Diagnostic Criteria and the Management of Dystocia

Janis E. Byrd, MD, Diane E. Lytton, PhD, Susan C. Vogt, MS, and James A. Raczek, MD
Madison, Wisconsin, and Marquette, Michigan

Cephalopelvic disproportion has been identified as making an important contribution to the rising cesarean birth rate. O'Driscoll and colleagues in Dublin, Ireland, have suggested replacement of cephalopelvic disproportion by the term dystocia for failure of labor to progress and have defined two major subcategories: (1) true cephalopelvic disproportion, and (2) inefficient uterine action. A chart audit of reported indications for cesarean birth in a family practice residency population was done, and patients were classified using the O'Driscoll et al diagnostic criteria for dystocia. When reclassified, the percentage of cesarean births in this population for true cephalopelvic disproportion did not differ significantly from that reported from Dublin (6.1 as compared with 8.8), while the percentage done for inefficient uterine action was significantly greater (35.4 as compared with 4.2). This finding suggests there is a set of labors amenable to a management strategy that could result in a decrease in the cesarean birth rates if efficient uterine action is assured with adequate use of oxytocin.

Much recent obstetric literature has been devoted to an analysis of the cesarean birth rate.[1–5] Most writers now agree with the National Institutes of Health Consensus Development Conference that "the rising Cesarean birth rate is a matter of concern. The consensus statement reflects the judgment that the trend of rising Cesarean birth rates may be stopped and perhaps reversed while continuing to make improvements in maternal and fetal outcome".[6] Bottoms et al[1] found that dystocia accounted for a large part of the increase in cesarean birth rates. They suggested, "There may . . . be safe means of modifying the management of dystocia so that Cesarean birth rates are decreased. Further research is needed to see whether the use of oxytocin stimulation for the treatment of protracted active phase dilatation will decrease . . . the need for Cesarean birth."

The method of active management of labor in nulliparas was introduced by O'Driscoll et al[7,8] at the National Maternity Hospital in Dublin, Ireland. Using this method, O'Driscoll and colleagues have maintained a stable cesarean birth rate of about 5 percent while achieving a decline in perinatal mortality comparable to that of the United States. Their method is based on (1) accurate diagnosis of labor, (2) rigorous criteria for the diagnosis of dystocia, and (3) prompt treatment of dystocia with oxytocin using a strict protocol.[3,8,9] O'Driscoll et al define labor as regular, painful uterine contractions that are accompanied by one or more of four additional criteria: (1) dilation, (2) effacement in primiparas, (3) rupture of membranes, (4) loss of the mucous plug or bloody show. They divide dystocia into two major categories. The first category of dystocia, true cephalopelvic disproportion, is characterized by failure of descent of the head after complete dilation and includes the diagnosis of persistent occiput posterior. The second category, inefficient uterine action, is defined as failure of the cervix to dilate. Inefficient uterine action is divided into four subcategories: unsuccessful attempt at induction, error in diagnosis of labor, inadequate response to treatment, and oxytocin not given. Using the Dublin protocol, dystocia in primigravadas is managed by administration of oxytocin after spontaneous or induced rupture of the membranes when labor does not progress 1 cm/h.

In this study the reported indications for cesarean births in the family practice program at the University of Wisconsin were reviewed and reclassified using the diagnostic criteria for dystocia defined by O'Driscoll et al in an attempt to determine, prior to a prospective clinical trial, whether a group existed that might be amenable to a de-

crease in the cesarean birth rate with active management of labor.

METHODS

Study Population and Sampling Methods

This study compared data collected from the University of Wisconsin Department of Family Medicine and Practice family practice residency patients from 1979 to 1982 in Madison, Wisconsin, with those of O'Driscoll et al[7] reported from Dublin, Ireland, during 1980. For simplicity, hereafter the data will be referred to as Madison and Dublin data, but neither data set should be viewed as representing the entire city's births. The complete Madison sample of 780 family practice patients was identified by physician's name from the hospital's Delivery Room Log Book. Data on age, parity, use of oxytocin, and type of delivery (vaginal or cesarean) were recorded.

Two hundred ninety-four patients were selected for in-depth retrospective chart review. Criteria for selection were as follows: group 1, all 82 patients who gave birth by cesarean section; group 2, 109 of the 113 patients who gave birth vaginally who received oxytocin (four charts could not be located because patients' names had changed); and group 3, every fifth patient who gave birth vaginally who did not receive oxytocin (103 of 585).

Data Collection

Data collected from the hospital charts included the following: maternal age and parity; time, centimeters dilated, station, percentage of effacement, and presentation of fetus at time of admission; spontaneous labor or method of induction; time of and spontaneous or artificial rupture of membranes; time of and type of monitors used; fetal distress; characteristics of oxytocin usage including time and centimeters dilated at start of oxytocin, total duration, and maximum dosage of oxytocin given; indication for cesarean birth; time, dilation, station, effacement, and type of anesthesia at cesarean section; and maternal and infant morbidity and mortality.

Indications for cesarean birth were classified into five major categories: dystocia, breech, fetal distress, repeat cesarean section, and other. The O'Driscoll et al criteria were used for distinguishing two categories of dystocia, inefficient uterine action and true cephalopelvic disproportion. The hierarchical model and decision rules of Anderson and Lomas[9] were used to assign a single primary indication to deliveries with multiple diagnoses.

Calculations

Chi-square analyses, with the Yates' correction applied to all 2×2 tables, were used to assess the differences

TABLE 1. DUBLIN DELIVERIES (N = 8,742) COMPARED WITH MADISON DELIVERIES (N = 780) FOR RATE OF OXYTOCIN USE AND CESAREAN SECTION

| Characteristics of Deliveries	O'Driscoll et al, 1980 Dublin Maternity	Byrd et al, 1979–1982 Madison Family Practice	P
Patients who were primiparas	35.5	56.8	<.001
Primiparas receiving oxytocin	40.6	23.3	<.001
Cesarean birth rate (% of all deliveries)	4.8	10.5	<.001
Primiparas who had cesarean section	5.5	11.3	<.001
Multiparas who had cesarean section*	4.5	9.5	<.001

Includes repeat cesarean section

between Madison and Dublin data for mode of delivery, parity, and oxytocin use. A 2×6 chi-square analysis was used to compare the incidence of cesarean births in Madison and Dublin for the five major indications, with the two subcategories of dystocia, ie, inefficient uterine action and true cephalopelvic disproportion, handled separately in the analysis. To isolate the sources of association in the 2×6 table, an analysis of residuals was performed.

RESULTS

Table 1 displays the obstetric outcomes for Dublin and Madison. The overall cesarean birth rates were 4.8 percent in Dublin and 10.5 percent in Madison, a significant difference ($\chi^2 = 44.77$, 1 df, P < .001). The rate for primiparas was 5.5 percent in Dublin compared with 11.3 percent in Madison ($\chi^2 = 137.59$, 1 df, P < .001). The overall cesarean birth rate in the Madison family practice population was lower than the rate for the hospital and city as a whole, primarily because repeat cesarean births were eliminated by referral to an obstetrician.

Figure 1 presents the rates for each indication for cesarean births after reclassification. Overall, Madison had a higher percentage of cesarean births for dystocia, 41.5 percent compared with 13.0 percent for Dublin. The Dublin percentage done for fetal distress does not represent an increased rate. Rather, as the percentage done for dystocia is decreased, the percentage in other categories will automatically rise, as the total must remain 100 percent. The number of cesarean births for fetal distress, ex-
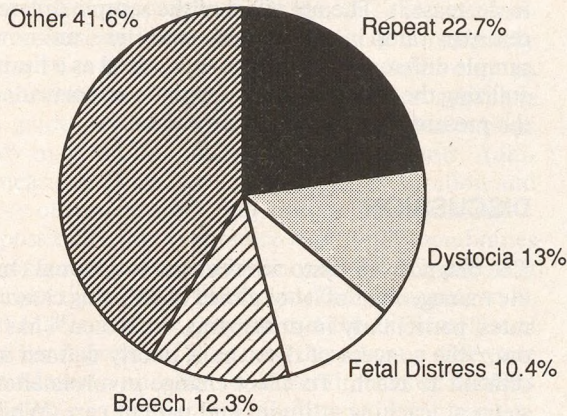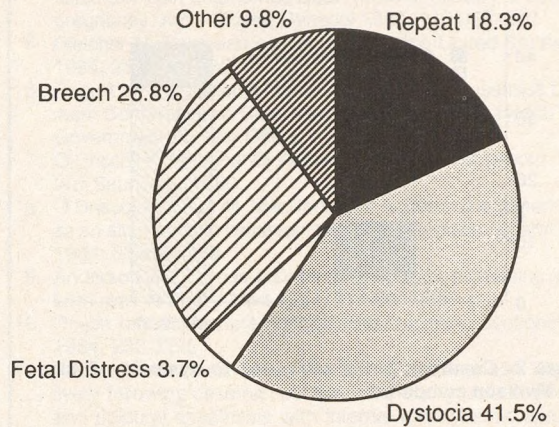
Figure 1. Indications for cesarean births—Dublin and Madison compared

pressed as a percentage of total births, was 0.5 in Dublin and 0.4 in Madison. The category of Other in Figure 1 refers to other medical or obstetric indications for cesarean birth such as hemorrhage, preeclampsia, heart disease, and so forth. A 2×6 chi-square analysis showed a highly significant association between location and indication for cesarean birth ($\chi^2 = 103.62$, 5 df, P < .001).
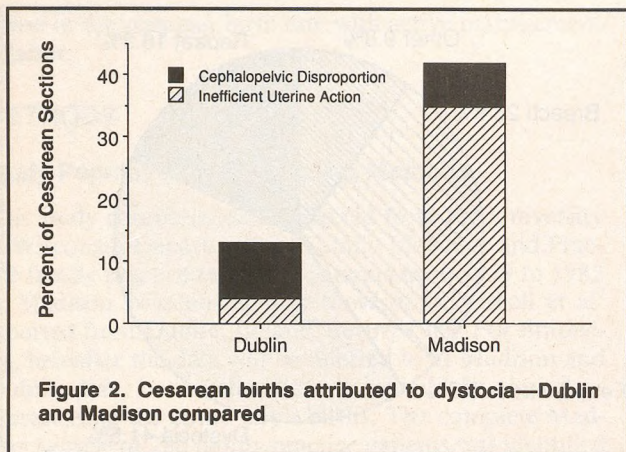
In Table 2 cesarean births are listed according to categories of dystocia (after reclassification) using the O'Driscoll et al criteria. After reclassification, Dublin's and Madison's percentages of cesarean births for true cephalopelvic disproportion did not differ, 8.8 compared with 6.1, whereas Madison's percentage of cesarean births for inefficient uterine action was greater than Dublin's, 35.4 compared with 4.2 (Figure 2). Using the 2×6 table, analysis of residuals showed that within the category of dystocia a large portion of the significant associations (chi-square with five degrees of freedom) could be attributed to inefficient uterine action (z [adjusted residual] = 8.96, P < .001). True cephalopelvic disproportion, on the other hand, did not contribute significantly to differences between the two locations (z [adjusted residual] = 0.80, not significant).

The majority of Madison's patients with inefficient uterine action fell into the subcategory of inadequate response to treatment (Table 2). Several further analyses and a conversation with O'Driscoll (Kieran O'Driscoll, MD, personal communication, March 8, 1985) suggested that in Madison oxytocin administration is delayed longer than in Dublin, and the average dose is significantly lower. For the Madison vaginal deliveries augmented by oxy-

TABLE 2. CESAREAN BIRTHS ATTRIBUTED TO DYSTOCIA—DUBLIN AND MADISON COMPARED

Indications for Dystocia	Percent of Cesarean Sections	
	Dublin (n = 423)	Madison (n = 82)
Total births	13.0	41.5
Inefficient uterine action	4.2	35.4
Inadequate response to treatment	1.2	24.4
Oxytocin not given	0.7	6.1
Unsuccessful attempt at induction	0.5	4.9
Error in diagnosis of labor	1.9	0.0
Persistent occiput posterior or cephalopelvic disproportion	8.8	6.1

tocin, the mean rate of progress prior to oxytocin was only 0.15 cm/h and in cesarean births it was 0.17 cm/h. In those patients making no progress, an average of 4.2 hours elapsed before oxytocin was administered. The average oxytocin dose was 11 mU/min. Using the O'Driscoll et al protocol, oxytocin is usually indicated within two hours after a diagnosis of abnormal labor (dilation less than 1 cm/h in primiparous patients), and most patients receive 32 mU/min to a maximum total dose of 10 units. In the Dublin study, 80 percent of the vaginal deliveries were completed within six hours and 99 percent within 12 hours. In the Madison study, 56.4 percent of the deliveries occurred within six hours and 82 percent within 12 hours.

Figure 2. Cesarean births attributed to dystocia—Dublin and Madison compared

Figure 3. Parity and age comparisons between Dublin and Madison

The overall proportion of patients receiving oxytocin was the same in both studies (18.1 percent in Dublin and 18.5 percent in Madison). In Dublin, however, a significantly higher percentage of primiparas received oxytocin, 40.6 percent compared with 23.3 percent ($x^2 = 48.58$, 1 df, P < .001) (Table 1). The reverse was true for multiparas; 12.2 percent received oxytocin in Madison compared with Dublin's 5.7 percent, reflecting differing opinion regarding the dangers of oxytocin use in multiparas.

Patient parity and age in the two populations are presented in Figure 3. The Madison population was primarily white and middle or lower middle class. The Dublin population was exclusively white and of varied socioeconomic background. Ninety-nine percent received prenatal care, which is available at no cost. The distribution of parity differed, with Madison having a greater proportion of primiparas than Dublin. Madison also had a younger sample, with 60 percent younger than 24 years, compared with 30 percent in Dublin. Primiparity would tend to increase
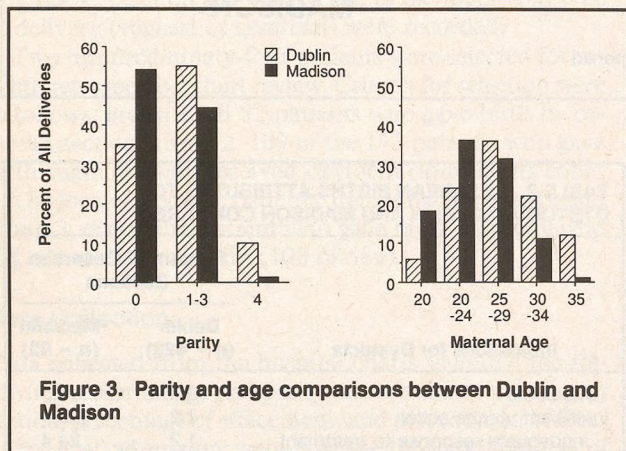
the cesarean birth rate, while the younger age would tend to decrease it. The net effect of the sample differences on cesarean rates in the present study are unknown. The sample differences should be recognized as a limit to generalizing the results to other populations, particularly since the present study is nonexperimental.

DISCUSSION

The diagnosis of dystocia is central to rational changes in the management of labor aimed at reducing cesarean birth rates, particularly in primiparas. As Rosen[10] has pointed out, "the concept of dystocia is poorly defined and thus difficult to teach. To effect change involves altering obstetrical teaching attitudes and patient care. While doing this we must avoid returning to traumatic obstetrical techniques." Concern about uterine rupture and neonatal morbidity and mortality have heretofore limited the use of oxytocin in many labors with abnormal labor graphs. The large Dublin series of primiparous patients delivered with more frequent use of oxytocin at higher dosages without increased fetal or maternal morbidity or mortality, as well as the 70 to 80 percent success rate of vaginal birth after cesarean section for cephalopelvic disproportion[11,12] demonstrates the need for a detailed examination of criteria and management protocols for dystocia.

Using more carefully defined criteria for dystocia, a significant percentage of patients with inefficient uterine action were identified. This group should be amenable to a decrease in the cesarean birth rate if efficient uterine action is achieved with oxytocin. Since a majority of this group did receive some oxytocin, albeit at a concentration lower than that recommended by the Dublin experience, attention must be given to details of dosage, timing, use with and without amniotomy, and definition and monitoring of the optimal level of uterine activity.[13,14] The ideal time for introducing oxytocin is unknown. One study suggests no differences in the cesarean birth rates when oxytocin was introduced at two or four hours after a diagnosis of abnormal labor but questions whether additional delay may reduce effectiveness.[15] The effect (or lack thereof) of amniotomy is also disputed and needs further investigation.[16] In Madison, amniotomy is not routinely performed before starting oxytocin. In Dublin all patients have spontaneous rupture of membranes or amniotomy before oxytocin use.

In Madison, internal monitoring is frequently used to document the desired uterine activity of 50-mm contractions every two minutes. In Dublin, desired uterine activity is defined clinically by progression of 1 cm of dilation or descent per hour with no more than seven contractions in a 15-minute period and no fetal distress. Monitoring

is done by a personal nurse. Most studies[13] have shown that in spontaneous progressive labors there is great variability in uterine activity, with the amplitude considerably above the 50-mm level in some women. Since only an arbitrary number (50 mm) rather than the labor graph is used to guide oxytocin administration, optimal uterine efficiency may not be obtained in many patients. Additional measures of uterine activity, such as duration and frequency of contractions, may need to be considered.

The possibility that premature rupture of membranes and admission at minimal dilation was adversely affecting the cesarean birth rate in primiparas did not appear to be true. All Madison study patients met the O'Driscoll et al criteria for a diagnosis of labor, and there was no difference between Madison and Dublin in centimeters of dilation at admission.

A major difference between Madison and Dublin is the organization of labor and delivery units, with each Dublin patient having intense personal nursing. Although the effect on labor of this support is unknown, one could postulate a positive effect based on studies showing a decreased length of labor when a supportive partner is present.[17]

In summary, several alternative explanations could account for the differences in cesarean birth rates between Dublin and Madison. The findings of this study suggest, however, that different strategies for diagnosing and managing dystocia may lead to different outcomes. Several recent prospective, randomized trials support this contention,[18-22] although one found no difference.[23] Although Leveno[24] advises caution in trying to emulate Dublin's low cesarean birth rate in different populations, the statistics he cites on neonatal outcomes are not related to oxytocin use, and their validity is refuted with more extensive analysis.[25] In light of similar outcomes for the infant, and a much lower cesarean birth rate associated with the O'Driscoll et al management compared with that of the Madison management of inefficient uterine action, a prospective study comparing outcomes using different protocols for oxytocin administration is indicated.

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