

# A normal appendix found during diagnostic laparoscopy should not be removed

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**Background:** Diagnostic laparoscopy has been introduced as a new diagnostic tool for suspected appendicitis. While the normal appendix used to be removed routinely, laparoscopy allows us to leave a normal looking appendix in place. This latter strategy is, however, not generally accepted. The long-term results of not removing a normal looking appendix were evaluated.

**Methods:** This was a prospective evaluation of 109 diagnostic laparoscopies for suspected appendicitis in which a normal looking appendix was left in place. After a median follow-up of 4.4 years a telephone questionnaire was performed.

**Results:** There were no false-negative laparoscopies. In 65 patients (60 per cent) another diagnosis was obtained (group 1). In 44 patients (40 per cent) no diagnosis was obtained (group 2). After a median interval of 8 months, 15 patients presented to the emergency department for symptoms possibly involving the appendix, during the median follow-up of 4.4 years. This resulted in readmission of nine patients, of whom eight were reoperated. In only one patient (1 per cent) was a histologically proven appendicitis found and the appendix removed. Some 105 patients were eligible for follow-up. Of the 100 patients interviewed (95 per cent), nine patients (9 per cent) (six in group 1 and three in group 2) still had recurrent pain in the right lower abdominal quadrant. There were no differences between patients with or without another diagnosis obtained during preceding laparoscopy.

**Conclusion:** It is safe to leave a normal looking appendix in place when a diagnostic laparoscopy for suspected appendicitis is performed, even if another diagnosis cannot be found at laparoscopy.

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## Introduction

Clinical criteria used in the diagnosis of appendicitis lead to 15–30 per cent of normal appendices being removed at open operation<sup>1–3</sup>. New diagnostic tools such as ultrasonography and computed tomography have been introduced and achieve sensitivity rates of 75–89 per cent and specificity rates of 86–100 per cent for the diagnosis<sup>4–7</sup>. In the 'laparoscopic era', diagnostic laparoscopy has also been used because it is usually a simple procedure with a high specificity and has the possibility of confirming other diagnoses<sup>8–11</sup>.

In the 'open era', the normal looking appendix found during exploration was removed routinely because the presence of the typical scar in the right lower abdominal quadrant might cause confusion about a future diagnosis. Since the introduction of diagnostic laparoscopy it has been

suggested that an apparently normal appendix should be left in place, even if another diagnosis is not found<sup>12,13</sup>. Others report that a normal looking appendix found during laparoscopy can be removed safely because this does not increase postoperative morbidity or hospital stay<sup>14</sup>. Furthermore, the presence of an 'endoappendicitis', which might not be recognized during laparoscopy and could equally be missed at open operation, may lead to recurrent abdominal complaints and subsequent appendectomy. This should justify the removal of an appendix that appears normal<sup>15,16</sup>. On the other hand, besides a prolonged operation time and costs, an increased number of complications after removal of a normal appendix has been reported<sup>17–20</sup>. Rarely, a normal appendix might also be useful in future reconstructive urological operations<sup>21</sup>. Considering the above aspects, the decision was made not to remove a normal looking appendix found during

laparoscopy for suspected appendicitis. The present study was initiated to evaluate the long-term results of this strategy.

## Patients and methods

### Initial assessment

Consecutive patients referred to the hospital by general practitioners for suspected appendicitis were evaluated prospectively in the period 1994–1997.

### Operative strategy

Diagnostic laparoscopy was performed in a selected group of patients, when there was doubt of the clinical diagnosis of appendicitis. Before laparoscopy metronidazole 500 mg was given intravenously. The appendix was removed only if appendicitis was confirmed during laparoscopy or when the appendix could not be interpreted clearly. A normal looking appendix was left in place even when no other explanation for the presenting abdominal symptoms could be found.

### Follow-up

Patients were evaluated in the outpatient clinic 6 weeks after operation. Readmission, reoperation or new referrals for similar symptoms were recorded. Histological examination was performed in all patients in whom the appendix was removed.

In November 1999 a telephone questionnaire was performed. Patients were asked about remaining symptoms possibly involving the appendix, such as recurrent pain in the right lower abdominal quadrant, acute appendicitis and treatment by the general practitioner or other specialists.

Statistical analysis was performed with the SPSS computer program (SPSS, Chicago, Illinois, USA).

## Results

### Treatment and negative appendectomy rates

There were 1050 patients (531 women (51 per cent), 389 men (37 per cent) and 130 children (12 per cent)) evaluated prospectively for suspected appendicitis. Of these, 202 patients (19 per cent) were eventually discharged without further treatment and 471 patients (45 per cent) underwent appendectomy by muscle splitting incision, resulting in a negative appendectomy rate of 13 per cent (61 of 471).

Some 377 patients (252 women (67 per cent), 83 men (22 per cent) and 42 children aged less than 11 years (11 per cent)) underwent diagnostic laparoscopy because there was

doubt about the diagnosis of appendicitis. From this group 268 patients (71 per cent) eventually underwent appendectomy, 94 patients laparoscopically and 174 patients by a muscle splitting incision. The negative appendectomy rate in this group was 15 per cent (41 of 268). There was one complication following laparoscopy; superficial bleeding in an umbilical trocar opening was treated with a local suture.

### Patients with a normal appendix found at laparoscopy

In 109 patients (29 per cent), a normal looking appendix was found during laparoscopy and left in place. Another diagnosis was obtained in 65 patients (60 per cent) (group 1), mostly gynaecological (48 patients; 74 per cent) (*Table 1*). When needed, appropriate treatment was initiated. In five patients laparoscopic adhesiolysis was performed and three patients with diverticulitis were treated conservatively. Gynaecologists treated nine patients with adnexitis with antibiotics, and three patients with ectopic pregnancy and four patients with adnexal torsion underwent ovariectomy. The remaining 15 patients received no further treatment. All patients recovered well.

In 44 patients (40 per cent) (group 2) no other diagnosis was obtained. These patients made an uneventful recovery without further therapy.

The median hospital stay was 2 days, 3 days for patients in group 1 and 2 days for those in group 2 ( $P=0.2$ ;  $\chi^2$  test). No patient developed signs of (perforated) appendicitis in the postoperative period.

### Follow-up

During follow-up 15 patients (14 per cent), eight in group 1 and seven in group 2, presented to the emergency

**Table 1** Other diagnoses obtained by laparoscopy (group 1)

	No. of patients
Ovulation bleeding	13
Salpingitis	9
Ovarian cyst	9
Torsion of adnex	4
Mesenteric lymphadenitis	6
Retrograde menstruation	5
Endometriosis	5
Adhesions	5
Ectopic pregnancy	3
Diverticulitis	3
Other	3
Total	65

Forty-eight patients with gynaecological diagnosis

department because of recurrent abdominal pain after a median time of 8 months. Nine of these, six patients in group 1 and three in group 2, were readmitted. One patient was discharged as the symptoms disappeared without further treatment.

In group 1, two patients were operated for suspected appendicitis; in one patient laparoscopy was performed in which a normal appendix was again left in place and one patient underwent appendectomy. Two patients underwent an elective appendectomy for chronic pain in the right lower quadrant. All appendices removed were normal and symptoms disappeared in all patients. One patient with signs of peritonitis underwent a laparotomy in which a perforated sigmoid was found and treated.

In group 2, one patient underwent an elective appendectomy for chronic pain in the right lower abdominal quadrant in which a normal appendix was removed. Symptoms remained unchanged in this patient. Two patients underwent appendectomy for suspected appendicitis; in one patient the appendix was normal and in one patient histologically proven appendicitis was found and the appendix was removed laparoscopically. There were no differences in recurrence of symptoms or treatment between groups 1 and 2.

After a median follow-up of 4.4 years a telephone questionnaire was performed. Three patients lived abroad and one patient had died from an unrelated disease so 105 patients were eligible for follow-up. One hundred patients (95 per cent) could be contacted, 59 patients in group 1 and 41 patients in group 2. Nine patients (9 per cent) still had episodes of recurrent pain in the right lower abdominal quadrant, six in group 1 and three in group 2. In group 1, two patients visited the general practitioner because of the pain, one patient an internist, one patient went to an emergency department elsewhere and two patients did not see another doctor. In none was another diagnosis obtained. The three patients in group 2 visited an internist, who diagnosed irritable bowel syndrome in two patients.

## Discussion

The present study showed that it is safe to leave a normal looking appendix in place when diagnostic laparoscopy is performed for suspected appendicitis, even if no other pathology is found. No patient developed signs of peritonitis in the early postoperative period after laparoscopy, indicating that there were no false-negative laparoscopies. The symptoms mimicking appendicitis in patients in whom no pathology was found during laparoscopy disappeared without further treatment, so it is assumed that these symptoms were mainly due to a self-limiting disease, such as gastroenteritis. If an entity such as endoappendicitis

exists it was of no clinical importance in this study population. The endoappendicitis was either cured by a single dose of metronidazole 500 mg given at laparoscopy or did not need further therapy.

During long-term follow-up an inflamed appendix was removed in only one patient (1 per cent). The chance of developing appendicitis was no higher than that in a normal population so there is no rationale for a 'prophylactic appendectomy'.

Symptoms disappeared in three of the five patients whose histologically normal appendix was removed during the second admission, but in one patient the symptoms remained unchanged and in one patient the symptoms disappeared after the appendix was again left in place during diagnostic laparoscopy. Therefore it remains doubtful whether the disappearance of symptoms in the three patients was in any way related to the appendectomy.

Ninety-one (91 per cent) of the interviewed patients were symptom free after a median follow-up of 4.4 years. It remains uncertain whether the pain in the right lower quadrant in the remaining nine patients was caused by the appendix. Their symptoms might also have been caused by other diseases such as irritable bowel syndrome.

There were no differences in recurrent symptoms or eventual treatment between patients in whom another diagnosis was made during laparoscopy and patients in whom no pathology was found during laparoscopy. It does not therefore seem justified to remove a normal looking appendix only when no other pathology is found during laparoscopy, as suggested previously<sup>22</sup>.

From the above results, the most valid reason for removing a normal looking appendix would be to avoid future diagnostic confusion in case of acute abdominal pain. This does not weigh favourably against the disadvantages of appendectomy, such as adhesion formation leading to possible future small intestinal obstruction and extra costs of (laparoscopic) equipment and histopathological examination.

From the present study it can be concluded that diagnostic laparoscopy for suspected appendicitis is a safe procedure that is helpful in obtaining other diagnoses. It also appears to be justifiable and possibly even preferable to leave the appendix in place as recurrent appendicitis and the need for surgery during follow-up is uncommon.

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