The psychological effects of laparoscopy on women with chronic pelvic pain

S. ELCOMBE,[1] D. GATH AND A. DAY

From the Department of Psychiatry, Warneford Hospital, Oxford

ABSTRACT

Background. Many women who undergo diagnostic laparoscopy for chronic pelvic pain do not have pelvic pathology. This has led to an interest in psychological factors that might contribute to their experience of pain. This study was designed to evaluate the effects of diagnostic laparoscopy on women with chronic pelvic pain and to explore possible psychological mechanisms.

Methods. Seventy-one women undergoing laparoscopy for chronic pelvic pain were randomly allocated to one of two groups waiting different lengths of time for laparoscopy. Women were interviewed before laparoscopy and were followed up 1 week, 3 months and 6 months afterwards. Pain was assessed with an interview measure, diaries and visual analogue scales.

Results. Pain reductions were observed from before to after diagnostic laparoscopy. Regression analysis was used to identify factors which predicted improvements in pain. The hypothesis that psychological factors would predict improvements in pain was confirmed. Pain improvements after laparoscopy were predicted by beliefs about pain and the change in each woman's evaluation of the seriousness of her condition. Other than baseline pain, these psychological variables were the only ones to emerge as predictors of pain change despite exploratory analysis of over 40 other variables.

Conclusions. Diagnostic laparoscopy can have beneficial effects in women with chronic pelvic pain. These effects appear to be the result of psychological mechanisms. Further investigation of these mechanisms could help in the understanding and treatment of women with chronic pelvic pain.

INTRODUCTION

Nearly 50 years ago Beecher published a paper on 'Pain in men wounded in battle' (1946) which suggested that psychological factors can influence the experience of pain. In recent years there has been increasing recognition that the experience of pain can be modified by psychological factors such as attention, attribution, expectations, control, coping responses, and environmental contingencies (see Jensen *et al.* 1991 for a review).

Among women who undergo diagnostic laparoscopy for chronic pelvic pain, many do not have pelvic pathology. Gillibrand (1981) found pelvic pathology in only 31% of a sample of 331 British women undergoing laparoscopy for chronic pelvic pain. In other countries, differing rates of pelvic pathology have been reported, for example 9–17% in the USA (Goldstein *et al.* 1979; Kresch *et al.* 1984), 37–40% in Italy (Magni *et al.* 1984; Vercellini *et al.* 1990), and 13–92% in Israel (Bahary & Gorrodesky, 1987; Levitan *et al.* 1985). Such variable rates of pelvic pathology have led researchers to be interested in the possibility that psychological factors contribute to pain experience in women with chronic pelvic pain.

The study described here arose out of two pilot studies exploring possible psychological factors contributing to chronic pelvic pain in women. In a first pilot study 30 women were interviewed who had undergone diagnostic laparoscopy for chronic pelvic pain approximately 3 years previously. The women selected

for interview were those for whom no pathology had been found at laparoscopy. We were surprised to find that 17 of the 30 women (57%) were free from pelvic pain at the time of the interview, and a further six women (20%) reported much less severe pain than before the laparoscopy. Of the 17 women who were free from pain, 10 (58%) reported that their pain had stopped within 6 months of the laparoscopy. This reported rate of recovery was the more remarkable because the average duration of pain before laparoscopy was 53 months for the whole sample, and 52 months for the 17 who became free from pain.

A second pilot study was carried out to explore this apparent association between diagnostic laparoscopy and reduction of chronic pelvic pain. A further 30 women were interviewed about 6 months after laparoscopy (as against approximately 3 years in the first pilot study). At interview 10 women (33%) were free from pelvic pain, and a further 11 women (37%) had little pain. For the 10 pain-free women, the average time between laparoscopy and cessation of pain was 1·3 months. In the whole sample the mean duration of pain before laparoscopy was 41 months. The second pilot study, thus, confirmed the findings of the first study that many women with chronic pelvic pain report recovering soon after diagnostic laparoscopy.

Those women who reported pain improvements after laparoscopy appeared to show a characteristic pattern of beliefs about their former condition and its investigation. They appeared to have had confidence in laparoscopy as a diagnostic tool, to have been pleased to hear the negative findings and to have been satisfied with the explanation they received. They also appeared to have modified their beliefs about the cause of their pain on the basis of the negative laparoscopy findings, and to have appreciated that pain could be influenced by factors other than pathology. In all, these psychological responses to the pain and its investigation appeared to the interviewer to be important determinants of the course of chronic pelvic pain after diagnostic laparoscopy.

Against this background it was decided to carry out a prospective study of laparoscopy in women with chronic pelvic pain. The study had two aims. The first was to explore the possibility that diagnostic laparoscopy had beneficial effects on chronic pelvic pain in women. The second aim was to identify factors that might predict any such improvements in pain. It was hypothesized that it would be possible to predict the extent of pain improvements after laparoscopy from psychological variables and that psychological variables would be more strongly associated with pain improvement than other factors such as pain chronicity.

METHOD

Selection of patients

Patients on the waiting list for diagnostic laparoscopy who met the following criteria were included in the study:

(i) the patient's main complaint was of chronic pelvic pain not related exclusively to menstruation;

(ii) the patient was awaiting routine admission to hospital for diagnostic laparoscopy to investigate pain;

(iii) no other investigative or therapeutic procedure was to be carried out with laparoscopy.

Design

Patients were randomly allocated to one or other of two groups.

(i) Long-wait Group

These patients received laparoscopy at the usual time, that is, about 10 weeks after being put on the waiting list.

(ii) Short-wait Group

These patients received laparoscopy about 2 weeks after being put on the waiting list (that is, 8 weeks earlier than usual).

All patients were interviewed in their own home by the principal investigator (S.E.) on three occasions: 1 week before laparoscopy; 1 week after laparoscopy; and 6 months after laparoscopy. All patients completed a daily pain diary during the week before each of these three interviews. In addition, 3 months after laparoscopy, patients completed a pain diary and were interviewed briefly by telephone about their pain. The Long-wait Group were also interviewed when put on the waiting list (about 10 weeks before laparoscopy).

This design made it possible to assess patients'

pain over adequate periods of time both before and after laparoscopy.

Methods of assessment

At the first interview demographic information (e.g. age, marital status), descriptive information (e.g. personality, health locus of control) and pain history variables (e.g. chronicity, previous treatments) were collected. At each interview questions were asked about aspects of pelvic pain (sensory, behavioural and cognitive) and about psychosocial functioning (social adjustment, psychiatric symptoms). At the interview 1 week after laparoscopy information was collected about women's responses to the laparoscopy findings (e.g. satisfaction with explanation received, expectations of future pain).

Sensory aspects of pain were measured in three ways: with visual analogue scales; with an interview measure of pain (Interview Pain Index); and with a pain diary.

(i) Visual Analogue Scales

At each of the three interviews the women completed two 10 cm Visual Analogue Scales, one for their 'usual pain' and one for their 'worst pain'. Each scale ranged from 0 ('no pain') to 100 ('worst possible pain').

(ii) Interview Pain Index

An interview measure of pain (Interview Pain Index) was developed by the principal investigator (S. E.). Pilot work had shown that it was difficult to evaluate a woman's overall experience of pain by considering duration, severity, and frequency of pain separately. Standardized measures of pain such as the McGill Pain Questionnaire (Melzack, 1975) do not allow duration, severity and frequency of pain to be considered concurrently. Therefore, the Interview Pain Index was devised as a combined measure of the duration, severity and frequency of pain.

To calculate the Interview Pain Index women were asked to specify the number of days in an average 4 weeks when they experienced pain at each level on a six-point pain scale (see Table 1). An average 4 weeks was specified because pilot work had shown that most of the women experienced their full range of pain in one menstrual cycle.

Table 1. *Pain Index Scale*

0 No pain
1 Very low level: aware of pain only at times
2 Mild: aware of the pain often but not all the time
3 Moderate: continually aware of the pain
4 Severe: aware of the pain so much that it is hard to think of anything else
5 Intense: unable to think of anything but the pain

Some rules of classification were adopted to maximize reliability and validity. Isolated paroxysms of pain, however severe, were classified as '1' because of their short duration. Severe pain was rated as '4' and extremely severe pain was rated as '5', even if pain had not stayed at these high levels for the whole day. This procedure was used because pain was only rarely experienced continually at high levels, and because it was desirable for the full range of the scale to be used.

The Interview Pain Index (IPI) was derived by multiplying each pain scale number by the number of days at that level and dividing the sum by the total number of days (28). The pain index provided an overall measure of pain that took into account duration, severity and frequency of pain. The Interview Pain Index is in effect a calculation of a woman's average daily pain. This enabled it to be calculated over shorter periods of time when the design of the study demanded this. For example, at the interview 1 week after laparoscopy it was possible to calculate an Interview Pain Index based on the post-operative week which was not confounded by pre-operative experience of pain.

The reliability of the IPI was evaluated by having an independent rater listen to tape recordings of 12 interviews and calculate the Interview Pain Index. The extent of agreement between the interviewer and the independent rater was calculated using the weighted kappa coefficient. Weighted kappa was 0·72 indicating substantial agreement (Landis & Koch, 1977).

(iii) Diary Pain Index

During the 7 days before each interview, patients used diaries to record their pain on the six-point scale (see Table 1) four times a day. An average daily level of pain (Diary Pain Index) was calculated from the patient's diary ratings of pain.

RESULTS

Patient numbers

Eighty-five women were asked to join the study and 78 (92%) agreed. Three women (3·8%) withdrew from the study (due to death in the family in two cases), while contact was lost with four women (5%). Thus, 71 women entered the study, of whom 39 women were allocated to the Short-wait Group and 32 to the Long-wait Group.

Sample characteristics

Social and demographic factors

The women's ages ranged from 16 to 62 years (mean 32·6, S.D. 9·8). Fifty-two (73·2%) were married or living as married and 42 had children.

Forty-three of the women (60·6%) were in full-time employment. Thirty-three women (46·5%) were in Social Classes I, II, and III Non-manual, while 33 women (46·5%) were in Social Classes III-Manual, IV, and V (Registrar General's Classification, Office of Population Censuses and Surveys 1980). For five women (7%) social class could not be established because neither the woman nor a partner was in full-time employment.

Pain onset and chronicity

Twenty-seven women (38%) associated the onset of the pelvic pain with an event. In 20 cases the event was obstetric or gynaecological (for example, childbirth, miscarriage). Pain chronicity was very variable, ranging from 3 to 312 months (median 15 months, mean 32·9 months, S.D. 48·2).

Twenty women (28·2%) had previously been referred to a gynaecologist for pelvic pain. Of these, six women had had two referrals and one woman had had three referrals, giving a total of 27 previous referrals. Nine women (12·7%) had previously had diagnostic laparoscopy. Of the 27 previous referrals 21 (78%) had resulted in no effective or acceptable treatment for the pain.

Baseline levels of pain

At the first interview the mean Interview Pain Index was 1·96, S.D. 1·04, range 0–4·36. A small subgroup of the sample ($N = 16$) reported very low levels of pain (Interview Pain Index < 1). The mean Diary Pain Index was 1·42, S.D. 1·32, range 0–4·33.

On the Visual Analogue Scale (VAS) the mean rating for usual level of pain in the 3 months preceding interview was 43·9, S.D. 20·2, range 0–90; while the mean rating for worst pain in the 3 months preceding interview was 75·1, S.D. 24·1, range 0–100.

Laparoscopy findings

A gynaecologist examined the operation sheet in each patient's medical file, and categorized the degree of pathology at laparoscopy. The findings were: 34 women (47·9%) had no pathology at
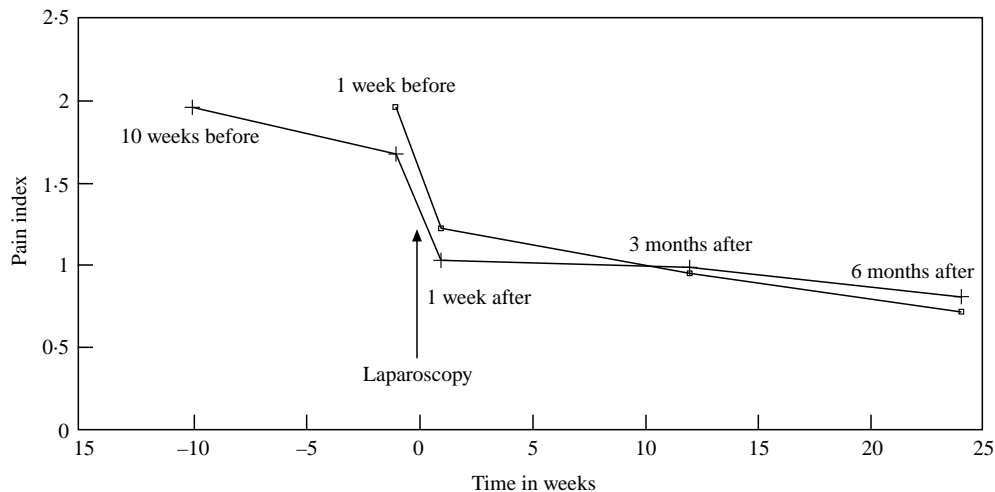

FIG. 1. Interview Pain Index: waiting groups compared (□, Short-wait Group; +, Long-wait Group).

Table 2. *Short-wait Group: pain scores at baseline and follow-up*

	Baseline	1 week after	3 months after	6 months after	P
Interview Pain Index	1·84	1·29	0·89	0·66	0·000**
Diary Pain Index	1·48	1·12	0·79	0·53	0·000**
VAS: usual pain	44·92	24·61	—	24·85	0·006**
VAS: worst pain	76·38	—	—	52·19	0·005**

** $P < 0.01$.

laparoscopy; 28 women (39·4 %) had some abnormality but not of clinical significance (e.g. a flimsy adhesion, tiny spots of endometriosis); nine women (12·7 %) had clinically significant abnormalities (endometriosis 4, ovarian cyst 2, adhesions 2 and inflammatory disease 1).

Aim 1. Does diagnostic laparoscopy have beneficial effects on chronic pelvic pain in women?

In Fig. 1, changes in the Interview Pain Index are shown for the Long- and Short-wait Groups over the course of the study. For both groups of women the Interview Pain Index fell rapidly after laparoscopy, and remained at a reduced level at 3- and 6-month follow-up. In the Long-wait Group there was a small reduction in pain while awaiting laparoscopy.

Statistical method

The data for the two groups were analysed separately because of the difference between the groups in the timing of the pre-laparoscopy assessments. Repeated measures analysis of variance was used to assess the significance of changes in pain over the course of the study. Data were screened to ensure that test assumptions were met and non-parametric methods were used where parametric analysis was not appropriate (for example, with ordinal data or where interval or ratio data were not normally distributed). Data were analysed using the Statistical Package for the Social Sciences (1988).

Table 2 shows the scores of the Short-wait Group on each pain measure at each of the four assessments.[1] There were significant improve-

ments in all four pain measures (the Interview Pain Index, the Diary Pain Index, the Visual Analogue Scale – Usual Pain, and the Visual Analogue Scale – Worst Pain).

Table 3 shows the scores of the Long-wait Group on each pain measure at each assessment. Significant improvements were observed on three of the measures (the Interview Pain Index, Diary Pain Index, and Visual Analogue ratings of worst pain) but not on the Visual Analogue rating of usual pain (although this just failed to be significant).

Overall these findings show that women in both groups had significant reductions in pelvic pain from before to after laparoscopy. These reductions in pain were evident on three independent measures of pain.

Long-wait Group: changes in pain while waiting for laparoscopy

To identify any changes in pain during the wait for laparoscopy, comparisons were made between the pain scores of the Long-wait Group at the start of their wait (mean 69 days before laparoscopy) and at the end of their wait (1 week before laparoscopy) on each of the four pain measures. Paired t tests were used for these comparisons.

As shown in the first two columns on Table 3, during the wait for laparoscopy there were significant but small improvements in the Interview Pain Index ($t = 2.81$, df = 29, $P = 0.009$) and the Visual Analogue Scale ratings of worst pain ($Z = -2.42$, $P = 0.015$). During this wait, however, there was a significant worsening of pain on the Diary Pain Index, ($t = -4.03$, df = 14, $P = 0.001$), while the Visual Analogue ratings of usual pain did not change significantly $t = 1.18$, df = 28, $P = 0.247$).

Long-wait Group: comparison of pain change before and after laparoscopy

In the Long-wait Group further analyses were carried out to determine whether pain improvement was as rapid in women awaiting laparoscopy as in women after laparoscopy. For the two measures of pain on which significant improvements were observed during the waiting period (Interview Pain Index and Visual Analogue rating of worst pain) the mean amount of pain improvement per week both before and after laparoscopy was calculated. This calcu-

[1] VAS ratings of worst pain were not collected in the interview one week after laparoscopy since worst pain experienced in 1 week could not be meaningfully compared with the worst pain over 3 months.

Table 3. *Long-wait Group: pain scores at baseline, 1 week before laparoscopy and at follow-up*

	Baseline	1 week before	1 week after	3 months after	6 months after	P
Interview Pain Index	1·86	1·50	0·98	1·03	0·67	0·006**
Diary Pain Index	0·87	1·45	0·70	0·68	0·42	0·031*
VAS: usual pain	42·26	24·68	21·42	—	24·95	0·052
VAS: worst pain	72·84	57·80	—	—	42·16	0·001**

* $P < 0.05$; ** $P < 0.01$.

lation was made by dividing the amount of change in pain by the number of weeks over which that change was observed. These comparisons showed that improvements on the Interview Pain Index were significantly quicker after laparoscopy than before (mean improvement per week before laparoscopy 0·03; mean improvement per week after laparoscopy 0·29; Mann–Whitney $U = -2.1055$; $P = 0.008$). Using the Visual Analogue Scale ratings of worst pain, it was found that the rates of improvement did not differ significantly before and after laparoscopy (mean improvement per week before laparoscopy 1·33; after laparoscopy 0·89; $t = -0.81$, df = 59, $P = 0.438$).

The results overall suggest that pain improvements occurring before laparoscopy were smaller or slower than those occurring afterwards.

Aim 2. What factors predict pain improvement after diagnostic laparoscopy?

I. Testing the hypothesis that psychological variables predict pain improvement after laparoscopy

Standard multiple linear regression was used to test the hypothesis that psychological variables would predict pain improvements after diagnostic laparoscopy.

Dependent variable

The dependent variable was the change in pain from before laparoscopy to 6 months afterwards measured by the Interview Pain Index.

There were two reasons for using change in pain (rather than absolute level of pain at 6 months) as the dependent variable. The first reason was that the absolute level of pain 6 months after laparoscopy was a poor indicator of pain improvement for those women who had experienced little pain throughout the study. The second reason was that the range of

Interview Pain Index scores at 6 months was narrow (0 to 3·54) and positively skewed. These features in a dependent variable would undermine the validity of regression. The change score had a wider range (-1.5 to 4.5) and was more normally distributed. The change score was thus a more suitable dependent variable for regression.

Independent variables

Five independent variables were examined, each of which had been identified as of possible importance in the pilot studies described in the introduction. These variables are described below.

(*i*) *Beliefs about laparoscopy* Before laparoscopy, an assessment was made of each woman's confidence in laparoscopy as a diagnostic procedure. Scores were derived from a scale designed to measure confidence in laparoscopy. This scale consisted of 10 statements about laparoscopy derived from the pilot interviews. The women rated the extent of their agreement with each statement on an eight point scale. Responses were summed to provide a total score of each woman's confidence in laparoscopy. In a test retest reliability study the scale was found to be very reliable (average item weighted kappa coefficient 0·68).

(*ii*) *Beliefs about pain* Before laparoscopy, an assessment was made of the extent to which each woman believed that pain must have a physical cause. Scores were derived from a scale specifically designed to measure pain beliefs. The scale consisted of nine statements derived from pilot interviews concerning pain. As with beliefs about laparoscopy women rated the extent of their agreement with each statement and their responses were summed to provide a total pain beliefs score. This scale was also found to be reliable (average item weighted kappa coefficient 0·60).

Table 4. *Standard multiple linear regression of psychological variables on pain improvement after laparoscopy* (N = 64)

Variable	r	Beta	t	P	Sr^2i
Confidence in laparoscopy	0·002	0·029	0·232	0·817	0·001
Pain Belief Score	0·301	0·278	2·347	0·022	0·076
Change in belief about seriousness of condition	−0·337	−0·329	−2·601	0·012	0·093
Satisfaction with explanation	0·158	0·061	0·462	0·646	0·007
Feelings on results	0·061	−0·045	−0·347	0·729	0·002
Summary statistics	Multiple R	Multiple R²	Adjusted R²	F	P
	0·449	0·202	0·133	2·93	0·019*

*$P < 0.05$.

(*iii*) *Belief about seriousness of medical condition* An assessment was made of how far each woman changed her evaluation of the seriousness of her medical condition from before to after laparoscopy. At each interview women were asked to suggest the most likely cause of their pain. Ratings were then made of how serious they considered this cause to be. Seriousness was rated on a nine-point scale ranging from 'not at all serious' to 'extremely serious'. A change score was calculated from the women's ratings of seriousness from 1 week before to 1 week after laparoscopy.

(*iv*) *Satisfaction with explanation of pain from laparoscopy* One week after laparoscopy an assessment was made of how far each woman was satisfied with the explanation she had just received for her pain. The women were asked to rate their satisfaction on a scale ranging from 0 ('not at all satisfied') to 100 ('completely satisfied').

(*v*) *Feelings on hearing the laparoscopy result* One week after laparoscopy women were asked what their feelings had been on hearing the laparoscopy results. Their responses were categorized as either positive or negative.

Findings

The results of the standard multiple linear regression analysis are shown in Table 4: the F value of 2·93 ($P = 0·019$) indicated that prediction of pain improvement based on psychological variables was significantly more accurate than chance. Multiple R² indicated that 20·2 % of the variance in pain improvement after laparoscopy was accounted for by the variables in this equation. The value adjusted for chance fluctuations (Adjusted R²) was 13·3 %.

As shown in Table 4, two variables con-tributed significantly to the regression, namely the change in belief about the seriousness of the medical condition, and the Pain Belief Score. Change in belief about the seriousness of the medical condition correlated negatively with pain improvement, indicating that women who attributed their pain to a more serious cause after laparoscopy improved more than women who attributed their pain to a less serious cause after laparoscopy. Pain Belief Score was positively correlated with pain improvement, indicating that women who believed that pain in general has a physical cause showed more pain improvement after laparoscopy than those who accepted other possible causes of pain.

II. Exploration of other possible predictors of pain improvement after laparoscopy

Stepwise multiple linear regression was used in exploratory analyses to identify other variables that might predict pain improvement after laparoscopy.

Statistical methods

Ordinal data or interval/ratio data not normally distributed were converted to binary categorical variables. All data were screened for multi-collinearity (very high correlations between independent variables). To prevent distortion of the analyses extreme scores were re-coded to fall within a normal distribution and missing values were re-coded to the sample mean. The statistical criterion for a variable to enter in stepwise regression was set as $P = < 0·05$.

Examination of large numbers of variables using stepwise regression can identify chance associations that would not be replicated by other samples. For this reason stepwise analyses which identified predictors of pain improvements

were repeated on randomly split halves of the sample. In this way findings not replicated in both halves of the sample could be rejected as chance associations rather than genuine relationships.

Dependent variable
The dependent variable was change in pain from before laparoscopy to 6 months afterwards (see above).

Independent variables
Seven groups of independent variables were examined. These were demographic variables (e.g. age, marital status), descriptive variables (e.g. personality, health locus of control), pain history variables (e.g. chronicity, previous treatments), current pain variables (e.g. Interview Pain Index, pain diary), measures of psychosocial functioning (e.g. social adjustment, psychiatric symptoms), medical variables (e.g. laparoscopy findings, treatments administered), and peri-laparoscopy variables (e.g. expectations of pain course, identification of coping strategies). The measures contained in each of the six groups are described in Appendix 1.

Findings
No predictors of pain improvement were identified from among the medical, or pain history variables. The variables that did emerge as possible predictors of pain improvement were Age (from the demographic variables), Extraversion[1] (from the descriptive variables), Interview Pain Index (from current pain variables), Social Adjustment with Children[2] from psychosocial variables) and Patients expectations of course of pain after laparoscopy (from the peri-laparoscopy variables). Of these variables, only the Interview Pain Index emerged as a predictor of pain improvement in both of the randomly split halves of the sample. Interview Pain Index accounted for 44·78 % (Adjusted R^2) of the variance in the dependent variable. This indicates that pain improvement after laparoscopy is significantly predicted by the amount of pain reported at baseline. Women with initially high levels of pain were those who reported the greatest pain improvements after laparoscopy.

The other four associations which were not replicated are likely to be chance statistical findings rather than indicating a genuine relationship between the dependent and independent variables.[3]

DISCUSSION

This study was designed to evaluate the effects of diagnostic laparoscopy on women with chronic pelvic pain.

The first main finding of the study was that improvements in pain were observed after diagnostic laparoscopy. These post-laparoscopy pain improvements occurred more quickly and were greater than the small pain improvements observed on some measures while women waited for laparoscopy.

It was found that the extent of pain improvements varied according to the baseline level of pain. Women with initially high levels of pain showed more improvement than women whose initial levels of pain were low. This finding may be partly accounted for by women with high levels of pain having the greatest potential for improvement. However, this would not provide a total explanation of the results because of the second main finding of the study.

The second main finding of the study was the confirmation of the hypothesis that psychological factors predict pain improvement after diagnostic laparoscopy. Pain improvements after laparoscopy were predicted by beliefs about pain and the change in each woman's evaluation of the seriousness of her condition. Other than baseline pain, these psychological variables were the only ones to emerge as predictors of pain change despite exploratory analysis of over 40 other variables. Most notable was the finding that medical variables, including the level of pathology found at laparoscopy, were not predictors of pain change after laparoscopy. It was also surprising to find that pain chronicity did not predict pain change after laparoscopy. The findings suggest that psychological variables may be more important than any factor other than baseline pain to the course of chronic pelvic pain after diagnostic laparoscopy.

The two psychological variables that predicted

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[1] Measured by the Eysenck Personality Inventory (Eysenck & Eysenck, 1964).
[2] Measured by the Social Adjustment Scale (Cooper *et al.* 1982).

[3] Further details of these analyses may be obtained from the authors.

pain improvements after laparoscopy were beliefs about pain and the change in each woman's evaluation of the seriousness of her condition from before to after laparoscopy. However, both were related to pain improvement in the opposite way to that expected. It was anticipated that holding a medical model of pain would be associated with less pain improvement after laparoscopy. This was because pilot studies suggested that women who thought that pain must have a physical cause found it difficult to believe the (usually negative) findings of the laparoscopy. Instead, it was found that women with a medical model of pain showed more pain improvement after laparoscopy than those with a more multi-factorial model of pain. One possible explanation for this finding is that women who saw pain as closely related to pathology may have come to expect less pain after hearing the (usually negative) results of the laparoscopy. Expecting less pain might be likely to reduce pain experience through a variety of psychological mechanisms such as reduced attention to and anxiety about pain.

Regarding beliefs about the cause of pain, it had been expected that women who reduce their evaluation of the seriousness of their condition would show the most pain improvement after laparoscopy. This was not the case. Instead, women who attributed their pain to something more serious after laparoscopy showed the most pain improvement.

Examination of individual cases suggest a possible explanation for this puzzling finding. It was observed that subjects sometimes rated their perceived condition as more serious after laparoscopy because they had not been offered treatment. They expected the pain to continue indefinitely and, therefore, viewed it as a serious condition. The change to viewing the pain as a permanent condition may have caused women to think and behave differently in relation to the pain in ways that served to reduce it. For example, women who viewed their condition as chronic might have increased their efforts to live and cope with the pain. The literature on psychological influences on pain would predict that using coping strategies to live with pain would minimize pain experience.

It would clearly be valuable if these speculations could be systematically explored in future research. More comprehensive assessments of the factors discussed above, conducted both before and after laparoscopy, might make it possible to identify more clearly the psychological changes engendered by laparoscopy and the mechanisms by which these translate into reduced experience of pain. The psychological changes and their effects are likely to be complex interactions rather than simple relationships between for example, anxiety and pain. It would also be interesting to combine such exploration with a consideration of the severity of initial pain. This would be important, as it is possible that the psychological processes operating in women who report high levels of pain before laparoscopy may be very different from the processes in women reporting very low level pain before the procedure.

A fuller understanding of the psychological processes that mediate pain improvements after diagnostic laparoscopy might have clinical applications. The present study draws attention to the beneficial effects that diagnostic laparoscopy may have for women with chronic pelvic pain. Understanding fully the processes involved may make it possible for clinicians to augment the effects, adding a therapeutic element to a primarily diagnostic procedure. If the findings reported here were replicated and developed it would also raise the possibility of refining psychological treatments for chronic pelvic pain as an alternative to medical investigation and treatment.

APPENDIX 1

Independent variable groups in exploratory analysis

1. Demographic variables

Age, marital status, number of children, plans to have children, social class, years in full-time education.

2. Descriptive variables

Personality (measured with Eysenck Personality Inventory, Eysenck & Eysenck 1964), health locus of control (measured using Multidimensional Health

Locus of Control Scale, Wallston & Wallston 1978), gynaecological history (referrals for problems other than chronic pelvic pain, descriptions of menstruation and menstrual difficulties), psychiatric history (previous consultations, referrals).

3. Pain history

Pain chronicity, previous referral for chronic pelvic pain, previous treatments.

4. Pain variables

Interview Pain Index, McGill Pain Questionnaire (Melzack, 1975) Sensory, Affective, and Evaluative scores, numbers of prescribed and non-prescribed analgesics used, Pain Cognitions Questionnaire (Boston *et al*. 1990) Positive and Negative scores.

5. Psychosocial functioning at baseline

Social Adjustment (measured with the Modified Social Adjustment Scale, Cooper *et al*. 1982), Mood (Profile of Mood States, McNair *et al*. 1971), Hospital Anxiety and Depression Scale, Zigmond & Snaith, 1983), psychiatric state (Present State Examination Version 9, Wing *et al*. 1974), Health (number of visits to GP for problems other than pain).

6. Medical variables

Laparoscopy findings (positive, borderline, or negative), medical treatment administered at laparoscopy (e.g. division of adhesions), medical treatment given after laparoscopy (e.g. antibiotics, surgery).

7. Peri-laparoscopy variables

Expected course of pain, expected pain status at 6 months (same better or worse), coping strategies (number identified at 1 week follow-up).

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