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CASE SERIES

Incarceration of the Gravid Uterus in Women with Previous Cesarean Section: Case Series and Literature Review

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Abstract: Incarceration of the gravid uterus (IGU) is a rare and serious condition associated with significant maternal and fetal morbidities. Its occurrence in women with a history of cesarean section (CS) poses a great challenge to obstetricians. We report two cases: Case 1 presented with acute urinary retention at 11 weeks of gestation, with IGU diagnosis ultimately established at 15 weeks following persistent symptoms. Initial manual reduction attempts failed, but resolution occurred later. Case 2 developed severe urinary retention at 16 weeks, and the uterus was repositioned after Foley catheter placement. Both patients underwent uncomplicated cesarean deliveries at term. To delineate the clinical characteristics and optimal management of this condition, we conducted a comprehensive literature review and identified 29 additional cases reported over the past 40 years. Analysis revealed a median gestational age of 17 weeks at presentation and 37 weeks at delivery or pregnancy termination. Among them, 16 had one or more risk factors in addition to previous CS. Clinical presentation and treatment methods paralleled those described in non-CS patients. Successful resolution with favorable outcomes was achieved in 19 cases, with interventions initiated before 20 weeks demonstrating a higher resolution rate. Severe maternal complications occurred in 30% of cases, predominantly in unresolved ones, including two uterine ruptures. Early diagnosis and active management are crucial for optimizing obstetric outcomes and reducing maternal complications in these patients.
Keywords: incarcerated retroverted uterus, cesarean section, pregnancy outcomes, uterine rupture

Introduction

Incarceration of the gravid uterus (IGU) is a rare gestational complication that affects approximately 1 in 3000 pregnancies.[1] It occurs when a retroverted uterus, which affects 15%-20% of non-pregnant women,[2] remains retroverted after the first trimester and becomes entrapped between the sacral promontory and pubic symphysis. As the uterus enlarges during pregnancy, the anterior uterine wall and the lower uterine segment thin out and protrude into the abdominal cavity while the uterine fundus is persistently confined within the pelvis.[1] The resultant anatomical distortion may give rise to significant maternal and fetal morbidities, including placenta previa, postpartum hemorrhage (PPH), stillbirth, etc.[3] Although the reported incidence of IGU remains relatively stable over the decades,[4–6] more case reports and series have been published in recent years, especially after 2000.[7]

Multiple risk factors for IGU have been suggested, including pelvic anomalies, pelvic masses, uterine malformations, endometriosis, and pelvic adhesions due to inflammation or prior abdominal surgeries.[3,8] Among these, a history of cesarean section (CS) is the most common risk factor according to a population-based study.[3] It is well known that CS predisposes women with placenta previa, placenta accreta, and uterine rupture in subsequent pregnancies.[9] As the CS rate continues to rise worldwide,[10] more women with CS scars may be susceptible to IGU, posing a potential challenge to obstetricians.

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Here we report a series of two cases of IGU in women with a history of CS. We also reviewed the existing literature to analyze the characteristics and complications of this rare condition, aiming to explore how previous cesarean delivery impacts the presentation, diagnosis, management, and outcomes of IGU.

Case Presentation

Case 1

A 34-year-old woman, gravida 4, para 2, who had sensation of incomplete bladder emptying and slow urinary flow for a week, first presented to the emergency department with acute urinary retention at 11 weeks of gestation. She had two uncomplicated term cesarean deliveries, followed by a cesarean scar pregnancy one year ago, which was successfully treated with hysteroscopic curettage under perioperative internal iliac artery occlusion during the first trimester. After complete recovery, the uterine muscle layer at the previous cesarean scar was 2.5 mm thick under ultrasound (US) examination.

The patient's symptom was temporarily relieved by transurethral catheterization; however, she frequently revisited the emergency department due to unremitted urinary retention in the following weeks. Around 13 weeks, she developed transient vaginal bleeding and constipation, even though abdominal US showed an intrauterine singleton pregnancy, a cervical length of 3.1 cm with the inner os closed, and normal kidneys and bladder. Urinary tract infection was suspected based on urinalysis (blood 2+, leukocyte esterase 3+), prompting empirical intravenous antibiotics administration combined with indwelling Foley catheterization for 7 days. The urine culture was negative, but persistent voiding dysfunction recurred once the catheter was removed. After urological consultation, she was prescribed oral tamsulosin (0.2 mg) daily in addition to continuous Foley catheter placement.

At 15 weeks of gestation, the patient presented to an obstetric consultant for recurrent dark red vaginal discharge. Prompted by her unique medical history, she initiated a targeted diagnostic investigation. A detailed US revealed a normal fetus in a retroflexed gravid uterus, with a closed cervix as long as 6.5 cm, folded back to the uterine body; the muscle layer at the lower segment of the anterior uterine wall was too thin to be visualized, while the total thickness of both the posterior wall of the bladder and the anterior wall of the uterus was only 0.3 mm. Magnetic resonance (MR) imaging showed an elongated cervix pressed against the bladder, parallel to the long axis of the retroverted uterine body, and a stretched and unmeasurable anterior lower uterine segment, while the uterine fundus was positioned in the rectouterine pouch (Figure 1A).

The patient was then diagnosed with IGU and admitted for uterine reduction. The procedure was performed the next day under US guidance in a theater without anesthesia. Because the fingers were not sufficiently long, sponge forceps wrapped with gauze pads were used to exert intravaginal pressure against the uterine fundus at the posterior vaginal fornix. Multiple attempts were made with great resistance in the lithotomy, knee-chest, and supine positions consecutively, and the patient finally gave up. Although unsuccessful in the operating room, her urination symptoms disappeared the following day, and the US confirmed a repositioned uterus.

The pregnancy was uneventful. Her cervical length returned to 3.1 cm and the lower segment of the anterior uterine wall recovered to 3.5 mm thick by US at 20 weeks. She underwent a third CS at 37 weeks and delivered a healthy female baby weighing 2490 g. The previous cesarean scar on the uterus was thin but intact, and no cause for uterine incarceration was identified.

Case 2

A 40-year-old woman, gravida 3, para 1, who had delivered a term baby by CS 16 years ago, presented at 16 weeks of gestation with incomplete voiding and heaviness in the lower abdomen for 7 days. The initial emergent US displayed a singleton intrauterine pregnancy, a highly distended bladder that reached 4 cm above the navel, and bilateral hydronephrosis (1.1–1.2 cm dilation of each collecting system) and hydroureter (0.6 cm dilation of each upper ureter); the cervix was not visible because of the enlarged bladder. A Foley catheter was placed, and 2700 mL of urine was drained intermittently over 2 h. The patient underwent a repeat US when her symptoms were relieved. It revealed an

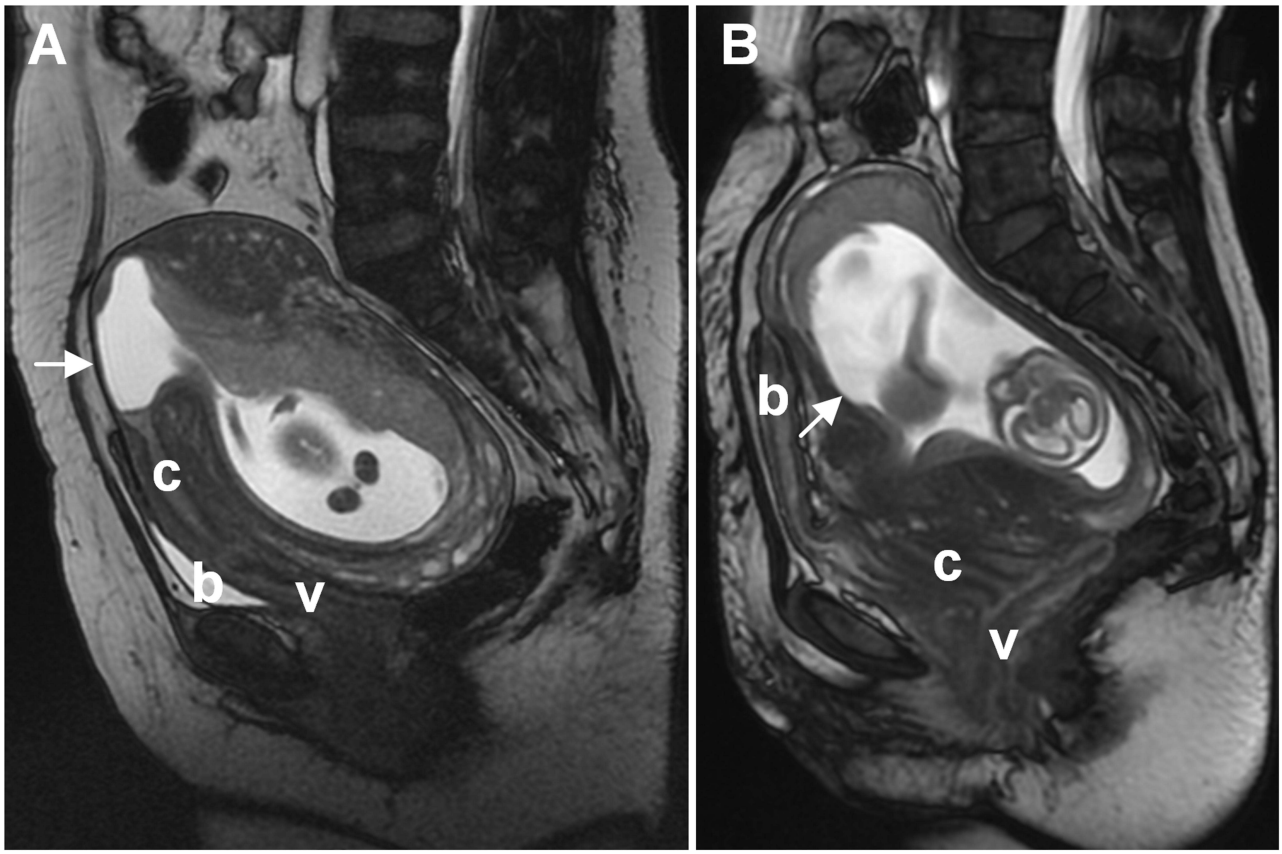

Figure 1 Midsagittal T2-weighted magnetic resonance images of two presented cases. (**A**) Case 1 at 15 weeks; the white arrow indicates the stretched anterior lower segment of the uterus that was unmeasurable. (**B**) Case 2 at 16 weeks; the white arrow indicates a cesarean scar niche at the anterior lower segment that was 3 mm at the thinnest point. **Abbreviations**: b, bladder; c, cervix; v, vagina.

extremely retroverted retroflexed uterus with a closed cervix of 4.2 cm in length, while the cervical inner os was higher than the uterine fundus, which was only 1.5 cm above the symphysis.

Uterine incarceration was confirmed, and the patient was hospitalized for observation. MR imaging on the same day revealed a cesarean scar niche at the anterior wall of the lower segment, which was 3 mm at the thinnest point, in addition to the fundus trapped in the pelvic cavity (Figure 1B). She noticed a small amount of dark vaginal bleeding the next day without any other symptoms. Interestingly, an ultrasonographic recheck three days later found that her uterus had been repositioned in the absence of any other treatment; subsequently, the Foley catheter was removed. The patient no longer experienced urination problems or vaginal bleeding. An elective CS was performed at 38 weeks, with a male baby weighing 2980 g. Some small endometriosis lesions were scattered at the posterior wall of the uterus, but no pelvic adhesions or pathologies were found with the potential for uterine incarceration.

Discussion

In addition to our cases, we performed a systematic search for articles published between January 1984 and December 2024 in PubMed, Web of Science, and Embase databases. The following search terms with Boolean operators were used: ("incarceration" OR "incarcerated" OR "uterine sacculation") AND ("gestation" OR "pregnant" OR "pregnancy" OR "gravid uterus") AND ("cesarean" OR "caesarean"). Inclusion criteria comprised: (1) Original case reports or case series published in English or Chinese; (2) Confirmed diagnoses of uterine incarceration or sacculation during pregnancy; (3) Clear documentation of obstetric history, including prior uterine surgery. Studies were excluded based on two criteria: (1) Literature reviews lacking original case data; (2) Case series with insufficient patient-level information (defined as missing ≥3 key parameters: clinical manifestations, gestational age at presentation/resolution, diagnostic

criteria, treatment modality, and maternal outcomes). The retrieved articles were screened to identify cases with a history of previous CS. Finally, 29 eligible cases from 24 articles were identified (Supplementary Table 1).[4,5,8,11–31]

A total of 31 cases, including ours, were taken in the analysis. The median maternal age was 34 years (range: 20–44). The median gestational age at presentation and at delivery or termination of pregnancy was 17 weeks and 37 weeks. Among them, 19.35%, 67.74%, and 12.90% of patients were presented in the first, second, and third trimester, respectively (Table 1). Four women had CS twice in the past and three conceived using assisted reproductive techniques.

Table 1 Clinical Characteristics of Included Cases

Clinical Characteristics	Number	Median [Range]/Percentage
General characteristics		
Maternal age (year)		34 [20–44]
GA at presentation (week)		17 [11–37]
GA at resolution (week)		15.5 [12–37]
GA at delivery/termination (week)		37 [18–40]
GA at presentation	N=31	
First trimester	6	19.35%
Second trimester	21	67.74%
Third trimester	4	12.90%
Risk factors (except CS)	N=30	
No	14	46.67%
Previous IGU	10	33.33%
Uterine malformations	3	10.00%
Leiomyomas	2	6.67%
Previous abdominal surgery	2	6.67%
Endometriosis	1	3.33%
Pelvic anomaly	1	3.33%
Confirmed causes	N=16	
No identifiable pathology	12	75.00%
Leiomyomas	2	12.50%
Uterine anomaly	1	6.25%
Pelvic anomaly	1	6.25%
Symptoms	N=27	
Asymptomatic	8	29.63%
Abdominal/pelvic pain	12	44.44%
Urinary retention	8	29.63%
Constipation	5	18.52%
Signs of abortion	3	11.11%
Diagnostic criteria	N=27	
PE alone	3	11.11%
PE+US	7	25.93%
US alone	8	29.63%
PE/US+MR	9	33.33%
Management	N=31	
No treatment	13	41.94%
Knee-chest position	2	6.45%
Manual reduction	9	29.03%
Transvaginal probe/forceps	3	9.68%
Colonoscopy-assisted	1	3.23%
Laparoscopy-assisted	1	3.23%
Laparotomic reduction	2	6.45%

(*Continued*)

Table 1 (Continued).

Clinical Characteristics	Number	Median [Range]/Percentage
Resolution	N=31	
Resolved	19	61.29%
Unresolved	12	38.71%
Treated	N=18	
Resolved	17	94.44%
Unresolved	1	5.56%
Untreated	N=13	
Spontaneous resolution	2	15.38%
Unresolved	11	84.62%
Outcomes	N=30	
Termination	3	10.00%
Preterm delivery	8	26.67%
Term delivery	19	63.33%
Vaginal delivery	2	6.67%
Cesarean delivery	25	83.33%
Complications	N=30	
Placenta accreta	4	13.33%
Placenta previa	1	3.33%
Uterine rupture/dehiscence	2	6.67%
Massive hemorrhage	2	6.67%
Hydronephrosis	1	3.33%
Bowel obstruction	1	3.33%
Hysterectomy	2	6.67%

Abbreviations: GA, Gestational age; CS, Cesarean section; IGU, Incarcerated gravid uterus; PE, Physical examination; US, Ultrasound; MR, Magnetic resonance.

Risk Factors and Causes

Many conditions have been proposed as risk factors for IGU in case reports and small case series.[1] Theoretically, IGU could be caused by pelvic masses or adhesions of various origins that prevent the uterine fundus from rising out of the pelvis between 12 and 14 weeks of gestation. A recent population-based study has associated IGU with a significantly higher incidence of previous CS, leiomyomas, ovarian cyst, endometriosis, pelvic inflammatory disease and adhesions.[3] Previous CS, as the most frequent risk factor, presented in 20% of IGU patients,[3] presumably taking effect through post-operational adhesions.

In our study, 16 patients (53.33%) had additional risk factors beyond previous CS, including uterine malformations, leiomyomas, previous abdominal surgery (bowels), endometriosis, pelvic anomalies (deep sacral concavity), and a history of IGU in previous pregnancies. To determine the potential causes, we examined 16 cases that reported the findings of the CS procedure. However, identifiable pelvic pathologies were found in only four cases, and none of them were relevant to CS-related adhesions. Moreover, as many as 10 patients (33.33%) had first-time CS due to IGU in their previous pregnancies, suggesting that the high frequency of previous CS in IGU patients may be a consequence rather than a cause of uterine incarceration (Table 1).

In addition, there were three cases of recurrent IGU caused by persistent pelvic pathologies that had not been corrected during the previous CS, such as leiomyomas and uterine malformations. This highlights the importance of careful examination and immediate management of potential etiological factors during CS in patients with IGU to prevent future recurrence.

Clinical Presentation and Diagnosis

Among the 27 cases that recorded symptoms and diagnostic criteria, 21 (67.74%) presented in the second trimester and 8 (29.63%) were asymptomatic, both of which were comparable to those in general IGU patients.[7,32] The most frequent symptom was abdominal or pelvic pain (44.44%), followed by urinary retention (29.63%), constipation (18.52%), and signs of abortion (11.11%) (Table 1). These non-specific symptoms could lead to misdiagnoses such as fibroid degeneration and urinary tract infection,[7] especially in the hands of inexperienced clinicians. As shown in our first case, if presenting symptoms are unresponsive to the initial treatment, more vigilance should be given, and a second opinion should be sought for differential diagnosis.

Diagnosis of IGU is generally difficult due to its non-specific clinical signs and late onset in the second or third trimester.[33] A careful pelvic examination may reveal an anteriorly displaced cervix (difficult to visualize on speculum examination), a unmovable mass in the posterior cul-de-sac (the trapped fundus), and smaller fundal height for the gestational age.[1] After 2000, more cases have been diagnosed with the aid of US and/or MR due to the advancement in imaging technology.[33] Recently, US has been proposed as the primary modality for diagnosis of IGU, with recommended criteria of diagnostic features.[34] These features include a retroverted and retroflexed uterus, a posterior fundus near or below the external cervical os, an anteriorly displaced and elongated cervix between the bladder and uterus, and overdistension of the bladder. Among the reviewed cases, 15 (55.56%) were diagnosed using US with or without physical evidence. Based on our experience, most criteria are met in definitive US scans, thus validating their value in clinical practice. In addition, the lower segment of the anterior uterine wall should be the focus in these patients to rule out uterine scar dehiscence or rupture.

MR is superior to US in its observer-independent visualization of an incarcerated uterus and its surrounding structure. The direction of incarceration, the stretched lower uterine segment, the placental location and adhesion, and the associated uterine torsion are especially valuable to the assessment.[35] MR is also helpful in determining the optimal surgical approach to avoid vaginal or cervical transection and bladder injury during CS.[22] Therefore, some researchers suggest that it should be applied to every IGU patient.[35] For both of our cases, we prescribed MR as a complement to US to gather more information about the placenta and the previous cesarean scar.

Management and Resolution

Several treatment methods are available for IGU, but no technique is clearly superior to the others.[33] Passive or conservative reduction is usually the first step, including bladder catheterization, positional change (knee-chest position), and manual reduction per vagina or rectum with or without anesthesia.[7] These methods can be used alone or in combination. If the initial manual reduction fails, repeated maneuvers can be attempted one week later.[1] Alternative techniques have also been described, including colonoscopy-assisted reduction,[22,36] vaginal balloon inflation,[37] and using a transvaginal ultrasound probe instead of fingers in a most recent report.[8] Invasive interventions with laparoscopy or laparotomy should be reserved for persistent or complicated cases.[12,19,28]

It has been well recognized that treatment before 20 weeks is associated with higher percentages of resolution, while later attempts are more likely to fail.[1] As a result, most IGU cases identified after 20 weeks received no interventions.[32] In the 31 cases reviewed, 18 (58.06%) were treated, most of which were before 20 weeks except for one. Seventeen of the 18 (94.44%) patients were successfully reduced, regardless of the treatment method. In contrast, in the 13 untreated cases, nine presented after 20 weeks; only two cases spontaneously resolved, with one at 16 weeks and the other at 26 weeks. Overall, the resolution rate was 61.29%, which was close to that reported in a systemic review of IGU cases.[32] These findings suggest that previous CS may not exert a detrimental effect on resolution, and that active management can more often than not achieve a successful reduction in such conditions.

Outcomes and Complications

Among the 30 cases that reported outcomes and complications, 25 (83.33%) underwent cesarean delivery, while only two delivered vaginally. Compared to previously reported CS rates of 48.6%-65.7% in general IGU patients,[3,7,32] this much higher level is mostly attributed to a prior CS history. Nineteen cases (63.33%) were delivered at term, including 18

resolved women. Meanwhile, seven out of eight preterm deliveries occurred in unresolved patients. This highlights the importance of successful management on IGU outcomes. Of note, three cases (10%) were terminated by laparotomy at approximately 18–19 weeks due to severe complications.

Altogether, nine cases (30%) had one or more severe maternal complications, including placenta accreta, placenta previa, uterine rupture, massive hemorrhage, hydronephrosis, and bowel obstruction (Table 1). Among them, seven were unresolved cases. Although it is unknown if IGU promotes placenta accreta,[1] placenta previa is found to be more frequent in women with IGU than those without (1.6% vs 0.5%).[3] On the other hand, previous CS is significantly associated with increased risk of placenta previa and placenta accreta in the subsequent pregnancies.[38] When these two conditions came together, the incidence of abnormal placentation was as high as 16.67%, which in turn led to one PPH and two hysterectomies.

Uterine rupture in patients with IGU has been less investigated because of its rarity. According to a retrospective study in the US population across 10 years, two ruptures occurred in 370 IGU patients, but no case details were recorded.[3] Another two cases in the existing English literature, one complete rupture and one uterine dehiscence, were reported before 1984, with no information of gravidity, parity and CS history.[33] Here, we include two more cases reported in the past 40 years, both of which were directly relevant to previous CS. The first one had spontaneous rupture on the lower segment cesarean scar at 19 weeks when the uterus was incarcerated by leiomyomas, resulting in massive hemorrhage and laparotomic repair.[14] The second was a case of uterine dehiscence found during a repeat CS at term, 5 months after IGU had been corrected at 16 weeks.[19] Though uterine rupture after previous low segment transverse CS often happens during labor and is rarely catastrophic,[39] these cases indicate that concurrent IGU may greatly add to maternal and fetal morbidity.

As shown in our two cases, repositioning of the incarcerated uterus could reverse the thinning of the lower segment around the previous cesarean scar and hence prevent possible uterine rupture.

Limitations and Research Implications

Although a systemic searching approach was employed to identify relevant cases, our literature review is limited by the small number of cases and language bias. Additionally, cases reported without an obstetric history and those in case series without individual patient's information were not included, which limits the quality of the evidence. Future investigations with case-control or cohort studies on a larger scale are needed to verify our preliminary findings and provide more information on the impact of previous CS on the incidence, complications and outcomes of IGU.

Conclusion

IGU in women with a history of CS is a rare and dangerous condition that carries a high risk for maternal and fetal morbidities. Previous CS is unlikely to affect the treatment and resolution of IGU, as long as it is recognized and treated early. A successful reduction can often be achieved through active management with a variety of methods. However, if not corrected timely, severe maternal complications may ensue with high incidences.

As cesarean delivery becomes more prevalent globally, maternity care providers are more likely to encounter challenging cases of IGU with a cesarean scar. Obstetricians and other specialists in this field should be aware of its common clinical manifestations, be familiar with its imaging characteristics under different diagnostic modalities, and be vigilant about its disastrous complications, such as abnormal placentation and uterine rupture. Early intervention before 20 weeks is recommended to secure a best chance of reduction and optimal outcomes in these patients.

Ethics Approval

This study was approved by the Ethics Committee of Women's Hospital, School of Medicine, Zhejiang University (approval number: IRB-20240239-R). Institutional approval for publication of the cases was obtained from the Women's Hospital, School of Medicine, Zhejiang University.

Consent for Publication

Written informed consent was obtained from the patients for publication of their cases and any accompanying images.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no conflicts of interest in this work.

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