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TRANSPERINEAL 4D ULTRASOUND IMAGING OF THE LEVATOR ANI DURING LABOUR.

Hypothesis / aims of study

The levator ani muscle has been defined to distend between 25 and 245% during labour (1). When the stretching of the levator hiatus occurs is unknown, it has been postulated that most of this distension occurs during the crowning of the head (2). Transperineal ultrasound imaging of the pelvic floor provides a non invasive investigation method to obtain imaging of the levator ani muscle. This pilot study was designed to enhance our understanding of the adaptation of the levator ani muscle during delivery. Our hypothesis was that stretching of the levator ani already starts during early labor and gradually continues until the crowning of the head.

Study design, materials and methods

Between November and December 2009 17 nulliparous women were included in this study. All women were scheduled for an elective induction of labour at term.

The examination of the levator ani muscle was performed using a GE Kretz Voluson 730 Expert and a Voluson I system, and a RAB 4-8 MHZ probe. Four-dimensional (4D) volume data sets were acquired at rest in the supine position, before delivery (A), during labour < 5 cm dilatation (B), > 5 cm dilatation (C), less then 6 hours after delivery (D), 6 weeks (E) and 3 months (F) after delivery. The percentual change in hiatal area was calculated as (measurement (B, C, D, E or F) – measurement A) / measurement A).

Offline analysis was performed using the software 4D View 9.0. At the plane of the minimal levator hiatus the dimension of the antero-posterior diameter, and left- right transverse diameter as well as the hiatal area were measured (3). For evaluation of levator ani defects TUI imaging was utilised.

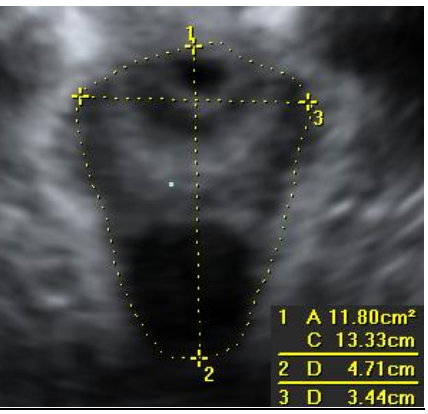
Results

Of the 17 included women, 13 women were eligible for evaluation in this study. Their age varied between 21-41 years, gestational age was between 38 and 41 weeks. The birth weight ranged between 2705 - 4240 gram. Three women delivered by secondary Caesarean section (C/S) (two because of fetal distress, one because of lack of progress in dilation). Ten women delivered vaginally, seven spontaneous, three underwent a vacuum delivery (VD) (one because of fetal distress and two because of lack of progress). In case 7 a 3rd degree anal sphincter injury occurred. Levator defects were diagnosed in four of thirteen cases (31%).

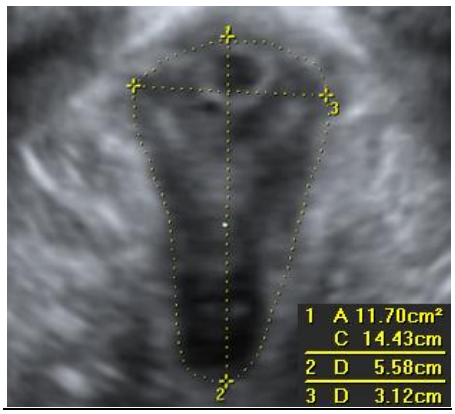
Table 1 Percentual changes of the hiatal area during and after delivery, at rest

CASE	B-A/A	C-A/A	D-A/A	E-A/A	Mode of delivery	Levator Defect
1		12 %	27 %	4 %	Sp	Yes
2	1 %			-7 %	C/S	No
3	13 %		17 %	3 %	Sp	No
4	-5 %			1 %	C/S	No
5		- 12 %	61 %		Sp	No
6	22 %		62 %	-8 %	Sp	Yes
7	22 %	40 %		113 %	VD	Yes
8	12 %			45 %	C/S	No
9	-3 %	7 %			VD	No
10		35 %	83 %	73 %	VD	Yes
11		9 %	25 %	- 4%	Sp	No
12	2 %	43 %	6 %	7 %	Sp	No
13	0 %	25 %	18 %		Sp	No

A: Before delivery; B: < 5 cm dilatation; C: > 5 cm dilatation; D: < 6 hours after delivery
E: 6 weeks after delivery



A.



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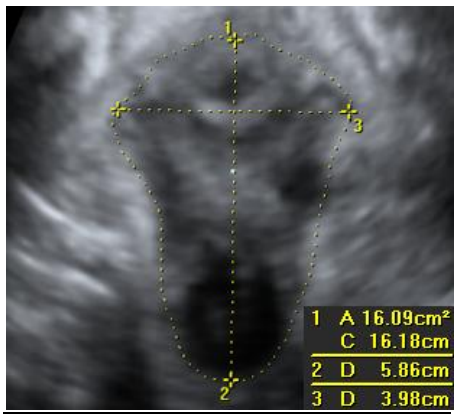

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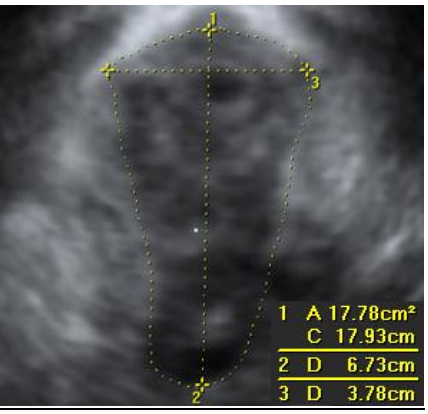

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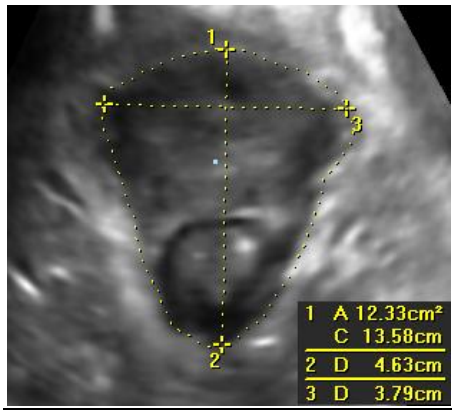

E.

Legends figure 1:

A: Before delivery
B: During delivery< 5cm
C: During delivery > 5cm
D: <6 hours after delivery
E: 6 weeks after delivery

Interpretation of results

This study shows that transperineal ultrasound can be performed during labour for acquiring information on morphological changes of the levator ani muscle. The investigation was well tolerated by the patient.
We found that during labour gradual distension of the levator hiatus occurs, already before crowning of the head of the baby. No statistical analysis was performed on the rate of distension due to the small number of patients included in this study.
It would be interesting to investigate whether these early changes of the levator can predict lack of progress in first or second stage labour. Also, a possible prediction of levator defects by means of these early labour changes needs to be further investigated.

After delivery the increase of the hiatal area in most women was partly reversible, sometimes to a near pre-delivery state. In concordance with previous reported results, in women diagnosed with the combination of a levator defect and an instrumental delivery the levator hiatus did not return to a predelivery state, but in fact, increased dramatically after delivery.

Concluding message

Stretching of the levator ani already starts during early labor and gradually continues until the crowning of the head. After delivery these changes are partly reversible in most women.

References

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Is this a clinical trial?	**Yes**
Is this study registered in a public clinical trials registry?	**No**
Is this a Randomised Controlled Trial (RCT)?	**No**
What were the subjects in the study?	**HUMAN**
Was this study approved by an ethics committee?	**Yes**
Specify Name of Ethics Committee	**Local ethics committee Erasmus Medical Centre, Rotterdam**
Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**