortion (OR=2.04, CI [0.96, 4.33]). Six (9.4%) patients with IUFD had a clinical postoperative DIC diagnosis, six (9.4%) returned to OR for D&C, and eight (12.5%) received blood products compared to the cohort undergoing induced abortion which experienced none of these outcomes (OR=28.56 [1.58, 515.38], 28.56 [1.58, 515.38], and 38.66 [2.19, 681.45], respectively). Preoperative bleeding risk was assessed as moderate in all patients who went onto have clinically diagnosed DIC, moderate in 9 (75.0%) and high in 3 (25.0%) of all patients with hemorrhage, and low in 1 (2.9%), moderate in 29 (85.3%), and high in 4 (11.8%) of all patients with clinically significant bleeding. Five of the six patients clinically diagnosed with DIC met pregnancy-modified score criteria for DIC based on their postoperative coagulation studies. Additionally, two patients not clinically diagnosed with DIC who had available postoperative coagulation studies also met criteria for DIC based on pregnancy-modified DIC score; one of these two patients had both clinically relevant bleeding and hemorrhage while the other patient had neither. We found no significant difference in preoperative hemoglobin levels between those who received blood products and those who did not (11.2 versus 12.2 g/dL, p=0.087). Those who received blood products had lower preoperative platelet counts on average than those who did not receive any blood products (172.0 versus 246.7 xl0^9/L, p=0.035). Overall, postoperative hemoglobin, platelet count, INR, and fibrinogen were not regularly collected in both patients with IUFD (10.9%, 14.1%, 28.1%, and 28.1%, respectively) and those undergoing D&E for induced abortion (2.3%, 2.3%, 0.0%, and 0.0%, respectively). No patient deaths occurred in either group. All complications and interventions are listed in Table 2.

Median modified QBL was 75.0mL (first quartile 50.0, third quartile 162.5) for patients with IUFD versus 110.0mL (50.0, 200.0) for patients undergoing induced abortion (p=0.083). In patients with IUFD with a GA size-date discrepancy of ≥2 weeks, median modified QBL was 62.5mL (first quartile 50.0, third quartile 187.5) compared to 87.5mL (50.0,

150.0) for those with <2-week discrepancy (p=0.861). We found no statistically significant association between size-date discrepancy and QBL in the cohort with IUFD (Spearman's correlation=−0.08, p=0.520).

4. Discussion

While there was a higher proportion of complications requiring intervention among patients undergoing D&E for IUFD, we found no statistically significant difference in clinically relevant bleeding or hemorrhage in patients undergoing D&E for IUFD compared to those undergoing D&E for induced second-trimester abortion. DIC, return to OR for D&C, and need for blood product administration occurred significantly more often among patients undergoing D&E for IUFD, but the low numbers of these complication events in both groups overall limits the validity of these findings. Our results are reassuring that D&E for the indication of IUFD is safe under our current institutional pre- and intra-operative protocols.

We did not find a statistically significant association between increasing blood loss and increasing GA size-date discrepancy among patients with IUFD. However, we recognize that size-date discrepancy may not accurately estimate the duration of fetal demise, since the etiology of the demise may have first caused fetal growth restriction, which would exaggerate the appearance of a size-date discrepancy [16,17]. As previously stated, the existing literature supports a higher theoretical and measured risk of DIC and hemorrhage in D&E for IUFD compared to D&E for other indications, with postulated mechanisms including tissue factor release from the placenta and endothelial cell damage, platelet activation, and intravascular thromboplastin release [18,19]. Most studies agree coagulopathy is exacerbated in cases of prolonged fetal retention; however, one retrospective cohort study of patients with IUFD demonstrated that the severity of DIC was unrelated to the degree of fetal maceration [4,20–22]. The recent advent of pregnancy-modified DIC scores calculated from laboratory coagulation studies, which are known to change in pregnancy, presents an opportunity to identify which patients with IUFD may go onto have complications requiring intervention [23–25]. Given the inherent limitations of our retrospective study, we did not have the necessary laboratory data available to calculate the pregnancy-modified DIC scores for all patients, rather only in those deemed to be high risk per our institutional preoperative bleeding risk assessment (thus meriting preoperative coagulation studies) and in patients with clinically suspected coagulopathy or other complications intra-or post-operatively (who had these labs drawn per clinician discretion). All but one clinically diagnosed case of DIC was confirmed based on calculated DIC score, lending credibility to our clinical diagnoses of DIC and suggesting that these pregnancy-modified DIC scores can accurately identify cases of DIC in patients in whom DIC is already clinically suspected. In contrast, in patients at moderate to high bleeding risk who are not yet clinically suspected to have DIC, calculation of preoperative DIC scores was not predictive of complications such as DIC or hemorrhage. Our institutional preoperative bleeding risk assessment correctly identified as moderate or high bleeding risk all patients who went onto have DIC or hemorrhage and all but one of those who went onto have clinically relevant bleeding, which supports continuing current practices. Further research, including prospective studies where preoperative and postoperative coagulation studies are routinely ordered on all patients, is indicated to better understand the pathophysiology of

DIC and to explore how pregnancy-modified DIC scores could be used to further stratify bleeding risk in patients with IUFD as well as other moderate-to-high-risk patients.

At their urban academic abortion clinic, Kerns et al. [3] found that D&E for IUFD was associated with 12.3 times greater odds of DIC and three times greater odds of any complication compared to age-matched controls, although their absolute risk of DIC and hemorrhage (defined more broadly by estimated blood loss >500 mL or need for interventions) among D&Es for IUFD was low at only 2%. By contrast, our frequencies of DIC (9.4%) and hemorrhage (12.5%) were higher, even though we used the narrower definition of hemorrhage established by Gilbert et al. [10]. Our more broadly-defined clinically relevant bleeding frequency, though still defined more narrowly than hemorrhage in Kerns et al. [3], is even higher at 25.0%; however, the definition of hemorrhage in Gilbert et al. [10] is a more specific indicator of serious complications resulting in adverse outcomes and therefore a more useful measure in such comparisons. Given our institution's broad catchment area and relatively large proportion of high-risk patient referrals, resulting delays in care and prolonged fetal retention after demise (as noted by greater GA size-dating discrepancy) may explain these differences in outcome frequencies for our patients with IUFD.

Strengths of our study are its matched cohort design, which helps to limit the risk of confounding by specific factors, as well as documentation of GA by both fetal size as measured on ultrasound confirming IUFD and by best dating method, allowing for size-date discrepancy analyses. Limitations of the study include its relatively small sample size and low frequency of outcomes of interest, which restrict our statistical power to detect significance or test for associations between patient-level characteristics and adverse outcomes. The study's retrospective design also constrains our ability to understand what other undocumented factors may be associated with DIC and hemorrhage.

Overall, this study showed a higher frequency of DIC but no statistically significant difference in frequency of hemorrhage in patients undergoing D&E for IUFD compared to those undergoing induced second-trimester D&E. Median QBL was not statistically significant between groups, nor was the difference in blood loss among patients with IUFD with increasing GA size-date discrepancy. These findings affirm our current institutional protocols in caring for patients with IUFD who desire D&E.

Funding:

The biostatistical analysis was supported by the National Center for Advancing Translational Sciences, National Institutes of Health (NIH), through grant number UL1 TR001860. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. This research did not receive any other specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

[1]. Strauss LT, Gamble SB, Parker WY, Cook DA, Zane SB, Hamdan S; Centers for Disease Control and Prevention (CDC). Abortion surveillance--United States, 2004. MMWR Surveill Summ. 2007 Nov 23;56(9):1–33.

[2]. Edlow AG, Hou MY, Maurer R, Benson C, Delli-Bovi L, Goldberg AB. Uterine evacuation for second-trimester fetal death and maternal morbidity. Obstet Gynecol. 2011 Feb;117(2 Pt 1):307–316. doi: 10.1097/AOG.0b013e3182051519. [PubMed: 21252744]

[3]. Kerns JL, Ti A, Aksel S, Lederle L, Sokoloff A, Steinauer J. Disseminated intravascular coagulation and hemorrhage after dilation and evacuation abortion for fetal death. Obstet Gynecol. 2019 Oct;134(4):708–713. doi: 10.1097/AOG.0000000000003460. [PubMed: 31503145]

[4]. Fontenot Ferriss AN, Weisenthal L, Sheeder J, Teal SB, Tocce K. Risk of hemorrhage during surgical evacuation for second-trimester intrauterine fetal demise. Contraception. 2016 Nov;94(5):496–498. doi: 10.1016/j.contraception.2016.06.008. [PubMed: 27343749]

[5]. Reddy UM, Laughon SK, Sun L, Troendle J, Willinger M, Zhang J. Prepregnancy risk factors for antepartum stillbirth in the United States. Obstet Gynecol. 2010 Nov;116(5):1119–26. doi: 10.1097/AOG.0b013e3181f903f8. [PubMed: 20966697]

[6]. Fretts R Stillbirth epidemiology, risk factors, and opportunities for stillbirth prevention. Clin Obstet Gynecol. 2010 Sep;53(3):588–96. doi: 10.1097/GRF.0b013e3181eb63fc. [PubMed: 20661043]

[7]. Committee Opinion No 700: Methods for estimating the due date. Obstet Gynecol. 2017;129(5):e150–e154. doi:10.1097/AOG.0000000000002046. [PubMed: 28426621]

[8]. Kerns J, Steinauer J. Management of postabortion hemorrhage: release date November 2012 SFP Guideline #20131. Contraception. 2013 Mar;87(3):331–42. doi: 10.1016/j.contraception.2012.10.024. [PubMed: 23218863]

[9]. Whitehouse K, Tschann M, Soon R, Davis J, Micks E, Salcedo J, Savala M, Kaneshiro B. Effects of Prophylactic Oxytocin on Bleeding Outcomes in Women Undergoing Dilation and Evacuation: A Randomized Controlled Trial. Obstet Gynecol. 2019 Mar;133(3):484–491. doi: 10.1097/AOG.0000000000003104. Erratum in: [PubMed: 30741801] Obstet Gynecol. 2019 Jun;133(6):1287–1288. [PubMed: 31135755]

[10]. Gilbert CM, Matulich MC, Ponzini MD, Wilson MD, Creinin MD. Clinical interventions are more accurate than quantitative measurements for defining hemorrhage with dilation and evacuation. Contraception. 2022 Dec 5:109914. doi:10.1016/j.contraception.2022.11.005.

[11]. ISTH DIC Scoring Algorithm: Modifications for use in Pregnancy. Sang Medicine Ltd: A Practical Guide to Haemostasis. February 3, 2023. <https://practical-haemostasis.com/Clinical%20Prediction%20Scores/Formulae%20code%20and%20formulae/Formulae/DIC/isth_dic_pregnancy_score.html>.

[12]. Erez O, Novack L, Beer-Weisel R, Dukler D, Press F, Zlotnik A, Than NG, Tomer A, Mazor M. DIC score in pregnant women--a population based modification of the International Society on Thrombosis and Hemostasis score. PLoS One. 2014 Apr 11;9(4):e93240. doi: 10.1371/journal.pone.0093240. [PubMed: 24728139]

[13]. Papageorgiou C, Jourdi G, Adjambri E, Walborn A, Patel P, Fareed J, Elalamy I, Hoppensteadt D, Gerotziafas GT. Disseminated Intravascular Coagulation: An Update on Pathogenesis, Diagnosis, and Therapeutic Strategies. Clin Appl Thromb Hemost. 2018 Dec;24(9_suppl):8S–28S. doi: 10.1177/1076029618806424. [PubMed: 30296833]

[14]. Rabinovich A, Abdul-Kadir R, Thachil J, Iba T, Othman M, Erez O. DIC in obstetrics: Diagnostic score, highlights in management, and international registry-communication from the DIC and Women's Health SSCs of the International Society of Thrombosis and Haemostasis. J Thromb Haemost. 2019 Sep;17(9):1562–1566. doi: 10.1111/jth.14523. [PubMed: 31218838]

[15]. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform. 2009 Apr;42(2):377–81. doi: 10.1016/jjbi.2008.08.010. [PubMed: 18929686]

[16]. Lees CC, Romero R, Stampalija T, Dall'Asta A, DeVore GA, Prefumo F, Frusca T, Visser GHA, Hobbins JC, Baschat AA, Bilardo CM, Galan HL, Campbell S, Maulik D, Figueras F, Lee W, Unterscheider J, Valensise H, Da Silva Costa F, Salomon LJ, Poon LC, Ferrazzi E, Mari G, Rizzo G, Kingdom JC, Kiserud T, Hecher K. Clinical Opinion: The diagnosis and management of suspected fetal growth restriction: an evidence-based approach. Am J Obstet Gynecol. 2022 Mar;226(3):366–378. doi: 10.1016/j.ajog.2021.11.1357. [PubMed: 35026129]

[17]. D'Antonio F, Khalil A, Mantovani E, Thilaganathan B; Southwest Thames Obstetric Research Collaborative. Embryonic growth discordance and early fetal loss: the STORK multiple pregnancy cohort and systematic review. Hum Reprod. 2013 Oct;28(10):2621–7. doi: 10.1093/humrep/det277. [PubMed: 23847112]

[18]. Mammen EF. Disseminated intravascular coagulation (DIC). Clin Lab Sci. 2000 Fall;13(4):239–45. [PubMed: 11586511]

[19]. Letsky EA. Disseminated intravascular coagulation. Best Pract Res Clin Obstet Gynaecol. 2001 Aug;15(4):623–44. doi: 10.1053/beog.2001.0204. [PubMed: 11478819]

[20]. Maslow AD, Breen TW, Sarna MC, Soni AK, Watkins J, Oriol NE. Prevalence of coagulation abnormalities associated with intrauterine fetal death. Can J Anaesth. 1996 Dec;43(12):1237–43. doi: 10.1007/BF03013432. [PubMed: 8955974]

[21]. Erez O Disseminated intravascular coagulation in pregnancy - Clinical phenotypes and diagnostic scores. Thromb Res. 2017 Mar;151 Suppl 1:S56–S60. doi: 10.1016/S0049-3848(17)30069-5. [PubMed: 28262236]

[22]. Muin DA, Haslacher H, Koller V, Kiss H, Scharrer A, Farr A. Impact of fetal maceration grade on risk of maternal disseminated intravascular coagulation after intrauterine fetal death - A retrospective cohort study. Sci Rep. 2018 Aug 24;8(1):12742. doi:10.1038/s41598-018-30687-0. [PubMed: 30143672]

[23]. Alhousseini A, Romero R, Benshalom-Tirosh N, Gudicha D, Pacora P, Tirosh D, Kabiri D, Yeo L, Thachil J, Hsu CD, Hassan SS, Erez O. Nonovert disseminated intravascular coagulation (DIC) in pregnancy: a new scoring system for the identification of patients at risk for obstetrical hemorrhage requiring blood product transfusion. J Matern Fetal Neonatal Med. 2022 Jan;35(2):242–257. doi: 10.1080/14767058.2020.1716330. [PubMed: 31931643]

[24]. Erez O, Othman M, Rabinovich A, Leron E, Gotsch F, Thachil J. DIC in pregnancy - pathophysiology, clinical characteristics, diagnostic scores, and treatments. J Blood Med. 2022 Jan 6;13:21–44. doi: 10.2147/JBM.S273047. [PubMed: 35023983]

[25]. Goksever Celik H, Celik E, Ozdemir I, Ozge Savkli A, Sanli K, Gorgen H. Is blood transfusion necessary in all patients with disseminated intravascular coagulation associated postpartum hemorrhage? J Matern Fetal Neonatal Med. 2019 Mar;32(6):1004–1008. doi: 10.1080/14767058.2017.1397125. [PubMed: 29065752]

Table 1:

Characteristics of patients undergoing second-trimester dilation and evacuation (D&E) for intrauterine fetal demise (n=64) and patients undergoing second-trimester D&E for induced abortion (n=128) at the University of California, Davis Medical Center from January 1, 2019 to May 31, 2021.

Characteristic	Patients undergoing D&E for IUFD	Patients undergoing D&E for induced abortion	*p* value
Total patients	64	128	
Patient age (years)	31.6 ± 5.2	30.8 ± 5.4	0.349 *T*
Gravidity	4 (2, 6)	3 (2, 5)	0.304 *W*
1	11 (17.2)	17 (13.3)	
2	7 (10.9)	30 (23.4)	
3+	46 (71.9)	81 (63.3)	
Parity	2 (1, 3)	1 (1, 2)	0.124 *W*
0	14 (21.9)	28 (21.9)	
1	12 (18.8)	42 (32.8)	
2	17 (26.6)	30 (23.4)	
3+	21 (32.8)	28 (21.9)	
Race			**
White	39 (60.9)	65 (50.4)	
Black/African American	5 (7.8)	28 (21.7)	
Asian	8 (12.5)	12 (9.3)	
American Indian/Alaska Native	1 (1.6)	3 (2.3)	
Native Hawaiian/Pacific Islander	1 (1.6)	1 (0.8)	
More than one race	2 (3.1)	4 (3.1)	
Unknown/Not Reported/Other	6 (9.4)	10 (7.8)	
Ethnicity			**
Hispanic or Latina	16 (25.0)	35 (27.3)	
Unknown/Not Reported	1 (1.6)	4 (3.1)	
BMI	30.2 ± 7.6	29.4 ± 7.1	0.467 *T*
Underweight [<18.5)	1 (1.6)	1 (0.8)	
Normal [18.5-25)	15 (23.4)	35 (27.3)	
Overweight [25-30)	19 (29.7)	41 (32.0)	
Class 1 obesity [30-35)	13 (20.3)	26 (20.3)	
Class 2 obesity [35-40)	12 (18.8)	15 (11.7)	
Class 3 obesity [>40]	4 (6.3)	10 (7.8)	
History of diabetes	6 (9.4)	3 (2.3)	0.062 *F*
History of hypertension	8 (12.5)	8 (6.3)	0.140 *C*
History of bleeding or clotting problems *	7 (10.9)	7 (5.5)	0.237 *F*
Previous Cesarean section	15 (23.4)	30 (23.4)	>0.999 *C*
Previous IUFD	3 (4.7)	0 (0)	0.036 *F*
GA by best dating (weeks)	17.7 (16.2, 20.5)	18.1 (16.0, 20.4)	>0.999 *W*

Characteristic	Patients undergoing D&E for IUFD	Patients undergoing D&E for induced abortion	*p* value
GA size-date discrepancy (weeks)	1.8 (0, 3.8)	0 (0, 0.6)	<0.001 *W*
Fetal anomaly, suspected or diagnosed	26 (40.6)	33 (25.8)	0.036 *C*
Preoperative bleeding risk			<0.0001 *C*
Low	3 (4.7)	56 (43.8)	
Moderate	56 (87.5)	69 (53.9)	
High	5 (7.8)	3 (2.3)	
Preoperative hemoglobin (g/dL)	12.5 ± 1.3	12.0 ± 1.1	0.017 *F*
Preoperative platelet count ($x10^9$/L)	233.2 ± 64.5	248.6 ± 65.5	0.127 *F*

Data are reported as n (%), mean ± standard deviation, or median (first quartile, third quartile) with *p* values calculated using chi-square or Fisher's exact test for categorical variables, t test for normal numeric variables, and Wilcoxon rank sum test for non-normal numeric variables. IUFD, intrauterine fetal demise; BMI, body mass index; GA, gestational age.

*Includes uterine fibroids; inflammatory bowel disease with blood in stool at time of presentation; venous thrombosis; pulmonary embolism; stroke; sickle cell trait; chronic idiopathic thrombocytopenia; and anemia, abnormal uterine bleeding, and obstetric hemorrhage requiring transfusion or hospitalization.

**For descriptive use only; no tests of association performed for race or ethnicity.

C Chi square test

F Fisher's exact test

T t test

W Wilcoxon rank sum test

Table 2:

Complications requiring intervention and outcomes for patients undergoing second-trimester dilation and evacuation (D&E) for intrauterine fetal demise (n=64) and patients undergoing second-trimester D&E for induced abortion (n=128) at the University of California, Davis Medical Center from January 1, 2019 to May 31, 2021.

Outcome	Patients undergoing D&E for IUFD	Patients undergoing D&E for induced abortion	*p* value
Total interventions	44	10	
Patients receiving any intervention	12 (18.8)	7 (5.5)	0.004 *C*
Hemorrhage	8 (12.5)	6 (4.7)	0.074 *F*
Clinically relevant bleeding	16 (25.0)	18 (14.1)	0.061 *C*
DIC	6 (9.4)	0 (0)	0.001 *F*
Modified QBL (mL; median [first quartile, third quartile])	75.0 (50.0, 162.5)	110.0 (50.0, 200.0)	0.083 *W*
Administration of ≥2 uterotonics	10 (15.6)	5 (3.9)	0.004 *C*
Administration of tranexamic acid	1(1.6)	0 (0)	0.333 *F*
Administration of blood product(s)	8 (12.5)	0 (0)	0.0001 *F*
Cervical laceration requiring repair	1 (1.6)	2 (1.6)	>0.999 *F*
Uterine balloon tamponade	4 (6.3)	2 (1.6)	0.097 *F*
Uterine artery embolization	1 (1.6)	0 (0)	0.333 *F*
Rehospitalization	2 (3.1)	1 (0.8)	0.258 *F*
Return to OR for D&C	6 (9.4)	0 (0)	0.001 *F*
Return to OR for hysterectomy	1 (1.6)	0 (0)	0.333 *F*

All data are reported as n (%) unless otherwise noted, with *p* values calculated using Chi square, Fisher's exact, or Wilcoxon rank sum test. IUFD, intrauterine fetal demise; DIC, disseminated intravascular coagulation; OR, operating room; D&C, dilation and curettage.

C Chi square test

W Wilcoxon rank sum test

F Fisher's exact test