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CLINICAL ARTICLE

Implications of perihepatic adhesions in women undergoing laparoscopic surgery for ectopic pregnancy

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ABSTRACT

Objective: To establish whether the finding of perihepatic adhesions (PHAs) at laparoscopy for ectopic pregnancy (EP) is associated with poor perioperative and reproductive outcomes. *Methods:* A retrospective cohort study was undertaken of all cases of EP managed surgically at a teaching hospital in northeast London in 2003–2013. Data for symptoms, reproductive history, ultrasonography findings, blood parameters, and findings at surgery were compared between patients with and without perihepatic adhesions (PHAs) identified at laparoscopy. *Results:* Among 802 women with EP, PHAs were identified during surgery for 60 (7.5%). Compared with women without PHAs, patients with PHAs were significantly more likely to have had previous pelvic inflammatory disease, previous EP, previous tubal surgery, and the finding of abnormal contralateral adnexa or other adhesions during laparoscopy ($P \le 0.024$ for all). They also had higher preoperative hemoglobin concentrations and smaller hemoperitoneum volumes ($P \le 0.04$ for both). *Conclusion:* Women with PHAs at laparoscopy for EP had lower blood loss than did those without PHAs. The finding of PHAs was associated with an increased rate of recurrent EP, irrespective of a previous history of PID or EP.

1. Introduction

Ectopic pregnancy (EP) affects 1.5%–2.0% of all pregnancies worldwide [1], so is estimated to affect more than 12 000 women every year in the UK. Although most women who have EP have no risk factors, pelvic infection—through its effects on the fallopian tube—increases the risk of EP [2,3]. Women with a history of pelvic inflammatory disease (PID) are 6–10 times more likely to have an EP [4,5]. Infection with *Chlamydia trachomatis* or *Neisseria gonorrhoeae* is associated with PID—between 10% and 40% of women who contract *C. trachomatis* infection will develop PID [6]—but only some women who contract these infections will have symptoms, and not all with symptoms will receive any or timely treatment. The true incidence of PID in the community is therefore difficult to estimate.

Perihepatic adhesions (PHAs) result from perihepatic inflammation and are associated with the transperitoneal spread of *C. trachomatis* and/or *N. gonorrhoeae* pelvic infection [7–9]. The association of right upper-quadrant pain with PID—known as Fitz-Hugh–Curtis syndrome and described by Stajano [10] as early as 1920—seems likely to result from the initial perihepatitis and could precede adhesion formation. Because PHAs are evidence of transperitoneal microbial spread, they can be considered to be a marker for an altered state in the peritoneal cavity and are the only sign of previous PID in some women. Inspection of the upper abdomen is a routine part of gynecologic laparoscopy, and the presence of PHAs should confirm that deciliation and impaired tubal ciliary function, with resulting ectopic implantation of the embryo, is probably secondary to PID [2,3].

The aim of the present study was to compare the demographic characteristics, symptoms at presentation, ultrasonography findings, intraoperative findings, and treatment of patients found to have PHAs—denoting serious PID with intraperitoneal spread—during their treatment of EP. The findings should allow a more objective assessment of the association between patient characteristics and intraoperative outcomes in surgically managed EP and PID.

2. Materials and methods

A retrospective cohort study was undertaken using a database of all cases of EP managed surgically at a teaching hospital in northeast London, UK, between January 1, 2003, and December 31, 2013. The data were stored according to the Caldicott principles, which state that the use of patient information must be justified; identifiable information was not necessary and therefore not used, and individuals accessing patient-identifiable information were aware of their responsibilities for maintaining confidentiality and understood and complied with the law. Formal ethics approval was sought and was not deemed necessary because the management of the patients was not altered in any way and the data formed part of an ongoing quality-of-care audit.

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Informed consent was not necessary because the analysis was a retrospective audit using anonymous data.

Demographic information, reproductive history, self-reported history of PID, scan findings, surgical management and findings at surgery had been recorded by clinical staff involved in the care of the women found to have EP. PHAs were diagnosed when adhesions were seen from the liver surface to the peritoneal surface.

The association of PHAs with outcomes was evaluated by comparing the data for women with and without PHAs at laparoscopy. Additionally, a subgroup analysis was conducted of patients with PHAs. The Mann–Whitney *U* test was used for comparisons of nonparametric data and the χ^2 test for comparisons of parametric and ordinal data. The analysis was performed with SPSS version 20 (IBM, Amonk, NY, USA). $P < 0.05$ was considered statistically significant.

3. Results

In total, 802 women with EP were treated surgically between 2003 and 2013. PHAs were identified in 60 (7.5%) women. Compared with women without PHAs, women with PHA were significantly more likely to have had PID ($P < 0.001$), previous EP ($P = 0.024$), and tubal surgery ($P = 0.020$) (Table 1). Women with PHAs presented at a later stage of pregnancy than did those without PHAS, although the difference was not significant ($P = 0.054$) (Table 1). Women found to have PHAs had significantly higher hemoglobin concentration on admission ($P = 0.02$) (Table 1) and a smaller measured hemoperitoneum volume ($P = 0.04$) (Table 2).

Table 1
Demographic characteristics and medical history.[a]

Variable	PHAs (n = 60)	No PHAs (n = 742)	*P* value
Age, y	31 ± 5.2	31 ± 4.2	0.988
Parity			
0	36 (60)	316 (42.6)	0.040
1	12 (20)	189 (25.5)	
2	7 (11.7)	123 (16.6)	
3	4 (6.7)	64 (8.6)	
≥4	1 (1.7)	33 (4.4)	
Not recorded	0	17 (2.3)	
Pregnancy duration, wk	7 ± 1.7	6 ± 1.9	0.054
Pain	53 (88.3)	691 (93.1)	0.433
Vaginal bleeding	49 (81.7)	615 (82.9)	0.528
Vomiting	3 (5.0)	73 (9.8)	0.094
Diarrhea	0	13 (1.8)	0.187
Shoulder-tip pain	3 (5.0)	76 (10.2)	0.122
Syncope	7 (11.7)	79 (10.6)	0.692
Smoker	7 (11.7)	113 (15.2)	0.225
Previous EP	12 (20.0)	76 (10.2)	0.024
Previous tubal surgery	15 (25.0)	63 (8.4)	0.020
Previous induced abortion	13 (21.7)	133 (15.2)	0.474
Previous spontaneous abortion	12 (20.0	184 ( )	0.159
History of pelvic surgery	12 (20.0)	133 (17.9)	0.904
Assisted reproduction	3 (5.0)	32 (4.3)	0.788
History of pelvic inflammatory disease	19 (31.7)	41 (5.5)	<0.001
Progesterone only pill	0	17 (2.3)	0.167
Morning-after pill	0	8 (1.1)	0.194
Combined oral contraceptive pill	0	35 (4.7)	0.095
Copper intrauterine contraceptive device	1 (1.7)	9 (1.2)	0.551
Levonorgestrel-releasing intrauterine system	0	7 (0.9)	0.202
Condoms	3 (5.0)	30 (4.0)	0.784
Adnexal mass felt	55 (91.7)	619 (83.4)	0.461
Fetal heart activity	8 (13.3)	64 (8.6)	0.142
Fluid in pouch of Douglas	44 (73.3)	535 (72.1)	0.338
Hemoglobin on admission, g/L	117 ± 19	111 ± 29	0.020
Sickle cell			
Trait	0	2 (0.3)	0.981
Disease	7 (11.7)	37 (5.0)	0.118

Abbreviations: PHA, perihepatic adhesion; EP, ectopic pregnancy.
[a] Values are given as mean ± SD or number (percentage), unless indicated otherwise.

Table 2
Surgical findings.[a]

Finding at surgery	PHAs (n = 60)	No PHAs (n = 742)	*P* value
Contralateral adnexa			
Abnormal	14 (23.3)	54 (7.3)	<0.001
Previous salpingectomy	6 (10.0)	27 (3.6)	0.020
Adhesions	6 (10.0)	29 (3.9)	0.010
Hemoperitoneum, mL	357.3 ± 763.1	475.8 ± 809.0	0.040
Site of pregnancy			0.144
Cornual	5 (8.3)	21 (2.8)	
Cesarean scar	0	3 (0.4)	
Heterotopic	0	1 (0.1)	
Ovarian	0	19 (2.6)	
Peritoneal	0	1 (0.1)	
Tubal	55 (91.7)	699 (94.2)	

Abbreviation: PHA, perihepatic adhesion.
[a] Values are given as number (percentage) or mean ± SD, unless indicated otherwise.

At laparoscopy, women with PHA were more likely to have abnormal contralateral adnexa ($P < 0.001$) or other adhesions ($P = 0.010$) (Table 2). The presence of PHAs was only associated with EP in cornual and tubal locations (Table 2). Cornual pregnancies were more common among women with PHAs than among those without PHAs, although the difference was not significant ($P = 0.144$) (Table 2).

In the subgroup analysis of the 60 women with PHAs, there were no significant differences in demographic characteristics, reproductive history, symptoms at presentation, or surgical findings between women with (n = 19) and without (n = 41) a history of PID (data not shown). When women with (n = 12) and without (n = 48) a history of EP were compared, the only significant differences were observed in terms of history of tubal surgery (3 [25.0%] vs 4 [8.3%]; $P < 0.001$) and history of pelvic surgery (8 [66.7%] vs 4 [8.3%]; $P < 0.001$).

In the subset of 87 women who had a second EP within the study period, 12 (13.8%) had PHAs at laparoscopy; this prevalence of PHAs was almost double that in the cohort as a whole ($P = 0.01$).

4. Discussion

Pelvic infection was associated with EP in the present cohort, but it was not reported by most women with evidence of PHAs, reflecting the fact that PID can be an asymptomatic condition with the only sign being PHA. The stigma associated with sexually transmitted infections could also lead to under-reporting by patients at presentation to hospital.

The rate of PHAs in the present cohort was lower than that described by Ali et al. [11] (7.5% vs 14%) among women undergoing treatment for EP and lower than that described by Sharma et al. [12] among women undergoing laparoscopic sterilization. These previous studies were done between 1998 and 2002, whereas the data for the present cohort were recorded from 2003 to 2013. Additionally, Sharma et al.'s cohort differed from the present cohort in their indication for laparoscopy. The frequency of smoking—another influence on ciliary function—was not significantly different between the two populations.

Under-reporting could also be a factor: in emergency surgery with significant bleeding, inspection of the upper abdomen might be neglected. However, it is standard practice at the study center to inspect and record the appearance of the upper abdomen during all laparoscopies.

Women with PHAs were more likely to have had PID, tubal surgery, and previous EP, as expected. It is likely that the EP and tubal surgery were attributable to tubal damage caused by PID.

The absence of a reported history of PID in 42 (68.9%) women with PHAs confirms that PID is often asymptomatic [13]. Presentation, reproductive histories, and findings at surgery were not different between those reporting and those not reporting a history of PID. We suggest that causative organisms for PID in these respective subgroups of women could be inferred from the reported history or lack

of reported history of PID and findings of PHAs (and therefore confirmation of PID) at laparoscopy. *N. gonorrhoeae* tends to cause symptoms and therefore women give a history of PID, whereas *C. trachomatis* tends to be asymptomatic.

The delayed presentation of women with PHAs in the present study is difficult to explain. Women with PHAs found at laparoscopy had higher hemoglobin levels on admission and lower measured blood loss at laparoscopy than did those without PHAs, suggesting that they bled less before diagnosis and resultantly had fewer symptoms and later diagnosis. It could be tentatively suggested that tubal damage and scarring caused by PID could reduce local blood flow available for developing EPs and therefore reduce bleeding, symptoms from bleeding, and blood loss at surgery. The frequency of cornual pregnancies tended to be increased in the PHA group; the difference was not significant, but this may have been a type 2 error. Women with a cornual pregnancy generally present later, but these pregnancies are associated with increased blood loss [14].

Women with PHAs were significantly more likely to have a repeat EP within the study period. The probable reason is that they had a history of PID—a recurrent risk factor for EP. Women with a finding of PHAs during surgical treatment for EP could be at a higher risk of EP recurrence than are women overall (the overall reported rate being approximately 10% [1]), irrespective of a previous history of PID or EP.

The absence of a history of PID in women diagnosed with PHAs highlights the difficulty of preoperative counselling and the need to individualize care for each patient. There is debate as to whether salpingotomy is superior to salpingectomy as a fertility-enhancing procedure in the management of EP [15,16]. In patients with an abnormal contralateral tube, UK guidelines [17] recommend the performance of fertility-sparing surgery (salpingectomy rather than salpingotomy) if the woman's family is not complete and future fertility is desired. In a study by Becker et al. [18], salpingectomy in patients with EP and a history of fertility-reducing factors resulted in an intrauterine pregnancy rate of 40%, compared with 75% after salpingotomy.

The decision as to whether to remove a fallopian tube or to conserve it depends on the patients' history and the operative findings. Relevant operative findings include the presence or absence of tubal rupture, the size of the pregnancy, and the surgeon's perception of the future "functionality" of the fallopian tube. In the literature, PHAs are not reported as evidence for considering conservative management.

The present study has highlighted that not all women who have had PID report a history of PID, and women should therefore be counselled in respect to the possibility of the finding of PHA and the association with recurrent EP. Counselling regarding salpingotomy or salpingectomy should not be based on history alone. Further studies are required to investigate the rates of subsequent fertility and recurrent EP among women treated conservatively for EP in the presence of PHA.

Conflict of interest

The authors have no conflicts of interest.

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