Ultrasound in the labour room
How, why and when?

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SFOG veckan
Ørebro 2024

NTNU

Stavanger University Hospital
Stavanger Hospital Trust

Why?

Human births

The Temple of Kom Ombo, Egypt, 200 b.c

- Most human births are successful without any kind of surveillance

Nature puts women at risk

- Sierra Leone 2009

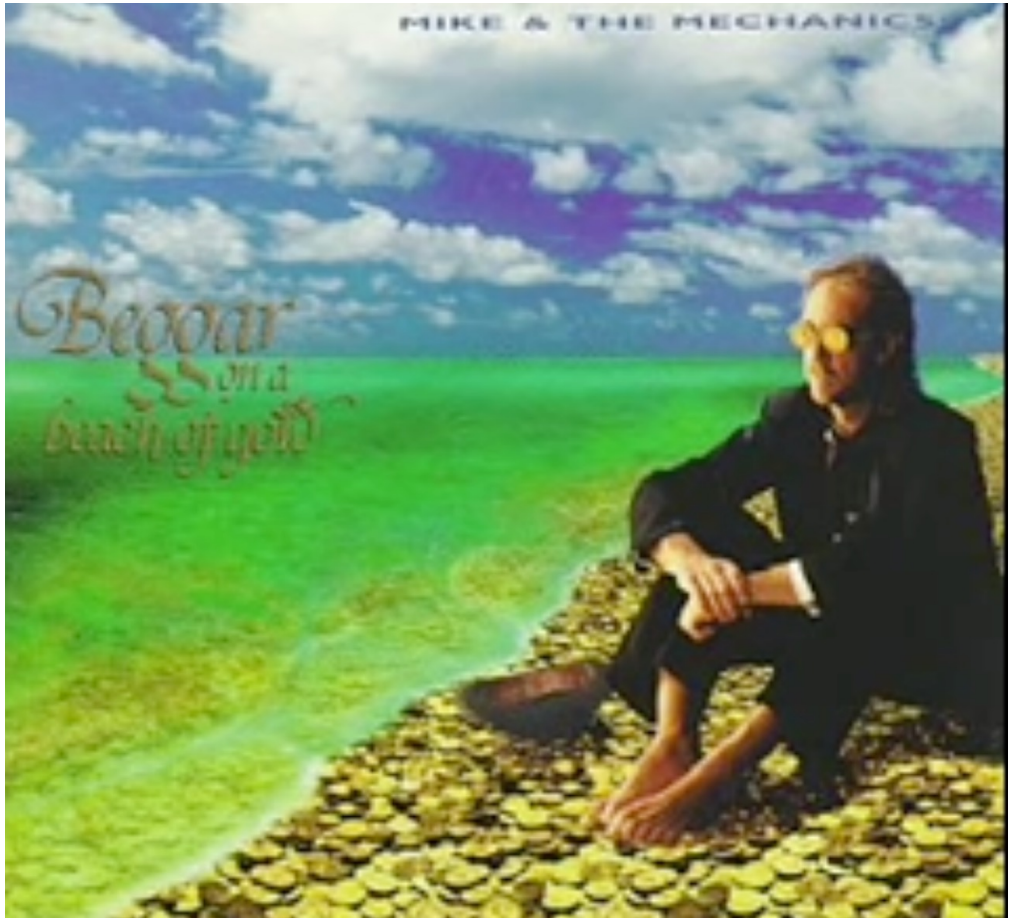
Maternal mortality rate >1%

Lifetime mortality risk >10%

Obstetricians are conservative

Looking back over my shoulder

Mike Rutherford



Clinical assessment of position is inaccurate

Digital examination during instrumental delivery failed to identify the correct fetal head position in about one quarter of cases

Comparison of transvaginal digital examination with intrapartum sonography to determine fetal head position before instrumental delivery

S. AKMAL*, N. KAMETAS*, E. TSOI*, C. HARGREAVES† and K. H. NICOLAIDES*

*Harris Birthright Research Centre for Fetal Medicine, King's College Hospital, Denmark Hill, London and †Department of Obstetrics and Gynaecology, King George's Hospital, Ilford, Essex, UK

Clinical assessment of descent is subjective

Birth simulator: Reliability of transvaginal assessment of fetal head station as defined by the American College of Obstetricians and Gynecologists classification

Olivier Dupuis, MD,[a,b,*] Ruimark Silveira, MS,[b] Adrien Zentner, MS,[b]
André Dittmar, PhD,[b] Pascal Gaucherand, MD,[c] Michel Cucherat, MD,[d]
Tanneguy Redarce, PhD,[b] René-Charles Rudigoz, MD[a]

Numerical errors occurred in 36-88%

Undiagnosed high stations accounted for 20% of errors

Labour mechanics

- Knowledge about labour mechanics should be emphasized
- Important to understand labour progress
- Help clinicans in decision-making

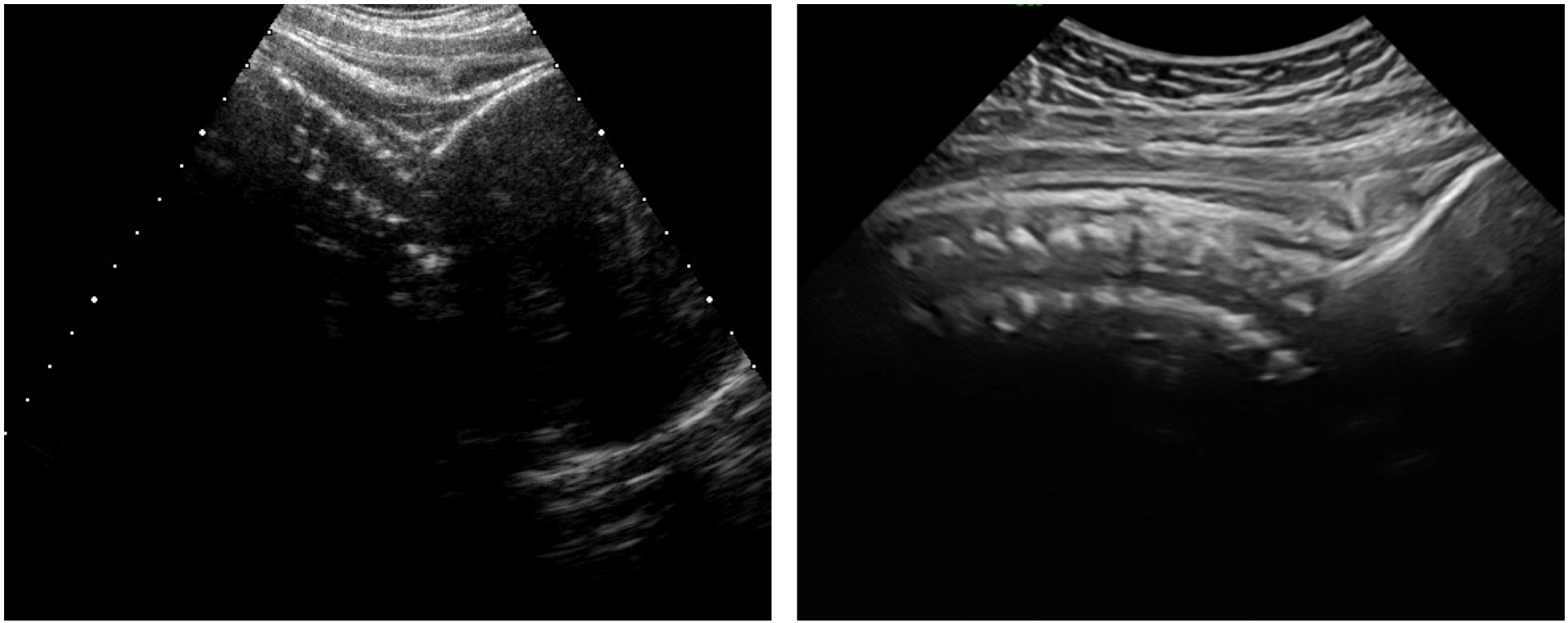
7 movements in Anglo-American tradition

1. Engagement
2. Descent
3. Flexion
4. Internal rotation
5. Extension
6. External rotation
7. Expulsion

Williams obstetrics, 1989

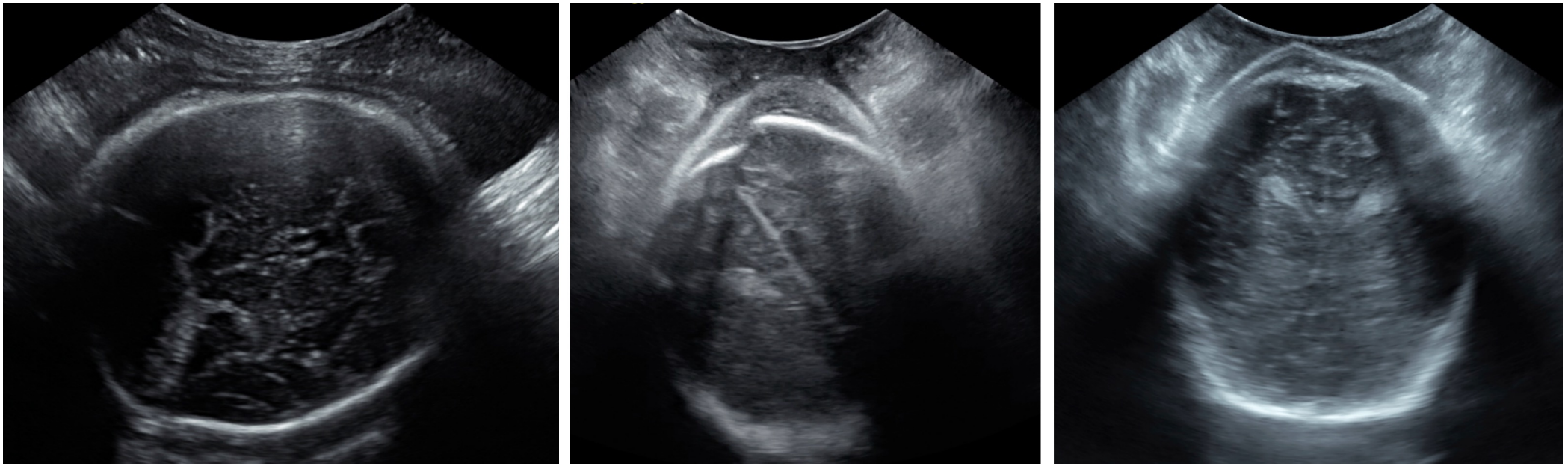
- The three extra movements refer to fetal descent
- Engagement is simply a stage of descent
- Expulsion simply the ultimate result of the descent

First movement (flexion)



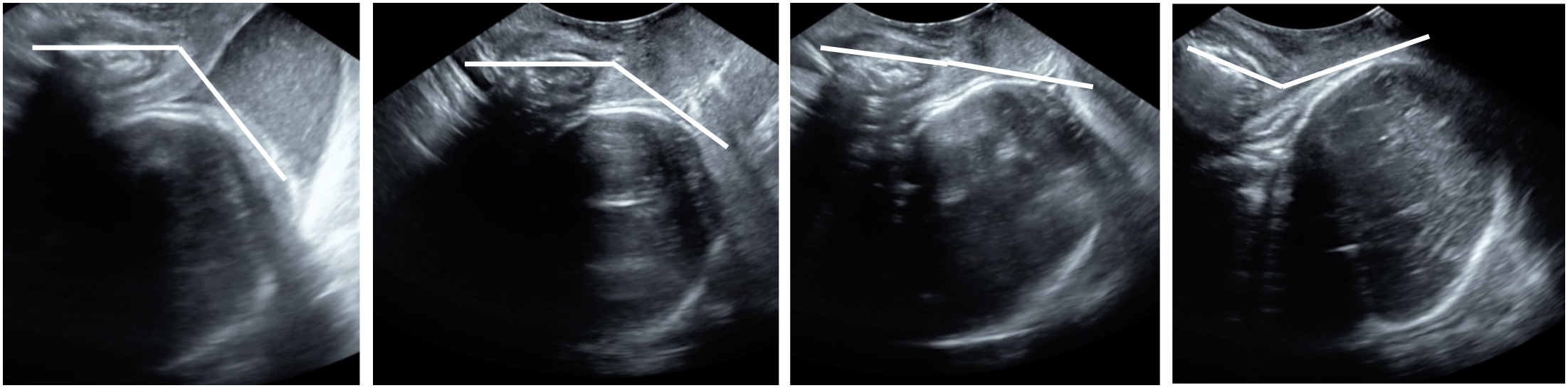
Fetus with extended (left image) and flexed (right image) attitude

Second movement (internal rotation)



Occiput at 8.30 (transabdominal scan), 10.30 and at 12 o'clock (transperineal scan) from left to right

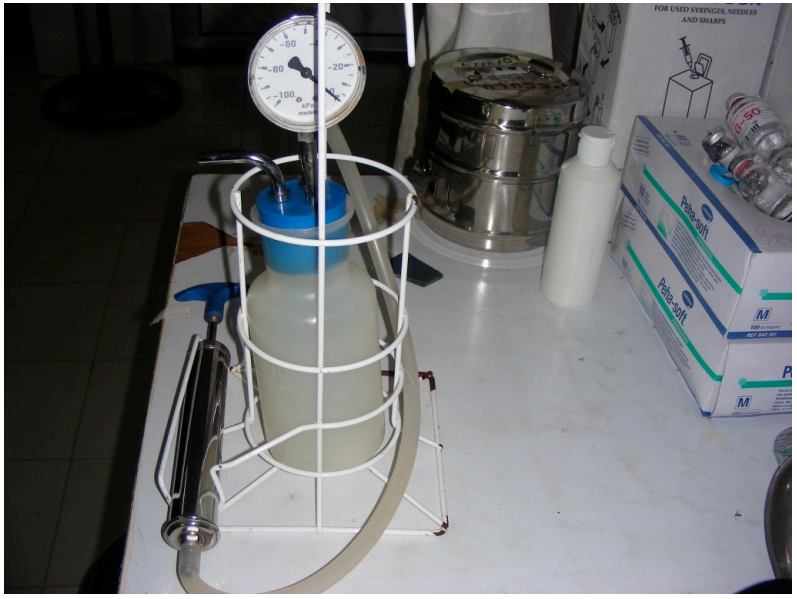
Third movement (extenstion)



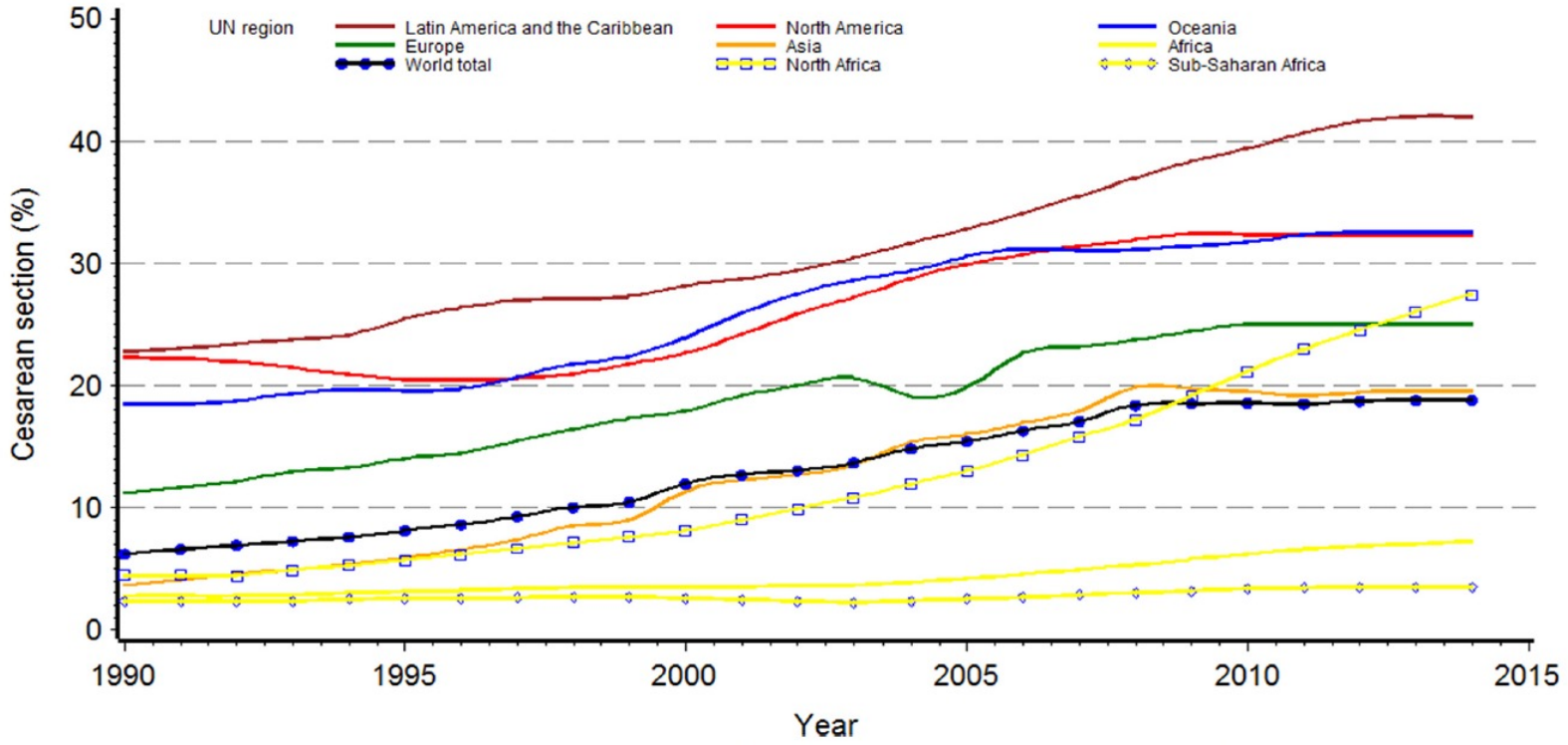
Fourth movement (external rotation)

The images show extension of the neck (third movment), followed by rotation of the sholders (fourth movement) and expulsion of the fetus

Caesarean, vacuum or forceps?
or
just wait?



Caesarean trends are not as recommended



Betran et al. Plos One 2015

Underuse of assisted vaginal births

- In the UK and in the Scandinavian countries >10% of women are delivered with vacuum extraction or forceps
- In low and mid resource countries an underuse of these procedures with less than 1% in many institutions has been reported
- Ultrasound can reassure clinicians when a vacuum extractions is safe

A simple and safe diagnostic tool is warranted

Can fetal descent be measured with ultrasound?

Lewin

1977

Paris

Measuring the height of a cephalic presentation: an objective assessment of station

D. Lewin, G. Sadoul and Th. Beuret

Department of Obstetrics and Gynecology, Centre Hospitalier de Poissy, Université Paris V, France

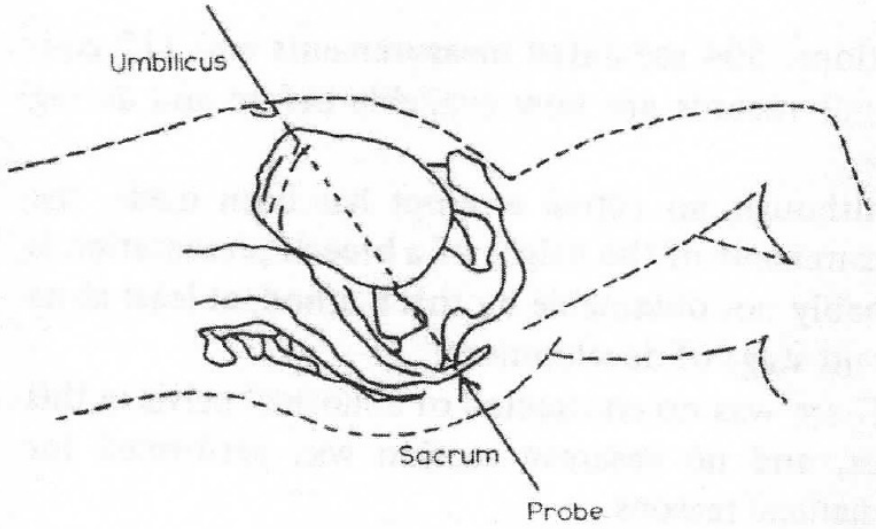


Fig. 4. Position of the probe and direction of the ultrasonic waves.

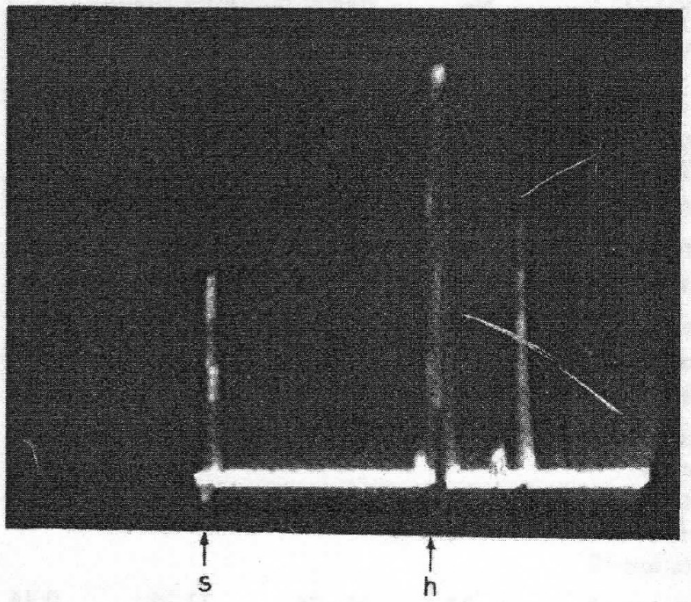


Fig. 5. Observed echoes. s = echo of the sacral tip; h = first echo of the head.

How to do ultrasound?

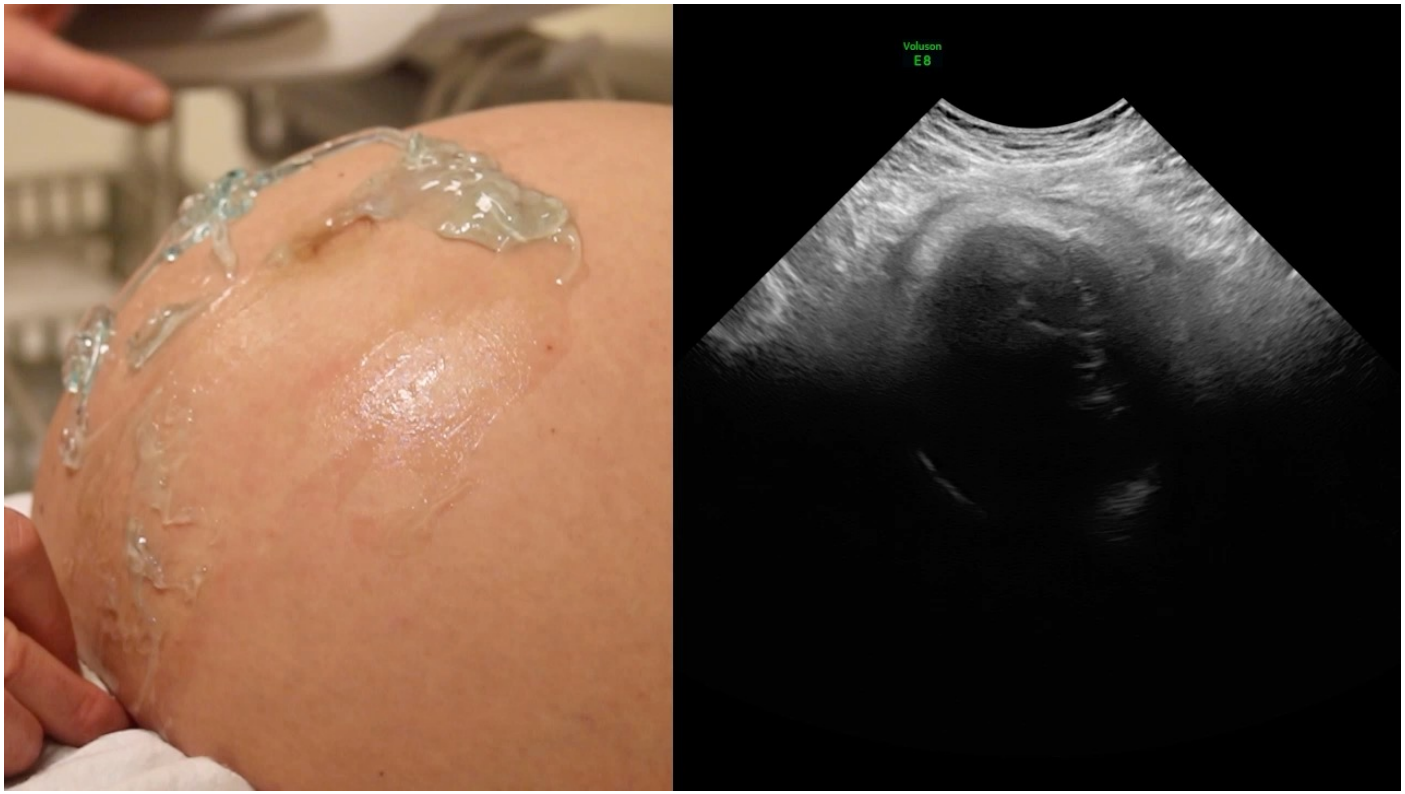
Principal fetal movements

- Rotation
- Flexion/extension
- Descent

Definitions

- Lie
  - Longitudinal, transverse, oblique
- Presentation
  - Breech, occiput, sinciput, brow, face
- Position
  - Rotation of fetal head (like a clock)
- Attitude
  - Flexion/deflexion

Transabdominal scanning


Voluson
E8

Information from a transabdominal scan

- Heart rate?
- Placenta ?
- Amniotic fluid?
- Lie?
- Position head?
- Position spine
- Attitude?
- Presentation?

- Normal (150)
- Anterior- right
- Present
- Longitudinal
- Occiput posterior (5 o’clock)
- 5 o’clock
- Deflected
- Brow

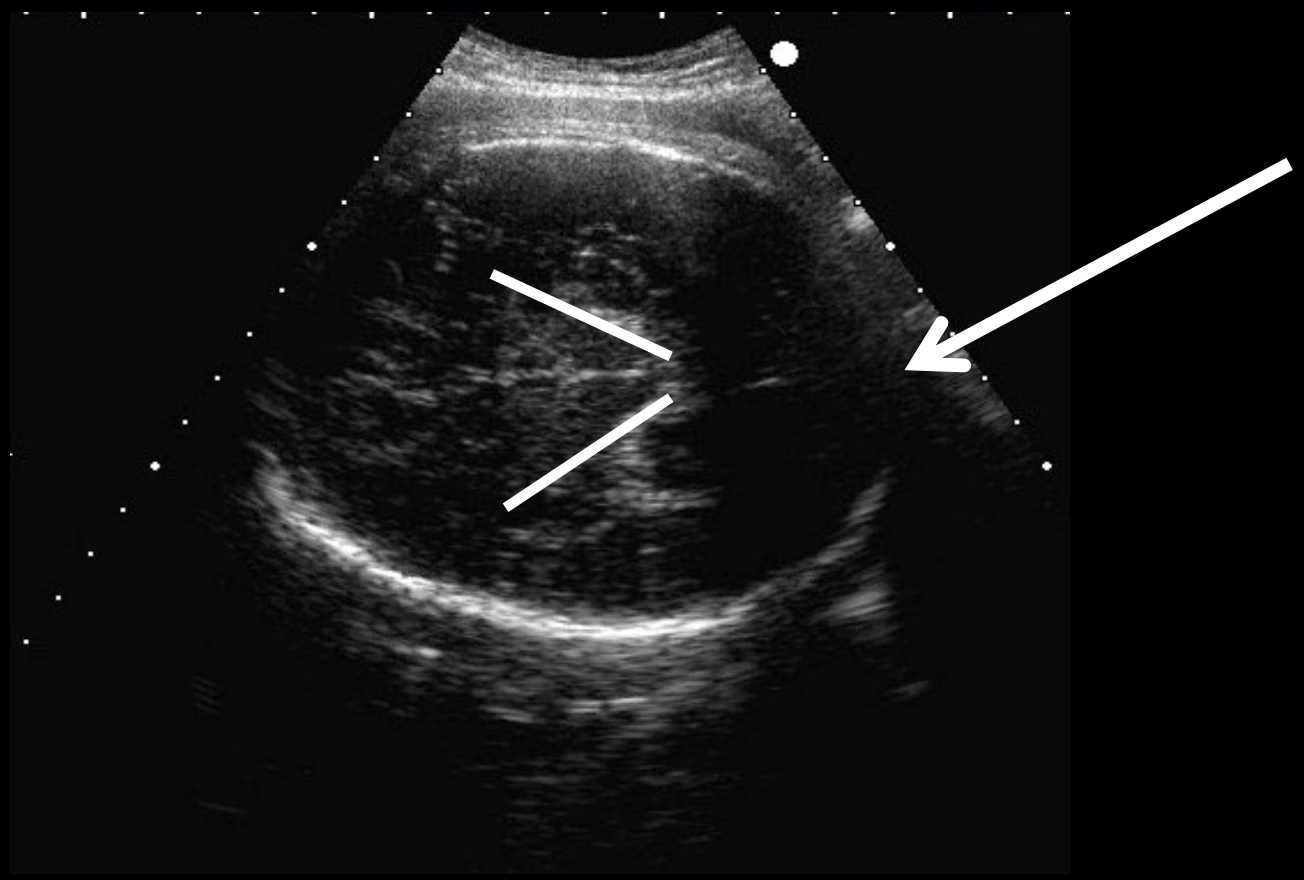
Position

Fetal position categorized as a clock

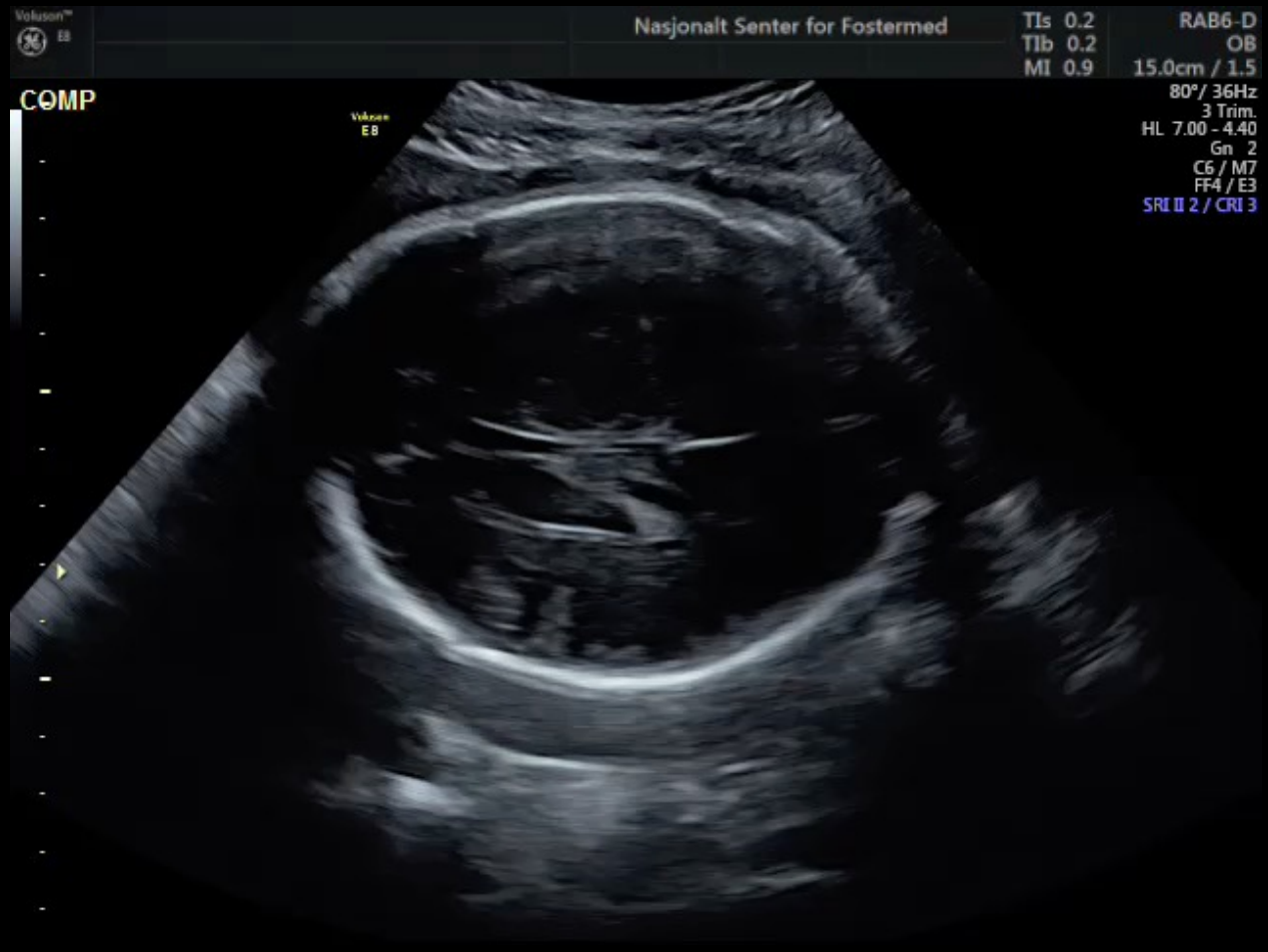
- Occiput anterior (OA)
  ≥10.00 and ≤ 02.00
- Occiput posterior (OP)
  ≥ 04.00 and ≤ 08.00
- Left occiput transverse (LOT)
  > 02.00 and <4.00
- Right occiput transverse (ROT)
  > 08.00 and <10.00

Akmal S, Tsoi E, Howard R, Osei E, Nicolaides KH. Investigation of occiput posterior delivery by intrapartum sonography. Ultrasound Obstet Gynecol 2004;24:425-8

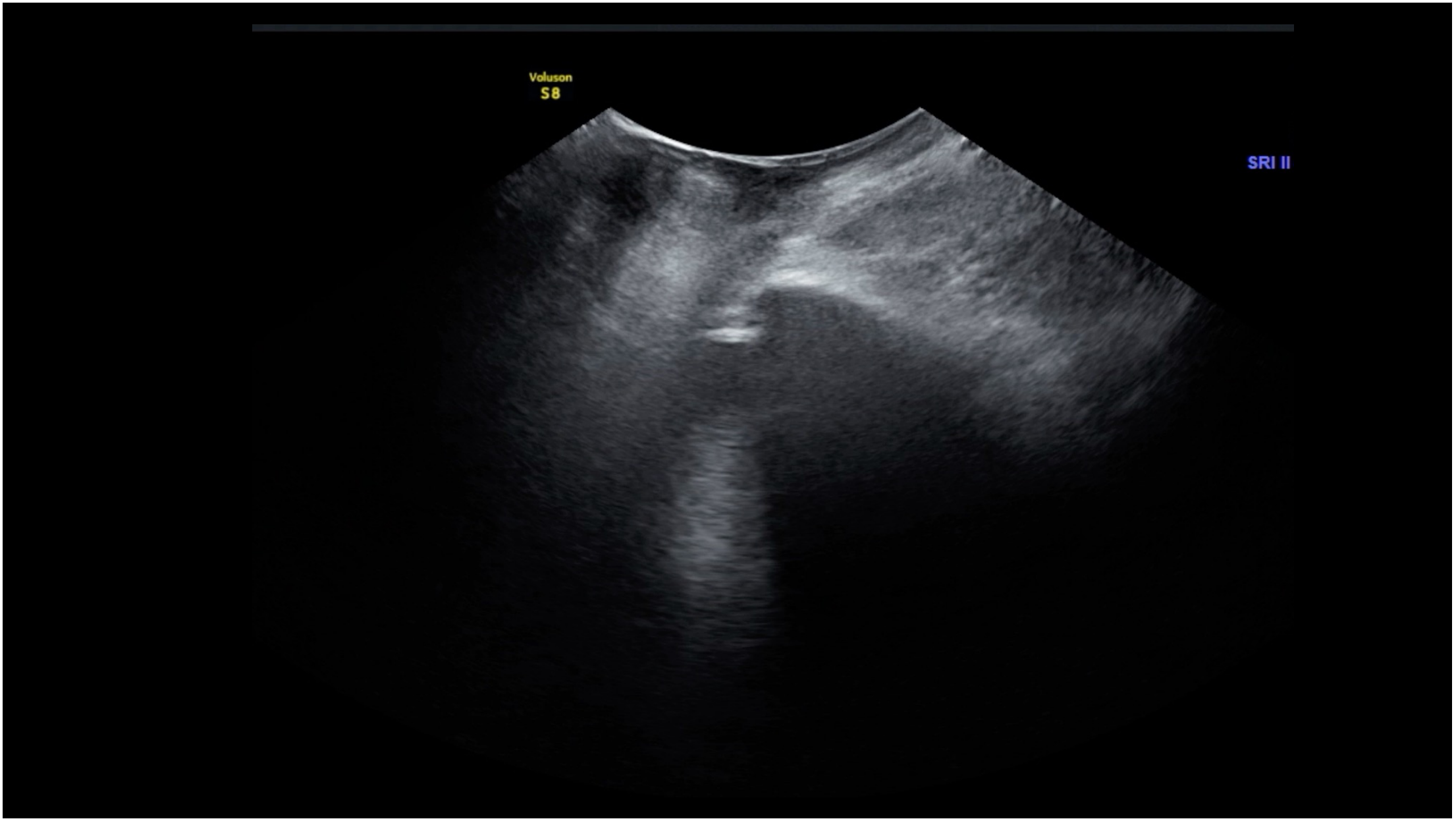
Transabdominal transverse



Choroid plexus

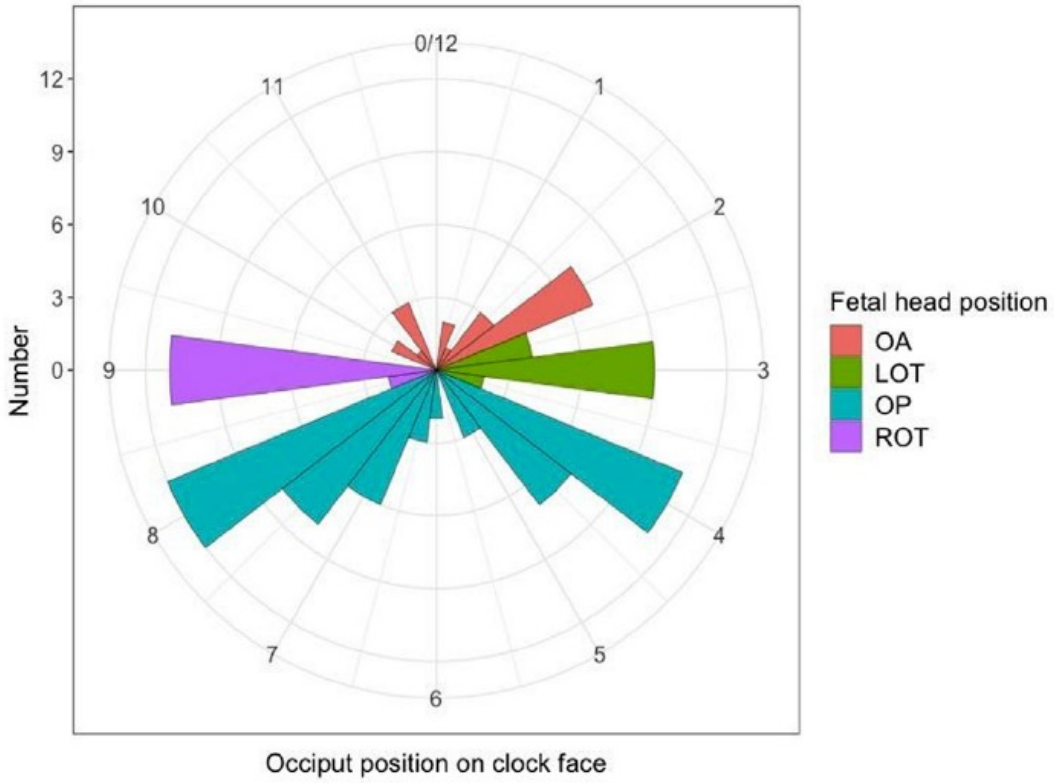


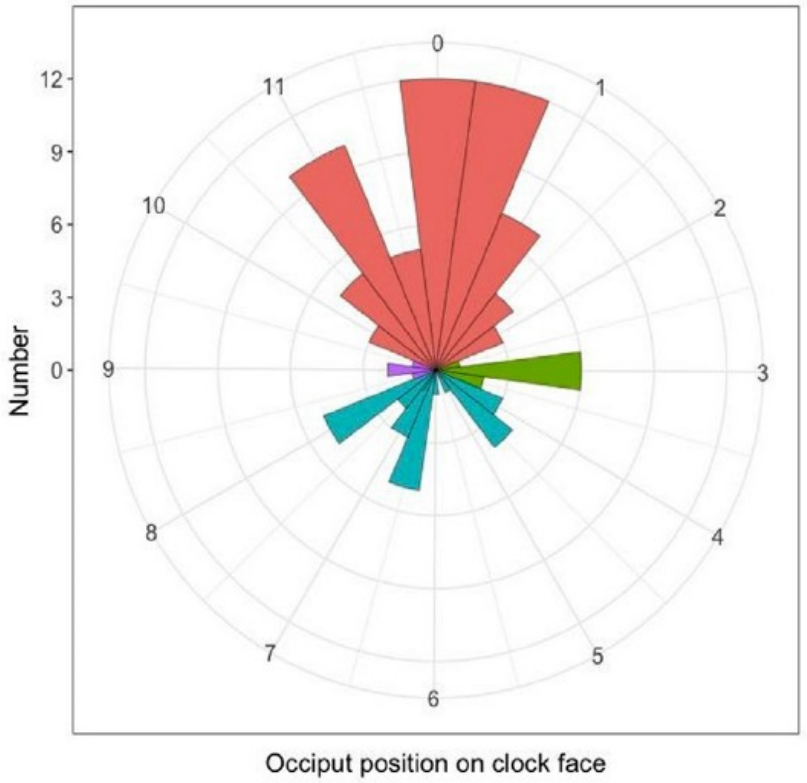
Occiput posterior position


Voluson
S8
SRI II


Voluson™
E10
COMP
107655
TIs <0.1
TIb <0.1
MI 0.7
RM6C
19Hz/14.0cm
90°/1.2
Routine 2 Trim./OB
HD Res 6.00 - 4.80
Gn 2
C7/M7
FF2/E2
SRI II 3/CRI 4
Voluson
E10

Rotation often occurs late in labor

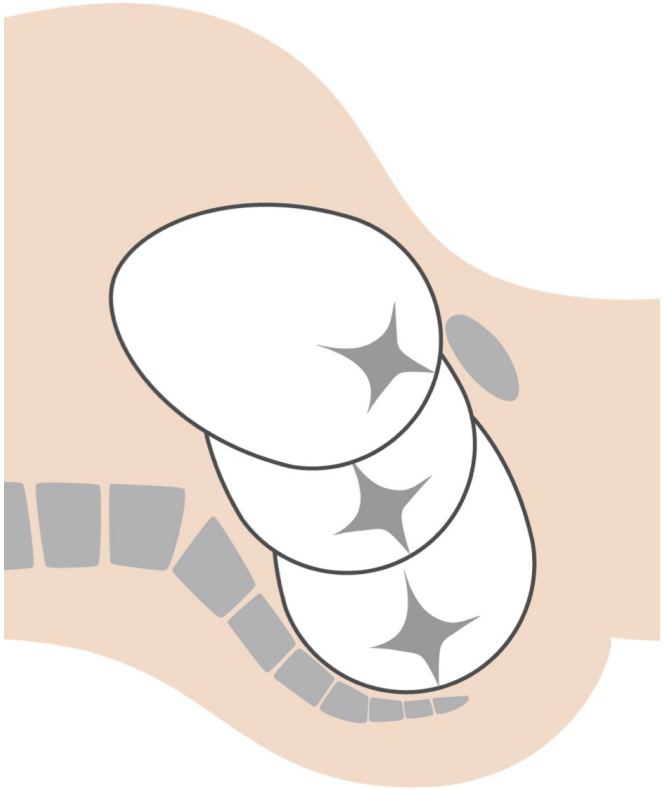


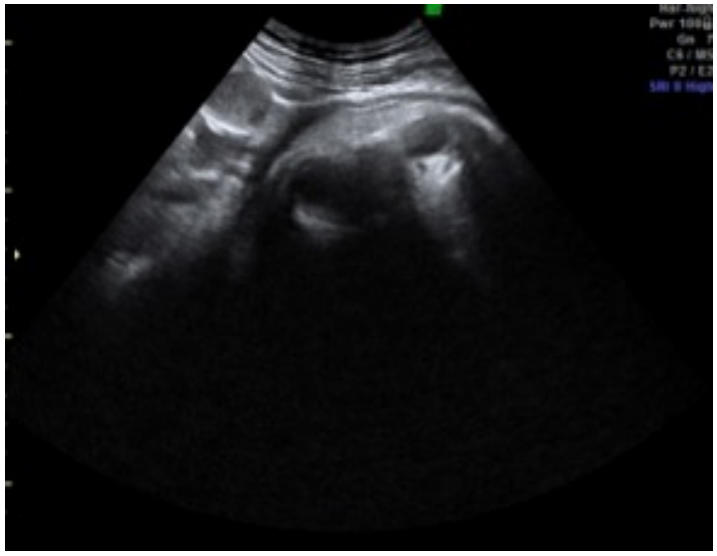


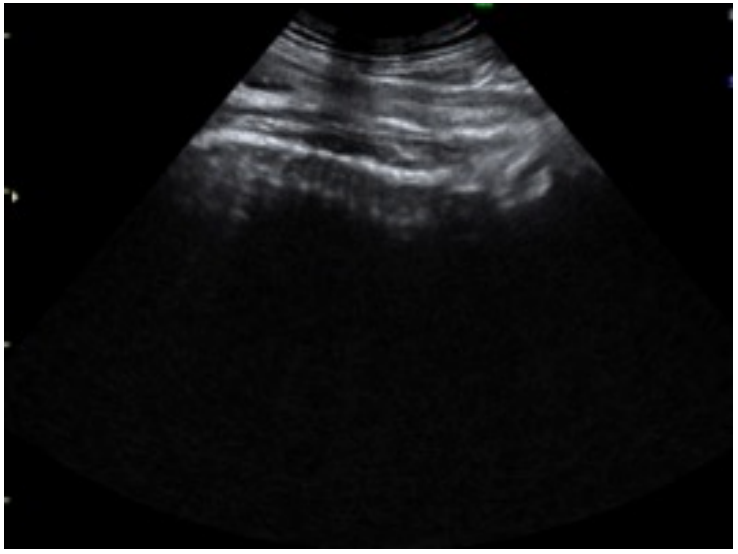
Hjartardottir et al. AJOG 2020

Occiput transverse position
and
anterior asynclitism

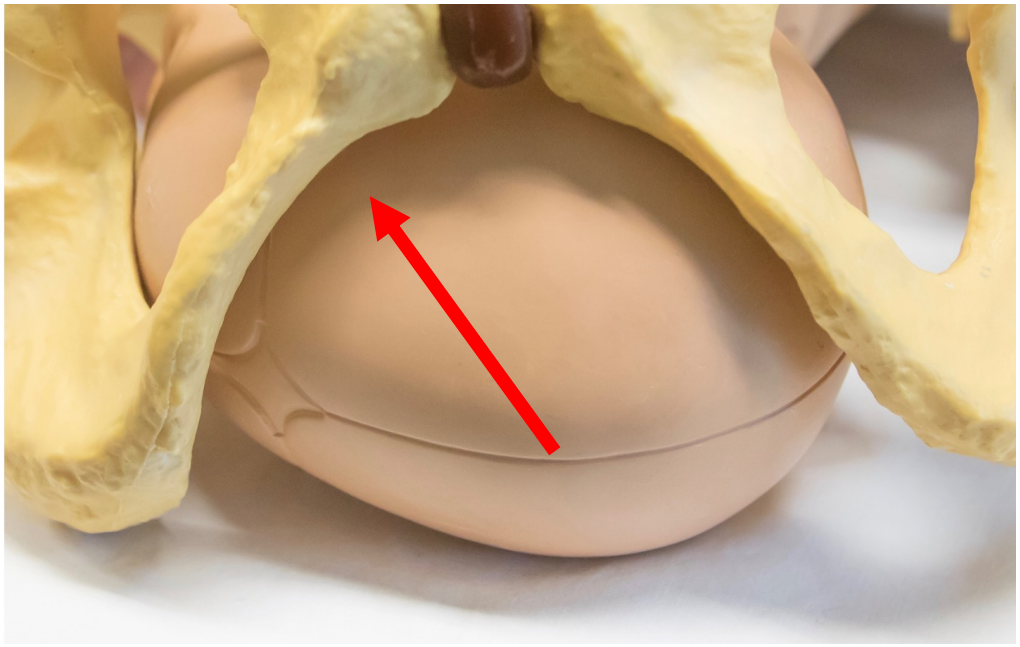
Anterior asynclitism





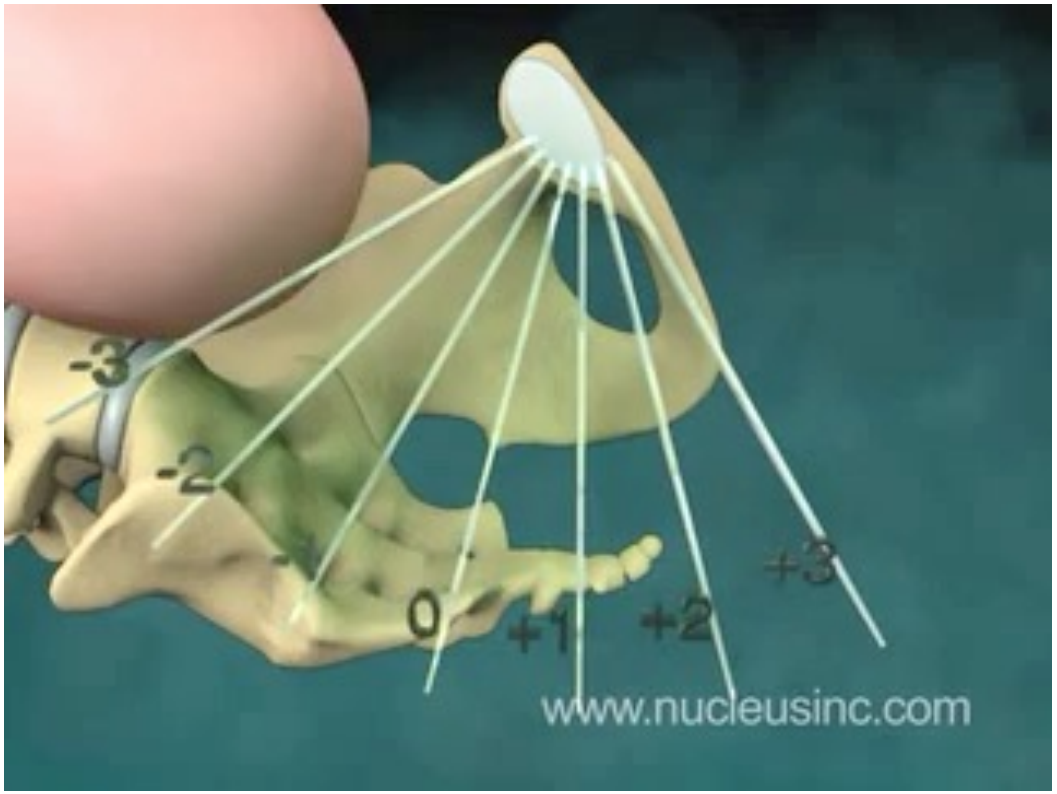


Anterior asynclitism and delivery



Vacuum
Manual rotation
Rotational forceps

Descent

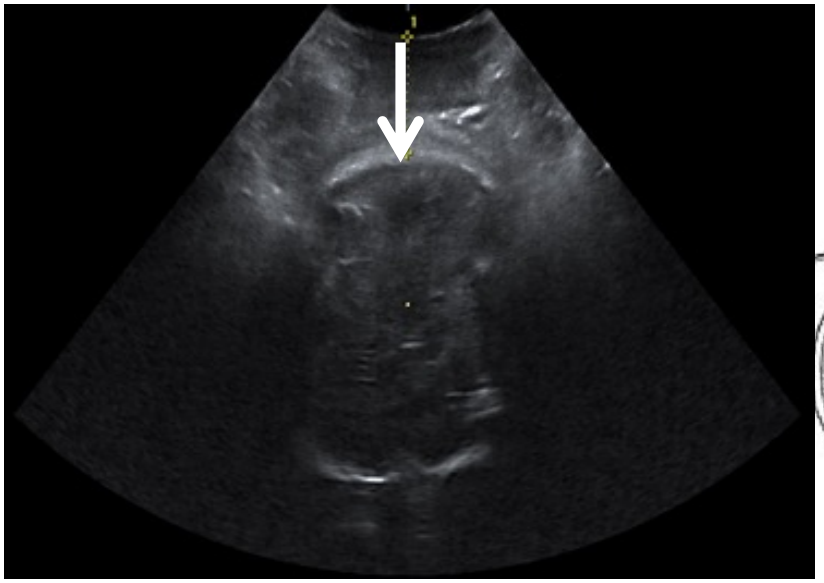


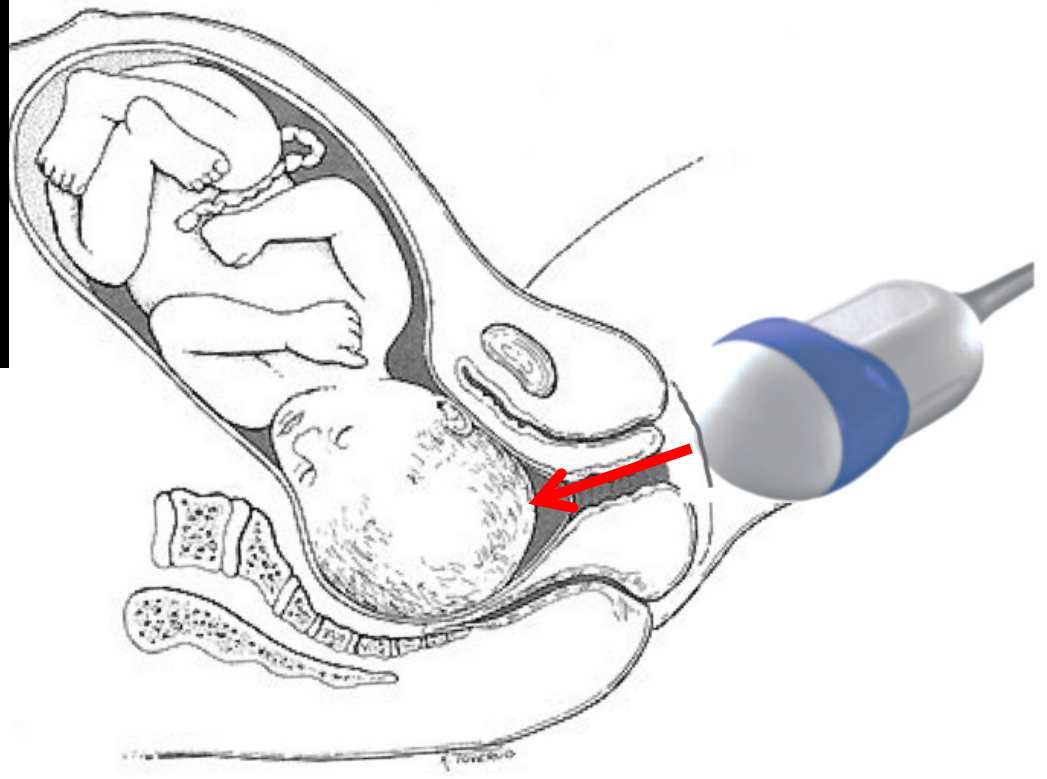
Transperineal scan


C4-8


C4-8

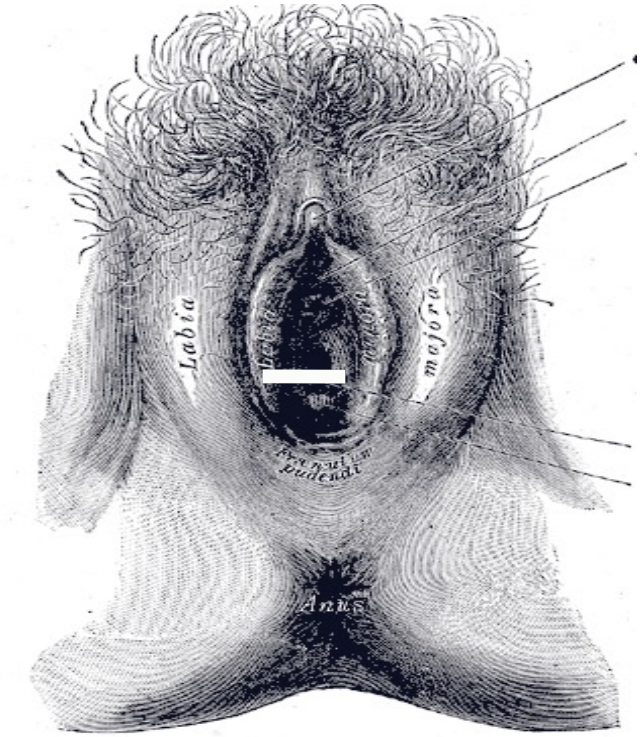
Head-perineum distance



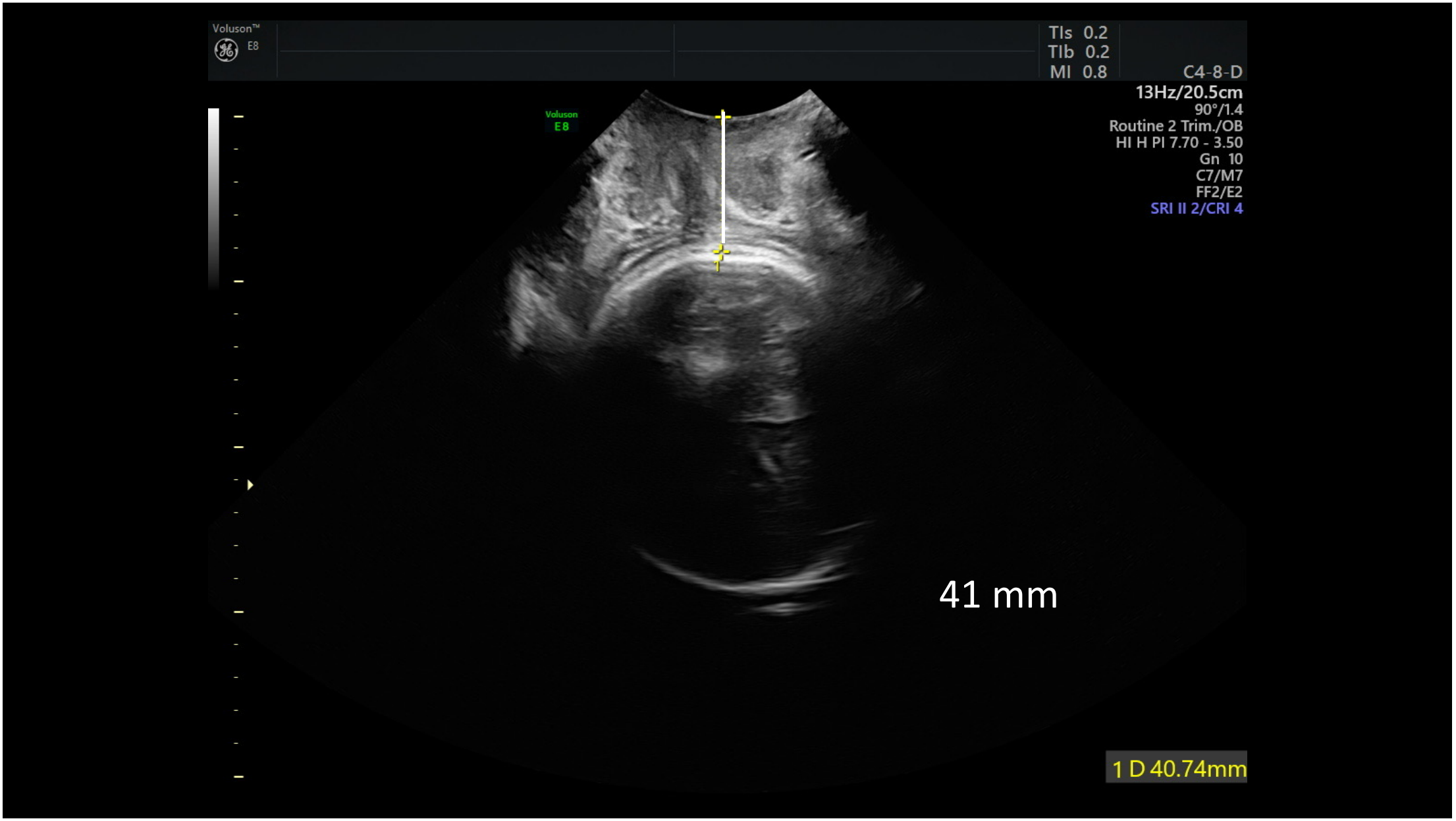


Posterior fourchette

- Between labia majores
- Compress soft tissue
- Move and angle the transducer
- Freeze image
- Use cineloop




Voluson™
E8
COMP
TIs 0.2
TIb 0.2
MI 0.8
C4-8-D
13Hz/20.5cm
90°/1.4
Routine 2 Trim./OB
HI H PI 7.70 - 3.50
Gn 10
C7/M7
FF2/E2
SRI II 2/CRI 4
Voluson
E8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E8
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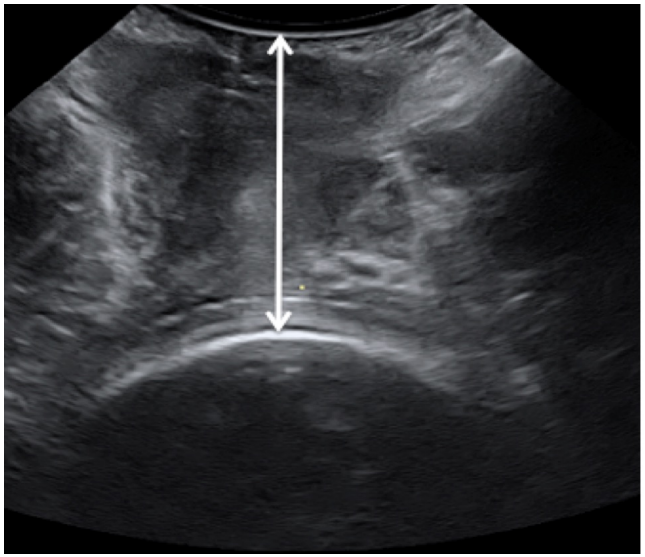
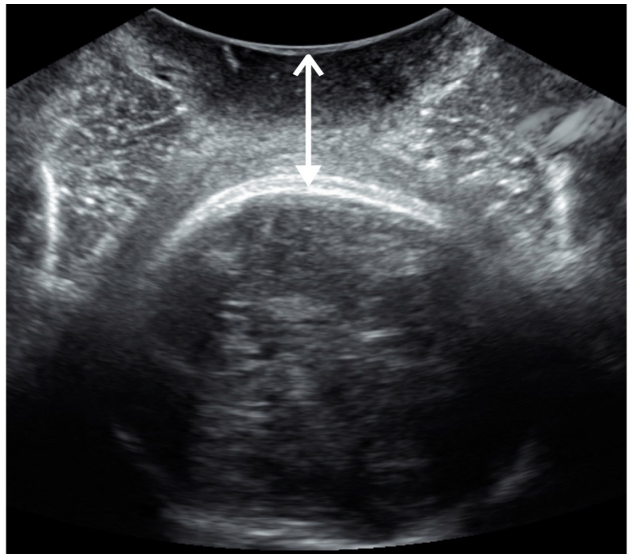
Routine 2 Trim./OB
HI H PI 7.70 - 3.50
Gn 10
C7/M7
FF2/E2
SRI II 2/CRI 4
Voluson
E8
41 mm
1 D 40.74mm

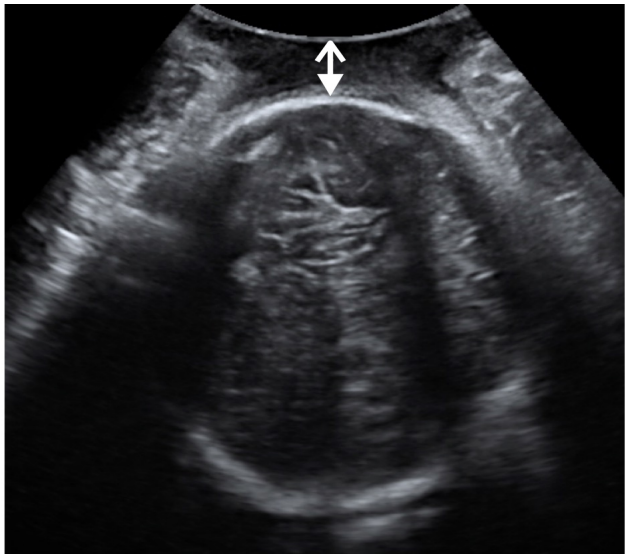
Head-perineum distance



High station (60 mm)



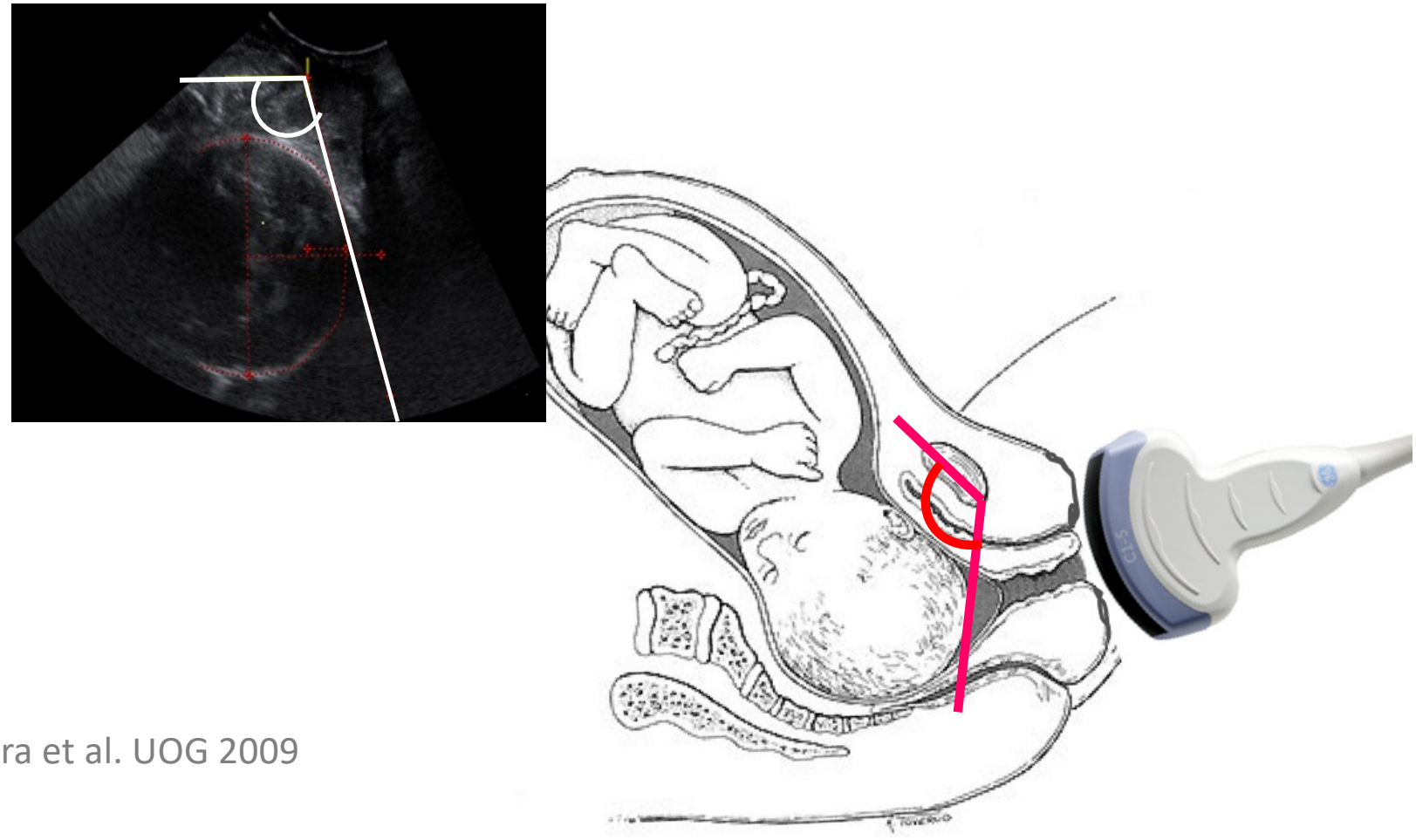
Mid station (35 mm)



Low station (20 mm)

Benediktsdottir et al. AOGS 2017

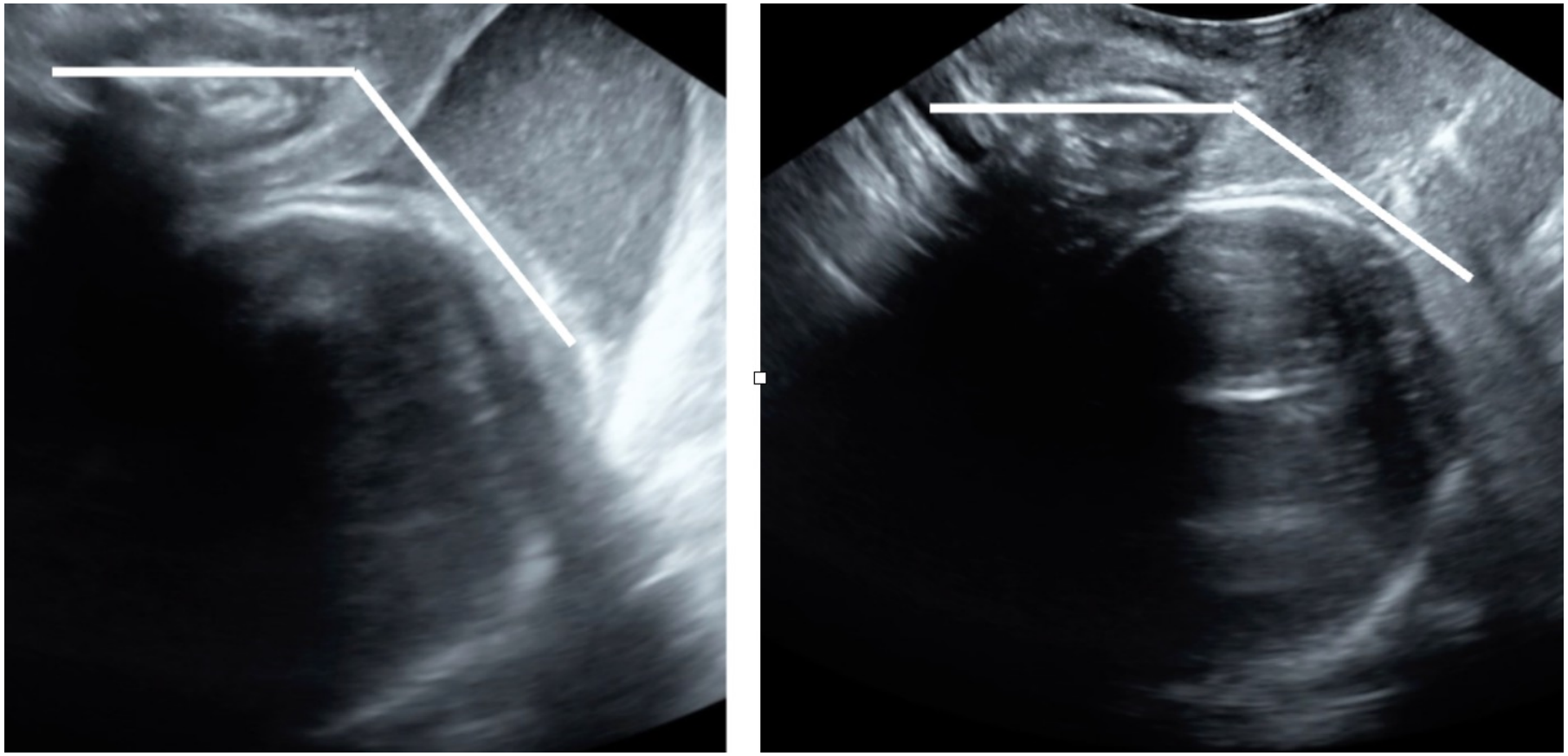
Angle of progression



Barbera et al. UOG 2009


Voluson™
E8
COMP
TIs 0.2
TIb 0.2
MI 0.8
C4-8-D
12Hz/17.3cm
89°/1.0
Routine 2 Trim./OB
HI H PI 7.70 - 3.50
Gn 10
C7/M7
FF2/E2
SRI II 2/CRI 4
Voluson
E8

Angle of progression

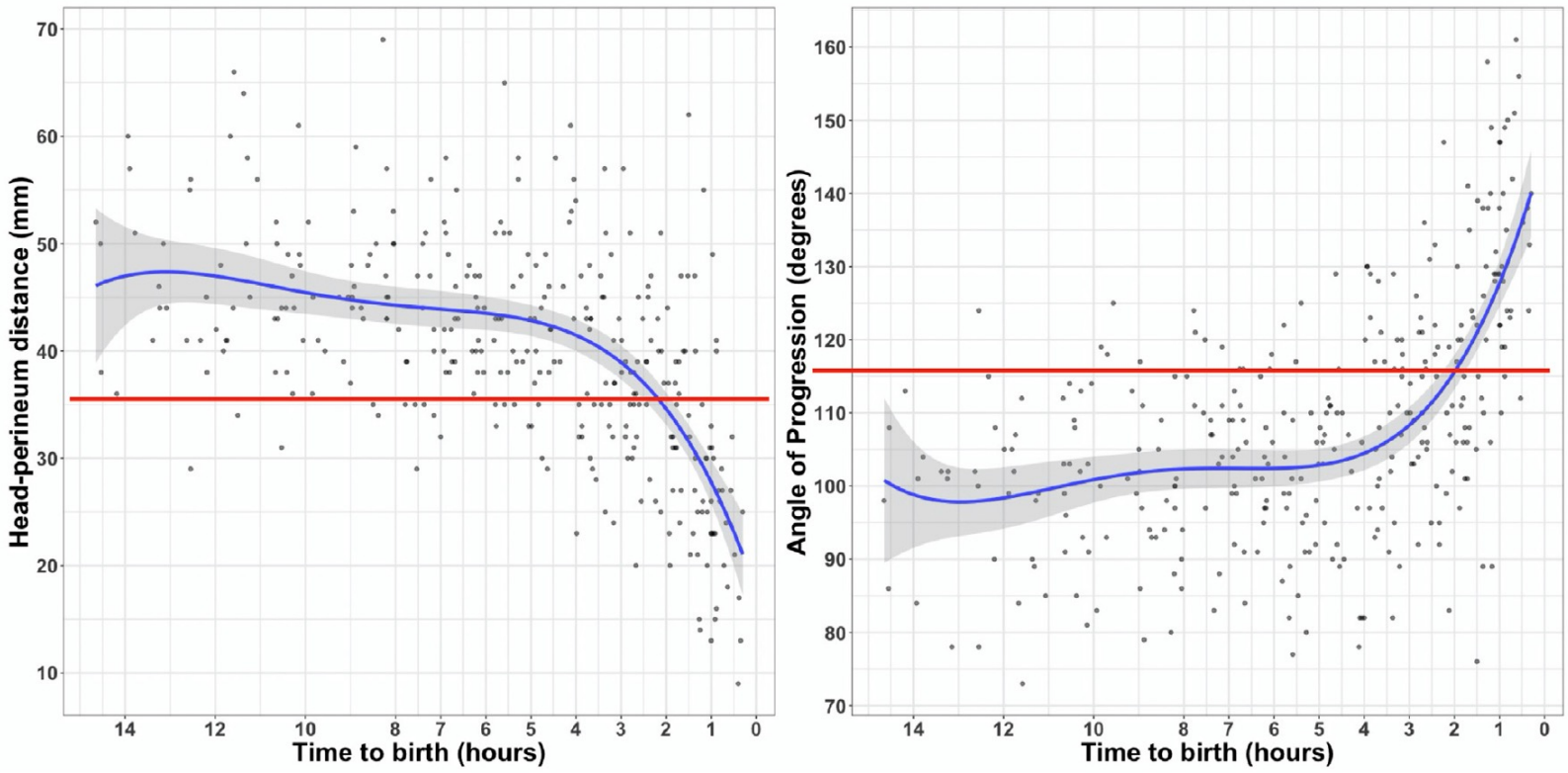


OBSTETRICS

Fetal descent in nulliparous women assessed by ultrasound: a longitudinal study

Hulda Hjartardóttir, MD; Sigrún H. Lund, PhD; Sigurlaug Benediktsdóttir, MD; Reynir T. Geirsson, MD, PhD; Torbjørn M. Eggebø, MD, PhD

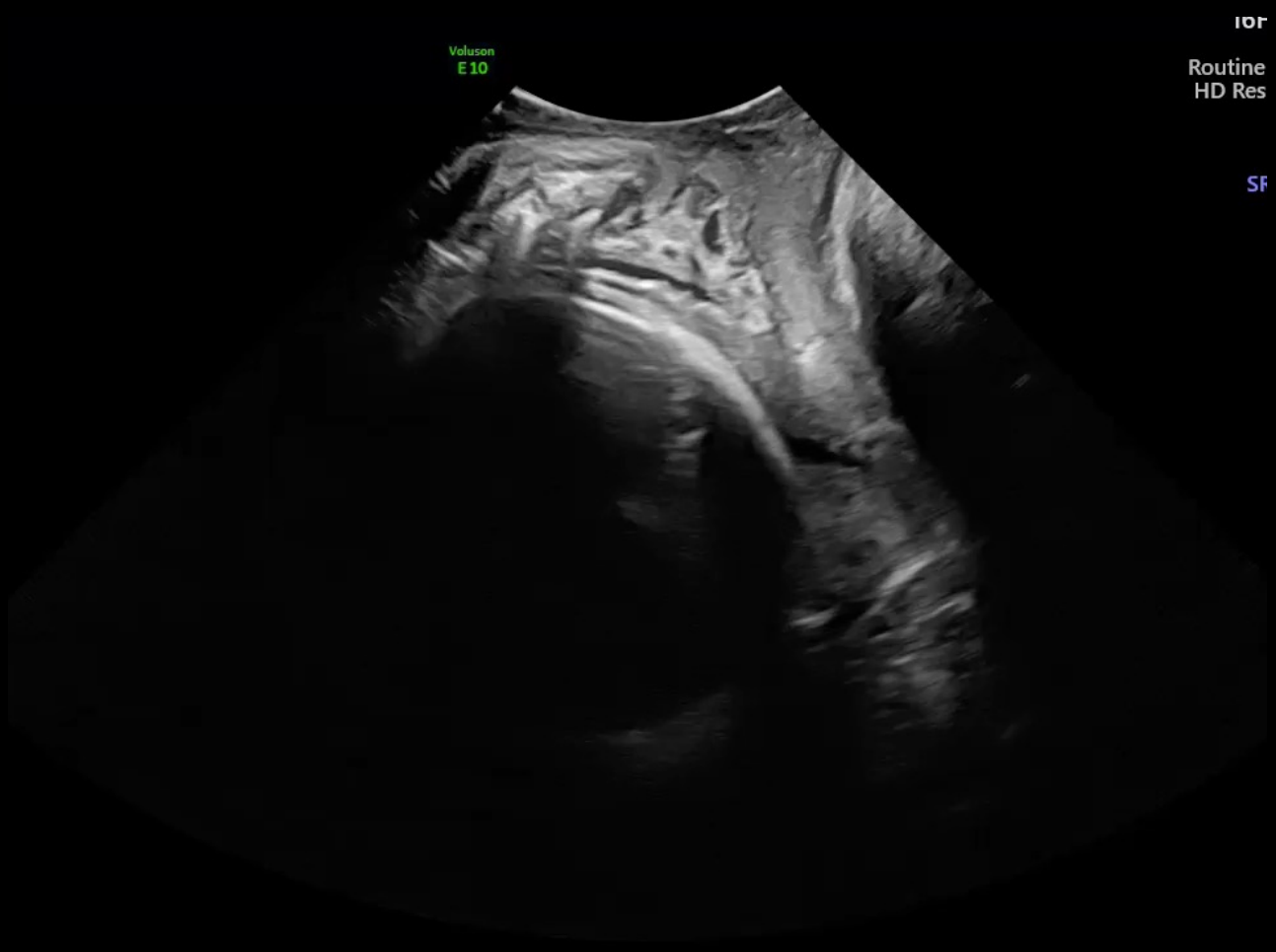
Fetal descent measured with ultrasound



Hjartardottir et al. AJOG 2020

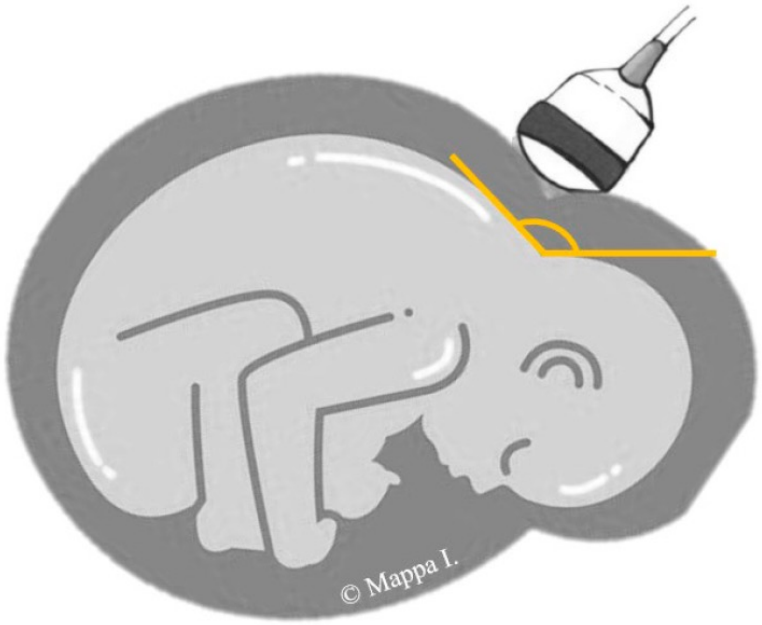
Movement of fetal head

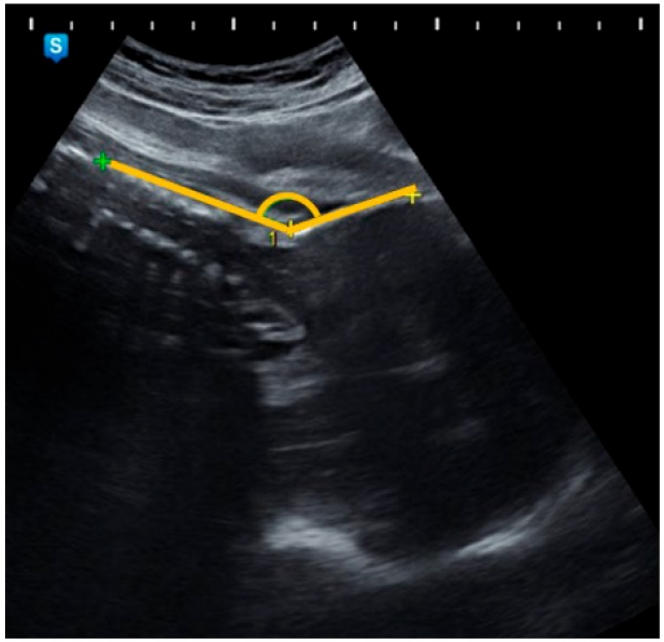
Pushing



Attitude

Occiput spine angle

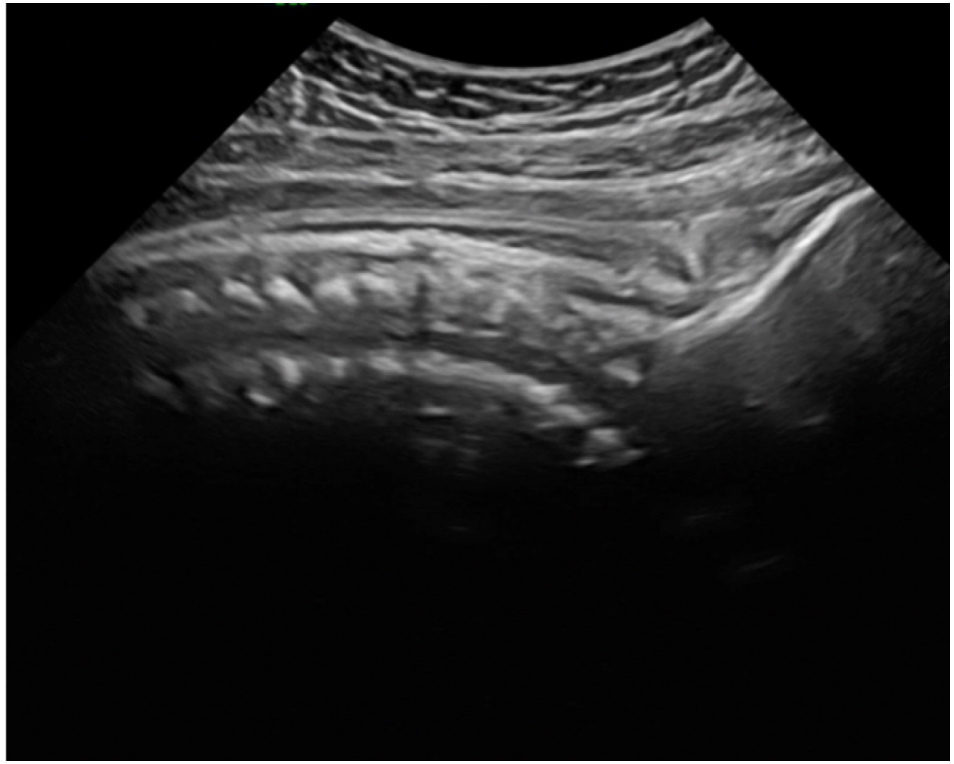




Ghi et al. AJOG 2016

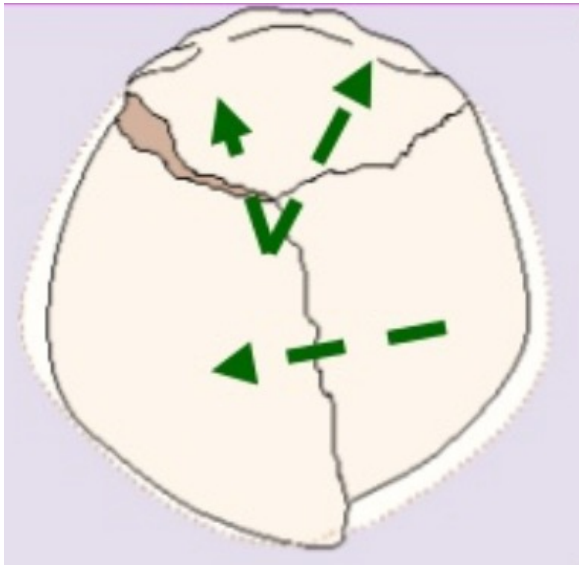
Examples of flexed and deflexed OA in early labour

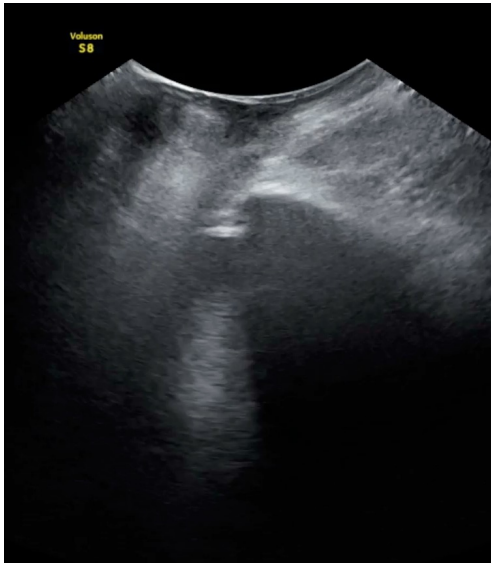
Early labour



Late in labour

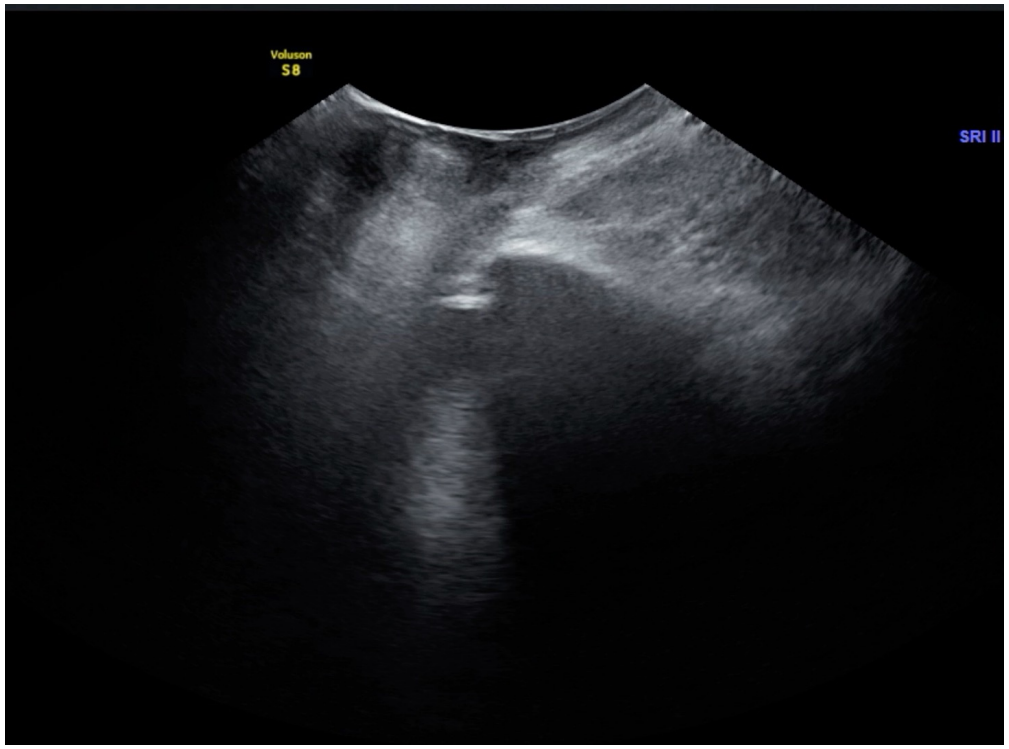
Molding




Voluson
S8


Voluson
S8

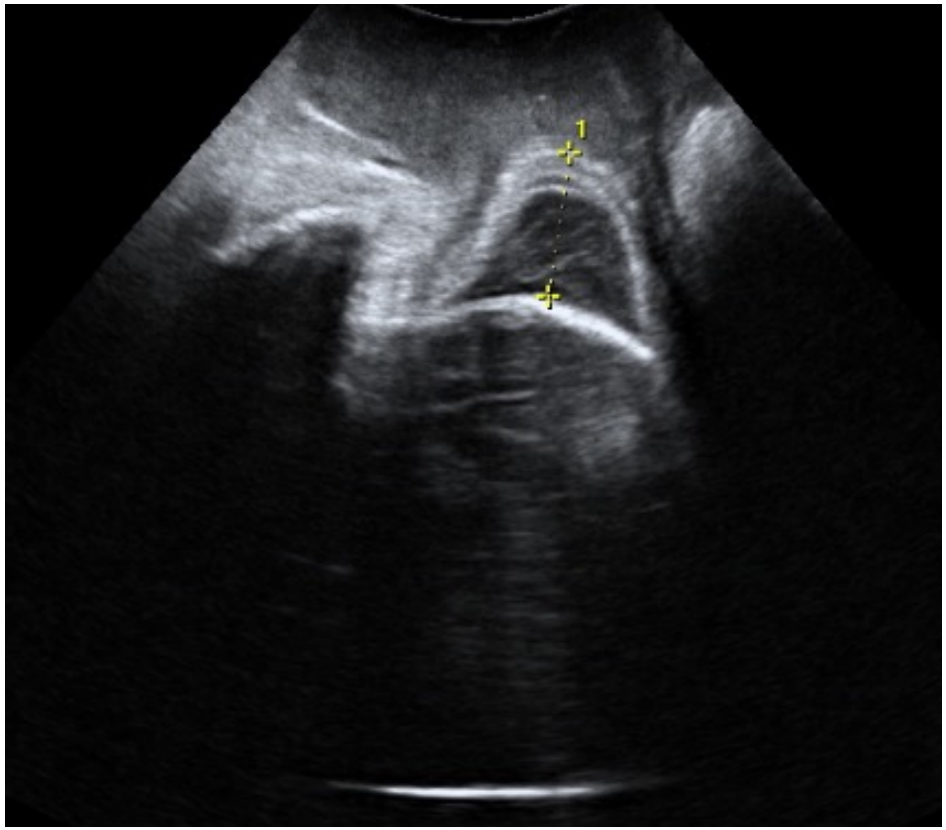
Molding



- Occipito-parietal moulding is common and not associated with difficult operative delivereis

Iversen et al. AJOG 2020

Caput succedaneum



- Caput succedaneum is associated with obstructed labour, but not a contraindication for an operative vaginal delivery

Hassan et al. ANJOG 2015

When?

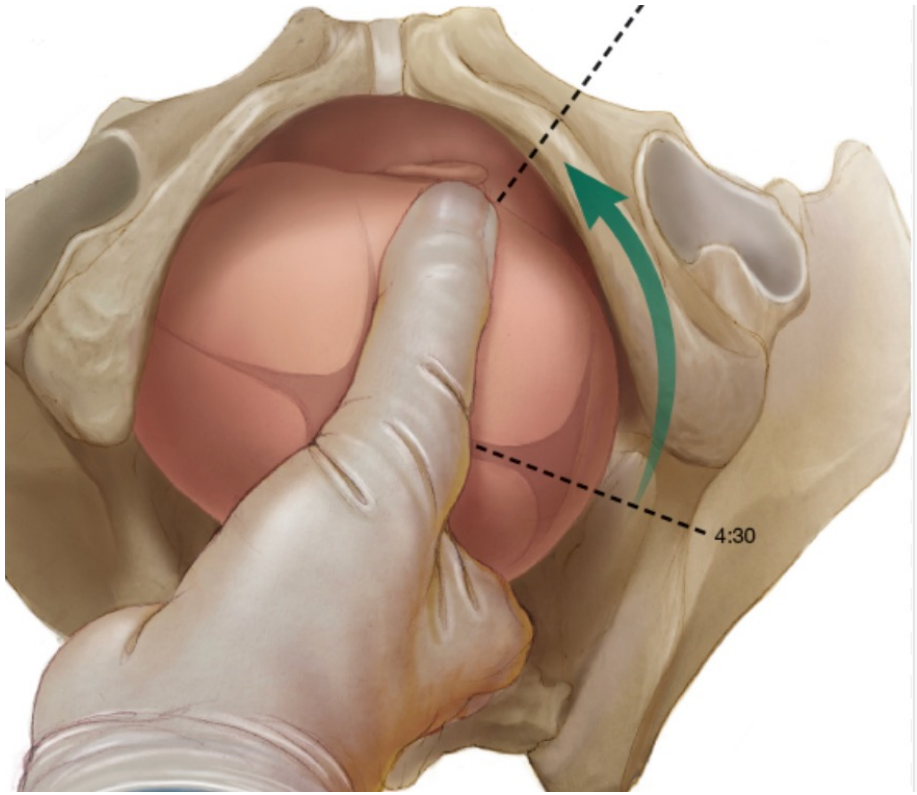
When to scan

- Slow progress or arrest of labor in the first stage
- Slow progress or arrest of labor in the second stage
- Ascertainment of fetal head position and station before considering or performing instrumental vaginal delivery
- Objective assessment of fetal head malpresentation

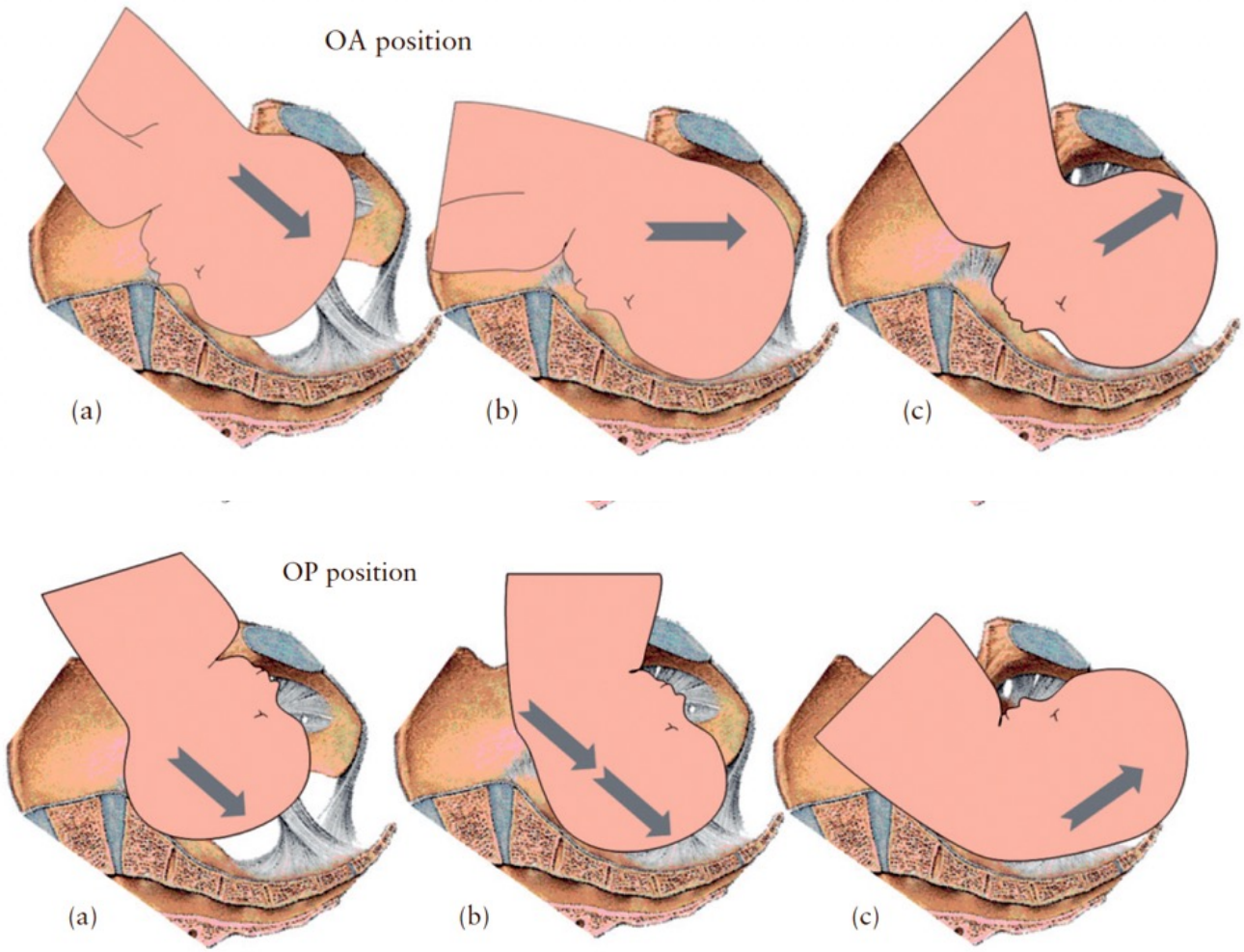
isuog.org GUIDELINES

ISUOG Practice Guidelines: intrapartum ultrasound

Before manual rotation



Mdedge.com
Robert L. Barbier *OBG Manag*. 2019



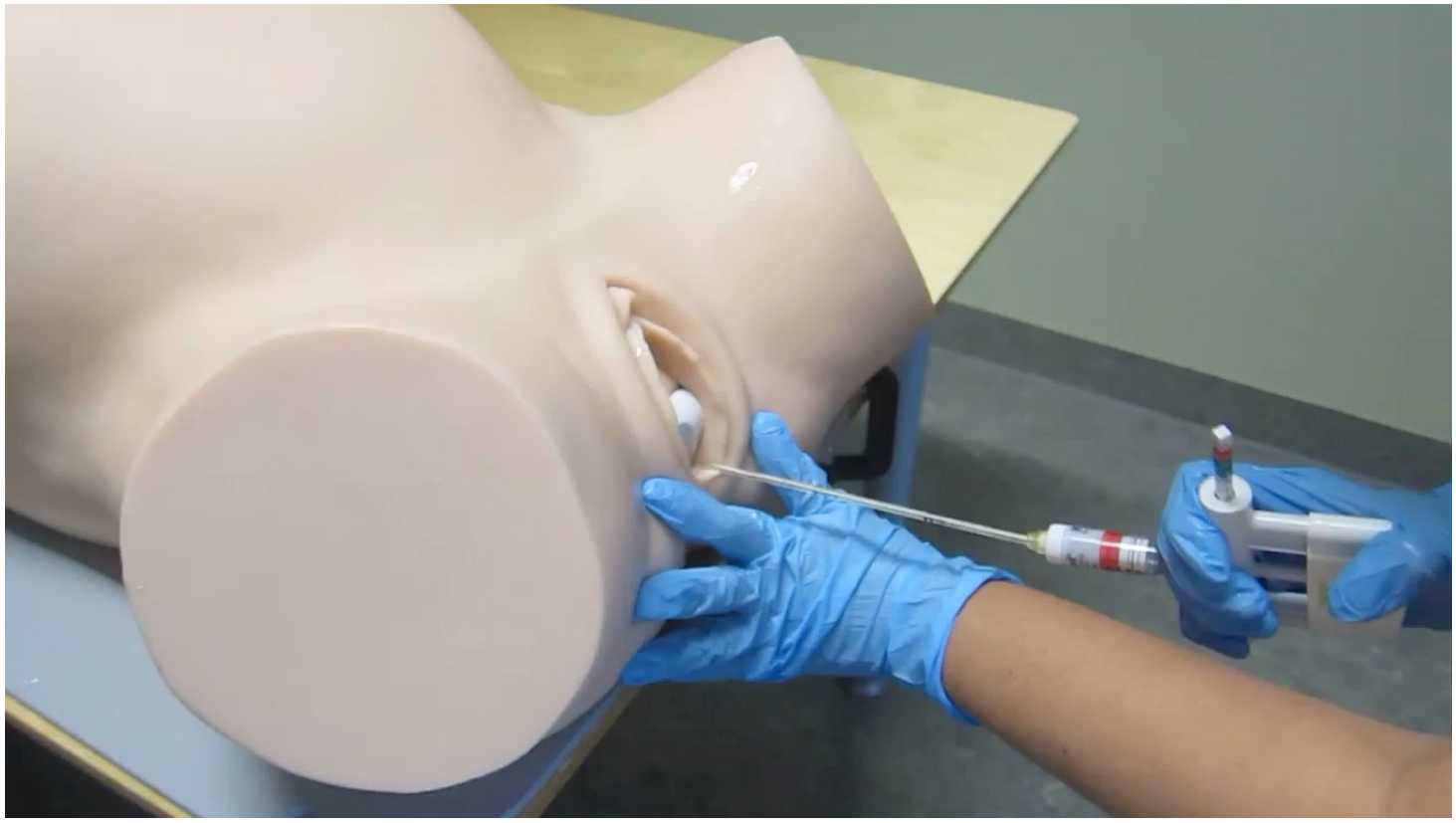
GHI et al. 2014

Head direction

OA

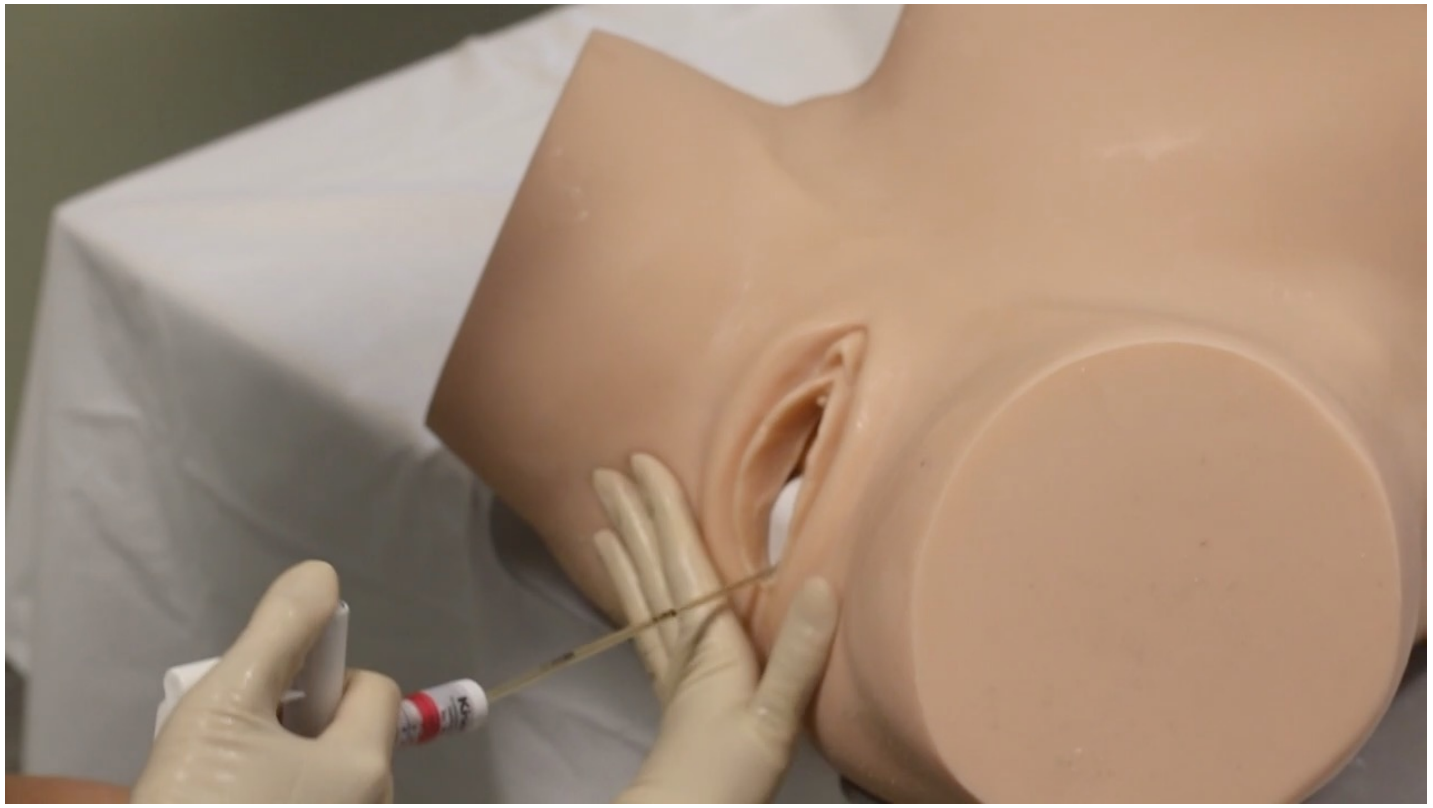
OP

OA position



OP position
(third cardinal movement)

OP position



Conversion table

Clinical station	Angle of progression	Head-perineum distance
0	120	35
+2	140	25

Assisted vaginal birth

- OA position
- Good prognostic signs:
  - Head direction up, AoP >120 degrees, HPD ≤35 mm

- OP positions
- Good prognostic signs:
  - Head direction up, flexed attitude, AoP >140 degrees , HPD ≤25mm

Evidence

RCT's

- In labour we have many inputs and many outcomes
- Complex procedures
- RCT have a yes/no answer
- 94% probability means "no"
- The conclusion of an underpowered RCT should not be "no" but "we don't know"
- Underpowered RCT's may hide the truth

- Why are doctors so interested in looking for fetal abnormalities, but not interested in what's going on during labour?

An RCT was not necessary to convince me that a parachute was a good idea

Ultrasound benefits

Instrumental delivery and ultrasound : a multicentre randomised controlled trial of ultrasound assessment of the fetal head position versus standard care as an approach to prevent morbidity at instrumental delivery

M Ramphul,[a] PV Ooi,[b] G Burke,[c] MM Kennelly,[d] SAT Said,[b] AA Montgomery,[e] DJ Murphy[a]

The primary outcome measure was incorrect diagnosis of the fetal head position

An ultrasound assessment prior to instrumental delivery **reduced the incidence of incorrect diagnosis** of the fetal head position without delaying delivery

Clinical examinations and infections

American Journal of Obstetrics & Gynecology MFM
Volume 5, Issue 2, February 2023, 100817

Original Research

Assessment of labor progress by ultrasound vs manual examination: a randomized controlled trial

Maya Oberman MD, Inbal Avrahami MD, Noa Lavi Shoseyov MD, Amir Kandel MD, Alon Ben-Arie MD, Miri Sacagiu MD, Edi Vaisbuch MD, MBA *, Roni Levy MD *

- When compared with the control group, the ultrasound group had
- **Significantly lower rates of intrapartum fever**
  - (11.1% vs. 26.1%; *P*=.01)
- **Clinical chorioamnionitis**
  - (3.3% vs 16.5%; *P*>.01)
- **Histologic chorioamnionitis**
  - (2.2% vs 9.8%; *P*=.03)

Women prefer ultrasound

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ORIGINAL ARTICLE

Is intrapartum translabial ultrasound examination painless?

Ying Tze Viola Chan[1], Kwun Sin Vivian Ng[1], Wai Kuen Yung[1], Tsz Kin Lo[2], Wai Lam Lau[1], and Wing Cheong Leung[1]

[1]Department of Obstetrics and Gynecology, Kwong Wah Hospital, Kowloon, Hong Kong and [2]Department of Obstetrics and Gynecology, Princess Margaret Hospital, Hong Kong

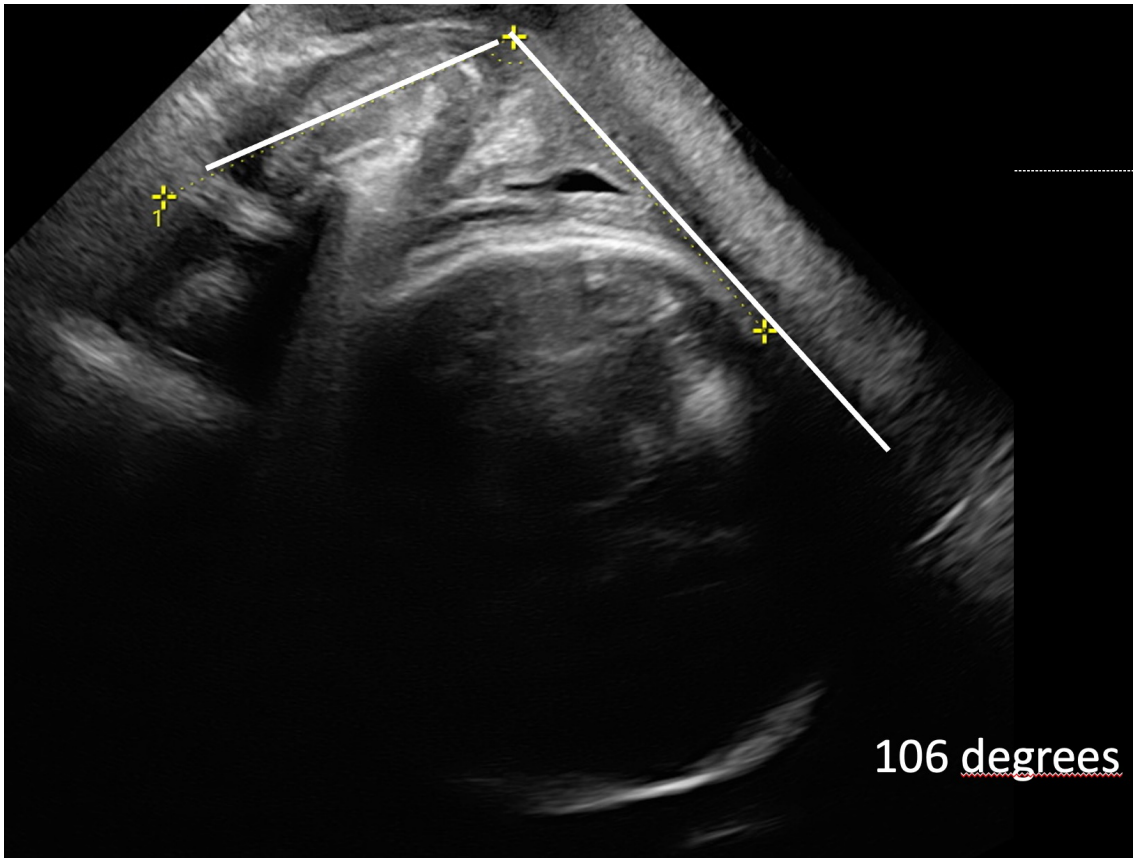
- The median pain score for transperineal ultrasound was 0 (range 0–8), while that for vaginal examination was 4.5 (range 0–10)

Biofeedback

- The midwife and the delivering woman should see the screen
- Effective pushing
- Reduction in the duration of the second stage
- Reduction in perineal tears

Gilboa et al. UOG 2018

Images can be stored



Objective documentations in case of litigation

Use ultrasound to train your clinical skills

THE JOURNAL OF MATERNAL-FETAL & NEONATAL MEDICINE
https://doi.org/10.1080/14767058.2019.1651283

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ORIGINAL ARTICLE

Structured clinical examinations in labor: rekindling the craft of obstetrics

Johanne Kolvik Iversen[a,b], Anne Flem Jacobsen[a,b], Thea Falkenberg Mikkelsen[a] and Torbjørn Moe Eggebø[c,d]

Training skills

		Manual assessment			
		OA	LOT	OP	ROT
Ultrasound examination	OA	38	3	0	1
	LOT	3	1	2	0
	OP	0	3	37	0
	ROT	2	0	1	1

Cohen's Kappa 0.72

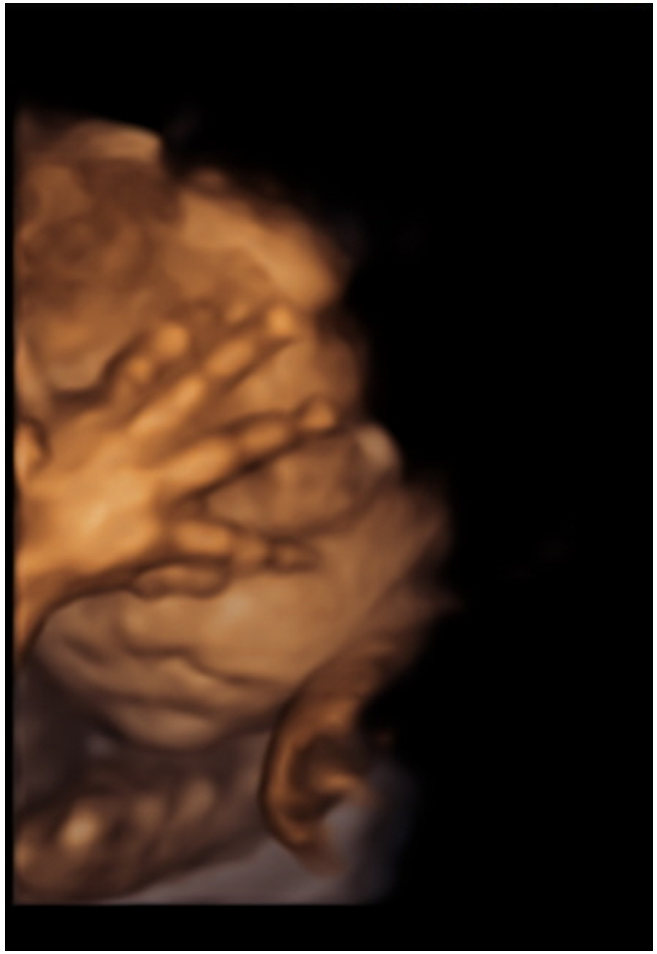
Iversen et al. The Journal of Maternal-Fetal & Neonatal Medicine. 2019

RCT's investigating fetal position

- Ghi et al. UOG 2018
  - No differences between the groups regarding outcome
- Popowski et al. UOG 2015
  - There was a statistically significant increased risk for overall operative delivery and cesarean delivery in the VE+US group
- Barros et al. AOGS 2021
  - No difference in maternal or neonatal outcomes

Benefits in mortality and morbidity not proven in RCT's

- Should we close our eyes?
- If it is better never to know the fetal position



Understanding

The key to good decision making is not knowledge. It is understanding. We are swimming in the former. We are desperately lacking in the latter.

A. Youssef and G. Pilu
Knowledge, understanding and fetal occiputposition. Ultrasound Obstet Gynecol2016;47: 523 – 526

Gladwell M. In Blink: The Power of Thinking Without Thinking. Penguin Books: London, 2006; ***265****.*

Knowledge and understanding

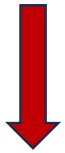
Knowledge is to know that tomato is a fruit

Understanding is not to put tomatos into the fruit salad

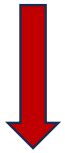
We need knowledge

and

should train how to use the knowledge



better understanding



better outcomes