

Risks of planned vaginal birth vs. planned cesarean section after previous cesarean

Clinical question

What are the risks of planned vaginal birth vs. planned cesarean section after previous cesarean section?	
Population:	Healthy women with previous cesarean section
Intervention:	Planned vaginal birth after a) spontaneous or b) induced labour
Comparison:	Planned cesarean birth
Primary Outcome:	Uterine rupture
Secondary Outcomes:	Maternal transfusion, hysterectomy, maternal infection, maternal mortality, perinatal death or 5 min Apgar <7, admission to NICU.

Search strategy

- Time period: 1990 - 2009
- Search terms: Vaginal birth after cesarean, vaginal birth, cesarean section, attempted vaginal birth, trial of labour, uterine scar, uterine rupture.
- Databases searched: MEDLINE (Ovid SP); EMBASE; Cochrane CDSR, CENTRAL, DARE, & Geneva Medical Foundation.
- Titles reviewed –220; abstracts reviewed – 140; papers reviewed – 96; papers meeting eligibility for inclusion – 25
- Exclusions: Studies with misoprostol as primary method of induction

Synthesis of the evidence

The relative risk of uterine rupture for women planning vaginal vs. cesarean birth after a previous cesarean is 2-3 times higher, but the absolute difference is 2-4/1,000. Oxytocin induction compared to spontaneous labour among women

planning a vaginal birth is associated with a 1.5 – 3-fold increase in risk of uterine rupture, with a range in absolute increase from 2-9/1,000. Maternal mortality was 0.2-0.4/1,000 less frequent in the planned vaginal group. Maternal transfusion occurred less frequently (absolute difference approximately 1-3/1,000 among women planning vaginal birth but this finding was inconsistent across studies. Hysterectomy (absolute difference 1-2/1,000) and infection (2-40/1,000) were consistently less frequent in the planned vaginal birth group. Differences in perinatal mortality varied from 0-3/1,000 between studies in either direction. Newborns of mothers who planned vaginal birth experienced a reduction in incidence of five minute Apgar scores less than seven and admissions to NICU ranged from 2-46/1,000.

Limitations

There are major limitations in the evidence related to the safety of planned VBAC vs. planned C/S:

1. Absence of any randomized clinical trials
2. Inconsistent inclusion criteria, e.g. gestational age, previous vertical incision
3. Inconsistent or lack of definition of uterine rupture
4. Inconsistent outcome definitions, e.g. failure to exclude perinatal deaths due to congenital anomalies
5. Oxytocin induction and augmentation protocols are not always provided, and some are not congruent with Canadian practice guidelines
6. Misoprostol is an induction agent in some studies but its use is not recommended in Canada for induction at term with a viable fetus
7. Four of the 5 meta-analyses include studies from the 1980's when obstetrical practice differed from today's standards
8. Insufficient power to precisely evaluate risk for rare adverse outcomes including perinatal deaths

Conclusions

The risk of uterine rupture among women with a previous cesarean section increases by 2-9/1,000 for those planning vaginal versus cesarean delivery. Risk of uterine rupture increases when labour is induced, particularly with prostaglandins, to a maximum reported rate of 15/1,000. Maternal mortality is 0.2-0.4/1,000 less frequent in planned vaginal versus cesarean birth. Comparisons of perinatal mortality are inconsistent across studies and vary with differences of 0-3/1,000 in either direction. There is decreased maternal and newborn morbidity associated with planned vaginal birth. Overall this review suggests that healthy women at term with a singleton fetus should be encouraged to plan vaginal birth after a discussion of risk vs. benefit. Induction of labour should also be offered after a discussion of risk vs. benefit.

Meta-analysis	Inclusion	Findings	Comments
<p>Rossi, C. et al. 2008 AJOG: September</p> <p>Maternal morbidity following a trial of labour after cesarean section vs elective repeat cesarean delivery: a systematic review with meta-analysis</p>	<p>Seven studies published 2000-2007</p> <p>Retrospective studies (3) Hibbard, 2001, USA, n= 1,755 Spaans, 2002, Europe, n= 214 Tan, 2007, Aust-NZ, n= 1,000</p> <p>Prospective studies (4) Bias, 2001, Europe, n= 252 Blanchette, 2001, USA, n= 1,481 Kwee, 2007, Netherlands, n= 4,569 Landon, 2004, USA, n= 33,699</p> <p>n= 42,970 planned VBAC n = 24,349 planned CS n = 18,621</p> <p>Inclusion:</p> <ul style="list-style-type: none"> spontaneous, induced and augmented labour singleton pregnancies delivery > 20 weeks gestation or a newborn weight of >500g <p>Exclusion:</p> <ul style="list-style-type: none"> induction of labour for termination or intrauterine death studies performed in selected populations (postterm, multiple pregnancy) studies conducted in developing countries 	<p>Planned VBAC vs. Planned C/S</p> <p>Uterine Rupture 1.3% vs. 0.4% OR 3.13 (1.30-7.50)</p> <p>Secondary Outcomes:</p> <p>Maternal morbidity (any type) 6.7% vs. 4.0% p= .12</p> <p>Transfusion 1.7% vs. 1.2% p= .86</p> <p>Hysterectomy 0.2% vs. 0.3% p= .32</p>	<p>Uterine rupture defined:</p> <ul style="list-style-type: none"> disruption of the myometrium and visceral peritoneum intraoperative finding of fetal parts within the abdominal cavity clinical symptoms including abnormal FHS, abdominal pain, loss of engagement of the presenting fetal parts intraperitoneal or vaginal hemorrhage requiring emergency laparotomy <p>Uterine dehiscence defined:</p> <ul style="list-style-type: none"> disruption of the uterine muscles with intact serosa detection of a “window” in the lower uterine segment with either membranes bulging or fetal parts visualized through it. <p>Maternal morbidity pooled but not defined.</p>

Meta-analysis	Inclusion	Findings	Comments
<p>Mozurkewich E, & Hutton E. 2000 American Journal Obstetrics & Gynecology:183</p> <p>Elective repeat cesarean delivery versus trial of labour: A meta-analysis of the literature from 1989 to 1999</p>	<p>15 studies, 1989-1999, n=47,682</p> <p>Retrospective cohorts (8) Erikson, 1989, USA, n=141 Roumen, 1990, Netherlands, n=249 Paterson, 1991, UK, n=1059 Troyer, 1992, USA, n=567 Raynor, 1993, USA, n=59 Hook, 1997, USA, n=989 Obara, 1998, Japan, n=310 Swaim, 1998, USA, n=306</p> <p>Prospective cohorts (7) Phelan, 1989, USA, n=1088 Iglesias, 1991, Canada, n=137 Abitbol, 1993, USA, n=312 Flamm, 1994, USA, n=7229 Granovsky, 1994, Israel, n=52 McMahon, 1996, Canada, n=6138 Rageth, 1999, Switzerland, n=29,046</p> <p>Inclusion:</p> <ul style="list-style-type: none"> spontaneous, induced, augmented labour women with >1 previous C/S <p>Exclusion:</p> <ul style="list-style-type: none"> twins breech previous vertical incision 	<p>Planned VBAC vs. Planned C/S</p> <p>Uterine rupture: 11/15 studies Absolute risk: 0.4% vs. 0.2% OR 2.10 (1.45-3.05)</p> <p>5/8 prospective cohorts OR 2.06 (1.40-3.04)</p> <p>6/7 retrospective cohorts OR 2.57 (0.78-8.47)</p> <p>Secondary Outcomes:</p> <p>Maternal mortality: 8/15 studies: .01% vs.0</p> <p>Maternal transfusion: 7/15 studies: 1.1% vs. 1.7% OR 0.57 (0.42-0.76)</p> <p>Hysterectomy: 6/15 studies: 0.2% vs. 0.4% OR 0.39 (0.27-0.57)</p> <p>Perinatal mortality: 9/15 studies (excluded deaths occurring before onset of labour, and those attributable to lethal anomalies and prematurity) 0.2% vs. 0.1% OR 2.05 (1.17- 3.57)</p> <p>5 minute Apgar <7: 7/15 studies: 2.2% vs. 0.9% OR 2.24 (1.29-3.88)</p>	<ol style="list-style-type: none"> All women with elective C/S group were eligible for trial of labour All causes of maternal mortality included Uterine rupture defined: <ol style="list-style-type: none"> symptomatic or required surgical repair or involved extrusion of fetal parts NNT: 374-809 women would need to undergo elective repeat C/S to prevent one uterine rupture

Systematic Reviews	Inclusion	Findings	Comments
<p>Dodd, J. et al. 2009 The Cochrane Collaboration. Issue 2</p> <p>Planned elective repeat caesarean section versus planned vaginal birth for women with a previous caesarean birth</p>	<p>5 Meta-analysis of cohort studies: Selected 1966-2004 n= 698,977</p> <p>Rosen, 1991, 31 studies, n=11,417 Boulvain, 1997, 17 studies, n= 4,500 Mozurkewich, 2000, 15 studies, n= 47,682 Guise, 2003, 48 studies, n= 634,929 Dodd, 2004, 2 studies, n= 449</p> <p>Inclusion:</p> <ul style="list-style-type: none"> • spontaneous, induced and augmented labour • any number prior CS • any type of uterine scar 	<p>Did not pool results of 5 meta-analyses so results of each meta-analysis provided separately</p>	<p>Three of the 5 meta-analysis Dodd included are described in this review (Mozurkewich 2000; Guise 2003; and Dodd 2004). Dodd also included Rosen (1991) and Boulavaine (1997), but we excluded Rosen because all studies dated 1982-1989, and Boulvain because it was conducted in Sub-Saharan Africa and did not have a comparison group.</p>
<p>Dodd, J. et al. 2009 The Cocharane Collaboration. Issue 3</p> <p>Elective repeat caesarean section versus induction of labour for women with a previous caesarean birth</p>	<p>Inclusion:</p> <ul style="list-style-type: none"> • published, unpublished, or ongoing RCTs where women with a previous CS were randomized to a planned elective CS or induction of labour 	<p>No RCTs were identified, therefore no conclusions drawn</p>	<p>The review concludes that the evidence regarding the relative benefits and harms of induction of labour in the presence of a previous cesarean section vs. elective repeat cesarean section is drawn from non-randomized studies, and associated with potential bias.</p>

Systematic Reviews	Inclusion	Findings	Comments
<p>McDonagh, M. et al. 2005. International Journal of Obstetrics and Gynecology: 112</p> <p>The benefits and risks of inducing labour in patients with prior caesaren delivery: a systematic review</p>	<p>7 observational studies: n = 8397</p> <p>Blanco, 1992 n = 81 Flamm, 1987 n = 1490 Flamm, 1997 n = 5022 Meehan 1989 n = 289 Paul, 1985 n = 684 Stovall, 1987 n = 249 Blanchette, 1999 n = 582 Total n = 839</p> <p>Induced labour n = 1802 Spontaneous labour n = 6595</p> <p>Inclusion:</p> <ul style="list-style-type: none"> spontaneous, induced, and augmented labour low transverse or unknown scar studies published > 1980 <p>Exclusion:</p> <ul style="list-style-type: none"> women with an emergent medical need for delivery Studies focused on specific medical/obstetrical conditions e.g. preterm or multiple gestation 	<p>Uterine Rupture: Induced vs. Spontaneous labour</p> <p>Blanco 0 vs. 0</p> <p>Flamm, 1987 0.4% vs. 0.1% OR 4.16 (0.38-46.0)</p> <p>Flamm, 1997 1.3% vs. 0.7% OR 1.85 (0.77-4.43)</p> <p>Meehan & Burke 0.8% vs. 0 OR 3.85 (0.06-7.56)</p> <p>Paul 0.35% vs. 0.5% OR 0.68 (0.06-7.56)</p> <p>Stovall 0.75% vs. 0 OR 2.64 (0.11-65.4)</p> <p>Blanchette 2.0% vs. 0.34% OR 6.15 (0.74-51.4)</p>	<p>Method of Induction:</p> <p>Oxytocin: Meehan & Burke; Paul; Flamm, 1987, Stovall PGE2: Blanco Oxytocin & PGE2/Misoprostol: Meehan & Burke; Flamm, 1997; Blanchette</p> <p>Measures of association using pooled data were not reported.</p> <p>Studies of poor quality because:</p> <ul style="list-style-type: none"> Uterine rupture not defined Number of prior CS unknown Reason for induction not provided Type of uterine scar unknown Infant outcomes missing

Systematic Reviews	Inclusion	Findings	Comments
<p>Dodd, J & Crowther, C. 2004 Australian & New Zealand Journal of Obstetrics and Gynecology; 44</p> <p>Vaginal birth after Caesarean versus elective repeat caesarean for women with a single prior caesarean birth: A systematic review of the literature</p>	<p>Prospective cohorts (2) n = 449</p> <p>Iglesias, 1991, Canada n = 137 Abitbol, 1993, USA n = 312</p> <p>Inclusion:</p> <ul style="list-style-type: none"> spontaneous, induced and augmented labour one previous C/S eligible for VBAC 	<p>Planned C/S vs. Planned VBAC</p> <p>Uterine scar dehiscence: Iglesias: <0.01% vs. 2.8% OR 0.22 (0.01-4.57) Uterine scar rupture: Abitbol: <0.01% vs.0.53%, OR 0.50 (0.02-12.26)</p> <p>Perinatal deaths: Abitbol: 0.8% vs. 1.1%, OR 0.3 (0.01-4.57)</p> <p>Apgar <7 @ 5 min: Abitbol: 0.8% vs. 4.3%, OR 0.18 (0.02-1.46)</p>	<p>The two studies that met inclusion criteria had differences in definitions of outcomes (only one study reported all outcomes of interest) and data could not be incorporated into meta-analysis.</p>
<p>Guise, JM et al. 2004. BMJ:329</p> <p>Systematic review of the incidence and consequences of uterine rupture in women with previous caesarean section</p>	<p>21 studies, 1982-2002. n = 56,092</p> <p>Retrospective studies (2) McMahon, 1996, Canada, n=6138 Smith, 2002, Scotland, n=24,529</p> <p>Prospective studies (15) Meier, 1982, USA, n=269 Martin, 1983, USA, n=717 Paul, 1985, USA, n=908 Flamm, 1987, USA, n=1776 Phelan, 1987, USA, n=2110 Stovall, 1987, USA, n=272 Duff, 1988, USA, n=227 Flamm, 1988, USA, n=1776 Meehan, 1989, Ireland, n=719 Blanco, 1992, USA, n=81 Blanchette, 2001, USA, n=1481</p>	<p>Planned VBAC vs. Planned C/S</p> <p>Symptomatic uterine rupture: 2/17 Retrospective/prospective</p> <p>Excess risk for planned VBAC: Risk difference 0.27% (0.07%-0.47%)</p> <p>Asymptomatic uterine rupture: 3 Prospective studies: Excess risk for planned VBAC Risk difference 1.6% (0.54-2.84%) vs.1.3% (0.43-2.62%)</p>	<ol style="list-style-type: none"> Definitions: "Symptomatic uterine rupture" used when uterine separation diagnosed at laparotomy or symptoms of uterine rupture present. "Asymptomatic uterine rupture" for uterine separations without signs or symptoms. Also includes Phan and McMahon from previous meta-analysis. Repeat C/S group in some cases included women for whom ToL was contra-indicated. Most studies reported only on ToL group. Measures of association were not included for uterine rupture for induction of labour vs. spontaneous labour.

Systematic Reviews	Inclusion	Findings	Comments
<p>Guisse, JM et al. 2004 BMJ:329. cont.</p>	<p>Cowan, 1994, USA, n=593 Flamm, 1990, USA, n=3957 Flamm, 1994, USA, n=5229 Flamm, 1997, USA, n=5022</p> <p>Case control studies (2) Connolly, 2001, Ireland, n=26 Leung, 1993, USA, n=140</p> <p>Case series studies (2) Bujold, 2002, Canada, n=23 Leung, 1993, USA, n=99</p> <p>Inclusion:</p> <ul style="list-style-type: none"> • spontaneous, induced, augmented labour • women with unclassified scar • >1 previous C/S <p>Exclusion:</p> <ul style="list-style-type: none"> • antenatal preeclampsia • multiple gestation • breech presentation • babies with lethal anomalies • studies conducted in “developing” countries • studies using ICD-9 codes to identify uterine rupture 		

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<p>Guise, JM et al. 2004 Obstetrics & Gynecology:103(3)</p> <p>Safety of vaginal birth after cesarean: A systematic review</p>	<p>20 studies, 1982 - 2002; n= 57,363</p> <p>RCTs (2) Lelaidier, 1994, France, n=32 Rayburn, 1999, USA, n=294</p> <p>Retrospective studies (2) McMahon, 1996, Canada, n=6138 Smith, 2002, Scotland, n=24,529</p> <p>Prospective Cohort (16) Meier, 1982, USA, n=269 Martin, 1983, USA, n=717 Paul, 1985, USA, n=889 Loa, 1987, Hong Kong, n=666 Phelan, 1987, USA, n=2110 Stovall, 1987, USA, n=272 Flamm, 1987, USA, n=1776 Duff, 1988, USA, n=227 Flamm, 1988, USA, n=1776 Meehan, 1989, Ireland, n=719 Flamm, 1990, USA n=3957 Blanco, 1992, USA n=81 Raynor 1993, USA n=67 Flamm 1994, USA n=7229 Flamm 1997, USA n=5022 Cowan 1995 USA n=593</p>	<p>Planned VBAC vs. Planned C/S</p> <p>Symptomatic uterine rupture: 9 studies: Excess risk for planned VBAC Risk difference 0.27% (0.07-0.47%)</p> <p>Secondary Outcomes: Transfusion: (2 studies) 1.1% vs. 1.3% (NS) (McMahon, 1996) 0.72% vs.1.72% (P=.001) (Flamm, 1994)</p> <p>Hysterectomy: 0.2% vs. 0.2% (McMahon, 1996) 0.12% vs. 0.27% (Flamm,1994) 0.27% vs. 3.2% (Paul, 1985)</p> <p>Maternal Death: 0 vs. 0 (McMahon, 1996)</p>	<ol style="list-style-type: none"> 1. Three studies in previous systematic review published by Guise BMJ (Leung, 1993, USA Connolly, 2001, Ireland & Bujold, 2002, Canada) not included in this review. 2. The RCTs were for testing other hypothesis and were analyzed in a cohort approach for this review. 3. Repeat C/S group in some cases included women for whom ToL was contra-indicated. 4. Perinatal deaths did not exclude infants with lethal anomalies.
<p>Sanchez-Ramos, et al. 2000:43(3). Clinical Obstetrics and Gynecology</p> <p>Cervical ripening and labor induction after previous cesarean delivery</p>	<p>Prostaglandin PGE₂ in women with previous CS undergoing cervical ripening/induction vs. spontaneous labour</p> <p>10 studies: Goldberg, 1989 n = 174 Blanco, 1992 n = 81</p>	<p>Uterine scar disruption PGE₂ vs. Spontaneous labour 1.6% vs. 1.23% OR 1.46 (0.96-2.22)</p> <p>Uterine scar disruption Oxytocin vs. Spontaneous labour 0.83% vs. 0.62% OR 1.43 (0.76-2.69)</p>	<p>“Uterine scar” or “wound disruption” include: a rent in the integrity of the uterine wall, often associated with serious maternal and perinatal morbidity and mortality. This opening of the previous uterine scar can also involve serosa with various degrees of extrusion of intrauterine contents</p>

Systematic Reviews	Inclusion	Findings	Comments
Sanchez con't	<p>Behrens, 1994 n = 385 Schneider, 1994 n = 142 Naeff, 1995 n = 170 Flamm, 1997 n = 5022 Zelop, 1999 n = 1262 Ravasia, 2000 n = 1716 Bebbington, 2000 n = 3227 Fleishman, 2000 n = 600 Total n = 12,779</p> <p>PG2 Gel n = 1,682 Spont. labour n = 11,097</p> <p>Oxytocin in women with previous CS undergoing cervical ripening/in duction vs spontaneous labour</p> <p>5 studies: Molloy, 1987 n = 1480 Lao, 1987 n = 666 Ravasia, 2000 n = 1971 Bebbington, 2000 n = 3050 Fleishman, 2000 n = 684 Total n = 7851</p> <p>Oxytocin n = 1566 Spontaneous. labour n = 6285</p> <p>Inclusion:</p> <ul style="list-style-type: none"> • spontaneous, induced, augmented labour • titerature published January 1986 and January 2000 		<p>into the abdominal cavity. The term “uterine dehiscence” refers to an opening of the previous uterine scar with intact serosa covering the area. A dehiscence is usually an asymptomatic event discovered on direct visualization at laparotomy, or detected during manual exploration of the uterus after vaginal delivery.</p>

Prospective Cohort Studies	Sample	Outcomes	Comments
<p>Grobman, W. et al. 2007. Obstetrics & Gynecology:109</p> <p>Outcomes of induction of labour after one prior cesarean</p>	<p>19 NICH MFM Units Network from 1999-2002, USA.</p> <p>n = 11,778 No prior vag delivery n = 6,132 Prior vag delivery n = 5,646</p> <p>Inclusion:</p> <ul style="list-style-type: none"> spontaneous and induced labour viable singleton pregnancy one prior LTCS ≥ 37 weeks <p>Exclusion:</p> <ul style="list-style-type: none"> antepartum intrauterine demise 	<p>No Prior Vaginal Delivery/Birth (VB) vs. prior vaginal birth</p> <p>Uterine Rupture:</p> <p>Induced vs. Spontaneous Labour No prior VB: 1.5% vs. 0.8% OR 1.84 (1.11-3.05) Prior VB: 0.6% vs. 0.4% OR 1.39 (0.62-3.13)</p> <p>No oxytocin or prostaglandin: No prior VB: 0 vs. 0.8% p= 1.00 Prior VB: 0 vs. 0.4% p= 1.00</p> <p>Prostaglandin only: No prior VB: 0 vs. 0.8% p= 1.00 Prior VB: 0 vs. 0.4% p= 1.00</p> <p>Oxytocin without prostaglandin: No prior VB: 1.8% vs. 0.8% OR 2.19 (1.28-3.76) Prior VB: 0.6% vs. 0.4% OR 1.53 (0.66-3.54)</p> <p>Oxytocin with prostaglandin: No prior VB: 1.2% vs. 0.8% OR 1.47 (0.57-3.76) Prior VB: 0.5% vs. 0.4% OR 1.17 (0.16-8.86)</p> <p>Secondary Outcomes (Induced vs. Spontaneous)</p> <p>Endometritis No prior VB: 3.8% vs. 3.7% OR 1.03 (0.77-1.38) Prior VB: 1.3% vs. 1.8% OR 0.72 (0.43-1.18)</p> <p>Blood Transfusion No prior VB: 2.3% vs. 1.4% OR 1.65 (1.10-2.48) Prior VB: 1.2% vs. 1.1% OR 1.13 (0.66-1.95)</p>	<p>Uterine rupture defined as a disruption or tear of the uterine muscle and visceral peritoneum or as a separation of the uterine muscle with extension into the bladder or broad ligament and did not include asymptomatic uterine scar dehiscences, which were coded separately.</p> <p>Results stratified by “No prior vaginal delivery” and “Prior vaginal delivery”.</p>

Prospective Cohort Studies	Sample	Outcomes	Comments
Grobman cont.		<p>Hysterectomy No prior VB: 0.4% vs. 0.1% OR 3.92 (1.10-13.9) Prior VB: 0.1% vs. 0.1% OR 0.873 (0.18-4.34)</p> <p>Composite Maternal Morbidity No prior VB: 2.5% vs. 1.4% OR 1.78 (1.20-2.65) Prior VB: 1.2% vs. 1.1% OR 1.11 (0.65-1.90)</p> <p>Apgar score < 4 @ 5 minutes No prior VB: 0.4% vs. 0.2% OR 1.96 (0.68-5.64) Prior VB: 0.3% vs. 0.2% OR 1.50 (0.44-5.14)</p> <p>Umbilical cord artery pH < 7.0 No prior VB: 1.9% vs. 2.0% OR 0.97 (0.49-1.94) Prior VB: 1.5% vs. 1.2% OR 1.23 (0.48-3.17)</p> <p>NICU Admission No prior VB: 9.6% vs. 9.4% OR 1.03 (0.85-1.24) Prior VB: 8.6% vs. 7.4% OR 1.19 (0.-1.47)</p> <p>Intrapartum or neonatal death No prior VB: 0.12% vs. 0.07% OR 1.74 (0.29-10.4) Prior VB: 0.2% vs. 0.02% OR 7.90 (0.82-76.0)</p>	
<p>Spong, C. et al. 2007. Obstetrics & Gynecology;110(4)</p> <p>Risk of uterine rupture and adverse Perinatal outcome at term after cesarean delivery.</p>	<p>19 Academic Centres from 1999-2002, USA.</p> <p>n = 39,117 Planned vaginal n = 15,323 Planned CS n = 23,794</p> <p>Inclusion:</p> <ul style="list-style-type: none"> • singleton gestation • term gestation 	<p>Planned VBAC vs. Planned C/S</p> <p>Uterine Rupture: 0.7% vs. 0.05% Uterine dehiscence: 0.7% vs. 0.5%</p> <p>Secondary outcomes: Hysterectomy: 0.2% vs. 0.4% Transfusion: 1.5% vs. 1.3% Endometritis: 2.9% vs. 2.3% Maternal death: 0.01% vs. 0.03% Neonatal death: 0.08% vs. 0.08%</p>	No measures of association or p values provided.

Prospective Cohort Studies	Sample	Outcomes	Comments
<p>Kolas, T. et al. 2006 AJOG:195</p> <p>Planned cesarean versus planned vaginal delivery at term: Comparison of newborn infant outcomes</p>	<p>24 maternity units from Jan. 1 to June 30, 1999, Norway</p> <p>n = 18,653 Planned vaginal n = 7,828 Planned CS n = 825</p> <p>Inclusion:</p> <ul style="list-style-type: none"> type of labour - not specified singleton pregnancies term gestation <p>Exclusion: congenital malformations</p>	<p>Planned C/S vs. Planned VBAC</p> <p>Secondary Outcomes</p> <p style="text-align: right;">RR for Planned C/S</p> <p>Apgar 5 min <7: 0.4% vs. 1.0% 0.37 (0.12-1.16) Apgar 5 min <4: 0.2% vs. 0.3% 0.88 (0.22-3.62) Transfer to NICU: 9.8% vs. 5.2% 1.87 (1.51-2.32) Pulmonary disorder: 1.6% vs. 0.8% 2.07 (1.17-3.63) Abnormal neurological status: 0.1% vs. 0.2% 0.55 (0.08-4.03) Intracranial hemorrhage: 0.12 vs. 0.28 4.32 (0.51-37.00) Neonatal convulsions : 0.1% vs. 0.2% 0.75 (0.10-5.46) Bacterial infection: 0.5% vs. 0.8% 0.63 (0.23-1.69)</p>	
<p>Landon, M. et al. 2004. New England Journal of Medicine:351(25)</p> <p>Maternal and perinatal outcomes associated with a trial of labour after prior cesarean delivery</p>	<p>19 academic medical centres in the USA, 1999-2002</p> <p>n = 45,988 ToL n = 17,898 EC/S n = 15,801</p> <p>Planned VBAC inclusion:</p> <ul style="list-style-type: none"> spontaneous, induced and augmented labour > 20 weeks or 500 g. singleton pregnancy >1 previous C/S previous uterine classical and unknown scars induction and augmentation 	<p>Planned VBAC vs. Planned C/S</p> <p>Uterine Rupture (Spontaneous labour): 0.7% vs. 0 p<0.001</p> <p>Uterine Dehiscence (Spontaneous labour): 0.7% vs. 0.5% OR 1.38 (1.04-1.85)</p> <p>Uterine Rupture: Type of labour vs. spontaneous Augmented vs. spontaneous 0.9% vs 0.4% OR 2.42 (1.49-3.93)</p> <p>Induction (all) vs. spontaneous: 1.0% vs. 0.4% OR 2.86 (1.75-4.67)</p> <p>Any prostaglandin/with or without oxytocin vs. spontaneous: 1.4% vs. 0.4% OR 3.95 (2.01-7.79)</p>	<p>Uterine rupture defined as a disruption of the uterine muscle and visceral peritoneum or a uterine muscle separation with extension to the bladder or broad ligament.</p> <p>Uterine dehiscence defined as a disruption of the uterine muscle with intact serosa.</p>

Prospective Cohort Studies	Sample	Outcomes	Comments
Landon cont.	<p>Planned C/S inclusion:</p> <ul style="list-style-type: none"> • prior classical and inverted T incisions • prior myomectomy • breech or transverse presentations • non-reassuring FHS • genital HSV • medical conditions precluding labour <p>Exclusion:</p> <ul style="list-style-type: none"> • newborns with congenital malformations. 	<p>Prostaglandins alone vs. spontaneous: 0% vs. 0.4% Not provided</p> <p>Mechanical induction with/without oxytocin vs. spontaneous: 0.9% vs. 0.4% OR 2.48 (1.30-4.75)</p> <p>Oxytocin alone vs. spontaneous: 1.1% vs. 0.04% OR 3.01 (1.66-5.46)</p> <p>Secondary Outcomes: (Combined) Planned VBAC vs. Planned C/S</p> <p>Transfusion: 1.7% vs. 1.0% OR 1.71 (1.41-2.08) Hysterectomy: 0.2% vs. 0.3% OR 0.77 (0.51-1.17) Endometritis: 2.9% vs. 1.8% OR 1.62 (1.40-1.87) Maternal death: 0.02% vs.0.04% OR 0.38 (0.10-1.46) Neonatal death: 0.08% vs.0.05% OR 1.82 (0.73-4.57) HIE: 0.08% vs.0 p=<0.001</p>	
<p>Kamath, B. et al, 2009 Obstetrics & Gynecology: 113(6) June</p> <p>Neonatal outcomes after elective cesarean delivery</p>	<p>University of Colorado Perinatal Database between October 1, 2005 and July 1, 2008.</p> <p>n=672 Planned VBAC n=329 Planned CS n=343</p> <p>Inclusion:</p> <ul style="list-style-type: none"> • spontaneous and induced labour • one previous C/S • singleton pregnancy (cont.) 	<p>Planned C/S vs. Planned VBAC</p> <p>Admission NICU: 9.3% vs. 4.9% p=0.025</p>	<p>14 women with chronic medical disease included in planned C/S group and not adjusted for in analysis</p>

Retrospective Cohort Studies	Sample	Findings	Comments										
Kamath cont.	<ul style="list-style-type: none"> > 37 weeks gestation <p>Exclusion:</p> <ul style="list-style-type: none"> newborns with congenital anomalies 												
<p>Grossetti, D. et al. 2007. Acta Obstetrica et Gynecologica:86</p> <p>Rupture of scarred uterus</p>	<p>Women with a low transversal scar after a previous C/S in a Level 3 University Hospital, France, from 1995-2003.</p> <p>n=2,128</p> <table border="0"> <tr> <td>Planned CS</td> <td>n=588</td> </tr> <tr> <td>Planned VBAC</td> <td>n=1540</td> </tr> <tr> <td>Spontaneous labour</td> <td>n=1074</td> </tr> <tr> <td>Oxytocin induction</td> <td>n=148</td> </tr> <tr> <td>Cervical ripening –PG2</td> <td>n=318</td> </tr> </table> <p>Inclusion:</p> <ul style="list-style-type: none"> Induced & spontaneous labour symptomatic and asymptomatic rupture one previous C/S <p>Exclusion:</p> <ul style="list-style-type: none"> multiple pregnancies non-vertex presentation GA < 24 weeks T-shape low transversal, classical and multiple scars 	Planned CS	n=588	Planned VBAC	n=1540	Spontaneous labour	n=1074	Oxytocin induction	n=148	Cervical ripening –PG2	n=318	<p>Planned VBAC vs. Planned C/S</p> <p>Uterine Rupture:</p> <p>Spontaneous labour vs. EC/S 1.0% vs. 0.3% OR 3.0 (0.7-28.2)</p> <p>Oxytocin induction vs. EC/S 1.4% vs. 0.3% OR 4.0 (0.3-55.6)</p> <p>Prostaglandin induction vs. EC/S 2.2% vs. 0.3% OR 6.6 (1.2-65.3)</p>	<p>Asymptomatic and symptomatic ruptures not defined.</p>
Planned CS	n=588												
Planned VBAC	n=1540												
Spontaneous labour	n=1074												
Oxytocin induction	n=148												
Cervical ripening –PG2	n=318												

Retrospective Cohort Studies	Sample	Findings	Comments
<p>Cahill, A. et al. 2006 AJOG:195</p> <p>Is vaginal birth after cesarean (VBAC) or elective repeat cesarean safer in women with a prior vaginal delivery?</p>	<p>Women with a prior C/S who had also had a prior vaginal delivery, in 17 centers, 1996 to 2000.</p> <p>Prior vaginal delivery n = 6619 Planned VBAC n = 5041 Planned EC/S n = 1578</p> <p>Inclusion:</p> <ul style="list-style-type: none"> Spontaneous, induced labour <p>Exclusion:</p> <ul style="list-style-type: none"> hysterotomy other than low-transverse fetal anomalies breech presentation triplets or high order multiples 	<p>Planned VBAC vs. Planned C/S</p> <p>Uterine Rupture 0.4% vs. 0.06% Unadj OR 6.26 (0.84-46.6) Adj OR 0.70 (0.08-6.15)</p> <p>Composite outcome (uterine rupture, bladder or bowel injury, or uterine artery laceration) 1.1% vs. 1.3% *Adj OR 0.32 (0.14-0.72) * Adjusted for number of prior uterine scars, labor method, gestational age at delivery.</p> <p>Postpartum fever 6.5% vs. 18.6% *Adj OR 0.21 (0.15-0.28) * Adjusted for gestational age at delivery, diabetes mellitus, preeclampsia, gestational hypertension</p> <p>Blood transfusion 0.4% vs. 2.1% *Adj OR 0.17 (0.06-0.47) * Adjusted for gestational age at delivery, preeclampsia, gestational hypertension, macrosomia.</p>	<p>Uterine rupture defined: Full-thickness separation of the prior uterine scar found at the time of surgery, and clinically correlating evidence of uterine rupture; hemoperitoneum found at the time of laparotomy, nonreassuring fetal heart rate tracing, or maternal hemodynamic instability (sBP <70, dBP<30, or pulse >120 bpm). The definition excluded incidental scar separations found at the time of surgery and "uterine windows". The timing of the prior vaginal delivery relative to the prior C/S is unknown).</p>
<p>Gonen et al. 2006. Obstetrics & Gynecology</p> <p>Results of a well-defined protocol for a trial of labor after prior cesarean delivery</p>	<p>Tertiary university facility in Haifa, Israel.</p> <p>Previous CS n = 1308 Planned VBAC n = 841 Planned C/S n = 467</p> <p>Inclusion:</p> <ul style="list-style-type: none"> spontaneous labour and induction by oxytocin or amniotomy, and augmentation with oxytocin 1 previous low-segment cesarean delivery singleton pregnancy > 34 wks 	<p>Planned VBAC vs. Planned C/S</p> <p>Uterine Rupture 0.12% vs. 0 p = .5</p> <p>Secondary Outcomes</p> <p>Major complications (hysterectomy, relaparotomy, uterine rupture, operative injury, ≥ 2 unit trans.) 1.8% vs. 1.3% p =.50 (cont.)</p> <p>Minor complications (febrile morbidity, abdominal wound infection, 1 unit blood transfusion, uterine scar dehiscence) 5.4% vs. 3.6% p =.17</p> <p>Neonatal ICU Admissions 2.4% vs. 4.3% p =.055</p>	<p>Uterine rupture defined as a disruption or tear of the uterine muscle and visceral peritoneum or a separation of the uterine muscle with extension to the bladder or broad ligament.</p> <p>Uterine dehiscence defined as a disruption of the uterine muscle with intact serosa.</p>

Retrospective Cohort Studies	Sample	Findings	Comments
<p>Locatelli, A. et al. 2006 The Journal of Maternal-Fetal and Neonatal Medicine</p> <p>Induction of labour: Comparison of a cohort with uterine scar from previous cesarean section vs. a cohort with intact uterus</p>	<p>University of Milano-Bicocca, January 1992 – December, 2001.</p> <p>n = 5730 Induction/ previous CS n = 310 Induction with intact uteri n =5420</p> <p>Inclusion:</p> <ul style="list-style-type: none"> • induction of labour • singleton pregnancies • previous low-transverse CS <p>Exclusion:</p> <ul style="list-style-type: none"> • women with uterine surgery other than previous cesarean • previous classical C/S 	<p>Induction with previous C/S vs. Intact uterus</p> <p>Uterine Rupture: 0.3% vs. 0.02% p = 0.22 P = 0.16, OR 10.3 (0.7-143.1) when adjusted for maternal age, nulliparity, gestational age at delivery, bishop score, duration of labour, use of PG gel or oxytocin, and birth weight (rates not provided).</p> <p>Secondary Outcomes:</p> <p>Apgar score < 7 at 5 min.: 0.3% vs. 0.5% p = 0.93 Umbilical artery pH < 7: 0.3% vs. 0.5% p = 0.46</p> <p>Induction protocol for women with one previous CS</p> <ul style="list-style-type: none"> • Cervical ripening with intracervical PGE2 gel 0.5 mg every 8 hours OR intravaginal PGE2 gel, 1 mg every 12 hours until a bishop score of >6 or a maximum of 4 doses. When BS >6, ARM done, and oxytocin started 2 hours later if not in labour. • Oxytocin infusion started at 1.3-2.6 mu/min and doubled every 40 mins. to a maximum of 42 mu/min. <p>Induction protocol for women with intact uterus</p> <ul style="list-style-type: none"> • Cervical ripening with intracervical PGE2 gel 0.5 mg every 6 hours until a bishop score of >4 or a maximum of 2 doses. When BS >4, intravaginal PGE2 1 mg for nullip and 2 mg for multips for a maximum of two doses. After two doses or when BS > 6, ARM done, and oxytocin started 2 hours later if not in labour. • Oxytocin infusion started at 1.3-2.6 mu/min and doubled every 40 mins. to a maximum of 42 mu/min. (same protocol as for previous CS) 	<p>Uterine rupture defined as full-thickness separation of the uterine wall associated with at least one of the following: hemorrhage (presence of any intraperitoneal blood at laparotomy), extrusion of the placenta or fetal parts, or severe fetal heart rate abnormalities, defined as tachycardia > 180 bpm, reduced variability, bradycardia < 100 bpm lasting > 10 min, repetitive late decelerations, or severe variable decelerations.</p>

Retrospective Cohort Studies	Sample	Findings	Comments
<p>Macones, G. et al. 2005. Obstetrics & Gynecology; 193</p> <p>Maternal complications with vaginal birth after cesarean delivery: A multi-centre study</p>	<p>17 tertiary and community hospitals in USA using a case-control study, 1996-2000. Controls were randomly selected from a set of women who attempted VBAC but did not experience a uterine rupture.</p> <p>n= 25,005 Attempted VBAC n = 13,706 Elective CS n = 11,299</p> <p>Inclusion:</p> <ul style="list-style-type: none"> • spontaneous, induced and augmented labour • > 1 previous CS <p>Exclusion:</p> <ul style="list-style-type: none"> • unknown prior scar • prior classical incision 	<p>Attempted VBAC vs. Elective CS</p> <p>Uterine rupture: 0.9% vs. 0.004% RR 21.1 (8.6-51.5)</p> <p>Secondary outcomes: Blood transfusion: 0.7% vs. 1.2% RR 0.58 (0.45-0.75) Postpartum fever: 9.4% vs. 13.0% RR 0.73 (0.68-0.78)</p>	<p>Uterine rupture defined a priori as separation of the uterine scar (determined at laparotomy) immediately preceded by either a nonreassuring fetal heart pattern, or by signs/symptoms of acute maternal bleeding (BP<70/40, HR>120) or by the presence of blood in the maternal abdomen at the time of laparotomy.</p>

Retrospective Cohort Studies	Sample	Findings	Comments
<p>Durnwald, C. 2004. Journal of Maternal-Fetal Medicine; 15</p> <p>Vaginal birth after cesarean delivery: predicting success, risks of failure.</p>	<p>Level III Perinatal Centre, 1989-2001, USA.</p> <p>n = 768</p> <p>Attempted VBAC n = 522 Elective CS n = 246</p> <p>Inclusion:</p> <ul style="list-style-type: none"> spontaneous and induced labour women who delivered first liveborn, singleton infant by primary low transverse CS <p>Exclusion:</p> <ul style="list-style-type: none"> women with extension into the upper uterine segment or conversion to a T-incision at the time of low transverse CS prior uterine surgery contraindicating a trial of labour women who delivered an intervening viable pregnancy at another institution other than the study institution first of second pregnancy delivered < 23 weeks gestation multiple gestation 	<p>Attempted VBAC vs. Elective CS</p> <p>Uterine rupture: 0.8 % vs. 0</p> <p>Secondary outcomes:</p> <p>Chorioamnionitis: 5.9% vs. 0 p = < 0.0001 Postpartum fever: 5.2% vs. 2.4% p = 0.09 Endometritis: 4.6% vs. 2.0% p = 0.10 NICU admission: 7.5% vs. 6.5% p = 0.76 5 min Apgar < 7: 2.3% vs. 0 p = 0.01</p>	

Retrospective Cohort Studies	Sample	Findings	Comments
<p>Loebel, G. et al. 2004. Journal of Maternal-Fetal and Neonatal Medicine;15.</p> <p>Maternal and neonatal morbidity after elective repeat cesarean delivery versus a trial of labor after previous cesarean delivery in a community teaching hospital.</p>	<p>Community hospital, 1995-1998, USA.</p> <p>n = 1408 Attempted VBAC n = 927 Elective CS n = 481</p> <p>Inclusion:</p> <ul style="list-style-type: none"> • singleton, vertex presentation • term • no contraindications to vaginal delivery • neonates with congenital anomalies 	<p>Attempted VBAC vs. Elective CS</p> <p>Uterine rupture: 0.4 % vs. 0 p = 0.5</p> <p>Secondary outcomes:</p> <p>Transfusion: 1.3% vs. 0.6% p = 0.2 Infection: 2.5% vs. 2.3% p = 0.8 NICU admission: 4.2% vs. 5.6% p = 0.2 Neonatal death: 0.1% vs. 0.2% p = 0.6</p>	<p>The two neonatal deaths were associated with congenital cardiac anomalies.</p>
<p>Wen S. et al. 2004 AJOG;191</p> <p>Comparison of maternal mortality and morbidity between trial of labour and elective cesarean section among women with previous cesarean delivery</p>	<p>Canadian women who delivered between 1988-2000.</p> <p>n = 308,755 ToL n = 128,960 Elective CS n = 179,795</p> <p>Inclusion:</p> <ul style="list-style-type: none"> • spontaneous and induced labour <p>Exclusion:</p> <ul style="list-style-type: none"> • multiple pregnancy • preeclampsia/eclampsia • malpresentation • preterm labour • placental abruption • HSV • maternal age < 14 years 	<p>Planned VBAC vs. Planned C/S</p> <p>Uterine rupture (total study population): 0.65% vs. 0.25% OR 2.6 (2.32-2.93)</p> <p>Uterine rupture (Induced vs. spontaneous labour): 0.82% vs. 0.49 p = .001</p> <p>Secondary Outcomes:</p> <p style="text-align: right;">*Adjusted OR</p> <p>Transfusion 0.19% vs. 0.15% OR 1.67 (1.39-2.00) Hysterectomy 0.1% vs. 0.08% OR 1.26 (0.99-1.61) PP Infection 0.38% vs. 0.47% OR 0.81 (0.77-0.97) In-hosp Death 1.6 vs 5.6/100,000 OR 0.32 (0.07-1.47) * Adjusted for year of birth, hospital volume, & mat. age.</p>	<p>No differentiation from CIHI data source between rupture and dehiscence.</p> <p>Approximately half of ToL group were induced.</p>

Retrospective Cohort Studies	Sample	Findings	Comments
<p>Delaney, T. et al. 2003 Obstetrics & Gynecology</p> <p>Spontaneous versus induced labour after a previous cesarean delivery</p>	<p>Nova Scotia Atlee Perinatal database January 1992-January 2000.</p> <p>n = 3746 Induced labour n= 2943 Spontaneous labour: n= 803</p> <p>Inclusion:</p> <ul style="list-style-type: none"> • spontaneous labour and induction by PGE2, oxytocin, intracervical laminara tent or catheter, and ARM <p>Exclusion:</p> <ul style="list-style-type: none"> • multiple gestation • placenta previa • previous uterine surgery • HSV at time of delivery • non-vertex presentation • 1 previous C/S 	<p>Induced vs. Spontaneous labour</p> <p>Uterine rupture: 0.7% vs. 0.3% p= .13 Uterine scar defect: 0.5% vs. 0.3% p=.50</p> <p>Secondary Outcomes:</p> <p>Transfusion: 0.6% vs. 0.5% p= .58 Hysterectomy: 0.2% vs. 0.1% p= .20 Maternal infection : 3.4% vs. 2.8% p= .36 NICU Admission: 13.3% vs.9.4% p=.001 Neonatal death: 0.2% vs.0.2% P= .68 (antepartum and intrapartum deaths discussed, but reasons for neonatal deaths not discussed).</p>	<p>Ruptured uterus defined as a significant and serious event necessitating emergency surgery.</p> <p>Uterine scar defect defined as a non serious situation often noted at the time of cesarean delivery as an unexpected finding.</p>

Retrospective Cohort Studies	Sample	Findings	Comments
Hibbard, J. et al. 2001 AJOG:184(7) Failed vaginal birth after a cesarean section: How risky is it?	1989-1998 at Chicago Lying-In Hospital, singletons, n = 1,755 EC/S n= 431 Attempted VBAC n =1,324 Inclusion: <ul style="list-style-type: none"> spontaneous, induced, augmented labour a maximum of two previous low transverse or low vertical uterine incisions cephalic and breech adequate pelvis Exclusion: <ul style="list-style-type: none"> other uterine surgery active HSV 	Planned C/S vs. Planned VBAC Uterine Rupture: OR for Planned VBAC All disruption: 0.5% vs. 1.1% 2.29 (0.52-10.1) Dehiscence: 0.5% vs. 0.3% 0.65 (0.12-3.56) True rupture: 0.0% vs. 0.8% Not calculated Secondary Outcomes: OR for Planned VBAC PPH > 1,000 ml: 7.4% vs. 3.5% 0.45 (0.28-0.71) Transfusion: 1.4% vs. 0.8% 0.59 (0.22-1.62) Hysterectomy: 0.0% vs. 0.5% Not calculated Chorioamnionitis: 4.2% vs. 12.8% 3.41 (2.06-5.66) Endometritis: 8.8% vs. 8.2% 0.93 (0.63-1.36)	Rupture not defined.
Lydon-Rochelle, M. et al. 2001. NEJM:234(1). Risk of uterine rupture during labour among women with a prior cesarean delivery.	Data Jan.1,1987 to Dec. 31, 1996 n = 20,095 spontaneous labour 10,789 prostaglandins 366 induction,no prost 1,960 elective repeat CS 6,980 Inclusion: <ul style="list-style-type: none"> spontaneous & induced labour singleton births 	Planned VBAC, vs. Planned C/S Uterine rupture: Spontaneous labour 0.52% vs. 0.16% RR 3.3 (1.8-6.0) Induced without prostaglandin: 0.77% vs. 0.16% RR 4.9 (2.4-9.7) Induced with prostaglandin: 2.45% vs. 0.16% RR 15.6 (8.1-30.0)	Uterine rupture defined by ICD-9-CM diagnosis code 665.0 or 665.1 It is not known whether prostaglandins were used alone or in combination with other agents, nor did the study differentiate between misoprostol and dinoprostone.

Primary Outcome: Uterine Rupture / Dehiscence in Women with a Prior Cesarean Section, by Type of Labour

Author	Induced (method unspecified) vs Spontaneous labour	Oxytocin only vs Spontaneous Labour (unless otherwise indicated)	PGE2/PEG1 only vs Spontaneous Labour	Oxytocin with PG/Miso vs Spontaneous Labour
Systematic Reviews McDonagh, M., 2005		Flamm, 1987; 0.4% vs. 0.1% OR 4.16 (0.38-46.0)	Blanco: 0 % vs. 0 %	Flamm, 1997 1.3% vs. 0.7% OR 1.85 (0.77-4.43)
		Paul 0.35% vs. 0.5% OR 0.68 (0.06-7.56)		Meehan & Burke 0.8% vs. 0% OR 3.85 (0.06-7.56)
		Stovall 0.75% vs. 0% OR 2.64 (0.11-65.4)		Blanchette 2.0% vs. 0.34% OR 6.15 (0.74-51.4)
Sanchez-Ramos, 2000		Uterine scar disruption 0.83% vs. 0.62% OR 1.43 (0.76-2.69)	Uterine scar disruption 1.6% vs. 1.23% OR 1.46 (0.96-2.22)	
Prospective Cohorts Grobman, W. et al. 2007		No prior VB: 1.8% vs. 0.8% OR 2.19 (1.28-3.76) Prior VB: 0.6% vs. 0.4% OR 1.53 (0.66-3.54)	No prior VB: 0 vs. 0.8% p= 1.00 Prior VB: 0 vs. 0.4% p= 1.00	No prior VB: 1.2% vs. 0.8% OR 1.47 (0.57-3.76) Prior VB: 0.5% vs. 0.4% OR 1.17 (0.16-8.86)
Landon, M. et al. 2004	Uterine Dehiscence 0.7% vs. 0.5% OR 1.38 (1.04-1.85)	1.1% vs. 0.04% OR 3.01 (1.66-5.46) Augmented vs. spontaneous 0.9% vs 0.4% OR 2.42 (1.49-3.93)	0 vs. 0.4%	1.4% vs. 0.4% OR 3.95 (2.01-7.79)
Retrospective Cohorts Grossetti, D. et al. 2007		Oxytocin induction VBAC vs. EC/S 1.4% vs. 0.3% OR 4.0 (0.3-55.6)	Prost. induction VBAC vs. EC/S 2.2% vs. 0.3% OR 6.6 (1.2-65.3)	
Wen S. et al. 2004	0.82% vs. 0.49 p = .001			
Delaney, T. et al. 2003	Uterine rupture: 0.7% vs. 0.3% p= .13 Uterine scar defect: 0.5% vs. 0.3% p=.50			
Lydon-Rochelle, M. et al. 2001		Medical Induction VBAC, vs. Planned C/S 0.77% vs. 0.16% RR 4.9 (2.4-9.7)	Prostin Induction vs. Planned C/S 2.45% vs. 0.16% RR 15.6 (8.1-30.0)	