THE EFFECT OF PARTURITION ON ANAL SPHINCTER COMPLEX BY TRANSPERINEAL ULTRASONOGRAPHY (TPUS)

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Abstract

Anatomical and functional integrity of External Anal Sphincter (EAS) and Internal Anal Sphincter (IAS) following uncomplicated vaginal deliveries is a matter of concern and may be a reason for maternal request for Caesarean section. So, in depth studies in this field are warranted.

Objective: In this study on the effect of parturition on anal sphincter complex the primary objective was to measure EAS and IAS thickness by TPUS (Trans Perineal Ultrasonography) to detect any such change.

Secondary objectives were to correlate the changes with risk factors like episiotomy, baby weight, head circumference and duration of second stage of labor and clinically by postpartum anal incontinence scale.

Design: A prospective cohort study , in the Department of Obstetrics & Gynaecology, Medical College Kolkata, July 2015 to June 2016.

Method: 50 primiparaous (P-Group) and 50 multiparous (M-Group) mothers fulfilling the inclusion and exclusion criteria were recruited from the labour room. TPUS was performed before the onset of labour and at 6 weeks . The thickness of EAS & IAS were recorded in all four quadrants. George and Wexner's Postpartum Incontinence Scale was used to assess anal incontinence clinically. Risk factors were recorded for analysis.

Results: 8% of P group developed significant reduction in thickness of both EAS & IAS in 12 o'clock (p= 0.039, & p= 0.012 respectively) position and IAS at 6'o clock position (p=0.031). There was significantly reduced IAS at 12 o'clock position (P= 0.038) in 4% mothers of M group. The % of reduction in EAS and IAS in all four quadrants between the P and M groups was not significant. None of the mothers showed poor anal incontinence score (p=0.42). Big babies as well as long labours also contributed to reduced EAS and IAS at 12 o' clock position.

Conclusions: Occult anal sphincter defects both in the EAS and IAS especially at 6 o' clock and 12 o' clock following uncomplicated vaginal deliveries do not cause any subjective fecal incontinence. So, the fear of leaking stools following any vaginal delivery is to be discouraged and routine postpartum anal sphincter evaluation is not necessary.

Introduction & Objectives

Introduction: Clinically, anal sphincter tears are detected in 0.36–8.4% of all deliveries[1,2], it is especially high among primiparous women with rates varying from 11.5% to 35.4% [3-6]. Such high prevalence warrants in depth studies on the effect of normal delivery on anorectal sphincter complex.

Transperineal ultrasound (TPUS) using the transvaginal (TVS) probe is the latest non-invasive, cheap, patient friendly and easy to perform imaging technique available to assess the anal sphincter complex both EAS & IAS. TPUS images the anal sphincter complex under more physiological condition without intra anal probe.

So in this study we envisaged to image anatomical changes in EAS and IAS following uncomplicated vaginal deliveries by TPUS and correlate them with risk factors of perineal damage as well as with functional derangements of the anal sphincter i.e fecal incontinence.

Objectives: The Primary Objective was to assess anal sphincter complex (EAS and IAS) postpartum with TPUS following uncomplicated vaginal delivery.

Secondary Objectives were to correlate the sphincter changes if any with risk factors - episiotomy, baby weight, head circumference and duration of second stage of labor and to correlate clinically by postpartum anal incontinence scale (George & Wexner)

Materials & Methods

STUDY DESIGN: Prospective cohort study in the Department of Obstetrics & Gynaecology, Medical College Kolkata (1st July 2015-30th June 2016)

STUDY POPULATION: 50 primiparaous (P-Group) and 50 multiparous (M-Group) mothers fulfilling the inclusion and exclusion criteria were recruited from the labour room

- **Inclusion criteria**: singleton pregnancy, cephalic presentation, gestational age ≥ 37+6wks
- **Exclusion criteria**: medical, surgical or obstetric complications, pre-existent anal sphincter injury, previous anal surgery or undergoing instrumental vaginal delivery and perineal tear.

STUDY METHOD:

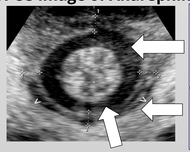
- Proper counselling, informed consent, patient history, clinical examination was done.
- TPUS was performed by Philips Clear Vue 550 machine using a TV transducer in dorsal position with partially abducted, semi-flexed legs, the probe positioned on midperineum, oriented backward at a 45-degree angle to get transverse images of anal canal.
- Thickness of EAS & IAS were measured in four quadrants 12, 3, 6, 9 o'clock positions
- Twice, once before onset of labour and once more at 6 weeks postpartum.
- Duration of 2nd stage of labour,interventions, episiotomy birth weight and head circumference were recorded.
- Postpartum (6weeks) incontinence was assessed by George & Wexner scale – (Table 1)

Table 1: George & Wexner scale- Cutoff score 6

Symptom	0-Never	1-Rarely <1/m	2-sometimes 1/wk-1/m	3-usually 1/d-1/wk	4-always >1/d
Flatus					
Liquid stool					
Solid stool					
Wears a pad					
Fecal urgency (5 mins)					

MEASUREMENTS: (Fig 1)

TPUS image of Anal sphincter complex



Internal Anal Sphincter (IAS)- approximately 3-mm thick hypoechoic inner black band surrounding the more echogenic rectal mucosa

External Anal Sphincter (EAS)- 5mm thick - >mixed echogenicity, deficient posteriorly & superiorly

A round hyperechoic (intersphincteral space) between IAS & EAS.

Changes in thickness of all the four quadrants [Antenatal (ANC) vs Postnatal (PNC)] were measured according to following formula.

External Sphincter % reduction = ANC – PNC/ANC x 100

Internal Sphincter % reduction = ANC – PNC/ANC x 100

STATISTICAL METHODS:

In order to detect a change of 20% in sphincter thickness, with a power of 80% and α=0.05 sample size was calculated as 50. So we took 50 in each P and M group. The two groups were compared using Student t –test or Chi –square test as necessary by Statistical software SPSS version 20

Results

A total of 134 pregnant mothers were recruited. Amongst them 13 mothers developed labor complications (like instrumental deliveries or underwent Caesarean Section, and 21 mothers were lost to follow up. The remaining 50 primiparous and 50 multiparous mothers were finally included.

The baseline parameters in both the groups were comparable (Table 2)

Table 2: Baseline Parameters

Parameters Mean (SD)	P (n=50)	M (n=50)	P value
AGE (Yrs)	21.64 (2.6)	22.72 (2.34)	0.48
POG (Weeks))	39.3 (0.85)	38.9 (0.86)	0.98
DURATION OF 2ND STAGE (Hours)	1.86 (0.39)	0.44 (0.08)	1.95
BIRTH WEIGHT (KG)	2.51 (0.37)	2.4 (0.36)	0.81
HEAD CIRCUMFERENCE (CM)	32.14 (1.53)	32.34 (1.52)	0.98
EAS at 12 O' CLOCK (MM)	4.43 (0.45)	4.51 (0.39)	0.31
EAS at 3 O'CLOCK (MM)	3.83 (0.431)	3.88 (0.396)	0.55
EAS at 6 O'CLOCK (MM)	4.058 (0.57)	4.09 (0.469)	0.17
EAS at 9 O'CLOCK (MM)	3.73 (0.439)	3.77 (0.397)	0.49
IAS at 12 O' CLOCK (MM)	2.896 (0.13)	2.846 (0.10)	0.16
IAS at 3 O'CLOCK (MM)	2.496 (0.19)	2.468 (0.20)	0.59
IAS at 6 O'CLOCK (MM)	2.658 (0.18)	2.61 (0.184)	0.80
IAS at 9 O'CLOCK (MM)	2.45 (0.21)	2.44 (0.22)	0.67

Table:3 The summary of all measurements

	P Group (n=50)				M Group (n=50)			
Position	AN -Mm Mean (SD)	PN - Mm Mean (SD)	Δ change	p Value	AN - Mm Mean (SD)	PN - Mm Mean (SD)	Δ change	p Value
External Anal Sphincter (EAS)								
12 O' CLOCK	4.43 (0.45)	4.37 (0.44)	1.18 (3.81)	0.04	4.51 (0.39)	4.48 (0.39)	0.56 (2.05)	0.06
3 O' CLOCK	3.83 (0.43)	3.82 (0.44)	0.26 (1.81)	0.32	3.88 (0.4)	3.88 (0.4)	0 (0)	NA
6 O' CLOCK	4.06 (0.57)	4.02 (0.5)	0.4 (5.99)	0.25	4.09 (0.47)	4.08 (0.47)	0.23 (0.97)	0.09
9 O' CLOCK	3.73 (0.44)	3.72 (0.44)	0.18 (0.9)	0.18	3.77 (0.4)	3.77 (0.4)	0.1 (0.73)	NA
Internal Anal Sphincter (IAS)								
12 O' CLOCK	2.9 (0.13)	2.84 (0.2)	1.82 (4.96)	0.01	2.85 (0.16)	2.83 (0.18)	0.66 (2.17)	0.04
3 O' CLOCK	2.5 (0.19)	2.49 (0.2)	0.33 (2.36)	0.32	2.47 (0.2)	2.47 (0.2)	0 (0)	NA
6 O' CLOCK	2.66 (0.18)	2.63 (0.21)	1.23 (3.94)	0.03	2.61 (0.18)	2.61 (0.19)	0.32 (1.36)	0.10
9 O' CLOCK	2.45 (0.21)	2.44 (0.21)	0.24 (1.31)	0.18	2.44 (0.22)	2.44 (0.22)	0 (0)	NA

Incidence of occult tears in this study was 6%.

Four of the fifty P group mothers (8 %) had significant reduction in both EAS and IAS at 12o'clock position.

2 out of 50 (4%) in M-Group had both EAS and IAS significantly reduced at 12 o' clock and 6 o' clock position

% change in sphincter thickness between P and M groups was not significant.

All P group mothers required mediolateral episiotomy, whereas M group delivered without any episiotomy or tear. Sphincter thickness reduction between the P and M group was not significant statistically. So, episiotomy has no effect on sphincters.

When duration of 2nd stage of labor was > 2hour there was statistically significant reduction at only 12 o'clock (EAS - p=0.004, IAS-p=0.041) and 6 o' clock positon (EAS-p = 0.025, IAS- p=0.016) in P group, & no significant change in M group (>1 hr)

In deliveries of big babies- birth weight >3kg and head circumference >35 to 36cm , in the P group there was significant reduction in EAS & IAS in all points . In M group there was significant reduction in EAS in 12'o clock & 9'o clock & also in IAS in 12'o clock & 6'oclock.

8% from P group and 14% from M group developed frequent complaints of flatus incontinence (one / day- one /week) with George and Wexner Postpartum incontinence scale of 4.

2% M group mother had rare (once/ month) incontinence of liquid stool along with flatus incontinence having a total score of 4.

So by definition i.e. cut off of 6, there was no fecal incontinence in our patients (p value 0.42)

Discussion

The results of our study show 8% occult sphincter damage in our P group comparable to the study of Valsky et al (7.9%)[4] but lower than Sultan *et al.*[5] -35% , Oberwalder *et al.*[6] - 26.9% , and Rooplekha C. et al [7] - 15%, This may be may be because ours and that of Valsky excluded mothers having grade III or IV perineal tears while the others included them.

Both Valsky et al and Rooplekha C. et al. , showed significant reduction in both EAS & IAS at 12o'clock position as is consistent with the results of our study. They also showed the % reduction in IAS was statistically significant at 12 and 6 o clock positions and external sphincter at 12 o clock position in babies having birth weight >3kg just like us.

IAS, under autonomic control contributes 70% to resting anal sphincter complex tone (REF), EAS mainly serves to maintain voluntary continence. Damage of IAS is much more predictive of severe fecal incontinence symptoms than damage to EAS.

In our study the minimal reduction of IAS thickness at 12 o'clock position as well as a statistically significant reduction of EAS thickness at 12 and 6 o' clock positions did not cause any major alteration in the postpartum incontinence scale (George and Wexner).

The limitations of our study included short duration and assessment of sphincter complex by TPUS which can only image the lower portion, so changes in upper and middle levels were not measured.

Strengths of our study were an adequate power (>80%) designed to detect the occult sphincter defect in uncomplicated vaginal delivery unlike other previous studies that included mothers with delivery complications . Moreover, TPUS use was very easy and acceptable to mothers. No other studies have compared the relationship of birth weight ,head circumference of baby and 2nd stage of labour with occult anal sphincter defect in various quadrants.

Conclusion

In uncomplicated vaginal delivery, there may be occult anal sphincter defects both in EAS (12o'clock & 6o'clock position) & IAS (6o'clock position) without any fecal incontinence. They are more in deliveries of big babies (>3kg, HC >35cm) and long labours. However, there is no difference between the primiparous and multiparous mothers. So no need to worry about feacal leaks as a sequlae of vaginal deliveries and routine postpartum sphincter assessment need not be practised.

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