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Shoulder dystocia. One of the complications in obstetrics that requires evaluation and attention

Distocia de hombros. Una de las complicaciones en obstetricia que requiere evaluación y atención

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Abstract

Shoulder dystocia occurs when the anterior fetal shoulder is impacted behind the maternal pubic symphysis or when the posterior fetal shoulder is embedded in the sacral promontory, generating a mechanical obstruction during delivery. The aim of this review was to describe shoulder dystocia and the obstetric maneuvers most commonly used for its resolution, since it is an emergency that requires immediate evaluation and specialized care. A literature review was carried out, selecting 43 articles published mostly in the last five years, complemented with classic references from more than a decade, from databases such as PubMed, Mendeley, SciELO, Epistemonikos, The Cochrane Library and ClinicalTrials.gov. The results show that the main risk factor for shoulder dystocia is the increase in fetal weight at birth, especially in cases of macrosomia. Likewise, women with a history of shoulder dystocia and brachial plexus injury in previous deliveries have an increase of up to five times in the risk of recurrence. This obstetric complication, considered one of the most unexpected, is associated with high fetal and maternal morbidity if the external and internal maneuvers necessary for its resolution are not applied in a timely manner. Fetal consequences include intrauterine death, brachial plexus palsy, severe hypoxia, and possible alterations in cognitive development. In the mother, complications include fourth-degree perineal tears, postpartum hemorrhage, and the need for emergency cesarean sections with hysterectomy. Early identification of risk factors and training in obstetric maneuvers are essential to reduce associated morbidity and mortality.

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Resumen

La distocia de hombros se produce cuando el hombro fetal anterior se impacta detrás de la sínfisis púbica materna o cuando el hombro fetal posterior se enclava en el promontorio sacro, generando una obstrucción mecánica durante el parto. El objetivo de esta revisión fue describir la distocia de hombros y las maniobras obstétricas más utilizadas para su resolución, dado que constituye una urgencia que requiere evaluación inmediata y atención especializada. Se realizó una revisión de la literatura, seleccionando 43 artículos publicados en su mayoría en los últimos cinco años, complementados con referencias clásicas de más de una década, provenientes de bases de datos como PubMed, Mendeley, SciELO, Epistemonikos, The Cochrane Library y ClinicalTrials.gov. Los resultados evidencian que el principal factor de riesgo para la distocia de hombros es el aumento del peso fetal al nacer, especialmente en casos de macrosomía. Asimismo, las mujeres con antecedentes de distocia de hombros y lesión del plexo braquial en partos previos presentan un incremento de hasta cinco veces en el riesgo de recurrencia. Esta complicación obstétrica, considerada una de las más inesperadas, se asocia con elevada morbilidad fetal y materna si no se aplican oportunamente las maniobras externas e internas necesarias para su resolución. Entre las consecuencias fetales se incluyen muerte intrauterina, parálisis del plexo braquial, hipoxia severa y posibles alteraciones en el desarrollo cognitivo. En la madre, las complicaciones abarcan desgarros perineales de cuarto grado, hemorragias posparto y la necesidad de cesáreas de emergencia con histerectomía. La identificación temprana de factores de riesgo y el entrenamiento en maniobras obstétricas son esenciales para reducir la morbimortalidad asociada.

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Introduction

Shoulder dystocia (SD), one of the most challenging complications in obstetrics-gynecology, occurs when there is an impact of the anterior fetal shoulder, behind the maternal pubic symphysis, or when the posterior fetal shoulder is impacted on the sacral promontory, occurs in approximately 0.2 – 3 % of vaginal deliveries[1,2].

According to the American College of Obstetricians and Gynecologists (ACOG), there are 3 mechanisms that can promote DHF: i) increased resistance between the vaginal walls and the fetus; in cases of fetal macrosomia. ii) presence of a large fetal chest in relation to the fetal head; in neonates of diabetic mothers. iii) rapid descent that avoids rotation of the bisacromial diameter within the pelvis; when a hasty birth occurs[3].

Clinically, SD is recognized when, after the exit of the fetal head, there is evidence of a retraction of the fetal head towards the perineum, generating the "turtle sign" accompanied by the following parameters: i) when the fetus's shoulders cannot be removed; only using a smooth downward traction. ii) need for additional obstetric maneuvers to achieve the successful delivery of the newborn. iii) interval between the birth of the head and the body of >1 minute[3].

SD can cause maternal complications including: postpartum hemorrhage (11 %) and obstetric anal sphincter injuries (3.8 %)[4]. The most common neonatal injuries are those of the brachial plexus and clavicular or humeral fractures, approximately 10 % of transient injuries of the brachial plexus can result in permanent neurological injury, and SD can cause death or brain damage to the baby[5,6].

Once the SD has been resolved, it should be expected approximately 1 minute to allow placental blood to return to the baby before cutting the umbilical cord[7,8].

The gynecoid pelvis is on average 12 cm anteroposterior diameter and 13 cm transverse, the average-sized fetus has a biacromial diameter of about 12 to 15 cm, the shoulders are usually located in the anteroposterior diameter above the pelvic entrance, but pass through the pelvic entrance in the larger transverse diameter. Although the biacromial diameter is usually larger than the transverse diameter of the pelvic entrance, there is usually no obstruction because the shoulders are compressible and are pushed into the fetal thorax[9-12].

When the head exits the vulva, the fetal shoulders usually pass through the entrance of the pelvis, most cases of SD are in fact caused by a large fetus, which tries to pass through a normal-sized pelvis[11].

SD is an unpredictable obstetric complication with devastating consequences, as individual evaluation and timely counseling are important[13].

The ACOG and the Royal College of Obstetricians and Gynaecologists (RCOG) of the United Kingdom have proposed manoeuvres for the acute resolution of SD. External maneuvers, such as McRoberts and suprapubic pressure, should be performed first, followed by internal maneuvers such as internal rotation methods and posterior arm delivery. If these maneuvers have failed when the affected mother is in a lying position, she should be rotated to a 4-legged position. The last resort is more invasive procedures such as cleidotomy, symphysiotomy, and Zaravelli's maneuver[14].

The technique to perform, the McRoberts maneuver, consists of hyperflexing both maternal legs against the abdomen, with the aim of elevating the maternal buttocks, a midwife on each side, must use their hands to press the posterior thigh and push towards the maternal head, however, this procedure is difficult when the woman is obese due to the weight of the legs. The maneuver will be correctly performed

when there is an observable elevation of the maternal buttocks[14,15].

The suprapubic pressure technique (Rubin I) consists of the midwife exerting pressure on the suprapubic region with the heels of the hands intertwined, first using firm, constant pressure and, if unsuccessful, a rocking pressure to push the posterior aspect of the anterior shoulder in order to adduct it externally. In these cases, obesity plays a role against it, being less effective due to the poor transmission of force through the thick abdominal wall[14,16].

The Rubin maneuver (Rubin II, Rubin anterior), consists of vaginally inserting the midwife's hand or fingers under the pubic arch to the posterior aspect of the anterior shoulder to adduce it, it may be difficult to insert the midwife's hand or fingers under the pubic arch, which is limited by its bone structure[14,17].

To perform the wood screw technique, the entire hand must be inserted, as if inserting the blade of a forceps, into the posterolateral aspect of the maternal pelvis and deep enough to press evenly on the anterior thorax[18].

When only 2 fingers are inserted, they can only reach and press on the collarbone, increasing the risk of clavicular fractures. In the inverted Woods screw technique, the midwife inserts a hand into the posterior aspect of the posterior shoulder and exerts a rotational force, this technique is not feasible if the posterior shoulder is stuck at a higher level. The technique of posterior arm delivery consists of the midwife's hand being passed through the vagina in front of the fetus's breast, along the posterior arm to the forearm, and then the posterior forearm is removed in front of the breast[14,19].

4-legged position (Gaskin maneuver): consists of the woman in labor lying on her stomach and resting on her knees and her hands or forearms; requires additional traction of the fetal neck or internal maneuvers[14,20].

Posterior axillary traction, in this maneuver, the midwife's fingers form a clamp in the posterior armpit to pull it down and rotate the shoulder[14].

Traction With a posterior axillary sling, the midwife uses a rubber catheter or gauze tape to form a sling under the posterior armpit to pull. A non-elastic but sturdy tape gauze is preferred over an elastic rubber catheter for effective traction, when the posterior armpit is obstructed at a higher level, long right-angled forceps can be used to reach the armpit and facilitate sling formation[14].

Among the invasive methods, there is in the first instance the cleidotomy, the midwife intentionally breaks the clavicle by exerting direct upward pressure at its midpoint or pulling its anterior part outwards. Direct inward compression on the clavicle should be avoided to minimize injury to adjacent vascular structures[14].

Zavanelli's maneuver; It consists of placing the fetal head back into the vagina in reverse, first turning the head to its pre-replacement position, then gently flexing and applying constant pressure to put it back in the vagina requires general or regional anesthesia to perform it. Abdominal rescue technique, the anterior and posterior shoulder are manually rotated and disimpacted through the hysterotomy wound, it is only required in cases where the posterior shoulder is trapped above the sacral promontory and general or regional anesthesia is necessary[14].

The objective was to describe SD and the most important maneuvers frequent obstetrics that requires evaluation and care.

Material and methods

Eligibility criteria. For the review, 43 scientific articles were taken into consideration, mostly publications from the last 5 years on the research topic and others taken from more than 10 years ago with very relevant information.

Inclusion criteria. i) The selected articles were in

Spanish and English with the theme SD. One of the complications in obstetrics that requires evaluation and attention. ii) Articles with the terms were searched; Fetal SD, SD, shoulder fractures, dystocia. *Exclusion criteria.* i) Inconclusive studies with incomplete or unavailable data were excluded. ii) Articles referring to other topics in obstetrics.

Sources of Information. A structured review of the literature was carried out, articles were chosen, in databases such as PubMed, SciELO, Epistemonikos, observational studies, literature reviews, systematic reviews, clinical trials and recommendations on the research topic were used.

Results

Downward traction should not be exerted on the head immediately because it can interfere with shoulder rotation at entry and contribute to iatrogenic SD[4].

The most important risk factor for recurrent SD is an increase in birth weight, followed by prolongation of the second stage of labor, instrumental delivery, maternal diabetes, increased maternal body mass index (BMI), and severe neonatal morbidity[13].

Like the McRoberts maneuver, the Gaskin maneuver is just a repositioning of the mother in labor and still more fetal traction or internal manipulation is needed to achieve delivery. Several points should be taken into account after a patient assumes the four-legged position. *First*, care when applying downward traction to the now anterior shoulder (the original posterior shoulder) because it poses a risk of brachial plexus injury. If the brachial plexus on the other side (the original anterior shoulder) was injured when the mother was in the McRoberts position, it can lead to bilateral brachial plexus injury. *Second*, the midwife's hand must still be inserted through the more spacious lateral sacral sides of the maternal pelvis, which would now be in the positions of 1 to 2 o'clock or 10 to 11 o'clock. *Third*, the direction of the fetus's face is also reversed. The midwife should switch to the other hand depending on the direction in which the fetus is oriented for internal rotation or delivery with the posterior arm[14].

In cases of SD, because it is an instance of high maternal-fetal morbidity and mortality and because it is rare, teaching with simulation and virtual reality is very useful, improving the skills of physicians in training to improve scores in complicated delivery care[21-23].

A study revealed that women with SD are susceptible to severe pain, associated with a higher rate of bleeding, tears, and the need for emergency cesarean section and hysterectomy with statistical significance[24].

A randomized controlled study evaluated the percentage of SD in patients with gestational diabetes who had expectant delivery or induction of labor, 1.9 % of neonatal complications[25].

In the United States, a 4-year retrospective study between 2016 and 2019, SD presented a 17 % increase in a population of 9 913 838 births, the study reported SD in 228 120 births (23.0 per 1000), among the most important risk factors reported; diabetes mellitus, and the gestational age of the mother[26].

In a retrospective cohort study, the relationship between dystocic vaginal deliveries and increased maternal BMI, overweight or obesity, associated with the development of brachial plexus palsy, in cases of obesity, the performance of obstetric maneuvers such as McRoberts[27].

In a study conducted between January 1, 2016 and December 31, 2019, cases of complicated deliveries with SD were identified in 11 Houston hospitals, only 6.8 % had brachial plexus palsy[28].

Neonatal consequences can be serious if they are not resolved in a timely manner, due to complicated delivery they may present neonatal encephalopathy, ne-

onatal death, intrauterine fetal death, head trauma, spinal trauma[29].

A retrospective cohort study reported a 5.7 % de crease in brachial plexus injury in multiparous women, because the greater the parity, the lower the risk, however, women with a history of SD and brachial plexus injury in previous deliveries also had a 5-fold increase in the risk of complication[30].

In Finland, an increase in the incidence of SD was observed by 0.18 %, whose risk factors included; instrumental vaginal delivery, maternal diabetes, BMI ≥25, age over 40 years and ≥41 weeks of gestation[31].

In Scandinavia, a study was collected among all deliveries in the Helsinki Hospital District and Uusimaa between 2006 and 2015 and reported 537 cases of SD, noting that the risk of brachial plexus palsy increased when none of the four obstetric maneuvers were performed, such as McRoberts, suprapubic pressure, rotational maneuvers, delivery of the posterior arm[32].

It should be noted that, although there are predisposing risk factors, most cases of dystocia occur without warning[33].

In a study that evaluated the results associated with the implementation of simulation exercises to reduce the sequelae of SD. They concluded that the SD intervention reduced the rate of neonatal brachial plexus palsy in SD cases; increasing the diagnosis of SD and the rate of cesarean deliveries[34].

The "reverse shoehorn" technique is a novel manual technique that involves the doctor sliding the first 2 fingers of the hand between the back of the affected anterior fetal shoulder and the lower part of the pubic symphysis. The patient is asked to push with maximum force. The fetus's anterior shoulder should slide under the pubic symphysis along the guide table generated by the physician's fingers[35].

A randomized study of 522 women in whom obstetric pushing maneuver underwent a decrease in the risk of developing SD (1.5 %) compared to 523 women with standard delivery care (3.8 %)[36].

In obese women with a BMI > of 30 kg m^{-2} and diabetes mellitus, an adverse perinatal outcome is SD, however, in a study conducted in 913 patients, 5 % had no risk factors, 52 % had 1, 33 % had 2 and 10 % had ≥3 risk factors, which was significantly associated with SD.

According to the American Diabetes Association, there is a direct association between glucose levels, the oral glucose tolerance test and complications that include SD, because it is necessary to monitor glucose during pregnancy to avoid complications. To prevent SD in pregnancies with diabetes and estimated fetal weight > 4500 g or in those without diabetes and weighing > 5000 g, cesarean section should be performed[37-40].

An observational study in 39 adolescents with obstetric complications: 10.3 % of cases had SD and tears in the second stage of labour[41].

Zavanelli's maneuver is performed as a last resort when internal and external maneuvers have failed[1,2].

SD is unpredictable, because a woman without any risk factor can present it and fetal biometry does not reliably predict it, SD prediction methods have been shown to be clinically inefficient[42].

In a population-based registry study that included babies born vaginally, singleton and cephalic births, between 1997 and 2019, in Sweden, they compared changes in the incidence rates of brachial plexus palsy (BPP) and obtained as results that the incidence of PPB in babies born vaginally in cephalic presentation decreased from 3.1 per 1000 births in 1997 to 1.0 per 1000 births in 2019. In contrast, the incidence of DHF increased from 2.0 per 1000 in 1997 to 3.3 per 1000 in 2019. Over time, the proportion of women with a BMI greater than 30 kg m^{-2} increased 14.5 %

in 2019 compared to 8.0 % in 1997, more women had labor induction 20.5 % in 2019 compared to 8.6 % in 1997 and epidural analgesia 41.2 % in 2019 compared to (29.0 % in 1997)[43].

Conclusion

SD is one of the most unexpected obstetric complications and with the highest fetal morbidity, for this the obstetrician-gynecologist must be prepared, because, if the external and internal maneuvers necessary for its resolution are not performed, very serious complications such as fetal death, PPB, fetal hypoxia and cognitive development disorders can arise that would affect child development in the future. It is also worth emphasizing maternal complications such as fourth-degree perineal tears that can later lead to fecal or urinary incontinence, it is important to mention hemorrhages with the need for emergency cesarean sections, which may even lead to the need for a hysterectomy. For all of the above, it is necessary for the obstetrician to know and master the main current techniques to resolve a case of dystocia that can occur in any pregnant woman and not only in those who have some risk factor.

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Conflicts of interest

The authors declare that they have no conflict of interest.

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Ethical considerations

All participants as authors of the review contributed to the research in a free way to propose, execute or present the data and were supervised by an external reviewer who is not listed among the authors of the article.

Limitations in research

A very limited topic because it is something infrequent.

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Not applicable.

Contribution of the authors in the article

The authors declare to have contributed to the original idea (*Maria Calderón*), study design (*Humberto Campoverde*, *Paulina Cerezo*, *Ingrid Carranza*, *Alyson Triana*), data collection (*Paulina Cerezo*, *Alyson Triana*), data analysis (*Humberto Campoverde*, *María Calderón*, *Ingrid Carranza*), drafting and article writing (*María Calderón*, *Humberto Campoverde*, *Paulina Cerezo*, *Ingrid Carranza*, *Alyson Triana*).

Use of artificial intelligence

We assume that the entire document was written based on ethical and professional criteria, and AI was not used to make the text.

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