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Authors	Ugezu, C. H.;Corcoran, Paul;Dunn E. A.;Burke C.
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University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Title: Does Membrane Sweep Work? Assessing Obstetric Outcomes and Patient Perception of Cervical Membrane Sweeping at Term in an Irish Obstetric Population; A Multicentre Prospective Study.

Authors:

[1]Ugezu CH, [2]Corcoran P, [1]Dunn E,[3]Burke C.

Corresponding author:

Ugezu CH

chugez031070@yahoo.co.uk

+353 87 698 1323

Affiliations:

[1]Wexford General Hospital.

[2]National Perinatal Epidemiology Centre, Department of Obstetrics and Gynaecology, University College Cork.

[3]Cork University Maternity Hospital.

Abstract

Background: Cervical membrane sweep is a mechanical method of cervical ripening at term gestation with the aim of avoiding prolonged pregnancy and reducing the need for labour induction for this indication. There is no published data on obstetric outcomes following membrane sweep or any studies on patient perception of membrane sweep in an Irish obstetric population.

Aims: This study aimed to determine if cervical membrane sweep at term has an effect on duration of pregnancy and delivery outcome in an Irish population. We also evaluated postnatal patients' perception and experience of cervical membrane sweep.

Methods: This was a prospective multi-centred study of a cohort of women who had cervical membrane sweep at term in two Irish obstetric units, intended to assess the duration of labour and delivery outcomes in women undergoing membrane sweep.

Results: Spontaneous labour occurred in seventy-nine percent of women following membrane sweep. A quarter of nulliparae (25%) and 18% of multipara had labour induction despite membrane sweep. Three quarters of both nulliparae (73%) and multipara (76%) delivered within seven days of membrane sweep. In the presence of a Bishop score more than six, the rate of spontaneous labour was 97% in our patient cohort. Nine of ten women (91%) had previously heard of cervical membrane sweep. Two of three women (65%) thought that membrane sweep helped them to labour and over 80% would recommend it to other pregnant women despite 63% of women reporting moderate discomfort with the procedure.

Conclusions: Cervical membrane sweep is associated with spontaneous onset of labour within seven days in the majority of patients, more so in the presence of higher Bishop score and better quality sweep.

Keywords

Membrane, sweep, labour, induction

Introduction

Cervical membrane sweep is a mechanical method of cervical ripening at term gestation. It involves performing a vaginal examination, inserting a sterile gloved finger through the internal cervical os and circumferentially rotating the finger to separate the membrane from the lower uterine wall. Membrane sweep is known to cause an increase in the release of maternal endogenous prostaglandin metabolites which are associated with ripening of the cervix and ultimately spontaneous labour onset [1,2,3]. The primary aim of sweeping is to hasten the onset of labour. The favourability of the cervix is assessed vaginally using the Bishop score, a set of criteria designed to assess cervical dilatation, consistency, length, position and station of the presenting part of the foetus. The higher the score the easier it should be to initiate labour.

Recent studies on the efficacy of membrane sweeping at term and its effect on the duration of pregnancy have shown that sweeping of the membranes at term is safe and reduces the incidence of post-dates gestation [4]. Furthermore, patients' perception of the procedure and its aftermath has been evaluated in only three studies published in the international literature with emphasis on patient discomfort during cervical membrane sweep [5,6,7]. The perception and outcome of cervical membrane sweep at term has never been published in relation to an Irish obstetric population.

The primary aim of our study was to evaluate whether cervical membrane sweep at term gestation fulfils its objective of shortening the duration of pregnancy. We also wished to assess patients' perception and experience of the procedure.

Methods

We performed a prospective multi-centred study of a cohort of women who had cervical membrane sweep at term in two Irish obstetric units, one being a university teaching hospital, Cork University Maternity Hospital (CUMH) with approximately 8000 deliveries per year and the second being a regional maternity hospital, Wexford General Hospital (WGH) with approximately 2000 deliveries per year. Obstetric outcomes evaluated included gestation at onset of labour, duration between membrane sweep and labour onset, duration of labour, intrapartum events and delivery type. The study was performed over a six-month period following receipt of ethical approval from Wexford

General Hospital ethics committee and Cork University Maternity Hospital ethics committee.

Two hundred and ninety four pregnant women were screened for eligibility to participate in the study, of whom 68 were deemed ineligible. Of the remaining 226, 27 declined participation. Thus, 199 women were enrolled in the study.

Our study population comprised women attending a low-risk antenatal clinic having membrane sweep as part of their routine antenatal care in both consultant led and midwifery led antenatal clinics. Exclusion criteria in the study cohort were women with a growth-restricted foetus for whom induction of labour was planned, twin or higher multiple pregnancies and those booked for elective lower segment caesarean sections (LSCS). Women who had previously undergone membrane sweep and subsequently required formal induction of labour for a reason other than post-dates pregnancy were excluded. Informed consent was obtained from the pregnant women before being enrolled for the study.

Basic demographic and clinical information regarding the pregnancy was recorded by the clinician performing the membrane sweep at the clinic, with information entered on a standardised datasheet. Cervical assessment details (Bishop Score) were recorded. Bishop score assesses the position, length, consistency and dilation of the cervix, as well as station of the presenting part of the foetus, and can be assigned a maximum score of 13. Higher Bishop scores indicate a cervix which is more amenable to cervical sweep, being shorter, more anterior and of softer consistency. Discomfort during membrane sweep was documented by the patient on a visual analogue scale (VAS) of 0-10 where a score of 0 represents no pain and 10 represents worst imaginable pain. Patients were kindly requested to complete a questionnaire after delivery assessing their experience of membrane sweep and its aftermath. These patients were identified by means of a coloured sticker placed on their maternity chart once the recruited in the antenatal clinic and researchers identified patients through regular chart search on the postnatal ward.

As part of the postnatal patient evaluation of their experience of membrane sweep, patients' views w**e**re sought regarding prior knowledge of cervical membrane sweep,

the source of this knowledge, number of membrane sweeps performed before labour onset, and pain experienced during and after the procedure. Cervical membrane sweep quality could be limited/failed or good quality as assessed by the healthcare professional that performed the membrane sweep. These patients were asked if they thought that membrane sweep had helped their labour onset, as well as their overall opinion on membrane sweep and the likelihood that they would recommend membrane sweep to other women.

Obstetric outcomes measured were as follows; gestation at labour onset, time interval (in days) between most recent cervical membrane sweep and labour onset, pre-labour rupture of membranes (PROM), mode of delivery and postpartum complications. (measured by NICU admission and length of hospital stay).

Data was collected antenatally following informed consent via a proforma datasheet. A postnatal chart review of obstetric and neonatal outcomes was carried out with information recorded on a standardised datasheet. Patient questionnaires were completed prior to patient discharge from hospital. All data was transferred to an electronic database for later analysis. Chi-square test were used to assess differences between the profile of patients in both centres and Poisson regression were used to assess the associations between patient and clinical characteristics and the study outcomes, spontaneous onset of labour (SOL) and delivery within seven days of sweep. P values less than 0.05 were considered statistically significant.

Results:

Eighty-eight nulliparae and one hundred and eleven multipara were included in the study. Two thirds of the study population were aged 25-34 years, with one in six women being of advanced maternal age of >35 years. The age profile of patients was somewhat higher in the larger tertiary level unit, possibly reflecting a higher-risk population. Two in five women were overweight (38%) and one in five (20%) obese (Table I).

One hundred and ninety nine women had membrane sweep prior to delivery with 80% n=158) having a single membrane sweep. One in five women (n=41) had more than

one sweep performed, with 39 and two women respectively having two and three membrane sweeps before delivery. The comparison in the Bishop score, gestation at membrane sweep and spontaneous onset of labour within seven days of cervical membrane sweep among primiparae and multipara were shown in Table II.

Pain score during membrane sweep score was 0 in 2% of women, mild (VAS 1-4) in 27% and moderate (VAS 5-7) in 63%. Eight per cent reported severe discomfort (VAS 8-10) during and after the procedure. Membrane sweep performed by midwives was associated with the least discomfort while most discomfort was reported by patients who had membrane sweep performed by a senior house officer.

Four of every five women (79%) undergoing membrane sweep laboured spontaneously, with 75% percent of nulliparae and 82% of multipara labouring spontaneously. Three quarters of both nulliparae and multipara (73% and 76%) delivered within 7 days of membrane sweep. The rate of induction of labour was 21% overall, being 25% and 18% in nulliparae and multipara respectively. Spontaneous vaginal delivery was the delivery mode in 62% of cases. The rate of instrumental delivery was 26% and the caesarean section rate was 12%, being significantly higher in nulliparae. (Table II).

The quality of membrane sweep as assessed by the performing clinician correlated well with the likelihood of SOL. With good quality sweeps, the likelihood of SOL was 85% versus 69% for limited or failed sweeps ($p=0.005$). Only half of women who went on to have a second or third sweep had SOL compared to 84% of women who had one sweep ($p <0.001$).

Four factors showed significant association with an outcome of spontaneous labour and delivery within seven days of membrane sweep, which is the principle objective of this intervention. Later gestational age, higher Bishop score and better quality sweep were associated with an increased chance of this outcome (Table III). The chance of spontaneous onset of labour was halved among women who had more than one membrane sweep.

In women undergoing membrane sweep, 40% of nulliparae and 27% of multipara had pre-labour rupture of membrane. This difference is not statistically significant ($p =$

0.065) but shows a trend towards a greater likelihood of spontaneous rupture of membrane (SROM) in nulliparae undergoing membrane sweep. It was not possible for us to assess whether the rate of PROM, postnatal complications or length of hospital stay differed in women undergoing membrane sweep.

Regarding patients' knowledge and perception of membrane sweep, ninety one percent of our study population had heard of cervical membrane sweep prior to the procedure. More than 30% of women heard of membrane sweep through their friends with around one in five hearing about it both from antenatal classes and the midwife. Two thirds (65%) of women thought that membrane sweep helped them get into labour and over 80% would recommend it to other women.

Discussion

Studies on the effectiveness of cervical membrane sweep at term have produced conflicting results, probably due to variations in study design and methodology. No study published to date has assessed both the obstetric outcome and patients' perception of cervical membrane sweep at term in Ireland. A recent Cochrane review with meta-analysis of 19 randomised control trials in which some of the trials compared sweeping of membrane with control patients who did not have membrane sweep, and others compared sweeping together with prostaglandin (PGE2) or oxytocin, suggested that routine use of membrane sweeping from 38 weeks onwards does not seem to produce any clinical benefits[8,9]. De Miranda *et al* pointed out that the major limitation of this Cochrane review concerned the relatively small size of the studies included, heterogeneity between trials which could result from methodological differences between studies, and a suspicion of publication bias [7,8].

Previously published studies have examined cervical membrane sweep at different gestational ages in conjunction with formal induction of labour with or without PGE2, amniotomy or oxytocin. We objectively evaluated the interval between cervical membrane sweep and labour onset, mode of delivery, rate of induction of labour and length of hospital stay. We also sought to assess individual patients experience of

cervical membrane sweep in terms of discomfort/pain, their assessment of whether it helped them to labour spontaneously and, based on their experience, whether they would recommend membrane sweep to other women. To our knowledge, our study is the first to assess both the positive and negative patient opinions about cervical membrane sweep at term in an Irish obstetric population.

We found that membrane sweep was widely known about, with around 90% of patients being aware of the procedure. While most patients experienced only mild or moderate discomfort during membrane sweep, severe discomfort was experienced by 8% of patients. This is less than the 17% rate of severe discomfort reported by de Miranda *et al* [7]. In our study, membrane sweep performed by midwives was associated with least discomfort while those performed by senior house officer (SHO) caused most discomfort. This may relate to a lack of experience on the part of SHOs or to stronger continuity of care and a greater trust relationship in the context of a midwifery-led clinic. Despite the fact that a relatively high proportion of patients experienced moderate discomfort during the procedure, a majority thought that the procedure helped get them into labour and would recommend the procedure to other women.

In our study, membrane sweep was performed in the outpatient clinic by health professionals with varying degrees of obstetric experience. We cannot be certain as to how experienced individual practitioners were in the performance of membrane sweep, or how effectively membrane sweep was performed. Similarly the assessment of quality of membrane sweep by clinicians is inherently subjective. However a study by Wong *et al* in which they standardised the method of performing membrane sweep by using four obstetricians to perform all the sweeps did not show any difference in the efficacy of membrane sweep in reducing the need for formal induction of labour [10].

Four in five women who underwent membrane sweep subsequently had spontaneous onset of labour. Three quarters of both nulliparae and multipara delivered less than 7 days after membrane sweep. These findings are consistent with those of Zamzami *et al* who reported 81.3% of women entering spontaneous labour following a single membrane sweeping and delivered one week earlier than controls [11]. A greater proportion of nulliparae (25%) than multipara (18%) had induction of labour ($p=0.024$).

This is consistent with the finding that Bishop score in our study population at the time of membrane sweep was consistently higher in multipara than in nulliparae.

We found that performing membrane sweep in the presence of a Bishop score >8 was highly significantly associated with spontaneous onset of labour within 7 days, which is not a surprising finding. This supports the observation of Harris *et al*, that the effect of membrane sweep on cervical ripening can be inferred from the reduced need for prostaglandins for induction of labour in the intervention group [12].

While the majority (86%) of women laboured following one membrane sweep, 14% laboured following more than one sweep. Moreover, the likelihood of entering spontaneous labour lessened when more than one membrane sweep was required. This suggests that repeated membrane sweeps have a diminishing clinical effect. The twofold difference in the rate of multiple membrane sweeps in the larger centre could be explained by the fact that a large proportion of study patients were recruited at midwifery-led low risk antenatal clinics where the proportion of multipara and the motivation to achieve vaginal delivery are thought to be higher.

Regrettably we were unable to definitively compare outcomes of women who had undergone membrane sweep with those who had not. It was however a useful reminder of the importance of meticulous care in the selection of control groups in prospective clinical research projects.

Conclusions:

The findings from our study show that cervical membrane sweep is associated with onset of spontaneous labour within seven days in the majority of patients undergoing the procedure. The probability of labour onset within 7 days is higher in the presence of a higher Bishop score, later gestational age at membrane sweep and better quality sweep.

There is a high level of knowledge and acceptability regarding membrane sweep in our obstetric population. Despite being associated with some discomfort, most women who had membrane sweep thought it helped them get into labour and would recommend it to other pregnant women.

Our study findings support the continued use of membrane sweep in our obstetric units and will help us provide more comprehensive patient information regarding membrane sweep locally.

Disclosures

There is no conflict of interest to declare.

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Table I. Maternal age, parity and body mass index of study participants by hospital

Variable	Category	WGH (N=100)	CUMH (N=99)	All (N=199)
Age	<25yrs	21 (21%)	12 (12.1%)	33 (16.6%)
	25-34yrs	69 (69%)	65 (65.7%)	134 (67.3%)
	35yrs+	10 (10%)	22 (22.2%)	32 (16.1%)
Parity	Nulliparous	43 (43%)	45 (45.5%)	88 (44.2%)
	Multiparous	57 (57%)	54 (54.5%)	111 (55.8%)
BMI	Lean (<25)	36 (36%)	48 (48.5%)	84 (42.2%)
	Overweight (25<30)	31 (31%)	44 (44.4%)	75 (37.7%)
	Obese (30)	33 (33%)	7 (7.1%)	40 (20.1%)

Note: BMI=body mass index measured in kg/m^2

Table II. Cervical membrane sweep and delivery characteristics by parity.

Variable	Category	Nulliparae, N=88	Multiparous, N=111	Total, N=199
Had >1 sweep	No	73 (83%)	85 (77%)	158 (79%)
	Yes	15 (17%)	26 (23%)	41 (21%)
Gestation at sweep	<39 weeks	8 (9%)	11 (10%)	19 (10%)
	39 weeks	20 (23%)	39 (35%)	59 (30%)
	40 weeks	42 (48%)	39 (35%)	81 (41%)
	>40 weeks	18 (20%)	22 (20%)	40 (20%)
Bishop Score	Low (<4)	27 (31%)	32 (29%)	59 (30%)
	Medium (4-5)	33 (38%)	42 (38%)	75 (38%)
	High (6+)	28 (32%)	37 (33%)	65 (33%)
Sweep by	Consultant	24 (27%)	21 (19%)	45 (23%)
	Midwife	33 (38%)	44 (40%)	77 (39%)
	Registrar/SHO	31 (35%)	46 (41%)	77 (39%)
Sweep quality	Limited/failed	39 (44%)	38 (34%)	77 (39%)
	Good quality	49 (56%)	73 (66%)	122(61%)
SOL within 7 days	No	24(27%)	26 (24%)	50 (25%)
	Yes	64 (73%)	85 (76%)	149 (75%)
Mode of delivery	SVD	33 (38%)	90 (81%)	123 (62%)
	OVD	36 (40%)	17 (15%)	53 (26%)
	LSCS	19 (22%)	4 (4%)	23 (12%)

Note: SOL=spontaneous onset of labour; SHO=senior house officer; SVD=spontaneous vaginal delivery; OVD=obstetric vaginal delivery; LSCS=lower segment caesarean section.

Table III. Factors assessed for their relationship to spontaneous onset of labour within seven days of membrane sweep

Variable	Category	n/N (%)	Crude RR (95% CI)	p-value
Hospital	WGH	73/100 (73.0%)	1.00 (ref grp)	
	CUMH	59/99 (59.6%)	0.82 (0.58-1.15)	0.247
Age group	25-34yrs	92/134(68.7%)	1.00 (ref grp)	
	<25yrs	20/33 (60.6%)	0.88 (0.54-1.43)	0.613
	35yrs+	20/32 (62.5%)	0.91 (0.56-1.48)	0.703
Parity	Nulliparous	56/88 (63.6%)	1.00 (ref grp)	
	Multiparous	76/111(68.5%)	1.08 (0.76-1.52)	0.678
BMI	Lean (<25)	59/84 (70.2%)	1.00 (ref grp)	
	Overweight (25-29)	46/75 (61.3%)	0.87 (0.59-1.28)	0.491
	Obese (30+)	27/40 (67.5%)	0.96 (0.61-1.52)	0.864
Had >1 sweep	No	117/158 (74.1%)	1.00 (ref grp)	
	Yes	15/41 (36.6%)	0.49 (0.29-0.85)	0.010
Gestation at sweep	<39 weeks	6/19 (31.6%)	1.00 (ref grp)	
	39 weeks	30/59 (50.8%)	1.61 (0.67-3.87)	0.287
	40 weeks	59/81 (72.8%)	2.31 (1.00-5.34)	0.051
	>40 weeks	37/40 (92.5%)	2.93 (1.24-6.94)	0.015
Bishop Score	Low (<4)	25/59 (42.4%)	1.00 (ref grp)	
	Medium (4-5)	53/75 (70.7%)	1.67 (1.04-2.68)	0.035
	High (6+)	54/65 (83.1%)	1.96 (1.22-3.15)	0.005
Sweep by	Consultant	34/45 (75.6%)	1.00 (ref grp)	
	Midwife	48/77 (62.3%)	0.83 (0.53-1.28)	0.391
	Registrar/SHO	50/77 (64.9%)	0.86 (0.56-1.33)	0.496
Sweep quality	Limited/failed	40/77 (51.9%)	1.00 (ref grp)	
	Good quality	92/122 (75.4%)	1.45 (1.00-2.10)	0.049

Note: RR=risk ratio, CI=confidence interval, ref grp=reference group, BMI=body mass index measured in kg/m^2