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Effectiveness of combined obstetric maneuvers and instrumental assist techniques in the management of shoulder dystocia: a systematic review of maternal-fetal outcomes and associated complications

Eficacia de las maniobras obstétricas combinadas y técnicas de asistencia instrumental en el manejo de distocias de hombros: una revisión sistemática de resultados materno-fetales y complicaciones asociadas

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ABSTRACT

Shoulder dystocia is a rare but serious obstetric emergency associated with significant maternal and neonatal morbidity. Although various maneuvers such as the McRoberts position, suprapubic pressure, and rotational techniques are established first-line interventions, recent studies suggest that combined maneuvers and instrumental assist techniques may improve outcomes. However, their effectiveness and associated complications remain debated. This review aims to evaluate the effectiveness of combined obstetric maneuvers and instrumental assist techniques in the management of shoulder dystocia, with a focus on maternal-fetal outcomes and complications. A narrative review is conducted using recent literature from PubMed, ScienceDirect, Google Scholar, and the Cochrane Library. Studies assessing maternal and neonatal outcomes following combined maneuvers (e.g., McRoberts with suprapubic pressure, posterior arm delivery with rotational techniques) and instrumental assists (vacuum extraction, forceps) were included. Key outcomes analyzed were delivery success, maternal morbidity, neonatal injury, and complication rates. Evidence shows McRoberts with or without suprapubic pressure resolves only 25.8% of shoulder dystocia cases, highlighting limited standalone efficacy. Posterior arm delivery demonstrates the highest success rate (86.1%), surpassing rotational maneuvers (62.4%) and external methods (56%), with computational models confirming reduced brachial plexus strain. Instrumental assists carry trade-offs: vacuum increases shoulder dystocia risk (OR ~2.9), while forceps achieve higher success but with greater maternal trauma (33.8% severe lacerations). Sequential vacuum–forceps use markedly elevates neonatal morbidity (RR 3.9 intracranial hemorrhage). Newer strategies like posterior axilla sling traction (success 18/19 cases) and safety bundles significantly reduce neonatal trauma and NICU admissions. Combined obstetric maneuvers are generally safe and effective in resolving shoulder dystocia, reducing both delivery time and neonatal hypoxia. Instrumental assists should be reserved for refractory cases due to their higher complication rates. Standardized protocols and multicenter prospective studies are needed to optimize decision-making, minimize risks, and improve maternal-fetal outcomes in shoulder dystocia management.

Keywords: Shoulder dystocia, Obstetric maneuvers, Instrumental delivery, Maternal outcomes, Neonatal outcomes, Brachial plexus injury.

RESUMEN

La distocia de hombros es una emergencia obstétrica poco frecuente pero grave, asociada a una morbilidad materna y neonatal significativa. Aunque diversas maniobras, como la posición de McRoberts, la presión suprapúbica y las técnicas rotacionales, son intervenciones de primera línea establecidas, estudios recientes sugieren que las maniobras combinadas y las técnicas de asistencia instrumental pueden mejorar los resultados. Sin embargo, su eficacia y las complicaciones asociadas siguen siendo objeto de debate. Esta revisión tiene como objetivo evaluar la eficacia de las maniobras obstétricas combinadas y las técnicas de asistencia instrumental en el tratamiento de la distocia de hombros, centrándose en los resultados y las complicaciones materno-fetales. Se realiza una revisión narrativa utilizando bibliografía reciente de PubMed, ScienceDirect, Google Scholar y la Biblioteca Cochrane. Se incluyeron estudios que evaluaban los resultados maternos y neonatales tras maniobras combinadas (por ejemplo, McRoberts con presión suprapúbica, extracción del brazo posterior con técnicas rotacionales) y asistencia instrumental (extracción con ventosa, fórceps). Los resultados clave analizados fueron el éxito del parto, la morbilidad materna, las lesiones neonatales y las tasas de complicaciones. Las pruebas demuestran que la maniobra de McRoberts, con o sin presión suprapúbica, solo resuelve el 25,8 % de los casos de distocia de hombros, lo que pone de relieve su limitada eficacia por sí sola. El parto con brazo posterior presenta la tasa de éxito más alta (86,1 %), superando a las maniobras rotacionales (62,4 %) y a los métodos externos (56 %), y los modelos computacionales confirman una reducción de la tensión del plexo braquial. Las asistencias instrumentales conllevan ventajas e inconvenientes: El uso de ventosas aumenta el riesgo de distocia de hombros (OR ~2,9), mientras que el uso de fórceps logra un mayor éxito, pero con un mayor traumatismo materno (33,8 % de laceraciones graves). El uso secuencial de ventosas y fórceps eleva notablemente la morbilidad neonatal (RR 3,9 de hemorragia intracraneal). Las estrategias más recientes, como la tracción con cabestrillo axilar posterior (éxito en 18/19 casos) y los paquetes de seguridad, reducen significativamente el traumatismo neonatal y los ingresos en la UCIN. Las maniobras obstétricas combinadas son generalmente seguras y eficaces para resolver la distocia de hombros, reduciendo tanto el tiempo de parto como la hipoxia neonatal. Las asistencias instrumentales deben reservarse para los casos refractarios debido a sus mayores tasas de complicaciones. Se necesitan protocolos estandarizados y estudios prospectivos multicéntricos para optimizar la toma de decisiones, minimizar los riesgos y mejorar los resultados materno-fetales en el tratamiento de la distocia de hombros.

Palabras clave: Distocia de hombros, Maniobras obstétricas, Parto instrumental, Resultados maternos, Resultados neonatales, Lesión del plexo braquial.

INTRODUCTION

Shoulder dystocia is a complication of vaginal delivery that occurs when the anterior fetal shoulder becomes impacted behind the maternal pubic symphysis. Less commonly, it occurs when the posterior shoulder becomes lodged behind the maternal sacral promontory (Davis et al., 2023). It is typically characterized by failure to deliver the fetal shoulders using the usual gentle downward traction and the need for additional obstetric maneuvers to deliver the infant successfully(Stitely & Gherman, 2014).Shoulder dystocia is thought to occur in approximately 0.2% to 3% of all vaginal deliveries in which the fetus is in a vertex presentation(Davis et al., 2023) (Stitely & Gherman, 2014). The incidence of shoulder dystocia increases as the size of the infant increases. The incidence of shoulder dystocia in deliveries with infants weighing <4,000 g is approximately 1%. However, for deliveries with infants weighing 4,000 to 4,500 g, this increases to about 5% to 9% and rises to approximately 14% to 23% for infants weighing more than 4,500 g (Menticoglou, 2018)(Tsikouras et al., 2024)(Sentilhes et al., 2015).

Shoulder dystocia occurs when the fetal shoulders fail to navigate smoothly through the maternal pelvis, typically due to a persistent anterior–posterior alignment or simultaneous descent of the shoulders at the pelvic inlet. The American College of Obstetricians and Gynecologists (ACOG) identifies three primary mechanisms underlying this complication: increased resistance between the vaginal walls and the fetus, as often seen in cases of fetal macrosomia; a disproportionately large fetal chest relative to the head, which is common among neonates of diabetic mothers; and rapid fetal descent during precipitous labor, which prevents proper rotation of the bisacromial diameter within the pelvis (Davis et al., 2023).

Given the potential for severe maternal and neonatal complications—ranging from brachial plexus injuries and bone fractures in newborns to maternal lacerations, postpartum hemorrhage, and even uterine rupture—timely and effective management is paramount (Tsikouras et al., 2024). The foundational approach involves external obstetric maneuvers such as the McRoberts maneuver (flexing maternal hips toward the chest), often combined with suprapubic pressure, which resolves up to 42% of cases when used alone (Gesner et al., 2024). These maneuvers are endorsed by major guidelines, including those published in NCBI-affiliated literature (Giouleka et al., 2024). When initial maneuvers fail, more complex techniques come into play, such as rotational maneuvers (e.g., Rubin II, Woods corkscrew) and internal methods like posterior arm delivery or axillary traction (Alves et al., 2022). Although randomized controlled trials are lacking, retrospective evidence suggests that posterior arm delivery may yield the highest success rates (86%) compared to rotational and external maneuvers (Lau et al., 2024). Additionally, combining maneuvers—for instance, McRoberts, suprapubic pressure, and posterior arm delivery—can achieve timely resolution in up to 95% of cases (Ashley Hill et al., 2020). Given the absence of high-level trials, the evolving evidence on the efficacy and safety of combined obstetric maneuvers and instrumental-assisted techniques merits a comprehensive narrative synthesis. This review aims to clarify their relative effectiveness, maternal and neonatal outcomes, and potential complications, thereby informing clinical decision-making and guiding best practices in managing this challenging obstetric emergency.

METHODOLOGY

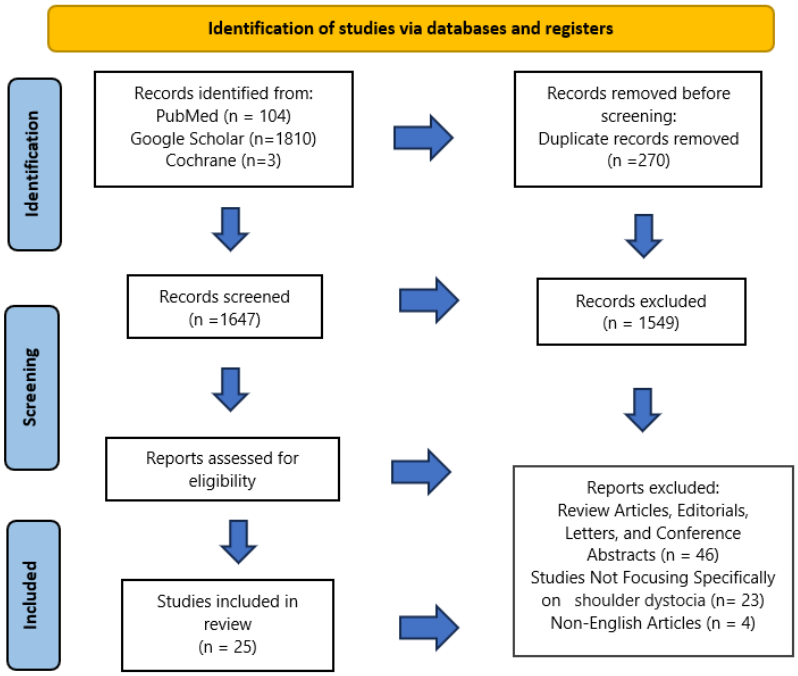
This narrative review adopts an integrative approach, systematically examining and synthesizing literature retrieved from PubMed, ScienceDirect, Google Scholar, and the Cochrane Library. The review framework was adapted from established methods in narrative and integrative reviews, modified to address the obstetric emergency of shoulder dystocia. The search process was conducted using specific keywords such as "shoulder dystocia," "combined obstetric maneuvers," "instrumental assist techniques," "vacuum," "forceps," "posterior arm delivery," "maternal outcomes," and "neonatal complications." Boolean operators (AND, OR) were applied to refine the search queries, ensuring that the most relevant and high-quality studies were included in the evidence base.

Inclusion and Exclusion Criteria

This review included peer-reviewed studies published upto 2025 that investigated obstetric maneuvers (e.g., McRoberts, suprapubic pressure, posterior arm delivery, rotational maneuvers) and/or instrumental assist techniques (vacuum, forceps, posterior axilla sling traction) in the management of shoulder dystocia. Eligible designs were randomized trials, cohort studies, case–control studies, systematic reviews, and meta-analyses reporting maternal and/or neonatal outcomes. Studies were excluded if they: (1) involved animal or simulation-only models without clinical correlation, (2) focused solely on cesarean or non-shoulder dystocia cases, (3) lacked outcome data, or (4) were non-English, conference abstracts, or opinion pieces. The initial database search retrieved 1917 studies, of which 98 were shortlisted after screening titles and abstracts for relevance. Following full-text review, 25 studies met all criteria and were included in the final synthesis.

Extracted data were organized thematically into effectiveness of combined maneuvers, instrumental assist techniques, maternal outcomes, neonatal outcomes, and reported complications.

Figure 1. SEQ Figure * ARABIC: Prima Flow Diagram



Source: the authors.

RESULTS

Effectiveness of Combined Obstetric Maneuvers

The effectiveness of combined obstetric maneuvers in resolving shoulder dystocia has been widely investigated, with particular attention given to the McRoberts maneuver, suprapubic pressure, posterior arm delivery, rotational techniques, and emerging adjunctive strategies such as posterior axilla sling traction (PAST).

McRoberts Maneuver with Suprapubic Pressure

A large cross-sectional study by Lok et al. (2016) examined 198 cases of shoulder dystocia and reported that McRoberts' maneuver with or without suprapubic pressure (M±S) was successful in only 25.8% of cases, highlighting that while McRoberts remains a first-line maneuver, its standalone effectiveness is limited (Lok et al., 2016). The study also identified that instrumental vaginal deliveries were strongly associated with failed M±S, suggesting that operators must be trained in alternative maneuvers when shoulder dystocia follows assisted delivery. This is consistent with the continuing education review by Gesner et al. (2024), which emphasized that while McRoberts is simple, it should not be relied upon exclusively, as subsequent traction on the fetal head increases the risk of brachial plexus injury (Gesner et al., 2024). The biomechanical underpinnings of these maneuvers have been clarified in computational modeling research. Iaconianni et al. (2024) simulated delivery maneuvers on maternal–neonate models and demonstrated that McRoberts alone modestly reduces brachial plexus (BP) strain, but the greatest reduction in both required delivery force and BP strain occurred with posterior arm delivery. Suprapubic pressure applied at higher force levels was also found to incrementally lower both maternal force requirements and neonatal BP loading (Iaconianni et al., 2024). These findings provide mechanistic support for prioritizing internal maneuvers when external methods fail.

Posterior Arm Delivery

Posterior arm delivery consistently demonstrates superior effectiveness In a critical appraisal by Lau et al. (2024), success rates across maneuvers were compared, showing that posterior arm delivery achieved 86.1% effectiveness, surpassing

rotational maneuvers (62.4%) and external maneuvers such as McRoberts or suprapubic pressure (56%). The authors stressed that posterior arm delivery and internal rotations are anatomically rational, aiming either to rotate the shoulders into a wider pelvic dimension or to reduce the bisacromial diameter (Lau et al., 2024). However, these maneuvers are technically demanding and may be perceived as riskier, though retrospective evidence suggests that higher injury rates are more likely due to delayed use after failed external methods rather than the maneuvers themselves (Lau et al., 2024). The integration of these findings into structured management strategies has been addressed by Menticoglou (2018), who emphasized that McRoberts and suprapubic pressure should be attempted first, but rapid progression to posterior shoulder traction or posterior arm delivery is crucial in refractory cases. The review underscored that prolonged reliance on external maneuvers not only prolongs delivery time but also heightens risks of hypoxia and brachial plexus injury (Menticoglou, 2018). Similarly, Alves et al. (2022) noted that simulation-based training improves clinicians' ability to transition promptly between maneuvers, reducing neonatal trauma and improving documentation practices (Alves et al., 2022).

Posterior Axilla Sling Traction (PAST)

As a rescue technique, PAST has shown promise in refractory cases. Newer adjunctive methods such as posterior axilla sling traction (PAST) have been described in case-based literature. A case review by Cluver and Hofmeyr (2015) reported 19 uses of PAST, achieving success in 18 cases, with delivery times under 3 minutes once the sling was applied (Cluver & Hofmeyr, 2015a). While humeral fractures and transient Erb's palsy occurred in a minority of cases, the technique was particularly valuable in severe impactions refractory to standard maneuvers. Importantly, PAST enabled a novel rotational method, facilitating shoulder rotation through 180 degrees in five cases, potentially reducing trauma when direct posterior arm delivery was not feasible. The comparative evidence supports a tiered approach where McRoberts and suprapubic pressure serve as initial, low-risk strategies, but posterior arm delivery and rotational maneuvers are often required for definitive resolution. Computational and clinical evidence converge to suggest that posterior arm delivery not only achieves higher success rates but also minimizes brachial plexus strain, particularly when implemented early. Moreover, rescue techniques such as PAST expand the armamentarium for intractable cases and warrant inclusion in advanced obstetric training. In summary, the literature indicates that while McRoberts and suprapubic pressure remain essential first-line interventions, their limited success necessitates readiness to escalate to internal maneuvers (Cluver & Hofmeyr, 2015b). Posterior arm delivery consistently demonstrates the highest effectiveness and safety profile, particularly when executed promptly and skillfully.

Role of Instrumental Assist Techniques

Operative vaginal delivery (OVD) requires careful selection of instruments to achieve vaginal birth while minimizing maternal and neonatal morbidity. Evidence consistently highlights the risks and benefits associated with vacuum-assisted delivery, forceps-assisted delivery, and sequential instrument use, emphasizing the need for structured protocols and clinical judgment.

Vacuum-Assisted Delivery

Vacuum-assisted delivery is widely used for second-stage labor assistance. Meta-analytic evidence indicates that vacuum delivery significantly increases the risk of shoulder dystocia compared with spontaneous vaginal birth (OR ~2.9) but shows no significant difference when compared with forceps (Dall'Asta et al., 2016). Population-based studies, including Zhang et al. (2023), report that vacuum extraction is associated with higher rates of neonatal cephalohematoma, though severe outcomes such as NICU admissions remain low and are not directly attributable to instrument type. Vacuum extraction is generally associated with lower maternal trauma than forceps, particularly in terms of perineal injury and pelvic floor complications (Zhang et al., 2023).

Forceps-Assisted Delivery

Forceps have long been regarded as the most effective tool in delivery of vaginal birth. Systematic reviews, such as Verma et al. (2021), allude to the likelihood of successful delivery when forceps are used but at a cost of maternal morbidity, especially severe perineal trauma, escalated pain, and a broader use of analgesia. As expressed in cohort studies, neonatal trauma can be less massive as it is at vacuum, although a significant risk was noted in the maternal aspect, which points to the trade-off between efficacy and safety (Verma et al., 2021).

Sequential Instrument Use

Sequential vacuum and forceps use is associated with the greatest risk of both maternal and neonatal. Fong et al. (2014) and Gardella et al. (2001) indicated that a combination of instruments drastically elevates maternal complications including third- and fourth-degree tears, postpartum hemorrhage, and failure of operation. Neonatal hazards, such as that of brachial plexus injury, intracranial hemorrhage and seizures also augment beyond the cumulative impacts of individual equipment (Fong et al., 2014)(Gardella et al., 2001). Sequential instrumentation is therefore highly not recommended with the exception of a few cases. Structured safety practices and device-specific advances are backed by recent evidence. Wang et al. (2024) showed that the Kiwi OmniCup minimized that there were low incidences of severe neonatal morbidity relative to forceps (27.2% vs. 42.3%), with no increment of maternal complications (Wang et al., 2024). Similarly, implementation of a safety bundle, including intrapartum ultrasound, structured time-outs, and postnatal debrief pathways, has been shown to reduce failed OVD attempts (6.3% vs. 8.3%) and severe neonatal trauma (1.3% vs. 2.5%) while lowering NICU admissions (1.8% vs. 2.7%) (Skinner et al., 2025). Overall, vacuum-assisted delivery has minimal maternal trauma with neonatal risks occurring on the scalp, forceps have excellent outcomes at the cost of delivering an additional traumatized maternal patient with clearly increased neonatal morbidity and symptoms are highly increased with sequential use. Implementation of contemporary devices and safety bundles improve results focusing on clinical experience, the institution-specific protocols, and unceasing training in OVD management.

Maternal Outcomes

Maternal outcomes following operative vaginal delivery (OVD) vary considerably depending on the instrument used, the number of maneuvers attempted, and the overall intrapartum context. Evidence consistently demonstrates a trade-off between effectiveness of forceps and the maternal morbidity associated with their use. A comprehensive review by Black & Murphy (2019) reported that while forceps deliveries have lower failure rates compared with vacuum extraction, they are associated with significantly higher rates of pelvic floor trauma and severe perineal injury(Black & Murphy, 2019). This aligns with findings from the NICHD MFMU Network cohort study (Bailit et al., 2016), which compared vacuum, forceps, and second-stage cesarean in 2,531 women (Bailit et al., 2016). Vacuum extraction was associated with the lowest maternal complication rates—postpartum infection (0.2% vs. 0.9% forceps vs. 5.3% cesarean) and hemorrhage (1.4% vs. 2.8% forceps vs. 3.8% cesarean)—although severe perineal lacerations were more frequent with vacuum (19.1%) than with cesarean (0%) and remained lower than forceps (33.8%)(Bailit et al., 2016).

The risk of obstetric anal sphincter injury (OASIS) is particularly relevant. A large population-based cohort from Denmark (Jangö et al., 2014) found that vacuum extraction significantly increased the risk of OASIS (aOR 2.99; 95% CI, 2.86–3.12) (Jangö et al., 2014). Importantly, mediolateral episiotomy was protective, reducing the risk by nearly half (aOR 0.60). More recent data from Zhang et al. (2023) in Singapore showed similar trends, with postpartum hemorrhage and OASIS rates comparable across instruments, but forceps carried a higher risk of severe trauma (Zhang et al., 2023). Sequential use of instruments appears to carry the greatest risk. A Californian population-based study (Fong et al., 2014) demonstrated that combined vacuum and forceps delivery was associated with higher rates of severe lacerations, postpartum hemorrhage, and operative failure than single-instrument use. This finding underscores the maternal cost of escalation when initial OVD attempts fail (Fong et al., 2014). Contemporary reviews emphasize that while vacuum may minimize maternal morbidity relative to forceps or second-stage cesarean, trade-offs remain. The review on Shoulder Dystocia by Davis et al., (2023) highlights that inappropriate or prolonged maneuvers can exacerbate maternal morbidity, particularly postpartum hemorrhage and pelvic trauma, emphasizing the importance of timely escalation (Davis et al., 2023).Taken together, these studies demonstrate that vacuum extraction is generally associated with fewer maternal complications than forceps or second-stage cesarean, though at the expense of higher perineal trauma. Forceps remain more effective in achieving vaginal delivery but at a significantly increased risk of pelvic floor injury. Sequential instrument use should be minimized due to its additive harm. Ultimately, maternal outcomes are best optimized by careful instrument selection, timely decision-making, and judicious use of episiotomy.

Neonatal Outcomes

Neonatal morbidity remains a significant concern in the context of shoulder dystocia (SD) and operative vaginal delivery (OVD). Spain et al. (2015) retrospectively studied 231 cases of term SD at a tertiary center and reported no independent association between specific maneuvers—Rubin, Wood's screw, or posterior arm delivery—and neonatal composite morbidity after adjustment for nulliparity and SD duration (Spain et al., 2015). The primary morbidity, defined as injury (clavicular/humeral fracture, brachial plexus injury) or depression (Apgar <7 at 5 min, cord pH <7.1, or need for respiratory support), occurred similarly across maneuver groups, suggesting duration of impaction, rather than maneuver

type, is the key determinant (Spain et al., 2015). Doty et al. (2020) extended these findings, examining 46 children with neonatal brachial plexus palsy (NBPP). Persistence of NBPP at 2 years was strongly associated with >3 maneuvers (100% vs. 62%, RR 1.6, 95% CI 1.2–2.2) and with SD lasting >120 seconds (100% vs. 63%, RR 1.6, 95% CI 1.1–2.2). Involvement of all five plexus nerves was also more frequent when impaction exceeded 120 seconds (RR 2.2, 95% CI 1.03–4.6), highlighting duration as a critical prognostic factor (Doty et al., 2020). Regarding OVD, Gardella et al. (2001) reported markedly increased risks with sequential vacuum-forceps use compared to spontaneous delivery, including intracranial hemorrhage (RR 3.9), brachial plexus injury (RR 3.2), and low Apgar scores (RR 3.0) (Gardella et al., 2001). In contrast, a Singapore cohort (Zhang et al., 2023) of 906 OVDs found low overall morbidity, with cephalohematomas more frequent after vacuum but no major differences in NICU admission between vacuum and forceps (Zhang et al., 2023).

Interventions to improve safety have shown promise. At Monash Health, implementation of an OVD safety bundle (Skinner et al., 2025) reduced severe neonatal trauma (1.3% vs. 2.5%, P<.001) and NICU admissions (1.8% vs. 2.7%, P=.02) (Skinner et al., 2025). Additionally, Wang et al. (2024) demonstrated that the Kiwi OmniCup system reduced severe neonatal morbidity compared with forceps (27.2% vs. 42.3%, aOR 0.49, 95% CI 0.33–0.73)(Wang et al., 2024). Finally, a global meta-analysis (Woldegeorgis et al., 2024) highlighted the burden in LMICs, reporting pooled birth trauma incidence of 34/1000 live births, highest in Africa (52.9/1000). SD (OR 6.11, 95% CI 3.84–9.74) and OVD (OR 3.19, 95% CI 1.92–5.31) were major contributors (Woldegeorgis et al., 2024). Collectively, these studies emphasize that neonatal outcomes are most adversely affected by prolonged SD and combined instrument use, while structured safety interventions and device innovation can mitigate risks.

Complications and Limitations

The literature highlights that the use of excessive traction and sequential instrumentation in shoulder dystocia carries consistent risks for both maternal and neonatal morbidity. Black and Murphy (2019) emphasized that while forceps have lower failure rates than vacuum extraction, they are associated with significantly higher rates of severe perineal trauma, including third- and fourth-degree tears (Black & Murphy, 2019). Similarly, Ali and Norwitz (2009) noted that vacuum-assisted vaginal delivery, though safer for maternal tissues than forceps, remains linked to neonatal scalp trauma and cephalohematomas, underscoring the trade-offs inherent in instrumental techniques(Robinson et al., 1999). Emerging rescue techniques such as posterior axilla sling traction (PAST) have been described in case reviews (Cluver & Hofmeyr, 2015a). While PAST demonstrated success in resolving otherwise intractable dystocia, reports included humeral fractures and transient brachial plexus palsy, reflecting its utility as a last-resort intervention but also its potential for iatrogenic injury. Alternative positioning strategies such as the hands-and-knees maneuver were assessed by Zheng et al. (2021), who found improved resolution rates and reduced neonatal trauma compared with supine-based maneuvers; however, these findings derive mainly from small cohort and observational studies, and their generalizability remains uncertain (Xin et al., 2021).

Biomechanical insights provide further context. A recent computational model by Iaconianni et al. (2024) demonstrated that suprapubic pressure and posterior arm delivery markedly reduced brachial plexus strain compared with baseline lithotomy, suggesting biomechanical superiority of certain maneuvers. Nevertheless, translation from simulation models to clinical endpoints remains limited (Iaconianni et al., 2024). Finally, systematic reviews stress that much of the evidence base is derived from retrospective or heterogeneous datasets with inconsistent definitions of shoulder dystocia and varied reporting of complications (Davis et al., 2023). Guidelines, such as those by ACOG, emphasize stepwise algorithms, yet the paucity of randomized controlled trials limits high-level evidence (Anderson et al., 2017). Taken together, current data suggest that while innovative techniques and computational models inform practice, clinical application remains constrained by variability, potential for maternal trauma, and limited prospective validation.

DISCUSSION

The management of shoulder dystocia continues to rely on prompt, systematic maneuvers that balance maternal safety with the reduction of neonatal morbidity. Across the literature, it is clear that first-line strategies such as the McRoberts maneuver and suprapubic pressure, while simple and low-risk, achieve relatively low standalone success rates. Lok et al. (2016) showed only 25.8% resolution with McRoberts ± suprapubic pressure, a finding reinforced by Lau et al. (2024), who reported higher effectiveness with posterior arm delivery (86.1%) compared with rotational maneuvers (62.4%) or McRoberts alone (56%) (Lok et al., 2016)(Lau et al., 2024). Computational modeling by Iaconianni et al. (2024) provided a mechanistic rationale, demonstrating that posterior arm delivery and suprapubic pressure significantly reduce both brachial plexus strain and delivery force (Iaconianni et al., 2024). Similarly, Menticoglou (2018) and Alves et al. (2022) emphasized that outcomes improve when clinicians transition rapidly to internal maneuvers, suggesting that delays in escalating beyond McRoberts may contribute more to injury than the maneuvers themselves (Menticoglou, 2018)(Alves et al., 2022). Together, these findings

underscore a tiered, time-sensitive approach in which external maneuvers are attempted first, but internal techniques—particularly posterior arm delivery—are prioritized when impaction persists.

The role of instrumental assistance remains contentious, as evidence highlights both their utility and potential risks. Meta-analysis by Dall'Asta et al. (2016) demonstrated that vacuum extraction significantly increases the risk of shoulder dystocia compared with spontaneous delivery, though no major differences were seen between vacuum and forceps (Dall'Asta et al., 2016). Population studies from Fong et al. (2014) and Gardella et al. (2001) consistently reported that sequential vacuum–forceps use carries disproportionate risks, including perineal trauma, postpartum hemorrhage, and neonatal intracranial hemorrhage (Fong et al., 2014)(Gardella et al., 2001). More recent cohort data from Zhang et al. (2023) and Wang et al. (2023) nuanced this view (Zhang et al., 2023)(Wang et al., 2024), finding that newer devices such as the Kiwi OmniCup reduce neonatal morbidity compared with forceps, while institutional safety bundles (Skinner et al., 2025). lowered unsuccessful OVD rates and NICU admissions. Thus, while forceps remain effective for expediting delivery, the evidence favors vacuum in reducing maternal trauma, provided sequential instrument use is avoided and protocols are standardized.

Maternal outcomes largely reflect the balance between instrument effectiveness and morbidity. Studies by Black & Murphy (2019), Bailit et al. (2016), and Jangö et al. (2014) all demonstrate that vacuum generally minimizes maternal complications relative to forceps, though with higher rates of perineal lacerations. Sequential instrument use again emerges as the greatest risk factor (Black & Murphy, 2019)(Bailit et al., 2016)(Jangö et al., 2014)(Fong et al., 2014). Neonatal outcomes similarly point to prolonged impaction and multiple maneuvers as key determinants of morbidity. Spain et al. (2014) and Doty et al. (2020) showed that the duration of dystocia and the number of maneuvers correlate more strongly with hypoxia and brachial plexus palsy than any single maneuver, while Gardella et al. (2001) and Woldegeorgis et al. (2024) emphasized the global burden of trauma associated with OVD and SD (Spain et al., 2015)(Doty et al., 2020)(Gardella et al., 2001)(Woldegeorgis et al., 2024). Encouragingly, structured training and device innovation have shown measurable reductions in severe neonatal trauma (Skinner et al., 2025)(Wang et al., 2024).

Despite these advances, several limitations persist. Much of the evidence base is retrospective, with heterogeneity in definitions, outcome measures, and documentation, limiting direct comparison across studies (Davis et al., 2023). Computational models provide biomechanical insight but lack prospective validation, while rescue methods such as posterior axilla sling traction remain supported only by case series(Cluver & Hofmeyr, 2015a). Future research must focus on prospective multicenter trials, standardized reporting frameworks, and the integration of simulation training to refine escalation pathways. Clinically, the implication is clear: while McRoberts and suprapubic pressure remain indispensable first steps, clinicians must be skilled and ready to transition swiftly to posterior arm delivery or rotational maneuvers, use instruments judiciously, and adopt structured protocols to mitigate maternal and neonatal morbidity.

CONCLUSION

This review highlights that the combined use of obstetric maneuvers and instrumental assist techniques can improve success rates and reduce delivery time in managing shoulder dystocia. McRoberts maneuver with suprapubic pressure and posterior arm delivery remain first-line interventions, while adjunctive use of vacuum or forceps may be beneficial in select cases but carries added risk of maternal and neonatal trauma. Maternal complications such as perineal tears and postpartum hemorrhage, and neonatal risks including brachial plexus injury, remain concerns. Overall, evidence suggests a stepwise, judicious application of combined strategies offers the best balance between effectiveness and safety.

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