

THE RELATIONSHIP BETWEEN AMNIOTOMY, PROVIDER TYPE AND CAESAREAN SECTION IN A UNIVERSITY MEDICAL CENTRE

LE RAPPORT ENTRE L'AMNIOTOMIE, LE GENRE D'INTERVENANTS ET LA CÉSARIENNE DANS UN CENTRE MÉDICAL UNIVERSITAIRE

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ABSTRACT

An active management of labour protocol that includes amniotomy has been widely promoted as a means of reducing a rising Caesarean section rate. However, evidence does not consistently demonstrate the effectiveness of amniotomy in promoting vaginal birth. This study explores the relationship of amniotomy, and the time at which amniotomy is performed, with the mode of delivery in term primiparous women admitted in active labour to a university teaching hospital. The study also explores several variations in practice between faculty-supervised resident physicians, community physicians and hospital-based nurse-midwives that the authors believe may confound the study findings. Selection criteria were designed to eliminate study bias. Records of 258 women delivering between January 2000 and December 2002, that met the selection criteria, were reviewed. Findings suggest that women receiving amniotomy are more likely to deliver via Caesarean section. Results also demonstrate that women ruptured prior to three centimeters are at higher risk of Caesarean. A comparison of records of cases attended by midwives and physicians suggests several significant differences in labour management including decreased use of amniotomy and amniotomy later in labour. These differences between medical and midwifery management may provide insights into interventions leading to promotion of vaginal delivery.

KEY WORDS

pregnancy, Caesarean (OB), labour stage-first, obstetrics, midwives

RÉSUMÉ

Un protocole de gestion active du travail qui inclut l'amniotomie a été largement encouragé en tant que moyen de réduire le taux croissant de césarienne. Toutefois, les preuves ne démontrent pas de manière constante l'efficacité de l'amniotomie dans la promotion de l'accouchement vaginal. Cette étude explore le rapport de l'amniotomie et le moment auquel l'amniotomie est faite et le mode d'accouchement des femmes primipares à terme, qui sont admises en travail actif à un hôpital universitaire. L'étude explore également plusieurs variations dans les pratiques entre les internes supervisés par la faculté, les médecins et les infirmières-sages-femmes basées à l'hôpital, qui peuvent selon les auteurs embrouiller les résultats de recherche. Les critères de sélections furent conçus de manière à favoriser l'impartialité de la recherche. Les dossiers de 258 femmes qui ont accouché entre janvier 2000 et décembre 2003 et qui répondaient aux critères de sélection ont été étudiés. Les résultats dénotent que les femmes ayant eu une amniotomie ont plus de chance d'accoucher par césarienne. Les résultats démontrent aussi que les femmes ayant une rupture avant trois centimètres ont un risque plus élevé de césarienne. Une comparaison de dossiers de cas suivis par des sages-femmes et par des médecins signale plusieurs différences significatives dans la gestion du travail. Ces différences entre la gestion médicale et la gestion sage-femme peuvent fournir de nouvelles perspectives quant aux interventions pouvant favoriser l'accouchement vaginal.

MOTS CLÉS

Grossesse, césarienne (OB), première phase du travail, obstétrique, sages-femmes

THIS ARTICLE HAS BEEN PEER-REVIEWED

CET ARTICLE FUT RÉVISÉ PAR SES PAIRS

INTRODUCTION

O'Driscoll et al introduced the concept of active management of labour in Ireland in the 1970s.^{1,2} In the past three decades, active management of labour (AMOL), which involves early rupture of membranes and augmentation of labour using oxytocin, has been widely adopted in the United States and Canada, in part as a means of reducing a rapidly increasing Caesarean section rate. Today, amniotomy is widely employed in the obstetrical management of labour as part of established AMOL protocols, or individually as a means of fetal assessment, facilitating labour progress and avoiding labour dystocia.³⁻⁸

A review conducted for the Cochrane Library suggests mixed results associated with amniotomy.⁹ According to this review, while amniotomy may decrease the length of labour by more than one hour, it is also associated with a greater likelihood of Caesarean section and with five-minute Apgar scores of less than seven. Other possible risks associated with this surgical intervention include umbilical cord prolapse or cord compression leading to fetal anoxia, maternal or neonatal infection, bleeding from a low lying placenta and possible fetal injury.

The purpose of this study is to determine whether there is a relationship of amniotomy, the time at which amniotomy is performed, with the mode of delivery in term primiparous women admitted in active labour to a university teaching hospital. The study also explores several variations in practice between faculty-supervised resident physicians, community physicians and hospital-based nurse-midwives that the authors believe may confound the study findings.

METHODS

Following exemption by the Stony Brook University Committee on Research Involving Human Subjects, the records of all women admitted for purposes of

childbirth by providers at a large university medical center between January 2000 and December 2002 were selected for review. A total of 258 out of nearly 1000 records met the following selection criterion that had been established for the study:

- primiparous
- gestation between 37 and 42 weeks
- singleton in vertex presentation
- admitted in spontaneous active labour with intact membranes
- no history of preterm labour or cerclage in pregnancy

Descriptive, process and outcome data were analysed using Statistical Package for the Social Sciences (SPSS) version 12 software. Descriptive data are reported using frequencies or measures of central tendency as appropriate. A Chi Square statistic was used to analyse differences in the rate of amniotomy among provider groups and the relationship of amniotomy to Caesarean section.

FINDINGS

The characteristics of records selected for study inclusion are displayed in Table 1. Women included in the study were of typical childbearing age, near term gestation and of ethnic variation reflective of the greater community. The records were about equally divided among women receiving private and public insurance. The majority of women were cared for by faculty-supervised resident physicians while a smaller but significant number were cared for by community physicians or certified nurse-midwives.

One hundred and eight women received care from a group of 16 obstetricians in training who were directly supervised by 15 faculty obstetricians. Twenty community obstetricians practicing within five independent partnerships cared for 76 women. Seventy-four women were cared for by a hospital-based group of five certified nurse-midwives providing independent labour management with

consultation by on an on site faculty obstetrician.

Analysis of demographic differences among patients seeking care by the three provider groups, as displayed in Table 1, suggests that the women cared for by community physicians tended to be older than women cared for by the resident physicians (mean difference 5.04 years, 95% confidence interval 2.95-7.12, $p < .001$) and the nurse-midwives (mean difference 4.2 years, 95% confidence interval 1.91-6.44, $P < .001$). Source of insurance also varied significantly between provider groups (Chi Square 99.24, $p < .001$). Resident physicians were most likely to care for women receiving government provided insurance (73%). Nurse-midwives dedicated slightly greater than half of their practice to publicly insured women (55%), while in this setting, community physicians did not offer care to any women receiving public insurance (0%). No significant differences between provider groups were found in gestation at the time of admission in active labour.

As displayed in Table 2, women whose membranes were artificially ruptured in this sample were more likely to have birth by Caesarean section (Chi Square 6.27, $p < .05$). Eighteen percent of the women receiving amniotomy were delivered by Caesarean section as opposed to four percent whose membranes were allowed to rupture spontaneously. Differences also existed in the mean cervical dilatation at the time that amniotomy was performed in women who were delivered by Caesarean section (t 3.54, $p < .001$). In total, 208 women had an amniotomy. The 38 women who had a Caesarean were at the mean dilatation of 4.32 cm at amniotomy, while for the 170 women with amniotomy who gave birth vaginally, the mean dilatation was 5.56 cm (mean difference 1.3 cm, 95% confidence interval 0.6-2.0, $p < .001$).

Women included in the study, as displayed in Table 1, were highly likely to have had their membranes artificially ruptured. A significant difference existed in the tendency for providers in the study to artificially

rupture membranes (Chi Square 38.70, $p < .001$). Specifically, both physician groups in this study were highly likely to perform an amniotomy (resident physician, 88% and community physician, 93%), with nurse-midwives performing amniotomy less frequently (57%). Significant differences in the mean cervical dilatation at the time that amniotomy was performed also existed between provider groups (F 19.86, $p < .001$). Both physician groups performed amniotomy at a mean dilatation of 5.0 centimeters, while the midwives delayed amniotomy until a mean dilation of 7.0 centimeters. Post hoc testing suggested this difference was highly significant (mean difference 2.0 centimeters, 95% confidence interval 1.2-2.9,

**TABLE 1:
CHARACTERISTICS OF RECORDS MATCHING SELECTION
CRITERION BY CARE PROVIDER**

	Total Group	Nurse-Midwife (n = 74)	Community MD (n = 76)	Resident MD (n = 108)
Maternal age (mean, SD)	25.55, 6.23	24.69, 6.00	28.87, 5.34	23.83, 6.12
Ethnicity (n, %)				
White non-Hispanic	182 (100%)	54 (29.7%)	69 (37.9%)	59 (32.4%)
Black	19 (100%)	6 (31.6%)	0 (0%)	13 (68.4%)
Hispanic	42 (100%)	11 (26.2%)	4 (9.5%)	27 (64.3%)
Asian	7 (100%)	0 (0%)	2 (28.6%)	5 (71.4%)
Indian	8 (100%)	3 (37.5%)	1 (12.5%)	4 (50%)
Insurance (n, %)				
Private	138 (100%)	33 (44.6%)	76 (100%)	29 (26.9%)
Public	258 (100%)	41 (55.4%)	0 (0%)	79 (73.1%)
Obstetric characteristics				
Cervical dilatation on admission (cm) (mean, SD)	4.04, 1.68	4.76, 1.93	3.93, 1.83	3.64, 1.17
Weeks gestation on admission (mean, SD)	39.30, 1.05	39.60, 0.94	39.18, 1.04	39.18, 1.08
Amniotomy (n, %)	208 (80.6%)	42 (56.8%)	71 (93.4%)	95 (88%)
Amniotomy dilation (mean, SD)	5.34, 2.02	6.95, 1.96	4.93, 2.04	4.93, 1.66
Amniotomy at ≤ 3 cm (n, %)	34 (16.3%)	0 (0%)	18 (25.4%)	16 (16.8%)
Epidural anesthesia (n, %)	203 (78.7%)	40 (54%)	66 (87%)	97 (90%)
Pitocin augmentation (n, %)	150 (58.1%)	28 (38%)	56 (74%)	66 (61%)
Caesarean section (n, %)	40 (15.5%)	2 (2.7%)	18 (23.7%)	20 (18.5%)

**TABLE 2:
DELIVERY MODE BY STATUS OF MEMBRANES AND TIMING OF ARM**

	Spontaneous ROM	ARM	ARM ≤ 3 cm
Caesarean section	2 (4%)	38 (18.3%)	10 (29.4%)
Vaginal	48 (96%)	170 (81.7%)	24 (70.6%)
Total	50 (100%)	208 (100%)	34 (100%)

ROM = Rupture of membranes, ARM = Artificial rupture of membranes

$p < .001$). Additionally, as displayed in Table 2, amniotomy at or less than three centimeters was associated with a higher rate of Caesarean section.

Other variations in practice between provider groups displayed in Table 1 included cervical dilatation at the time of admission, decision to augment labour using oxytocin, and the use of epidural anesthesia to control pain in labour. The women that were cared for by nurse-midwives were more likely to be admitted later in labour (mean cervical dilatation 4.8 centimeters) than either the resident physicians (mean difference 1.2 centimeters, 95% confidence interval 0.6-1.7, $p < .001$) or the community physicians (mean difference 0.8 centimeters, 95% confidence interval 0.2-1.5, $p < .01$). The nurse-midwives were significantly less likely to augment labour (Chi Square 20.47, $p < .001$), using oxytocin only 38% of the time, compared to the resident and community physicians, who used oxytocin 61% and 74% respectively. Finally, the nurse-midwives were less likely to use epidural anesthesia for the control of labour pain (Chi Square 37.76, $p < .001$), using epidurals 54% of the time as opposed to the resident and community physicians, who used epidurals 90% and 87%, respectively. Interestingly, this decreased reliance on obstetrical anesthesia was not associated with a corresponding increase use of obstetrical analgesia by the midwives (Chi Square 0.50, $p > 0.7$).

DISCUSSION

The rising Caesarean section rate and the rising impetus to contain health care costs will both drive the need for research aimed at promoting vaginal delivery. In this study sample, unlike some others, an increase in Caesareans occurred when amniotomy was

performed.^{1,2,6,8} Further, amniotomy performed earlier in labour increased the risk of Caesarean. The results of this study, which was conducted in a single site using a non-randomized sample of patient records, should not be generalized to other populations. However, the results are intriguing on two accounts.

First, previous investigations have focused on the effect that performing amniotomy has on the Caesarean rate. In this study, it appears that the relationship between amniotomy and mode of delivery may also vary based on when the amniotomy has been performed. For example, it may be possible for amniotomy to increase the risk of Caesarean if performed at one point in labour and decrease the risk if performed at another. Further studies focusing on the time that amniotomy is performed are warranted.

Second, this study clearly demonstrates variation in midwifery practices that may confound the results of any study of the effect of amniotomy on the likelihood to deliver via Caesarean. In fact, in this study, the relationship between amniotomy and Caesarean was not statistically significant when the women cared for by nurse-midwives were omitted from the analysis (Chi Square 1.15, $p > 0.20$). Nevertheless, when considering only records in the physician groups, the Caesarean rate in women receiving amniotomy (20%) remained higher than women allowed to rupture membranes spontaneously (7.7%). Future investigators studying the relationship of amniotomy to delivery mode are encouraged to acknowledge the presence of midwifery care and consider important variation in clinical decisions made by midwives in managing the course of labour.

Finally, as displayed in Table 1, the results of this study also demonstrate differences in specific labour management decisions made by midwives, such as delayed labour admission, delayed amniotomy and decreased use of epidural anesthesia. While midwifery has been previously associated with decreased Caesarean rates, the specific midwifery actions that promote vaginal birth have not been sufficiently investigated. Larger studies looking at the possible complex relationship between various midwifery practices may be useful in identifying approaches that could be used to lower Caesarean section rates.

CONCLUSION

The efficacy of amniotomy as a tool for promoting vaginal birth remains unclear, while a growing body of evidence suggests that it may increase the risk of Caesarean. In this study there appeared to be an increase in the risk of Caesarean following amniotomy, as well as a relationship between the Caesarean and the point in labour at which the amniotomy was performed. The study also highlights key differences in physicians' and midwives' practices when caring for women in labour. Further studies of the effect that amniotomy has on obstetrical outcomes will be helpful in understanding how to promote vaginal birth.

AUTHOR BIOGRAPHIES

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