Symphysiotomy for obstructed labour: a systematic review and meta-analysis

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SYMPHYSIOTOMY FOR OBSTRUCTED LABOUR: A SYSTEMATIC REVIEW AND META-ANALYSIS

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ABSTRACT

Background: Obstructed labour is a major cause of maternal mortality. Caesarean section can be associated with risks, particularly in low and middle income countries, where it is not always readily available. Symphysiotomy can be an alternative treatment for obstructed labour and requires fewer resources. However, there is uncertainty about the safety and effectiveness of this procedure.

Objectives: To compare symphysiotomy and caesarean section for obstructed labour.

Search strategy: MEDLINE, EMBASE, Cochrane library, CINAHL, African Index Medicus, Reproductive Health Library, and Science Citation Index (inception- November 2015) without language restriction.

Selection criteria: Studies comparing symphysiotomy and caesarean section in all settings, with maternal and perinatal mortality as key outcomes.

Data collection and analysis: Quality of the included studies was assessed using the STROBE checklist and the Newcastle Ottawa scale. Relative risks (RR) were pooled using the random effects model. Heterogeneity was assessed using I^2 tests.

Main results: Seven studies (n=1266 women), all of which were set in low and middle income countries (as per the World Bank definition) and compared symphysiotomy and caesarean section were identified. Meta-analyses showed no significant difference in maternal (RR 0.48 95% CI 0.13, 1.76: P = 0.27) or perinatal (RR 1.12 95% CI 0.64, 1.96: P = 0.69) mortality with symphysiotomy when compared to caesarean section. There was a reduction in infection (RR 0.30 95%CI 0.14, 0.62) but an increase in fistulae (RR

4.19 95%CI 1.07, 16.39) and stress incontinence with symphysiotomy (RR 10.04 95%CI 3.23, 31.21).

Conclusions: There was no difference in key outcomes of maternal and perinatal mortality with symphysiotomy when compared to caesarean section.

Keywords: Symphysiotomy, Obstructed labour, Caesarean section, low and middle income countries.

INTRODUCTION

The World Health Organisation (WHO) states that women should have access to obstetric care, including caesarean section (1). The WHO has suggested that a caesarean section rate that was either too low or too high could be associated with poor outcomes (1).

Caesarean section is suggested to be the most common major operation performed in Sub-Saharan Africa to save mother's lives, yet few women in this region receive the caesarean section they need (2). Caesarean section is suggested to be as low as 0.5% of the total women requiring caesarean section in some areas (3). However, caesarean section can also be associated with severe morbidity and mortality even when performed under optimal conditions (4). Furthermore the consequences of a scarred uterus from caesarean section on subsequent pregnancies if appropriate care is not sought can be catastrophic.

Symphysiotomy can be performed as an alternative in obstructed labour in regions where caesarean section is not available or not acceptable. Symphysiotomy can enlarge the pelvic diameter and facilitate birth in obstructed labour (box S1). Symphysiotomy can widen the symphysis by 2.5cm (5), it requires minimal equipment and anaesthesia and can be carried out by a practitioner trained in this technique (6). Aftercare consists of elastic strapping, bed rest and bladder catheterisation (5, 7).

However, there is scepticism around the practice of symphysiotomy (8), as symphysiotomy is not without risk. Published reports suggested that without training symphysiotomy can be harmful and result in complications (9, 10). Research also suggests that there are long term complications for this procedure, such as high-grade sacroiliac joint osteoarthritis when women are followed up around 40 years after the procedure (11). However, some reports have suggested that both procedures can be comparable in some settings in terms of risk for the mother's life (12); therefore it is essential that the benefits and risks of each procedure are weighed for the woman and the setting. Furthermore, a Lancet commentary identified symphysiotomy as an 'underused priority technology' and suggested a systematic review and gathering data on long term clinical follow up as the critical next steps (13). Therefore we have performed a systematic review with the best available evidence to compare the outcomes of symphysiotomy and caesarean section.

METHODS

Search Strategy: Databases were searched for studies comparing symphysiotomy and caesarean section for obstructed labour in all settings. The key outcomes of interest were maternal and perinatal mortality. Measures of maternal and perinatal morbidity were also examined. Following the hierarchy of evidence, the best available evidence was included in the review. MEDLINE, EMBASE, Cochrane library, CINAHL, African Index Medicus, the Reproductive Health Library, and the Science Citation Index were searched (from database inception to November 2015: Appendix 1). Hand searching

complemented electronic searches, and reference lists were checked. The search terms were ‘symphysiotomy’. No language restrictions were applied to the search.

Selection Criteria: In the absence of higher levels of evidence, case comparison studies comparing symphysiotomy and caesarean section for obstructed labour were selected with the key outcomes of maternal and perinatal mortality. Initially the electronic searches were scrutinised by review of the abstracts, and full manuscripts of relevant studies were acquired. Final decisions on inclusion or exclusion of manuscripts were made after inspection of these manuscripts by multiple reviewers (AW, DE, ET). No studies were excluded on the basis of quality.

Methodological quality assessment: Once studies were deemed as suitable for inclusion, the quality of each study was assessed by two reviewers. The studies were assessed for adequacy of reporting using the STROBE checklist (14). Risk of bias in the studies was assessed using the Newcastle Ottawa Scale (15). The studies were evaluated for case definition adequacy, representativeness of the cases, selection of the controls, definition of the controls, comparability of the cases and controls, ascertainment of the exposure, as well as non-response rate. The risk of bias was deemed low if a study obtained four stars for selection, two stars for comparability and three stars for ascertainment of exposure (15). Medium risk of bias was suggested to exist in studies with two or three stars for selection, one for comparability and two for exposure. Any study scoring one or zero stars for selection, comparability or exposure was classed as having high risk of bias.

Data Collection: Information was extracted from each article on study characteristics, study quality and outcome data by multiple reviewers (AW, DE, ET). The key outcomes of interest were maternal and perinatal mortality. Further outcomes of interest were measures of maternal morbidity measures such as fistulae, infection, haemorrhage, stress incontinence, stillbirth and perinatal mortality.

Statistical Analysis: Data for effect estimates (Risk Ratios) were extracted and meta-analysed using a random effect model, to account for the variability in the setting and clinical indication of the caesarean section or symphysiotomy of the women included. Heterogeneity of treatment effects was evaluated using forest plots, chi square tests and its magnitude determined by computing I^2 statistic. Analyses were performed using REVMAN 5.3 statistical software.

RESULTS

Seven case comparison studies were included in the review (5, 7, 16-20). The process of literature search and selection is given in Figure 1. A total of 1266 women were included in this review, 537 cases (symphysiotomies) and 729 controls (caesarean sections). Study characteristics are shown in Table S1, and the data of the outcomes reported in the studies are provided in Table 1 and Table 2.

Study characteristics: All seven studies were set in low and low to middle income countries as classified by the World Bank (21); Nigeria, Tanzania, India, Papua New Guinea (2 studies) and Zimbabwe (2 studies). The studies were conducted between 1961(7) and 2006 (5) and compared symphysiotomy and caesarean section for obstructed labour. A variety of settings were reported, one study took place in rural

hospitals (20), two studies took place in general hospital (18, 19), and three in central or referral hospitals (7, 16, 17), and one study did not report the setting (5). Two studies reported on the cadre of the operator, in one study mainly obstetricians performed both symphysiotomies and caesarean sections (7), and in another study, during the earliest years of the study, symphysiotomies were performed by experienced doctors (16). Two studies were prospective (5, 7) and five studies were retrospective (16-20) case comparison studies. The definition of obstructed labour or description of the diagnosis was reported with varying detail in the studies. Four studies reported a diagnosis of cepholpelvic disproportion on which the definition of obstructed labour was based (5, 7, 19, 20), following failure to progress (19). Three studies gave limited details reporting only that assisted delivery had failed (18) or that the procedure was performed due to obstructed labour (16, 17). Studies reported on maternal, neonatal or perinatal mortality. Fistula, incontinence, haemorrhage and infection were other commonly reported outcomes.

Patient characteristics: All studies reported similar patient characteristics in terms of age and parity. Most women were between 20 and 30 years of age and were primigravid (16-20). Two studies reported more primigravid participants in the symphysiotomy groups (16, 18) and one study reported a lower maternal height in the symphysiotomy group when compared with the caesarean section group (20). Selection criteria for participants in the studies were similar, for example cases included: 1) obstructed labour due to mild to moderate cephalopelvic disproportion (5, 19, 20) with an alive fetus, vertex presentation, advance cervical dilatation and a well engaged fetal head <3/5th head palpable per abdomen (5, 17, 19, 20); 2) obstructed labour after failed

ventouse or forceps (5, 17, 18); 3) trapped after coming head in vaginal breech (5) and 4) shoulder dystocia (5).Two studies (17, 19) reported the inclusion of women with breech fetuses, and three studies included fetuses with vertex presentation only (5, 18, 20).

Study quality: The studies achieved scores of between 8 to 16 out of 22 on the strobe checklist; for several studies, there were lack of details on study design, study size, bias, data sources, variables, statistical methods, participants, descriptive data, study limitations and funding (Table S2). The studies were deemed to have high risk of bias for selection, medium to low risk of bias for comparability, and medium to low risk of bias for outcome on the Newcastle Ottawa Scale (Table S3). Some studies reported on the efforts made to match cases, for example Hartfield et al (7) stated that consecutive patients having symphysiotomies were matched with the nearest patient in time having a caesarean section. A further two studies reported that attempts were made to time match index delivery (5, 16). Two studies gave limited information and stated that both procedures were performed under similar conditions (19) or during the same period of time (20). A further study stated difficulties in finding equal groups to compare (17).

PRIMARY OUTCOMES

Maternal Mortality: Six studies, with 1203 women (5, 7, 17-20) demonstrated no significant difference in maternal mortality with symphysiotomy when compared with caesarean section (RR 0.48 95%CI 0.13, 1.76 p=0.27: Figure 2); however this was

based on 14 events. There was no evidence of heterogeneity in the analysis (I^2= 0% p=0.81).

Perinatal Mortality: Five studies, with 1128 women (7, 17-20) demonstrated no significant difference in perinatal mortality with symphysiotomy when compared with caesarean section (RR 1.12 95%CI 0.64, 1.96 p=0.69: Figure 3). One study in this analysis included two intrauterine deaths that had occurred before the procedure had started (20).There was moderate heterogeneity in the analysis (I^2=53% p=0.07).

SECONDARY OUTCOMES

Neonatal outcomes: Two studies reported on neonatal mortality and stillbirth (326 in each analyses (5, 17)). Meta-analysis demonstrated no significant difference in neonatal mortality or stillbirth with symphysiotomy when compared with caesarean section (RR 0.97 95%CI 0.55, 1.73 p=0.93: Figure S1 and RR 1.67 95%CI 0.47, 5.96 p=0.43: Figure S2). There was no evidence of heterogeneity in the analysis (I^2=0% p=0.52 and I^2=0% p=0.61).

Maternal morbidity: Three studies reported on haemorrhage (669 women (5, 7, 17)) and meta-analysis demonstrated no significant difference in cases of haemorrhage with symphysiotomy when compared with caesarean section (RR 0.53 95%CI 0.21, 1.32 p=0.17: Figure S3). There was moderate evidence of heterogeneity in the analysis (I^2=58% p=0.09).

Three studies reported on vesico-vaginal fistulae (804 women (7, 17, 19)) and meta-analysis demonstrated an increase in fistulae with symphysiotomy when compared with caesarean section (RR 4.19 95%CI 1.07, 16.39 p=0.04: Figure S4). There was no evidence of heterogeneity in the analysis (I^2=0% p=0.43). One study stated that it was difficult to determine if the vesico-vaginal fistula was caused by obstructed labour or the operative interference (7), whereas another study stated that one vesico-vaginal fistula was caused by the procedure as a urinary catheter was not used. Another vesico-vaginal fistula was reported to be the result of pressure necrosis of the bladder neck, not be related to the procedure (20). Furthermore, meta-analysis also showed more cases of stress incontinence with symphysiotomy when compared with caesarean section (954 women RR 10.04 95%CI 3.23, 31.21 p=<0.0001: Figure S6 (7, 17-19)). There was no evidence of heterogeneity in the analysis (I^2=0% p=0.92). No data were provided for baseline prevalence of urinary incontinence in any of the studies, and no definitions were given for this outcome in the included studies. The reported cases were all described as stress incontinence, or stress incontinence needing operative treatment whilst receiving postnatal care.

Four studies reported infection as an outcome (839 women (5, 17-19)) and meta-analysis demonstrated less infection with symphysiotomy when compared with caesarean section (RR 0.30 95%CI 0.14, 0.62 p=0.001: Figure S5). There was moderate heterogeneity in the analysis (I^2=62% p=0.05). Three of these studies (5, 17, 19) gave prophylactic antibiotics to patients receiving symphysiotomy. Limited information was provided on the infective complications experienced. Furthermore, the

reference definition that was used for this outcome was not reported in the primary studies. Mola et al reported this outcome as wound or genital tract infections without any further description (19); this was also the case for the caesarean section group in the study by Basak et al (5). Another study by Mola et al reported wound infections needing drainage or resuturing (18), without giving further details. Verkuyl et al (17) reported both wound infections and sepsis; however it was suggested that the higher sepsis rate in the symphysiotomy group was due to the classification of cases. For example cases of fever with no other obvious cause of infection would be classed as sepsis, whereas cases of fever with some wound infection would be recorded as wound infection.

Long-term follow up: Limited data reported on long term outcomes (n= 270 women). Three studies compared the long-term outcomes of symphysiotomy and caesarean section (Table 2)(7, 16, 17) Outcomes were reported between 20 months and 10 years in one study (7), up to 15 years in another study, with a mean reported follow up time of four years for symphysiotomy and 2.9 years for caesarean section (16), and between 10 to 13 years in the remaining study (17). Long term outcomes for pain when walking (RR 1.75 95% CI 0.76, 4.04; p=0.19; I^2=0%), dancing (RR 0.82 95% CI 0.24, 2.79; p=0.75; I^2=0%), jumping (RR 1.79 95% CI 0.57, 5.65; p=0.32; I^2=0%), and carrying (RR 2.30 95% CI 0.85, 6.23; p=0.10; I^2=0%), showed no significant difference between caesarean section and symphysiotomy. There were no significant differences reported between the groups for scar or uterine pain (RR 0.20 95% CI 0.02, 2.07; p=0.18; I^2=79%) (16, 17) backache (RR 0.75 95% CI 0.12, 4.79; p=0.76; I^2=46%)(16, 17) leg pain (RR 1.40 95% CI 0.73, 2.70; p=0.31; I^2=0%)(16, 17) or abdominal pain (RR 1.27

95% CI 0.49, 3.26; p=0.62; I^2=7%). Similarly there were no significant differences reported in infertility (RR 0.73 95% CI 0.20, 2.76; p=0.65; I^2=18%), dyspareunia or sexual problems between the groups (RR 1.95 95% CI 0.87, 4.37; p=0.11; I^2=0%)(16, 17). Single studies reported on long term incontinence (16), muscle pain (7), headache (16), utero-vaginal prolapse (7), stress incontinence (7), sub-fertility (7), irregular menstrual cycle (7), scanty periods (7) and dysmenorrhoea (7). There were no significant differences reported in any of these outcomes between the two groups, although follow up for some studies was poor (7).

DISCUSSION

Main Findings: Maternal mortality and perinatal mortality were comparable for both interventions. There were no differences in perinatal or neonatal mortality or haemorrhage. There was an increase in fistulae and incontinence with symphysiotomy. Infection was less frequent with symphysiotomy although prophylactic antibiotics were given to most patients that received symphysiotomy. Most of these inferences however are based on a small number of events reported in the studies.

Strengths and Limitations: The main limitation of this review is the potential bias. None of the studies adjusted for confounding factors, for example, for factors such as duration of labour, delay in receiving treatment, or cadre and experience of operator. Only three studies attempted to case match symphysiotomies with caesarean sections and this was not always possible due to the varying incidence of both procedures (5, 7, 16). Furthermore, there was also heterogeneity in the definition of obstructed labour

used across the studies, adding further limitation and possible bias to the results. Moreover, the poor follow up rate with some studies was another limitation in this review. For example, in one study that assessed long term complications (7) up to ten years after the procedure, only 52% (109/207) of participants were followed up. There are known difficulties with long term follow up in studies, which may be increasingly problematic in low income countries (22, 23).

The small sample size of the studies is an additional limitation, thus most inferences are based on limited numbers of events. Although there was no difference in maternal mortality with symphysiotomy when compared with caesarean section, most maternal deaths in the symphysiotomy group (7) were due to pre-eclampsia, rather than complications associated with the procedure; deaths from caesarean were primarily due to complications associated with the procedure, such as haemorrhage and infection.

A further limitation could be the disparity in the measurement of more subjective outcomes such as pain, incontinence and pyrexia, as studies did not give their reference definitions used to measure these outcomes. This is also limited detail on how infection was defined. There is therefore a possibility that measurement bias maybe present in these outcomes. Moreover, some outcomes such as incontinence may occur over time with or without either procedure; none of the studies provide information on the prevalence of incontinence in the studied population, nor do they state if this outcome was present prior to the procedure.

Interpretation: Obstructed labour remains a leading cause of maternal mortality, and although caesarean section is advocated to reduce morbidity and mortality (24), there are risks with caesarean section not only for the current pregnancy, but also for the woman's future reproductive outcomes. Caesarean section scars the uterus and puts it at risk of rupture in future pregnancies, which is more likely in areas where resources are limited and lengthy transfers between health centres are common. In countries where mortality from caesarean section is low, such as high income countries with current standards of obstetric care, symphysiotomy may be obsolete (25). Even at the peak of the popularity of symphysiotomy, it was not widely used in Britain and North America (26).

In the absence of randomised data, a Cochrane review (27) concluded that research was needed to provide robust evidence on the effectiveness and safety of symphysiotomy compared with caesarean section in clinical situations in which the risks and benefits are uncertain. One systematic review (12) of retrospective case series concluded that with training, symphysiotomy poses no greater risks and compares favourably with caesarean section, in terms of risk for the mother's life. Moreover symphysiotomy is simpler and cheaper than caesarean section. A retrospective review of operative deliveries in Nigeria (28) suggested that the practice of symphysiotomy reduced the caesarean section rate and prevented cases of maternal mortality and morbidity in subsequent pregnancies.

CONCLUSION

Research recommendations: Further primary research of sound quality is needed to draw firm inferences on the safety of symphysiotomy for obstructed labour. The appropriateness of using a randomised controlled trial to answer this question needs to be considered. Caesarean section is one the commonest surgical procedures performed worldwide and has good data on the benefits and risks (29). Caesarean section is generally associated with a low complication rate (27) yet like many surgical procedures this can fluctuate with the skill of the operator, the reason for the procedure, the clinical environment and any co-morbidities (29), and thus the complication rate may differ significantly between high and low income countries. A comparable body of evidence is not available for the risks and benefits associated with symphysiotomy (27), as it is a much less common procedure.

Practical recommendations: The inferences made from this review are based on the limited data available; however our analysis suggests that there is no difference in maternal and perinatal mortality from symphysiotomy when compared with caesarean section. The incidence of fistulae is increased with symphysiotomy, yet infection, a common cause of maternal mortality, appears to be lower with symphysiotomy, although this may be due to the administration of prophylactic antibiotics to this group. This review found long term complaints to be similar for symphysiotomy and caesarean section. However a retrospective case-control study (11) (n=50) found that there were more cases of high-grade sacroiliac joint osteoarthritis with symphysiotomy (80%). This

however, was seen in the majority of women in both groups when followed up at a mean time of 41.6 years after the procedure. Moreover, there was a higher prevalence of parasymphyseal degeneration in women that underwent caesarean section when compared to symphysiotomy .

There has been recent debate about symphysiotomy and pubiotomy being performed on women in the Republic of Ireland between 1944—1984. It has been suggested that many women underwent symphysiotomies during childbirth, without knowledge and adequate informed consent and experienced morbidity for many years after the procedure (30). Thus several women that underwent this procedure without adequate knowledge and consent are contemplating legal proceedings (30).

Based on the current evidence, we conclude that symphysiotomy may be useful in situations where caesarean section is too risky or unavailable (box S1). As neither procedure is without risk, it is essential to weigh up the risks and benefits of each procedure, in line with the setting, population, resources available, and the patients reproductive history and future reproductive plans.

Contributions to manuscript

Amie Wilson: Systematic review, literature search, study selection, data extraction, data analysis, quality assessment, data interpretation, discussion

Ewa Truchanowicz: Study selection, data extraction, quality assessment and critical feedback to manuscript

Diaa Elmoghazy: Systematic review, literature search, study selection, data extraction, quality assessment

Christine MacArthur: Data interpretation, discussion and critical feedback to manuscript

Arri Coomarasamy: Data interpretation, discussion and critical feedback to manuscript

Conflicts of interest

We declare that we have no conflicts of interest

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BOX 1: Clinical Criteria for Symphysiotomy (1):

Review for indications:- contracted pelvis;

- vertex presentation;

- prolonged second stage;

- failure to descend after proper augmentation;

- AND failure or anticipated failure of vacuum extraction alone.

• Review conditions for symphysiotomy:

- fetus is alive;

- cervix is fully dilated;

- fetal head at –2 station or no more than 3/5 above the symphysis pubis;

- no over-riding of the head above the symphysis;

- caesarean section is not feasible or immediately available;

- the provider is experienced and proficient in symphysiotomy.

1. World Health Organisation, 2001. WHO, UNFPA, UNICEF, World Bank. Managing complications in pregnancy and childbirth. A guide for midwives and doctors. Geneva: WHO, 2001:53.

Table 1: Data of outcomes reported (maternal mortality, pain, fistulae, laceration, haemorrhage, infection, pyrexia, incontinence, neonatal mortality, perinatal mortality, length of hospital stay, poor wound healing), comparing symphysiotomy and caesarean section (*pelvic pain)

Study Year	**Hartfield 1973[7]**		**Mola 1981[19]**		**Van Roomalen 1987[22]**		**Mola 1995[18]**		**Basak 2011[5]**		**Verkuyl 2006[17]**	
	sym	**cs**	**sym**	**cs**	**sym**	**cs**	**sym**	**cs**	**sym**	**cs**	**sym**	**cs**
Maternal Mortality N(%)	1/105 (1)	2/105 (2.1)	0/86 (0)	3/258 (1)	0/54 (0)	5/100 (5)	0/65 (0)	0/108 (0)	1/25 (4)	2/50 (4)	0/172 (0)	0/79 (0)
Pain N(%)	NR	NR	NR	NR	NR	NR	NR	NR	8/25* (32)	0/50* (0)	NR	NR
Vesico-vaginal Fistulae N(%)	4/105 (4.2)	1/105 (1)	3/86 (3.5)	0/258 (0)	NR	NR	NR	NR	NR	NR	4/172 (2.3)	1/79 (1.2)
Laceration N(%)	4/105 (4.2)	0/105 (0)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Haemorrhage N(%)	8/105 (8.4)	19/105 (19.9)	NR	NR	NR	NR	NR	NR	4/25 (16)	27/50 (54)	9/172 (5.2)	2/79 (2.5)
Infection N(%)	NR	NR	10/86 (11.8)	47/258 (18.2)	NR	NR	3/65 (4.6)	29/108 (26.8)	1/25 (4)	26/50 (52)	16/172 (9.3)	24/79 (30.3)
Pyrexia N(%)	80/105 (84)	91/105 (95.5)	NR	NR	NR	NR	NR	NR	5/25 (20)	20/50 (40)	44/172 (25.6)	43/79 (54.4)
Incontinence N(%)	7/105 (7.3)	0/105 (0)	8/86 (9.4)	2/258 (0.8)	NR	NR	2/65 (3)	0/108 (0)	NR	NR	4/172 (2.3)	0/79 (0)
Neonatal Mortality N(%)	NR	NR	NR	NR	NR	NR	NR	NR	7/25 (28)	12/50 (24)	14/172 (8.1)	8/79 (10.1)
Stillbirth N(%)	NR	NR	NR	NR	NR	NR	NR	NR	1/25 (4)	2/50 (4)	9/172 (5.2)	2/79 (2.5)
Perinatal Mortality N(%)	17/105 (17.8)	7/105 (7.3)	7/86 (8)	41/258 (16)	11/54 (5.9)	13/100 (13)	2/65 (3)	5/108 (4.6)	NR	NR	23/172 (13.4)	10/79 (12.7)
Days in hospital Mean no days	11.2	11.4	13.3 (9.8)	12.9 (8.2)	NR	NR	NR	NR	NR	NR	9.1 (5-10)	9.2 (6-10)
Delayed/poor wound healing N(%)	17/105 (17.8)	39/105 (40.9)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Table 2: Long term follow up outcome data comparing the outcomes of symphysiotomy and cesarean section

Outcome	**Ersdal 2008[16]**		**Verkuyl 2006[17]**		**Outcome**	**Hartfield 1973[7]**		**Verkuyl 2006[17]**	
	sym	**cs**	**Sym**	**Cs**		**sym**	**cs**	**sym**	**cs**
Pain on walking n (%)	8/34 (23.5)	4/29 (13.8)	7/55 (13.0)	3/43 (7.0)	Dysmenorrhoea n (%)	3/61 (4.9)	3/48 (6.3)	NR	NR
					Scanty periods n (%)	0/61 (0)	1/48 (2.1)	NR	NR
Pain on dancing n (%)	1/34 (2.9)	2/29 (6.9)	4/55 (7.4)	3/43 (7.0)	Irregular menstrual cycle n (%)	0/61 (0)	3/48 (6.3)	NR	NR
Pain on Jumping n (%)	3/34 (8.8)	2/29 (6.9)	6/55 (11.1)	2/43 (4.7)	Sub-fertility n (%)	4/61 (6.6)	4/48 (8.3)	NR	NR
Pain or problems carrying n (%)	3/24 (8.8)	2/29 (6.9)	10/55 (18.5)	3/43 (7.0)	Stress incontinence n (%)	2/61 (3.3)	1/48 (2.1)	NR	NR
Painful scar or uterus n (%)	1/34 (2.9)	15/29 (51.7)	6/55 (11.1)	9/43(20.9)	Utero-vaginal prolapsed n (%)	1/61 (1.6)	0/48 (0)	NR	NR
					Backache n (%)	0/61 (0)	2/48 (4.2)	15/55 (27.3)	9/43 (20.9)
Dyspareunia or sexual problems n (%)	10/34 (29.4)	5/29 (17.2)	7/55 (13.0)	2/43 (4.8)	Occasional backache n (%)	6/61 (9.8)	7/48 (14.6)	NR	NR
					Leg pain n (%)	2/61 (3.3)	0/48 (0)	17/55 (30.9)	10/43 (3.3)
Infertility n (%)	0/34 (0)	2/29 (6.9)	8/71 (11.3)	6/53 (11.3)	Occasional leg pain n(%)	7/61 (11.5)	5/48 (10.4)	NR	NR
Stress Incontinence n (%)	1/34 (2.9)	2/29 (6.9)	NR	NR	Abdominal pain n (%)	0/61 (0)	1/48 (2.1)	15/55 (27.3)	8/43 (18.6)
Headache n (%)	0/61 (0)	1/48 (2.1)	NR	NR	Muscle pain n (%)	0/61 (0)	1/48 (2.1)	NR	NR

Figure 1. Study selection process in the systematic review of symphysiotomy

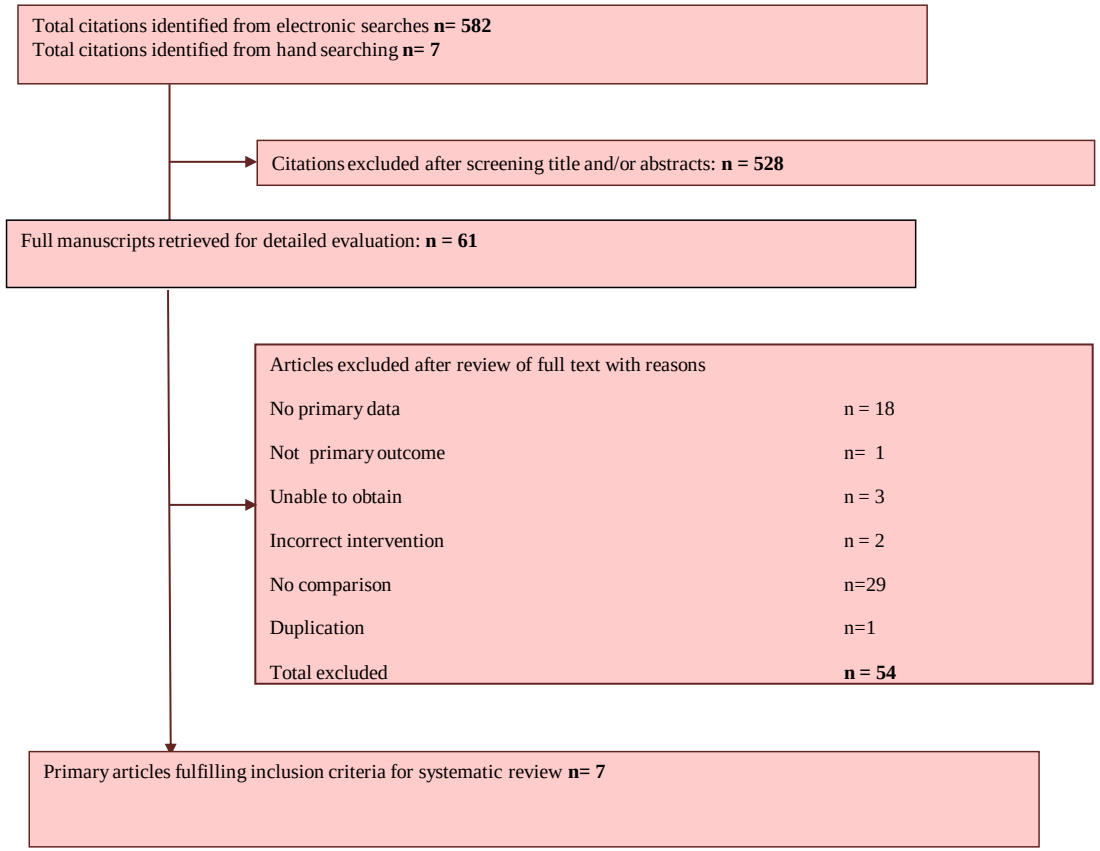


Figure 2:Maternal Mortality

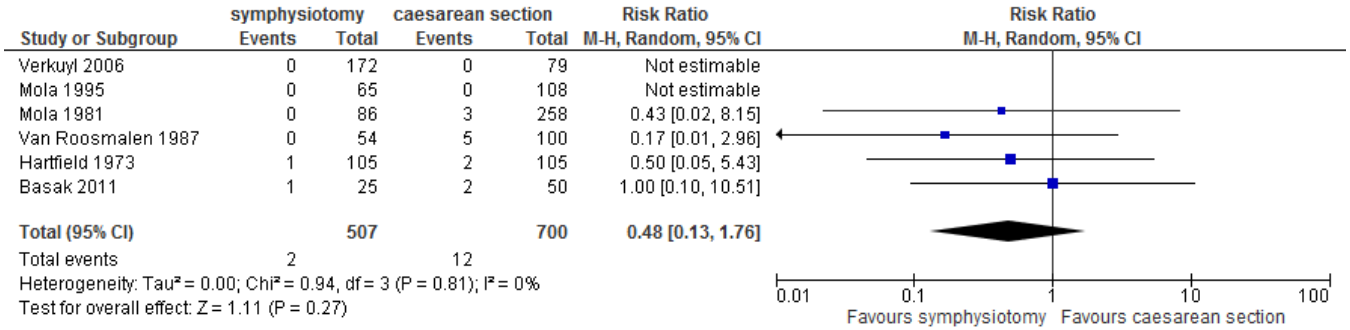


Figure 3: Perinatal Mortality

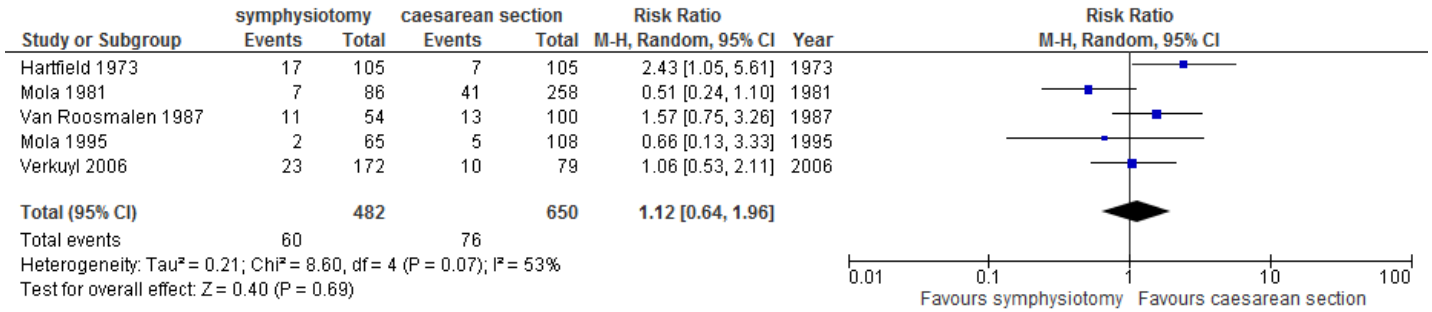


Table S1: Summary of Included Studies

Study, population and selection	Definition of obstructed labour	Matching	Symphysiotomy (sym.)	Caesarean section (cs.)	Antibiotics given	Outcome
Hartfield, 1973[7] Referral hospital with an obstetric unit in Southern Nigeria1961-69. Prospective case comparison study with women who had sym. or cs. for CPD. CPD commonest indication for cs.	Moderate - severe CPD at pelvic inlet, nearly half of patients had laboured 24 hours before admission. No further details.	Consecutive patients matched with patient nearest in time having cs. for CPD. In the last three years of study sym. outnumbered cs. First cs. were matched with the nearest sym. in time. 32 sym. were omitted from analysis.	n=105 mean age 25.7, parity 2 (range 0-10). Sym. performed immediately before delivery with episiotomy 84 (80%) by lead obstetrician under local anaesthetic. After care: Bed rest 8 -10 days, encouraged to lie on side, reduced 3-5 days later. No further details on women or operator	n=105 mean age 26.1, parity: 1.8 (range 0-9). 84 (80%) by lead obstetrician, 8 (8%) under local anaesthetic. No further details on women or operator	No details provided	Maternal mortality (MM), perinatal mortality (PM) major maternal complications. Vesico-vaginal fistula. Symptoms at 6 weeks, complications long-term follow up (20 months – 10 yrs). Mean number of days in hospital, temperature >38.0^{o}C, blood transfusion rate. Stress incontinence.
Mola, 1981[19] General hospital in Southern Papua New Guinea 1974 -80. Retrospective case comparison study with consecutive inclusion with women who had sym. or cs. Majority primigravid and had supervised labours.	CPD diagnosed following failure to progress.	Sym. and cs. were performed under similar conditions, late in labour, as an emergency procedure.	n=85 mean age 23, parity: 54 (63%) primi, 31 (36%) multi, 6 (1%) grand multi. Seedat and Crichton method before delivery with episiotomy, most had vacuum extraction. After care: catheter 24 hours (10 days if blood stained). Analgesia, bed rest in lateral position, knees loosely bound for 12 hours. Movement encouraged after 12 hours and ambulate after 48 hours. Discharged when ambulant, avoid exercise for 6 weeks. No further details on women or operator	n=258 mean age 26, parity: 173 (67%) primi. 85 (32%) multi, 18 (1%) grand multi. Cs. late in labour. No further details on women or operator	Prophylactic antibiotics given.	MM, PM, Vesico-vaginal fistula, UTI, incontinence, haematoma, osteitis pubis, paralytic ileus, wound or genital tract infection, cs., 3rd degree tear, problems at 6 weeks.
van Roosmalen **1987**[22] Two rural hospitals in Southwest Highlands, Tanzania 1976-83. Retrospective case comparison study reporting on all sym. and cs. Maternal health services delivered by medical auxiliaries with supervision by general doctors. Transport is unreliable.	CPD with live cephalic presenting fetus. No further details	Details on matching are not reported.	n=54 36 (67%) primi 6(11%) grandmulip. 20 (37%) women below 150 cm. Labour augmented in 24 women due to delay in first stage (44%). 21 (38%) vertex presentations, 2 (3%) face presentations, 1 (1%) breech presentation. Seedat and Crichton method. Live fetus, vertex presentation. Often failed ventouse attempt. No further details on women or operator	n=100 no further details on women or operator	No details provided.	MM and serious morbidity. PM (2 deaths before sym. started). Urinary problems – (no catheter inserted). Vesico-vaginal fistula.
Mola **1995**[18] Set in a general hospital in Southern Papua New Guinea 1988-94. Retrospective case	Failed assisted delivery. No further details provided.	All failed delivery attempts that had sym. or cs. were included.	n=62 40 (66%) primi. Duration of 1st and 2nd stages 6-37 hours and 1-5 hours. Seedat and Crichton technique. No further details on	n=108 78 (73%) primi. Duration of 1st and 2nd stages 6-38 hours and 1-6 hours cs. No further details on women or	No details provided.	MM, PM, morbidity, agars <7 at 5 mins, >24 hrs special care unit admission, post op. stay >10 days,

comparison study of women who had sym. or cs. for failed attempts of assisted delivery of cephalic presentations. No difference in parity or duration of first and second stages of labour between cs. and sym. Majority primigravid. Operating theatre 1km from labour ward. Transportation problematic at night.			women or operator	operator		further surgery
***Basak* 2011** [5] India 2005-06. Prospective case comparison study of all women who had sym. or cs for obstructed labour presenting on ward at any time. Retrospective follow up.	One of the following: a) obstructed labour -mild to moderate CPD, fetus alive, vertex presentation, advanced cervical dilatation, well engaged fetal head b) obstructed labour after failed instrumental delivery c) trapped after coming head in breech, d) shoulder dystocia.	Attempts to time match index delivery.	n=25 6 (20%) forceps, 6 (20%) ventouse. Decision to delivery interval was <1 hour 19 (76%). After care: Bed rest on side with iliac strapping on knees for 3 days. Indwelling catheter 5 days. Discharged 7 days, advised to avoid weight bearing activities for 3 months. No further details on women or operator	n=50 decision to delivery in most patients 20 (40%) interval was 2-3 hours. No further details on women or operator	Prophylactic antibiotics given.	MM and morbidity (PPH, sepsis, genitourinary trauma, pelvic pain, gait problems). NM, morbidity from birth, live birth, stillbirth, asphyxia, intracranial haemorrhage, cephalohematoma and hypoxic ischemic encephalopathy.
***Ersdal* 2008** [16] Central, academic and district hospitals, in Zimbabwe 1994-96. Retrospective case comparison of women who had sym. or cs. for obstructed labour with prospective follow up. cs. group had cs. for probable pelvic outlet obstruction, recorded in register as having cs. after failed vacuum extraction.	No definition provided	Not possible to find enough time matched failed vacuum extractions followed by cs. in the hospital registers so included delivery records of other tertiary hospitals. 70 women were selected like this and tried to match the time since index delivery as much as possible	n=34 mean age 26.1. mean parity before delivery 0.8. Sym. earlier than these dates included, performed by experience doctors. No further details on women or operator.	n=29 mean age 26.8. mean parity before delivery 1. Often had failed vacuum delivery. No further details on women or operator.	No details provided.	NM, maternal morbidity (serious soft tissue injuries in birth canal, haemorrhage, sepsis). Pain on walking/ dancing/ jumping/carrying. Pain in scar, dyspareunia, infertility, incontinence.
***Verkuyl* 2006** [17] Central maternity hospital in Zimbabwe 1976-79. Retrospective case comparison study from hospital notes of women that could or should (according to the author) have had sym., but were delivered by cs. Sym. group younger and lower parity. Duration of second stage shorter in sym. Prospective follow up	Not provided but includes women approaching second stage with obstructed labour, including failed vacuum, failed forceps, failed breech, fetal distress.	Selected from the same delivery registers from 1976-79. Difficult to find women during the time of the highest frequency of sym. resulting in a smaller cs. cohort. Conditions for the cs. selection group were live fetus at time of decision, longitudinal lie, >9cm dilated, some engagement of the presenting part, failed instrumental delivery.	n=172 mean age 20.6. Parity before delivery 0.4. 116 (67.9)% were booked, average duration of second stage 1.3 hours, average duration of first stage is 17.4 hours, meconium stained liquor 92 (53.5%), mean cervical dilation 9.8cm, Seedat and Crichton technique. Most delivered with vacuum. Three women refused cs. No further details on women or operator.	n=79 mean age 24.6 parity before delivery 1.8. Mainly obstructed labour and failed vacuum. Mainly under general anaesthesia with transverse lower segment incision. 56 (71.6%) were booked, average duration of second stage 2.8 hours, average duration of first stage is 16.6 hours, meconium stained liquor 40 (51.6%), mean cervical dilation 9.8cm. No further details on women or	IV antibiotics given to most, continued for 5 days if infection.	PM, MM and morbidity, SB, Apgar>7 at 5 min, mean number days in hospital, total transfused blood units, VVF/VVR, stress incontinence, ileus, wound infection, burst abdomen, ICU admission. Walking, dancing or sexual problems, problems with carrying heavy things, abdominal, leg and back

using questionnaire by mail, home visits.				operator.		

Table S2: Strobe reporting checklist (Y=reported, N=not reported)

	STROBE	Hartfield 1972[7]	Mola 1981[19]	Van Roosmalen 1987[22]	Mola 1995[18]	Basak 2011[5]	Ersdal 2008[16]	Verkuyl 2006[17]
Title and Abstract	design	N	N	N	N	Y	N	Y
	summary	Y	Y	N	Y	Y	Y	Y
Introduction	background	Y	Y	N	Y	Y	Y	Y
	objectives	Y	Y	N	Y	N	Y	Y
Methods	study design	Y	N	N	N	Y	Y	Y
	setting	Y	Y	Y	Y	Y	Y	Y
	participants	Y	N	N	Y	Y	Y	Y
	variables	N	N	N	Y	Y	Y	Y
	data sources	N	N	N	Y	N	Y	Y
	Bias	N	N	N	Y	N	Y	N
	study size	N	N	N	N	N	N	N
	quant. variables	Y	N	N	Y	N	N	Y
	stat. methods	N	N	N	Y	N	N	Y
Results	participants	N	Y	Y	N	N	Y	Y
	descriptive data	N	Y	N	N	N	Y	Y
	outcome data	Y	Y	Y	N	Y	Y	Y
	main results	N	Y	N	N	Y	Y	Y
	other analysis	N	Y	N	Y	N	N	N
Discussion	key results	N	Y	Y	N	Y	Y	Y
	limitation	N	N	N	N	N	N	N
	interpretation	N	Y	N	Y	N	Y	Y
	generaliability	Y	Y	Y	Y	Y	Y	Y
Other	funding	N	N	N	N	N	Y	N

Table S3: Risk of Bias for studies (Y=reported, N=not reported)

Case Studies		Hartfield 1972[7]	Mola 1981[19]	Van Roosmalen 1987[22]	Mola 1995[18]	Basak 2011[5]	Ersdal 2008[16]	Verkuyl 2006[17]
Selection	Definition adequate	Y	N	N	N	Y	N	N
	Representativeness of the cases	Y	N	N	N	N	N	Y
	Selection of controls	Y	Y	N	N	N	N	N
	Definition of controls	Y	N	N	Y	N	N	N
Comparability	Comparability (2 points available)	Y	Y	N	Y	N	Y	Y
Exposure	Ascertainment of exposure	Y	Y	Y	Y	Y	Y	Y
	Same method of ascertainment	Y	Y	Y	Y	Y	Y	Y
	Non-response rate	N	Y	N	Y	Y	Y	N

Figure S1: Neonatal mortality

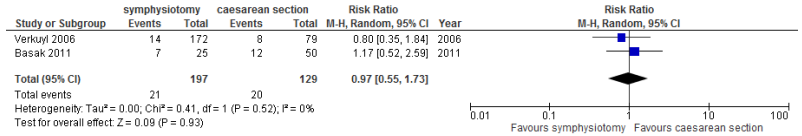


Figure S2: Stillbirth

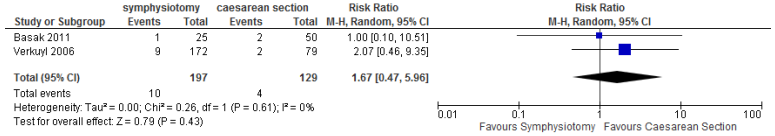


Figure S3: Haemorrhage

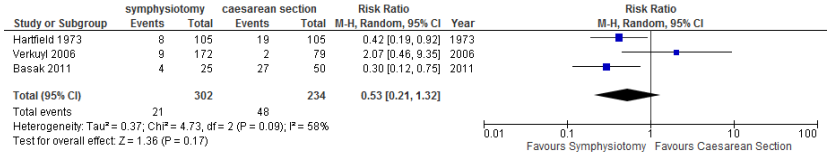


Figure S4: Vesico-vaginal Fistulae

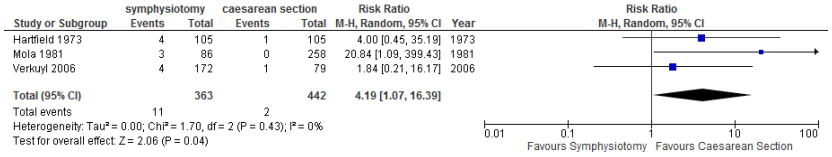


Figure S5: Infection

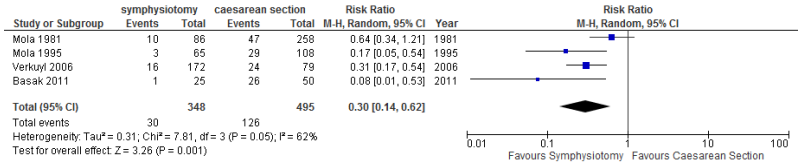
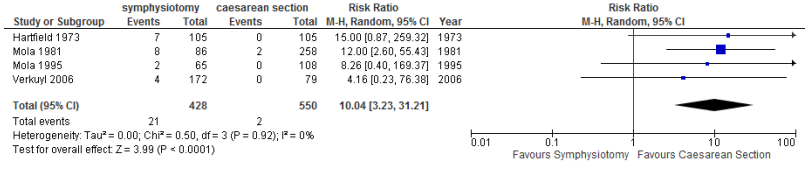


Figure S6: Stress Incontinence



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