# Vaginal birth after classical Caesarean section

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## Introduction

Current belief in obstetric practice is that the scar of a classical Caesarean section is more prone to rupture than that of a lower segment Caesarean section and that for this reason elective repeat Caesarean should always be undertaken in subsequent pregnancies.

This review of the history of management of women after a previous classical Caesarean section was prompted by the presentation of a 30-year-old woman who, in her eighth pregnancy, was admitted in established labour and with a moderate degree of intrapartum haemorrhage. She was unbooked and had received no antenatal care. A rapid consultation revealed the following obstetric history:

1. 1990 – normal vaginal delivery;
2. 1991 – miscarriage;
3. 1994 – classical Caesarean section at 27 weeks for fetal distress in premature labour, performed in our hospital. Well documented operative details: Pfannenstiel skin incision, midline incision in upper uterine segment, repair of uterus in three layers with polyglactin 910 (Vicryl, Ethicon), no postoperative pyrexia or other apparent complication.
4. 1996–2001 – four normal vaginal deliveries in a country hospital; no booking or antenatal care in any pregnancy; on each occasion presented in labour; largest baby weight 4100 g; no complications with any delivery.

Staff at the country hospital had believed her Caesarean section had been a lower segment procedure, an impression reinforced by her Pfannenstiel scar.

On examination, she was haemodynamically stable and cardiotocography was satisfactory. A portable ultrasound scan showed a posterior placenta but it was impossible to see the lower edge owing to body habitus; her weight was greater than 130 kg. In the operating theatre a vaginal examination showed the cervix to be thin and 7 cm dilated, the placenta was not praevia, the fetal head was well down in the pelvis and vaginal bleeding slight. Labour was allowed to continue under the direct view of a senior obstetrician, and within 1 h a normal vaginal delivery of a male infant, 3460 g, occurred. Total blood loss was 700 mL and the woman was clinically well postpartum. Six weeks later she had open tubal ligation performed – the scar of the classical Caesarean section was barely visible on inspection.

## Historical literature review

Whilst trial of vaginal birth after lower segment Caesarean section (VBAC) is now widely encouraged, practised and accepted as safe, vaginal birth after classical Caesarean section (VBACC) is considered by contemporary obstetricians to pose an unacceptable risk of uterine rupture threatening both mother and baby.[1] All recent series of trials of VBAC exclude previous classical Caesarean section.[1–4] Interest in this case, admittedly a single example of successful vaginal births following classical Caesarean section, led to a literature search in an attempt to answer firstly, whether the current accepted practice of not allowing trial-of-scar (TOS) in women with a previous classical Caesarean section is based on good scientific evidence and if so, why there should be such an apparent difference in the behaviour of the upper and lower uterine segments, in pregnancy and labour following Caesarean section.

Cragin's famous phrase of 1916 'once a Caesarean always a Caesarean' was coined because Cragin believed the only indication for Caesarean section was pelvic contraction.[5] However many other obstetricians of the time were using Caesarean section for a variety of non-recurrent indications and it was soon clear that safe vaginal birth following previous Caesarean section was possible.[6] The vast majority of Caesarean sections up until the 1920s were via the upper segment, the operation of lower segment Caesarean section (LSCS) being in its infancy. In 1921 Holland conducted detailed studies into the subject of rupture of Caesarean section scar and this work formed the basis for much subsequent writing on the subject.

Holland collected 97 case reports of ruptured uteri following previous Caesarean section from numerous obstetricians – there was only one LSCS, but there were 54 classical Caesarean sections with a midline uterine incision, and a variety of other upper uterine incisions including transverse fundal and posterior median, or an unknown incision,

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in the remainder.[6] Eighty-eight women had undergone one previous Caesarean section, six had two, two women had three Caesarean sections, one unknown. Suture materials used in the uterus included catgut, silk and reindeer tendon. Sixty-six cases had experienced febrile morbidity after the Caesarean section. At the time of rupture the placenta was noted to be implanted over the Caesarean section scar in at least 34 cases and there were complicating factors (twins, hydramnios, abruption) thought to have precipitated the rupture in 17 cases. Interestingly, at least 36 ruptures occurred prior to the onset of labour.[6]

Holland also carried out a retrospective study in which he asked obstetricians throughout the British Isles for details of all Caesarean sections they had performed and of any follow-up. He identified 1103 women of whom 78 had a subsequent vaginal birth and 352 a subsequent repeat Caesarean section. The number of ruptures including those that occurred before labour began, those that occurred during labour and those observed at repeat Caesarean section was 18. Many of these ruptures, the exact number not being specified, were silent 'dehiscences' of the type not infrequently observed in lower segment scars today. The type of previous Caesarean section is also not specified although it can be assumed that there were few lower segment Caesarean sections and also that there were some transverse fundal incisions. At that time, Caesarean section was only ever performed in the third trimester.[6]

From these two studies Holland concluded that the overall incidence of rupture of Caesarean section scars (all types) in a subsequent pregnancy or labour was 4%; that the cause of ruptured scar is imperfect healing, leading to a thin scar; the insertion of the placenta over the scar predisposes to rupture; that rupture occurs almost as often in late pregnancy as in labour; that the scar of the transverse fundal incision is especially liable to rupture and that using catgut rather than silk as suture material increases the rate of subsequent rupture.[6] Holland's figures were subsequently widely quoted by many authors, but queried in 1938 by Moir, who pointed out that ruptures during pregnancy and labour should be distinguished from one another, and that a true denominator on which to base rates of rupture could not be determined from Holland's figures.[7] Looking back today, it is clear that he was correct.

Up until the mid 1950s, TOS after classical Caesarean section was still reasonably common on both sides of the Atlantic. Browne in Dublin (1951) reported 100 consecutive vaginal deliveries after previous Caesarean section, eight of these followed classical Caesarean section and there were no ruptures, 76 followed lower segment Caesarean sections and there was one rupture, 16 had unknown scars.[8] Hindman of Boston in 1948 described 177 successful vaginal deliveries in 118 women following previous Caesarean section; 104 followed classical Caesarean sections, 36 followed lower segment Caesarean sections, four either two classical, or classical and lower segment Caesarean section, the remainder rarer incisions or incisions not known. Hindman quotes various other studies which give figures of between 1.5% and 6% for scar rupture following classical Caesarean section 'with a gener-

ally accepted average of 4%'. Hindman's personal experience of classical scars in women labouring led him to conclude that 'attempts at pelvic delivery are to be encouraged' after previous classical Caesarean section, providing certain precautions were observed.[9,]

Eames in 1953 carried out a review of all reports in the *American Journal of Obstetrics and Gynecology* over a 2.5 year period: all studies were retrospective. Amongst TOS after classical Caesarean section, there were 23 ruptures in 902 cases (2.6%); where TOS was conducted after lower segment Caesarean section there were 11 ruptures amongst 880 cases (1.3%).[10]

Also in 1953, Lane and Reid of Boston reported on 246 patients with prior classical Caesarean section who had a subsequent term pregnancy: 155 had repeat Caesarean sections (two dehiscences observed), two ruptured in late pregnancy, one ruptured in labour giving an overall rupture rate of 2%.[11] This was less than the rupture rate of 3.3% amongst women in the same study who had undergone previous lower segment Caesarean section. In response to Lane and Reid's study, Dewhurst published both a personal retrospective study and a review of recent UK studies.[12,13]

Dewhurst's personal study showed a rate of rupture of classical scars of 6%.[12] However his study is of 68 women who underwent 103 classical CS and 16 women who had both classical Caesarean section and lower segment Caesarean section, in some cases multiple times. He does not specify whether some of those who ruptured had more than one classical Caesarean section but it seems logical to conclude that they did. In his review, of six studies including his own, two studies had no classical Caesarean sections, being concerned only with lower segment Caesarean section, and one had only 16 classical Caesarean sections, so that the overall results are greatly influenced by his personal study results.[13] In the review he added together the rates of scar rupture overall, in pregnancy and labour (2.2% for classical Caesarean section, 0.5% for lower segment Caesarean section). He then took his figures for rupture and expressed them as a percentage of women who were allowed to labour (4.7% of classical Caesarean section and 0.8% lower segment Caesarean section, respectively) and finally as a percentage of those delivering vaginally (8.9% for classical Caesarean section and 1.2% for lower segment Caesarean section). However, only a small number of women with previous classical Caesarean section were allowed to attempt vaginal delivery so the use of the latter two groups as denominators for the whole is erroneous and skews the final figures. The impression is given, and has since been widely quoted in the literature, that 8.9% of women with previous classical Caesarean section attempting vaginal delivery had uterine rupture – this is not the case.[12,13,17,18] Dewhurst was firmly opposed to the concept of TOS for women with prior classical Caesarean section and his paper marks a turning point in obstetricians' attitudes to the subject. From that date on, in both the American and the European literature, there was almost universal caution against TOS. Dewhurst did also emphasise what other writers had noted, that the uterine rupture after classical Caesarean section could be more severe than that of a lower

segment Caesarean section scar, with possible major haemorrhage and fetal death, although simple dehiscence also occurred.[13]

Nevertheless, some later reports exist. Graham (1984) describes five patients who were allowed to labour after previous low vertical or classical Caesarean section – all delivered vaginally without incident.[14] Tahilramaney, in the same year, carried out a retrospective study that included 21 women with a vertical (low or classical) uterine scar – five delivered safely vaginally, 16 had repeat Caesarean sections at which two were found to have scar dehiscence, the incidence of dehiscence was not statistically different from the dehiscence rate in a much larger control group of lower segment Caesarean section scars.[15]

Three other studies are of interest. Clow and Crompton in 1973 followed the progress of 45 women, who had undergone termination of pregnancy by hysterotomy, through 46 subsequent term pregnancies.[16] There were 37 vaginal deliveries including two sets of twins, eight forceps deliveries and one assisted breech, and nine Caesarean sections. There was one case of uterine rupture of slight degree; 14 scars were considered 'thin' at Caesarean section or by postpartum palpation and one was 'dangerous' – nevertheless, these did not rupture.

Halperin (1988) in a retrospective study compared 70 pregnancies subsequent to a primary classical Caesarean section for a preterm infant, with 71 pregnancies subsequent to primary LSCS, also performed preterm.[17] The classical Caesarean section cases had experienced a higher incidence of postoperative pyrexia (16%) compared to the lower segment Caesarean section cases. There were four scar dehiscences and five 'thin' scars following classical Caesarean sections, none after lower segment Caesarean sections, however, these figures did not quite reach statistical significance, and whereas 97% of women with previous classical Caesarean sections were again delivered abdominally only 83% of those with previous lower segment Caesarean section had repeat Caesarean section. No mention is made of suture materials or placental site at the original Caesarean section. Halperin, although stating that she believes that there is a true increase in classical Caesarean section scar rupture compared to that of lower segment Caesarean section scar rupture, comments on the limits of such retrospective studies: physicians might have been more likely to look for a dehisced classical scar, and having found it, to report it.[16] Despite the limitations of her study, it, like Dewhurst's, has been widely quoted as describing a 'high rate of uterine rupture (12%)' in TOS following classical Caesarean section – this is not in fact the case.[18]

Martin (1997) describes 11 years of personal experience with TOS after low vertical Caesarean section performed at 31 weeks' gestation or greater, and reviews all recent studies –82% of 382 women had successful vaginal deliveries, and the incidence of uterine rupture was 1.05%.[19] He concluded that TOS after low vertical Caesarean section was as safe as after low transverse incision, although the same precautions should be taken. He concedes that in some cases low vertical incisions do encroach upon the upper segment although attempts were made in his study to exclude all cases where the incision may have extended more than 2 cm into the upper segment.

A summary of all the studies discussed is shown in Table 1. Clearly there are some notable differences between most of the cases that have formed the basis for our belief that the classical Caesarean section scar should not be subject to TOS, and cases of classical Caesarean section today. Approximately only 1% of all Caesarean sections in contemporary practice are classical Caesarean sections – at term these are mostly for placenta praevia or transverse lie.[20] However at 24 weeks' gestation 20%, and at 30 weeks', 5% of Caesarean sections are classical.[20] Suture material is likely to be longer lasting (polyglactin, now commonly used, has about twice the tensile strength at 2 weeks postpartum compared to chromic gut, the substance most frequently used up until the late 1980s). Antibiotics are routinely given and postoperative pyrexia rapidly treated. It is possible that these differences might significantly affect the strength of the subsequent scar, as might the site of the placenta in the previous and current pregnancy. Contemporary practice in women with previous classical Caesarean sections is to perform elective repeat Caesarean section at 37–38 weeks if pregnancy continues to that point, to avoid rupture during labour. Rupture of the scar in the third trimester, without labour, is not a common problem today, yet the observations of earlier writers suggest that it should be if the classical scar of today corresponds to that of earlier times.

If there is indeed a difference between the behaviour of scarred upper and lower uterine segments in subsequent pregnancies, why should this be so? It has been postulated that the upper segment is less 'at rest' than the lower in the postpartum period.[6,8] However the lower segment also undergoes dramatic cellular atrophy and diminution in size. It has also been suggested that the upper segment myometrium is more active in labour.[6,8] A recent study failed to demonstrate any regional differences in the myometrium in regard to the rate or force of muscle fibre contraction.[21] Normal labour will also always involve very considerable stretching of the lower segment and of any scars that are present. Provided adequate coaptation of the edges of the original incision has been achieved and maintained, both classical and lower segment uterine incisions should heal by first intention, forming a fibrous scar that has at least 80% of the tensile strength of the surrounding tissue.[22] Infection could play a role in diminishing scar strength as suggested by Halperin's paper.[17] The placental site, both in the index pregnancy and in subsequent pregnancies, might be significant.[6] In support of this possibility is our knowledge that when placenta praevia occurs in a lower segment that has been the site of a previous Caesarean section, morbidly adherent placenta is more frequent.[23] Where there has been prior classical Caesarean section the placenta is likely to be found implanted over the scar (i.e. on the anterior uterine wall) in approximately 40% of pregnancies, which might account for a higher rate of rupture of classical scars.[24]

Little is known about the relationship of visibly 'thin' scars to subsequent uterine rupture. 'Thin' scars are relatively often noted and reported at repeat lower segment Caesarean

**Table 1** Summary of reports of uterine rupture/dehiscence in pregnancies following previous Classical caesarean section

| Author | Year | Type of study | No. cases | No. controls | Conclusion |
|---|---|---|---|---|---|
| Holland (1) | 1921 | Case reports | 97 | – | Amongst earliest descriptions of uterine rupture following Caesarean section |
| Holland (2) | 1921 | Retrospective case collection | 430 (78 vaginal births, 352 repeat CS) | – | Rupture rate for all types of CS 4% |
| Hindman | 1948 | Descriptive, retrospective | 177 vaginal deliveries in 118 women (104 previous classical CS, 36 previous LSCS) | – | No ruptures in this series* |
| Browne | 1951 | Descriptive, retrospective | 100 (8 classical CS, 76 LSCS, 16 unknown scars) | – | No ruptures following classical CS, 1 rupture after LSCS, 1.3% |
| Eames | 1953 | Meta-analysis | 902 previous classical CS allowed TOS | 880 previous LSCS allowed TOS | 2.6% rupture rate for classical, 1.3% rupture rate for LSCS |
| Lane and Reid | 1953 | Retrospective, case control | 246 previous classical CS, 89 vaginal deliveries, 157 repeat CS | 451 previous LSCS, 25 vaginal deliveries, 426 repeat CS | 5 cases of clinical rupture or silent dehiscence in cases (2%), 14 in controls (3.3%) |
| Dewhurst | 1956 | Retrospective, descriptive | 84 women, 68 had 103 previous classical CS, 16 had both classical and LSCS | – | 6% rupture rate – number with multiple scars not recorded |
| Dewhurst | 1957 | Review of 6 studies (including Dewhurst 1956) | 762 women with classical CS (including an unknown number with multiple scars), 17 ruptures | 1530 women with LSCS scars, 8 ruptures | 2.2% rupture rate for classical CS (unknown number with multiple scars), 0.5% rupture rate for LSCS scars |
| Clow and Crompton | 1973 | Prospective descriptive study of pregnancies following hysterotomy for TOP | 45 women, 46 pregnancies | – | 37 full-term vaginal births, 1 uterine rupture |
| Graham | 1984 | Descriptive, retrospective | 5 women with previous classical scars | – | No ruptures |
| Tahilramaney | 1984 | Retrospective, case/control | 21 women with low vertical or classical CS | 374 women with previous LSCS | No ruptures in 5 cases allowed TOS, 2 dehiscences in 16 women with repeat CS. 10 ruptures/dehiscences in controls, no statistical difference between cases and controls |
| Halperin | 1988 | Retrospective, case/control | 70 women with previous classical CS, 4 dehiscences and 5 'thin scars' – 97% repeat CS | 71 women with previous LSCS, no dehiscences –83% repeat CS | No statistical differences, few women allowed to labour |
| Martin | 1997 | Retrospective, descriptive | 382 women with previous low vertical CS scars | – | TOS attempted in all, 82% vaginal birth rate, 1.05% uterine ruptures |

*Hindman describes earlier studies of classical scars in subsequent pregnancies: Sanger 1895, 500 cases no ruptures, Audebert 1923 6% rupture rate, Kerr 1924 2% rupture rate, Elton 1940 1.5% rupture rate.
CS, Caesarian section; LSCS, lower segment Caesarean section; TOS, trial-of-scar.

section and are seen as justification both for that Caesarean section and subsequent ones; it is common clinical practice to advise such women that they are at risk. However amongst women selected for TOS after lower segment Caesarean section, and who do proceed to successful VBAC, must also be some with a 'thin' scar that does not rupture. Also not well documented is whether it is the fibrous scar tissue itself which tears, or the adjacent myometrium. Earlier writers have differed in their views on this matter.[8] Furthermore, when lower segment Caesarean section is performed preterm the lower segment is often poorly formed and though a low transverse uterine incision is possible it frequently encroaches on the thicker myometrium of the upper uterus, yet such women are allowed to labour in subsequent pregnancies with apparently no adverse results.

Certainly the literature suggests that some classical scars might be more prone to rupture than others. However the risk of rupture of a single well-healed classical Caesarean section scar during a subsequent TOS cannot be determined from any of the studies cited above. It does appear that where there has been no postpartum febrile morbidity and where the placenta in both the current and Caesarean section pregnancies has not been sited under the incision, the risk of rupture for a woman attempting vaginal birth after a single classical Caesarean section might be not much greater than that associated with TOS following one lower segment Caesarean section, and might be similar to that for TOS after two lower segment Caesarean sections, now an acceptable practice.[25,26] It might also be that in many cases, the scar of a prior classical Caesarean section has already shown its strength by reaching the point of spontaneous labour intact.

This is by no means a recommendation for VBACC or even a randomised trial of VBACC. However there might be a place for the careful prospective collection of further data from classical Caesarean section and subsequent pregnancies (with both positive and negative outcomes). Women having had a previous classical Caesarean section are a relatively small group, but amongst them are some who would wish to have a vaginal birth if they could safely do so.[25,26] It might be that, contrary to current opinion, some of them could. At the moment, we just don't have the evidence.

## Acknowledgements

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