

Optimizing Forceps Delivery Safety: Predicting Anal Sphincter Injury with Intrapartum Ultrasound

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Introduction

Risk factors of OASIS

Obstetric Anal Sphincter Injuries

- Asian ethnicity (OR 2.27, 95%CI 2.14-2.41)
- Nulliparity (RR 6.97, 95%CI 5.40-8.99)
- Prolonged second stage of labor
 - 2-3 hours (RR 1.47, 95%CI 1.20-1.79)
 - 3-4 hours (RR 1.79, 95%CI 1.43-2.22)
 - >4 hours (RR 2.02, 95%CI 1.62-2.51)
- Instrumental delivery
 - forceps* (OR 6.53, 95%CI 5.57-7.64)
 - ventouse* (OR 1.89, 95%CI 1.74-2.05)
- Occiput-posterior (RR 2.44, 95%CI 2.07-2.89)

Labor analgesia

Japanese patients are inherently at high risk of OASIS, and some factors (boxed in red) further increase with labor analgesia.

Labor analgesia has more than tripled over the past decade in Japan, making preventive measure for OASIS essential especially for forceps delivery.

Aim

To clarify whether intrapartum ultrasound can predict the occurrence of OASIS caused by forceps delivery.

Method

Study Design : Prospective cohort study

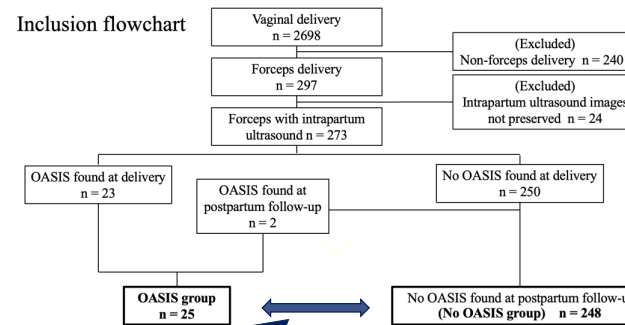
Participants : Patients who underwent forceps delivery in Showa University Hospital.

Time : April 2021 - September 2024.

We compared the maternal, fetal, and labor-related characteristics, along with intrapartum ultrasound parameters, between cases with and without OASIS in forceps deliveries.

Results

Inclusion flowchart



There were no statistically significant difference in maternal, fetal, nor labor-related characteristics.

Intrapartum ultrasound parameters

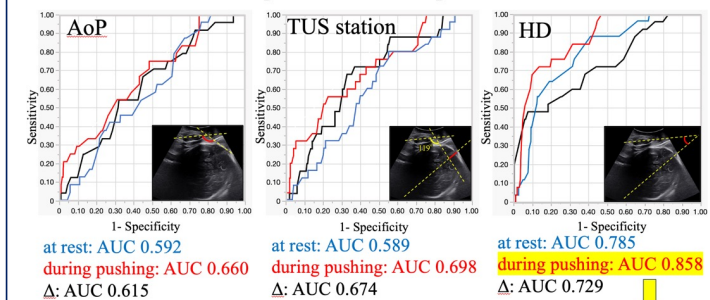
	OASIS n=25	No OASIS n=248	P value
Angle of progression (AoP)			
At rest	145 (124-158)	146 (115-190)	0.13
During pushing	163 (128-180)	170 (122-220)	0.009
ΔAoP*	18 (-6-43)	22 (2-74)	0.06
Transperineal ultrasound (TUS) station			
At rest	2.1 (0.5-3.8)	2.4 (0.5-6)	0.14
During pushing	3.2 (1.0-4.9)	4.1 (-0.5-5.1)	0.001
ΔTUS station*	1.1 (0.14-2.7)	1.6 (-0.5-5.1)	0.004
Head direction (HD)			
At rest	28 (11.7-43)	38 (-5-68)	<0.0001
During pushing	32 (15-50)	48 (-5-80)	<0.0001
ΔHD*	3.2 (-4.9-23)	10 (-4-45)	<0.001
Midline angle	19.3 (0-56)	15.0 (0-177)	0.19

*Δ: (during pushing) - (at rest)

median (range) Mann-Whitney U test

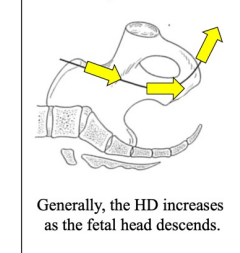
HD was the most predictive of OASIS.

ROC curve of intrapartum ultrasound parameters for OASIS



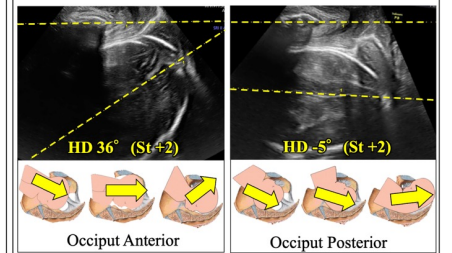
Cutoff point based on the highest Youden index : 36° (sensitivity 0.72, specificity 0.86)

①HD during fetal head descent.



Generally, the HD increases as the fetal head descends.

②Difference of HD at the same head station.



HD is a comprehensive indicator that reflects not only the fetal head descent but also the head rotation and the position of the maximum head circumference. This may be the reason HD is more predictive of OASIS compared to other parameters.

Conclusion

Intrapartum ultrasound, particularly HD measurement during pushing, is a valuable predictor of OASIS in forceps deliveries.

Setting the HD cutoff at 36° may enhance the safety of forceps.