ELSEVIER

European Journal of Obstetrics & Gynecology
and Reproductive Biology 74 (1997) 57–62

OBSTETRICS & GYNECOLOGY

The relationship between laparoscopic disease, pelvic pain and infertility; an unbiased assessment

J.G. Thornton*, S. Morley, J. Lilleyman, J.L. Onwude, I. Currie, A.C. Crompton

Institute of Epidemiology and Health Services Research, University of Leeds, Leeds LS2 9LN, UK

Received 21 November 1996; revised 27 February 1997; accepted 19 March 1997

Abstract

Objectives: To measure the relationship between laparoscopically detected pelvic pathology and pelvic pain or infertility. *Methods*: Women undergoing diagnostic laparoscopy either for the investigation of pelvic pain, for sterilisation or for the investigation of infertility were studied. The indication for surgery was recorded before laparoscopy. At operation a series of 35-mm slide photographs were taken of the pelvis and later scored by two independent assessors without knowledge of the indication for surgery. *Results*: Satisfactory photographs were obtained in 298 women. Minimal endometriosis was not associated with pain (adjusted OR 1.3; 0.5–2.8), although moderate disease was non-significantly so (2.5; 0.4–7.1). Severe disease was significantly more common and never occurred in patients being sterilised ($P=0.02$). The odds of pain were not increased in the presence of dilated veins >9 mm diameter (OR 1.1; 0.4–3.2) or adhesions (OR 0.6; 0.2–4.7). The odds of infertility were non-significantly increased in the presence of minimal and moderate endometriosis (OR 2.0; 0.8–5.3, and OR 4.2; 0.6–25 respectively) and again significantly more common in the presence of advanced disease ($P=0.002$). The odds of infertility tended to be lower in the presence of severely dilated veins (OR 0.2; 0.032–1.2). There was no clear effect of adhesions (OR 0.9; 0.1–5.9). *Conclusions*: The long established associations between severe endometriosis and pelvic pain, and between endometriosis in general and infertility are confirmed. However there is little or no association between minimal endometriosis, pelvic adhesions or dilated pelvic veins and pain. Previously reported associations may have been an artefact of the surgeon's knowledge of the indication for operation when assessing the pelvis. © 1997 Elsevier Science Ireland Ltd.

Keywords: Pelvic pain; Endometriosis; Pelvic varices; Adhesions; Infertility

1. Introduction

Chronic pelvic pain lasting more than three months is an important gynaecological problem. The causes are believed to include endometriosis, pelvic infection or adhesions, and varicose dilatation of the pelvic veins [1]. Although there is general agreement about the importance of advanced endometriosis and of active pelvic infection, the significance of minor degrees of endometriosis, adhesions and of pelvic varices is disputed [2]. Endometriosis, infection and adhesions are best assessed laparoscopically and numerous studies, reviewed by [3], have shown an association between the laparoscopic appearance and the severity of pain. However, not all studies have shown the association [4], and it is also well recognised that some patients with pain have no observable pathology, and conversely that some women with pathology report no pain [5]. Some authors have recognised the possibility that observed associations may be spurious [6].

Elucidation of the pathophysiology of pelvic pain requires careful assessment of exactly what laparoscopic findings are really associated with pain. It is not justified to blame an apparent pathological finding for a symptom if it is found equally frequently in people without the symptom. Most studies reporting associations between pain and putative pathology have been susceptible to observer bias in that associations may be exaggerated if surgeons are aware of the patient's subjective pain severity. This hypothesis was supported by a study [2] where pain scores

*Corresponding author: Tel.: +44 113 2926370; fax: +44 113 2926452

0301-2115/97/$17.00
PII S0301-2115(97)00082-1

were concealed from the surgeon, and no significant relationship between endometriosis disease severity and pain severity was found. Despite this there was still an association between the presence or absence of disease and the presence or absence of pain. This may be because the surgeon would know the likelihood that the patient had pain, since this is less likely among women being sterilised or undergoing dye instillation. Since it is impossible to truly blind surgeons to the indication for the laparoscopy, we assessed the pelvis indirectly by scoring a standard set of laparoscopic photographs.

2. Methods

A number of women (455) who were undergoing diagnostic laparoscopy for sterilization, the investigation of infertility or the investigation of pelvic pain of more than three months duration were invited to participate. Each woman was interviewed either on the morning of operation or within one week before it and the primary indications for operation were recorded. If more than one indication was present, pain was considered to be the primary indication since our hypothesis was concerned with the relationship between pelvic findings and this symptom. The indications are shown in Table 1.

Patients underwent laparoscopic pelvic assessment in the usual way. However before performing any procedure, the surgeon was asked to take the following 35-mm slide photographs of the pelvis; an overall view of the pelvis, close-up views of right and left ovaries and fallopian tubes, and a close up of the uterosacral ligaments and pouch of Douglas. The surgeon also took a single polaroid print of the overall view of the pelvis for showing to the patient. For various reasons the full set of 35-mm slides of the pelvis were not obtained in all cases. Sometimes the surgeon was too short of time, sometimes camera, film or technical faults meant that the final picture quality was inadequate for diagnosis. Overall satisfactory slides were obtained in 298 women who formed the study population.

After the operation two gynaecologists, a consultant and an experienced senior registrar viewed the slides independently, and without knowledge either of the reason for the laparoscopy or of the patients' self-reported pain symptoms. These assessors were never the same individual as the operating surgeon. Endometriosis and pelvic adhesions were scored according to the revised American Fertility Society classification [7]. Endometriotic lesions were also classified into 'typical black', 'vesicular red', 'red flamelike/haemorrhagic', 'papular' and finally, 'old inactive including peritoneal pouches' by comparison with typical examples illustrated in Shaw's atlas [8]. The diameter of the largest visible pelvic vein on each side was assessed subjectively by comparison with other pelvic landmarks. After recording their independent scores these two surgeons reviewed the slides together, again without knowing the reason for laparoscopy or pain score or whether their initial assessments had differed, reached an agreed pelvic pathology score.

Finally the diagnosis made by the operating surgeon was abstracted from the medical records. Operating surgeons were of varying seniority from registrar to consultant. Surgeons were diligent in recording the presence or absence of pathology but were inconsistent in their methods of classifying the degree of pathology. The operating surgeon's assessment was therefore dichotomised into simply the presence or absence of endometriosis, adhesions or dilated pelvic veins.

2.1. Statistics

Statistical analysis was done with the SPSS for Windows program. Multiple logistic regression was therefore used to examine the correlation between pathological findings and pain or infertility after adjustment for other factors such as age, time of menstrual cycle and the presence of more than one recorded pathology. These independent effects are expressed as the adjusted odds ratios of the operative indication being pain or infertility respectively.

3. Results

The rate of obtaining such photographs did not differ significantly by operative indication (Table 1). The reasons for not obtaining all five slides were not recorded prospectively, but included the surgeon having insufficient time, film or camera failure.

3.1. Inter-observer agreement

The degree of agreement between the two surgeons for the diagnosis of endometriosis is shown in Table 2. Their agreed diagnosis is compared with that of the operating surgeon in Table 3. Depending on whether endometriosis is classified as present or absent or into absent, mild and

Table 1
Primary indication for laparoscopy

	Total	Photographs obtained (%)
Sterilisation	159	105 (66%)
Investigation of chronic pain	201	132 (66%)
Investigation of infertility	95	61 (64%)

Table 2
Comparison between the two assessors' diagnoses of endometriosis

	Assessor 1			
	No path	Score 1–4	Score >4	Total
Assessor 2				
No path	171	29	4	204
Score 1–4	19	39	2	60
Score >4	7	13	14	34
	197	81	20	298

Presence/absence $\kappa=0.76$.
Absent/mild/severe $\kappa=0.49$.

Table 3
Agreement between operating surgeon's diagnosis and assessors agreed diagnosis on slides

		Assessors		
		Endometriosis		
		Absent	Present	Total
Surgeon	Absent	176	84	262
	Present	19	19	38
		195	105	298

$\kappa=0.1$.

severe, the assessors κ statistic was 0.76 or 0.49, i.e. fair to good [9]. The degree of agreement between the assessors and the operating surgeon was very poor ($\kappa=0.098$). It was not possible to measure agreement on severity of endometriosis because this was rarely recorded by the operating surgeon.

3.2. Clinicopathological correlations

The pathological findings in each group, and the adjusted odds ratios for the operative indication being either pain or infertility in the various pathological categories are shown in Table 4.

Severe endometriosis (AFS score 16–40) was significantly more common in patients with both pain and infertility and was never seen in the sterilisation group. The relationship of lesser degrees of endometriosis to pain and infertility was less clear cut. Only scores over 6 were associated with increased odds of pain although any degree of endometriosis was associated with increased odds of infertility. However, for all these minimal/moderate endometriosis/symptom associations the confidence intervals were wide and compatible with no difference. None of the individual subtypes of endometriosis were significantly associated with either pain or infertility although the trend towards increased odds of both pain and infertility in patients with vesicular red lesions approached statistical significance. Neither adhesions nor dilated pelvic veins were associated with increased odds of either pain or

Table 4
The adjusted odds ratio for the operative indication being pain or infertility for the presence of various pelvic pathology as diagnosed by the assessors from the slides[a]

	Steri.	Pain	Adjusted OR for pain (95% CI)[b]	Infert.	Adjusted OR for infert. (95% CI)[b]
Total	105	132	61		
Normal	73	85	28		
Endometriosis					
0	77	88	30		
Score 1–5	24	30	1.3; 0.5–2.8	21	2.0; 0.8--5.3
6–15	4	8	2.5; 0.4–7.1	7	4.2; 0.6--2.5
16–40	0	6*	5**		
Type					
Typical black	5	16	1.2; 0.6–2.4	9	1.1; 0.6--2.2
Red flamelike	15	8	0.5; 0.3–0.9	9	0.7; 0.4--1.4
Vesicular red	3	15	2.1; 0.9–5.2	11	2.0; 0.8--4.7
Petechial	10	6	0.5; 0.1–1.1	3	0.5; 0.2--1.2
Old inactive	2	4	1.2; 0.5–3.3	5	1.6; 0.6--4.2
Adhesions					
None	98	126	57		
Present	7	6	0.6; 0.2–4.7	4	0.9; 0.1--5.9
Dilated veins					
<5 mm	50	51	34		
5–9 mm	17	33	1.4; 0.6–3.1	14	0.7; 0.3--2.0
>9 mm	9	15	1.1; 0.4–3.2	2	0.2;.03–1.2

[a] The markers do not always add up because some women had more than one type of endometriosis, and some women without endometriosis had other pelvic pathology.
[b] Odds ratios adjusted for age and for stage of menstrual cycle (proliferative or luteal).
* $P=0.02$ χ^2.
** $P=0.002$ χ^2.

Table 5
The operating surgeon's findings

	Sterilisation	Pain	Infertility
Total	105	132	61
Endometriosis present	1 (0.95%)	24 (18%)	13 (21%)
Adhesions present	10 (9.5%)	28 (21%)	19 (31%)
Dilated veins present	1 (0.95%)	2 (1.5%)	0

infertility. The trend was for severely dilated veins to be associated with reduced odds of infertility.

The assessors agreed diagnoses simplified into the presence or absence of disease in the various groups are compared with those of the operating surgeons in Tables 5 and 6. The operating surgeon was less likely than the assessors to diagnose endometriosis among women undergoing sterilisation and more likely to diagnose adhesions among women with pain or infertility. The operating surgeon diagnosed dilated veins much less often than the assessors in all three groups.

4. Discussion

We have confirmed the relationship between severe degrees of endometriosis and chronic pelvic pain, between lesser degrees of endometriosis and infertility, and between severely dilated pelvic veins and fertility. However, we have failed to demonstrate any relationship between minimal endometriosis, pelvic adhesions, or dilated pelvic veins and pain. Nor have we demonstrated a relationship between adhesions and infertility.

The strong association between the surgeon's diagnosis of endometriosis and pain supports the hypothesis that surgeons may be biased in their scoring. Human nature is such that when a patient complains of pain the surgeon is particularly thorough and classifies any doubtful lesions as disease. Conversely when the operative indication is sterilisation and the patient has no pain the surgeon may turn a blind eye to mild endometriosis or even not notice it. The modest degree of agreement between assessors that we observed confirms that there is ample scope for such subjectivity.

Table 6
The assessors findings classified in the same way as the operating surgeon

	Sterilisation	Pain	Infertility
Total	105	132	61
Endometriosis present	28 (27%)	44 (33%)	33 (54%)
Adhesions present	7 (6.7%)	6 (4.5%)	4 (6.6%)
Dilated veins present (>9 mm)	9 (8.6%)	15 (11%)	2 (3.3%)

While the assessment of pelvic pathology from slides may differ from that in real time this cannot account for the difference in rate of agreement between the retrospective and real-time diagnosis of infertility versus pain. The approximate one third of cases in which the slide quality was inadequate to grade the pelvis will not have biased our results since the main reason for inadequate quality was technical camera or film failure, and the rate of inadequate slides did not differ by operative indication (Table 1). A better assessment of disease might be obtained from videotapes of the laparoscopy and we have tried to assess the pelvis this way. Unfortunately the technical problems of storing, labelling and reviewing laparoscopy films were considerable and surgeons sometimes negated the advantage of blinding the assessors by highlighting the lesions they believed were significant.

Previous workers had suggested that the classical black lesion was most likely to cause organic pain and papillary most likely to be functional [10]. Although the numbers in this study are small the only type of endometriotic lesion which we found to be associated with increased pain was the vesicular red lesion, although we do confirm no association between papillary lesions and pain.

The lack of association between pain and minimal/mild endometriosis contradicts many previous reports [3,11]. However, with one exception no steps were taken in those studies to blind the surgeon who assessed the degree of pathology to the severity of pain. In the exception [2] there was no correlation between disease and pain severity. We recognise that there is only a modest correlation between naked eye classification of endometriosis and pathological classification [12]. This may have the effect of weakening any observed correlation but should not abolish it altogether, and cannot account for the fact that endometriosis was associated with infertility.

The lack of correlation between minimal/mild endometriosis and pain may provide an explanation for the poor results of medical therapies on pain in some controlled trials [13]. Even those trials that have found that danazol or progestagens are better than placebo for pain relief have not tested whether the pain relief obtained is greater in women with endometriosis compared with those without [14].

The finding of no correlation between pain and pelvic adhesions is less surprising since many surgeons were already unconvinced that adhesions cause pelvic pain [15,16] unless they are also causing bowel obstruction or torsion of a viscus. Nevertheless there have been uncontrolled reports of successful treatment for pelvic pain by adhesiolysis [17,18]. The present observations indicate the need for proper controlled trials before such treatment is introduced.

We have found no relation between the presence of dilated pelvic veins and pelvic pain. The lack of an

association between dilated veins and pain among fertile women casts doubt on the theory that pelvic varices are a recognisable cause of otherwise unexplained pelvic pain [1,19].

This study has supported numerous other reports in suggesting that there is a positive relationship between both mild and severe degrees of endometriosis and infertility. The relationship is robust and is not abolished when the surgeon is blind to the operative indication. The lack of relationship between pelvic adhesions and infertility is surprising and may be an artefact of our study design. Firstly the assessors identified much less adhesions than the operating surgeon so the numbers studied were small and secondly the assessors were rarely able to identify tubal blockage. Other authors have found a similarly very weak association [20]. Severely dilated veins were less common in women undergoing laparoscopy for investigation of infertility. Since dilated veins are uncommon in women who are not ovulating, and it is well recognised that anovulatory cycles are less painful than ovulatory ones, dilated veins may simply be a marker of ovulatory cycles.

These findings have a number of implications for the diagnosis and management of pain. Firstly, they should alter our interpretation of supposed psychological differences between women with and without pelvic 'pathology'. It has been claimed that patients with chronic pelvic pain have higher neuroticism, anxiety and depression scores [21,22] than controls, but has been difficult to disentangle the extent to which this is cause or effect. Some studies have shown no difference in psychiatric profiles between women with 'organic pathology' and those without 'pathology' [23] and interpreted this to mean that psychiatric factors are unimportant. It may equally well reflect the irrelevance of some 'pathology' in the aetiology of pain.

Secondly, these findings call into question the need for laparoscopy to investigate women with pelvic pain and no clinical abnormality on palpation. Since it is usually possible to suspect the presence of severe degrees of endometriosis on bimanual examination, laparoscopy only results in increased diagnosis of minimal/mild endometriosis, pelvic adhesions and dilated pelvic veins, none of which are significantly more common in women with pain. It is not surprising that a randomised trial comparing treatment of pelvic pain with or without laparoscopy found no advantages of laparoscopy on short or long term pain scores [24]. Unless laparoscopy can be shown to have some clear therapeutic benefit perhaps by providing reassurance it should not be performed.

It is important to remove spurious associations from the belief systems of gynaecologists since otherwise affected women are at risk of receiving unproven and illogical treatments. For example surgeons in uncontrolled experiments have tried pelvic vein ligation and embolisation as treatment for dilated pelvic veins [25]. This is unlikely to be successful, certainly carries a small risk and if used at all this should be within adequately controlled trials. Medical treatments, such as hormones to suppress ovulation, may be successful but there is no reason to believe that they will be less effective in women with no identifiable lesions at laparoscopy than in those with minimal/mild endometriosis or pelvic varices.

We conclude that minimal endometriosis and dilated pelvic veins are not associated with pelvic pain. When identified at laparoscopy in such patients they should be regarded as variants of normal. Future studies relating pelvic pathology to patients symptoms should ensure that the assessors of the pathology are unaware of the patient's symptoms.

Acknowledgments

This work was supported by a grant from Birthright (now Wellbeing).

References

[1] Beard RW, Highman JW, Pearse S, Reginald PW. Diagnosis of pelvic varicosities in women with chronic pain. Lancet 1984; ii: 946–949.

[2] Stout C, Steege JF, Dodson WC, Hughes CL. Relationship of laparoscopic finds to self report of pelvic pain. Am J Obstet Gynecol 1991;164:73–79.

[3] Cunanan RG, Courey NG, Lippes J. Laparoscopic findings in patients with pelvic pain. Am J Obstet Gynecol 1983;146:589–591.

[4] Fedele L, Parazzini F, Bianchi S, Aracaini L, Candiani GB. Stage and localisation of pelvic endometriosis and pain. Fertil Steril 1990;53:155–158.

[5] Fukaya T, Hoshiai H, Yajima A. Is pelvic endometriosis always associated with chronic pain? A retrospective study of 618 cases diagnosed by laparoscopy. Am J Obstet Gynecol 1993;169:719–722.

[6] Wardle PG, Hull MGR. Is endometriosis a disease?. Baillieres Clin Obstet Gynaecol 1993;7(4):673–685.

[7] American Fertility Society. Revised Fertility Society classification of endometriosis. Fertil Steril 1985; 43:351.

[8] Shaw RW. An atlas of endometriosis. Parthenon Publishing Group 1993; Carnforth.

[9] Fleiss. Statistical methods for rates and proportions. Wiley 1981. New York.

[10] Vercellini P, Bocciolone L, Vendola N, Colombo A, Rognoni M, Fedele L. Peritoneal endometriosis: morphological appearance in women with chronic pelvic pain. J Reprod Med 1991;36:533–536.

[11] Fedele L, Bianchi S, Bocciolone L, Dinola G, Parazzini F. Pain symptoms associated with endometriosis. Obstet Gynecol 1992;79:767–769.

[12] Jansen RP, Russel P. Non-pigmented endometriosis: clinical, laparoscopic and pathologic definition. Am J Obstet Gynecol 1986;155:1154–1159.

[13] Fayez JA, Collazo LM, Vernon C. Comparison of different modalities of treatment for minimal and mild endometriosis. Am J Obstet Gynecol 1988;159:927–932.

[14] Telimaa S, Puollaakka J, Ronnberg L, Kaupilla A. Placebo controlled comparison of danazol and high-dose medroxyprogesterone

acetate in the treatment of endometriosis. Gynecol Endocrinol 1987;1:13–25.
[15] Alexander-Williams J. Do adhesions cause pain?. Br Med J 1987;294:659–660.
[16] Ikard RW. There is no current indication for laparoscopic adhesiolysis to treat abdominal pain. South Med J 1992;85:939–940.
[17] Daniell JF. Laparoscopic enterolysis for chronic abdominal pain. J Gynaecol Surg 1989;5:61–66.
[18] Sutton C, MacDonald R. Laser laparoscopic adhesiolysis. J Gynaecol Surg 1990;6:155–159.
[19] Beard RW, Reginald PW, Wadsworth J. Clinical features of women with chronic lower abdominal pain and pelvic congestion. Br J of Obstet and Gynaecol 1988;95:153–161.
[20] Mahmood TA, Templeton AA, Thompson L, Fraser C. Br J Obstet and Gynaecol 1990;98:558–563.
[21] Renaer M, Vertommen H, Nijs P, Wagemans L, Van Hemelrijck T. Psychological aspects of chronic pelvic pain in women. Am J Obstet Gynecol 1979;134:75–80.
[22] Rosenthal RH, Ling FW, Rosenthal TL, McNeeley SG. Chronic pelvic pain: psychological features and laparoscopic findings. Psychosomatics 1984;25:833–841.
[23] Pearce S. The concept of psychogenic pain: a psychological investigation of women with pelvic pain. Curr Psychol Res Rev 1987;3:219–228.
[24] Peters AAW, van Dorst E, Jellis B, Zuuren Z, Hermans J, Trimbos JB. A randomised clinical trial to compare two different approaches in women with chronic pelvic pain. Obstet Gynecol 1991;77:740–744.
[25] Edwards RD, Robertson IR, MacLean AB, Hemingway AP. Case report: pelvic pain syndrome—successful treatment of a case by ovarian vein embolisation. Clin Radiol 1993;47:429–431.