

## Association between Shoulder Dystocia Maneuvers and Cervical Laceration Requiring Repair

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### Abstract

**Objective:** To determine if there is an association between shoulder dystocia maneuvers (SDM) and cervical laceration requiring repair (CLRR).

**Study design:** Retrospective cohort study in a single university-affiliated community hospital for term singleton vertex vaginal deliveries from 7/1/05-7/24/13. Data were analyzed by two-tailed exact mid-p test and risk ratio.

**Results:** A total of 391 from 7,153 (5.5%) term singleton vertex vaginal deliveries required SDM. A total of 27 (0.38%) cervical lacerations were identified, 22 (81%) of which were repaired. Four of 391 patients (1.0%) with SDM had CLRR compared to 18 of 6,757 patients (0.3%) without SDM ( $p=0.035$ ). The RR for CLRR with SDM was 3.84 (95% CI: 1.3-11.5). There was no statistical difference ( $p=0.36$ ) in delivery of the posterior arm with the incidence of cervical laceration requiring repair.

**Conclusion:** SDM were significantly associated with CLRR. Cervical laceration may be an infrequent, but unavoidable consequence of SDM; however, this association may also reflect common risk factors between shoulder dystocia and cervical laceration.

**Keywords:** Cervical laceration; Shoulder dystocia; Maternal comorbidity

### Introduction

Shoulder dystocia is a serious complication during childbirth and is accompanied by severe morbidity for the newborn as well as the parturient. There is an increasing trend of occurrence of shoulder dystocia which might be related to increasing birth weight [1,2] or increased recognition and better documentation. Several definitions for shoulder dystocia have been proposed: The need for additional maneuvers like supra pubic pressure [3], McRoberts or Woods corkscrew maneuver as well as delivery of the posterior shoulder have been suggested as management well as definition for shoulder dystocia. Lately the time from delivery of the head to the time of delivery of the shoulders has been introduced into the definition. Spong et al. advocate a head to body delivery time exceeding 60 seconds to be used to define shoulder dystocia. Known newborn consequences of shoulder dystocia can include Erbs' palsy, clavicular/humeral fractures or asphyxia related morbidities and death [4]. Adverse outcomes for the maternal side are primarily related to lacerations, either spontaneous or iatrogenic as attempts are made to expand the space needed to effect delivery.

The American Congress of Obstetricians and Gynecologists (ACOG) offers no recommendations on order preference for manipulations to relieve a shoulder dystocia [5]. Limited knowledge is available about the potential maternal consequences related to shoulder dystocia maneuvers and no studies are available stating preferred maneuvers to limit maternal morbidity. This study hypothesized that cervical laceration is more common when shoulder dystocia is encountered and when the posterior shoulder is attempted to be delivered.

### Methods

This retrospective cohort study was done using an electronic database of a single university-affiliated community hospital for term singleton vertex vaginal deliveries from 7/1/05-7/24/13. The dates of the review are related to the introduction of the electronic medical record (EMR). Inclusion criteria were singleton vertex term deliveries,

excluded were preterm, twin or triplets gestations, incomplete medical documentation or postpartum admission. Shoulder dystocia was defined as every vaginal birth in which additional maneuvers were required to deliver the shoulders of the neonate [6]. When a shoulder dystocia is diagnosed, a registered nurse (RN) records the time and, as soon as the body is delivered, the end-time is noted by the same RN. A standard shoulder dystocia form in the EMR prompts the physician to identify which maneuvers were employed and in what sequence. The choice and order of the maneuvers was determined by the attending physician.

All term singleton vertex vaginal deliveries complicated by either shoulder dystocia requiring maneuvers (SDM), cervical laceration requiring repair (CLRR) for hemostasis or reconstruction of the cervix, were identified for this study. Cases with a SDM and CLRR were further evaluated by age, parity, neonatal weight, Apgars, pH and base excess of the cord blood and complications. Lastly, the shoulder dystocia maneuvers were recorded. Data were analyzed by two-tailed exact mid-p test and risk ratio (RR) using OpenEpi [7].

IRB approval was granted for this study before data collection and analysis.

### Results

During the study time period, 391 of 7,153 (5.5%) deliveries

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required shoulder dystocia maneuvers (SDM). In addition, a total of 27 (0.38%) cervical lacerations were identified, 22 (81%) of which were repaired (Table 1). Four of 391 patients (1.0%) with SDM had CLRR compared to 18 of 6,757 patients (0.3%) without SDM ( $p=0.035$ ). The relative risk (RR) for CLRR with SDM was 3.84 (95% CI:1.3-11.5).

Four patients had a SDM and CLRR, in three patients the posterior arm was used to release the shoulder dystocia (Table 2). There was no statistical difference ( $p=0.36$ ) in delivery of the posterior arm with the incidence of cervical laceration requiring repair (Table 2).

Based on the prevalence of the exposure (posterior arm maneuver) and the outcome (CLRR) in the presented data, the required sample size to detect difference with a two sided significant level of 95% and power of 80% is 2816 [8].

All four of the patients with both SDM and CLRR had vaginal deliveries. McRobert's was performed on all of the patient (Table 3). Three of the four patients also had the posterior arm delivered as a maneuver, and suprapubic pressure was performed for two. One patient had an anterior arm maneuver performed. Birth weight ranged from 3770 to 4365 grams with a mean of 4128 grams.

Patient 1 was a 32 y/o P1011 at 41 weeks in spontaneous labor who had previously undergone a cesarean delivery for arrest of dilatation at 6 cm and elected for a TOLAC. She progressed to full dilatation without augmentation, her membranes were artificially ruptured and amniotic fluid was stained with meconium. McRoberts maneuver was required to effect delivery of a 4080 gram neonate with Apgar scores of 1/6/9 and umbilical artery cord pH 7.18 with base excess -3. Her cervical laceration required repair in the OR and she had a total estimated blood loss of 1500 cc.

Patient 2 was a 28 y/o P1001 at a gestational age of 39 weeks and 4 days who came in with decreased fetal movement and a reassuring but non-reactive strip with irregular contractions. She had had a prior vacuum-assisted vaginal delivery of a 3680 gram neonate. Her cervix was 5/50/-4, and she needed to be augmented for further progress. She developed meconium-stained amniotic fluid and chorioamnionitis which was treated with IV antibiotics and progressed to fully dilated. Her shoulder dystocia was released with McRoberts, suprapubic pressure, anterior Ruben's maneuver and posterior shoulder delivery. The neonate had a birth weight of 4365 grams with Apgar scores of 2/5/7, and a pH of 7.22 with Base Excess of -11. The cervical laceration was repaired in the labor suite, and the patient had a total of 350 cc of blood loss.

Patient 3 was a 27 y/o P2002 at 40 weeks who came in with spontaneous ruptured membranes for clear fluid. She had had a prior spontaneous vaginal delivery and thereafter a C-section for breech presentation. This pregnancy was notable for a mild gestational thrombocytopenia of 117 at its nadir. She was admitted with a cervical exam of 1/50/-4 and started on Pitocin; once she reached 6 cm she precipitously progressed to fully dilated in 10 minutes and quickly delivered the fetal head. McRoberts, supra-pubic pressure and the posterior arm maneuver resulted in delivery of a neonate with a birth weight of 3770 grams and Apgar scores of 9/9 with a pH of 7.23 and a BE of -4. She had an extensive cervical laceration necessitating

	Cervical laceration requiring repair	No cervical laceration	Relative Risk
Shoulder dystocia	4	387	3.84
No shoulder dystocia	18	6739	reference

Table 1: Correlation between Shoulder Dystocia and Cervical Laceration Requiring Repair ( $p=0.035$ ).

	Cervical laceration requiring repair	No cervical laceration requiring repair	Relative Risk
Posterior arm maneuver	3	190	NS
No Posterior arm maneuver	1	197	reference

Table 2: Posterior arm delivery and cervical laceration requiring repair in the group of shoulder dystocia, N = 391.

	Age	Parity	Birth weight	SDM performed	Head to body interval	Maternal intervention	Estimated Blood loss
Patient 1	32	1011	4080 g	McRobert's	70 seconds	Cervical laceration repair in the OR	1500
Patient 2	28	1001	4365 g	McRobert's, suprapubic pressure, anterior Rubin's, posterior shoulder	40 seconds	Cervical Laceration repair in Labor room	350
Patient 3	37	2002	4295 g	McRobert's, suprapubic pressure, posterior arm	10 seconds	Hysterectomy for uncontrolled hemorrhage & blood transfusion	2200
Patient 4	28	1001	3770 g	McRobert's, posterior arm	101 seconds	Cervical laceration repair in the OR & blood transfusion	1500

Table 3: Characteristics of patients with a Shoulder Dystocia and Cervical Laceration Requiring Repair.

exploratory laparotomy with hysterectomy secondary to a hemorrhage of 2200 cc, requiring blood products.

Patient 4 was a 28 y/o P1001 at 40 weeks and 4 days admitted in labor with cervical dilatation of 6.5/100/-1. She had had a prior spontaneous vaginal delivery and her comorbidity was significant for morbid obesity (BMI 43). She progressed spontaneously and delivered the fetal head without difficulty. McRoberts, suprapubic pressure and the delivery of the posterior shoulder were required for release of the body after head delivery. The neonate had a birth weight of 4295 grams and Apgar scores of 1 and 9 with pH of 7.35 and BE of 1. Her cervical laceration was repaired in the OR. She had an estimated blood loss of 1500 cc and required a blood transfusion.

## Discussion

Most research in shoulder dystocia has focused on adverse events in the neonate [6,9,10]. In this retrospective analysis of shoulder dystocia our focus was on maternal side effects of a shoulder dystocia and the association between a shoulder dystocia and cervical laceration requiring repair was again conformed; however we did not find an association with a cervical laceration requiring a repair and a posterior arm delivery with a shoulder dystocia.

The four case reports described in the results have antepartum risk factors for shoulder dystocia and associated comorbidities. For case 1, 2 and 3 the neonatal birth weights were above 4000 gram, augmentation of labor was required in case 2 and 3 and the rapid second stage of labor in case 3 predisposed this individual for a shoulder dystocia. Lastly the obesity of the last patient increased her risks of dystocia. These risk factors are very common in the studied population. Awareness, training and team communication is proven to be beneficial in the final outcome after an encountered shoulder dystocia [11]. The presented

cases underline the importance for regular multidisciplinary training drills.

Although the association of shoulder dystocia with cervical laceration is already known [12]; these results prompt the obstetrician to carefully inspect the cervix after every delivery complicated by a shoulder dystocia regardless of the maneuvers applied to deliver the neonate's body.

Our 5.5% incidence of shoulder dystocia is higher than the range of 0.6-1.4% found in the literature [5]. This may be due to our definition of shoulder dystocia, which included any maneuvers other than standard downward traction, and an electronic record which prompts the physician to list all maneuvers performed. Furthermore we had a rate of 0.38% of cervical lacerations identified compared to the literature of 1.1%, which was after excluding the deliveries complicated with a shoulder dystocia [13]. This can be related to the fact that the analysis was done on data from an academic teaching hospital. Possibly residents keep stricter to the definition of shoulder dystocia and cervical lacerations or are more likely to overcall these morbidities. Cervical lacerations are most likely more common than identified however cervical lacerations which don't require repair are not clinically relevant and where therefore excluded by our analysis. A cervical laceration may be an infrequent, but unavoidable consequence of shoulder dystocia maneuvers, or might reflect common risk factors between shoulder dystocia and cervical laceration [12].

The maneuvers and it's mechanism of those maneuvers applied during the encounter of a shoulder dystocia are available in the literature [11]. As noted in Table 2, McRoberts was applied in all 4 cases, followed by suprapubic pressure application. These maneuvers are straightforward maneuvers, easy applied and recognizable by the supervising attending during the case. Internal maneuvers (Rubins, posterior shoulder/arm delivery) are more difficult to recognize as a bystander and need to be identified by the provider who is actively doing the maneuvers. Since the database for this study is from a university-affiliated community hospital with residents performing practically all the deliveries, it is depending on the level of the resident whether all maneuvers were correctly identified and noted in the delivery summary. Therefore under recognition of these maneuvers might influence our study.

That being said, the major limitation of our study was the relatively small number of shoulder dystocia's and cervical lacerations requiring repair. The non-significant relation between de posterior arm delivery

and cervical laceration requiring repair and might therefore be prone to a type II error. As mentioned in the results a sample size of at least 2816 shoulder dystocia's are needed to detect significance, whereas this cohort only 391 shoulder dystocia's were encountered. Based on this preliminary data and although increasing number of shoulder dystocia's but still relatively rare event in relation with cervical laceration requiring repair, this correlation should be investigated in national databases.

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