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Original Article

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# Detection of Occult Anal Sphincter Injuries in Primipara by 2D Transperineal Ultrasound and its Clinical Association: A Cohort Study

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## ABSTRACT

**Introduction:** Endoanal Ultrasound (EAUS), the gold standard for the detection of occult Obstetric Anal Sphincter Injuries (OASI) has limited clinical application due to its intrusiveness and need for specialised equipment and personnel. A 2D Transperineal Ultrasound (TPU) is simple, non invasive and shows a high degree of agreement with EAUS. Few studies have evaluated the use of 2D TPU in determining the incidence and clinical outcomes of occult OASI in primigravida.

**Aim:** To study the incidence, risk factors, and clinical outcome of occult obstetric anal sphincter injury using 2D TPU in primigravida.

**Materials and Methods:** The present cohort study was conducted in the Department of Obstetrics and Gynaecology in collaboration with the Department of Radiology at Guru Teg Bahadur Hospital, Delhi, India, from November 2018 to April 2020. A total of 200 low risk primigravida ≥36 weeks period of gestation underwent baseline TPU of the anal sphincter complex antenatally and on day 2 postpartum. On the basis of difference between pre and postdelivery measurements, they were divided into group I (n=91): women with occult OASI {(diagnosed as thinning of the internal and External Anal Sphincter (EAS), interruption in the anal sphincter, alteration in mucosa and half-moon sign)} and group II (n=109): no OASI. Group I was followed at two and six weeks postpartum with TPU and clinical tests were applied at six weeks to assess clinical outcomes of sphincter injury. Data was analysed using Chi-square test/Fisher's-exact test for qualitative parameters, Analysis of Variance (ANOVA) for comparison of predelivery and postpartum measurements; and multiple logistic regression for determining sphincter injury determinants.

**Results:** Incidence of occult OASI was 91/200 (45.5%). Significant risk factors for OASI were lower baseline thickness of anal sphincter, position of baby (p=0.028), longer duration of second stage of labour (p<0.001), greater length and angle of episiotomy (p<0.001) and greater baby weight (p=0.042). Group I had significantly lower pelvic floor muscle strength testing score (p<0.001), Digital Rectal Examination Scoring System (DRESS) resting (p=0.013) and squeeze scores (p=0.008), weaker muscle contraction (p<0.001), reduced anal sphincter tone, and was more clinically symptomatic at six weeks postpartum.

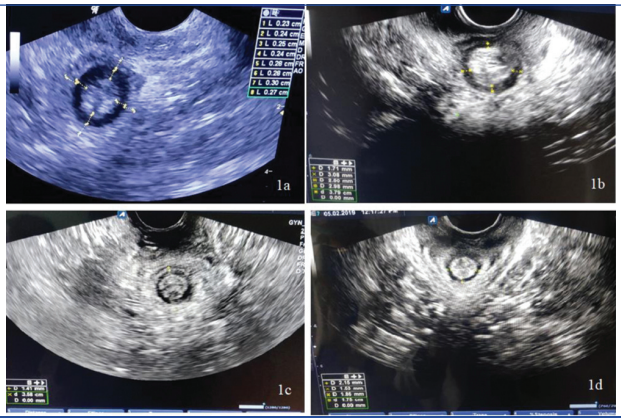
**Conclusion:** The technique of 2D TPU is simple and feasible to detect OASI. Women, who sustain OASI, can be followed-up in perineal clinic more meticulously, using TPU for pelvic floor rehabilitation.


**Keywords:** Delivery, Episiotomy, Incontinence, Pelvic floor

## INTRODUCTION

Perineal injuries are extremely common during childbirth. Occult injuries to the anal sphincter, which are often not recognisable, on routine clinical examination, can be seen in as many as 35-41% of primiparous women undergoing vaginal birth, of which about 5% manifest clinically [1,2]. These injuries can have late onset consequences like faecal incontinence, flatulence, dyspareunia, etc., and affects every aspect of a woman's life. An inadequate repair after delivery, increases the chances of further damage during subsequent deliveries [3]. Hence, early recognition and prompt management strategies are essential to achieve effective functional outcomes. Clinical examination is often not sufficient to detect occult injuries immediately after delivery and the reported range of missed tears ranges from 26-87% [4]. This warrants the use of ultrasonographic techniques for early detection and subsequent monitoring of women, who sustain anal sphincter injuries during childbirth.

The EAUS is considered the gold standard technique for the assessment of anal sphincter complex [5-7]. However, the limited availability of equipment and trained personnel, the invasive nature of the technique, and discomfort to the patient, particularly in immediate postpartum preclude its routine use. The insertion of the ultrasound probe into the anal canal may distort the normal anatomy, precluding dynamic evaluation of the anal sphincter and mucosa on sphincter contraction, which seems to enhance the definition of the muscular defect [8]. The technique of TPU for the study of the anal canal dates back to 1997 but, its use in evaluation of OASI has been under evaluation for a decade or so [Table/Fig-1]. The technique shows a high degree of agreement with clinical examination [9] and EAUS [10] for determining the degree of perineal tear after vaginal delivery. The positive and negative predictive value of TPU for OASIs has been estimated to be 91% and 99%, respectively [11] The measurements




**[Table/Fig-1]:** A 2D Transperineal Ultrasound (TPU) image showing: a) Measurement of thickness of anal sphincter at four quadrants; b) Disruption of sphincter continuity; c) Abnormality in the star shaped mucosal fold; d) Half moon sign.

of the anal sphincter obtained using this technique are reproducible and show high interobserver reliability [12,13]. Given its non invasive nature, ready availability of low cost transducers, and better patient acceptability, TPU appears promising in detecting occult anal injury [8,14-16].

Most studies on the utility of TPU in the detection and follow-up of OASI have focussed on 3D and 4D imaging, which allow extensive evaluation along the entire length and breadth of the anal sphincter. However, the availability of these techniques is still limited especially in the Indian scenario. The more readily available transabdominal and transvaginal probes have also been studied in this regard. Ozyurt S et al., screened 201 primigravid women for occult OASI after vaginal delivery and found occult tears in 11.5% of cases. After two months, mild to moderate incontinence (Wexner continence scale) was found in 34.8% of women with occult OASI [1]. Timor-Tritsch IE et al., also demonstrated the successful use of transvaginal probes in TPU in the detection of occult OASI to the extent of comparing the quality of imaging to that of Magnetic Resonance Imaging (MRI) [17]. Despite this, evidence to date on the use of transvaginal probes for 2D TPU is limited; none in the Indian context. Also, data correlating the findings of 2D TPU with clinical outcomes is sparse. This was a cohort study to determine the risk factors and clinical outcomes of occult anal sphincter injury by 2D TPU using transvaginal probe in primiparous women undergoing vaginal delivery in the Indian scenario.

## MATERIALS AND METHODS

The present cohort study was conducted in the Department of Obstetrics and Gynaecology in collaboration with the Department of Radiology at Guru Teg Bahadur Hospital, Delhi, India, from November 2018 to April 2020. The present study was performed in line with the principles of the declaration of Helsinki. Approval was granted by the Institutional Ethical Committee for human research (Dated 26.10.2018/No 36).

**Inclusion criteria:** Low risk primigravida who underwent vaginal delivery at term were included in the study.

**Exclusion criteria:** Elderly primigravida (>35 years), women with multifoetal pregnancy, medical disorders such as diabetes, hypertension, cardiac disorders, women who underwent preterm vaginal delivery, still birth and women who suffered third and fourth degree perineal tear were excluded from the study.

### Study Procedure

Primigravida at or beyond 36 weeks gestation, who attended the outpatient antenatal clinic in the Department of Obstetrics and Gynaecology at the tertiary care centre were evaluated after obtaining informed and written consent. Antenatal care and delivery were done as per hospital protocol. Socioeconomic status was assessed using Modified Kuppuswamy Scale Consumer Pricing Index 2018 [18].

**Antepartum:** Patients underwent baseline 2D TPU using a transvaginal probe (7 MHz). It was covered with lubricated condom and kept at 90° on the posterior fourchette and the following structures were visualised:

- Fold of rectal mucosa in the shape of a star.
- Hypoechoic concentric ring of the Internal Anal Sphincter (IAS).
- Hyperechoic ring of the EAS.
- Levator ani appearing as a hammock

Internal and EAS thickness were measured in four quadrants.

**Intrapartum:** Details of labour patients who underwent vaginal delivery in labour room, were recorded in World Health Organisation (WHO) partogram. Parameters such as details of foetal position and presentation, spontaneous or induced labour, episiotomy angle, and baby weight were noted.

**Postpartum:** On day 2 postpartum the subjects underwent a repeat scan after the application of 2% lignocaine jelly at local site. The thickness of the external and IAS was measured in four quadrants and the difference between pre and postdelivery values were used to detect thinning of the sphincter.

On the basis of the difference between predelivery and postdelivery measurements, the participants were divided into group I (OASI) (defined as thinning of the internal and EAS, interruption in the internal and EAS, alteration in star shaped mucosal fold and half moon sign) and Group II (no OASI). As the literature doesn't give any cut-off value for sphincter thickness to define OASI, thinning of more than 0.05 mm on day 2 of postpartum was taken as cases and less than or equal to 0.05 mm as control as it was the median value of 200 subjects. Ultrasound was again repeated for group I at two and six weeks postpartum to follow-up sphincter injury. Furthermore, these subjects were examined at six weeks postpartum in the postnatal clinic and were assessed using the following scores:

- **Pelvic Floor Distress Inventory 20 (PFDI20) [19]:** It is a composite score of three parameters:
  - Pelvic Organ Prolapse Distress Inventory 6 (POPDI-6)
  - Colorectal Anal Distress Inventory 8 (CRAD-8)
  - Urinary Distress Inventory 6 (UDI-6)

  Of the 20 questions in PFDI 20 form, each question response has a yes or no as a potential answers. No response corresponds to a score of 0. If patients answers yes then the response will be based on an ordinal range from 1 to 4 in terms of the bother and severity of the symptoms: 1=not at all; 2=somewhat; 3=moderately; 4=quite a bit.
- **Pelvic floor muscle strength testing (oxford grading) [20]:** The examination was carried out after emptying the bladder in the dorsal position, with the knees semi flexed. Patients were requested to contract the muscles of the pelvic floor lifting up inside, closing of introitus and drawing the anus in and the perineum and labia were observed for any visible contraction, followed by palpation of the vaginal wall with two fingers. A score from 0-5 was given according to the validated Oxford Scale.
- **Digital Rectal Examination (DRE) scoring system [21]:** During DRE separate number was assigned to Resting Pressure (RP) and to maximal Squeeze Pressure (SQ). A score of 3 is normal; a resting score of 5 indicates very high pressures and a tight anal canal, whereas, a score of 0 denotes an open or patulous anal canal at rest with separation of the buttocks. A squeeze score of 5 indicates a very strong squeeze, almost painful to the examiner, while a score of 0 denotes no discernible increase in pressure from rest with maximal patient effort.

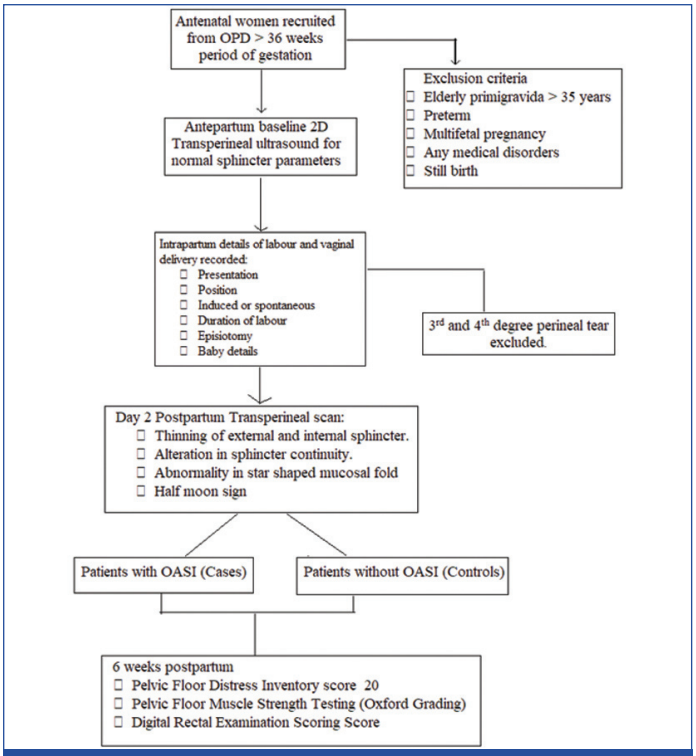
Routine pelvic exercises were offered to all women. Study methodology is detailed in the flowchart [Table/Fig-2].

## STATISTICAL ANALYSIS

Data was analysed using Statistical Package for Social Sciences (SPSS) version 20. All the qualitative parameters were analysed by Pearson's Chi-square test and quantitative parameters using repeated Student's t-test for comparison between two groups and ANOVA for ≥2 groups comparison. Friedman test was applied for comparison of serial measurements of anal sphincter thickness. Multiple logistic regression analysis was used to detect sphincter injury determinants. The p-value of <0.05 was considered significant.

## RESULTS

The two groups were comparable with respect to age, Body Mass Index (BMI), educational and socioeconomic status [Table/Fig-3]. On review of antenatal sphincter dimensions when the two groups were defined it was observed that during pregnancy mean EAS




**[Table/Fig-2]:** Methodology flowchart.

thickness was significantly less in cases as compared to controls at 12'o clock and 6'o clock position. Whereas, IAS at all four positions i.e. 12, 3, 6, 9'o clock position the thickness was significantly less in cases as compared controls [Table/Fig-4].

| Parameters | | Group I (case) n=91 | Group II (control) n=109 | p-value |
|---|---|---|---|---|
| Age (years) | | 23.86±3.34 | 24.71±3.75 | 0.096 |
| Socioeconomic status | Upper middle | 13 (14.3%) | 7 (6.4%) | 0.089 |
| | Lower middle | 59 (64.8%) | 74 (67.9%) | |
| | Upper lower | 19 (20.9%) | 24 (22%) | |
| | Lower | 0 | 4 (3.7%) | |
| Education | Primary | 12 (13.2%) | 8 (7.3%) | 0.113 |
| | Middle | 14 (15.4%) | 15 (13.8%) | |
| | Secondary | 17 (18.7%) | 31 (28.4%) | |
| | Senior secondary | 36 (39.6%) | 50 (45.9%) | |
| | Graduate | 11 (12.1%) | 5 (4.6%) | |
| | Postgraduate | 1 (1.1%) | 0 | |
| BMI (kg/m$^2$) | | 22.68±0.69 | 22.81±0.52 | 0.081 |

**[Table/Fig-3]:** Comparison of demographic profile in both groups.
Student's t-test; ANOVA; Modified kuppuswamy scale CPI 2018 [17]

| Position (o'clock) | | Group 1 (case)* n=91 | Group 2 (control)* n=109 | p-value |
|---|---|---|---|---|
| External Anal Sphincter (EAS) (mm) | 12 | 1.90±0.51 | 2.24±0.46 | <0.001 |
| | 3 | 2.33±0.50 | 2.29±0.40 | 0.576 |
| | 6 | 2.21±0.49 | 2.27±0.43 | <0.001 |
| | 9 | 2.29±0.50 | 2.30±0.42 | 0.094 |
| Internal Anal Sphincter (IAS) (mm) | 12 | 2.19±0.60 | 2.27±0.44 | 0.017 |
| | 3 | 2.21±0.49 | 2.42±0.39 | <0.001 |
| | 6 | 1.90±0.59 | 2.25±0.49 | <0.001 |
| | 9 | 2.12±0.49 | 2.23±0.54 | <0.001 |

**[Table/Fig-4]:** Comparison of average thickness of anal sphincter in antenatal period in both the groups.
[a]Student's t-test
*Cases and controls were defined retrospectively based on the pre and postdelivery measurements. Sphincter thinning of >0.05 mm on day 2 postpartum was taken as the criteria for cases; and those with sphincter thinning ≤0.05 mm were taken as controls. Value of 0.05 mm was chosen as it was the median value of 200 participants

Comparison of serial thickness of EAS and IAS in group I are shown in [Table/Fig-5]. As compared to baseline thickness of EAS in antenatal period, the EAS became thinner at day 2; however, its thickness remained same subsequently till six weeks, suggesting permanent stretching of muscle fibers. As compared to baseline the IAS became thinner at day 2 postpartum; however, the thickness improved subsequently in all positions, except at 6'o clock position where it reduced further. Apart from thinning, interruption in anal sphincter was observed in 41/91 (45.1%) of cases, half moon sign in 1/91 (1.1%) and alteration in rectal mucosa in 9/91 (9.9%) cases.

| Position (o'clock) | | Antepartum (mm) | At day 2 postpartum (mm) | At 2 weeks (mm) | At 6 weeks (mm) | p-value |
|---|---|---|---|---|---|---|
| External Anal Sphincter (EAS) (mm) | 12 | 1.90±0.51 | 1.75±0.63 | 1.76±0.65 | 1.76±0.63 | 0.154 |
| | 3 | 2.33±0.50 | 2.10±0.82 | 1.84±0.66 | 1.84±0.66 | 0.104 |
| | 6 | 2.21±0.49 | 1.82±0.64 | 1.82±0.65 | 1.82±0.65 | 0.260 |
| | 9 | 2.29±0.50 | 1.82±0.64 | 1.85±0.65 | 1.89±0.65 | 0.104 |
| Internal Anal Sphincter (IAS) (mm) | 12 | 2.19±0.60 | 1.80±0.64 | 1.85±0.60 | 1.84±0.61 | <0.001 |
| | 3 | 2.21±0.49 | 1.91±0.67 | 1.96±0.57 | 1.95±0.56 | <0.001 |
| | 6 | 1.90±0.59 | 1.82±0.65 | 1.70±0.63 | 1.71±0.61 | <0.001 |
| | 9 | 2.12±0.49 | 1.78±0.60 | 1.82±0.58 | 1.81±0.56 | <0.001 |

**[Table/Fig-5]:** Comparison of serial thickness of anal sphincter in group-I.
[a]Friedman test

Logistic regression analysis of risk factors for occult anal sphincter injury is shown in [Table/Fig-6]. The significant risk factors for the occurrence of OASI were length and angle of episiotomy, position of baby, baby weight, duration of the second stage of labour, and instrumental delivery. Various clinical tests that were done and compared between cases and controls at six weeks postpartum are described in [Table/Fig-7]. Mean PFDI 20 scores were similar in cases and controls with no statistical difference. Controls had significantly better pelvic floor muscle strength as compared to

| Parameters | | Group I (case)* n=91 | Group II (control)* n=109 | p-value | Odds ratio (95% CI) |
|---|---|---|---|---|---|
| Induction | Yes | 43 (47.3%) | 51 (46.8%) | 0.657 | 0.948 (0.549-1.638) |
| | No | 48 (52.7%) | 58 (53.2%) | | |
| Duration of second stage of labour (minutes) | | 28.55±14.84 | 22.52±8.15 | <0.001 | 1.047 (1.019-1.076) |
| Position of baby | LOA | 64 (70.3%) | 91 (83.5%) | 0.028 | 2.133 (1.084-4.196) |
| | ROA | 26 (28.6%) | 17 (15.6%) | | |
| | LOP | 1 (1.1%) | 1 (0.9%) | | |
| Baby weight (kg) | | 2.77±0.53 | 2.64±0.35 | 0.042 | 1.94 (1.017-3.706) |
| Instrumental delivery | Yes | 5 (5.5%) | 0 | 0.999 | 0 |
| | No | 86 (94.5%) | 109 (100%) | | |
| Type of instrument | Forceps | 4 (80%) | 0 | 0.025 | 0 |
| | Vacuum | 1 (20%) | 0 | | |
| Episiotomy given | Yes | 88 (96.7%) | 101 (92.7%) | 0.212 | 2.32 (0.6-9.03) |
| | No | 3 (3.3%) | 8 (7.3%) | | |
| Episiotomy angle in degree | | 27.25±9.73 | 33.35±10.93 | <0.001 | 0.944 (0.915-0.973) |
| Episiotomy length (cm) | | 5.30±1.75 | 3.60±1.33 | <0.001 | 2.496 (1.84-3.386) |
| Episiotomy extension | Yes | 2 (2.19%) | 0 | 0.161 | 0.12 (0.01-2.26) |
| | No | 89 (97.8%) | 109 (100%) | | |

**[Table/Fig-6]:** Comparison of labour parameters in both groups.
LOA: Left occiput anterior; ROA: Right occiput anterior; LOP: Left occiput posterior
Multiple Logistic regression analysis
*Cases and controls were defined retrospectively based on the pre and postdelivery measurements

controls at six weeks postpartum. DRESS resting and squeeze scores were better in controls as compared to cases; although the difference was not statistically significant. Good muscle contraction was seen in 6/91 (6.6%) cases vs 13/109 (11.9%) controls, suggesting greater pelvic floor muscle damage in patients with occult anal sphincter injury. OASI was also seen to be associated with reduced anal sphincter tone in cases as compared to controls.

| Clinical tests | | Group I (case) n=91 | Group II (control) n=109 | p-value |
|---|---|---|---|---|
| Pelvic Floor Distress Inventory (PFDI 20) | Pelvic Organ Prolapse Distress Inventory 6 (POPDI 6) | 1±0.67 | 0.94±0.63 | 0.491 |
| | Colorectal Anal Distress Inventory 8 (CRAD-8) | 0.92±0.67 | 0.90±0.61 | 0.829 |
| | Urinary Distress Inventory 6 (UDI 6) | 0.02±0.15 | 0 | 0.122 |
| Pelvic floor muscle strength testing | | 2.77±0.56 | 3.09±0.37 | <0.001 |
| Digital Rectal Examination Scoring System (DRESS) | Resting score | 2.93±0.33 | 3±0.14 | 0.054 |
| | Squeeze score | 2.97±0.53 | 3±0.19 | 0.803 |
| Pelvic floor muscle contraction | Weak contraction (Oxford grade 1-2) | 27 (29.6%) | 3 (2.75%) | <0.001 |
| | Moderate contraction (grade 3) | 58 (63.7%) | 93 (85.3%) | 0.005 |
| | Good contraction (grade 4-5) | 6 (6.6%) | 13 (11.9%) | 0.232 |
| Anal sphincter tone | Normal resting tone | 81 (89%) | 107 (98%) | 0.013 |
| | Normal squeeze tone | 74 (81.3%) | 105 (96.3%) | 0.008 |

**[Table/Fig-7]:** Comparison of clinical tests in both groups at six weeks postpartum.
[a]Student's t-test

The most common symptoms experienced by participants in both groups: sense of incomplete evacuation, straining too hard to pass stools, pressure in lower abdomen and heaviness and dullness in pelvic area were significantly more in cases as compared to controls (p<0.001) [Table/Fig-8].

| S. No. | Symptoms | Group I (case) n=91 | Group II (control) n=109 | p-value | Mean score for group-I | Mean score for group II | p-value |
|---|---|---|---|---|---|---|---|
| 1. | Sense of incomplete evacuation | 83 (91.2%) | 34 (31.1%) | <0.001 | 1.15±0.36 | 1.03±0.22 | 0.073 |
| 2. | Strain too hard to pass stools | 82 (90.1%) | 60 (55.04%) | <0.001 | 1.13±0.34 | 1.08±0.27 | 0.247 |
| 3. | Pressure in lower abdomen | 71 (78.02%) | 50 (45.8%) | <0.001 | 1.08±0.28 | 1.03±0.19 | 0.275 |
| 4. | Heaviness and dullness in pelvic area | 50 (54.9%) | 22 (20.1%) | <0.001 | 1.02±0.19 | 1.26±0.44 | 0.001 |
| 5. | Frequent urination | 3 (3.2%) | 0 | 0.0925 | 1 | 0 | - |
| 6. | Pain while passing stools | 2 (2.19%) | 0 | 0.205 | 1 | 0 | - |
| 7. | Incontinence to loose stools | 1 (1.09%) | 0 | 0.455 | 1 | 0 | - |

**[Table/Fig-8]:** Common symptoms of Pelvic Floor Distress Inventory (PFDI).
[a]Pearson Chi-square test; [b]Student's t-test

## DISCUSSION

2D TPU is largely being studied as a substitute for the more intrusive endo-anal ultrasound for the detection of occult OASIs. The incidence of radiologically diagnosed occult anal sphincter injury in the present study came out to be 45.5% which is in concert with the available literature [1,2]. Both the EAS and IAS thickness reduced significantly from their antepartum values. On serial comparison of postdelivery measurements in women with OASI, the EAS did not seem to recover from the day 2 measurements suggesting permanent stretching and thinning of muscle fibres. Paradoxically, the DRESS squeeze scores were comparable in the two groups at six weeks postpartum. On the other hand, the thickness of IAS gradually improved over six weeks, however still being lesser than the antepartum measurements. Consequentially, these women had reduced anal sphincter tone compared to those who did not sustain OASI. Sticklemann et al., observed that with the natural healing process, it is very probable that the width of third-degree tears and anal incontinence symptoms decrease during the six months after delivery [22]. However, in the present study follow-up of the index patients was done only for six weeks. More long term follow-up studies are required to study how OASIs behave over time. Of note is the fact that women with OASI performed poorly on pelvic floor muscle strength testing and PFDI than those who did not. A possible explanation for this is that the factors which play a significant role in the causation of OASI also have damaging effects on the pelvic floor.

In the present study, prolonged duration of the second stage of labour seemed to have an adverse impact on anal sphincter injuries probably due to stretching of sphincter fibres by the head at the perineum. Eventhough, total duration of labour has been shown to be a significant risk factor for OASI in primigravida undergoing vaginal delivery [23], the effect of prolonged second stage of labour is not well studied. In the present study more women who sustained OASI had right occipito anterior position of the baby and lesser number had left occipito-anterior position than those who did not sustain OASI, the difference being statistically significant. Greater baby weights and use of instrumental delivery were also identified to be significant risk factors in incidence of OASIs which has also been confirmed by a meta-analysis. As per available literature, birth weights >4 kg increase the risk of OASI [24] while <4 kg decrease the incidence [25,26]. However, in the present study, the average birth weights were much lesser supporting that perhaps Asian ethnicity is an underlying risk factor for OASI [27]. Mediolateral episiotomy has been shown to be protective for OASI [22,28]. The incidence of OASI was similar whether or not an episiotomy was given. However, greater angle and shorter length of episiotomy showed lesser degree of damage to anal sphincter. The above findings could help take timely and accurate decisions to avoid the risk of OASIs especially, in women with history of OASI in prior deliveries. The authors found that, women who sustained OASI had lower thickness of both the external and IASs even in the antenatal period which could explain why some women are at a higher risk of sphincter injuries during childbirth. Till this date, there are no studies on the effect of antenatal thickness of anal sphincter on incidence of OASI. Prior identification of such women could lead to more meticulous delivery practices in this subset of women however, the clinical application of this finding is presumptive and requires more research.

However, the present study is the first ever study to define the baseline thickness of anal sphincter in 200 antenatal women using TPU. It successfully demonstrates the use of TPU in detection of occult OASI in the Indian setting. Further studies correlating the degree of thinning of anal sphincter with symptoms are required to devise appropriate management strategies.

### Limitation(s)

The study was conducted only in low risk primigravida at or more than 36 weeks and <35 years of age (inclusion criteria). Thus, the effect of maternal age, prematurity, multifoetal pregnancy, previous

vaginal deliveries could not be studied. Due to equipment limitations, 2D transvaginal probe was used to carry out TPU.

## CONCLUSION(S)

The technique of 2D TPU is simple, easily available and feasible to detect OASI. The scope of 2D TPU in identification and monitoring of OASI is ever expanding making it an active area of research. It can be used to identify which injuries are amenable to surgical repair and which by more conservative measures. It could also be useful in objectively defining the anatomical distortions sustained during childbirth which could be helpful in the intraoperative settings. It can be used for prioritising patients who require close follow-up and who do not. If done in the antenatal period, especially in women with prior history of OASI, it could enable meticulous preparation for delivering beforehand or even help in planning the mode of delivery thus, reducing the incidence of OASI. All these practices can actually make childbirth a safe procedure for women without unwanted long lasting consequences.

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