

Frequency Of Morbidly Adherent Placenta In Pregnant Women With Previous Uterine Scar.



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ABSTRACT

Objective: To evaluate the occurrence of morbidly adherent placenta (MAP) among women in pregnancy who had already scarred uterus, and to measure the risk factors related to it.

Methodology: This is a cross-sectional study that was carried out at the Department of Obstetrics and Gynaecology, Liaquat National Hospital, Karachi. Non-probability consecutive sampling was used to enroll 163 pregnant women aged 20-55 years and with singleton pregnancies who had a history of uterine surgery. Patients with renal and other acute abdominal diseases were not included. Doppler ultrasonography was used to diagnose MAP and its types (accreta, increta, percreta). It was done on a structured proforma and analyzed through SPSS version 21. Associations were measured using Chi-square and Fisher's Exact tests; $p \leq 0.05$ was taken as statistically significant.

Results: The frequency of MAP was 11.0%. Placenta accreta was the most common type (4.9%), followed by increta (3.7%) and percreta (2.5%). MAP was significantly associated with placenta previa ($p = 0.008$), parity ≥ 3 ($p = 0.048$), and preterm delivery < 37 weeks ($p = 0.001$). No significant association was found with age group, BMI, previous cesarean section, myomectomy, or scar duration.

Conclusion:

Morbidly adherent placenta is a prevalent and serious condition in women with prior uterine scarring. The presence of placenta previa, higher parity, and preterm delivery are strong predictors. Early detection and risk-based prenatal surveillance are essential for improving maternal and fetal outcomes, especially in high-risk obstetric populations.

Keywords: Placenta Accreta, Cesarean Section, Uterine Scars, Placenta Previa

INTRODUCTION

Uterine scarring, often resulting from cesarean section, is a growing concern in contemporary obstetrics¹. Cesarean delivery is a life-saving procedure in many obstetric complications, and its utilization has risen across the globe importantly in the last two decades². It may also occur from myomectomy, cornual resection, and surgical management of congenital uterine anomalies³. According to the World Health Organization, cesarean section rates have risen globally from about 7% in 1990 to over 21% recently, with some countries reporting rates greater than 50%³.

The rate of cesarean delivery has also continuously increased in Pakistan, with as many as one out of every four births being cesarean in some urban settings. This increase has improved maternal and

fetal outcomes in high-risk pregnancies, but it has also led to a concerning rise in complications of abnormal placentation, such as morbidly adherent placenta (MAP)⁴. MAP, consisting of placenta accreta, increta, and percreta, is strongly associated with prior uterine surgery, especially with multiple cesarean sections, and there is a corresponding increase in maternal morbidity and mortality risk. The increasing burden of cesarean delivery therefore shows how important it is to study MAP frequency and risk factors in women with prior uterine scars. Placenta accreta, increta, and percreta are all forms of morbidly adherent placenta (MAP), which are among the most serious sequelae of previous uterine surgery⁵. These diseases are characterized by abnormal placental tissue

invasion into or through the uterine wall and are part of the placenta accreta spectrum⁶. Placenta accreta involves shallow attachment to the myometrium, placenta increta involves penetration of the myometrium, and placenta percreta involves invasion through the uterine serosa, sometimes involving adjacent pelvic organs such as the bladder. The degree of invasion varies. Some reports indicate that MAP can account for as much as 7% of all maternal deaths and is now known to be a common cause of life-threatening hemorrhage during pregnancy and delivery. To control bleeding, a peripartum hysterectomy is often necessary⁷.

Over the last few decades, MAP has become increasingly prevalent, with global incidence estimates moving from 1 in 2,500 pregnancies in the 1980s to around 1 in 500 pregnancies in recent years, correlating closely with increased cesarean section rates⁸. For women in resource-limited settings where acute hospital capacity or multidisciplinary care is sometimes limited and significant advanced imaging is unavailable, MAP potentially poses a greater threat to maternal survival. As such, there is a need for increased clinical vigilance, ultrasonographic and MRI early antenatal diagnosis, and a comprehensive delivery approach to lessen the risk of adverse maternal and neonatal outcomes.

Despite advanced imaging modalities such as transvaginal ultrasound, Doppler studies, and MRI aiding in improved antenatal diagnosis of MAP, timely identification of MAP and corresponding risk stratification can still be a challenge in resource-limited settings⁹. If MAP can be identified in the prenatal setting, beneficial multidisciplinary planning can be employed that can ultimately identify or minimize complications including massive hemorrhage, hysterectomy, urological injury, and unplanned intensive care admissions¹⁰. Women with previous uterine surgery are known to increase their risk of MAP substantially. The more cesareans, the higher the risk^{11,12}.

The increasing trend of cesarean delivery globally has resulted in a marked rise in pregnancy-related complications, specifically morbidly adherent placenta (MAP), which can be extremely hazardous to maternal and fetal health¹³⁻¹⁵. Women who have had prior uterine scars significantly increase their risk for MAP, and this risk becomes greater with each additional cesarean section. MAP is associated with significant obstetric hemorrhage, increased blood transfusions, longer hospital stays, and increased rates of peripartum hysterectomy. Despite the increasing incidence of cases worldwide, limited region-specific data are indicated, particularly in Pakistan's major urban areas, such as Karachi, where cesarean section rates have continued to rise over the last decade.

Accurate local estimations are critical to enhance obstetric readiness, allocate resources, and guide clinical processes for patients with high-risk pregnancies. Thus, understanding the occurrence of MAP in women with prior uterine scarring is an obligation to identify and treat patients, provide effective prenatal care, and facilitate collaboration among providers to mitigate the risks of potentially fatal maternal and newborn outcomes. The objective of this study was to determine the prevalence of morbidly adherent placenta in women with prior uterine scars.

METHODOLOGY

This cross-sectional study was performed in the Obstetrics and Gynaecology Department at Liaquat National Hospital, Karachi, for Three months, in the span of June 2025 to September 2025. Ethical approval for the study was sought from the Institutional Research and Ethics Committee before the study commenced Approval No: 1214-2025-LNH-ERC. Written informed consent for involvement in the study was obtained from all subjects, and any personal and medical information collected throughout the study was treated confidentially according to the Declaration of Helsinki principles.

The sample size calculations was made using the WHO sample size calculator using the published prevalence of morbidly adherent placenta of 14.3%, 95% confidence level with a margin of error of 4.5% yielding a required sample of 163 participants.¹⁶ Non-probability consecutive sampling techniques were used in the interest of efficient recruitment and involved eligible women recruited from the obstetric outpatient clinic and the labor and delivery unit.

The study population included pregnant females between the ages of 20 and 55 years old, with a history of uterine surgery such as a cesarean section, myomectomy, or hysterectomy and had a singleton pregnancy. This age range was chosen based on the increased risk of placental implantation abnormalities in older maternal age groups and in women with a history of trauma or surgical intervention to the uterus. Exclusion criteria included women with chronic renal disease, those who were unwilling or unable to provide informed consent, and those with acute abdominal or pelvic disease unrelated to pregnancy, including appendicitis, pancreatitis, cystitis, urethritis, cholecystitis, or ruptured ovarian cyst, based on clinical history, examination, and relevant investigation.

Diagnosis of morbidly adherent placenta (MAP) was made using grayscale ultrasonography followed by three-dimensional power Doppler imaging for vascular assessment. Standardized sonographic definitions were followed: abnormal placental vascularity, bridging vessels crossing the uterine-

placental interface, disruption or absence of the hypoechoic zone between placenta and myometrium, and abnormality at the myometrial-bladder interface. In more extreme presentations, exophytic masses were characteristic of placental invasion through the uterine serosa, and some cases required diagnosis of possible urinary bladder invasion. MAP was classified according to depth of invasion: Placenta accreta: abnormal adherence of chorionic villi to the myometrium without invasion. Placenta increta: placental villi penetrate into the myometrial muscle layer. Placenta percreta: placental tissue is seen to extend through the myometrium to the uterine serosa, with possible invasion of adjacent pelvic structures (as seen in the bladder).

The occurrence of placenta previa, which refers to the placenta partially or completely covering the internal cervical os, was also recorded. Gestational age at presentation was classified as preterm (<37 weeks) or full term (37–42 weeks), per standard obstetric definitions.

Data were collected utilizing a structured and pre-tested proforma that included demographic and clinical parameters. Variables included maternal age, height, weight, body mass index (BMI), gestational age, parity, type and time since previous uterine surgery, the presence or absence of placenta previa, and ultrasound-based diagnosis and classification of MAP. All ultrasound assessments were performed by a single consultant radiologist with extensive experience in obstetric imaging to reduce inter-observer variability.

In order to mitigate the effects of potential confounders, stratification was performed during the data analysis phase by age groups, BMI categories, gestational age, parity, and duration of time since previous uterine surgery. Data entry, as well as statistical analysis, was performed using IBM SPSS Statistics Version 21.0 (IBM Corp., Armonk, NY, USA). Quantitative variables (maternal age, BMI, gestational age, and period since scar) were evaluated for normality using the Shapiro–Wilk test. Normally distributed variables are reported as mean $\pm$ standard deviation, whereas non-normally distributed values are reported as median with interquartile range (IQR). The categorical variables such as parity, type of previous uterine surgery, presence of placenta previa, and type of MAP are reported as frequency and percentages. The Chi-square test was used to evaluate the association between categorical outcomes, and for the purposes of this analysis, we considered $p \leq 0.05$ statistically significant.

RESULTS

A total of 163 pregnant women with previous uterine scars were included in the study. The mean age of the participants was 32.4 years (± 5.3), with an average BMI of 28.7 kg/m² (± 3.9). The median gestational age at presentation was 35 weeks (IQR: 33–37), and the mean duration since the previous uterine scar was 4.2 years (± 2.1) (Table 1).

Table 1: Demographic and Obstetric Characteristics of Study Participants (n = 163)

Variable	Mean $\pm$ SD / Median (IQR)
Age (years)	32.4 $\pm$ 5.3
Height (cm)	159.6 $\pm$ 6.2
Weight (kg)	73.5 $\pm$ 9.4
Body Mass Index (kg/m ²)	28.7 $\pm$ 3.9
Gestational Age (weeks)	35 (33 – 37)
Duration of Scar (years)	4.2 $\pm$ 2.1

In terms of clinical characteristics, 50.3% of women had parity of three or more, while 49.7% had fewer than three deliveries. The most common cause of uterine scarring was previous cesarean section, reported in 76.1% of cases, followed by myomectomy (15.3%) and hysterectomy (8.6%). Placenta previa

was observed in 23.9% of the participants. Morbidly adherent placenta (MAP) was diagnosed in 11.0% of the women, with placenta accreta being the most common subtype (4.9%), followed by placenta increta (3.7%) and placenta percreta (2.5%) (Table 2; Figures 1 & 2).

Table 2: Clinical Profile and Distribution of Key Variables (n = 163)

Variable	Categories	Frequency n (%)
Parity	<3	81 (49.7%)
	≥ 3	82 (50.3%)
Reason for Previous Uterine Scar	Cesarean section	124 (76.1%)
	Myomectomy	25 (15.3%)
	Hysterectomy	14 (8.6%)
Placenta Previa	Present	39 (23.9%)

	Absent	124 (76.1%)
MAP	Present	18 (11.0%)
	Absent	145 (89.0%)
Type of MAP	Placenta accreta	8 (4.9%)
	Placenta increta	6 (3.7%)
	Placenta percreta	4 (2.5%)
Abbreviations: MAP = Morbidly Adherent Placenta		

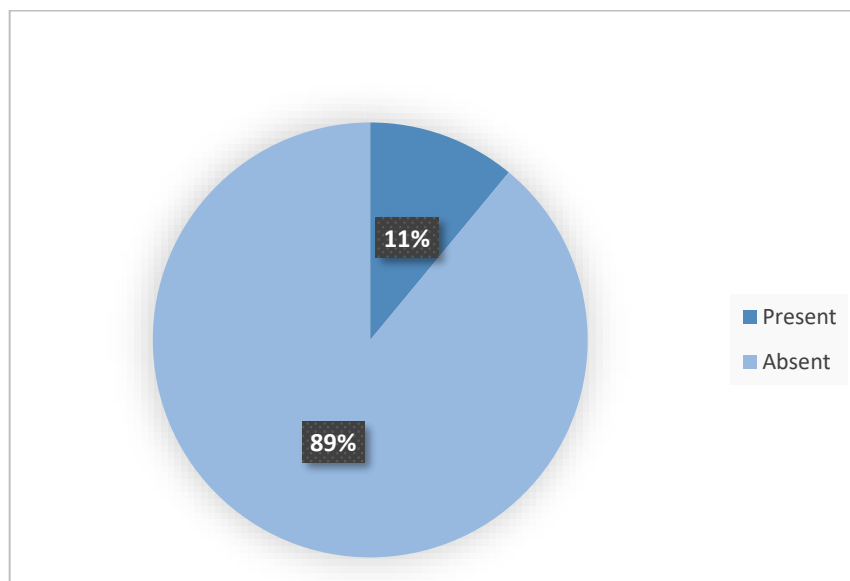


Figure 1: A Pie Chart Showing the Frequency Distribution of Morbidly Adherent Placenta Among Study Participants.

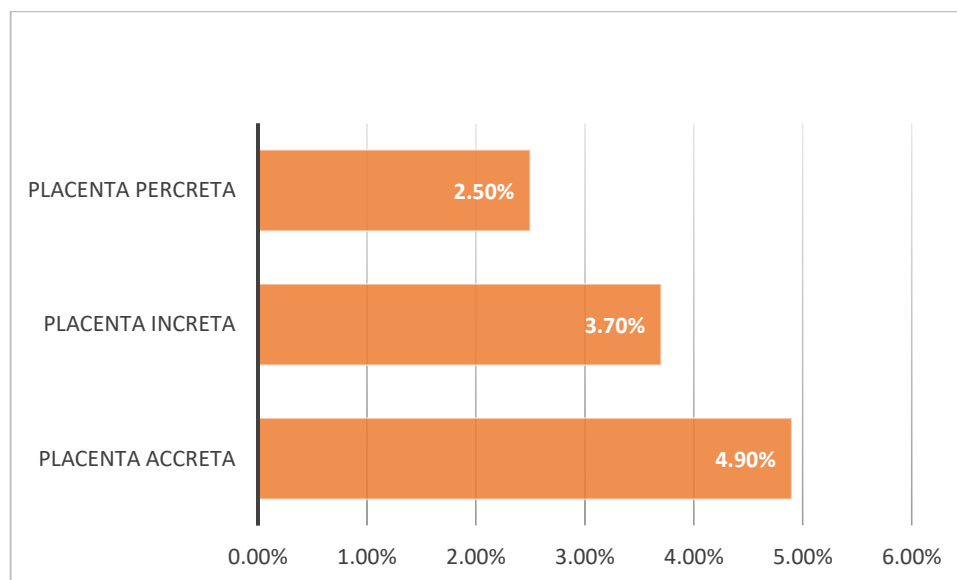


Figure 2: A graph showing the distribution of the types of Morbidly Adherent Placenta among the Study Participants.

The statistical analysis indicated that MAP was significantly associated with multiple risk factors. MAP was noted more often in women who had a parity of ≥ 3 (72.2%) versus women with parity of < 3 (27.8%; $p = 0.048$). Placenta previa was also significantly associated with MAP, as MAP occurred in 55.6% of women with MAP compared to 20.0% of

women without MAP ($p=0.008$). Preterm gestational age (< 37 weeks) was significantly associated with MAP, as 66.7% of women with MAP had a gestational age < 37 weeks ($p=0.001$). No statistically significant associations were noted with age group, BMI, duration of uterine scar, history of C-section or myomectomy (Table 3).

Table 3: Association of Risk Factors with Morbidly Adherent Placenta (n = 163)

Variable	Categories	MAP Present (n=18)	MAP Absent (n=145)	p-value
Age (years)	<30	5 (27.8%)	67 (46.2%)	0.137
	≥30	13 (72.2%)	78 (53.8%)	
BMI (kg/m²)	<30	11 (61.1%)	117 (80.7%)	0.056
	≥30	7 (38.9%)	28 (19.3%)	
Gestational Age	<37 weeks (Preterm)	12 (66.7%)	42 (29.0%)	0.001*
	≥37 weeks (Full-term)	6 (33.3%)	103 (71.0%)	
Parity	<3	5 (27.8%)	76 (52.4%)	0.048*
	≥3	13 (72.2%)	69 (47.6%)	
Duration of Scar	<5 years	9 (50.0%)	96 (66.2%)	0.175
	≥5 years	9 (50.0%)	49 (33.8%)	
Placenta Previa	Present	10 (55.6%)	29 (20.0%)	0.008*
	Absent	8 (44.4%)	116 (80.0%)	
Previous CS only	Yes	11 (61.1%)	113 (77.9%)	0.114
	No	7(38.8)	32(22.0%)	
Previous Myomectomy	Yes	4 (22.2%)	21 (14.5%)	0.390
	No	14 (77.8%)	124 (85.5%)	
Preterm Delivery	Yes	12 (66.7%)	42 (29.0%)	0.001*
	No	6 (33.3%)	103 (71.0%)	

The chi-square test was used to assess associations between categorical variables and MAP, where applicable. Fisher's Exact test was applied in cases where expected cell counts were <5.

*A p-value ≤ 0.05 was considered statistically significant.

Abbreviations:

CS = Cesarean Section

BMI = Body Mass Index;

DISCUSSION

Morbidly adherent placenta (MAP), a significant obstetric risk factor in women with a history of uterine surgery (particularly prior cesarean section), is increasingly recognized as a serious complication. The increase in MAP is occurring alongside maternal requests and the overall trend toward having deliveries by a cesarean, which often serves to preserve the life of the mother or infant or prevent maternal complications. In the current study, the frequency of MAP was 11.0%, which is consistent with the range indicated in much of the existing regional and international literature. The report of MAP frequency of 18% in a study cohort in Pakistan is also comparable.¹⁷ A study showed 22.1% prevalence rate in Lahore, Pakistan also supports the link between an increased frequency of cesarean delivery and MAP¹⁸. Most recently, a study report that the MAP incidence increases exponentially as the number of cesarean deliveries increases, particularly when properly identified with placenta previa¹⁹.

Such compelling literature supports an understanding of the cumulative impact of surgical precedence and trauma to the uterine wall resulting in inadequate re-molding of the placental bed, and resulting predisposition for abnormal placental adherence in subsequent pregnancies.

The present study revealed a strong association between placenta previa and MAP, with 55.6% of MAP cases having placenta previa. This is also consistent with the literature as placenta previa has historically been identified as one of the most important clinical predictors of MAP. A study noted that at least 30.6% of those diagnosed with placenta accreta spectrum disorders also had placenta previa, making it a critical ultrasound marker for MAP risk²⁰. The pathophysiology behind this is abnormal implantation of the placenta in the lower uterine segment often overlying a prior surgical scar, which contributes to impaired decidualization and inappropriately invasive trophoblastic tissue into the myometrium²¹. Clinically, this also emphasizes the

importance of appropriate antenatal screening protocols for women with previous uterine scar and placenta previa as risk factors, and facilitation of timing labor and delivery in appropriate facilities equipped for complex obstetric surgery.

In the present study's cohort, the gestational age at delivery was also significantly associated with MAP, wherein 66.7% of MAP cases delivered before 37 weeks of gestation. This corresponds with the findings of the study that reported preterm birth rates were increased for women with MAP, likely based on planned early delivery or urgent delivery due to antepartum hemorrhage, abnormal fetal testing, or other obstetric complications²². The pathway to early delivery faces the challenge of balancing the risk of severe maternal hemorrhage while minimizing risk from prematurity. Planned preterm delivery at pediatric tertiary care centers helps avoid the risk of maternal collapse but increases the inherent risk of neonatal respiratory distress, sepsis, and length of stay in the NICU. This dual risk further emphasizes the need for a collaborative team approach among obstetricians, anesthesiologists, neonatologists, and surgical teams. The early onset of complications such as antepartum hemorrhage lead to early delivery not only to optimize maternal risk but fetal risk as well. While early delivery may minimize maternal catastrophic events it also increases neonatal morbidity and requires optimal timing and multidisciplinary care planning.

Parity also arose as an important factor in our study, identifying higher parity (≥ 3) as significantly associated with MAP. This finding supports the contribution of our findings with a study that showed that multiparity, particularly in the setting of previous cesarean scars, significantly increases the risk of abnormal placentation²³. As repeated pregnancies occur over time, the endometrial, myometrial interface may become weakened, and with surgical scars, the risk of abnormal invasion increases. However, in our cohort, the effect of maternal age was not a statistically significant risk factor, whereas it has been reported as a contributory risk factor in other studies^{24,25}. All or some combination of the distribution of obstetric risk factors, differences in population composition or statistical power due to sample size could have accounted for this discrepancy.

Notably, in our study, there was no statistically significant association between BMI or time since previous uterine surgery with MAP. However, our study reported non-significant trends for more obese women, or longer intervals for scar as well. In contrast to other reports suggesting that obesity contributes to perioperative difficulties, likely increases surgical trauma and interrupts natural healing of tissues, resulting in greater risk of

abnormal placentation²⁶. These variables may act in a synergistic manner with risk factors that are more powerful like placenta previa, number of placentas, and parity, and potentially more difficult to separate out in smaller studies.

There are multiple important implications for obstetric practice in Pakistan and elsewhere with increasing rates of cesarean delivery. First, the strong association between placenta previa and morbidly adherent placenta (MAP) demonstrates the need for targeted ultrasound screening for women with two risk factors, previous uterine scar and low-lying placenta, early in pregnancy. Targeted screening in this case should reasonably be undertaken by qualified sonographers utilizing grayscale and/or Doppler modalities to facilitate timely identification of abnormal placental invasion.

Second, the identified association between high parity and MAP demonstrates the importance of preconception counseling for women with multiple prior pregnancies and surgical deliveries, so they understand the potential risks to pregnancy and are also counselled about the need for close antenatal surveillance in their subsequent pregnancies. Early referral of these patients to a tertiary care center with a multidisciplinary team for obstetric patients including an obstetrician, anesthesiologist, urologist, neonatologist and transfusion medicine physician will help prepare for complex surgical procedures, such as cesarean hysterectomy.

Lastly, the high rates of preterm delivery in the cases of MAP highlights the need to weigh maternal safety verses unexpected neonatal outcomes when planning for delivery. A planned preterm cesarean delivery may be indicated the gestational age can minimize the risks of maternal hemorrhage and neonatal morbidities. This decision should be accompanied by antenatal steroid administration to accelerate fetal lung maturity. In conclusion, the study supports utilizing risk assessment tools in routine obstetric care to classify clinical history, past surgical history, and imaging to direct allocation of surveillance resources. The implementation of these strategies may lead to improved incidentally detected screening, improved surgical preparedness and ultimately improved maternal and neonatal morbidity and mortality related to MAP.

Our study has several important limitations. The findings of this single-center study conducted in a tertiary care facility may not be entirely generalizable to the wider obstetric community, especially in rural or developing settings. Non-probability consecutive sampling may be a source of selection bias, in addition to the small sample size restricting statistical precision. Furthermore, although the diagnosis of MAP was based on pre-defined ultrasonographic and Doppler criteria, histopathology was not performed in all cases which

may lead to over-or under-diagnosis. Additionally, certain clinical information, such as the type and reasoning behind previous uterine surgery, was retrospectively retrieved and may be subject to recall or documentation bias.

Regardless of these limitations, the current study gives important thought to the prevalence and risk factors associated with MAP in a high-risk obstetric population. It reiterates the well-documented association of placenta previa and MAP, the effect of multiparity, and the significant risk of preterm delivery, all of which can contribute to the care of women. These issues have direct clinical importance by providing aspects relevant to the development of routine antenatal surveillance, early referral pathways, and delivery planning for at-risk women. Future research should focus on large-scale, multicenter prospective studies that utilize standardized imaging practices, and surgical or histopathological confirmation. Developed validated risk stratification models assessing demographic, surgical, and sonographic predictors would be very helpful in improving early diagnosis, and possibly in assisting in preventive counselling. Further expanding antenatal care services specific to high risk women will help facilitate delivery in an appropriate institution, ideally with a pre-arranged multidisciplinary care plan, which will help reduce maternal and neonatal morbidity and mortality from MAP.

CONCLUSION

The results from the study add to the literature emphasizing the need for early diagnosis and close antenatal surveillance of women identified as high risk, in particular those with previous caesarean deliveries and concomitant placenta previa. Multidisciplinary planning with appropriate timing of delivery in a tertiary institution will reduce maternal and neonatal morbidity. In addition, heightened awareness with implementation of risk based screening protocols will contribute to improvements, in future pregnancies effected with MAP.

LIST OF ABBREVIATIONS:

MAP: Morbidly Adherent Placenta
WHO: World Health Organization
BMI: Body Mass Index
CS: Cesarean Section

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