

A retrospective survey of patients with one previous caesarean section delivered at the Port Moresby General Hospital: a comparative study of those delivered vaginally and those delivered by repeat caesarean section

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SUMMARY

We studied 510 patients in a retrospective, nonrandomized, comparative survey of vaginal births and repeat caesarean section after one primary caesarean section at the Port Moresby General Hospital. 478 (94%) were allowed a trial of scar (TOS). The most common indications for elective caesarean section in the other 32 patients were cephalopelvic disproportion (CPD) 31%, contracted pelvis 19% and preeclampsia 12.5%. In 41% of patients TOS was terminated by emergency caesarean section. Logistic regression analysis showed that the following were significantly associated with repeat caesarean section after TOS: parity of one, no vaginal birth after the primary caesarean section, narrow obstetric conjugate, birthweight of 2500 g or greater, short stature, high level of the head at admission to the labour ward and region of origin.

Introduction

In addition to the financial and psychosocial disadvantages, statistics show that the maternal morbidity and mortality rates of caesarean section are much higher than those of vaginal delivery. The rate of maternal deaths associated with caesarean section is four times that associated with vaginal delivery (40 vs 10 per 100,000 births). The rate attributable to the caesarean section per se after controlling for the condition for the operation, is at least twice that of vaginal delivery (1,2). The major complications which contribute to the higher maternal morbidity and mortality are haemorrhage, anaesthetic complications, ileus, postoperative infection, thromboembolism, adhesions, intestinal obstruction, bladder injury during subsequent surgery and uterine scar dehiscence in a subsequent delivery.

Because of the universal adoption of the lower segment incision, Craigin's 1916 dictum

of 'once a caesarean section, always a caesarean section' (3), made in the old obstetric days when the classical incision prevailed, no longer applies. It has now been established that the majority of women with caesarean section scars will have a safe vaginal delivery if given the chance to labour and that this policy will reduce the number of caesarean sections performed, and reduce the higher financial costs, morbidity and mortality associated with caesarean section.

In institutions with appropriate facilities, about 60% of patients who have had primary caesarean section are now elected for test of scar (TOS) and 50-80% of those permitted this test of scar have a safe vaginal delivery (1,4-8). TOS requires the selection of appropriate cases, a well-equipped hospital with facilities for vigilant observation of labour and facilities for performing caesarean section without delay. 'Without delay' was defined by the American College of Obstetricians and

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Gynecologists as 30 minutes from the time the decision for caesarean birth was made until the surgical procedure was started (9). But even when all these guidelines are correctly followed, the procedure can still go horribly wrong (10-12). At the Port Moresby General Hospital (PMGH), 8% of all caesarean sections are performed solely because of previous caesarean section. Selected patients with only one previous caesarean section are given a TOS. In the absence of medical and other obstetric factors which may demand caesarean section in their own right, the factors which are routinely considered in deciding between TOS and elective repeat caesarean section are: type of previous caesarean section, obstetric conjugate (OC) and fundal height. Those with a previous lower segment incision are allowed a TOS but those with classical or inverted T incisions are not. An obstetric conjugate of less than 10.4 cm and a fundal height of greater than 40 cm (large baby) will favour elective repeat caesarean section.

Even though the caesarean section rate at PMGH is still comparatively low (4-5% of all deliveries), it is necessary periodically to audit repeat caesarean section on account of one previous caesarean section to determine if the operation was justified. The above considerations were the rationale for this study.

Measurable objectives

The measurable objectives were as follows:

- 1 To determine the proportion of patients with one previous caesarean section delivered at PMGH
- 2 To determine the proportion allowed TOS and the proportion delivered by elective caesarean section
- 3 To determine the outcome of TOS
- 4 To audit the indications for terminating a TOS
- 5 To determine the maternal and perinatal morbidity
- 6 To determine if the repeat caesarean section patients and the patients with vaginal birth after caesarean section (VBAC) differ in selected characteristics.

Patients and Methods

This was a retrospective, nonrandomized, comparative survey of vaginal birth and repeat caesarean section following one previous caesarean section. It was carried out at the maternity unit of the PMGH. The labour ward register was used to identify patients with one previous caesarean section from 1 January 1991 to 31 December 1993. 520 patients were identified but only 510 case notes were retrieved. We analyzed the information by computer using Epi Info version 6 and the SPSS PC+ statistical packages. We used the Mantel-Haenszel chi squared test and odds ratios for comparing the frequencies of categorical variables and the Kruskal-Wallis H test for comparing the means of continuous variables, to determine the potential risk factors for patients to require repeat caesarean section. Where it was necessary to test for interaction between covariates, we performed forward logistic regression analysis. An odds ratio whose 95% confidence interval did not enclose 1 and chi squared and two-tailed Fisher exact tests with p values less than 0.05 were taken as statistically significant.

Results

The proportion of patients with one previous caesarean section delivered at the labour ward of the PMGH was 1.7%. Of the 510 patients available for study, 478 (94%) were allowed a trial of scar. The rest (32 patients) were delivered by elective caesarean section. The main indications for elective caesarean section were cephalopelvic disproportion (CPD) 31%, contracted pelvis 19% and preeclampsia 12.5%. Of those allowed a TOS, 283 (59%) had a successful vaginal delivery; the rest were delivered by emergency repeat caesarean section. The main indications for repeat caesarean section after TOS were CPD 30%, contracted pelvis 12%, prolonged first stage 13% and fetal distress 14%.

Of the 195 patients who had repeat caesarean section after TOS, the indication for the operation was found not to be justified in 7 patients (4%). The main reason for finding these indications not justified was that labour was not appropriately augmented.

Sociodemographic characteristics and mode of delivery

Highlands women had a significantly greater risk of repeat caesarean section in comparison with women from the Southern Region (60% vs 33%) (Table 1). The mean height of patients delivered by repeat section was significantly less than that of women delivered vaginally, 153.9 cm (sd 7.7) vs 157.1 cm (sd 7.6); and the proportion of women less than 150 cm tall was

higher in the repeat section group (27% vs 15%). Age made no difference to the mode of delivery.

Past obstetric characteristics

The following variables were significantly associated with repeat section (Table 2): mean parity (1.5 vs 2.4), the proportion of patients who are para 1 (71% vs 35%), no vaginal delivery after the primary caesarean section

TABLE 1

SOCIODEMOGRAPHIC CHARACTERISTICS AND MODE OF DELIVERY

Panel A: Categorical variables

| Caesarean | Vaginal | M-H p value | OR (95% CI) |
|---|-----------------|-------------|-------------------|
| Southern Region origin: Yes 64/194 (33.0%) | 135/282 (47.9%) | 0.001 | 0.54 (0.36-0.80)* |
| Highlands Region origin: Yes 117/194 (60.3%) | 107/282 (37.9%) | 0.00000 | 2.49 (1.68-3.68)* |
| Momase Region origin: Yes 9/194 (4.6%) | 24/282 (8.5%) | 0.10 | 0.52 (0.22-1.21) |
| Islands Region origin: Yes 4/194 (2.1%) | 16/282 (5.7%) | 0.054 | 0.35 (0.10-1.14) |
| Age more than 35 years: Yes 10/193 (5.2%) | 21/282 (7.4%) | 0.34 | 0.68 (0.29-1.53) |
| Age less than 20 years: Yes 6/193 (3.1%) | 6/282 (2.1%) | 0.92 | |
| Height less than 150 cm: Yes 43/159 (27.0%) | 34/222 (15.3%) | 0.005 | 2.05 (1.20-3.51)* |

Panel B: Continuous variables

| | Caesarean | Vaginal | K-W p value |
|-----------------------|--------------|--------------|-------------|
| Mean age (SD) (years) | 26.14 (4.64) | 27.11 (4.91) | 0.03* |
| Mean height (SD) (cm) | 153.9 (7.7) | 157.1 (7.6) | 0.0001* |

Caesarean = patients who failed a trial of scar (TOS)
 Vaginal = patients who delivered vaginally after a TOS
 M-H = Mantel-Haenszel chi squared test
 OR = odds ratio
 CI = confidence interval
 K-W = Kruskal-Wallis H test
 SD = standard deviation
 * Statistically significant

TABLE 2

PAST OBSTETRIC CHARACTERISTICS

Panel A: Categorical variables

| | Caesarean | Vaginal | M-H p value | OR (95% CI) |
|--|------------------|-----------------|--------------------|--------------------|
| Parity before index pregnancy: Parity | | | | |
| 1-4 | 188/194 (96.9%) | 261/282 (92.6%) | 0.04 | 0.40 (0.14-1.07) |
| 5-9 | 6/194 (3.1%) | 21/282 (7.4%) | | |
| Parity 1 before index delivery: Yes | | | | |
| | 137/194 (70.6%) | 99/282 (35.1%) | 0.00000 | 4.44 (2.94-6.72)* |
| Vaginal delivery before primary caesarean: Yes | | | | |
| | 61/194 (31.4%) | 107/283 (37.8%) | 0.14 | 0.75 (0.50-1.12) |
| Vaginal delivery after primary caesarean: No | | | | |
| | 160/194 (82.4%) | 145/238 (60.9%) | 0.00000 | 4.35 (2.76-6.88)* |
| Primary caesarean less than 2 years previously: Yes | | | | |
| | 16/194 (8.2%) | 19/283 (6.7%) | 0.54 | 1.24 (0.59-2.61) |
| CPD as indication for primary caesarean section: Yes | | | | |
| | 78/194 (40.2%) | 63/283 (22.3%) | 0.00003 | 2.33 (1.53-3.55)* |
| Past perinatal death: Yes | | | | |
| | 43/194 (22.2%) | 55/283 (19.4%) | 0.49 | 1.17 (0.73-1.88) |
| Past neonatal death: Yes | | | | |
| | 21/194 (10.8%) | 36/283 (12.7%) | 0.52 | 0.83 (0.45-1.52) |
| Past stillbirth: Yes | | | | |
| | 40/194 (20.6%) | 46/283 (16.3%) | 0.23 | 1.33 (0.81-2.18) |

Panel B: Continuous variables

| | Caesarean | Vaginal | K-W p value |
|---|------------------|----------------|--------------------|
| Mean parity (SD) | 1.53 (1.04) | 2.36 (1.41) | 0.00000* |
| Mean years after primary caesarean section (SD) | 3.28 (1.99) | 5.04 (3.40) | 0.00000* |
| Birth order of primary caesarean section (SD) | 1.5 (1.0) | 1.6 (1.0) | 0.152 |

Caesarean = patients who failed a trial of scar (TOS)
 Vaginal = patients who delivered vaginally after a TOS
 M-H = Mantel-Haenszel chi squared test
 OR = odds ratio CI = confidence interval
 CPD = cephalopelvic disproportion
 K-W = Kruskal-Wallis H test
 SD = standard deviation
 * Statistically significant

(82% vs 61%) and CPD as the indication for the primary caesarean section (40% vs 22%). The mean interval between the primary caesarean section and the index delivery in years was longer in the vaginal delivery group than in the caesarean delivery group: 5.0 years (sd 3.4) vs 3.3 years (sd 2.0). But when those who had the primary caesarean section less than 2 years earlier were compared with those who had it more than 2 years earlier, there was no difference.

Vaginal delivery before the primary caesarean section, a past perinatal or neonatal death, or a past stillbirth did not make any difference to the mode of delivery.

Present pregnancy and delivery characteristics

Among patients who underwent a TOS, the proportions of the following were significantly more frequent in the repeat caesarean section group (Table 3): gestational age of 37 weeks or more (93% vs 82%); performance of erect lateral pelvimetry (ELP) (43% vs 16%); obstetric conjugate less than 10.4 cm (40% vs 11%); high station on admission to the labour ward (99% vs 86%); cervical dilatation less than 4 cm at admission to the labour ward (78% vs 62%). Mean gestational age in weeks, sex of the baby, hypertension and antepartum haemorrhage in the index pregnancy did not have any significant association with the mode of delivery of patients undergoing TOS. Babies delivered by repeat caesarean section had a significantly greater mean birthweight: 3328.0 g (sd 623.9) vs 3073.5 g (sd 632.9). Of the patients who were delivered by repeat caesarean section, only 5% weighed less than 2500 g. However, when the babies with birthweight higher than 3000 g were studied, there was no difference between the groups.

The perinatal mortality rate was not different in the two groups. However, there were fewer babies with Apgar score more than 6 in the caesarean section group (79% vs 98%). More of the babies delivered by repeat caesarean section were admitted to the special care nursery (SCN) but the vaginally delivered babies spent more time in the SCN: 9.6 days (sd 7.1) vs 5.2 days (sd 4.1).

The commonest causes of maternal morbidity

found in the patients delivered by elective caesarean section were pyrexia of unknown origin (PUO) (19%), abdominal wound infection (2%) and anaemia (haemoglobin level less than 8 g/dl) (2%). Of the patients who had a repeat caesarean section after TOS, the main puerperal complications were PUO (22%), puerperal sepsis (2%) and wound infection (8%). Among the women who delivered vaginally, the main complications were PUO (5.5%) and perineal wound infection (0.8%). There were no maternal deaths.

When the variables which were found to be significantly associated with repeat caesarean section were modelled by forward logistic regression analysis, the variables in Table 4 remained significantly associated with caesarean delivery. The rest became redundant.

Discussion

About 8000 mothers were delivered at the maternity unit of the PMGH annually during this study period. The caesarean section rate was 5-6%. About 1% of the total deliveries were repeat caesarean sections, 90% of which followed one previous section. Labour was terminated by caesarean section in 41% of these patients; the rest had a successful vaginal delivery. These figures are similar to those obtained elsewhere (1,4-8).

Highlands women were more likely to have a repeat caesarean section than women of the Southern, Momase and Islands regions (Table 1). Highlands babies delivered at the PMGH have been shown to be heavier than babies from other ethnic origins and are more likely to be delivered by caesarean section (13,14). Moreover, this study showed that highland women have smaller pelvic dimensions than women from other provinces. The combination of bigger babies and smaller pelvices would be the most likely reason for the increased caesarean rate.

Women of short stature, less than 150 cm, were at a greater risk of repeat caesarean section. This is to be expected though it is not the experience of all workers (15). It was interesting, however, that the proportion of short women with small pelvices was no different from the proportion of tall women with small pelvices (33% vs 30%). It was

TABLE 3

PRESENT PREGNANCY AND DELIVERY CHARACTERISTICS

Panel A: Categorical variables

| | Caesarean | Vaginal | M-H p value | OR (95% CI) |
|--|-----------------|-----------------|-------------|---------------------|
| Gestational age at delivery | | | | |
| 20-36 weeks | 13/175 (7.4%) | 44/249 (17.7%) | | |
| 37-42 weeks | 162/175 (92.6%) | 205/249 (82.3%) | 0.002 | 2.67 (1.33-5.46)* |
| Hypertension in the present pregnancy: No | 185/194 (95.4%) | 276/283 (97.5%) | 0.12 | 0.47 (0.16-1.37) |
| Antepartum haemorrhage in this pregnancy: Yes | 1/194 (0.5%) | 1/283 (0.4%) | 0.79 | |
| Erect lateral pelvimetry: Yes | 76/177 (42.9%) | 40/254 (15.7%) | 0.00000 | 4.03 (2.51-6.48)* |
| Narrow obstetric conjugate (OC) - OC <10.4 cm: Yes | 25/62 (40.3%) | 4/36 (11.1%) | 0.002 | 5.43 (1.56-20.61)* |
| Birthweight (g) | | | | |
| 500-2499 | 8/166 (4.8%) | 36/261 (13.8%) | | |
| 2500-3800 | 158/166 (95.2%) | 225/261 (86.2%) | 0.003 | 3.16 (1.35-7.65)* |
| Birthweight 3000 g or more: Yes | 146/190 (76.8%) | 171/231 (74.0%) | 0.51 | 1.16 (0.73-1.87) |
| Sex of baby | | | | |
| Male | 101/194 (52.1%) | 152/282 (53.9%) | 0.65 | |
| Station high at admission to the labour ward: Yes | 160/161 (99.4%) | 197/230 (85.7%) | 0.00002 | 26.8 (3.87-532.80)* |
| Cervix ≥4 cm: No | 124/159 (78.0%) | 146/234 (62.4%) | 0.001 | 2.14 (1.32-3.47)* |
| Apgar >6: Yes | 130/165 (78.8%) | 215/219 (98.2%) | 0.00000 | 0.07 (0.02-0.21)* |
| Perinatal death: Yes | 5/190 (2.6%) | 9/283 (3.2%) | 0.69 | 0.80 (0.23-2.66) |
| Admission to the SCN: Yes | 33/174 (19.0%) | 24/255 (9.4%) | 0.004 | 2.26 (1.24-4.14)* |
| Blood transfusion: Yes | 41/179 (22.9%) | 15/255 (5.9%) | 0.00000 | 4.49 (2.34-8.71)* |

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Panel B: Continuous variables

| | Caesarean | Vaginal | K-W p value |
|---|------------------|----------------|--------------------|
| Mean birthweight (SD) (g) | 3328.0 (623.9) | 3073.5 (632.9) | 0.00005* |
| Gestational age at delivery (SD) (weeks) | 38.9 (2.0) | 38.5 (2.4) | 0.35 |
| Mean number of days spent at the SCN (SD) | 5.16 (4.11) | 9.63 (7.07) | 0.02* |

Caesarean = patients who failed a trial of scar (TOS)

Vaginal = patients who delivered vaginally after a TOS

M-H = Mantel-Haenszel chi squared test

OR = odds ratio CI = confidence interval

SCN = special care nursery

K-W = Kruskal-Wallis H test

SD = standard deviation

* Statistically significant

likely that the reason for the increased risk of repeat caesarean section in this group of women may have been a reluctance on the part of the attendants to subject them to a rigorous TOS.

Experience of a vaginal delivery after the primary caesarean section significantly reduced the risk of a repeat operation (Table 2). This is what one would expect and is in agreement with work done elsewhere (15,16). However, other workers (17) have urged caution when selecting patients with this feature for TOS. A successful post-caesarean vaginal delivery would imply adequacy of the pelvis and be expected to reduce the risk for a repeat operation. However, a vaginal delivery before the primary caesarean section had no association with the mode of delivery. This is in agreement with the findings of other workers (15,18). The tendency of babies to get bigger with increasing parity and soft tissue scarring may be contributory.

The mean parity of patients who were delivered vaginally was significantly higher than that of patients who had a repeat section. This is in agreement with work done elsewhere (19). Of the patients who had repeat caesarean section, 71% were para 1, whereas only 35% of the women who delivered vaginally were para 1. In other words, being of parity more than

one made it more likely that a patient would deliver vaginally, as was found by other workers (18,20). In a case-control study (16), the labour curves of women with previous caesarean section and no prior vaginal birth were similar to those of nulliparous patients and labour disorders were present more frequently. This could explain the increased caesarean section rate in those patients whose only delivery was the caesarean section.

A repeat caesarean section was more likely if the indication for the primary caesarean section was CPD. This is in agreement with work done elsewhere (15,17,21); however, after multiple logistic regression analysis, the association disappeared, as was also shown by Pickhardt et al. (22), who could not find any cluster of variables which could accurately predict success or failure of a TOS on an individual basis. CPD is often misdiagnosed. Desultory and inadequately augmented labour leads to its prolongation, which may be misinterpreted as CPD. However, in a retrospective study of women who underwent a caesarean section for dystocia, it was found that subsequent labours were similar or longer in duration than those of nulliparous patients (23). In spite of this, women who undergo caesarean section because of dystocia should still be given an adequate TOS because a large proportion will achieve a vaginal delivery.

A repeat caesarean section was more likely to be performed in a term pregnancy than before 37 weeks gestation (Table 3). There was a significant difference between the mean birthweight of babies delivered vaginally and the birthweight of those delivered by repeat operation. 95% of babies delivered by repeat caesarean section weighed 2500 g or more. This is to be expected, However, when the larger babies were examined, there was no difference between the birthweights of the caesarean-delivered babies and the vaginally delivered babies.

Patients with small obstetric conjugate, less than 10.4 cm, were more likely to have a repeat caesarean operation than a vaginal delivery. This is in keeping with our standard practice and therefore not surprising as there would be a reluctance to subject any woman to a prolonged TOS when the OC was considered small. What was interesting was the fact that patients who had erect lateral pelvimetry were more likely to have a repeat caesarean section. Similar findings were recorded by Krishnamurthy et al. (24). Pelvimetry has an influence on the planned mode of delivery. If pelvimetry suggests that a pelvis may be of

borderline adequacy it is only natural that the attendant might be unwilling to subject the scar to an adequate trial, whereas in the absence of pelvimetry the attendant would feel more confident in doing so. However, pelvimetry is maternally focused and does not assess fetal size and presentation. Moreover, it is a static examination which does not take account of changes in pelvic and fetal dimensions in labour. Pelvimetry in patients who have had a primary caesarean section would appear not to be useful in the management of subsequent delivery. In the absence of uniform facilities for intensive management of patients in labour, we would continue to recommend that patients with caesarean scars are sent to hospitals where they can be adequately managed. Even in these better equipped hospitals, careful monitoring of labour will help select patients who may more safely be delivered by repeat caesarean section.

If a fetal head was at 3/5 or higher the patient was more likely to be delivered by repeat caesarean section. This was similar to findings in a previous study at the PMGH on primary caesarean section (14). A high fetal head at admission in labour may simply mean that the patient is in early labour. On the other hand it

TABLE 4

MULTIPLE LOGISTIC REGRESSION ANALYSIS OF VARIABLES ASSOCIATED WITH REPEAT CAESAREAN SECTION

| Variable | Log likelihood | -2 log LR | Significance |
|--|----------------|-----------|--------------|
| Birthweight \geq 2500 g | -291.380 | 23.567 | 0.0000 |
| Obstetric conjugate less than 10.4 cm | -270.434 | 25.112 | 0.0000 |
| Erect lateral pelvimetry | -262.287 | 5.381 | 0.0679 |
| No vaginal delivery after primary caesarean section | -266.811 | 17.866 | 0.0000 |
| Parity = 1 | -264.798 | 13.839 | 0.0010 |
| Height less than 150 cm | -261.645 | 7.533 | 0.0231 |
| High station of the head at admission to the labour ward | -280.520 | 45.283 | 0.0000 |
| Region of origin within PNG | -263.201 | 10.647 | 0.0308 |

could also mean that there may be some degree of disproportion.

The perinatal outcome of the index pregnancy was not different in the two groups. Babies of patients who were delivered by caesarean section were more likely to be sent to the special care nursery (SCN) but babies delivered vaginally stayed there longer. It would seem that the caesarean-delivered babies with lower 1 minute Apgar scores were more likely to have been sent for observation only whilst the vaginally delivered babies sent to the unit were more likely to have other more serious problems.

There are good reasons to encourage vaginal birth after caesarean section. Such a policy will continue to reduce the overall caesarean section rate, with its attendant benefits, even in our hospital where the rate is already low. We have to accept, however, that in spite of being well informed, some patients will still elect to undergo a repeat caesarean delivery. Whilst we continue to make attempts to deliver women with previous caesarean scars vaginally, it would be prudent to take into consideration the factors which have been shown in our study to be associated with repeat caesarean section. But they are not absolute. They only guide us in our management of these patients, all of whom deserve to be closely monitored.

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