BMC Medical Education

RESEARCH

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Educational efficacy of the simulation-based episiotomy training: a multi-center observational study

Zixing Zhong[1,2], Yijuan Lu[1], Yuqun Pu[1], Qiong Luo[1*] and Baihui Zhao[1*]

Abstract

Background Interprofessional training programmes are now widely used for training junior doctors and nurses. This study aimed to evaluate the educational efficacy of an obstetric operative simulation programme in both junior and senior obstetricians and midwives.

Methods We conducted a 30-minute professional course in midwifery at three obstetric centers in Zhejiang, China. The course mainly aimed at improving the knowledge and techniques of mediolateral episiotomies (MLE). Both junior and senior obstetricians and midwives were recruited for evaluation. A questionnaire was completed by all participants at the beginning. Systematic evaluation of individual's MLE skills were compared and analysed before and after the instructional session. The primary outcome was length of the episiotomy incision (mm). The secondary outcomes were the distance from the starting point of the incision to the fourchette (mm); and the perpendicular angle of incision (degrees). Continuous variables were presented as means ± SD or medians and ranges, with Student's t-test used for comparisons between groups. Categorical variables are presented as rates, and the chi-square test was employed to assess differences between proportions. Data were analysed using SPSS statistical software (version 19), with $P < 0.05$ was considered statistically significant.

Results Eighty-two participants (35 obstetricians and 47 midwives) joined this programme, of which, 29 were junior obstetrics professionals and 53 were senior obstetrics professionals. Midwives had more MLE training and hands-on experience than obstetricians ($p < 0.01$). At the end of the programme, the mean values of the three main parameters of MLE were significantly improved in most perinatal care providers. Moreover, midwives, particularly senior midwives, benefited more after the programme, with the incision length and accuracy of MLE improved significantly ($P < 0.01$).

Conclusions Operative obstetric simulation training with appropriate instructions should be advocated. Both junior and senior perinatal care providers can benefit from the educational programme. Senior midwives may particularly benefit in their respective fields.

Keywords Episiotomy, Midwife, Obstetrics, Anal sphincter, Injuries, Medical training

*Correspondence:
Qiong Luo
luoq@zju.edu.cn
Baihui Zhao
zhaobh@zju.edu.cn

[1]Department of Obstetrics, Women's Hospital, School of Medicine, Zhejiang University, No. 1 Xueshi Road, Hangzhou 310006, Zhejiang, China
[2]Center for Reproductive Medicine, Department of Obstetrics, Zhejiang Provincial People's Hospital (Affiliated People's Hospital, Hangzhou Medical College), Hangzhou, Zhejiang, China

Introduction

An episiotomy is performed to expedite delivery in cases of fetal distress, enlarge the vaginal outlet to facilitate instrumental delivery when necessary, which was more evident among nulliparous prior to vacuum assisted delivery [1, 2]. More importantly, episiotomy is expected to reduce the risk of obstetric anal sphincter injuries (OASIS) in some instances [1]. OASIS are severe perineal tearing or third- and fourth-degree tears that can occur during vaginal birth. A meta-analysis found that 30–50% of women were symptomatic one year after OASIS, even after repair [3]. OASIS can result in long-term anal incontinence and urgency for 53–80% of women, thereby affecting their quality of life [3, 4]. Other long-term consequences include dyspareunia, chronic pelvic pain, and psychosexual disorders [5, 6]. The surgical skill in performing an episiotomy is very important to patient safety. This technique is usually assessed on three main parameters: (1) the length of the incision; (2) the incision angle; and (3) the distance between the starting point and the posterior fourchette. Several types of episiotomies have been described, but no significant differences in pain, incidence of dyspareunia, and infection were identified in comparison [7, 8]. However, the midline episiotomy is associated with higher rates of OASIS when compared with the mediolateral episiotomy (MLE) [7, 9]. In China, the MLE is more commonly performed than the other two types when episiotomy is considered.

Routine or liberal use of the episiotomy is not recommended by the World Health Organization anymore in vaginal birth [10]. This has resulted in fewer complications but may reduce opportunities for training junior obstetricians and midwives. Therefore, simulation training is critical for junior perinatal care providers to learn and master the skill. Conventionally, the simulated training courses were more focused on junior doctors and nurses. There has been little research that compared whether the effects of a training programme differ between senior and junior practitioners. In this study, we conducted a programme involving simulated practice of MLE for obstetricians and midwives of different levels of experience to evaluate the differences in training effects.

Materials and methods

Eighty-two participants (including 35 obstetricians and 47 midwives) were recruited voluntarily from three different tertiary obstetrics clinics (Women's Hospital, School of Medicine, Zhejiang University, Hangzhou Women's Hospital, Jinhua Municipal Central Hospital). The former two hospitals are maternity unit based in Hangzhou, with annual deliveries more than 10,000. Jinhua Municipal Central Hospital is a general hospital based in Jinhua, which has an obstetric volume of 3,000 births per annum. The junior obstetricians and midwives were defined as having less than 5 years of relevant clinical experience, while seniors were defined as having 5 years or more working experience. This study was approved by the Ethics Committees of Women's Hospital, School of Medicine, Zhejiang University (IRB No. 20190057), and was approved in the other two hospitals. Informed consent was obtained from all participants who completed the 30-minute sandwich mode (self-assessment (practice), training, self-assessment) simulated training course conducted by a senior consultant obstetrician with more than 20 years of working experience. This course focused on three main topics: details of the perineal anatomy and its transformation at crowning; how to properly perform the MLE incision; and techniques for repairing episiotomy and perineal tears.

Before the training session, participants were asked to complete a cross-sectional questionnaire (Supplementary File) within 10 min. The questions were developed by the trainer of this course, some questions derived from previous similar training courses. It contained questions about their occupation, working experience in the obstetrics field, four questions regarding their knowledge of the perineum anatomy, delivery, and episiotomy, and three multiple-choice questions regarding the history of episiotomy training, reasons for mediolateral episiotomy, concerns about performing MLE, and concerns about severe tears. In order to effectively and accurately assess the skills of the participants, a paper pad clearly presented the perineal anatomy (Fig. 1.) was provided to all participants to perform simulated MLE. After collecting the paper pads and questionnaires, the training session began. Three parameters were assessed for each episiotomy: the primary outcome was the the length of the incision (in centimetre), and the secondary outcomes were distance of the starting point of the incision from the posterior fourchette (in millimetre); the angle of the incision (in degrees) (Fig. 1.). When performing MLE, it is recommended that the surgical incision should be between 45 and 60 degrees from the midline [8]. Recommended values for the incision length and distance have not yet been reported; therefore, we usually cut a length of 3 to 4 cm [8]. During the course, participants were taught to perform an episiotomy following these parameters: length of 3 to 4 cm or more; angle of 45 to 60 degrees; and distance of 1 cm. Then, the participants were asked to cut the paper pad according to what they had learned in the training session. A unique number that was created for each participant was marked on their pads and questionnaires (anonymously). Angles and distances were measured by the trainer using common protractors and rulers.

Continuous variables are presented as means ± standard deviations or medians and ranges, as appropriate. Categorical variables are presented as rates. The Student's

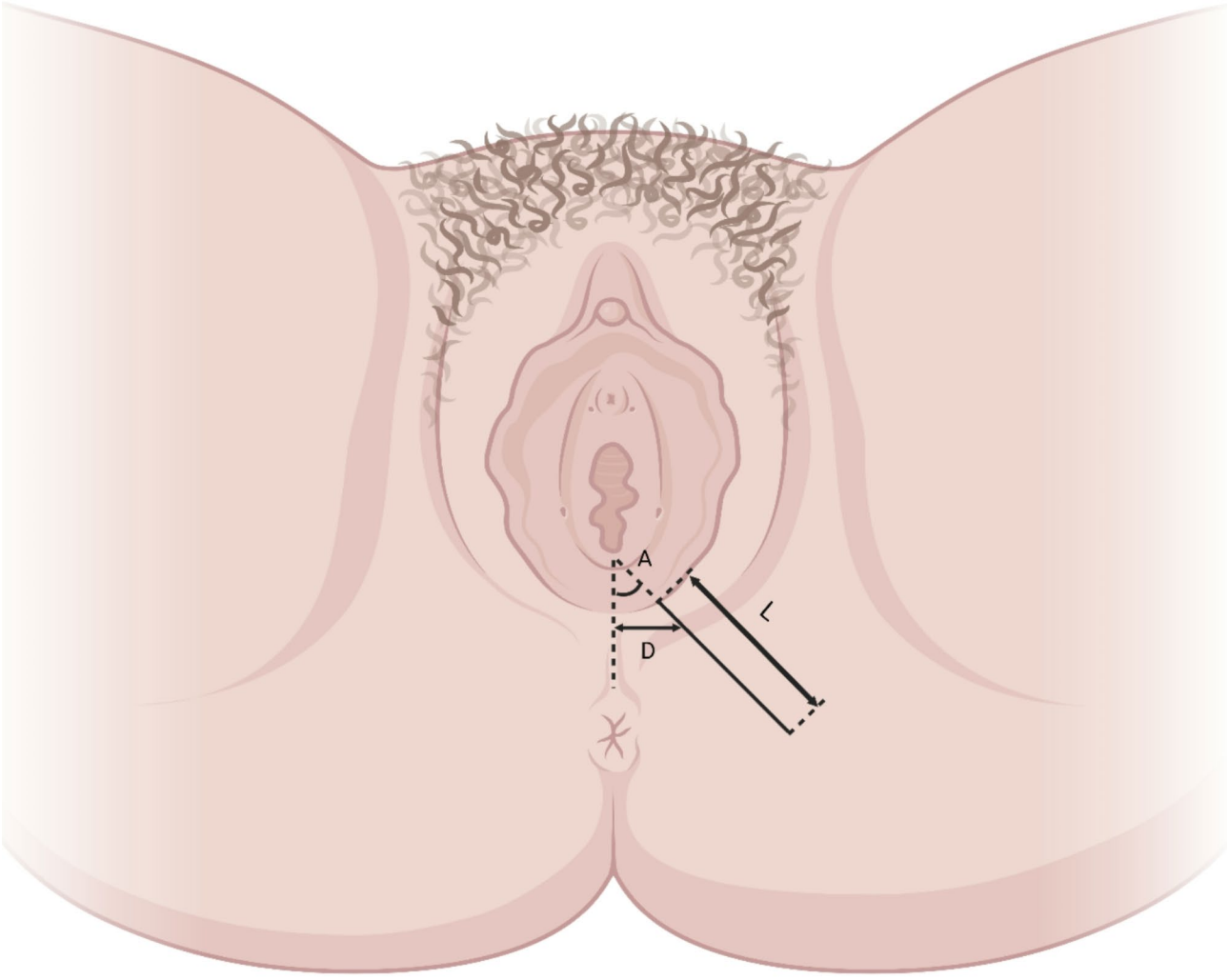

Fig. 1 Perineal view for mediolateral episiotomy (MLE) simulation. Measurements were performed after each MLE was completed by the participants. D = distance from the starting point of the incision to the fourchette (mm); A = perpendicular angle of incision (degrees); L = length of the incision (mm). Created in BioRender. Zhong, Z. (2025) https://BioRender.com/n61g941

t-test was used to compare parametric data, while the Mann-Whitney U Test were applied for non-parametric data. The chi-square test was used to analyse categorical variables. All tests applied were two-tailed, and statistical significance was considered if $p < 0.05$. Data were analysed using SPSS statistical software (version 19; SPSS Inc., Chicago, IL).

Results

The characteristics of the 82 participants (35 obstetricians and 47 midwives) are provided in Table 1. Over half (51.4%, 18/35) participants were junior obstetricians having been working for less than five years and 23.4% (11/47) were junior midwives, respectively. The majority of participants had a proficient understanding of pelvic anatomy prior to the course, with fewer than 5% (4/82) lacking relevant knowledge. More than 90% (74/82) participants had different types of episiotomy training previously, including theoretical training (29.3%, 24/74), hands-on training (25.6%, 21/74), and combined training (35.3%, 29/74). Notably, more than half of the obstetricians had performed less than 10 mediolateral episiotomies (MLEs) or had assisted less than 10 deliveries. In contrast, most midwives had performed more than 50 MLEs or had assisted at least 50 deliveries.

According to the survey results, to prevent the potential OASIS was believed to be the main indication for performing MLE, with more than 90% (74/82) participants agreed. To save the baby from fetal distress and to assist the delivery of macrosomia were the second and third indications, respectively. For the obstetricians, in particular, facilitating of instrumental delivery was the main indication for performing MLE (30/35). When performing MLE, most participants (53/82) were concerned about whether they created a proper incision. OASIS comprised the main concern; 84.1% (69/82) of

Table 1 Characteristics of participants and their occupation history

	Obstetrician *N* = 35 (%)	Midwife *N* = 47 (%)	*p*-value
Clinical experience			0.011
< 5years	18 (51.4)	11 (23.4)	
≥ 5years	17 (48.6)	36 (76.6)	
Knowledge of perineum anatomy			0.023
Master	16 (45.7)	33 (70.2)	
Acquaintance	18 (51.4)	11 (23.4)	
Unfamiliar	1 (2.9)	3 (6.4)	
Training history			
Theoretical + practical	5 (14.3)	24 (51.1)	0.001
Theoretical	15 (42.9)	9 (19.1)	
Practical	9 (25.7)	12 (25.5)	
None	6 (17.1)	2 (4.3)	
Number of births			< 0.001
< 10	18 (51.4)	5 (10.6)	
≥ 10–50	8 (22.9)	2 (4.3)	
≥ 50–100	4 (11.4)	3 (6.4)	
≥ 100	5 (14.3)	37 (78.7)	
Cases of mediolateral episiotomies			< 0.001
< 10	20 (57.1)	7 (14.9)	
≥ 10–50	11 (31.4)	9 (19.1)	
≥ 50–100	1 (2.9)	7 (14.9)	
≥ 100	3 (8.6)	24 (51.1)	

participants reported concerns about the difficulties in suturing the torn perineum. Furthermore, the consequences of repeated suturing and pelvic floor disorders were also concerns.

The details of the incisions performed before and after the course are shown in Table 2. After training, the mean values of the three parameters significantly improved. Midwives performed much better after the training course in terms of the length of incision and distance following episiotomy training ($p = 0.001$ and $p = 0.004$, respectively). These were mainly driven by the progress made in senior sub-group ($P = 0.008$ and $P = 0.020$, respectively). The angle was more accurately conducted by obstetricians after proper training ($P = 0.022$). Although the degrees and accuracies of the angles created by the junior and senior groups improved, no statistical significance was identified. Overall, after the educational programme, the accuracy of the length significantly improved ($p = 0.001$); however, the accuracy of the angle showed no significant difference. Senior obstetricians and midwives demonstrated greater improvement, with the progress being particularly pronounced among senior midwives (Table 3).

Discussion

The restrictive episiotomy is regarded as a useful procedure in delivery, which may potentially reduce the risk of OASIS. However, due to its restrictive use, obstetricians

Table 2 Mediolateral episiotomy parameters performed by participants before and after the training course

	Length (mm)			Angles (degrees)			Distance (mm)		
	before	after	*p*-value	before	after	*p*-value	before	after	*p*-value
Obstetricians (*n* = 35)	34.0	34.7	0.558	48.7	53.1	0.022	9.2	10.4	0.111
Midwives (*n* = 47)	29.6	34.0	0.001	47.5	48.8	0.393	9.0	11.1	0.004
Junior (*n* = 29)	33.1	35.1	0.099	46.5	49.6	0.140	9.3	11.1	0.013
Obstetricians	34.4	35.1	0.610	47.2	51.8	0.084			
Midwives	30.9	35.0	0.070	45.2	45.9	0.844			
Senior (*n* = 53)	30.6	33.9	0.008	48.9	51.2	0.107	9.0	10.7	0.020
Obstetricians	33.9	34.1	0.926	50.3	54.3	0.189			
Midwives	29.1	33.4	0.006	48.5	49.7	0.472			
Total (*N* = 82)	31.5	34.3	0.002	48.0	50.6	0.028	9.1	10.8	0.001

Table 3 Accuracy of mediolateral episiotomy performed by participants before and after the training course

	Validity of length *n* (%)			Validity of angle *n* (%)		
	before	after	*p*-value	before	after	*p*-value
Obstetrician (*n* = 35)	25(71.4)	28(80.0)	0.371	23(65.7)	23(65.7)	1.000
Midwife (*n* = 47)	22(46.8)	34(72.3)	0.003	24(51.1)	34(72.3)	0.055
Junior (*n* = 29)	22(75.9)	23(79.3)	1.000	15(51.7)	21(72.4)	0.181
Obstetricians	14/18(77.8)	14/18(77.8)	1.000	11/18(61.1)	14/18(77.8)	0.121
Midwives	8/11(72.7)	9/11(81.8)	1.000	4/11(36.4)	7/11(63.6)	0.395
Senior (*n* = 53)	25(47.2)	39(73.6)	0.002	32(60.4)	36(67.9)	0.540
Obstetricians	11/17(64.7)	14/17(82.4)	0.438	12/17(70.6)	9/17(52.9)	0.481
Midwives	14/36(38.9)	25/36(69.4)	0.009	20/36(55.6)	27/36(75.0)	0.083
Total (*N* = 82)	47(57.3)	62(75.6)	0.001	47(57.3)	57(69.5)	0.144

and midwives are less likely to have extensive exposure to this procedure, especially for beginners. In this case, a highly effective simulation programme led by experienced staff can be an ideal opportunity for training the junior medical professionals. In our study, we have demonstrated that most participants, regardless of their clinical experience, can benefit from a training session that mixed anatomical theory and hands-on practice. We also identified a lack of training and clinical exposure to normal deliveries and episiotomies for obstetricians. Senior midwives, unexpectedly, could also benefit from this programme. This should be extrapolated with caution for a few reasons: (1) As the number of junior midwives was less than one thirds of their senior peers, the statistical power may be under detected; (2) The participants volunteered the placement instead of randomly selected by the system, which could cause selection bias; (3) All three clinical centers are tertiary teaching hospitals that shoulder the responsibility of training midwives and physicians from hospitals of various levels, with significant variability in individual competencies, knowledge, and surgical levels. These factors might impede the generalisation of the representativeness of the study conclusion.

Severe perineal laceration often resulted from substandard care, and this could even occur with proficient hands. Andrews et al. revealed that only 22% (13/58) of obstetricians and no midwives (0/40) correctly created the MLE incision at Mayday University Hospital, in Croydon, London [11]. Béchard et al. found that only 38% (8/21) of midwives versus 46% (31/68) of doctors made incisions within the correct range in episiotomies in a French maternity unit with facilities and capacities for high-risk pregnancies [12]. This was also reflected in our study. However, conventional training courses primarily focused on passing skills to junior medical practitioners, rather than providing support to seniors. Therefore, we specifically designed this educational programme to explore whether regular revision programme could bring potential benefits to senior doctors and nurses. The overall results demonstrated positive effects. Another factor that prompted us to initiate this educational scheme was our discovery of large discrepancy of incision length between obstetricians and midwives in daily medical practice. Our study revealed that midwives tended to cut smaller angles compared to their obstetrician colleagues. This was also reported by other studies. Obstetricians tended to cut longer episiotomy incisions with more obtuse angles compared to midwives [9, 11, 12]. Wong et al. identified similar discrepancy between midwives and obstetricians in their investigation, with 61 midwives drew angle of episiotomies between 29.6 and 47.1 degrees versus obstetricians who drew between 46.4 and 56.7 degrees. Moreover, obstetricians tended to perform longer incisions in episiotomy (3.6 Vs 2.3). The training session can narrow the gap [13].

There were limited studies focusing on medical training for episiotomy. The most recent study from Demir-Kaymak et al. suggested virtual reality to offer immersive simulation to risky situations for midwifery undergraduates to gain clinical experience [14]. This provided a novel perspective for future medical training, but the proportion of participants were relatively small: only 6/88 and 10/82 of third and fourth grade midwifery students attended this programme, respectively [14]. This may cause biased results. A larger study from Yang et al. initiated a cross-sectional web survey to show the status of episiotomies performed in Henan province, the most populous province with possibly the largest annual births in China. Their report involved 900 participants from 90 public hospital in the province, and results demonstrated that accoucheurs of lower levels hospitals performed episiotomies more frequently, which were driven by previous training, clinical experience and local norms, rather than the latest medical evidence. They called for appropriate trainings for episiotomies [15]. Our study identified similar facts with them, but we improved the situation with educational training. An earlier evidence-based interventional programme set in nine centers across four Southeast Asian countries also improved the practice of episiotomy by reducing its rate and its severe perineal trauma [16].

Guler et al. mentioned different simulation-based episiotomy training (SBET) models with beef tongue (37 midwifery students involved) and sponge (36 midwifery students involved) to improve midwifery students' confidence in performing episiotomy in real practice [17]. The merit of this study was that they designed a detailed questionnaire to assess the students' confidence in each process. However, the level of self-confidence was simply classified as slightly and highly self-confident, and they lack comparisons between junior students and senior accoucheurs [17]. By contrast, we paid similar attention on the senior and the junior staffs. The results regarding senior midwives may be surprising, we analysed the results and discussed possible causes: (1) the midwives had different educational and training backgrounds in comparison to obstetricians. As there were no national training programme for nursing practitioners, the traditional apprenticeship model remains prevalent. This has resulted in significant variations in technical skills among nursing practitioners, particularly noticeable among senior staffs; (2) the voluntary recruitment can also lead to the results, as those senior obstetricians and midwives who feel the need of reviewing the LME were more likely to participate.

The main strength of our study was that we paid similar attention to obstetricians and midwives, junior and

senior practitioners as they shared clinical duties in daily work. Second, we took advantage of a sandwich model (self-assessment, training, self-assessment) to better examine the progress made after appropriate training. Third, our highly effective paper pads allowed easier replication, yielding higher effectiveness for trainees. However, there were limitations to our study. Firstly, despite being a multi-center study, our sample size was still small. We considered to expand our size to allow for more participants in our future programme since this one had been successful. Secondly, the recruitment process will give rise to selection bias in nature. Most participants who wanted to join the programme were either junior or senior staffs who felt they needed a refresher course. Thirdly, there was no consensus regarding the optimal MLE approach, and this caused inconvenience in our training methods. We will select an approach with standard protocol agreed upon by authoritative academic societies in our future educational initiative. Lastly, we did not continue our follow-up to examine whether this educational session has long-lasting positive effects on participants.

Conclusions

Regular simulated training course should be advocated for the whole delivery team, as both obstetricians and midwives could benefit. Senior accoucheurs may particularly benefit in some certain procedures.

Abbreviations

MLE	Mediolateral episiotomy
OASIS	Obstetric anal sphincter injuries
SBET	Simulation-based episiotomy training

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12909-025-06887-4.

Supplementary Material 1

Acknowledgements

The authors thank the obstetric and midwifery colleagues from the three hospitals.

Author contributions

B.Z. led the training program, B.Z. and Q.L. conceptualized this idea, Z.Z., Y.L., Y.P. did data collection and analysis, Z.Z. wrote the original manuscript, Q.L. and B.Z. reviewed the manuscript.

Funding

This work was supported by 4 + X Clinical Research Project of Women's Hospital, School of Medicine, Zhejiang University (No. ZDFY2022-4 × 204).

Data availability

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committees of Women's Hospital, School of Medicine, Zhejiang University (IRB No. 20190057), and was approved in the other two hospitals. Informed consent was obtained from all participants of the study. This study adhered to the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 25 April 2024 / Accepted: 19 February 2025
Published online: 06 March 2025

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