

# BMJ Open Diagnosis and repair of perineal injuries: knowledge before and after expert training – a multicentre observational study among Palestinian physicians and midwives

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#### ABSTRACT

**Objective:** To assess whether a 2 days training with experts teaching on diagnosis and repair of perineal injuries among Palestinian midwives and physicians could change their level of knowledge towards the correct diagnosis and treatment.

**Study design:** Multicentre observational study.

**Setting:** Obstetric departments in 6 government Palestinian hospitals.

**Participants:** All physicians and midwives who attended the training.

**Methods:** A questionnaire comprising of 14 questions on the diagnosis and repair of perineal tears was distributed to all participants before the training (n=150; 64 physicians and 86 midwives) and 3 months after the training (n=124, 53 and 71, respectively). Characteristics, differences of the study population and level of knowledge before and after the training were presented as frequencies and percentages. Consistency in responses was tested by estimating the p value of McNemar test.

**Results:** Among physicians only 11.4% had accurate knowledge on perineal anatomy before the training compared with 78.85% after the training (p<0.001). For midwives, the corresponding numbers were 9.8% and 54.2%, respectively (p<0.001). Before the training, 5.8% of the physicians were aware that rectal examination is mandatory before and after suturing of episiotomies compared with 45.8% after the training (p<0.001). The corresponding numbers for midwives were 0% and 18% (p<0.001), respectively. Physicians knowledge of best practice of skin repair following episiotomy improved from 36.5% to 64.5% (p=0.008) and among midwives from 26.1% to 50.7% (p<0.001). Physicians knowledge of the overlap technique in the repair of full thickness external anal sphincter tears improved from 28.5% to 42.8% (p=0.05), whereas knowledge of repairing torn internal anal sphincter separately improved from 12.8% to 86.8% (p<0.001).

#### Strengths and limitations of this study

- Almost all midwives and physicians in the six participating hospitals were trained.
- The training was conducted on silicon models of human sphincters as well as animal sphincters looking similar to human anal sphincters. Additionally the 'in vitro' training may have helped the participants to overcome the problems of acquisition of technical skills.
- The actual clinical practice was not evaluated since our data were based on questionnaires only. Also, the data were self-reported known to be prone to information bias.
- Non-specialist doctors also work in hospitals in Palestine, but unfortunately we did not collect data on whether the physicians were specialists or not.
- Evaluation of knowledge 3 months after the training may be too short to reflect long-term effects.
- Not all questions were answered by all participants, suggesting that they did not know the answers. Also, some of midwives and physicians did not participate in the training due to clinical duties.

**Conclusions:** Improvement in the level of knowledge on diagnosis and repair of perineal tears was observed for all physicians and midwives who attended the 2 days' expert training. Regular ongoing training will serve to maintain the newly acquired knowledge.

#### INTRODUCTION

Perineal tears are considered to be one of the most common complications of vaginal births.<sup>1</sup>

In low-income countries, one in three women screened for repair of a presumed obstetric fistula had unrepaired obstetric anal sphincter injuries (OASIS). This was largely due to inadequate training.<sup>1</sup> One study explored the prevalence of OASIS in seven African, nine Asian and eight Latin American countries using cross-sectional data from the WHO Global Survey on Maternal and Perinatal Health from 2004 to 2008 in 372 facilities.<sup>2</sup>

Among 214 599 women who underwent vaginal delivery, the prevalence of severe perineal tears ranged from 0.1% in China to 15% in the Philippines. Owing to reporting prevalence of severe perineal tears between 0% and 76%, indicating misdiagnosis and a lack of knowledge of obstetrical perineal tears, many facilities were excluded.<sup>2</sup> In the UK, 85% of women giving birth are reported to have some degree of perineal injury requiring suturing; where the anal sphincter is affected in between 0.5% and 7%.<sup>3</sup>

In general, OASIS cannot be predicted, the most important risk factors for OASIS are primiparity, macrosomia, midline episiotomy and instrumental delivery.<sup>4</sup> A study from Finland including 16 000 women reported that primiparous women have a threefold increased risk of OASIS compared with multiparous women, and that the risk for OASIS increased with increasing birth weight.<sup>5</sup> In instrumental deliveries, the risk of OASIS is increased twofold to fourfold compared with spontaneous deliveries.<sup>5 6</sup> Episiotomy should not be performed routinely, but only when clinically indicated. When episiotomy is indicated, mediolateral and lateral episiotomy may reduce the risk of OASIS, whereas midline episiotomy increases the risk of OASIS by twofold.<sup>7</sup> Although there are variations in episiotomy indications between different countries, the most frequent indications for episiotomy recommended by American College of Obstetricians and Gynaecologists were shortening of the second stage of labour or highly suspicious risk for OASIS.<sup>8</sup>

The incidence of OASIS varies between delivery units and between countries.<sup>9</sup> The reasons for this variation are not fully understood. Different clinical routines during the latter part of the second stage of delivery, poor understanding of perineal anatomy, incomplete primary diagnosis and registration, and incorrect classification of perineal tears may explain some of the differences.<sup>9-11</sup> Some studies have suggested that the knowledge of obstetricians and gynaecologists on repair of perineal tears is limited, especially for OASIS.<sup>12 13</sup> Educational workshops and courses for physicians and midwives are recommended to improve the management of perineal tears.<sup>14 15</sup> The National Institute for Health and Care Excellence and the Royal College of Obstetricians and Gynaecologists (RCOG) have published guidelines on the diagnosis and management of perineal tears.<sup>16 17</sup>

The objective of this study was to evaluate whether 2 days of training by experts in diagnosis and repair of

perineal tears could increase the level of knowledge on perineal injuries among Palestinian physicians and midwives.

## METHODS

This study is a prospective multicentre observational study measuring the knowledge of physicians and midwives on different types of perineal injuries using the same questionnaire before and after educational lectures and practical training.

### The training

A 2-day standard training programme was conducted for all physicians and midwives in six hospitals in Palestine between January and February 2015 as shown in [table 1](#).

The training programme consisted of both lectures and practical training. The first day of training comprised of a series of lectures and videos on the accurate diagnosis of perineal tears and classification, identification of internal and external anal sphincter muscles and methods of repairing the different degrees of perineal tears. On the second day, the clinical hands-on training was divided into two parts using animal tissue such as anal sphincters and hearts from sheep, cows and pigs. The first part included training on first-degree and second-degree tears and episiotomies on sheep hearts for all participants. The second part included training on third-degree and fourth-degree perineal tears on cow and pig sphincters for physicians only. Each participant had to register his/her attendance to the training each day by signing on the registration sheet. For practical training, each participant was supervised by the trainers. Each hospital was provided with a comprehensive textbook,<sup>18</sup> a DVD containing the lectures on anatomy, diagnosis and repair of episiotomy and OASIS, latex training model (The Sultan Anal Sphincter Trainer, Limbs and Things, Bristol, UK) as well as further materials on the website (<http://www.perineum.net>).

### Questionnaire

Before the training started on the first day, all participants were handed a questionnaire (see the questionnaire in online supplementary file 1) to be answered in the lecture room; all were handed out the questionnaire

**Table 1** The schedule for training in the six hospitals in Palestine

Dates of training	Gaza	West Bank
31 January to 1 February 2015	Aqsa Martyrs Hospital	Palestine Medical complex
2 February to 3 February 2015	Shifa Medical complex	Rafidia Surgical Hospital
4 February to 5 February 2015	Al Helal Emarati hospital	Alia Governmental Hospital

at the same time and answering the questionnaire may have taken ~20 min. This was done to establish the baseline knowledge of the participants. The first part of the questionnaire was distributed to physicians and midwives, and included questions aiming to evaluate their knowledge on the perineal anatomy, episiotomy repairing techniques and classification of different types of perineal tears. The second part was completed by physicians only, and included questions on the technique of repairing OASIS. The same questionnaire was redistributed by hand to the same participants at each hospital, at the same time, 3 months after the training.

### Statistical analysis

IBM SPSS Statistics for Windows (V.21.0, Chicago, Illinois, USA) was used to perform the statistical analyses. Descriptive methods were used to present frequencies (%). The responses from the physicians and midwives were analysed separately, and McNemar test was used to test the consistency in responses before and after the training estimating *p* values.

### RESULTS

A total of 150 participants, 64 (42.7%) physicians and 86 (57.3%) midwives, participated in the training and answered the pretraining questionnaire. Three months after the training, more than 80% completed the second questionnaire. The main reasons for the missing responses from the participants were maternity leave, external vacation or departure from the obstetric department of the hospital. The details of participants and hospitals are listed in [table 2](#).

The proportion (%) of participants who conducted episiotomy repair without supervision on <10 occasions was 18 (33.9%) before the training and 8 (15%) after the training among physicians and 27 (50.9%) before the training and 48 (67.6%) after the training among midwives.

As shown in [table 3](#), a statistically significant difference was observed in the knowledge of physicians before and

after the training on episiotomy and perineal anatomy, techniques of episiotomy repair and the appropriate time for per rectal examinations. For midwives, even more pronounced changes in knowledge were observed ([table 3](#)).

In contrast to the doctors, there was a statistically significant improvement in knowledge regarding classification of perineal tears among midwives ([table 4](#)).

The questions regarding the knowledge of OASIS, except the classification, were answered by physicians only, as midwives are not allowed to repair these types of tears. The proportion (%) of physicians who answered how many times they repaired OASIS without supervision on <10 occasions was 22 (41.5) before the training and 36 (67.9%) after the training.

There was a statistically significant improvement in knowledge regarding the methods and techniques of repair of OASIS after the training ([table 5](#)).

### DISCUSSION

Overall, we observed an improvement in the level of knowledge regarding the correct diagnosis and appropriate repair of perineal tears for all attending physicians and midwives. The level of knowledge before the training and 3 months after training differed significantly between attending midwives when compared with the physicians. There were, however, also significant variations in the level of knowledge among the physicians according to their level of experience. This may be explained by the fact that in Palestine, it is common for non-specialists to be practising in hospitals. Additionally, lack of systematic postgraduate education including training programme for urogynaecology or National Guidelines including requirements for levels of knowledge on pelvic floor anatomy or classifications of perineal tears may also explain all these variations. The knowledge of physicians and midwives regarding anatomy, types of episiotomy and the best method of repair of episiotomy was inadequate.

The proportion (%) of participants who performed episiotomy repair without supervision on <10 occasions was higher among midwives and lower among physicians, which could be explained by the fact that in Palestine most of episiotomies were repaired by physicians. This means that most of the midwives and physicians with a little experience were urged to repair more episiotomies as they practised in the training.

The study also revealed a lack of understanding of the indications for episiotomy, and that the mediolateral cut is the recommended type in most countries with a cutting angle of '60°' away from the midline when the perineum is distended.<sup>10 17</sup> Before the training programme, when compared with midwives, a larger proportion of physicians had knowledge about the mediolateral episiotomy. There was, however, a significant improvement in midwives' knowledge about mediolateral episiotomy after the training. The study also

**Table 2** The distribution of responders in the six hospitals, before and after the expert training

Hospitals	Before N (%)	After N (%)
Gaza	81 (54)	73 (58.8)
Shifa hospital	34 (22.6)	32 (25.8)
Aqsa Martyrs hospital	33 (22)	32 (25.8)
Al Helal Emarati hospital	14 (9.3)	9 (7.3)
West Bank	69 (46)	51 (41.2)
Rafidia surgical hospital	23 (15.3)	18 (14.5)
Alia governmental hospital	21 (14)	12 (9.7)
Palestine Medical Complex	25 (16.8)	21 (16.9)
Total	150	124

N, valid number.

**Table 3** Knowledge of physicians and midwives before and after the expert training, regarding episiotomy types, perineal muscles, rectal examination and skin repair

	Physicians (N=53)			Midwives (N=71)		
	Before N (%)	After N (%)	p Value	Before N (%)	After N (%)	p Value*
Type of episiotomy done	48 (90.6)	46 (86.8)		55 (77.4)	68 (95.7)	
Midline	3 (6.3)	2 (4.3)	0.89	8 (14.5)	18 (26.4)	0.08
Lateral	3 (6.3)	2 (4.3)	0.62	31 (56.3)	8 (11.7)	<0.001
Mediolateral	42 (87.4)	42 (91.4)	0.69	16 (29.2)	42 (61.9)	<0.001
Knowing what muscle was cut	44 (83.0)	52 (98.1)		55 (77.4)	61 (85.9)	
No	5 (11.4)	3 (5.8)	0.92	18 (32.7)	15 (24.5)	0.88
Yes	5 (11.4)	41 (78.8)	<0.001	5 (9.1)	32 (52.4)	<0.001
Don't know	34 (77.2)	8 (15.4)	<0.001	32 (58.2)	14 (23.1)	0.002
Time provided for rectal examinations	52 (98.1)	48 (90.6)		70 (98.5)	66 (92.9)	
Only if third degree suspected	11 (21.2)	6 (12.5)	0.78	11 (15.7)	4 (6.1)	0.12
Before suturing	9 (17.3)	15 (31.3)	0.302	2 (2.8)	34 (51.5)	<0.001
After suturing	29 (55.8)	5 (10.4)	<0.001	57 (81.5)	10 (15.1)	0.004
Before and after suturing	3 (5.7)	22 (45.8)	<0.001	0 (0)	18 (27.3)	<0.001
Technique of perineal skin repair in episiotomy	52 (98.1)	53 (100.0)		69 (97.1)	69 (97.1)	
Continuous	10 (19.2)	19 (35.8)	0.096	17 (24.6)	25 (36.2)	0.26
Interrupted	23 (44.2)	3 (5.6)	<0.001	34 (49.2)	9 (13.0)	<0.001
Subcuticular	19 (36.6)	31 (58.6)	0.01	18 (26.2)	35 (50.8)	<0.01

N=valid numbers of completed questionnaire before and after the course received from 53 physicians and 71 midwives.

\*p Value of McNemar test was used to measure the significant change of knowledge (each row is compared with all others combined as 2x2 table).

**Table 4** Correct classification\* of anal sphincter injuries among physicians and midwives before and after the expert training

Questions	Correct answer	Physicians (N=53)			Midwives (N=71)		
		Before N† (%)	After N (%)	p Value	Before N (%)	After N (%)	p Value‡
EAS exposed only	2nd	3/40 (7.5)	3/45 (6.7)	0.62	14/53 (26.4)	5/63 (7.9)	0.02
EAS torn partially	3a	25/53 (47.2)	24/51 (47.1)	0.96	10/71 (14.1)	35/69 (50.7)	<0.001
EAS torn completely	3b	8/44 (18.2)	6/49 (12.2)	0.75	10/54 (18.5)	2/65 (3.1)	0.04
IAS exposed but not torn	3b	21/40 (52.5)	29/43 (67.4)	0.61	5/37 (13.5)	5/66 (7.5)	0.69
IAS torn	3c	10/53 (18.9)	17/53 (32.1)	0.33	5/43 (11.6)	18/63 (28.6)	<0.001
Rectal mucosa and sphincter torn	4th	30/39 (76.9)	36/46 (78.3)	0.29	14/50 (28)	20/61 (32.8)	0.50

\*According to RCOG No. 29. 2015.<sup>17</sup>

†N=number of correct answers/total valid number of participants who answered the question.

‡p Value of McNemar test was used to measure the significant change of knowledge.

EAS, external anal sphincter; IAS, internal anal sphincter; N, valid numbers of completed questionnaire before and after the course received from 53 physicians and 71 midwives.

showed that the knowledge of physicians and midwives in naming the muscles that are cut during an uncomplicated episiotomy, improved after the training; almost 80% of the physicians and more than 50% of the midwives reported the correct muscles after the course. These results can be compared with a similar study from the UK conducted after identical expert training was conducted; 69% of physicians and 25% of midwives knew which muscles were cut during an uncomplicated episiotomy after training.<sup>19</sup>

In this study, there was also a statistically significant change in the knowledge of midwives and physicians regarding the timing of per rectal examination. Prior to

the training, most participants believed that a rectal examination should only be performed after suturing, which is not in line with international guidelines<sup>16 17</sup> and the latest updated Palestinian national guidelines which recommends doing rectal examination before and after suturing.<sup>20</sup> In order to diagnose OASIS, the examination must be performed before the repair is commenced as it is very difficult to identify OASIS after the repair.<sup>17 18</sup> The anal sphincter has to be repaired before the perineal muscles are sutured. A rectal examination is performed after the repair in order to check that the repair was complete and that no sutures are penetrating the rectum. The significant improvement in

**Table 5** Physicians knowledge on OASIS diagnosis and repair before and after the expert training

Questions	Physicians (N=53)		p Value*
	Before N (%)	After N (%)	
Technique used for repair of the EAS when it is completely torn	28 (52.8)	39 (73.6)	
End-to-end figure of eight sutures	6 (21.4)	6 (15.3)	0.38
End-to-end mattress sutures	14 (50)	12 (30.8)	0.18
Overlap	8 (28.6)	21 (53.9)	0.05
Suture material	39 (73.6)	37 (69.8)	
Catgut	5 (12.8)	0 (0)	0.50
Vicryl	19 (48.7)	32 (86.5)	0.004
Dexon	15 (38.5)	1 (2.7)	0.02
PDS	0 (0)	4 (10.8)	0.12
If IAS torn, does the provider repair the internal sphincter separately	39 (73.5)	38 (71.7)	
Don't know	8 (20.5)	2 (5.3)	0.008
No, together with EAS	26 (66.6)	3 (7.9)	<0.001
Yes, separately	5 (12.9)	33 (86.8)	<0.001

N=valid numbers of completed questionnaire before and after the course received from 53 physicians and 71 midwives.

\*p Value of McNemar test is used to test the difference (each row is compared with all others combined as 2x2 table).

EAS, external anal sphincter; IAS, internal anal sphincter; OASIS, obstetrical anal sphincter injuries.

understanding the importance of a rectal examination both before and after suturing was a major achievement.

The study findings can be compared with a study based on a 1-day training workshop by the same experts focusing on the knowledge on episiotomy and perineal tears among 497 physicians and midwives in the UK.<sup>14</sup> This study showed an improvement in the correct classifications of perineal tears ranging from 45% to 80% before the training and 67% to 89% after training.<sup>14</sup> In our study, the knowledge regarding classification of perineal injuries did not appear to have changed among the physicians (37.9% before the course to 40.5% after the course), but some improvement was observed among the midwives namely, from 17.8% to 22.9%. The reasons for these variations may be attributed to some of the participating physicians reluctance to learn about the new classifications. The concept of continuous learning throughout one's career is not commonly applied in Palestine and there is a lack of national training programmes for postgraduate education.

A Cochrane review concluded that while the overlap technique for full thickness external anal sphincter tears appeared to be associated with lower risks of developing urgency and anal incontinence symptoms; at 36 months there was no difference in flatus or faecal incontinence between the overlap and end-to-end techniques.<sup>21</sup>

However, since this evidence was based on only two small trials, more research evidence is needed in order to confirm or refute these findings.<sup>12 21</sup> In this study, the physicians knowledge about using the overlap technique in the repair of full thickness external anal sphincter tears had statistically improved from 28.5% before the training to 42.8% after the training.

There was no statistically significant change in the knowledge of physicians before and after the training regarding the figure of eight methods in the end-to-end repair of external anal sphincter injury.

Only six physicians have answered this question as the ideal method of repair. Current teaching<sup>18</sup> and the RCOG guidelines<sup>17</sup> recommended avoiding the figure of eight sutures in the repair of complete external anal sphincter tears as this could lead to tissue ischaemia. Most of the physicians used Vicryl instead of polydioxanone suture (PDS) sutures to repair the anal sphincter. This could be due to unavailability of PDS in government hospitals in Palestine but Vicryl is still preferable to catgut which may cause adverse tissue reaction and increase the risk of infection.<sup>17 22</sup>

A recent multicentre study from the UK explored the perception, knowledge and practice of 592 midwives on perineal tear management, and concluded that most of the midwives reported their inability to identify the anatomy of the perineal area clearly and that their training on perineal tears repair before graduation was insufficient,<sup>23</sup> which is consistent with this study's finding. In Palestine, midwifery students may also get insufficient training on perineal tears repair due to strict hospital policies on students training, giving limited authorisation for students to participate in patient care.

A study evaluated the perception of training, supervision and experience of 72 obstetrics and gynaecology residents in Catalonia hospitals in Spain regarding the management of perineal tears after assisted vaginal delivery.<sup>24</sup> In line with this study's findings, they concluded that most of the residents did not have enough knowledge on perineal anatomy and the majority of them indicated the necessity for more training in the repair of perineal tears,<sup>24</sup> which is consistent with this study's results. Another study used a semistructured questionnaire to evaluate the perception of 69 midwives and 17 physicians regarding their preparation and practice in managing the perineum in the second stage of labour.<sup>25</sup> In this study, 71% of the midwives reported that they had received training in diagnosing OASIS but only 16% of them reported that they were very confident in making this diagnosis.<sup>25</sup> This suggests that training of healthcare professionals on assessment and making the correct classification of perineal tears needs to be prioritised.<sup>26</sup>

### Strength and limitation of the study

The strengths of the study include: since we trained almost all midwives and physicians in six study hospitals on diagnosis and management of perineal tears, we

expect to minimise the morbidity associated with vaginal delivery. The training was conducted on silicon models of human sphincters as well as animal sphincters looking similar to human anal sphincters. The 'in vitro' training may have helped the participants to overcome the problems of acquisition of technical skills.

Limitations of the study include: the actual practice of diagnosis and management of perineal tears was not evaluated as our data were obtained from the questionnaires only. Additionally, the data were self-reported, which is known to be prone to information bias. A 3-month follow-up after the training may be too short, and may therefore not reflect the longer term effects, such as whether improvements in knowledge and practice of the medical teams sustained. Not all questions were answered by all participants, suggesting that they did not know the answers. In addition, some midwives and physicians could not attend the training due to clinical duties and hence they did not participate in our study. Non-specialist doctors also work in hospitals in Palestine, but unfortunately we did not collect data on whether the physicians were specialists or not.

## CONCLUSION

Improvement in the level of knowledge on diagnostics and repair of perineal tears was observed for all physicians and midwives who attended the 2 days expert training. Regular ongoing training will serve to suggest that maintain the newly acquired knowledge that is an essential component to developing the require skills. Supervision during actual repairs and frequent training on models during the residency programme may be helpful.

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**Contributors** KZ was involved in training preparations in Gaza, data collection, data analysis and drafted the manuscript. RT and AHS were involved in study design, questionnaire development, training programme development and

implementation, conceptualisation and commented on the manuscript. KL and EF were involved in study design, protocol development and commented on the manuscript. AV was involved in study design, protocol development, preparation and coordination for the training in Gaza, commented on the manuscript. MZ and HA were involved in data collection and commented on the manuscript. SH was involved in study design, conceptualisation, protocol development, preparation and coordination for the training in the West Bank, data collection, and critical comments on the manuscript. All authors have read and approved the final version of the manuscript.

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**Competing interests** None declared.

**Ethics approval** The Regional Committee for Medical and Health Research Ethics, Section C, South East Norway, reviewed the Research Project 'Can perineal injuries be prevented following births in Palestine?' on 21 October 2014 and found the Research Project to be outside the remit of the Act on Medical and Health Research (2014/1727). The project was done in accordance with common rules for healthcare services in Palestine and Norway regarding, for example, privacy.

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## REFERENCES

- Lozo S, Eckardt MJ, Altawil Z, *et al*. Prevalence of unrepaired third and fourth degree tears among women taken to the operating room for repair of presumed obstetric fistula during two fistula camps in Kenya. *Int Urogynecol J* 2016;27:463–6.
- Hirayama F, Koyanagi A, Mori R, *et al*. Prevalence and risk factors for third and fourth-degree perineal lacerations during vaginal delivery: a multi-country study. *BJOG* 2012;119:340–7.
- Kettle C, Tohill S. Perineal care. *BMJ Clin Evid* 2008;9:1–18.
- Groutz A, Hasson J, Wengier A, *et al*. Third and fourth degree perineal tears: prevalence and risk factors in the third millennium. *AJOG* 2011;204:347e1–4.
- Räisänen S, Vehviläinen Julkunen K, Cartwright R, *et al*. Vacuum-assisted deliveries and the risk of obstetric anal sphincter injuries—a retrospective register-based study in Finland. *BJOG* 2012;119:1370–8.
- Dandolu V, Chatwani A, Harmanli O, *et al*. Risk factors for obstetrical anal sphincter lacerations. *Int Urogynecol J Pelvic Floor Dysfunct* 2005;16:304–7.
- Sooklim R, Thinkhamrop J, Lumbiganon P, *et al*. The outcomes of midline versus medio-lateral episiotomy. *BMC Med* 2007;4:10.
- American College of Obstetricians-Gynecologists. ACOG Practice Bulletin. Episiotomy, clinical management guidelines for obstetrician and gynaecologists. No. 71, April 2006. *Obstet Gynecol* 2006;107:957–62.
- Andrews V, Sultan AH, Thakar R, *et al*. Occult anal sphincter injuries—myth or reality? *BJOG* 2006;113:195–200.
- Carroli G, Mignini L. Episiotomy for vaginal birth. *Cochrane Database Syst Rev* 2009;(1):CD000081.
- Laine K, Skjeldestad FE, Sandvik L, *et al*. Incidence of obstetric anal sphincter injuries after training to protect the perineum: cohort study. *BMJ Open* 2012;2:e001649.
- Fernando RJ, Sultan AH, Radley S, *et al*. Management of obstetric anal sphincter injury: a systematic review & national practice survey. *BMC Health Serv Res* 2002;2:9.
- McLennan TM, Melick FC, Clancy LS, *et al*. Episiotomy and perineal repair: an evaluation of resident education and experience. *Obstet Gynecol Survey* 2003;58:374–6.
- Andrews V, Thakar R, Sultan AH. Structured hands-on training in repair of obstetric anal sphincter injuries (OASIS): an audit of clinical practice. *Int Urogynecol J Pelvic Floor Dysfunct* 2009;20:193–9.

15. Krissi H, Aviram A, Hiersch L, *et al*. Structured hands-on workshop decreases the over-detection rate of obstetrical anal sphincter injuries. *Int J Colorectal Dis* 2016;31:45–50.
16. Anderson B, Attwood B, Baird G, *et al*. *National Institute for Health and Clinical Excellence intrapartum care: management and delivery of care to women in labour*. Clinical Guideline No 55. London: NICE, 2015.
17. Fernando RJ, Sultan AH, Freeman RM, *et al*. Royal College of Obstetricians and Gynaecologists: the management of third- and fourth-degree perineal tears. Green Top Guidelines, No. 29. RCOG; June. 2015.
18. Sultan AH, Thakar R, Fenner D. *Perineal and anal sphincter trauma*. London: Springer, 2007.
19. Sultan AH, Kamm MA, Hudson CN. Obstetric perineal trauma: an audit of training. *J Obstet Gynaecol* 1995;15:19–23.
20. Kurd A, Belbisi A, Jaber S, *et al*. Palestinian guidelines and protocols for obstetricians, general practitioners and midwives: Second and third stage of labor. Palestinian National Authority, MOH November, 2014:29–35.
21. Fernando RJ, Sultan AH, Kettle C, *et al*. Methods of repair for obstetric anal sphincter injury. *Cochrane Database Syst Rev* 2013; (12):CD002866.
22. Webb S, Sherburn M, Ismail KM. Managing perineal trauma after childbirth. *BMJ* 2014;349:g6829.
23. Selo-Ojeme D, Pathak S, Joshi V. The knowledge, practice and opinion of midwives in the UK on their training in obstetric perineal repair. *Arch Gynecol Obstet* 2015;291:1265–70.
24. Cornet A, Porta O, Pineiro L, *et al*. Management of obstetric perineal tears: do obstetrics and gynaecology residents receive adequate training? Results of an anonymous survey. *Obstet Gynecol Int* 2012;2012:316983.
25. East CE, Lau R, Biro MA. Midwives' and doctors' perceptions of their preparation for and practice in managing the perineum in the second stage of labour: a cross-sectional survey. *Midwifery* 2015;31:122–31.
26. Ann Morris MBaAD. Professional's skills in assessment of perineal tears after childbirth-A systematic review. *Open J Obstet Gynecol* 2013;3:7–15.

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# Diagnosis and repair of perineal injuries: knowledge before and after expert training—a multicentre observational study among Palestinian physicians and midwives

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