

## Outcomes of Adjunctive Membrane Sweeping with Labour Induction at Term in a Tertiary Hospital, South-West, Nigeria

Jolayemi Waliyat A, Fasanu Adeniyi.Olanipekun\*, Adekanle Daniel Adebode, Komolafe Johnson. Olusanmi

Department of Obstetrics & Gynaecology, LTH, Osogbo

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\*Corresponding author: Fasanu Adeniyi Olanipekun

### Abstract

### Original Research Article

Membrane sweeping is the insertion of the digit beyond the internal cervical os followed by circumferential passes of the digit causing separation of the membranes from the lower uterine segment. The study aimed to determine the effect of membrane sweeping in conjunction with induction of labour in a teaching hospital in south western Nigeria. It was a randomized controlled trial among pregnant women with valid indications for labour induction at term in Ladoko Akintola University of Technology (LAUTECH) Teaching Hospital, Osogbo. Seventy-six women were randomised into "sweep" and "no-sweep" groups with 38 in each arm. The women were blinded to the groups and only the doctors who performed the initial vaginal examination knew the allocation. The outcome of induction of labour, induction to delivery interval, usage of Oxytocin for augmentation of labour, the pain scores, usage of analgesia and satisfaction level were determined between the two arms of the study. The collected data was analysed using Statistical package for Social Sciences (SPSS- 20) Software. Level of significance was set at  $<0.05$ . Seventy-six women were recruited for the study, 38 women had their membrane swept before commencement of induction while 38 women had only induction without membrane sweeping. No patient dropped out from the study. Swept women had higher spontaneous vaginal delivery rate (100% compared with 84.2%,  $p=0.011$ ), shorter induction to delivery interval (mean 10hours compared with 14hours,  $p=0.001$ ), fewer required oxytocin use (39.5% compared with 78.9%,  $p < 0.001$ ) and less requirement for analgesia (31.6% compared 68.4%,  $p = 0.001$ ) The study revealed that membrane sweeping at initiation of labour induction had significant effect on the spontaneous vaginal delivery rate, reduced oxytocic drug use, shortened induction to delivery interval and reduced usage of analgesia.

**Keywords:** Membrane sweeping, Induction of Labour, Term pregnancy, Effect.

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## INTRODUCTION

The overall goal of safe motherhood is ensuring the delivery of a healthy baby to a healthy mother in a satisfied family and achieving this goal may sometimes require the delivery of the foetus before the spontaneous onset of labour to prevent adverse outcome to the baby and or the mother [1]. Intervention may then become necessary when on close assessment of the obstetric balance; the benefit of terminating the pregnancy far outweighs the benefit of continuing it [2]. At this stage there are two available options of terminating the pregnancy either caesarean section or induction of labour. The decision on appropriate option depends on the risk assessment of the foetus and the pregnant woman [1].

Induction of labour is the artificial initiation of labour before its spontaneous onset at a viable gestational age with the aim of achieving vaginal delivery of foeto-placenta unit in a pregnant woman with

intact foetal membrane [3]. A common obstetric procedure often indicated when the benefits to the mother or foetus outweigh the benefits of continuing the pregnancy. It can involve certain interventions that may defy routines and present numerous choices and challenges for both clinicians and mothers [3]. The continuation of a woman's pregnancy requires that her cervix remains close and rigid and her uterus quiet and not contracting. Both these condition need to be reversed to initiate labour [4]. The way this is achieved is unknown; however, evidence has suggested the foetus itself plays an integral part [4]. A woman's cervix contains little smooth muscle with predominant connective tissue with collagen as its main component, and this must undergo a process called cervical ripening. This allows its shape to change from being long and closed to being thinned (effaced) and opening (dilating). In addition, the uterus, which consist mostly smooth muscle cells, must begin to respond to the stimuli which cause these cells to contract in the waves

that characterise labour [4]. It has been recognised that both these component of labour (cervical and uterine changes) involve prostaglandins, inflammatory mediators and other agents which most methods of induction of labour exploit in order to initiate labour [4].

The rate of induction of labour varies by location and institutions. In the UK, the rate varies from 17 - 21%, in the US, it varies from 9.5-33.7% of all pregnancies annually [3]. In Nigeria, a rate ranging between 1.4-11.5% has been reported [3, 5]. In Maiduguri Northern Nigeria, a prevalence of 6.6% was reported [5]. African countries generally have lower induction of labour rates compared with Latin American and Asian countries [6]. There are various indication for IOL, but one of the most common indication is prolonged pregnancy [7]. Induction for this reason has been shown to reduce the likelihood for perinatal death [8]. Other indications include situations that require termination of conservative management of high risk pregnancies, potential foetal compromise such as significant foetal growth restrictions, non-reassuring foetal surveillance, maternal medical conditions like diabetes, renal disease, hypertension, IUFD [3, 9]. Induction is sometimes performed for (social or geographical reasons) non-medical indication [3]. Induction when successful results in vaginal delivery but sometimes fails with potential risk of increased rate of operative vaginal delivery and caesarean birth[3].

Prior to commencement of induction, the woman must be assessed for its indications, contraindications to the procedure, gestational age, cervical favourability using Bishop scoring system, assessment of the pelvis, foetal size, presentation, membrane status(intact or ruptured) and foetal wellbeing. Documentation of discussion with the patient including indication for induction and disclosure of risk factors must be undertaken [3].

There are two major methods for induction of labour: Mechanical and pharmacological method. Membrane sweeping as a mechanical form of induction involves doing a vaginal examination and a finger is inserted through the cervix to rotate against the wall of the uterus to separate the amniotic membrane from the decidua in a clockwise and counter clockwise manner [9, 10]. Membrane sweeping has been shown to release endogenous prostaglandins and increased phospholipase A3 and oxytocin level (Ferguson reflex) [9, 11, 12]. The uterine contraction frequency increases after membrane sweeping [11]. It has also been postulated that a mechanically dilated and disrupted cervix after membrane sweeping may offer less resistance to further dilation during labour induction [9]. Other mechanical methods include use of balloon-tipped catheters, amniotomy and use of hygroscopic agents (laminaria).

The pharmacological methods include use of oxytocin and prostaglandins. The aim of this study is to determine the effect of membrane sweeping at initiation of induction of labour on induction to delivery interval, usage of oxytocin for augmentation of labour, mode of delivery and requirement for usage of analgesia and pain score of the parturient and patient satisfaction.

## METHODS AND MATERIALS

### Study design and participants

The study was a randomised control study that was carried out in the labour ward of Ladoke Akintola University of Technology Teaching Hospital, Osogbo from July to December, 2017. The total deliveries within the study period were 358.

A block randomization of subjects in to each arm of the study was done after having used a computer generated table of random numbers. A block of four possible combination of treatment and control was done making a total block of six and the numbers were picked from the computer generated random numbers until the total sample size was complete. (Treatment was membrane sweeping before induction of labour and control was no membrane sweeping). All blocks generated were written on a small card and put inside a brown envelope. Once patient present for the process of induction, they were duly counselled about the research. Subjects with favourable cervix suitable for induction of labour were selected while those with unfavourable cervix were excluded from the study. A card was subsequently picked from the envelope and opened by the clinician who performed the initial vaginal examination just before that examination. The card was then discarded after knowing the group the patients' falls into. The treatment allocation was not revealed to the women, and only the clinician performing the initial vaginal examination at initiation of labour induction was aware of the allocation.

The study group were women for membrane sweeping prior to IOL while the control group were women without sweeping prior to IOL.

The favourability of the cervix was checked by vaginal examination to determine the Bishop score and a score of 6 or more out of 13 was taken as favourable. This was applicable to both groups. The procedure of labour induction was then commenced by performing amniotomy. The procedure of labour induction was commenced by 6<sup>0</sup> clock in the morning and prior to the process subjects in the study group had their membrane swept while for the control group IOL was commenced without membrane sweeping. The parturient are then made comfortable on bed and feto-maternal parameters monitored. Vaginal examination was repeated every 4hours without further sweeping for the study group. Oxytocin was used for those that had less than 3 contractions 2hours after amniotomy. For any parturient that was unable to bear the labour pain they were given

intramuscular pentazocin 30mg stat; however, for any patient envisaged to be delivering within 4hours from point of requirement for analgesia, intramuscular paracetamol 600mg was given.

The subjects' history including socio-demographic data, indication for induction, obstetric history, induction -delivery interval, usage of oxytocin, pain score using Numerical Rating Score with zero representing no pain and ten representing worst pain as bad as one can imagine, usage of analgesic, patient satisfaction after delivery were obtained using the study proforma by the accoucheur.

### Procedure of membrane sweeping and pre-induction assessment

Prior to the commencement of the procedure of membrane sweeping and induction of labour, the subject's case notes were reviewed to ascertain their demographic data, gestational age and whether they met inclusion criteria. The procedure was started by 6<sup>0</sup> clock in the morning.

The patients were examined and ensured there were no contraindications to vaginal delivery. Subjects with favourable cervix were selected for the study.

The patient was placed in dorsal position .Vaginal examination was done under asepsis by introducing a gloved index finger into the cervix and the Bishop score determined. Bishop score of six or more was taken as favourable cervix; the membrane was then swept by circumferential passes of the digit for the study group and for the control group following assessment for Bishop Score with gentle vaginal examination without sweeping the membrane the gloved fingers was withdrawn. The formal induction of labour was commenced by rupturing the membrane. Oxytocin infusion at 5 I.U in 500ml of normal saline was commenced in subjects who didn't have adequate uterine contraction (i.e less than 3 in 10minutes each lasting less than 40 seconds) two hours post amniotomy at rate of 10milliunit(15drops per minute) up to maximum of 40milliunit(60drops per minute). The patients were made comfortable on the bed and the progress of labour was monitored partographically.

### STATISTICAL ANALYSIS

The collected data was compiled and entered into statistical package for social sciences (SPSS) incorporated Chicago version 20.0 software. Analysis was then carried out, for categorical variables, Chi square test was used to test significance while for continuous variables the independent t-test was used to test for significance. Significant association was subjected to multivariate analysis.  $p < 0.050$  was taken as significant.

### Ethical consideration

Ethical approval for the study was taken from the ethical committee of the institution.

## RESULTS

Seventy-six patients were randomised to participate in the study (38 for membrane sweeping and 38 for no membrane sweeping before induction of labour) within the study period of six months (July to December, 2017). There was no difference in the sociodemographic characteristics and obstetrics data of the study and control group, the mean bishop score was 7.39 (SD  $\pm$ 1.242) in the study group and 7.00 (SD  $\pm$  0.900) in the control group. {t-test= 1.586, p: 0.117}. The estimated gestational age between the groups was also not significant. ( $40.6 \pm 1.37$  vs  $40.1 \pm 1.59$ , t-test = 1.277, p: 0.206) (Table 1). The indications for induction of labour is represented in Table 2 and it varied but post-dated pregnancy accounted for half (50%) of the reasons for IOL

Statistically membrane sweeping before induction of labour significantly reduces the induction-delivery interval as 30 (78.9%) of the study arm (membrane sweeping before formal induction of labour) had induction- delivery interval of less than 12hours while only 13(34.2%) of the control (no membrane sweeping before formal induction of labour) had induction-delivery interval of less than 12hours at a p: 0.001 and only 8 (21.1%) of the study arm had induction-delivery interval of more than 12hours while 25 (65.8%) of the control had induction-delivery interval of more than 12hours. About one-third of the 'membrane sweeping group' required the use of oxytocin while more than three-quarter of the 'no membrane sweeping group' used oxytocin. ( $X^2=12.258$ ,  $p < 0.001$ ). The significance in mode of delivery was evident by the fact that 100% of the study group had vaginal delivery with the control group accounting for 84.2% vaginal delivery and 15.8% having failed induction (Cephalo-pelvic disproportion, Fetal distress and maternal exhaustion) necessitating emergency caesarean delivery ( $X^2 = 6.518$ , p: 0.011). Comparing the mean pain score in both groups; the study group had mean pain score of 7.29 (SD  $\pm$ 0.956) while it was 7.42 (SD  $\pm$ 1.004) in the control group {t-test = 0.585, p: 0.560} (Table 3). The multivariate analysis of factors related to successful vaginal delivery is shown in Table 4.

The difference in usage of analgesia was depicted by 31.6% of the membrane sweep group used analgesia compared with 68.4% of the no sweeping before IOL ( $X^2 = 10.316$ , p: 0.001). FIG 1. Only the attitude of staff to work out of the information provided to the parturient on the procedure of IOL showed significant difference between groups, p: 0.021. FIG 2.

**Table-1: Comparative socio-demographic/obstetric data between study groups**

VARIABLES	MS+IOL	NO MS	Df	Test Statistics	p-value
<b>Age Group</b>					
15-24yrs	5.3%	21.1%	2	$X^2 = 5.116$	0.077
25-34yrs	78.9%	57.8%			
35-44yrs	15.8%	21.1%			
<b>Tribe</b>					
Yoruba	92.1%	94.7%	2	$X^2 = 2.347$	0.309
Hausa	2.6%	5.3%			
Igbo	5.3%	-			
<b>Education Status</b>					
None	5.3%	-	3	$X^2 = 5.040$	0.169
Primary	5.3%	15.8%			
Secondary	18.4%	26.3%			
Tertiary	71.0%	57.9%			
<b>Occupation</b>					
House-wife	5.3%	5.3%	4	$X^2 = 3.771$	0.438
Civil-Servant	21.1%	21.1%			
Business	31.6%	47.4%			
Professional	26.3%	10.5%			
Others	15.7%	15.7%			
<b>Parity</b>					
Nulliparous	44.7%	44.7%	1	$X^2 = 0.000$	1.000
Multiparous	55.3%	55.3%			
<b>Bishop Score before IOL</b>	<b>Mean ± SD</b> 7.39 ± 1.24	<b>Mean ± SD</b> 7.00 ± 0.90		t-test = 1.586	0.117
<b>Estimated Gestational Age</b>	<b>Mean ± SD</b> 40.6 ± 1.37	<b>Mean ± SD</b> 40.1 ± 1.59		t-test = 1.277	0.206

MS- Membrane Sweeping, IOL- Induction of Labour

**Table-2: Indications for induction of labour**

VARIABLES	FREQUENCY (N)	PERCENTAGE (%)
Post Date	38	50%
Prolonged Pregnancy	11	14.5%
Maternal Request	6	7.9%
Previous History of Intrauterine Foetal Death	3	3.9%
Intrauterine Growth Restriction at Term	3	3.9%
Pregnancy Induced Hypertension at Term	3	3.9%
Significant Proteinuria	2	2.6%
Severe Pre-eclampsia	2	2.6%
Immune Antibody on Indirect Coombs Test	2	2.6%
Reduced Foetal Movement	2	2.6%
Congenital Anomaly	2	2.6%
Suicidal Attempt in a Teenager	2	2.6%

**Table-3: Comparative variables of induction outcomes between study groups**

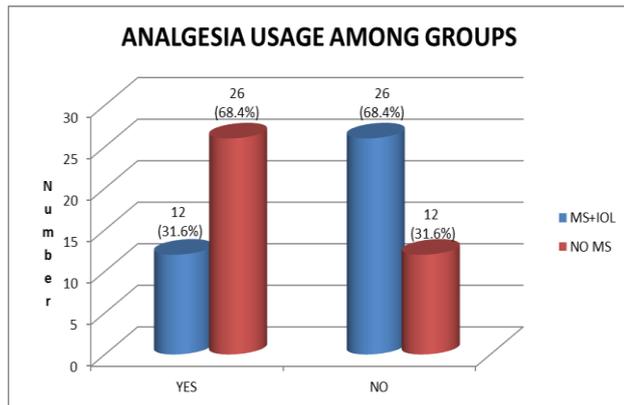
VARIABLES	MS + IOL	NO MS	Df	Test Statistics	p-value
<b>Induction-Delivery Interval(Hrs)</b>					
Mean ± SD					
Normal < 12Hrs	10.08 ± 4.20	13.69 ± 4.59		t-test = 3.581	0.001
Prolonged ≥ 12Hrs	78.9%	34.2%		$X^2 = 15.479$	
Nulliparous	21.1%	65.8%		t-test = 1.515	0.140
Multiparous	N-17, 12.39 ± 4.88 N-21, 8.20 ± 2.31	N-17, 14.93 ± 4.90 N-21, 12.68 ± 4.17		t-test = 4.307	
<b>Usage of Oxytocin</b>					
Used	39.5%	78.9%	1	$X^2 = 12.258$	< 0.001
Not used	60.5%	21.1%			
Nulliparous	<sup>a</sup> (44.4%), <sup>b</sup> (71.4%)	<sup>a</sup> (55.6%), <sup>b</sup> (28.6%)	1	$X^2 = 1.619$	0.203
Multiparous	<sup>a</sup> (16.7%), <sup>b</sup> (75.0%)	<sup>a</sup> (83.3%), <sup>b</sup> (25.0%)	1	$X^2 = 14.000$	< 0.001
<b>Mode of Delivery</b>					
Vaginal Delivery	100%	84.2%	1	$X^2 = 6.514$	0.011
Caesarean Delivery	-	15.8%			
<b>Pain Score from 0-10</b>					
Mean ± SD	7.29 ± 0.96	7.42 ± 1.00		t-test = 0.585	0.560

MS- Membrane Sweeping, IOL-Induction of Labour, a-Used Oxytocin, b-Not Used Oxytocin, SD- Standard Deviation.

**Table-4: Multivariate analysis of factors related to successful vaginal delivery**

VARIABLES	p-value	RELATIVE RISK	95% C.I
Non Membrane Sweeping			
Membrane Sweeping(Ref)	0.021	4.88	1.27 - 18.74
Non-usage of Oxytocin			
Usage of Oxytocin(Ref)	0.000	24.48	4.76 - 125.98
Birth Weight	0.381	0.45	0.08 - 2.69

Ref – Reference



**Fig-1: Comparative usage of analgesia in groups (X<sup>2</sup> = 10.316, p: 0.001)**



**Fig-2: Comparative satisfaction level in both groups**

## DISCUSSION

The findings from this study demonstrated the effect of membrane sweeping in conjunction with formal method of labour induction in term of reduced induction-delivery interval, increased successful vaginal delivery rate and reduced usage of oxytocin for augmentation of labour which were part of the objectives of this study.

The induction-delivery interval in hours was grouped as either less than twelve hours or twelve hours and more. The groups that had their membrane swept before commencement of amniotomy for induction of labour had majority of the participants (78.9%) delivering within 12hours while 34.2% of the participants in the no membrane sweep delivered within 12hours (X<sup>2</sup> = 15.479, p: 0.001) with 21.1% delivering

above 12hours. The Mean ± SD induction delivery interval in hours between groups was 10.08 ± 4.20hrs vs 13.69 ± 4.59hrs, t = 3.581, p: 0.001. Tan *et al.* did similar work [9] and showed difference between sweep and no sweep group (mean interval of 14hrs vs 19hrs, p: 0.003). Similarly, Foong *et al.* [10] also documented a reduced induction-delivery interval in the sweep group (mean- 13.6 ± 1.4 vs 17.3 ± 1.2 hrs, p: 0.01) even though, prostaglandins analogue was used as induction method in addition to the sweep or no sweep grouping but it was applicable across groups. Therefore it is in support of what was obtained in this study since amniotomy was done as method of formal induction in both groups. There was no difference in induction delivery interval in a Turkish study [13] and this may be due to their methodology.

Requirement for oxytocin usage was reduced in the sweep group compared with those that didn't have their membrane swept (39.5% vs 78.9%, p < 0.001) and same result was gotten from Tan study [9] (46% vs 59%, p: 0.037), these further shows the effect of membrane sweeping in conjunction with induction of labour. The successful vaginal delivery rate in the sweep group of our study was 100% compared with non-sweep of 84.2% p: 0.011. Other studies also quoted an increased rate of successful vaginal delivery in the sweep group compared with the non-sweep group (69% vs 56%, p: 0.0419<sup>9</sup>, 83.3% vs 58.2%<sup>10</sup>, p: 0.01) [10].

The pain score did not show a significant difference in both arms of the study groups with a mean pain score of 7.29±0.96 vs 7.42± 1.00, t-test= 0.585, p: 0.560. This contradicts what Tan *et al.* [9] obtained from their study in which the swept group experienced more pain than the non-sweep group, from their own study the pain assessment was done at the initiation of the labour process while for this study the pain was scored at the end of labour when each parturient had delivered and this may be responsible for the result obtained in this study. The Bishop score also showed no difference between both groups (7.39± 1.24 vs 7.00± 0.90, t-test = 1.586, p: 0.117) as noted by Tan and colleague [9] (5.1±1.8 vs 4.7±2.0, p: 0.098) though in this study all participants had a favourable cervix prior to either membrane sweeping or no sweeping.

The satisfaction level on the information given about the procedure to the participants, level of care given to participant before delivery and attitude of labour ward staff to work was assessed. These were not reported separately in a previous study [9], the only satisfaction level reported was an improved visual analog score of satisfaction on birth process. So this study further provide information on the patient satisfaction in terms of information on procedure of labour induction, care given during the birthing process and the attitude of the labour ward staffs to patients when they are in labour. From this study there was no significant difference in satisfaction on information given to patients about the procedure of induction of labour (0, 47.4%, 52.6% vs 5.3%, 63.2%, 31.6%,  $X^2 = 4.857$ , p: 0.088, had neutral, agreed and strongly agreed that the information given to them about the procedure of induction of labour was satisfactory in the sweep and no-sweep group respectively) and level of care given to patient before delivery (47.4%, 52.6% vs 63.2%, 36.8% agreed and strongly agreed in the sweep and no-sweep groups respectively) but there was difference in satisfaction in the attitude of labour ward staffs to work (42.1% vs 68.4% agreed that the attitude of staffs to work was good while 57.9% vs 31.6% strongly agreed that the attitude of labour ward staff to work was good. p: 0.021).

The requirement for analgesia usage showed significant difference between the arms of the study. This was not looked at in studies that did similar work [9]. About one-third of the sweep group had analgesia during labour (31.6%) while 68.4% of the no-sweep group had analgesia. ( $X^2 = 10.316$ , p: 0.001). Our study has the strength that it was a randomised study which eliminated bias during subject recruitment. However, have some limitations, such as a small sample size and short duration of the study of six months. Irrespective of these limitations the study was still able to show the significant benefits of membrane sweeping in conjunction with formal induction of labour.

## CONCLUSION

The results of this study indicated that membrane sweeping at initiation of formal labour induction in conjunction with established methods of labour induction had beneficial effects. Membrane sweeping is simple and quick, requires no equipment, and possibly needs only to be performed at the initiation of formal labour induction. The pain score was not different between the arms of the study, therefore performing membrane sweeping before labour induction will help reduce the time the parturient will

spend in labour and subsequently reduce the requirement for analgesia. With sweeping of membrane prior to induction there is reduce requirement for usage of oxytocin and overall still produce a good level of satisfaction post- delivery.

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