Labour in patients with a caesarean section scar

The place of oxytocin augmentation

C. J. VAN GELDEREN, M. J. ENGLAND, G. A. NAYLOR, T. C. KATZEFF

Summary

Fifty-two patients who had had a single previous caesarean section were submitted to a trial of scar. Labour was monitored by internal tocography and direct fetal heart rate monitoring. Oxytocin infusion was employed when uterine work proved to be inadequate. The oxytocin-augmented and unstimulated groups were compared. Oxytocin augmentation improved uterine work and did not result in significant fetal or maternal morbidity or mortality. Internal tocography was found to be of value, but fetal heart rate monitoring was essential.

Patients and methods

Fifty-two patients who had had one previous caesarean section and in whom the clinically estimated relative sizes of fetus and pelvis were considered to be adequate for vaginal delivery were allowed to go into labour. The indication for the previous caesarean section was noted (Table I). Patients were monitored by the usual clinical criteria, as well as the following:

1. Recording of uterine activity via a commercially available solid transducer-tipped catheter (Gaetec); this was linked to a commercially available cardiotocograph which, in addition to the transducer, exhibits the features of a uterine activity integrator which quantifies the area under the uterine contraction curve. Uterine activity is then recorded as kilopascal seconds (kPa s) per 15-minute period.

2. Continuous recording of the fetal heart rate via a scalp electrode.

Oxytocin was given by intravenous infusion at rates varying from 1 to 20 mIU/min on the basis of the recording of uterine work. If the latter was persistently less than 1 000 kPa s/15 min, or if labour was not established, oxytocin administration was commenced and the dose gradually increased until levels of 1 000 kPa s/15 min were achieved. Administration was continued at a rate that would maintain uterine work at this level, or was discontinued if the readings exceed 1 500 kPa s/15 min. Patients whose uterine work values exceeded 1 000 kPa s/15 min spontaneously were given no uterine stimulation and served as the 'normal' group.

Results

A total of 22 patients received oxytocin, while 30 required no stimulation. The overall outcome of labour was similar in both groups, 14 patients (63.6%) delivering vaginally in the oxytocin-stimulated group and 17 (56.7%) in the unstimulated group. There was no significant difference between the two groups as regards age and parity. The indications for the previous caesarean section as well as the effect of that indication on the outcome of this labour are reflected in Table I.

There were only 7 cases in which the duration of recording was sufficient to allow meaningful analysis both before and after commencement of oxytocin administration. Table II indicates that in these patients the previously scarred uterus was capable of...
responding to oxytocin by increasing both contraction rate and work performance. Comparison of all stimulated and unstimulated patients revealed that uterine work in the former after oxytocin was similar to that achieved in the latter, mean figures being 1237 kPa s/15 min and 1328 kPa s/15 min respectively. Mean work per contraction in the two groups was 251 and 254 kPa s respectively. These values indicate that oxytocin had improved uterine action to relatively normal levels. The mean hourly work rates for these two groups are shown in Fig. 1. There was no significant statistical difference between them. In the oxytocin-treated patients whose labours ended in a second caesarean section, uterine work per hour and per contraction was higher than in unstimulated patients delivering in the same manner, as shown in Fig. 2. The difference was not statistically significant. The oxytocin group showed an increased work rate in the last 3 hours before delivery, almost certainly an iatrogenic phenomenon. There was no significant difference between the unstimulated caesarean section group and the oxytocin group achieving vaginal delivery.

Complications
The most serious complications reported in patients having a trial of scar are uterine rupture and fetal asphyxia. There were no major uterine ruptures in this series, but in 3 patients, 1 of whom received oxytocin, scar dehiscence occurred. The oxytocin-treated patient had high uterine work and contraction rates, while the other 2 had normal and subnormal rates respectively. It is possible that in the latter case the uterine damage had already occurred when the tracing was commenced. These features are compared in Table III.

There was no indication on any of the tracings that dehiscence had occurred, apart from the sudden onset of patterns indicating distress in the fetal heart record in 2 cases. No dehiscences were detected after vaginal delivery, although every scar was palpated after delivery. No specific contraction pattern was associated with either fetal distress or neonatal asphyxia, and the range of uterine action in these patients varied from very low to very high. Fetal distress or neonatal asphyxia occurred in 5 patients, but there was no mortality or morbidity. Asphyxia was diagnosed by an umbilical vein pH of less than 7.25, an Apgar score of less than 7, or both. Features of these labours are compared in Table IV.
Dehiscence detected. The difference was not significant. However, in this group oxytocin was used it in 7 patients without ill-effects. Saldana et al. but surprisingly few authors directly address this issue. Riva described 3 patients who required oxytocin for a prolonged second stage; all needed an instrumental delivery. Mahan, as quoted by Donnelly and Franzoni, utilized oxytocin, and the only cases of uterine rupture were found in this group. Lavin et al. described 83 patients who received oxytocin in a trial of scar; 61% subsequently delivered vaginally. Again the only case of scar rupture occurred in the group which received oxytocin. Gibbs, in the second-largest series of vaginal births after caesarean section reported in the USA, used oxytocin for induction of labour in about 5% of his patients and for augmentation in another 5%.

The above series were compiled before acceptance and almost universal institution of routine cardiotocographic monitoring of these patients. In our study internal uterine tocoigraphy was instituted before giving oxytocin. We chose a uterine work value of 1 000 kPa s/15 min as indicative of adequate uterine work. It would appear that this figure is not unreasonable and that it compares favourably with the norm for multiparous patients.

Birth masses were average for the unit. Babies delivered by a second caesarean section tended to be heavier than those delivered vaginally, but the difference was not significant.

In all but 2 cases the reasons for a second caesarean section were either failure to progress or cephalopelvic disproportion (CPD). Of the remaining patients, 1 required caesarean section because of fetal distress (which proved to be related to scar dehiscence) and the other because of failure to establish labour in spite of oxytocin stimulation.

There was no significant difference in these criteria between any of the groups. Baseline pressure were, however, higher than had been expected (maximum 35-38 mmHg), and peaks in the first stage often exceeded 100 mmHg but averaged in the mid-70s. No ill-effects were noted at even the highest pressures. Contraction frequency averaged 20 per hour in both groups.

In Table IV the 6 cases in which either fetal distress or neonatal asphyxia was encountered are compared. It appears that neonatal asphyxia and/or fetal distress were unrelated to contraction frequency or mean uterine work and that no constant relationship was found, since uterine action ranged from very low to very high in this group of patients.

When considering the management of delivery when a patient has had a previous caesarean section the greatest danger is possible uterine rupture. This question is of prime importance when uterine work is suboptimal and oxytocin augmentation is instituted in order to improve it. Oxytocin augmentation in labour complicated by a previous caesarean section has universally been considered to add to the risk of uterine rupture, but surprisingly few authors directly address this issue. Riva and Teich used it in 5 patients without ill-effects. Saldana et al. describe 3 patients who required oxytocin for a prolonged second stage; all needed an instrumental delivery. Mahan, as quoted by Donnelly and Franzoni, utilized oxytocin, and the only cases of uterine rupture were found in this group. Lavin et al. described 83 patients who received oxytocin in a trial of scar; 61% subsequently delivered vaginally. Again the only case of scar rupture occurred in the group which received oxytocin. Gibbs, in the second-largest series of vaginal births after caesarean section reported in the USA, used oxytocin for induction of labour in about 5% of his patients and for augmentation in another 5%.

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Uterine work in labour complicated by previous caesarean section in this study appears not to differ from that in a multipara in labour who has not had a previous caesarean section. The use of oxytocin has been shown to alter labour patterns from those in unstimulated or prostaglandin-augmented labour. However, in this group oxytocin was effective in improving uterine work. Hence the use of oxytocin in a labour with suboptimal uterine activity is logical.

We suggest utilizing a measure of uterine work rather than the maximum contraction pressure used by Flamm et al. as an end-point to indicate the cessation or decrease of oxytocin augmentation. There is no intra-uterine pressure at which a given scar will rupture; hence the value of the intra-uterine pressure monitor is seen in the case in which there is no progress in the presence of adequate uterine activity. Once adequate uterine work is documented, an adequate trial of labour has been undertaken.

Comparing our results with those of two recent studies by Horenstein et al. and Flamm et al., it is clear that the overall outcome in terms of vaginal delivery is comparable in the oxytocin-stimulated groups (Table V). The difference encountered in the unstimulated group cannot readily be explained. Horenstein et al. did not detail exact criteria for instituting oxytocin augmentation. When the indication for primary caesarean section is compared with the outcome of labour in this study and in others in which oxytocin stimulation was used, our vaginal delivery rate following caesarean section
for CPD (60%) is similar to the rates reported by Flamm et al.\textsuperscript{18} (67.3%) and Horenstein et al.\textsuperscript{12} (70%). It is interesting to note that in a study by Clark et al.\textsuperscript{19} it was found that the CPD group had the lowest rate of vaginal delivery (64%); there is, however, no mention of the use of oxytocin in this study.

Scar dehiscence was noted in 2 cases in which labour was not stimulated. Table III shows that this occurred within a wide range of uterine work. Dehiscence resulted in no fetal or maternal mortality. In 2 of the 3 cases, dehiscence was accompanied by the acute onset of a fetal heart rate pattern indicative of distress. We conclude that a healthy uterine scar is as resistant to dehiscence by pressure or work within normal limits as is the rest of the uterus; hence dehiscence is probably due to qualities inherent in the individual scar.

In 5 cases either fetal distress or neonatal asphyxia occurred, but there was no mortality or morbidity. Fetal distress was not related to extremes of uterine action within the normal range. This study has shown that oxytocin is safe for use in patients who have had one previous caesarean section. Intrauterine pressure monitoring is useful but not essential, since pressures and work rates do not appear to be related to complications. Fetal heart rate monitoring, however, is indispensable. The use of intra-uterine pressures, and especially work rates, is helpful in the decision whether or not to employ oxytocin. Oxytocin probably increases the vaginal delivery rate in these patients if uterine action has been suboptimal. Most of the patients in the oxytocin group would have had a second caesarean section if labour had not been augmented; after augmentation, they had a lower rate than the unstimulated patients. We therefore recommend the cautious employment of oxytocin in selected patients undergoing a trial of labour after a single previous caesarean section.

### REFERENCES