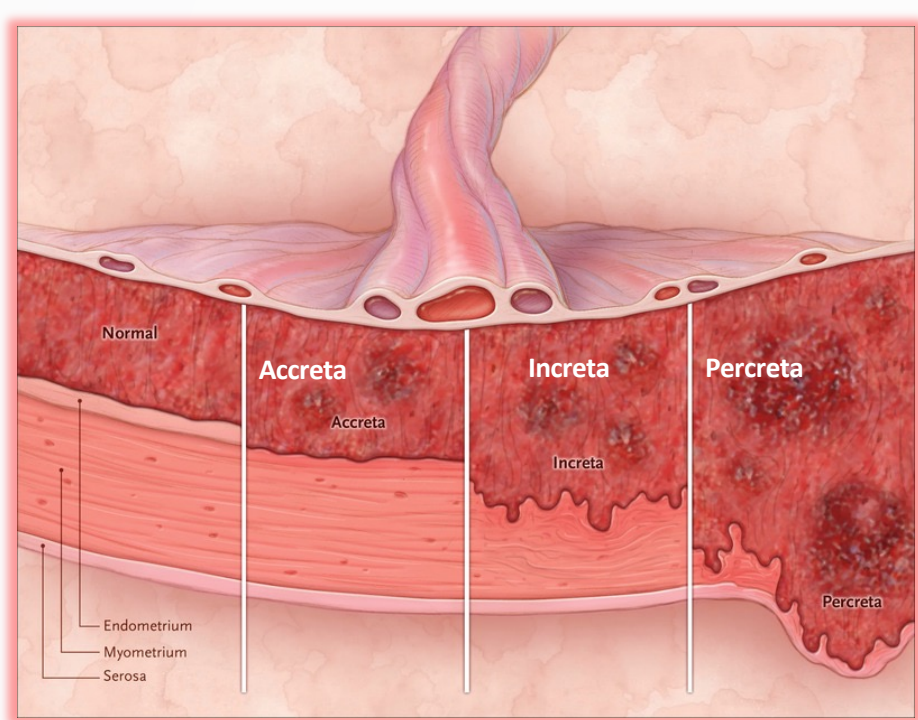


An Obstetric-Specific Surgical Apgar Score (ObSAS) predicts maternal morbidity from cesarean hysterectomy for Placenta Accreta Spectrum (PAS)

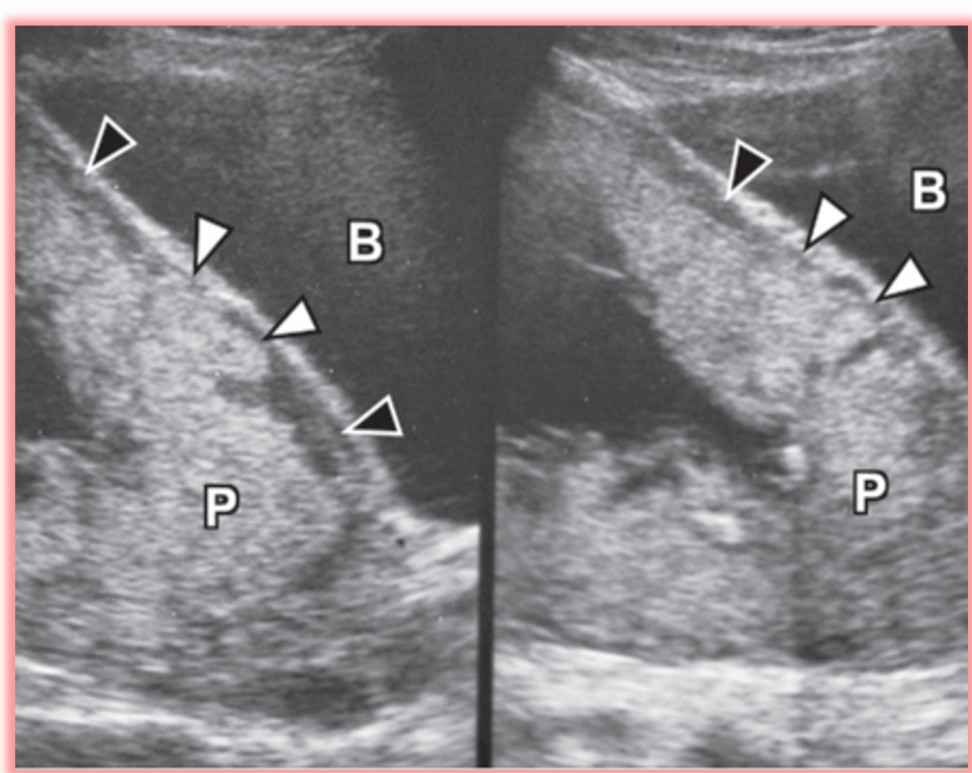
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Introduction

Placenta Accreta Spectrum (PAS)



- Incidence 1:250
- Risk factors include cesarean delivery and placenta previa



- Ultrasonography is a considered the diagnostic gold standard

- ~50 of cases are undiagnosed

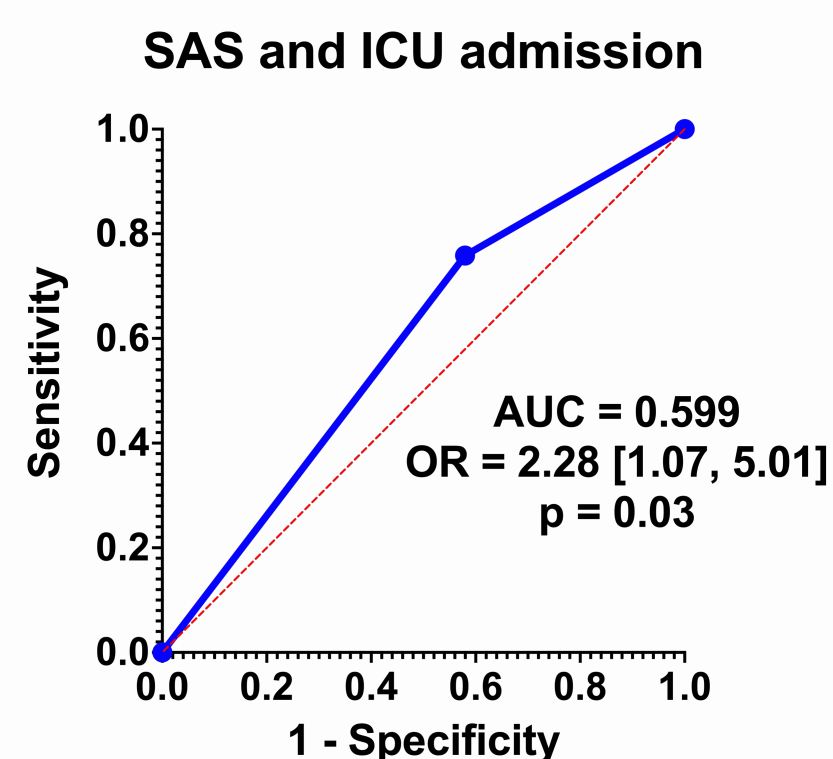


- Standard approach is cesarean hysterectomy
- Maternal morbidity impacts 80-90% of patients.
- 1% maternal death rate

Previous work

Table 1:

Variable	Points				
	0	1	2	3	4
Estimated Blood loss (mL)	>1,000	601-1000	101-600	<100	
Lowest mean arterial pressure (mmHg)	<40	40-54	55-69	>70	
Lowest heart rate (bpm)	>85	76-85	66-75	56-65	<55



Objective

Modify and validate the SAS system in the setting of cesarean hysterectomy for PAS

ObSAS

Table 2:

Variable	Points				
	0	1	2	3	4
Estimated Blood loss (mL)	>4,000	3001-4000	2001-3000	<2000	
Lowest mean arterial pressure (mmHg)	<35	35-49	50-64	>65	
Lowest heart rate (bpm)	>90	81-90	71-80	61-70	<60

Study Design

We created an Obstetric-Specific SAS scale to account for physiologic changes of pregnancy (2-fold increase in blood loss, 10% increased heart rate and 5% decreased mean arterial pressure) and analyzed 110 cases of pathology-confirmed PAS patients who underwent cesarean hysterectomy. All patients were delivered at our institution's established Placenta Accreta Program from 2005-2020.

Study demographics

Table 3:

Factor	SAS 0-4 (n=26)	SAS 5-8 (n=72)	SAS 9-10 (n=12)	p-value
Age	31.6±5.6	30.9±4.8	29.3±4.9	0.44 a
BMI	32.2±6.5	32.9±5.9	34.4±8.2	0.46 a
Gravity	5.5 [3, 8]	5 [4, 6]	4.5 [4, 6]	0.34 b
Parity	4 [2, 5]	3 [2, 4]	3 [3, 4]	0.09 b
History of CD	25 (96.2)	66 (91.7)	12 (100)	0.45 c
Number of prior CD	3 [2, 4]	2 [1, 3]	3 [2, 3]	0.08 b
Tertiary referral	16 (61.5)	56 (77.8)	10 (83.3)	0.20 c
GA at delivery	33 [29, 34]	34 [33, 36]	35 [34, 36]	0.01 b
PAS by Ultrasound				
Previa	10 (38.4)	27 (37.5)	5 (41.7)	0.96
Accreta	9 (34.6)	28 (38.9)	4 (33.3)	0.88
Increta	0 (0)	1 (1.4)	0 (0)	0.77
Percreta	7 (26.7)	16 (22.2)	3 (25)	0.88
Diabetes	3 (11.5)	6 (8.3)	2 (16.7)	0.64
Hypertension	1 (3.8)	9 (12.5)	1 (8.3)	0.44
Anemia	8 (30.1)	35 (48.6)	5 (41.7)	0.29
Emergent delivery	13 (50)	19 (26.4)	2 (16.7)	0.04 c
Public insurance	23 (88.5)	49 (68.1)	10 (83.3)	0.13

During the 16 year period, 110 cases of PAS were confirmed at UT Health

ObSAS 0-4 was associated with **earlier delivery** and need for **emergent delivery**

BMI=Body mass index, CD= cesarean delivery, GA= gestational age, PAS= placenta accreta spectrum
*p-value >0.05. a=ANOVA, b=kruskal wallis, c= X²

Results

Table 4:

Factor	SAS 0-4 (n=26)	SAS 5-8 (n=72)	SAS 9-10 (n=12)	p-value
Antepartum admission	20 (76.9)	50 (69.4)	7 (58.3)	0.28 c
Antepartum LOS	2 [1, 6]	1 [0, 7]	1 [0, 3]	0.24 b
Vaginal bleeding				
x1	4 (15.4)	13 (18.1)	1 (8.3)	0.69 c
x2	3 (11.5)	11 (15.3)	1 (8.3)	0.76 c
>2	7 (26.9)	7 (9.7)	0 (0)	0.03 c
PPROM	2 (7.7)	4 (5.6)	1 (8.3)	0.89 c
Preterm labor	5 (19.2)	2 (2.8)	0 (0)	0.008 c
FGR	0 (0)	2 (2.8)	0 (0)	0.58 c
Gestational hypertension	1 (3.8)	1 (1.4)	2 (16.7)	0.03 c
Pre-eclampsia without severe features	0 (0)	1 (2.4)	1 (8.3)	0.19 c
Pre-eclampsia with severe features	0 (0)	4 (5.6)	1 (8.3)	0.41 c
Gestational diabetes	4 (15.4)	13 (18.1)	1 (8.3)	0.69 c

LOS = length of stay, PPRM = preterm pre-labor rupture of membranes, FGR = fetal growth restriction

*p-value >0.05. a=ANOVA, b=kruskal wallis, c= X²

Lower ObSAS was associated **with bleeding >2 episodes** and **preterm labor**

Table 5:

Factor	SAS 0-4 (n=26)	SAS 5-8 (n=72)	SAS 9-10 (n=12)	p-value
Admission hgb (g/dL)	10.7±1.4	10.9±1.4	11.0±1.6	0.79 a
Operative time (min)	236 [177, 392]	196 [140, 317]	134 [108, 189]	0.0007 b
Urinary stent placement	10 (38.5)	37 (51.4)	6 (50)	0.76 c
EBL (mL)	6000 [4700, 12000]	2600 [2000, 4000]	1725 [1200, 2000]	<0.0001 b
Transfusion (any)				
Whole blood	6 (23.1)	14 (19.4)	0 (0)	0.21 c
Red blood cells	22 (84.6)	59 (81.9)	5 (41.7)	<0.0001 c
Platelets	20 (77.0)	20 (27.8)	0 (0)	<0.0001 c
Fresh frozen plasma	23 (88.5)	37 (51.4)	2 (16.7)	<0.0001 c
Cryoprecipitate	9 (34.6)	5 (6.9)	0 (0)	0.0015 c
GU injury				
Intentional cystotomy	3 (11.5)	5 (6.9)	0 (0)	0.43 c
Incidental cystotomy	12 (46.2)	12 (16.7)	1 (8.3)	0.004 c
Ureteral injury	3 (11.5)	2 (2.8)	0 (0)	0.13 c
PAS by pathology				
Accreta	1 (7.7)	15 (20.8)	6 (41.7)	0.04 c
Increta	6 (23.1)	22 (30.6)	3 (25)	0.74 c
Percreta	19 (69.2)	35 (48.6)	3 (33.3)	0.01 c
ICU admission	24 (92.3)	32 (44.4)	0 (0)	<0.0001 c
ICU LOS	1 [1, 2]	0 [0, 1]	0 [0, 0]	<0.0001 b
Post-operative LOS	4 [3, 5]	3 [3, 5]	3 [3, 5]	0.29 b

Hgb= hemoglobin, EBL=Estimated blood loss, GETA= general endotracheal anesthesia

GU=Genitourinary, PAS=Placenta accreta spectrum, ICU = intensive care unit, LOS = length of stay

Values presented as Mean ± SD, Median [P25, P75] or N (column %).

*p= >0.05. a=ANOVA, b=kruskal wallis, c= X²

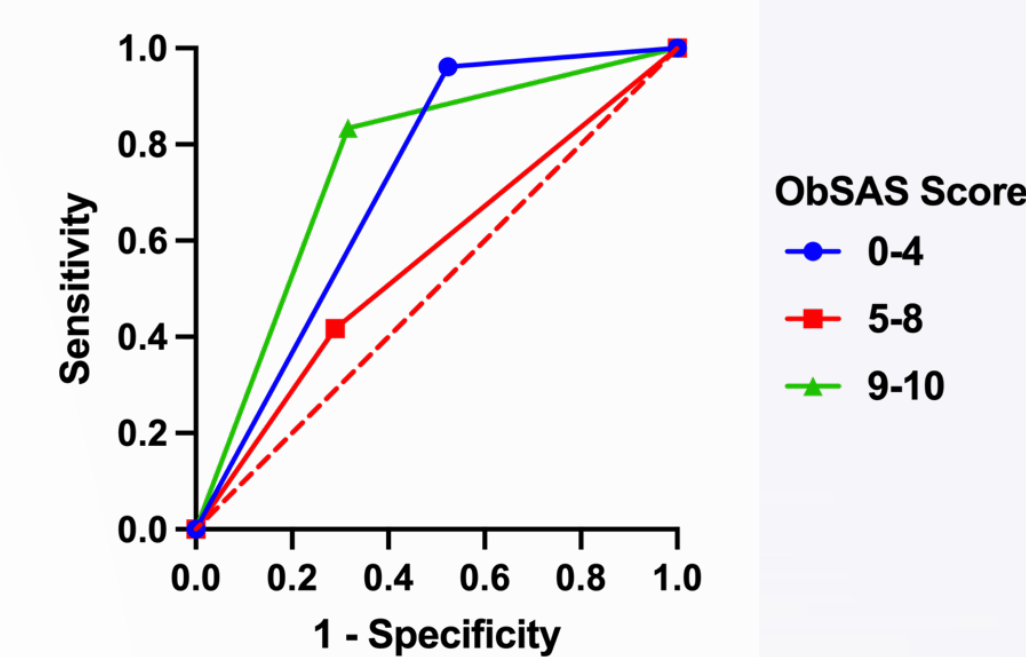
Lower ObSAS was associated **greater surgical complexity** and **ICU admission**

Results

Table 6:

Variable	OR	95%CI	p-value
Maternal morbidity composite	22.73	4.5-415	0.002
Intraoperative acidosis	8.06	2.7-25.3	0.002
Transfusion >4 units	26.4	5.2-584	0.002
ICU admission	40.6	7.9-742	<0.0001
LOS >4 days	3.2	1.3-8.4	0.012

ObSAS score and Maternal Morbidity



ObSAS 0-4 = **increased** maternal morbidity

Conclusion

- An ObSAS from 0-4 (poorest score) was significantly associated with increased risk of ICU admission (OR=40.6 [95%CI 7.9-742.9]), 100% rate of transfusion >4 units (26/26 patients) and greater surgical morbidity (OR=22.7 [95%CI 4.4-415.0])
- An intermediate ObSAS score (5-8) was significantly associated with fewer ICU admissions (OR=0.41 [95%CI 0.18-0.92]), fewer blood transfusions >4 units (OR=0.41 [95%CI 0.16-0.95]) and no difference in overall surgical morbidity (OR=0.57 [95%CI 0.23-1.3])
- ObSAS from 9-10 resulted in no ICU admissions (0/12), fewer blood transfusions (OR=0.1 [95%CI 0.1-0.4]). and less surgical morbidity (OR=0.09 [95%CI 0.01-0.37]).

- Given the overall surgical morbidity associated with PAS cesarean hysterectomy, the ObSAS score is a powerful tool with excellent predictive capabilities for ICU admission, blood transfusion and surgical morbidity, allowing for resource allocation, prophylactic interventions and optimal patient outcomes.