

# Laparoscopic Appendectomy Enables Military Personnel Return To Work Early

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## Abstract

Laparoscopic appendectomy (LA) involves some advantages such as less pain, short hospital stay and satisfactory exploration of the abdominal space since it was the first time described by Dr. Seem (1983) as an advanced laparoscopic procedure (1). LA appeared as the alternative approach against OA considering the return to routine life early (2,3,4). No consensus is accepted on a laparoscopic procedure for appendectomy was available in routine use (5,6,7). However some recent studies reported about new advantages against OA like a reasonable operation time and no need long learning curve (8,9). The aim of this study was to compare the outcomes and morbidities of between LA and OA in patients with acute appendicitis.

## INTRODUCTION

Laparoscopic appendectomy (LA) involves some advantages such as less pain, short hospital stay and satisfactory exploration of the abdominal space since it was the first time described by Dr. Seem (1983) as an advanced laparoscopic procedure (1). Open procedure in appendectomy (OA) has been well known procedure with complications for many years. LA appeared as the alternative approach against OA considering the return to routine life early (2,3,4). But some authors still state that LA is not superior on the OA considering the operation time when is longer in LA, postoperative complications and the cost benefit. No consensus is accepted on a laparoscopic procedure for appendectomy was available in routine use (5,6,7). However some recent studies reported about new advantages against OA like a reasonable operation time and no need long learning curve (8,9). The aim of this study was to compare the outcomes and morbidities of between LA and OA in patients with acute appendicitis.

## MATERIAL AND METHODS

From 1999 to 2003 we retrospectively analyzed 167 consecutive military personnel with acute appendicitis diagnosed by clinical exam, routine biochemical analysis and ultrasonography (US) undergoing laparoscopic appendectomy. Patients with additional disorders determined pre-operatively and diseases other than acute appendicitis were excluded. The first 10 LA were in the learning curve and were excluded as well. All cases were operated by three

surgeons and the senior residents under the supervising of the three. After each surgical procedure certain parameters as length of operation, first bowel movement, complications, hospital stay and return to work were analyzed. The data from 1997-2002 consisted of 200 military personnel's records undergoing OA and were analyzed in retrospectively in the registry of the department of general surgery.

## SURGICAL TECHNIQUE

Two different laparoscopic approaches were carried out. In LA group the laparoscope was inserted through 10 mm trocar on the umbilicus. Two additional 5 mm trocars were inserted at least 5 cm apart on the infra umbilical line. After the required dissection was carried out on the meso-appendix then the radix of appendix was ligated by 2/0 suture intracorporeally. That surgical technique is a modification of the one used by Gotz and Vallina (10,11). Each specimen was taken out by using endo- bag. No Endo-GIA stapler-cutter was employed to cut a meso-appendix. Appendiceal arteries were found during the dissection and clipped.

We performed laparoscopic assisted open appendectomy (LAOA) when the meso-appendix was not thick and short, and no gangrenous appendicitis.. Fifty-one patients underwent LAOA. The surgical technique of which was little different from previous one. After laparoscope was inserted via the umbilical port, one 10 mm trocar was inserted under direct vision in the right inferior quadrant to take the appendix out. After the appendix was taken out through the 10-12 mm trocar site on the right lower

quadrant, appendectomy was performed like an OA. In both laparoscopic approaches abdominal space was insufflated with 12 mmHg CO<sub>2</sub> and reverse trendelenburg with left tilt position was used. After the appendectomy, at least 2 liter saline solution was used for abdominal cleansing. Each 10mm trocar site in LAOA group was irrigated by using povidon iodine %10 solutions

## PAIN MANAGEMENT,

To resolve the postoperative pain, each patient took 20 mg piroxicam pill (po) in 0.5 hour before operation. In the end of operation 2 ml. 2% prilocaine was injected around each incision. One dose of meperidin (1 mg/kg, bid) was injected in 1 hour after the operation to eradicate the postoperative pain. Most of the patients (%90) had no need for further injection after postoperative 24 hours. For maintenance each patient took piroxicam (20 mg) pill two times a day. VAS scores were assessed for postoperative day (POD) 1, 2 and 7.

Patients aged 50 years received 5000 U low molecular heparin (Clexane, Aventis-Pharma, Turkey).

Thromboembolic elastic bandage was applied to patients with superficial varicous veins. Cefuroxime axetyl 750 mg IV (Zinnat, GlaxoSmithKline, Istanbul, Turkey, two times a day for 5 days) was employed for the patients with micro-perforation on appendix.

## EARLY FOLLOW UP

The patients were hospitalized about a day before surgery. After 7 days a convalescence period, they return to the work with hard military physical training in the Army. The patients were controlled at 10-12<sup>th</sup> week. The quality of life questionnaire (QoL-S23-Turkish) from EORTC (European Oncologic Research Trials Committee) (12) was filled by each one to assess the satisfaction of the patients.

## STATISTICAL ANALYSIS

All data were expressed mean and SD. The variables of two groups were compared by using two tailed bi-variate correlations-Pearson test. The parametric variables were also compared by using paired samples t test. A difference of the 5% level (p<0.05) was considered statistically significant.

## RESULTS

Three hundred and fifty-seven military personnel underwent appendectomy. Three hundred and twenty-two were men. The mean of follow up for patients was about 9 (1-18) months. The main results are summarized in table 1.

**Figure 1**

Table 1: Postoperative patients' characteristics

| Mean (±SD)                        | LA<br>(n=106) | LAA<br>(n=51) | OA<br>(n=200) | P value<br>(LA-OA)<br>(LAA-OA) |
|-----------------------------------|---------------|---------------|---------------|--------------------------------|
| Age (years)                       | 24 (±9)       | 27(±11)       | 23(±7)        |                                |
| Sex ratio (F/M)                   | 12/92         |               | 23/112        |                                |
| Operation time (minutes)          | 61.7(±18.9)   | 43(±15.6)     | 49 (±16.9)    | 0.048<br>0.043                 |
| FBM after surgery (hours)         | 16.1 (±5.8)   | 15(±4.3)      | 26(±9.8)      | 0.086<br>0.813                 |
| Hospital stay (h)                 | 46.4 (±31.1)  | 41.9 (±13.8)  | 53.4 (±31.6)  | 0.646<br>0.557                 |
| VAS scores                        | PO 24h        | 2.1 (±1.23)   | 3.8(±2.01)    | 0.001                          |
|                                   | PO 48h        | 0.8 (±0.76)   | 2.4(±1.14)    | 0.001                          |
|                                   | POD 7         | 0.2 (±0.39)   | 2(±1)         | 0.001                          |
| Time need to return to work (day) | 8.14 (±2.5)   |               | 12.6 (±15.5)  | 0.030                          |
| Normal appendix                   | 7             | 16            | 22            | 12.6%                          |
| Suppurative appendix              | 81            | 33            | 127           | 67.5%                          |
| Gangrenous appendix               | 18            | 2             | 51            | 19.8%                          |

LA: Laparoscopic appendectomy; LAA: Laparoscopic assisted appendectomy; OA: Open appendectomy; FBM: First Bowel Movement; POD: Postoperative day PO: Postoperative

Statistically significant differences were assessed in the outcomes of operation time, VAS scores and return to work early. Operation time in the patients with OA revealed shorter than the laparoscopic procedures (p=0.048, ad p=0.043). When comparing between first 30 and last 30 patients underwent laparoscopy it was seen 10 minutes decrease (p=0.001) (table 2).

**Figure 2**

Table 2: Comparing the first 30 and 50 operation time for LA

|             | Operation time | P (LA-LA <sub>30</sub> ) | P (LA-LA <sub>50</sub> ) |
|-------------|----------------|--------------------------|--------------------------|
| LA          | 61.7(±18.9)    | (pearsons'=0.598)        |                          |
| First 30 LA | 71.3 (±24.2)   | 0.001                    | (pearsons'=0.743)        |
| First 50 LA | 69.7 (±22.8)   |                          | 0.001                    |

Time to return to work were significantly shorter than that were seen in the patients underwent OA (p=0.030). During the early postoperative time period the patients underwent laparoscopic procedures experienced much less pain than the patient underwent OA and needed almost no painkiller after POD 2.

Hospital stay in the patients underwent LA and LAOA were shorter than that in the patients underwent OA which was not statistically significant. In the LAOA group normal appendectomy (10,5%) was performed (table 1). It might be the reason that operation time was the shortest. There was also no difference in the first bowel movement back (table 1). Eleven patients were not completed by laparoscopy and converted to open appendectomy (7%) (table 3).

**Figure 3**

Table 3: Conversion rates and complications seen in this study

| Complications                    |                    | Laparos. Procedure (157) | %    | Open surgery (n=200) | %   |
|----------------------------------|--------------------|--------------------------|------|----------------------|-----|
| Conversion to open               |                    | 11                       | 7    | NA                   | -   |
|                                  |                    |                          |      |                      |     |
| Intraabdominal abscess           |                    | 2                        | 1.3  | 5                    | 2.5 |
| Infection                        | Wound infection    |                          |      | 11                   | 5.5 |
|                                  | Portsite infection | 7                        | 4.5  |                      |     |
| Pearson's =0.199<br>p=0.653      |                    |                          |      |                      |     |
| Bleeding                         |                    | 3                        | 2    | 1                    | 0.5 |
| Pulmonary embolus                |                    | -                        | -    | 1                    | 0.5 |
| Pulmonary infection, Atelectasis |                    | 8                        | 5    | 4                    | 2   |
| Bowel obstruction                |                    | 4                        | 2.5  | 6                    | 3   |
| Upper GIS bleeding               |                    | 1                        | 0.6  | -                    | -   |
| Port site hernia                 |                    | 4                        | 2.5  | NA                   | -   |
|                                  |                    |                          |      |                      |     |
| Entero-cutaneous fistula         |                    | 1                        | 0.6  | 1                    | 0.5 |
| Urinary infection                |                    | 7                        | 4.5  | 5                    | 2.5 |
| IA another mass to be overlooked |                    | 1                        | 0.6  | 4                    | 2   |
| Total                            |                    | 19                       | 12.1 | 11                   | 5.5 |
| P=0.025<br>Pearson's =4.98       |                    |                          |      |                      |     |

Statistically significant differences were found complication rates in patients undergoing laparoscopic and open appendectomies (pearson's=4.98; p=0.025). Complications were composed of pulmonary, urinary and wound infections, bleeding, port site hernia and infections, and bowel obstruction. All trocar site hernia was occurred through 10 mm trocar in 4 patients. Complication rate in the laparoscopic and open procedures was 12.1% and 5.5% respectively.

At the first control examination 333 out of all patients participated were instructed to complete QoL-B-23. The rate of satisfaction was 91% in the group of patient undergoing LA while the 85 percent in the patients undergoing OA (table 4).

**Figure 4**

Table 4: the patients' satisfaction was evaluated by QoL questionnaires from EORTC

| QoL questionnaire        |         | Lap. App. N=145 | Open App. N=188 |
|--------------------------|---------|-----------------|-----------------|
| General health condition | Perfect | 68              | 42              |
|                          | Good    | 23              | 78              |
|                          | Fair    | 39              | 41              |
|                          | Bad     | 13              | 27              |
| Total satisfaction (%)   |         | 91              | 85.6            |

## DISCUSSION

Since laparoscopic appendectomy was performed first time by Semm in 1983 the interest of surgeons has been grown amazingly. Majority of the randomized trials have displayed laparoscopic appendectomy is the one as safe as open appendectomy (13,14,15). Less postoperative pain, similar complication and fewer infection ratios return to work or school in a short time, short hospitalization, and less infectious complications are advantages of the laparoscopic procedures for the appendicitis. Furthermore another imperative advantage is the finest view throughout the abdomen to make much more abdominal and pelvic exploration in the absence of acute appendicitis than that is possible through any type of small incision. However long operation time, higher cost and 3 different little cuts instead of a tiny McBurney's incision and a need for competent surgeon were disadvantages for laparoscopic approaches.

In the meta-analysis by Chung et al. less postoperative pain, early bowel movements, short hospital stay and a faster return to routine activities revealed in the patients undergoing LA. Additionally Kazemier and McCall et al. in their studies agreed the similar scrutiny. However they concluded that LA required longer operation time and higher incidence of intra-abdominal abscess (16,17,18). At the beginning of this study our thought from our laparoscopic experience and some reports of study (19,20,21) that LA caused to less postoperative pain, required short hospital stay, more complete abdominal examination and early return to routine

day life than OA. Yet not resulted in shorter operation time, better cosmesis and less infectious complication than OA. In this study LA was with longer operation time than OA ( $p=0.048$  and  $p=0.043$ ). Otherwise the operation time of LAA was the shortest. It might result from that was performed on-call hours, and frequently negative laparoscopy for normal appendix (30%) was occurred. However OA was performed by first and second year resident trained by a surgeon or chief resident. Hospital stay in laparoscopic approaches was shorter than that in OA which were not statistically significant. It was because a lot of official requirements were necessary for each military personnel to be discharged from hospital. Regarding the VAS scoring system the patients with LA felt more less pain and need less painkiller. It is vital for each military personnel that are to achieve their job as soon as possible. Hard training activities and busy working days were accomplished by one of them undergoing LA a week later. But in OA it took about 2 weeks. It is hard to stand for military personnel off the job for a long period of time.

As first bowel movement was appeared early in the patients undergoing laparoscopic surgery they continued solid food about 12 hours after surgery.

The decreased incidence of infection rate was evaluated in patients undergoing LA ( $_{9,16,22}$ ). Wound or trocar site infections rate were stated from 7-10% of patients for OA and from 3-5% of patients for LA in the studies. Tang et al. in their study stated that the incidence of abdominal abscess in the patients with perforated appendicitis demonstrated an increasing trend to 11% for LA and 2% for OA ( $_{9,23}$ ). It has been suggested that the carbon dioxide pneumoperitoneum facilitated the incidence of anaerobic bacterial translocation in to the bloodstream ( $_{23,24}$ ). In some experimental study no evidence of bacterial growth in blood was demonstrated. Besides more competent peritoneal bacterial clearance was found in LA than OA ( $_{25,26}$ ). Considering the divergent data we found intra-abdominal abscess was common in the OA (1.3% vs. 2.5%). The reason for the rate of gangrenous appendicitis was common in the patients undergoing OA and mechanical cleansing with enough saline solution was not achieved completely in the open procedures via the tiny incision. But there was no significant difference revealed in this study ( $p=0.653$ ). Moreover, wound (port site) infection was more common in OA group. The overall complication rate of 12.1% in LA and 5.5% in OA. It was also significant to be displayed that the overlooked intra-abdominal pathology was experienced about 3 fold more frequent in the

patients with OA (0.6% vs.2%). Conversion rate was 11 patients (7%).

At the end of this study our results such as less pain sense, reasonable short hospitalization, and shorter time to return to vital work or school in the Army supports LA as a safe method and provided some benefits of diagnostic laparoscopy. But longer operation time, no advantages of LA for complications and need more time period to perform the laparoscopic procedure particularly on call days support the idea that OA is feasible procedure except the military personnel with critical occupation need to return their job so early.

### CORRESPONDENCE TO

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