Intrapartum interventions for preventing shoulder dystocia (Review)

Athukorala C, Middleton P, Crowther CA

THE COCHRANE COLLABORATION®

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2009, Issue 4

http://www.thecochranelibrary.com

TABLE OF CONTENTS

[Intervention Review]

Intrapartum interventions for preventing shoulder dystocia

Chaturica Athukorala[1], Philippa Middleton[2], Caroline A Crowther[2]

[1]Discipline of Obstetrics and Gynaecology, The University of Adelaide, Adelaide, Australia. [2]ARCH: Australian Research Centre for Health of Women and Babies, Discipline of Obstetrics and Gynaecology, The University of Adelaide, Adelaide, Australia

Contact address: Chaturica Athukorala, Discipline of Obstetrics and Gynaecology, The University of Adelaide, Women's and Children's Hospital, Adelaide, South Australia, 5006, Australia. chaturica.athukorala@gmail.com. chaturica.athukorala@student.adelaide.edu.au.

Editorial group: Cochrane Pregnancy and Childbirth Group.
Publication status and date: New search for studies and content updated (no change to conclusions), published in Issue 4, 2009.
Review content assessed as up-to-date: 30 May 2009.

Citation: Athukorala C, Middleton P, Crowther CA. Intrapartum interventions for preventing shoulder dystocia. *Cochrane Database of Systematic Reviews* 2006, Issue 4. Art. No.: CD005543. DOI: 10.1002/14651858.CD005543.pub2.

ABSTRACT

Background

The early management of shoulder dystocia involves the administration of various manoeuvres which aim to relieve the dystocia by manipulating the fetal shoulders and increasing the functional size of the maternal pelvis.

Objectives

To assess the effects of prophylactic manoeuvres in preventing shoulder dystocia.

Search strategy

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register (May 2009).

Selection criteria

Randomised controlled trials comparing the prophylactic implementation of manoeuvres and maternal positioning with routine or standard care.

Data collection and analysis

Two review authors independently applied exclusion criteria, assessed trial quality and extracted data.

Main results

Two trials were included; one comparing the McRobert's manoeuvre and suprapubic pressure with no prophylactic manoeuvres in 185 women likely to give birth to a large baby and one trial comparing the use of the McRobert's manoeuvre versus lithotomy positioning in 40 women. We decided not to pool the results of the two trials. One study reported 15 cases of shoulder dystocia in the therapeutic (control) group compared to five in the prophylactic group (risk ratio (RR) 0.44, 95% confidence interval (CI) 0.17 to 1.14) and the other study reported one episode of shoulder dystocia in both prophylactic and lithotomy groups. In the first study, there were significantly more caesarean sections in the prophylactic group and when these were included in the results, significantly fewer instances of shoulder dystocia were seen in the prophylactic group (RR 0.33, 95% CI 0.12 to 0.86). In this study, 13 women in the control group required therapeutic manoeuvres after delivery of the fetal head compared to three in the treatment group (RR 0.31, 95% CI 0.09 to 1.02).

One study reported no birth injuries or low Apgar scores recorded. In the other study, one infant in the control group had a brachial plexus injury (RR 0.44, 95% CI 0.02 to 10.61), and one infant had a five-minute Apgar score less than seven (RR 0.44, 95% CI 0.02 to 10.61).

Authors' conclusions

There are no clear findings to support or refute the use of prophylactic manoeuvres to prevent shoulder dystocia, although one study showed an increased rate of caesareans in the prophylactic group. Both included studies failed to address important maternal outcomes such as maternal injury, psychological outcomes and satisfaction with birth. Due to the low incidence of shoulder dystocia, trials with larger sample sizes investigating the use of such manoeuvres are required.

PLAIN LANGUAGE SUMMARY

Intrapartum interventions for preventing shoulder dystocia

It is not clear whether altering maternal posture or applying external pressure to the mother's pelvis before birth helps the baby's shoulders pass through the birth canal.

Various manoeuvres are used to assist the passage of the baby through the birth canal by manipulating the fetal shoulders and increasing the functional size of the pelvis. These manoeuvres can also be used before the baby's head appears to prevent the fetal shoulders becoming trapped in the maternal pelvis (shoulder dystocia). In this review, the two studies involving 25 women were not large enough to show if manoeuvres such as manipulating the mother's pelvis can prevent instances of shoulder dystocia. Rates of birth injury did not appear to be affected by carrying out the manoeuvres early. Neither study addressed important maternal outcomes such as maternal injury, psychological outcomes and satisfaction with birth. Because shoulder dystocia is a rare occurrence, more studies involving larger groups of women are required to properly assess the benefits and adverse outcomes associated with such interventions.

BACKGROUND

Shoulder dystocia and associated risk factors

Shoulder dystocia is an obstetric emergency with a potentially catastrophic outcome. Following the birth of the head, delivery of the shoulders and body is complicated by the impaction of the fetal shoulders in the maternal pelvis. Typically, the term is used to describe births in which manoeuvres other than gentle downward traction are required to complete the delivery of the anterior shoulder. The overall incidence of shoulder dystocia varies based on fetal weight, occurring in 0.6% to 1.4% of births where the infant weighed between 2500 g to 4000 g. In infants with a birthweight of 4000 g to 4500 g the rate of shoulder dystocia increases to 5% to 9% (Baxley 2004). Incidence rates also vary depending on the criteria used for diagnosis.

Shoulder dystocia is associated with a high risk of physical and psychological complications for the mother and neonate. Common maternal complications include uterine rupture, postpartum haemorrhage (11%) and soft tissue damage to the cervix and vagina (3.8%) (Baxley 2004). Psychologically, mothers may experience postnatal depression, post-traumatic stress syndrome and may have problems with maternal-infant interaction (Coates 2004). Immediate fetal consequences include asphyxia and meconium aspiration. Following delivery, brachial plexus injuries are most commonly encountered occurring in 4% to 15% of infants (Baxley 2004). The brachial plexus is a major nerve network supplying the upper limb. It begins in the neck, extends into the axilla and can be injured by excessive stretching of the neck during birth. A large proportion of brachial plexus injuries resolve within six to 12 months. Cases in which complete severance of nerve roots has occurred may require several stages of surgery to restore function, but less than 10% result in permanent injury. Bony injuries involving the clavicle and, less often, the humerus are also common.

Although attempts to correctly predict cases of shoulder dystocia have had limited success, several risk factors are associated with an increased rate of its occurrence. Higher birthweight is the common denominator connecting most current reports on maternal and fetal risk factors for shoulder dystocia. The related maternal risk factors include diabetes, obesity and multiparity.

Keller 1991 identified shoulder dystocia in 7% of pregnancies complicated by gestational diabetes. It is important to note that diabetic women diagnosed with a macrosomic infant are more

likely to experience a difficult vaginal delivery (Coustan 1996). McFarland 1998 reported that macrosomic infants of diabetic mothers had larger shoulders and a decreased head-to-shoulder ratio than non-diabetic control infants of similar birthweight and length. These differences in anthropomorphic characteristics may explain the propensity for shoulder dystocia amongst this population.

In a study of pregnancy complications and adverse perinatal outcomes associated with obesity, Cedergren 2004 found that shoulder dystocia occurred three times more often in overweight women than in those of normal weight. Orskou 2003 found that women with parity greater than two had an increased risk of giving birth to infants weighing more than 4000 g (macrosomic) and hence were more likely to have adverse outcomes during birth including shoulder dystocia. There is evidence that macrosomia associated with continued fetal growth in post-term pregnancies poses a risk for shoulder dystocia (Baskett 1995).

A prior birth complicated by shoulder dystocia has been identified as a risk factor in some studies (Baskett 1995; Ginsberg 2001; Smith 1994). For instance, Smith 1994 reported recurrent shoulder dystocia in five out of 42 women (12%) who had previously had births complicated by shoulder dystocia. However, Baskett 1995 reported a smaller recurrence rate of only 1% to 2%. In a retrospective study of 602 births complicated by shoulder dystocia, Ginsberg 2001 reported a recurrence rate of 16.7%. The wide variation in recurrence rates reported in these studies may be attributed to varied population demographics of the sample and variations in the clinical definition of shoulder dystocia leading to under- or over-reporting of cases. Nevertheless, these studies do show that women with a history of shoulder dystocia are at a higher risk of a subsequent dystocia than the general population.

Using the knowledge of these risk factors, efforts, such as caesarean and induction of labour, have been made to prevent shoulder dystocia in women at risk. Since the 1970s, certain pregnancy risk factors have been used to identify women in whom a caesarean could potentially avoid shoulder dystocia. According to a study of the cost-effectiveness of prophylactic caesarean for fetal macrosomia by Rouse and Owen (Rouse 1999), it would require over 100 caesareans to prevent a single permanent brachial plexus injury. Reflecting this view, a review of the literature by *The American College of Obstetricians and Gynecologists* inferred that performing caesareans in all women suspected of carrying a macrosomic fetus is not appropriate. The same review proposed that planned caesarean delivery may be reasonable for a non-diabetic woman with an estimated fetal weight exceeding 5000 g or a diabetic woman whose fetus weighs over 4500 g. Some authors, however, continue to support caesarean in all cases of fetal macrosomia diagnosed by ultrasound (O'Leary 1992).

The ability to detect macrosomic fetuses accurately using clinical estimation and ultrasound has been the topic of several studies (Delpapa 1991; Deter 1985; Levine 1992). A study by Gonen 1996 found that the predictive value of clinical estimation of fetal weight alone may be slightly higher than when combined with ultrasonography. The second part of this study determined the effect of prenatal diagnosis of macrosomia on the incidence of shoulder dystocia and birth trauma and hence the ability to prevent such occurrences. Although fetal macrosomia is an obvious predisposing factor for a birth complicated by shoulder dystocia, most cases of shoulder dystocia and birth trauma occur in non-macrosomic infants (Geary 1995). In support of this, the study concluded that the prenatal diagnosis of fetal macrosomia had little effect on the predictability and, consequently, the preventability of shoulder dystocia.

Prevention and management of shoulder dystocia

A recent study assessing the effects of glycaemic control on pregnancy outcomes in women with gestational diabetes demonstrated that treatment of gestational diabetes reduces serious perinatal morbidity, including the risk of shoulder dystocia (Crowther 2005). This may be attributed to the reduced incidence of fetal macrosomia reported amongst women in the treatment group. Salim 2004 conducted a prospective study to determine whether differences in anthropometric measurements found in infants from diabetic mothers still persisted with strict glycaemic control. The results showed that infants of mothers with well-controlled gestational diabetes had anthropomorphic characteristics similar to infants of non-diabetic mothers. This may also contribute to the reduced incidence of shoulder dystocia seen in mothers with gestational diabetes subject to strict glycaemic control.

Induction of labour has been trialled as a preventative measure in women identified as having an increased risk of shoulder dystocia (Gonen 1997; Kjos 1993; Tey 1995). Two Cochrane reviews have assessed the role of induction of labour in preventing pregnancy complications including shoulder dystocia; Irion 1998 in cases of suspected fetal macrosomia and Boulvain 2001 in diabetic pregnant women. Both reviews concluded that there was insufficient evidence regarding the effect of inducing labour on preventing shoulder dystocia.

With the exception of the recent evidence regarding the benefits of strict glycaemic control in preventing shoulder dystocia, the efficacy of prophylactic treatment in women at risk prior to the onset of labour remains controversial. The difficulty in correctly predicting women at risk of shoulder dystocia has contributed to this controversy. Due to this unpredictability, health practitioners caring for women in labour must be educated in the management of shoulder dystocia to be able to provide appropriate care once it has occurred.

A key management strategy is the application of various manoeuvres. *The American College of Obstetricians and Gynecologists* has developed a shoulder dystocia drill to help better organise the emergency management of an impacted shoulder (ACOG 2000). The drill is a set of manoeuvres performed sequentially as needed to

complete vaginal birth. The manoeuvres are arranged from the simple, which require only movement of the mother, to the complex, requiring manipulation of the fetus.

Manoeuvres used late in the management of shoulder dystocia are complex, requiring direct manipulation of the fetus. These include the Woods manoeuvre, the Rubin manoeuvre, cleidotomy and the Zavanelli manoeuvre. The Woods corkscrew manoeuvre and the Rubin manoeuvre involve manual rotation and adduction of the fetal shoulders. Cleidotomy involves deliberate fracture of the clavicle to accomplish delivery but it is usually a difficult procedure, especially in a large, mature fetus. The Zavanelli manoeuvre remains the last resort in the management of shoulder dystocia and involves replacing the fetal head into the maternal pelvis followed by a caesarean section.

Manoeuvres used in the early management of shoulder dystocia aim to relieve the dystocia by manipulating the fetal shoulders and increasing the functional size of the maternal pelvis. The pelvis is a rigid structure consisting of four bones united by cartilaginous joints and ligaments and forms the walls of the birth canal. In pregnancy, the joints and ligaments undergo temporary changes under the influence of the hormones relaxin, progesterone and oestrogen allowing some movement of the joints to facilitate birth (Miller 1997). Therefore, by manoeuvring the mother and placing external pressure on the pelvis it is possible to take advantage of this laxity and aid the passage of the fetus.

The McRobert's manoeuvre, the all-fours position and the application of suprapubic pressure, are manoeuvres implemented in the early management of shoulder dystocia. Manoeuvres related to maternal position can be implemented at the commencement of the second stage of labour and held until delivery of the fetal shoulders is complete. The McRobert's manoeuvre involves assisting the mother into an exaggerated knee-chest position whilst lying flat (or slightly tilted upward) on her back. This does not change the actual dimensions of the pelvis but aids delivery by straightening the sacrum relative to the lumbar spine and rotating the pubic symphysis toward the mother's head allowing it to slide over the fetal shoulder (Gherman 2000). When there is a minor degree of shoulder dystocia, movement of the mother into an all-fours position can dislodge the obstruction so the shoulders can negotiate the pelvis normally. This position acts as an 'upside-down' McRobert's position and has the same beneficial effects as described above. The application of suprapubic pressure, by an assistant or the delivering practitioner, aims to displace the anterior shoulder away from the pubic symphysis (the anterior point of union of the pelvic bones) to allow the fetal shoulders to enter the pelvis in an oblique diameter. This is advantageous as the entry of the birth canal (the pelvic inlet) is oval in shape with the transverse diameter usually being the widest. Pressure is applied by delivery room nursing staff or the delivering physician as the fetal shoulders are traversing the birth canal.

The mechanics of shoulder dystocia would suggest that the complication could be avoided by applying the manoeuvres outlined previously in a prophylactic manner rather than as treatment once shoulder dystocia has occurred. The use of the McRobert's manoeuvre or the adoption of the all-fours position would maximise the functional size of the maternal pelvis thus minimising the chance of shoulder impaction. The application of suprapubic pressure late in the second stage of labour may prevent fixation of the descending shoulders under the pubic symphysis.

The efficacy, easy application and perceived safety of these manoeuvres may warrant their application as preventative measures in cases where the risk of shoulder dystocia seems high. There are reports of potential, albeit extremely rare, adverse effects related to their use. Heath 1999 describes a case of symphyseal separation and sacroiliac dislocation resulting from excessive or prolonged maternal hip flexion and Hankins 1998 reports a case of fetal injury resulting from the application of excessive pressure as it passed beneath the pubic symphysis. This review aims to determine the efficacy of such manoeuvres as intrapartum interventions for reducing the incidence of shoulder dystocia. In determining their efficacy, their ability to reduce the incidence of shoulder dystocia will be offset against any maternal or fetal morbidity arising as a consequence of their use.

OBJECTIVES

To assess the effects of intrapartum interventions for preventing shoulder dystocia.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials comparing any intrapartum intervention for the prevention of shoulder dystocia (including the prophylactic implementation of manoeuvres and maternal positioning) with routine or standard care.

Types of participants

Women with term, cephalic singleton gestations including those determined by the authors as being at risk for shoulder dystocia including:

- women with suspected fetal macrosomia as determined by ultrasound;
- women with a previous history of shoulder dystocia;
- women suffering from gestational diabetes or diabetes mellitus;

- women with post-term pregnancies.

Types of interventions

Prophylactic use of manoeuvres including:

- the McRobert's manoeuvre;
- the application of suprapubic pressure.

Positioning of the mother:

- the all-fours position.

Induction of labour for suspected fetal macrosomia will not be included.

Types of outcome measures

(1) The incidence of shoulder dystocia (variously defined by authors).
(2) Severity of shoulder dystocia as measured by:

- the use of manoeuvres (including suprapubic pressure, McRobert's manoeuvre, Woods corkscrew manoeuvre, the Rubin manoeuvre, delivery of posterior shoulder);
- the use of cleidotomy and the Zavanelli procedure;
- the force of traction required for delivery.

(3) Fetal outcomes

- Apgar score (less than seven at five minutes);
- asphyxia;
- meconium aspiration;
- newborn birth injuries including: brachial plexus injuries, clavicular and humeral fractures;
- perinatal death;
- long-term sequelae (for example, permanent nerve palsy).

(4) Maternal outcomes

- Postpartum haemorrhage;
- uterine rupture;
- soft tissue damage-cervix and vagina;
- trauma resulting from application of manoeuvres (including symphyseal separation and sacroiliac dislocation);
- episiotomy (degree);
- pain/discomfort;
- satisfaction with birth;
- psychological outcomes (including postnatal depression);
- disrupted mother-baby interaction;
- long-term sequelae (psychological and physical).

(5) Mode of birth

- Caesarean birth;
- normal delivery;
- instrumental vaginal delivery (forceps or vacuum extraction).

(6) Use of health services

- Admission to neonatal unit;
- maternal length of stay;
- neonatal length of stay.

Search methods for identification of studies

Electronic searches

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register by contacting the Trials Search Co-ordinator (May 2009).
The Cochrane Pregnancy and Childbirth Group's Trials Register is maintained by the Trials Search Co-ordinator and contains trials identified from:

1. quarterly searches of the Cochrane Central Register of Controlled Trials (CENTRAL);
2. weekly searches of MEDLINE;
3. handsearches of 30 journals and the proceedings of major conferences;
4. weekly current awareness alerts for a further 44 journals plus monthly BioMed Central email alerts.

Details of the search strategies for CENTRAL and MEDLINE, the list of handsearched journals and conference proceedings, and the list of journals reviewed via the current awareness service can be found in the 'Specialized Register' section within the editorial information about the Cochrane Pregnancy and Childbirth Group.
Trials identified through the searching activities described above are each assigned to a review topic (or topics). The Trials Search Co-ordinator searches the register for each review using the topic list rather than keywords.
We did not apply any language restrictions.

Data collection and analysis

All studies identified by the search strategy outlined above were considered for inclusion. They were evaluated for appropriateness and methodological quality without consideration of their results. Two authors performed this assessment independently. Differences in opinion were resolved by discussion.
Selection bias was assessed by examining the adequacy of allocation concealment. Two authors independently assessed this using the criteria outlined in Section six of the *Cochrane Reviewers' Handbook* (Alderson 2004). The adequacy of allocation concealment was indicated as adequate (A), unclear (B), or inadequate (C).
Due to the nature of the intervention being analysed, blinding is not feasible. Blinding of outcome assessors was noted. Completeness to follow up of each trial was not documented as no data for long-term outcomes were included.

The data were independently extracted and double entered. There was no blinding of authorship. Statistical analyses were performed using Review Manager software (RevMan 2003) and included trial data was processed as described in the *Cochrane Reviewers' Handbook* (Alderson 2004).

Dichotomous data were compared using risk ratios and 95% confidence intervals. Statistical heterogeneity between trials were tested using the I^2 statistic and the method described by Higgins 2002.

The types of participants included in the review were changed from the protocol to encompass all women with a term, cephalic, singleton gestation and not only those identified as being at increased risk of shoulder dystocia. Accordingly, the title of the review was changed from 'Intrapartum interventions for preventing shoulder dystocia in women at increased risk' to 'Intrapartum interventions for preventing shoulder dystocia'. The reason for this is that although several studies have identified factors associated with an increased incidence of shoulder dystocia (most commonly fetal macrosomia), most cases occur unexpectedly in women with no known risk factors and in non-macrosomic infants (Al-Najashi 1989; Geary 1995; McFarland 1995). Due to the unpredictability of impending shoulder dystocia, it was felt appropriate to extend the criteria to include all women with term, cephalic, singleton gestations.

A subgroup analysis was planned to examine the effect of intrapartum interventions for preventing shoulder dystocia in women identified as 'at risk' by trial authors for reasons including:

- suspected fetal macrosomia;
- maternal gestational diabetes mellitus;
- maternal obesity;
- multiparity;
- previous births complicated by shoulder dystocia.

RESULTS

Description of studies

See: Characteristics of included studies.

We identified two trials comparing prophylactic manoeuvres and standard or routine care which met our inclusion criteria, both of which were conducted in the USA (Beall 2003; Poggi 2004). Both used the McRobert's manoeuvre prophylactically; however, there were differences in other treatment and outcome measures.

Participants

Beall 2003 recruited women admitted for delivery at Harbor-UCLA Medical Center in Torrance, California with estimated fetal weights by ultrasound or clinical examination of greater than 3800 g and no contraindication to vaginal birth. A total of 185 women were enrolled and 90 were randomised to the treatment group and 95 to the control group. Forty-two women gave birth by caesarean, and of the women birthing vaginally, the head-to-body time was not reported in 15, leaving 128 evaluable cases (55 women in the treatment group and 73 women in the control group).

Poggi 2004 recruited women with a history of a vaginal birth of at least one term infant and arriving in labour or for the induction of labour with a term, cephalic, singleton gestation at Georgetown University Hospital. Of the forty women enrolled, 21 were assigned to the treatment group and 19 were assigned to the control group. Three women requiring caesarean delivery were excluded in addition to 10 women who gave birth with the use of the force-sensing glove, but data were not obtained because of technical or recording errors. This left 27 women (14 in the treatment group and 13 in the control group) available for analysis.

Interventions

Beall 2003 investigated the prophylactic use of the McRobert's manoeuvre with the addition of suprapubic pressure commencing at crowning of the fetal head versus therapeutic administration manoeuvres (including McRobert's manoeuvre, suprapubic pressure, delivery of posterior arm) if shoulder dystocia was evident after delivery of the fetal head. Poggi 2004 assessed the prophylactic use of the McRobert's manoeuvre for birth versus lithotomy positioning.

Outcomes

In Beall 2003, shoulder dystocia was defined as use of a manoeuvre or a head-to-body delivery time greater than 60 seconds and in Poggi 2004 it was defined as requiring manoeuvres other than moderate traction to deliver the shoulders. Other outcome measures used in the included studies are listed in the 'Characteristics of included studies' table.

For further details of the included studies, *see* the 'Characteristics of included studies' table.

Risk of bias in included studies

In Beall 2003, treatment was assigned by drawing the next in a series of sealed, opaque envelopes that included a treatment assignment, giving an allocation concealment code of A (adequate). In Poggi 2004, treatment allocation was assigned by drawing of a small, folded piece of paper with the word 'McRobert's' or 'lithotomy' from an opaque container giving an allocation concealment code of B (unclear).

Due to the nature of the intervention, blinding of caregivers and outcome assessors was not possible. This may have resulted in both performance and detection bias. In Beall 2003, 57 women were excluded after randomisation, 42 of whom gave birth by

caesarean. Of these 42 women, 31 were initially randomised to the prophylactic manoeuvre group and 11 were randomised to the control group, leaving a significant discrepancy in the sample size included in each group. In Poggi 2004, three women were excluded due to caesarean birth (groups not specified) and a further 10 women were excluded from analysis because of technical errors with the force sensing glove.

Effects of interventions

Two studies were included, one comparing the McRobert's manoeuvre and suprapubic pressure with no prophylactic manoeuvres in 185 women (Beall 2003) and one comparing the McRobert's manoeuvre with lithotomy positioning in 40 women (Poggi 2004).

Incidence of shoulder dystocia (graph 1.01 and 2.01)

In Beall 2003, 15 cases of shoulder dystocia were reported in the therapeutic group (n = 73) compared to five in the prophylactic group (n = 55) equating to 21 and 9% respectively (risk ratio (RR) 0.44, 95% confidence interval (CI) 0.17 to 1.14). When women giving birth by caesarean were included (86 women in the prophylactic group and 84 women in the therapeutic group), this result became statistically significant in favour of the prophylactic group (RR 0.33, 95% CI 0.12 to 0.86). In Poggi 2004, one episode of shoulder dystocia was reported in both the prophylactic (n = 14) and lithotomy groups (n = 13).

Head-to-body delivery time in seconds (graph 1.02 and 2.02)

In Beall 2003, the use of prophylactic manoeuvres was shown to decrease the head-to-body delivery time by approximately three seconds (mean difference (MD) -3.00, 95% CI -9.61 to 3.61), although this result is not statistically significant. In Poggi 2004, head-to-body delivery time was nearly four seconds longer in the prophylactic group (MD 3.70, 95% CI 1.72 to 5.68). Although this is statistically significant, it is possible that the variance measures are standard errors not standard deviations, in which case the statistical significance would disappear. This outcome was not specified in the review protocol.

Newborn birth injuries (graph 1.03 and 2.03)

The only birth injury reported was a brachial plexus injury which occurred in the control group in Beall 2003 (RR 0.44, 95% CI 0.02 to 10.61).

Apgar score less than seven at five minutes (graph 1.04 and 2.04)

One Apgar score less than seven at five minutes was recorded in the control group in Beall 2003 (RR 0.44, 95% CI 0.02 to 10.61).

Instrumental vaginal birth (graph 1.05 and 2.05)

Beall 2003 reported three out of 73 vaginal births in the therapeutic group required instrumental assistance (RR 0.19, 95% CI 0.01 to 3.58). Poggi 2004 reported two out of 14 births required instrumental assistance in the prophylactic group (RR 4.67, 95% CI 0.24 to 88.96).

Caesarean birth (graph 01.06)

In Beall 2003, there was a significantly greater rate of caesarean birth amongst women assigned to prophylactic manoeuvres compared with the control group (RR 2.97, 95% CI 1.59 to 5.55). The number of caesarean births indicated for failure to progress was statistically significantly increased amongst women randomised to the prophylactic manoeuvre group (RR 2.56, 95% CI 1.12 to 5.89), as was the rate of caesarean birth for all other indications (RR 3.69, 95% CI 1.26 to 10.80).

Force of traction required for delivery (peak force in pounds) (graph 2.06)

In Poggi 2004, the peak force of traction required for delivery was similar between the groups (MD 0.80 peak force lb, 95% CI 95% -2.16 to 3.76). This outcome was not specified in the review protocol.

Manoeuvres performed (graph 1.07)

In Beall 2003, 43 out of 55 women in the prophylactic group had prophylactic manoeuvres performed compared with one out of 73 in the therapeutic group (RR 57.07, 95% CI 8.11 to 401.75). Twelve women in the prophylactic group did not need a prophylactic manoeuvre after the baby's head was delivered. This outcome was not specified in the review protocol.

Thirteen out of 73 women in the therapeutic group had therapeutic manoeuvres performed after delivery of the fetal head compared with three out of 55 in the prophylactic group. This difference was not statistically significant (RR 0.31, 95% CI 0.09 to 1.02).

Admission to special care nursery (graph 1.08)

In Beall 2003, 15 out of 55 neonates in the control group required admission to a special care nursery compared to nine out of 73 in the treatment group. This difference was not statistically significant (RR 0.80, 95% CI 0.38 to 1.68).

Subgroup analysis

The planned subgroup analysis of the effects of prophylactic manoeuvres in women identified as at risk of shoulder dystocia is not shown separately as it equates to the results of Beall 2003 (women with estimated high fetal weight).

DISCUSSION

Only two studies were able to be included in this review. Beall 2003 investigated the prophylactic use of the McRobert's manoeuvre with the addition of suprapubic pressure versus therapeutic manoeuvres while Poggi 2004 compared the prophylactic use of the McRobert's manoeuvre versus lithotomy positioning. The results are presented separately since Beall 2003 recruited women with suspected fetal macrosomia and Poggi 2004 recruited women with a history of at least one vaginal birth.

In Beall 2003, there was a trend towards a reduction in the incidence of shoulder dystocia in the prophylactic group which gained statistical significance when women excluded from the trial for caesarean birth were included. This result is no doubt influenced by the larger number of caesareans (n = 31) in the prophylactic group than in the therapeutic group (n = 11). This trial included women identified as at risk of shoulder dystocia and therefore the presentation of women in a prophylactic position may have signalled to caregivers that these women were at risk. This awareness may have biased the management of these women and resulted in an increased caesarean rate in this group. The rate of caesarean delivery for failure to progress was statistically significantly increased amongst women randomised to the prophylactic manoeuvre group, as was the rate of caesarean delivery for all other indications. The fact that caesarean deliveries for all indications were increased amongst women randomised to the treatment group increases the likelihood that the results reflect bias introduced by an inability to blind delivering practitioners. It is difficult to see how a prophylactic McRobert's manoeuvre could cause physical changes that would require a caesarean section to be done.

The results of this review are limited by several methodological issues in addition to those arising from the exclusion of large numbers of randomised women from the analyses reported and the inability to pool the results of the two included trials. Both studies failed to address important maternal outcomes such as maternal injury, psychological outcomes and satisfaction with birth. Due to the nature of the intervention being assessed, blinding of caregivers and outcome assessors was not possible which may have been a source of bias. In light of the low incidence of shoulder dystocia and the rarity of complications associated with the implementation of the manoeuvres investigated, the sample size included was insufficient to adequately assess the risk and benefits of the intervention.

AUTHORS' CONCLUSIONS

Implications for practice

Neither study produced clear findings to either support or refute the use of prophylactic manoeuvres to prevent shoulder dystocia. In addition, both studies failed to address important maternal outcomes such as maternal injury, psychological outcomes and satisfaction with birth. It is not clear if the increased rate of caesarean births in the prophylactic group in Beall 2003 is an artefact of the trial's design or whether such prophylactic manoeuvres influence the decision to carry out a caesarean section.

Implications for research

Shoulder dystocia is associated with a high risk of physical and psychological complications for the mother and neonate. Therefore, the discovery of prophylactic measures to prevent its occurrence would be valuable. Further trials comparing prophylactic manoeuvres (for example, the McRobert's manoeuvre, the all-fours position and suprapubic pressure) administered prior to the delivery of the fetal head are required.

Future research should address maternal outcomes such as injury, psychological outcomes and satisfaction with birth. Attempts to determine the optimal timing for prophylactic manoeuvres to be implemented (that is, during the first stage or beginning or early in the second stage of labour) should also be made.

In light of the low incidence of shoulder dystocia, trials with larger sample sizes are indicated to properly assess the risks and benefits associated with the use of prophylactic manoeuvres for the prevention of shoulder dystocia. Studies should include all women regardless of their perceived risk until a good predictive tool for shoulder dystocia is established. This could also potentially reduce performance and detection bias introduced by an inability to blind caregivers and outcome assessors due to the nature of the intervention.

ACKNOWLEDGEMENTS

As part of the pre-publication editorial process, this review has been commented on by two peers (an editor, and a referee who is external to the editorial team), one or more members of the Pregnancy and Childbirth Group's international panel of consumers and the Group's Statistical Adviser.

REFERENCES

References to studies included in this review

Beall 2003 ***{published data only}***

Beall M, Spong C, Ito K, Ross M. Does prophylactic use of mcroberts maneuver and supra pubic pressure hasten shoulder delivery in the macrosomic fetus [abstract]. *American Journal of Obstetrics and Gynecology* 2002;**187**(6 Pt 2):S169.

* Beall MH, Spong CY, Ross MG. A randomized controlled trial of prophylactic maneuvers to reduce head-to-body delivery time in patients at risk for shoulder dystocia. *Obstetrics & Gynecology* 2003; **102**(1):31–5.

Poggi 2004 ***{published data only}***

Poggi S, Spong C, Patel C, Ghidini A, Pezzullo J. Randomized trial of prophylactic mcroberts versus lithotomy to decrease force applied to fetus during delivery [abstract]. *American Journal of Obstetrics and Gynecology* 2003;**189**(6):S191.

* Poggi SH, Allen RH, Patel CR, Ghidini A, Pezzullo JC, Spong CY. Randomized trial of McRoberts versus lithotomy positioning to decrease the force that is applied to the fetus during delivery. *American Journal of Obstetrics and Gynecology* 2004;**191**:874–8.

Additional references

ACOG 2000

American College of Obstetricians and Gynecologists. Fetal macrosomia. *Practice Bulletin No. 22*. American College of Obstetricians and Gynecologists, November 2000.

Al-Najashi 1989

Al-Najashi S, Al Suleiman SA, El-Yahia A. Shoulder dystocia - a study of 56 cases. *Australian and New Zealand Journal of Obstetrics and Gynaecology* 1989;**29**(2):129–31.

Alderson 2004

Alderson P, Green S, Higgins JPT, editors. Cochrane Reviewers' Handbook 4.2.2 [updated March 2004]. In: The Cochrane Library, Issue 1, 2004. Chichester, UK: John Wiley & Sons, Ltd.

Baskett 1995

Baskett TF, Allen AC. Perinatal implications of shoulder dystocia. *Obstetrics & Gynecology* 1995;**86**:15.

Baxley 2004

Baxley EG, Gobbo RW. Shoulder dystocia. *American Family Physician* 2004;**69**(7):1707–4.

Boulvain 2001

Boulvain M, Stan C, Irion O. Elective delivery in diabetic pregnant women. *Cochrane Database of Systematic Reviews* 2001, Issue 2. [DOI: 10.1002/14651858.CD001997]

Cedergren 2004

Cedergren MI. Maternal morbid obesity and the risk of adverse pregnancy outcome. *Obstetrics & Gynecology* 2004;**103**(2):219–24.

Coates 2004

Coates T. Shoulder dystocia. *Maye's midwifery: a textbook for midwives*. Bailliere Tindall, 2004.

Coustan 1996

Coustan DR. Gestational diabetes. *Contemporary OB/GYN* 1996;**7**: 18–24.

Crowther 2005

Crowther CA, Hiller JE, Moss JR, McPhee AJ, Jeffries WS, Robinson JS. Effect of treatment of gestational diabetes mellitus on pregnancy outcomes. *New England Journal of Medicine* 2005;**352**: 2477–86.

Delpapa 1991

Delpapa EH, Mueller-Heubach E. Pregnancy outcome following ultrasound diagnosis of macrosomia. *Obstetrics & Gynecology* 1991; **78**:340–3.

Deter 1985

Deter R, Hadlock F. Use of ultrasound in the detection of macrosomia: a review. *Journal of Clinical Ultrasound* 1985;**15**: 519–24.

Geary 1995

Geary M, McParland P, Johnson H, Stronge J. Shoulder dystocia - is it predictable?. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 1995;**62**:15–8.

Gherman 2000

Gherman RB, Tramont J, Muffley P, Goodwin M. Analysis of McRoberts maneuver by x-ray pelvimetry. *Obstetrics & Gynecology* 2000;**95**(1):43–7.

Ginsberg 2001

Ginsberg NA, Moisidis C. How to predict recurrent shoulder dystocia. *American Journal of Obstetrics and Gynecology* 2001;**184**: 1427–30.

Gonen 1996

Gonen R, Spiegel D, Abend M. Is macrosomia predictable and are shoulder dystocia and birth trauma preventable?. *Obstetrics & Gynecology* 1996;**88**(4):526–9.

Gonen 1997

Gonen O, Roses DJD, Dolfin Z, Tepper R, Markov S, Fejgin MD. Induction of labor versus expectant management in macrosomia: a randomized study. *Obstetrics & Gynecology* 1997;**89**:913–7.

Hankins 1998

Hankins GD. Lower thoracic spinal cord injury - a severe complication of shoulder dystocia. *American Journal of Perinatology* 1998;**15**:443–4.

Heath 1999

Heath LT, Gherman RB. Symphyseal separation, sacroiliac joint dislocation and transient lateral femoral cutaneous neuropathy associated with McRoberts maneuver. *Journal of Reproductive Medicine* 1999;**44**:902–4.

Higgins 2002

Higgins JPT, Thompson SG. Quantifiying heterogeneity in a meta-analysis. *Statistics in Medicine* 2002;**21**:1539–58.

Irion 1998

Irion O, Boulvain M. Induction of labour for suspected fetal macrosomia. *Cochrane Database of Systematic Reviews* 1998, Issue 2. [DOI: 10.1002/14651858.CD000938]

Keller 1991

Keller JD, Lopez-Zeno JA, Dooley SL, Socol ML. Shoulder dystocia and birth trauma in gestational diabetes: a five year experience. *American Journal of Obstetrics and Gynecology* 1991;**165**:928.

Kjos 1993
Kjos SL, Henry OA, Montoro M, Buchanan TA, Mestman JH. Insulin-requiring diabetes in pregnancy: a randomized trial of active induction of labor and expectant management. *American Journal of Obstetrics and Gynecology* 1993;**169**:611–5.

Levine 1992
Levine AB, Lockwood CJ, Brown B, Lapinski R, Berkowitz RL. Sonographic diagnosis of the large for gestational age fetus: does it make a difference?. *Obstetrics & Gynecology* 1992;**79**:55–8.

McFarland 1995
McFarland M, Hod M, Piper JM. Are labour abnormalities more common in shoulder dystocia?. *American Journal of Obstetrics and Gynecology* 1995;**173**(4):1211–4.

McFarland 1998
McFarland MB, Trylovich CG, Langer O. Anthropometric differences in macrosomic infants of diabetic and non-diabetic mothers. *Journal of Maternal-Fetal Medicine* 1998;**7**:292–5.

Miller 1997
Miller A, Hanretty K. *Obstetrics illustrated*. Edinburgh: Churchill Livingstone, 1997.

O'Leary 1992
O'Leary JA. *Shoulder dystocia and birth injury*. New York: McGraw Hill, 1992.

Orskou 2003
Orskou J, Henriksen TB, Kesmodel U, Secher NJ. Maternal characteristics and lifestyle factors and the risk of delivering high birth weight infants. *Obstetrics & Gynecology* 2003;**102**(1):115–20.

RevMan 2003
The Nordic Cochrane Centre, The Cochrane Collaboration. Review Manager (RevMan). 4.2 for Windows. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2003.

Rouse 1999
Rouse DJ, Owen J. Prophylactic cesarean delivery for fetal macrosomia diagnosed by means of ultrasonography- a faustian bargain?. *American Journal of Obstetrics and Gynecology* 1999;**181**: 332.

Salim 2004
Salim R, Hasanein J, Nachum Z, Shalev E. Anthropometric parameters in infants of gestation diabetic women with strict glycemic control. *Obstetrics & Gynecology* 2004;**104**:1021–4.

Smith 1994
Smith RB, Lane C, Pearson JF. Shoulder dystocia: what happens at the next delivery?. *British Journal of Obstetrics and Gynaecology* 1994;**101**:713.

Tey 1995
Tey A, Eriksen NL, Blanco JD. A prospective randomized trial of induction versus expectant management in nondiabetic pregnancies with fetal macrosomia. *American Journal of Obstetrics and Gynecology* 1995;**172**:293.

* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Beall 2003

Methods	Treatment assigned by drawing next in series of sealed, opaque envelopes and determined by a random number table. A total of 185 women were enrolled in the study. 90 women were randomised into the intervention group and 90 were randomised into the control group. 42 women delivered by caesarean, and of the women delivering vaginally, the head-to-body time was not reported in 15 leaving 128 evaluable cases, 55 in the intervention group and 73 in the control group.
Participants	Inclusion: women with estimated fetal weights by ultrasound or clinical examination > 3800 g with no contraindication to vaginal delivery. Exclusion: women with indication for caesarean birth at admission, multiple gestations and non-cephalic presentation. 185 (randomised): 90 to McRobert's group and 95 to control group.
Interventions	Treatment group: prophylactic McRobert's manoeuvre and suprapubic pressure commencing at crowning of the fetal head (n = 90(55)). Control group: necessary maneuvers only administered following delivery of fetal head (including McRobert's manoeuvre, suprapubic pressure, delivery of posterior arm) (n = 95(73)).
Outcomes	Incidence of shoulder dystocia; head-to-body delivery time (seconds); newborn birth injuries; 5 min Apgar score < 7; instrumental vaginal delivery; prophylactic manoeuvres performed; therapeutic manoeuvres performed; admission to special care nursery.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Poggi 2004

Methods	Drawing of small folded piece of paper with the word 'McRobert's' or 'lithotomy' from an opaque container. 40 women were randomly assigned (19 to the control group and 21 to the intervention group). 3 women required caesarean delivery and 10 women that were delivered with the force-sensing glove were excluded due to technical or recording errors. Therefore 27 women (13 in the control group and 14 in the intervention group) were available for analysis.
Participants	Inclusion: multiparous women with term, cephalic singleton gestations, with a history of giving birth vaginally to at least 1 term infant.
Interventions	Treatment group: prophylactic McRobert's maneuver following delivery of the fetal head (n = 21(14)). Control group: lithotomy position (n = 19(13)).

Poggi 2004 (*Continued*)

Outcomes	Incidence of shoulder dystocia; head-to-body delivery time (seconds); newborn birth injuries; 5 min Apgar score < 7; instrumental vaginal delivery; perinatal death; peak force (lb) to deliver neonate and peak force (lb) to deliver anterior shoulder measured with use of a force-measuring system that consisted of a custom glove with force sensors.
Notes	It is possible that the standard deviations in head-to-body delivery time are really standard errors which would be more consistent with the non-significant result reported for this outcome in the paper.

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

min: minute

DATA AND ANALYSES

Comparison 1. Prophylactic McRoberts versus therapeutic manoeuvres

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Shoulder dystocia	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.1 Women with vaginal birth only	1	128	Risk Ratio (M-H, Fixed, 95% CI)	0.44 [0.17, 1.14]
1.2 Women with caesarean or vaginal birth	1	170	Risk Ratio (M-H, Fixed, 95% CI)	0.33 [0.12, 0.86]
2 Head-to-body delivery time (seconds)	1	128	Mean Difference (IV, Fixed, 95% CI)	-3.0 [-9.61, 3.61]
3 Newborn birth injuries	1	128	Risk Ratio (M-H, Fixed, 95% CI)	0.44 [0.02, 10.61]
4 Apgar score < 7 at 5 minutes	1	128	Risk Ratio (M-H, Fixed, 95% CI)	0.44 [0.02, 10.61]
5 Instrumental vaginal birth	1	128	Risk Ratio (M-H, Fixed, 95% CI)	0.19 [0.01, 3.58]
6 Caesarean birth	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
6.1 All women	1	185	Risk Ratio (M-H, Fixed, 95% CI)	2.97 [1.59, 5.55]
6.2 Failure to progress	1	185	Risk Ratio (M-H, Fixed, 95% CI)	2.56 [1.12, 5.89]
6.3 Indication other than failure to progress	1	185	Risk Ratio (M-H, Fixed, 95% CI)	3.69 [1.26, 10.80]
7 Manoeuvres performed	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
7.1 Prophylactic	1	128	Risk Ratio (M-H, Fixed, 95% CI)	57.07 [8.11, 401.75]
7.2 Therapeutic	1	128	Risk Ratio (M-H, Fixed, 95% CI)	0.31 [0.09, 1.02]
8 Admission to special care nursery	1	128	Risk Ratio (M-H, Fixed, 95% CI)	0.80 [0.38, 1.68]

Comparison 2. Prophylactic McRoberts versus lithotomy position

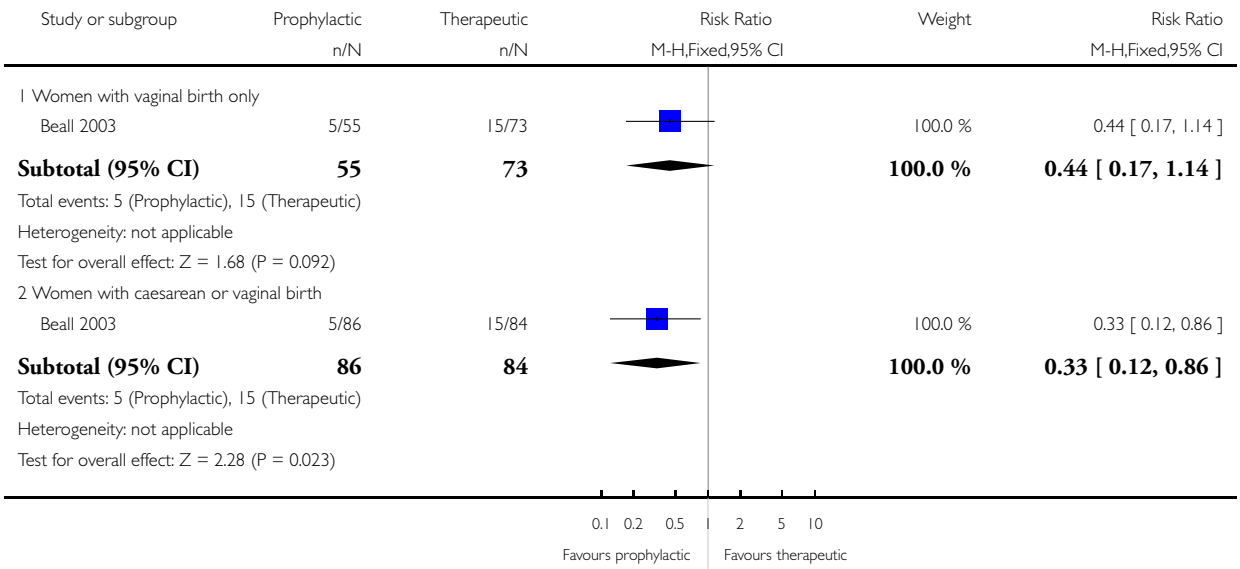
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Shoulder dystocia	1	27	Risk Ratio (M-H, Fixed, 95% CI)	0.93 [0.06, 13.37]
2 Head-to-body delivery time (seconds)	1	27	Mean Difference (IV, Fixed, 95% CI)	3.70 [1.72, 5.68]
3 Newborn birth injuries	1	27	Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
4 Apgar score < 7 at 5 minutes	1	27	Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
5 Instrumental vaginal birth	1	27	Risk Ratio (M-H, Fixed, 95% CI)	4.67 [0.24, 88.96]
6 Force of traction required for birth (peak force lb)	1	27	Mean Difference (IV, Fixed, 95% CI)	0.80 [-2.16, 3.76]

Analysis 1.1. Comparison 1 Prophylactic McRoberts versus therapeutic manoeuvres, Outcome 1 Shoulder dystocia.

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 1 Prophylactic McRoberts versus therapeutic manoeuvres

Outcome: 1 Shoulder dystocia

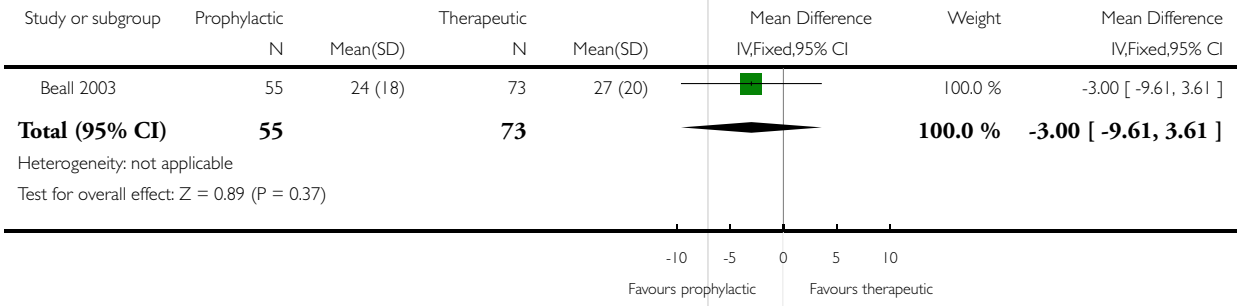


Analysis 1.2. Comparison 1 Prophylactic McRoberts versus therapeutic manoeuvres, Outcome 2 Head-to-body delivery time (seconds).

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 1 Prophylactic McRoberts versus therapeutic manoeuvres

Outcome: 2 Head-to-body delivery time (seconds)



Analysis 1.3. Comparison 1 Prophylactic McRoberts versus therapeutic manoeuvres, Outcome 3 Newborn birth injuries.

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 1 Prophylactic McRoberts versus therapeutic manoeuvres

Outcome: 3 Newborn birth injuries

Study or subgroup	Prophylactic n/N	Therapeutic n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Beall 2003	0/55	1/73		100.0 %	0.44 [0.02, 10.61]
Total (95% CI)	**55**	**73**		**100.0 %**	**0.44 [0.02, 10.61]**
Total events: 0 (Prophylactic), 1 (Therapeutic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.51 (P = 0.61)					

Analysis 1.4. Comparison 1 Prophylactic McRoberts versus therapeutic manoeuvres, Outcome 4 Apgar score < 7 at 5 minutes.

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 1 Prophylactic McRoberts versus therapeutic manoeuvres

Outcome: 4 Apgar score < 7 at 5 minutes

Study or subgroup	Prophylactic n/N	Therapeutic n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Beall 2003	0/55	1/73		100.0 %	0.44 [0.02, 10.61]
Total (95% CI)	**55**	**73**		**100.0 %**	**0.44 [0.02, 10.61]**
Total events: 0 (Prophylactic), 1 (Therapeutic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.51 (P = 0.61)					

Analysis 1.5. Comparison 1 Prophylactic McRoberts versus therapeutic manoeuvres, Outcome 5 Instrumental vaginal birth.

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 1 Prophylactic McRoberts versus therapeutic manoeuvres

Outcome: 5 Instrumental vaginal birth

Study or subgroup	Prophylactic n/N	Therapeutic n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Beall 2003	0/55	3/73		100.0 %	0.19 [0.01, 3.58]
Total (95% CI)	**55**	**73**		**100.0 %**	**0.19 [0.01, 3.58]**
Total events: 0 (Prophylactic), 3 (Therapeutic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.11 (P = 0.27)					

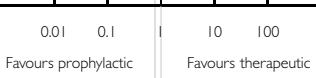
Analysis 1.6. Comparison 1 Prophylactic McRoberts versus therapeutic manoeuvres, Outcome 6 Caesarean birth.

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 1 Prophylactic McRoberts versus therapeutic manoeuvres

Outcome: 6 Caesarean birth

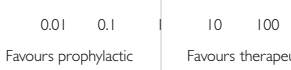
Study or subgroup	Prophylactic n/N	Therapeutic n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 All women					
Beall 2003	31/90	11/95		100.0 %	2.97 [1.59, 5.55]
Subtotal (95% CI)	**90**	**95**		**100.0 %**	**2.97 [1.59, 5.55]**
Total events: 31 (Prophylactic), 11 (Therapeutic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 3.42 (P = 0.00062)					
2 Failure to progress					
Beall 2003	17/90	7/95		100.0 %	2.56 [1.12, 5.89]
Subtotal (95% CI)	**90**	**95**		**100.0 %**	**2.56 [1.12, 5.89]**
Total events: 17 (Prophylactic), 7 (Therapeutic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 2.22 (P = 0.027)					



(*Continued* . . .)

(. . . *Continued*)

Study or subgroup	Prophylactic n/N	Therapeutic n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
3 Indication other than failure to progress					
Beall 2003	14/90	4/95		100.0 %	3.69 [1.26, 10.80]
Subtotal (95% CI)	**90**	**95**		**100.0 %**	**3.69 [1.26, 10.80]**
Total events: 14 (Prophylactic), 4 (Therapeutic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 2.39 (P = 0.017)					



Analysis 1.7. Comparison 1 Prophylactic McRoberts versus therapeutic manoeuvres, Outcome 7 Manoeuvres performed.

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 1 Prophylactic McRoberts versus therapeutic manoeuvres

Outcome: 7 Manoeuvres performed

Study or subgroup	Prophylactic n/N	Therapeutic n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 Prophylactic					
Beall 2003	43/55	1/73		100.0 %	57.07 [8.11, 401.75]
Subtotal (95% CI)	**55**	**73**		**100.0 %**	**57.07 [8.11, 401.75]**
Total events: 43 (Prophylactic), 1 (Therapeutic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 4.06 (P = 0.000049)					
2 Therapeutic					
Beall 2003	3/55	13/73		100.0 %	0.31 [0.09, 1.02]
Subtotal (95% CI)	**55**	**73**		**100.0 %**	**0.31 [0.09, 1.02]**
Total events: 3 (Prophylactic), 13 (Therapeutic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.92 (P = 0.054)					

Analysis 1.8. Comparison 1 Prophylactic McRoberts versus therapeutic manoeuvres, Outcome 8 Admission to special care nursery.

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 1 Prophylactic McRoberts versus therapeutic manoeuvres

Outcome: 8 Admission to special care nursery

Study or subgroup	Prophylactic n/N	Therapeutic n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Beall 2003	9/55	15/73		100.0 %	0.80 [0.38, 1.68]
Total (95% CI)	**55**	**73**		**100.0 %**	**0.80 [0.38, 1.68]**
Total events: 9 (Prophylactic), 15 (Therapeutic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.60 (P = 0.55)					

Analysis 2.1. Comparison 2 Prophylactic McRoberts versus lithotomy position, Outcome 1 Shoulder dystocia.

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 2 Prophylactic McRoberts versus lithotomy position

Outcome: 1 Shoulder dystocia

Study or subgroup	Prophylactic n/N	Lithotomy n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Poggi 2004	1/14	1/13		100.0 %	0.93 [0.06, 13.37]
Total (95% CI)	**14**	**13**		**100.0 %**	**0.93 [0.06, 13.37]**
Total events: 1 (Prophylactic), 1 (Lithotomy)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.05 (P = 0.96)					

Analysis 2.2. Comparison 2 Prophylactic McRoberts versus lithotomy position, Outcome 2 Head-to-body delivery time (seconds).

Review: Intrapartum interventions for preventing shoulder dystocia

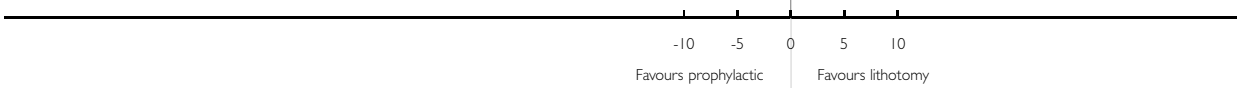
Comparison: 2 Prophylactic McRoberts versus lithotomy position

Outcome: 2 Head-to-body delivery time (seconds)

Study or subgroup	Prophylactic N	Mean(SD)	Lithotomy N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Poggi 2004	14	17 (3.1)	13	13.3 (2.1)		100.0 %	3.70 [1.72, 5.68]
Total (95% CI)	**14**		**13**			**100.0 %**	**3.70 [1.72, 5.68]**

Heterogeneity: not applicable

Test for overall effect: Z = 3.65 (P = 0.00026)



Analysis 2.3. Comparison 2 Prophylactic McRoberts versus lithotomy position, Outcome 3 Newborn birth injuries.

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 2 Prophylactic McRoberts versus lithotomy position

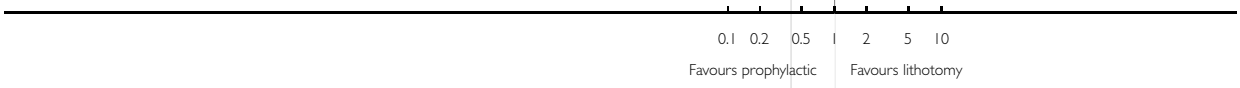
Outcome: 3 Newborn birth injuries

Study or subgroup	Prophylactic n/N	Lithotomy n/N	Risk Ratio M-H,Fixed,95% CI	Risk Ratio M-H,Fixed,95% CI
Poggi 2004	0/14	0/13		0.0 [0.0, 0.0]
Total (95% CI)	**14**	**13**		**0.0 [0.0, 0.0]**

Total events: 0 (Prophylactic), 0 (Lithotomy)

Heterogeneity: not applicable

Test for overall effect: Z = 0.0 (P < 0.00001)



Analysis 2.4. Comparison 2 Prophylactic McRoberts versus lithotomy position, Outcome 4 Apgar score < 7 at 5 minutes.

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 2 Prophylactic McRoberts versus lithotomy position

Outcome: 4 Apgar score < 7 at 5 minutes

Study or subgroup	Prophylactic n/N	Lithotomy n/N	Risk Ratio M-H,Fixed,95% CI	Risk Ratio M-H,Fixed,95% CI
Poggi 2004	0/14	0/13		0.0 [0.0, 0.0]
Total (95% CI)	**14**	**13**		**0.0 [0.0, 0.0]**
Total events: 0 (Prophylactic), 0 (Lithotomy)				
Heterogeneity: not applicable				
Test for overall effect: Z = 0.0 (P < 0.00001)				

Analysis 2.5. Comparison 2 Prophylactic McRoberts versus lithotomy position, Outcome 5 Instrumental vaginal birth.

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 2 Prophylactic McRoberts versus lithotomy position

Outcome: 5 Instrumental vaginal birth

Study or subgroup	Prophylactic n/N	Therapeutic n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Poggi 2004	2/14	0/13		100.0 %	4.67 [0.24, 88.96]
Total (95% CI)	**14**	**13**		**100.0 %**	**4.67 [0.24, 88.96]**
Total events: 2 (Prophylactic), 0 (Therapeutic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.02 (P = 0.31)					

Analysis 2.6. Comparison 2 Prophylactic McRoberts versus lithotomy position, Outcome 6 Force of traction required for birth (peak force lb).

Review: Intrapartum interventions for preventing shoulder dystocia

Comparison: 2 Prophylactic McRoberts versus lithotomy position

Outcome: 6 Force of traction required for birth (peak force lb)

Study or subgroup	Prophylactic N	Mean(SD)	Lithotomy N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Poggi 2004	14	8 (3.64)	13	7.2 (4.16)		100.0 %	0.80 [-2.16, 3.76]
Total (95% CI)	**14**		**13**			**100.0 %**	**0.80 [-2.16, 3.76]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.53 (P = 0.60)

WHAT'S NEW

Last assessed as up-to-date: 30 May 2009.

31 May 2009	New search has been performed	Search updated. No new trials identified.

HISTORY

Protocol first published: Issue 4, 2005

Review first published: Issue 4, 2006

11 September 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

Chaturica Athukorala developed and wrote the protocol. Philippa Middleton and Caroline Crowther commented on and revised the various drafts of the protocol during its development.

Chaturica Athukorala and Philippa Middleton assessed the appropriateness and methodological quality of all studies identified by the search strategy and independently extracted and entered the data.

Chaturica Athukorala wrote the discussion and conclusion of the review. Philippa Middleton and Caroline Crowther commented on and revised the various drafts of the text of the review during its development.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- Discipline of Obstetrics and Gynaecology, The University of Adelaide, Australia.

External sources

- Australian Department of Health and Ageing, Australia.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The title of this review has been changed from 'Intrapartum interventions for preventing shoulder dystocia in women at increased risk'. *See* Methods section for details of the reasons for this change.

INDEX TERMS

Medical Subject Headings (MeSH)

Delivery, Obstetric [*methods]; Dystocia [*prevention & control]; Shoulder

MeSH check words

Female; Humans; Pregnancy