



Shoulder Dystocia

T. C. Okeke^{1,2*} and B. U. Anyaehie²

¹Department of Obstetrics and Gynaecology, University of Nigeria Teaching Hospital (UNTH), Enugu, Nigeria.

²Department of physiology, College of Medicine, University of Nigeria, Enugu Campus, Enugu, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Author TCO designed the study, wrote the protocol, and wrote the first draft of the manuscript. Author BUA managed the analyses of the study. Author TCO managed the literature searches. All authors read and approved the final manuscript.

Review Article

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ABSTRACT

Background: Shoulder dystocia is an unpredictable, unpreventable obstetric emergency fraught with a universally accepted definition, no consensus management, and a wide variation in reported incidence worldwide.

Aim: The aim of this review is to create awareness to Obstetricians and residents in training, guidelines and a plan of action to the management of this obstetric emergency.

Methods: Review of pertinent literature on shoulder dystocia, selected references, conference papers, technical reports, journal articles, abstracts, and internet articles using Medline, Google scholar and Pubmed databases were critically reviewed.

Results: Shoulder dystocia is associated with 1% risk of serious long term disability or death in the neonates. The relative infrequency of shoulder dystocia and lack of standardized management means that few Obstetricians are truly experienced in the management of this obstetric emergency. Multiple maneuvers can be applied in an attempt to alleviate the dystocia.

Conclusion: Shoulder dystocia is highly unpredictable obstetric emergency which requires that all labour ward practitioners must possess a detailed knowledge of the condition and how to overcome it.

*Corresponding author: Email: ubabiketochukwu@yahoo.com;

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1. INTRODUCTION

Shoulder dystocia is a potentially life-threatening obstetric emergency that result in impaction of the shoulder after delivery of the fetal head [1,2]. A universally accepted strict definition has not been described [3-6]. RCOG defined shoulder dystocia as a vaginal cephalic delivery that requires additional obstetric maneuvers to deliver the fetus after the head has delivered and gentle traction has failed [2]. The definition is imprecise. Also proposed were objective diagnosis of use of head-to-body delivery time of more than 60 seconds and use of computer models to measure the forces necessary to release shoulder dystocia. Discrepancies in the definition, the degree of difficulty and the maneuvers used, have resulted in wide variations in reported incidence of this obstetric emergency and its complications [4,5]. Shoulder dystocia results from impaction of one or both fetal shoulders behind the bones of the maternal pelvis [3]. The reason for this impaction is a mechanical one [4,5]. There is no reliable method for predicting shoulder dystocia. The risk assessments for the prediction of shoulder dystocia are inadequately predictive to allow prevention of the significant majority of cases [2]. It requires prompt skillful management to avoid fetal damage or death. However, a high index of suspicion with planned action of events and guidelines/logical intervention to prevent injury to mother and her baby. This is a descriptive review, with the aim to create awareness to clinicians and residents in training on the management of this obstetric emergency.

2. METHODS OF LITERATURE SEARCH

This was a 3-month descriptive review of shoulder dystocia. The literature review was for ten years (2003-2013). Relevant literature search on shoulder dystocia was from August 1st, 2013 to October 31st, 2013. A search of literature on shoulder dystocia in English was conducted. Relevant materials on shoulder dystocia were selected. The keywords used are definition, incidence, risk factors, aetiology, pathophysiology, and maneuvers of shoulder dystocia with selected references, conference papers, technical reports, journal articles, abstracts, relevant books, and internet articles using Medline, Google scholar, and Pubmed databases were critically reviewed.

2.1 Incidence

The actual incidence is unknown, quoted figures range between 0.15–2% of all vaginal delivery [1,2,7,8]. The incidence varies greatly depending on the criteria used for diagnosis of shoulder dystocia [8,9], under-reporting [8], and upon the experience of the accoucheure and the position in which the woman delivers [5,8]. The incidence is increasing due to increasing incidence of maternal obesity, increasing birth weight, improved perinatal care, better reporting and documentation [2]. Based on prospective studies that examined shoulder dystocia incidence among vaginal deliveries, higher values have been reported [10,11].

2.2 Reasons for Wide Variation in Incidence

The two main reasons for the wide variation in incidence are:

- (a) There is no objective diagnosis for shoulder dystocia [12]. (b) Milder forms of shoulder dystocia are difficult to diagnose or are often uneventful and uncoded [13,14].

2.3 Criteria Used to Define Shoulder Dystocia

- (1) Use of maneuver to define shoulder dystocia (True shoulder dystocia). This was coined by Gross et-al [8,9,15]. Deliveries requiring in addition to downward traction and episiotomy, maneuvers to deliver the shoulders [9]. However, use of maneuvers to define shoulder dystocia has been criticized by Beall and associates [16], Spong and colleagues [17].
- (2) Use of head to body delivery time exceeding 60 seconds to define shoulder dystocia. This was proposed by Beall & Associates [16], Spong and Colleagues[17].
- (3) Use of computer models to measure the forces necessary to release shoulder dystocia. This was proposed by Gonik and Colleagues [18].

2.4 Pathophysiology of Shoulder Dystocia

In shoulder dystocia either the anterior shoulder or in severe forms, both the anterior and posterior shoulders are arrested at the pelvic inlet. The problem lies at the pelvic inlet [19]. The posterior shoulder enters the pelvis but there is impaction of anterior shoulder behind the symphysis pubis and it fails to rotate into a larger pelvic diameter. When both shoulders are impacted into the pelvic brim in an unfavourable diameter (anteroposterior diameter) it is a problem, more serious and difficult to correct, but it is favourable when it is in oblique or transverse diameter. Pelvic outlet and perineum do not contribute to shoulder dystocia. The use of extended episiotomy is to create space necessary for vaginal manipulations.

2.5 Aetiology

Maternal, fetal and intrapartum characteristics have been involved in the development of shoulder dystocia [6,20]. A combination of risk factors may increase the risk of shoulder dystocia. However, 50% of patients with shoulder dystocia have no risk factors [21]. Maternal risk factors include obesity, diabetes mellitus and multiparity. These factors are due to increased birth weight. Maternal diabetes has risk of excessive fetal growth and is a major risk factor for shoulder dystocia [22]. The strongest predictors of shoulder dystocia are related to fetal macrosomia [20]. For obese non-diabetic women carrying fetuses whose weights are estimated to be within normal limits, there is no increased risk of shoulder dystocia [20]. Other causes of fetal macrosomia either relative or absolute include multiparity and post-term pregnancies [23,24]. Although, shoulder dystocia increases with greater birth weight, but 50% of newborns with shoulder dystocia weighed less than 4kg [2,25]. This is the reason for unpredictable nature of this condition. Majority of the deliveries complicated by shoulder dystocia still can't be prevented through elective caesarean section [8]. However, the key element in effective management of shoulder dystocia is high index of suspicion in anticipation and preparation for this obstetric emergency. Other risk factors are previous history of shoulder dystocia and overall emergency recurrence risks for shoulder dystocia are approximately 10-15% [26]. Intrapartum characteristics involved in shoulder dystocia include prolonged 2nd stage of labour [25,27], midpelvic operative delivery [25,28]. Shoulder dystocia is seen in 9% of babies greater than 4kg, 15% greater than 4.5kg and 40% above 5.7kg [27]. However, 50% of the cases of shoulder dystocia occur in babies who weigh less than 4kg [29]. Although there is a relationship between fetal size and shoulder dystocia but it

is not a good predictor [2,25]. Moreover, clinical fetal weight estimation is unreliable and third-trimester ultrasound scans have at least a 10% margin for error for actual birth weight [2,25].

2.6 Signs of Impending Shoulder Dystocia

- (1) A “turtle sign” on delivery of fetal vertex (retraction of the fetal head back into the vagina just after delivery).
- (2) Failure of egress of amniotic fluid with delivery of the vertex.

2.6.1 Anticipation in antenatal period [7,32]

- Multiparity, previous large babies, past history of shoulder dystocia [29].
- Fetal macrosomia [30].
- Excessive weight gain in pregnancy [24].
- Gestational diabetes [22].
- Obesity (BMI >25) [30].
- Post term pregnancy [22].

2.6.2 Anticipation intrapartum [32]

- Prolonged labour especially protracted 1st stage with loosely applied cervix [30].
- Prolonged 2nd stage of labour [30].
- Midpelvic instrumental vaginal delivery [30].
- Delivery of the head without the shoulder emerging with next bearing down effort.
- Turtle neck sign.
- Induction of labour for impending macrosomia [31].

2.6.3 Diagnosis

- (1) Turtle neck sign (fetal head retracts or recoils against maternal perineum)
- (2) Failure to accomplish external rotation.

2.7 Complications of Shoulder Dystocia

2.7.1 Maternal complications

Postpartum haemorrhage from prolonged 2nd stage, uterine atony and also contributions from vaginal and cervical lacerations [3,5,33,34], and uterine rupture in attempts to release the baby, especially if fundal pressure is applied [5].

2.7.2 Fetal complications

Shoulder dystocia may be associated with pronounced fetal morbidity and even mortality.

2.7.2.1 Brachial plexus injury

This injury may be localized to the upper or lower part of the plexus. It may result from downward traction on the brachial plexus during delivery of the anterior shoulder. Erb palsy results from injury to the spinal nerves C5-C6 and sometimes C7. Infants of diabetic mothers

are particularly prone to this injury [35]. Various variations of Erbs palsy exist depending on the nerve roots involved. Affection of C5 and C6 result clinically in internal rotation and abduction of the shoulder, extension and pronation of the elbow and weak wrist extension. The biceps and Moro reflexes are abolished [36]. Lesions of the lower brachial plexus are less common. C4 injury results in phrenic nerve palsy and paralysis of hemidiaphragm. C8 and T1 injuries result in Klumpke's paralysis leading to claw hand. Moro reflex is normal but the palmar grasp is absent. Sensation is impaired with associated T1 cervical sympathetic outflow injury leading to an ipsilateral Horner's syndrome with diminished pigmentation of the iris. Erbs palsy is the commonest injury 60-70% [37], but has a better prognosis than lesions of the lower root injuries [38]. Brachial plexus injuries are one of the most important fetal complications of shoulder dystocia. The incidence of brachial plexus injury increases with the length of second stage, even after controlling for other co-factors [33]. Most cases resolve without permanent disability [36]. The brachial plexus injury probably comes from manual stretching of the nerves. Excess tension may physically tear the nerve roots out from the neonatal spinal column, resulting in total dysfunction. The ventral roots (motor pathway) are more prone to injury, since they are in the plane of greatest tension while the anterior (sensory pathway) are somewhat protected due to the usual inward movement of the shoulder.

The relationship between increasing fetal weight, shoulder dystocia and brachial plexus injury is well established. Data clearly support higher rates of shoulder dystocia and brachial plexus injury as fetal weight increases [22]. However, it is important to note that most shoulder dystocia occur in women with infants of normal weight [22].

2.7.2.2 Comment

It is important to point out that often Brachial Plexus Palsy is not associated with clinical evident shoulder dystocia [39]. These brachial plexus occurs in women without shoulder dystocia and without identifiable risk factors. This is important from medicolegal point of view [39,40]. It is also important to determine whether the affected shoulder was anterior or posterior at the time of delivery, because damage to the plexus of the posterior shoulder is considered unlikely to be due to action by the healthcare professional [41].

2.7.2.3 Skeletal Injury

The combination of traction on the head and fundal pressure is documented as the cause of increase incidence of fetal neurological and orthopaedic complications [9,42]. Fractures are commoner in clavicles 35-38%, humeral fracture 15-19% [37,43]. These injuries are not predictable and have good prognosis [44,45].

2.8 Management

Shoulder dystocia is an unpredictable, unpreventable obstetric emergency. The managing clinician should be versed in the management principles, a deliberate and planned action of events of prompt, skillful and logical intervention to prevent injury to the mother and her fetus.

- High index of suspicion
- Anticipation and preparation for this acute obstetric emergency.
- Call for help (Neonatologist, Anaesthetist and additional midwives).
- Correct positioning of the patient.

- Perform a generous episiotomy and adequate analgesia is important.
- There is no place for maternal pushing or fundal pressure which will worsen impaction.
- Avoid panics.

2.8.1 Place of episiotomy in shoulder dystocia

Episiotomy is not a maneuver to overcome shoulder dystocia. Episiotomy offers no mechanical benefit or clinical benefit to resolve shoulder dystocia when fetal maneuvers are not used. From recent studies, episiotomy does not decrease risk of brachial plexus injury and increases the risk of perineal trauma [46,47]. The only reason to perform episiotomy after a shoulder dystocia is diagnosed is to eliminate soft tissue resistance that is interfering with the ability to insert the hand into the hollow of the sacrum posteriorly in order to perform fetal maneuver.

2.9 Maneuvres to Overcome Shoulder Dystocia

Manipulations to overcome shoulder dystocia are not learnt from a book [3]. It is a good practice to undergo practical training in obstetric emergencies.

2.9.1 The McRoberts maneuver

This procedure was described by Gonik and Associates [48] in 1983 and popularized by William A McRoberts Jr. at the University of Texas at Houston. The maneuver is the primary procedure in relieving shoulder dystocia. It is successful in 85-90% of cases [49] and is the procedure of choice in shoulder dystocia maneuvers. This maneuver is without external forces on the fetus, thereby reduces the risk of fetal injury. The maneuver involves hyperflexion of maternal thighs over the maternal abdomen. This is followed by gentle suprapubic pressure to 'hunch' the fetal shoulders thereby reducing the bisacromial diameter of the fetus. This results in rotation of the pelvis and symphysis cephalad, aligns the axis of the pelvis to that of the lumbar vertebrae and a decrease in the angle of pelvic inclination. These will facilitate disimpaction of the shoulders from pubic symphysis. Pelvic dimension does not increase but pelvic rotation cephalad tends to free the impacted anterior shoulder. Gonik and co-workers [50] in 1989 tested McRoberts maneuver with laboratory models and found that it objectively reduced the forces needed to free the fetal head. Gherman and Colleagues [51] in 2000 analyzed McRoberts maneuver with x-ray pelvimetry and confirmed the above mentioned rotations and alignment of the pelvis with lumbar vertebrae.

2.9.2 The woods manoeuvre

This involves rotating posterior shoulder of the fetus through 180° in a corkscrew fashion so that the posterior shoulder which is usually lower, appears anterior and below the pubic symphysis. The posterior shoulder rotates anteriorly and could be released. This is referred to as the woods corkscrew maneuver.

2.9.3 Delivery of the posterior arm and shoulder

This follows careful sweeping of the posterior arm of the fetus across the chest and the perineum, followed by delivery of the arm. The shoulder girdle is then rotated into an oblique diameter of the pelvis with subsequent delivery of the anterior shoulder.

2.9.4 Rubin maneuver

Recommended two maneuvers (1) Rocking of fetal shoulders from side to side by applying force to maternal abdomen. (2) Pelvic hand should grasp accessible fetal shoulder and then be pushed towards the anterior surface of the chest. This maneuver results in abduction of both shoulders which produces a smaller shoulder to shoulder diameter and displacement of the anterior shoulder from behind the symphysis pubis.

2.9.5 Deliberate fracture of the clavicle

This is a popular procedure in a dead fetus. It is carried out by pressing the anterior clavicle against the pubic ramus. In the live fetus, it is difficult to carry out in a big fetus. The fracture will heal rapidly with good prognosis.

2.9.6 Zavanelli manoeuvre

This involves replacement of the fetal head and abdominal delivery. This is instituted when all other maneuvers have failed and is not used in modern obstetric practice [52].

2.9.7 Cleidotomy

This consists of cutting the clavicle with scissors or other sharp instruments and is usually used for a dead fetus and may cause maternal injuries [53].

2.9.8 Symphysiotomy

This was described by Hartfield [54] in 1986. It has been applied successfully in Nigeria [55]. However, it should be applied as last resort.

There is a new technique for delivery of posterior arm in intractable shoulder dystocia with posterior axilla sling traction [56]. This procedure is recently reported [57]. This method is applied where routine methods of delivery were unsuccessful. In this method a soft plastic suction catheter was folded in half over the operator's fingertip and digitally inserted around the posterior shoulder, under the axilla, and retrieved with the other hand to create a sling to which traction was applied. The posterior shoulder followed by the anterior shoulder, was easily delivered. Posterior axilla sling traction overcome intractable shoulder dystocia and avoids further traumatic procedures in fetal death [58].

In order to resolve shoulder dystocia a good number of labour positions and obstetrical maneuvers are sequentially performed in attempt to facilitate delivery. Shoulder dystocia should be managed systemically [2]. McRoberts maneuver is simple, rapid and most effective intervention with low rate of complication and should be performed first [2]. Success rate is up to 90% [2]. Fundal pressure should not be used but supra-pubic pressure should be used to improve the effectiveness of the McRoberts maneuver. Supra-pubic pressure is applied in a downward and lateral direction to push the posterior aspect of the anterior shoulder towards the fetal chest.

If simple measures (McRoberts and suprapubic pressure) fail to resolve shoulder dystocia, internal rotational maneuvers could be used. These interventions were originally described by Woods and Rubin to deliver the posterior arm. Impaction is resolved by rotation of the shoulders into a wider oblique diameter. All four techniques could be tried before or after

internal rotational method. The All fours technique has been described with 83% success rate in one case series [59]. For the cases resistant to all simple measures, other options like cleidotomy, symphysiotomy and Zavanelli could be used. These maneuvers are fraught with complications and must be handled by only those with enough exposure to manage shoulder dystocia.

Fetal death and hypoxic encephalopathy are the most severe outcomes related shoulder dystocia. Leung et al from Hong Kong reported in their series, a very low rate of hypoxic ischaemic injury if the head-to-body delivery time was less than five minutes. Therefore, the target time for delivery of the trunk should be within 5 minutes [60]. It is clear that risks may increase as the time to complete delivery increases. It is therefore important to manage the problem as efficiently as possible to avoid hypoxic acidosis and carefully to avoid unnecessary trauma.

4. ISSUES AND CONTROVERSIES

Most cases of shoulder dystocia can't be accurately predicted or prevented. Neither fetal macrosomia nor shoulder dystocia can be reliably predicted.

4.1 Fetal Weight Macrosomia

Fetal weight estimation either clinically or by ultrasound is notoriously inaccurate and the precision falls with increasing fetal size [23]. Even when advanced planning and preparations are made in isolation without involving other risk factors, shoulder dystocia is still unpredictable and can't be prevented.

Early induction to prevent shoulder dystocia in suspected macrosomia is not evidenced practice from observational and randomized trials [23,61]. Induced labours have a higher incidence of shoulder dystocia [3].

Strategies put forward to prevent shoulder dystocia are either ineffective (early induction) or lead to unnecessary and excessive intervention (elective caesarean section). Both procedures are not appropriate.

The stand of caesarean delivery in macrosomic babies is controversial. The American College of Obstetricians and Gynaecologists 2002 concluded that performance of caesarean delivery for all women with macrosomic fetuses is not appropriate except for established fetal babies over 5kg in non diabetic mothers and over 4.5kg in mothers with diabetes.

4.2 Use of Fundal Pressure to Overcome Shoulder Dystocia

Fundal pressure should not be used in attempts to overcome shoulder dystocia since its use is actually counterproductive. The reason for this is that pressure directed from behind the fetus complicates and further impacts the anterior shoulder. This will result in a more difficult situation and thereby increasing the risk of permanent brachial plexus injury [62,63].

4.3 Documentation

The details surrounding this obstetric emergency should be accurately recorded. This documentation is important for medicolegal reasons and also to help form a plan in any subsequent pregnancy [3,64-66].

Practical shoulder dystocia training has been shown to improve knowledge [67], confidence [68], and management of simulated shoulder dystocia [69]. Training has also been shown to improve actor-patients perception of their care during simulated shoulder dystocia [70]. Team training has resulted in a significant improvement in team performance and a significant increase in the use of new medical technical skills [71]. The effect of training on actual perinatal outcomes has been variable. It varies from significant reduction in neonatal injury at birth following shoulder dystocia [72] to an increase in the caesarean section rate [73].

5. CONCLUSION

Shoulder dystocia is an unpredictable, unpreventable acute obstetric emergency that requires intervention to prevent 1% risk of serious long term disability or death in the neonates¹. The relative infrequency of shoulder dystocia and lack of standardized management means that few obstetricians are truly experienced in the management of this complication. However, its unpredictability means that all labour ward practitioners must possess a detailed knowledge of the condition and how to overcome it [3,74].

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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