

The Zavanelli maneuver in two cases of shoulder dystocia

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Several reports describe the replacement of the partially delivered fetus into the vagina followed by Cesarean section after failed vaginal delivery. Undeliverable shoulder dystocia is by far the most common cause of failed vaginal delivery. The objective of this report was to review the safety and to reconsider when to perform the Zavanelli maneuver in the management of shoulder dystocia. We report two cases of severe shoulder dystocia in which commonly recommended therapeutic options failed. Cephalic replacement was performed with ease followed by Cesarean section. Endometritis was the maternal complication in both cases. Both infants had transient Erb's palsy. Although traditionally the Zavanelli maneuver is a method of last resort in the management of shoulder dystocia, consideration should be given to its use earlier in the treatment of obstructed vaginal delivery.

Key words: ZAVANELLI MANEUVER; SHOULDER DYSTOCIA

INTRODUCTION

The Zavanelli maneuver is the manual return into the vagina of a partially born but undeliverable fetus followed by Cesarean section. When applied to cephalic presentation, the first part of the maneuver consists of returning the head to the occipitoanterior or occipitoposterior position. The second step is to flex the head and gently push it back into the vagina, followed by Cesarean delivery. This maneuver was first described by Sandberg in 1985 and named 'Zavanelli' after the doctor who performed it for the first time in 1977¹. Many reports have appeared since the maneuver was first described, showing its efficacy not only in undeliverable shoulder dystocia cases²⁻⁴ but also in conjoined or locked twins⁵, sacrococcygeal teratoma⁶, gastroschisis⁷ and entrapment of the aftercoming head^{8,9}.

We report two cases in which the maneuver was performed for shoulder dystocia. Both infants had Erb's palsy that resolved without permanent disability. We review the methods used to resolve shoulder dystocia with emphasis on the applicability of the Zavanelli maneuver.

CASE REPORT 1

A 25-year-old woman, gravida 3, para 1-0-1-1, with type 2 diabetes for 2 years, presented in active labor, at 39 weeks' gestation. Her previous pregnancy had been uneventful

and had resulted in the vaginal delivery of a normal 7 lb 14 oz (3594 g) infant. During this pregnancy, her prenatal course was also unremarkable. She was 1.65 m in height and weighed 95 kg (BMI = 35 kg/m²). She gained 11 kg during this pregnancy. On admission, the cervix was 5 cm dilated and 80% effaced, and the vertex was at the -2 cm station. The fundal height was 46 cm and the estimated fetal weight by the Leopold maneuver was 10 lb (4535 g). Nonetheless, the managing physician thought that her pelvis was adequate for a trial of labor. After failure of adequate contractions to develop, the membranes were artificially ruptured and augmentation of labor was initiated with intravenous oxytocin. During labor, epidural anesthetic was given for pain management. The active phase of labor lasted 8 h with a deceleration phase of 4 h. Shoulder dystocia was anticipated based on the following risk factors: diabetes, obesity, multiparity, excessive fetal weight, prolonged deceleration phase and chorioamnionitis. The patient was transferred to the operating room. The managing obstetricians, anesthesiologists, pediatricians and nursing staff were present. Twenty minutes after the beginning of the second stage, the fetal head was delivered in an occipitoanterior position, over right mediolateral episiotomy, but the anterior shoulder could not be delivered. Commonly recommended

therapeutic options of relieving the shoulder dystocia such as suprapubic pressure, McRoberts maneuver, Woods corkscrew maneuver and posterior arm extraction all failed. After 2 min 20 s without success, cephalic replacement was attempted. The head was manually turned to the occipitoanterior position and flexed, and firm upward pressure was applied, resulting in a successful replacement of the fetal head into the vagina. Uterine relaxation was achieved with intravenous glyceryl trinitrate. While an attendant manually maintained the fetal head in the vagina, an emergency laparotomy with low-segment transverse uterine incision was performed under epidural anesthesia. A female infant, weighing 10 lb 10 oz (4997 g) was delivered 5 min after the cephalic replacement, with Apgar scores of 6, 7 and 7 at 1, 5 and 10 min, respectively. The infant was transferred to the neonatal intensive care unit for chest retractions and nasal flaring. She was also treated with antibiotics for suspected sepsis. The infant was discharged home on the 9th day of life with resolved Erb's palsy. The mother received antibiotics for chorioamnionitis and was discharged home on the 5th postoperative day.

CASE REPORT 2

A 22-year-old woman, gravida 1, para 0–0–0–0, was admitted in the latent phase of labor at 39 weeks' gestation after an uncomplicated prenatal course. She was 1.62 m tall and weighed 77 kg (BMI = 29 kg/m²). She gained approximately 16 kg during her pregnancy. The estimated fetal weight by the Leopold maneuver was 4 kg. The membranes were intact and the cervix was 4 cm dilated, 80% effaced and the vertex was at the –2 cm station. Amniotomy was performed revealing clear amniotic fluid and oxytocin augmentation was performed for inadequate contractions. Epidural anesthesia for pain relief was also given. The patient developed chorioamnionitis and was treated with broad-spectrum antibiotics. The active phase of labor lasted 9 h with a deceleration phase of 4 h. Shoulder dystocia was anticipated because of the following risk factors: obesity, suspected fetal macrosomia, prolonged deceleration phase and chorioamnionitis. The patient was taken to the operating room for vaginal delivery. After a second stage of 3 h with descent of the fetal head to the +3 cm station and reassuring fetal heart rate, vacuum extraction was performed because of poor maternal expulsive efforts. The fetal head was delivered over a four degree episiotomy, but it immediately retracted into the perineum. Suprapubic pressure, McRoberts maneuver, Woods corkscrew maneuver and delivery of the posterior arm were attempted without success. Four minutes after delivery of the head, the Zavanelli maneuver was performed and the head was easily replaced into the vagina. Uterine relaxation was obtained with intravenous glyceryl

trinitrate to facilitate the replacement. A Cesarean section was performed under epidural anesthesia. A female infant weighing 8 lb 14 oz (4043 g) was delivered by low-segment transverse Cesarean section 6 min after cephalic replacement, with Apgar scores of 5, 9 and 9 at 1, 5 and 10 min, respectively. The infant's hospital course in the neonatal intensive care unit was complicated by transient tachypnea of the newborn. She was discharged home on the 5th day of life with resolved Erb's palsy. The mother's postoperative course was uneventful. Antibiotic therapy for endomyometritis was continued for 2 days and the patient was discharged home on postoperative day 5.

DISCUSSION

Shoulder dystocia can lead to significant neonatal morbidity and/or mortality. It usually occurs with the biacromial diameter in the anteroposterior diameter of the pelvic inlet resulting in the impaction of the anterior fetal shoulder against the maternal pubic bone. It may also be defined as prolonged head-to-body delivery time of more than 60 s¹⁰. The incidence varies from 0.4% in primipara to 2% in multipara¹¹. Although shoulder dystocia cannot be predicted in all affected cases, there are certain risk factors that should raise the index of suspicion. The antepartum risk factors include diabetes, post-term delivery and excessive fetal or maternal weight³. Intrapartum risk factors are active-phase abnormalities, arrest disorders, protracted first and second stages of labor, as well as precipitous second stage of labor and mid-pelvic delivery.

Once shoulder dystocia is identified, the following order of procedures could help to resolve the problem:

- (1) Call for assistance;
- (2) Adequate episiotomy/adequate analgesia;
- (3) Suprapubic pressure;
- (4) Gentle traction downward;
- (5) McRoberts maneuver (flexing the mother's legs against her abdomen);
- (6) Woods corkscrew maneuver (progressively rotating the posterior shoulder 180° in a corkscrew fashion);
- (7) Delivery of the posterior shoulder by sweeping the posterior arm across the chest followed by delivery of the arm;
- (8) Deliberate fracture of the clavicle/humerus;
- (9) Zavanelli maneuver (cephalic replacement followed by Cesarean section);
- (10) O'Leary technique (abdominal rescue through hysterotomy to effect vaginal delivery);

- (11) Symphysiotomy (partial dissection of the symphysis after lateral displacement of the urethra);
- (12) The 'all-fours' maneuver (placing the patient on her hands and knees to allow rotation of the maternal pelvis with disimpaction of the anterior shoulder under the symphysis).

The replacement of the partially born fetus into the vagina can be applied to other situations that can cause entrapment of the fetus in the birth canal. For this reason, the Zavanelli maneuver has been adapted in the delivery of conjoined or locked twins⁵, fetuses with sacrococcygeal teratoma⁶, fetuses with gastroschisis⁷, or in breech presentations with an entrapped aftercoming head^{8,9}. In our Institution, Landy and co-workers first described, in 1994, the use of a vacuum extractor during abdominal rescue on a trapped aftercoming head¹².

Published experience with the Zavanelli maneuver mostly involves case reports and small case series. Since Sandberg's first report in 1985¹, 103 cases have been reported in the literature. Although most authors have described the procedure as easy with favorable neonatal outcome^{1,6,13,14}, others have reported that it is difficult^{2,15} or have reported failed cases requiring symphysiotomy for vaginal delivery¹⁶. Authors who found the Zavanelli maneuver difficult suggested that it could be applied in those circumstances of obstructed delivery when fetal death seems certain. In their opinion, it should be used for shoulder dystocia only after conventional maneuvers have been attempted.

On the other hand, Sandberg recommended the use of the Zavanelli maneuver earlier in the management of shoulder dystocia and, on occasion, even primary use in case of head entrapment or severe shoulder dystocia. In his review, Sandberg found a 92% success rate of the Zavanelli maneuver for cephalic replacement, and a 100% success rate for podalic replacement. There were no maternal deaths or fetal injuries ascribed to the maneuver and the existent newborn injuries appeared to be due to pre-Zavanelli manipulations^{6,17}. When exteriorized fetal parts were returned to the uterus in 4 min, Apgar scores were good even after 5–70 min of re-interiorization before Cesarean section delivery¹⁷.

Congenital brachial plexus palsy is a recognized serious complication associated with shoulder dystocia. Most cases resolve without permanent disability. Reports indicate that between 9% and 25% of brachial plexus injuries persist^{18,19}. Fewer than 10% of all shoulder dystocia cases result in persistent brachial plexus injury^{18,19}. Erb's palsy results from injury to the spinal nerves C5–C6 and sometimes C7. The timing and etiology of this injury remain controversial. When found after a shoulder dystocia event, its occurrence is presumed to be related to iatrogenic trauma despite a paucity of objective clinical evidence. However,

recent reports have documented cases of brachial plexus injury unrelated to birth trauma and at birth weights less than 4000 g²⁰.

Jenett and associates²¹ and Gherman and associates²² have presented evidence that brachial plexus injuries may precede the delivery itself and may occur even prior to labor. Gonik and co-workers²³ reported that neonatal brachial plexus injury was not explained by iatrogenically induced excessive traction. Spontaneous endogenous forces (uterine and maternal expulsive efforts) may contribute substantially to this type of neonatal trauma. Using a mathematical model, the authors estimated the compressive pressure on the fetal neck by the symphysis pubis during a shoulder dystocia event. The estimated pressures from endogenous forces were 4–9 times greater than the value calculated for clinician-applied forces. Acher and colleagues²⁴ reported that Erb's palsy was associated with rapid deliveries and forceful expulsive efforts, in a third of cases. More scientific studies are needed to achieve better definition of the factors leading to brachial plexus injuries.

In managing pregnant women with multiple risk factors for shoulder dystocia, Cesarean delivery may be offered to the patient. However, most cases of shoulder dystocia are not predictable. When one is faced with an undeliverable fetus, the Zavanelli maneuver allows one to rescue the partially born fetus by Cesarean delivery. In the two cases presented here, we found that the cephalic replacement allowed us to perform a Cesarean section, thereby preventing a more traumatic vaginal delivery.

The incidence of undeliverable shoulder dystocia is so rare that it is unlikely that a randomized study could be performed to explore at which point the Zavanelli maneuver should be undertaken. It appears that, in most cases, the Zavanelli maneuver can be performed with ease. For that reason, one ought to consider performing this procedure before other maneuvers that are associated with an increased rate of fetal injury¹⁹. Since a randomized controlled study is unlikely, our two cases further support the safety of the Zavanelli maneuver in undeliverable shoulder dystocia.

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