

# Shoulder dystocia: An update and review of new techniques



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The definition of shoulder dystocia and the incidence vary. Worldwide, shoulder dystocia may be increasing. In this update we look at the complications for both mother and fetus, and review the risk factors and strategies for possible prevention. Management options include the McRoberts position, techniques to deliver the anterior and posterior shoulder, and finally salvage manoeuvres, which include posterior axillary sling traction (PAST), the Zavanelli manoeuvre and fracture of the clavicles. In cases of fetal death associated with undelivered shoulder dystocia, one can consider the trans-abdominal performance or facilitation of traditional vaginal manoeuvres.

We suggest a simplified mnemonic, 'MAPS' – M: McRoberts, A: anterior shoulder, P: posterior shoulder, and S: salvage. A video teaching programme will be available shortly on the World Health Organization Reproductive Health Library ([www.who.int/rhl](http://www.who.int/rhl); [rhl@who.int](mailto:rhl@who.int)).

One of the most dangerous predicaments confronting midwives, doctors and obstetricians is shoulder dystocia. Survival of the baby depends on staff being trained in the rapid performance of a range of clinical manoeuvres.

## Definition

The American Society of Obstetricians and Gynecologists defines shoulder dystocia as a 'delivery that requires additional obstetric maneuvers following failure of gentle downward traction on the fetal head to effect delivery of the shoulders'.<sup>1</sup> The Royal College of Obstetricians and Gynaecologists defines shoulder dystocia as 'a delivery that requires additional obstetric manoeuvres to release the shoulders after gentle downward traction has failed'.<sup>2</sup> Some clinicians use their own judgement to diagnose shoulder dystocia, and some divide shoulder dystocia into mild or severe depending on the number of manoeuvres needed to deliver the baby.<sup>3</sup> Others use a head-to-delivery time with a cut-off of more than 60 seconds as a possible way of diagnosing shoulder dystocia and/or the necessity for ancillary obstetric manoeuvres.<sup>4</sup>

## Incidence

In the literature, the reported incidence varies from 0.2% to 3%.<sup>5</sup> This large range may be due to the fact

that there is no set definition for shoulder dystocia. The true incidence may actually be higher because it is not reported by doctors or midwives due to fear of litigation. Worldwide, shoulder dystocia may be increasing<sup>6</sup> because women are having children at a later age and the rate of obesity is increasing.

## Complications

Shoulder dystocia is associated with serious complications for both mother and baby.

Risks to the baby include contusions, lacerations, fractures of the humerus and clavicles, damage to the brachial plexus leading to nerve palsies, and hypoxia leading to cerebral palsy and even death. Cerebral palsy is associated with a prolonged head-to-shoulder delivery time.<sup>7</sup> About 20% of babies delivered with shoulder dystocia will suffer some sort of injury. The severity of the injury depends on the time it takes to resolve the shoulder dystocia and the number of manoeuvres used.

The mother who delivers a baby with shoulder dystocia has an increased chance of sustaining perineal trauma, tears to the cervix, third- and fourth-degree perineal tears or episiotomies that extend. She may experience significant blood loss caused from bleeding from tears or uterine atony and may need a transfusion. There is also a

risk of developing postpartum infections. Other reported complications include postpartum bladder atony, lateral femoral nerve palsies, injury to the symphysis pubis and rarely uterine rupture.

## Risk factors

### Macrosomia

The term macrosomia describes a large baby, based on post-delivery weight. It cannot be diagnosed with certainty before delivery. Definitions use various cut-offs ranging from 4 000 g to 5 000 g. A large baby has an increased chance of developing shoulder dystocia, but trying to determine which babies are large is very difficult as estimations using the Leopold manoeuvres are inaccurate in assessing fetal weight, and ultrasound is no better.<sup>8</sup> The American College of Obstetricians and Gynecologists bulletin on shoulder dystocia states that ultrasound has a sensitivity of only 22 - 44% and a positive predictive value of only 30 - 44% in predicting macrosomia.<sup>1</sup> Most babies with a birth weight above 4 000 g that are delivered vaginally do not develop shoulder dystocia.

### Diabetes

Babies born to diabetic mothers have an increased chance of developing shoulder dystocia, but macrosomia is as difficult to predict in diabetic mothers as it is in the non-diabetic population.

### Assisted delivery

Several studies have shown that assisted deliveries have a higher rate of shoulder dystocia<sup>9,10</sup> and a higher incidence of brachial plexus injury associated with shoulder dystocia.<sup>11</sup>

### Previous shoulder dystocia

The recurrent risk of shoulder dystocia is quoted as between 1.1% and 16.7% based on retrospective analyses. The Australian Carbohydrate Intolerance Study in Pregnant Women (ACHOIS trial) found no association between a previous birth complicated by shoulder dystocia and the risk of subsequent shoulder dystocia.<sup>3</sup> The American College of Obstetricians and Gynecologists states that 'because most subsequent deliveries will not be complicated by shoulder dystocia, the benefit of universal elective cesarean delivery is questionable in patients who have a history of shoulder dystocia'.<sup>1</sup>

### Maternal weight, weight gain, age and multiparity

An older mother is more likely to have an increased body mass index and is more likely to be multiparous. Whether these factors are independent risk factors or are risk factors due to the fact that they are in themselves risk factors for macrosomia is debatable. Bahar found no difference in the incidence of shoulder dystocia based on maternal

age alone.<sup>12</sup> The data linking maternal weight gain and fetal birth weight are controversial.

### Ethnicity

African-American women have an increased risk of shoulder dystocia.<sup>13</sup> This may be because they tend to have an android-shaped pelvis.

### Fetal presentation

The occipitoposterior position has a protective effect for shoulder dystocia, but the risk of brachial plexus injury is increased in the setting of a persistent occipitoposterior delivery.<sup>13</sup>

### Fetal gender

Male babies are usually bigger than female babies, but there is no convincing evidence that the gender of the baby influences the incidence of shoulder dystocia.

### Post-date pregnancy

Fetal growth continues, although at a slower rate, in the last few weeks of pregnancy. This may be a risk factor, as a larger baby has a higher chance of developing shoulder dystocia.

### Anaesthesia and oxytocin

There is no reported relationship between the use of oxytocin or anaesthesia and shoulder dystocia.

### Labour abnormalities

There is a reported higher incidence of shoulder dystocia when the second stage of labour is prolonged, but this may also be related to macrosomia. Shoulder dystocia is also thought to be more common in precipitous labour.

### Episiotomy

The Royal College of Obstetricians and Gynaecologists states that episiotomy may not be necessary in all cases of shoulder dystocia.<sup>2</sup> Dandolu *et al.* showed that a decrease in the use of episiotomy did not result in an increase in the occurrence of shoulder dystocia.<sup>14</sup>

Gurewitsch *et al.* found that in severe shoulder dystocia, if fetal manipulation can be performed without episiotomy, severe perineal trauma can be averted without incurring an increased greater risk of brachial plexus palsy.<sup>15</sup>

### Experience

Acker *et al.* found that the number of Erb's palsies following shoulder dystocia deliveries did not vary with either the number of years a physician had been in practice or the number of deliveries that physician performed.<sup>16</sup>

### Multiple risk factors

The more risk factors present, the greater the chance of developing shoulder dystocia.

## Prevention

Risk factors for shoulder dystocia have extremely poor positive predictive values, and it is therefore very difficult for the obstetrician, doctor or midwife to accurately and reliably predict it. A Cochrane review on the effects of prophylactic manoeuvres in preventing shoulder dystocia found no clear findings to support or refute their use.<sup>17</sup> A screening tool called the CALM Shoulder Screen™ has been designed but is not commercially available yet.

## Management

There is very little evidence to guide practice when dealing with shoulder dystocia. Randomised trials of strategies to prevent shoulder dystocia have found no evidence of benefit from labour induction for a woman with diabetes<sup>18</sup> or for a suspected big baby,<sup>19</sup> and shoulder dystocia is too rare and too unpredictable for prophylactic caesarean section to be of benefit.<sup>20</sup>

The solution for shoulder dystocia is for all birth attendants to know how to manage the condition when it arises.<sup>20</sup>

The first step in managing this emergency is to diagnose shoulder dystocia and to call for help. Signs of possible shoulder dystocia include failure of the baby's shoulders to deliver with the standard amount of maternal effort and moderate traction of the head, or the 'turtle sign' which occurs when the baby's head is retracted back against the mother's perineum.

Steps to manage the crisis should be taken calmly and quickly. The mother should be informed of the situation and encouraged to help actively. An assistant should record the times and manoeuvres attempted.

Shoulder dystocia arises when the shoulders are too broad to pass through the pelvic outlet simultaneously, and fundal pressure alone or direct traction to the baby's head does not help to deliver the shoulders and body. Several manoeuvres to overcome shoulder dystocia have evolved through clinical experience.<sup>21</sup> One should move quickly through the manoeuvres if they are unsuccessful. The sequence in which they should be performed has never been systematically evaluated.<sup>20</sup>

The McRoberts position is usually attempted first as it does not involve direct manipulation of the baby.<sup>21,22</sup> The mother's thighs are flexed towards her chest to tilt her pelvis forwards, thereby producing a significant cephalad rotation of the symphysis pubis and subsequent flattening of the sacrum.<sup>23</sup> While encouraging the mother to bear down, pressure is applied above her pubic symphysis to push the baby's anterior shoulder away from the midline and into the pelvis.

For delivery of the anterior shoulder, gentle posterior traction is applied to the baby's head to help deliver the anterior shoulder while continuing suprapubic pressure. One must be aware of the risk of Erb's palsy during this procedure as the brachial nerve plexus may be over-stretched.

For the posterior shoulder, a hand is inserted in the posterior aspect of the vagina to reach the baby's posterior arm, and the arm is swept across the baby's chest and out. Menticoglou described another method for delivery of the posterior arm where traction is applied in the baby's posterior axilla to bring the shoulder down with the right and left index fingers.<sup>24</sup> The arm is then swept out as described above. Delivery of the anterior shoulder and body should follow easily.

Another option is to rotate the shoulders, with two fingers of one hand in front of the posterior shoulder and two fingers of the other hand behind the anterior shoulder. Slight rotation may provide space for delivery, otherwise continuous rotation for 180° so that the posterior shoulder emerges beneath the pubic symphysis may help. Rotating in the opposite direction may also be tried.

Recent reports have recommended that the first step taken to overcome shoulder dystocia should be attempts to deliver the posterior rather than the anterior shoulder.<sup>25,26</sup> Rolling the mother onto all fours<sup>27</sup> and repeating the above manoeuvres may also be effective, as this may alter the angle of the pelvis.

For severe shoulder dystocia that cannot be overcome by any of these methods, three salvage procedures have been described. These maneuvers are posterior axillary sling traction (PAST), the Zavanelli manoeuvre, and fracture of the clavicles.

For posterior axillary sling traction-a, 12 or 14-gauge plastic suction catheter is folded over the tip of the operator's index finger. It is then fed around the posterior axilla. The loop is retrieved with the other index finger and the catheter is pulled through. The ends are clamped or held and traction is applied to bring down the posterior shoulder. Once the posterior shoulder is low enough one hand is re-inserted to sweep down the posterior arm.<sup>28</sup> Advantages to this procedure include the speed with which the shoulder dystocia can be resolved, the small amount of space occupied by the sling, and avoidance of maternal or fetal trauma. The risks to the baby have not been fully established, as this technique has only been used in a limited number of deliveries.

The second salvage method is the Zavanelli manoeuvre. The uterus needs to be relaxed with a tocolytic, and the baby's head is then replaced in the vagina and a caesarean section performed.<sup>29</sup> Despite published reports of high success rates with limited fetal ill-effects, one should be aware of adverse consequences, including neck trauma, associated with use of the manoeuvre.<sup>30</sup> A modified Zavanelli manoeuvre has been described where the fetal head is partially reinserted in the vagina to dislodge the impacted shoulders and then the mother is encouraged to bear down to deliver the baby vaginally.<sup>31</sup>

The third salvage method is to fracture one or both of the baby's clavicles with direct finger pressure at the midpoint, thus reducing the breadth of the shoulders. There are very few reports of this technique actually being performed.

Symphysiotomy has also been suggested,<sup>32</sup> but its use in shoulder dystocia is debated as it only widens the transverse diameter of the pelvis and not the anteroposterior diameter.

In cases of fetal death associated with an undelivered shoulder dystocia, the trans-abdominal performance or facilitation of traditional vaginal manoeuvres can be considered.<sup>32,33</sup> The PAST technique may be valuable as it avoids maternal surgery or destructive procedures.

Whatever the sequence chosen, all birth attendants must be skilled in the whole range of manoeuvres to manage this rare emergency calmly and with confidence. It is important to discuss management with the parents after delivery and to review all cases of shoulder dystocia.<sup>21</sup> Drills for shoulder dystocia are important in training staff on how to manage this acute emergency.

Many complicated mnemonics have been described to manage shoulder dystocia. We suggest a simplified mnemonic, 'MAPS': M: Mc Roberts, A: anterior shoulder; P: posterior shoulder, and S: salvage.

A video teaching programme demonstrating the manoeuvres used to overcome shoulder dystocia will shortly be available on the World Health Organization Reproductive Health Library ([www.who.int/rhl](http://www.who.int/rhl); [rhl@who.int](mailto:rhl@who.int)).

1. American College of Obstetricians and Gynecologists: Shoulder dystocia. ACOG practice bulletin clinical management guidelines for obstetrician-gynecologists. Number 40, *Obstet Gynecol* 2002; 100(5 Pt 1): 1045-1050.
2. Royal College of Obstetricians and Gynaecologists RCOG. Shoulder dystocia. *Clinical Green Top Guideline* (December) No. 42. London: RCOG, 2005.
3. Gottlieb AG, Galan HL. Shoulder dystocia: an update. *Obstet Gynecol Clin North Am* 2007; 34(3): 501-531, xii.
4. Spong CY, Beall M, Rodrigues D, et al. An objective definition of shoulder dystocia: prolonged head-to-body delivery intervals and/or the use of ancillary obstetric maneuvers. *Obstet Gynecol* 1995; 86: 433-436.
5. Gherman RB. Shoulder dystocia: the unpreventable obstetric emergency with empiric management guidelines. *Am J Obstet Gynecol* 2006; 195: 657-672.
6. MacKenzie IZ, Shah M, Lean K, Dutton S, Newdick H, Tucker DE. Management of shoulder dystocia: trends in incidence and maternal and neonatal morbidity. *Obstet Gynecol* 2007; 110(5): 1059-1068.
7. Ouzounian JG, Korst LM, Ahn MO, et al. Shoulder dystocia and neonatal brain injury: Significance of the head-shoulder interval. *Am J Obstet Gynecol* 1998; 178: S76.
8. Hendrix NW, Grady CS, Chauhan SP. Clinical vs. sonographic estimate of birth weight in term parturients. A randomized clinical trial. *J Reprod Med* 2000; 45: 317-220.
9. Benedetti TJ, Gabbe SG. Shoulder dystocia: A complication of fetal macrosomia and prolonged second stage of labor with midpelvic delivery. *Obstet Gynecol* 1978; 52: 526-529.
10. Nesbitt TS, Gilbert WM, Herrchen B. Shoulder dystocia and associated risk factors with macrosomic infants born in California. *Am J Obstet Gynecol* 1998; 179: 476-480.
11. McFarland MB, Langer O, Piper JM, Berkus MD. Perinatal outcome and the type and number of maneuvers in shoulder dystocia. *Int J Gynaecol Obstet* 1996; 55(3): 219-224.
12. Bahar AM. Risk factors and fetal outcome in cases of shoulder dystocia compared with normal deliveries of a similar birthweight. *BJOG* 1996; 103: 868-872.
13. Cheng YW, Norwitz ER, Caughey AB. The relationship of fetal position and ethnicity with shoulder dystocia and birth injury. *Am J Obstet Gynecol* 2006; 195(3): 856-862.
14. Dandolu V, Jain NJ, Hernandez E, Kruse L. Shoulder dystocia at noninstrumental vaginal delivery. *Am J Perinatol* 2006; 23(7): 439-444.
15. Gurewitsch ED, Donithan M, Stallings SP, et al. Episiotomy versus fetal manipulation in managing severe shoulder dystocia: a comparison of outcomes. *Am J Obstet Gynecol* 2004; 191(3): 911-916.
16. Acker D, Gregory K, Sachs B, Friedman E. Risk factors for Erb-Duchenne palsy. *Obstet Gynecol* 1988; 71: 389-392.
17. Athukorala C, Middleton P, Crowther CA. Intrapartum interventions for preventing shoulder dystocia. *Cochrane Database Syst Rev* 2006; Oct 18 (4).
18. Boulvain M, Stan C, Irion O. Elective delivery in diabetic pregnant women. *Cochrane Database Syst Rev* 2004; 2: 2.
19. Irion O, Boulvain M. Induction of labour for suspected fetal macrosomia. *Cochrane Database Syst Rev* 2004; 2: 2.
20. Gherman RB. Shoulder dystocia: an evidence-based evaluation of the obstetric nightmare. *Clin Obstet Gynecol* 2002; 45: 345-362.
21. Baxley EG, Gobbo RW. Shoulder dystocia. *Am Fam Physician* 2004; 69: 1707-1714.
22. Kwek K, Yeo GSH. Shoulder dystocia and injuries: prevention and management. *Curr Opin Obstet Gynecol* 2006; 18: 123-128.
23. Gherman RB, Tramont J, Muffley P, Goodwin TM. Analysis of McRoberts' maneuver by x-ray pelvimetry. *Obstet Gynecol* 2000; 95(1): 43-47.
24. Menticoglou SM. A modified technique to deliver the posterior arm in severe shoulder dystocia. *Obstet Gynecol* 2006; 108: 755-757.
25. Poggi SH, Spong CY, Allen RH. Prioritizing posterior arm delivery during severe shoulder dystocia. *Obstet Gynecol* 2003; 101(5 Pt 2): 1068-1072.
26. Kung J, Swan AV, Arulkumar S. Delivery of the posterior arm reduces shoulder dimensions in shoulder dystocia. *Int J Gynaecol Obstet* 2006; 93(3): 233-237.
27. Coppus SF, Langenveld J, Oei SG. An underestimated technique for the management of shoulder dystocia: the all-fours manoeuvre. *Ned Tijdschr Geneesk* 2007; 151(27): 1493-1497.
28. Cluver CA, Hofmeyr GJ. Posterior axilla sling traction: A technique for intractable shoulder dystocia. *Obstet Gynecol* 2009; 113: 486-488.
29. Sandberg EC. The Zavanelli maneuver: 12 years of recorded experience. *Obstet Gynecol* 1999; 93: 312-317.
30. Ross MG, Beall MH. Cervical neck dislocation associated with the Zavanelli maneuver. *Obstet Gynecol* 2007; 109(2 Pt 1): 453-454.
31. Zelig CM, Gherman RB. Modified Zavanelli maneuver for the alleviation of shoulder dystocia. *Obstet Gynecol* 2002; 100(5 Pt 2): 1112-1114.
32. O'Leary JA, Cuva A. Abdominal rescue after failed cephalic replacement. *Obstet Gynecol* 1992; 80(3 Pt 2): 514-516.
33. O'Shaughnessy MJ. Hysterotomy facilitation of the vaginal delivery of the posterior arm in a case of severe shoulder dystocia. *Obstet Gynecol* 1998; 92(4 Pt 2): 693-695.