

## Review

# Shoulder dystocia: guidelines for clinical practice from the French College of Gynecologists and Obstetricians (CNGOF)



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## ABSTRACT

Shoulder dystocia (SD) is defined as a vaginal delivery in cephalic presentation that requires additional obstetric maneuvers to deliver the fetus after the head has delivered and gentle traction has failed. It complicates 0.5–1% of vaginal deliveries. Risks of brachial plexus birth injury (level of evidence [LE]3), clavicle and humeral fracture (LE3), perinatal asphyxia (LE2), hypoxic-ischemic encephalopathy (LE3) and perinatal mortality (LE2) increase with SD. Its main risk factors are previous SD and macrosomia, but both are poorly predictive; 50–70% of SD cases occur in their absence, and most deliveries when they are present do not result in SD.

No study has proven that the correction of these risk factors (except gestational diabetes) would reduce the risk of SD. Physical activity is recommended before and during pregnancy to reduce the occurrence of some risk factors for SD (Grade C). In obese women, physical activity should be coupled with dietary measures to reduce fetal macrosomia and weight gain during pregnancy (Grade A). Women with gestational diabetes require diabetes care (diabetic diet, glucose monitoring, insulin if needed) (Grade A) because it reduces the risk of macrosomia and SD (LE1). Only two measures are proposed for avoiding SD and its complications. First, induction of labor is recommended in cases of impending macrosomia if the cervix is favorable at a gestational age of 39 weeks or more (professional consensus). Second, cesarean delivery is recommended before labor in three situations and during labor in one: (i) estimated fetal weight (EFW) >4500 g if associated with maternal diabetes (Grade C), (ii) EFW >5000 g in women without diabetes (Grade C), (iii) history of SD associated with severe neonatal or maternal complications (professional consensus), and finally during labor, (iv) in case of fetal macrosomia and failure to progress in the second stage, when the fetal head station is above +2 (Grade C).

In cases of SD, it is recommended to avoid the following actions: excessive traction on the fetal head (Grade C), fundal pressure (Grade C), and inverse rotation of the fetal head (professional consensus). The McRoberts maneuver, with or without suprapubic pressure, is recommended first (Grade C). If it fails and the posterior shoulder is engaged, Wood's maneuver should be performed preferentially; if the posterior shoulder is not engaged, it is preferable to attempt to deliver the posterior arm next (professional consensus). It appears necessary to know at least two maneuvers to perform should the McRoberts maneuver fail (professional consensus). A pediatrician should be immediately informed of SD. The initial

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clinical examination should check for complications, such as brachial plexus injury or clavicle fracture (professional consensus). If no complications are observed, neonatal monitoring need not be modified (professional consensus). The implementation of practical training with simulation for all care providers in the delivery room is associated with a significant reduction in neonatal (LE3) but not maternal (LE3) injury. SD remains an unpredictable obstetric emergency. All physicians and midwives should know and perform obstetric maneuvers if needed, quickly but calmly.

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## Introduction and method [1–3]

The sponsor (the French College of Gynecologists and Obstetricians (CNGOF)) appointed a steering committee (Appendix A) to define the exact questions to be put to the experts, to choose them, follow their work and draft the synthesis of recommendations resulting from their work [1]. The experts analyzed the scientific literature on the subject to answer the questions raised. A literature review identified the relevant articles through mid-2015 by searching the MEDLINE database and the Cochrane Library. The search was restricted to articles published in English and French [2,3]. Priority was given to articles reporting results of original research, although review articles and commentaries were also consulted. Guidelines published by organizations or institutions such as the American College of Obstetricians and Gynecologists (ACOG) [4] and the Royal College of Obstetricians and Gynaecologists (RCOG) [5] were reviewed, and additional studies were located by reviewing bibliographies of the articles identified. For each question, each overview of validated scientific data was assigned a level of evidence based on the quality of its data, in accordance with the framework defined by the HAS (French Health Authority) [3], summarized below.

### Quality of evidence assessment

- LE1: very powerful randomized comparative trials, meta-analysis of randomized comparative trials;
- LE2: not very powerful randomized trial, well-run non-randomized comparative studies, cohort studies;
- LE3: case-control studies;
- LE4: non-randomized comparative studies with large biases, retrospective studies, cross-sectional studies, and case series.

A synthesis of recommendations was drafted by the organizing committee based on the replies given by the expert authors. Each recommendation for practice was allocated a grade, defined by the HAS as follows:

### Classification of recommendations

- Grade A: Recommendations are based on good and consistent scientific evidence
- Grade B: Recommendations are based on limited or inconsistent scientific evidence
- Grade C: Recommendations are based primarily on consensus and expert opinion

Professional consensus: In the absence of any conclusive scientific evidence, some practices have nevertheless been recommended on the basis of agreement between the members of the working group (professional consensus).

All texts were reviewed by persons not involved in the work, i.e., practitioners in the various specialties (see Appendix A) and working in different situations (public, private, university or non-university establishments). Once the review was completed, changes were made, if appropriate, considering the assessment of the quality of the evidence.

The original long texts in French are cited [6–11], but their individual references are not included here in view of the enormous space they would occupy in this article intended to summarize the guidelines.

### Epidemiology of shoulder dystocia

Shoulder dystocia is a complication of vaginal delivery in cephalic presentation defined by the impaction of the fetal shoulder after delivery of the head and requiring recourse to obstetrical maneuvers other than gentle traction on the head or a replacement maneuver. This is the most consensual definition and the one best adapted to clinical practice (professional consensus). According to this definition, shoulder dystocia complicates 0.5–1% of vaginal deliveries.

Numerous factors are reported to be associated with shoulder dystocia, in particular, a history of shoulder dystocia, maternal diabetes, maternal obesity, a male fetus, gestational age at delivery, long duration of labor, operative vaginal delivery, and high birth weight. Nonetheless, most of these

associations are not independent of one another and are not always (or even mostly) found with it. According to the literature, only two characteristics are independent risk factors: a history of shoulder dystocia (which multiplies the risk by 10–20) and fetal macrosomia (risk multiplied by 6–20). Diabetes and maternal obesity are also consistently associated in the literature with an increased risk of shoulder dystocia (on the order of 2–4 times higher), but these associations are explained, at least in part, by the macrosomia they induce; the existence of a direct effect of maternal diabetes or obesity on this risk, independently of fetal weight, remains to be demonstrated. Nonetheless, even the factors associated continually and independently with shoulder dystocia do not enable its reliable prediction because they are not sufficiently discriminant. From 50 to 75% of all cases of shoulder dystocia occur in their absence, and the vast majority of deliveries in which they are present do not involve it. Shoulder dystocia therefore remains an unpredictable obstetric emergency. Nonetheless, knowledge of its risk factors is important because it allows increased attentiveness during delivery in at-risk situations (professional consensus).

### Prevention of risk factors for shoulder dystocia before delivery

It has been hypothesized that targeted action on the risk factors mentioned above might enable primary prevention of shoulder dystocia and thus reduce its incidence. Nonetheless, there is no direct proof that acting on any of these factors except gestational diabetes would reduce this risk.

In the general population, regular physical activity in the year preceding pregnancy reduces the risk of gestational diabetes (LE2) and of maternal weight gain during pregnancy, especially at its end (LE3). Studies report mixed results about its effect on fetal macrosomia (LE3). Although the optimal volume of physical activity to perform before pregnancy has not been clearly defined, about 30 min a day, 3–5 times a week is recommended (professional consensus). On the other hand, physical activity during pregnancy does not reduce the incidence of gestational diabetes (LE2). It is nonetheless recommended (grade C) for 30 min a day and 3–5 times a week (professional consensus) because it reduces maternal weight gain during pregnancy (LE3) as well as the risk of fetal macrosomia (LE3).

It is not recommended that women with a normal body mass index (BMI) start either a high-fiber or a low-glycemic index diet to prevent gestational diabetes or fetal macrosomia (Grade B). However, physical activity combined with these dietary measures is recommended (Grade A) for women who are overweight or obese (BMI  $\geq 25$ ), because it helps to reduce fetal macrosomia (LE1). Moreover, it allows a modest reduction in maternal weight gain during pregnancy (LE2), although it has no effect on gestational diabetes (LE1). No specific diet is recommended for this form of diabetes except the standard diet for diabetes (calorie intake of 25–35 kcal/kg/day including 40–50% of carbohydrates, eaten as 3 meals and 2–3 snacks), which is reported to prevent fetal macrosomia (Grade B).

In the general population, a return to preconception weight by 6 months after delivery is recommended to reduce the risk of macrosomia and gestational diabetes in subsequent pregnancies (Grade B). Women with a preconception BMI  $\geq 25$  or excessive weight gain during pregnancy or insufficient weight loss at 6 months (i.e., the failure to return to their preconception BMI of 18–25) should be referred to their general practitioner or another competent health professional to organize active management aimed at reaching a healthy BMI (Grade B). Women should be informed of the short- and long-term risks of maintaining this weight gain for more than 6 months postpartum (professional consensus). During pregnancy, it is recommended that women

with normal BMI follow the 2009 directives of the Institute of Medicine (IOM) (weight gain of 11.5–16 kg) to reduce the risk of fetal macrosomia (Grade B). Because macrosomia is the principal independent risk factor for shoulder dystocia, it is recommended that obese patients be made aware of the importance of controlling their weight gain during pregnancy (professional consensus). The results of adding new techniques (text messages, reminder letters, personal or group coaching) to the standard dietary measures to control weight gain during pregnancy are encouraging. Nonetheless, further studies are needed before these new methods can be recommended (professional consensus).

Specific treatment of gestational diabetes (diet, self-monitoring of blood glucose, insulin therapy if indicated) is recommended to reduce the risks of macrosomia and shoulder dystocia (Grade A).

In obese women, bariatric surgery combined with weight loss can reduce the incidence of pregnancy-related diabetes (LE3) and macrosomia (LE3). Nonetheless, the indication for bariatric surgery must not be based on obstetric criteria (professional consensus). The data currently available do not justify recommending the prescription of metformin for pregnant women with polycystic ovary syndrome to prevent gestational diabetes (Grade B).

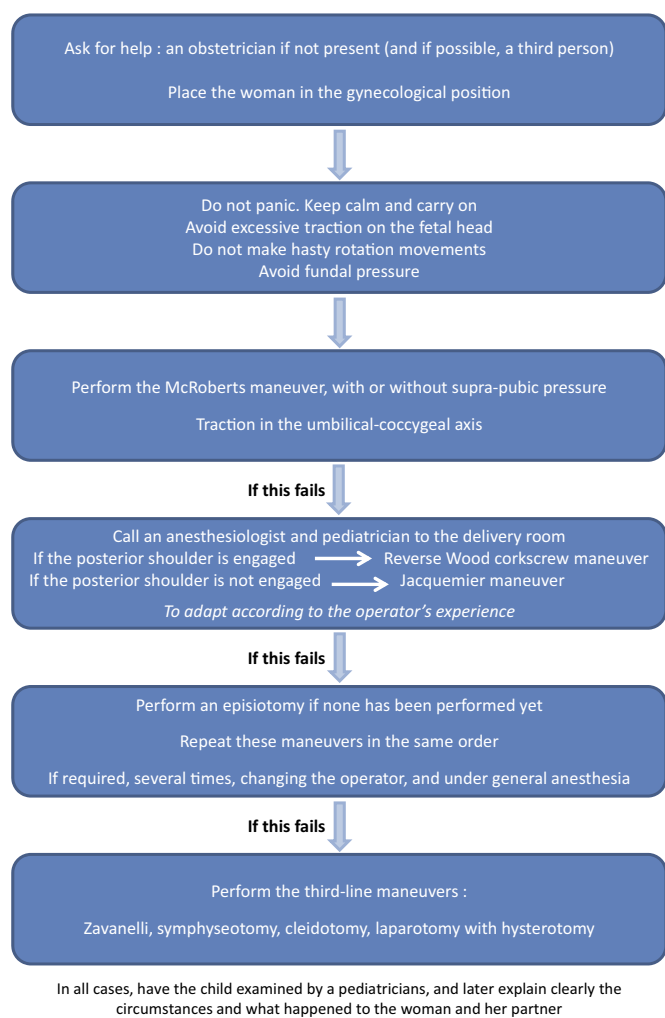
### Management of delivery to prevent shoulder dystocia in cases of identified risk factors

When fetal macrosomia is clinically suspected, an ultrasound is encouraged to clarify the situation and aid decision-making (professional consensus). Because of the high false-positive rate and the higher risks of cesarean delivery, the Guidelines Clinical Practice on diabetes and pregnancy issued by CNGOF in 2010 concluded and we reaffirm that X-ray pelvimetry is not indicated for suspected fetal macrosomia (professional consensus). Thus comparison of fetal and pelvic measurements is not recommended for suspected fetal macrosomia (Grade C). However, to avoid the complications of shoulder dystocia and in particular irreversible injury to the brachial plexus, cesarean delivery is recommended when the estimated fetal weight  $>4500$  g in women with diabetes (grade C) and  $>5000$  g in women without it (Grade C). The published data do not furnish formal evidence justifying a recommendation that labor be routinely induced in women with suspected fetal macrosomia (professional consensus). Nonetheless, the more favorable the cervical conditions are and the closer gestation age is to 39 weeks, the more likely it is that induction of labor will be preferred (professional consensus), and at or after 39 weeks, when local conditions are favorable, induction of labor is encouraged (professional consensus).

A prophylactic McRoberts maneuver is not recommended to prevent shoulder dystocia in cases of suspected fetal macrosomia (Grade C). In the absence of published data, no recommendations can be made about the performance of an episiotomy or replacement maneuvers to prevent shoulder dystocia in these cases (professional consensus).

As the CNGOF Clinical Practice Guidelines for operative vaginal deliveries stated in 2008, a cesarean is recommended in cases of suspected fetal macrosomia and failure to progress, when the presentation is not engaged or is high (Grade C). Because of the possibly severe maternal complications associated with a cesarean when the fetal head is enclosed in the pelvis, operative vaginal delivery is recommended when the head is engaged at lowpelvis or lower and then fails to progress (Grade C).

In women with a history of shoulder dystocia associated with severe neonatal or maternal complications, a cesarean might be envisioned for any subsequent pregnancy (professional consensus). In all other situations with a history of shoulder dystocia, vaginal delivery is possible (professional consensus).



**Fig. 1.** Proposed of algorithm for immediate management of shoulder dystocia.

### Management of shoulder dystocia (Fig. 1)

An obstetrician must be called as rapidly as possible when shoulder dystocia occurs in a delivery where one is not present (professional consensus). It is desirable, if local organization allows, to request assistance from a third staff person to facilitate performance of the McRoberts maneuver (professional consensus). The patient must be correctly placed in the lithotomy position (professional consensus). Analgesia/anesthesia must be optimal to facilitate the obstetrical maneuvers (professional consensus). Because the speed with which these maneuvers are performed determines the risk of neonatal asphyxia, they must be performed as quickly as possible (Grade B). Excessive pulling or traction on the fetal head, either down or laterally, must be avoided (Grade C). Fundal pressure must also be avoided (Grade C). Similarly to be avoided is a rotation that makes the fetal head pivot toward the fetal back (professional consensus). Umbilical cord blood gas analysis should be systematically performed in cases of shoulder dystocia (professional consensus).

Because of its simplicity of performance, efficacy and low morbidity, the first-line treatment recommended is the McRoberts maneuver (Grade C), with or without suprapubic pressure. Persistence is advised against when the maneuver, combined with this pressure, fails; it is recommended instead to move on to second-line maneuvers. The available data do not allow us to conclude that any one of these maneuvers is superior to any

another (Grade C). While we propose the following outline, it must be adapted to the operator's experience (professional consensus):

- if the posterior shoulder is engaged, the reverse Wood corkscrew maneuver should be performed
- if the posterior shoulder is not engaged, the Jacquemier maneuver should be performed

Every perinatal professional should know at least two second-line maneuvers for the management of shoulder dystocia that is not resolved by the McRoberts maneuver (professional consensus).

Zavanelli's maneuver, or a symphyseotomy, cleidotomy or laparotomy with hysterotomy, must be used only as a last resort, after failure of the other first- and second-line maneuvers performed several times in good conditions (professional consensus).

The performance of these obstetrical maneuvers for treating shoulder dystocia does not routinely require an episiotomy (professional consensus).

It is recommended that maternity units have a protocol for the management of shoulder dystocia (Grade C). We propose here an algorithm for this management (professional consensus) (Fig. 1)

The items that must be included in the delivery report are: the names of the clinicians (midwives and physicians) who performed the delivery and the maneuvers, the side of the fetal back or anterior shoulder, a specific description of each maneuver performed (rather than simply their names), any episiotomy, the calls for an anesthetist and pediatrician, Apgar score, results of the cord blood gas analyses performed at birth and of the pediatric examination (professional consensus). The use of a specific form to describe the exact circumstances of the delivery will improve the documentation of medical information (LE3).

Shoulder dystocia results in a higher risk of postpartum hemorrhage and severe perineal lesions (LE3); integrity of the anal sphincter must be routinely verified (grade C). In view of the potential neonatal complications, the newborn must be routinely and thoroughly examined by a pediatrician (professional consensus). The circumstances of the delivery must be explained to the patient and her partner after the delivery, and this information must be repeated during the postpartum hospitalization (professional consensus). A debriefing with the entire team managing the patient when the dystocia developed and requiring a second-line maneuvers is encouraged (professional consensus).

### Neonatal complications related to shoulder dystocia

Brachial plexus injuries can be classified according to the roots damaged or the type of neurological injury (expert opinion). The functional prognosis depends simultaneously on the anatomical group affected and the type of lesion (expert opinion). The risk of brachial plexus injury is higher in cases with macrosomia (LE3), gestational diabetes (LE3), shoulder dystocia (LE3), lack of progress in dilatation (LE3), and operative vaginal deliveries (LE3). Nonetheless this injury can occur in the absence of any risk factor (LE4), in the absence of shoulder dystocia (LE3), or after cesarean delivery (LE4).

Brachial plexus injury is diagnosed clinically (professional consensus). Radiography to search for bone injuries should be performed based on clinical observations (professional consensus). There is no evidence supporting the routine performance of either electromyography or MRI (professional consensus). In cases of brachial plexus injury, physical therapy must be started early (professional consensus), and an orthopedic consultation should take place at 1 month to determine the need for surgical treatment at 3 months, should the paralysis persist (professional consensus).

The risk of a fracture of the clavicle is higher after shoulder dystocia (LE3), but it can occur in the absence of shoulder dystocia and after a cesarean (LE4). This diagnosis is suspected clinically and then confirmed radiologically (professional consensus). Treatment (analgesics and immobilization) is necessary only for cases involving pain (professional consensus). The course is favorable (LE4). The incidence of fracture of the humeri is also higher after shoulder dystocia and varies according to the maneuvers used (LE3). This diagnosis is suspected clinically and then confirmed radiologically (professional consensus). Treatment requires immobilization by plaster or other bandage (professional consensus). The course is favorable in 4 weeks (LE4).

Shoulder dystocia increases the risk of perinatal asphyxia (LE2) and neonatal mortality (LE2). Umbilical cord blood gas analysis should be systematically performed in cases of shoulder dystocia (professional consensus). The team managing newborns in the delivery room must be capable of the necessary resuscitation procedures (according to the national guidelines of the French Society of Neonatology (SFN) and the International Liaison Committee on Resuscitation (ILCOR 2010), know the inclusion criteria for controlled hypothermia treatment, and have established a protocol for transfer to a NICU (professional consensus).

In view of the neonatal morbidity associated with shoulder dystocia and the importance of an early diagnosis of possible traumatic injuries for appropriate management, the pediatrician must be informed immediately when shoulder dystocia occurs (professional consensus) and must systematically examine the child (professional consensus). The moment of this examination will depend on the problems at delivery and the newborn's status at birth (professional consensus). In the absence of complications, the newborn should be monitored in the usual way after delivery (professional consensus). Babies born with macrosomia or of mothers with diabetes should be monitored according to the standard protocols (professional consensus). Before discharge, a pediatrician should perform a targeted clinical examination (professional consensus).

### **Impact of simulation to reduce neonatal and maternal morbidity of shoulder dystocia**

Prevention of these complications is improved by learning the necessary maneuvers during simulation sessions with a mannequin, compared with training by video tutorials (LE2). Learning these techniques during specific simulation sessions for shoulder dystocia improves technical procedures essentially for interns; simulated communication appears useful for all health care providers (LE3). The effect of specific simulation sessions for learning to draft the delivery report results in only a modest improvement in report quality (LE3). A specific rubric or form for dystocia appears useful for increasing the amount of information transcribed by the clinician (LE3).

The establishment of a specific training simulation program for the entire labor room staff is associated with a significant reduction in the rate of brachial plexus injuries (LE3) but does not appear to diminish maternal morbidity from shoulder dystocia (LE3).

Simulation programs for the management of shoulder dystocia should be encouraged in both initial and continuing medical training of all who work in the delivery room (professional consensus). Nonetheless, the combined economic and human cost of simulation impedes its widespread use.

### **Conflicts of interest**

LS was a board member and carried out consultancy work and lectured for Ferring. MVS, AIB, CDT, FF, GL, CLR, EL, TS, and VLS had no conflicts of interest.

## **Appendix A**

### *A.1. Steering committee*

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