

ORIGINAL ARTICLE

Gynecologic pathologies in our appendectomy series and literature review

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Purpose: Appendectomy applied from the diagnosis of acute appendicitis is one the most common operations in surgery. The rates of negative appendectomy are still high. The rates of negative appendectomy in males and females differ and are higher in females. In our study, these differences, particularly in females, were studied and possible solutions were discussed. **Methods:** Between October 2002 and October 2009, among women receiving urgent appendectomies, those whose primary cause was gynecological pathology were studied retrospectively. All our women subjects were examined by pre-operative gynecologists. After gynecological consultation, the patients were evaluated by a general surgeon due to lack of urgent ultrasonography, computed tomography (CT) and diagnostic laparoscopy and the patient received appendectomy due to acute appendicitis. **Results:** In our series of 1,969 appendectomies, the rate of female/male is 811/1,158. It was determined that the primary cause in 47 (47/811; 5.8%) women with applied appendectomy was gynecological pathology. As a gynecological pathology, it was observed that the most common cause was ovarian cyst ruptures at a rate of 72.3%. The negative appendectomy rate in males was found to be 14.94% (173/1,158), and in females it was 22.56% (183/811). The difference between them is significant ($P < 0.01$). Of these women, 5.8% were gynecologically-induced and 16.76% were unrelated to gynecological causes. **Conclusion:** We believe that gynecological consultation before appendectomy in women is necessary, but not sufficient. It is also important that at least one of the facilities, such as us, CT, magnetic resonance imaging, and diagnostic laparoscopy should be available in surgical use for the diagnosis of negative appendicitis.

Key Words: Acute appendicitis, Gynecologic, Ovarian cyst, Negative appendectomy

INTRODUCTION

An appendectomy is a surgical procedure which general surgeons commonly perform urgently or emergently. Although all surgical procedures are not performed by every general surgeon, appendectomy is a procedure that is performed by all surgeons. Even though an appendectomy is a common procedure, the full spectrum of etiolo-

gies of appendicitis has not been determined. The negative appendectomy [1] (non-inflamed appendix) rate remains high, therefore several imaging techniques and other laboratory methods have been reported in the literature to reduce this rate. Acute appendicitis can be confused with diseases of other organs localized in the right lower quadrant and the exact distinction has remained elusive. The negative appendectomy rate in males and females are

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different. In our study, females who underwent negative appendectomy and had gynecologic pathology were evaluated and potential solutions to lowering the negative appendectomy rate are discussed.

METHODS

Between October 2002 and October 2009, among appendectomised patients who underwent urgent appendectomies with a diagnosis of acute appendicitis, negative appendectomy cases and patients in whom the primary etiology was gynecologic were studied retrospectively. All females who underwent an appendectomy also had a gynecologic consultation and a gynecologic ultrasonography (USG) under emergency conditions by a gynecologist. After consultation, the patients were examined again by a general surgeon and underwent an appendectomy for acute appendicitis under general anesthesia by the surgeon. The urgent abdominal USG, computed tomography (CT), and magnetic resonance imaging (MRI) were not available to the radiologist for the pre-operative evaluation of the appendix. Diagnostic laparoscopy was also not available by the surgeon for the pre-operative evaluation of the appendix. The surgical specimen was put into a solution of 10% formalin saline and sent to the pathology laboratory. The cases in our series were studied in terms of age, gender, intra-operative findings, and histopathologic diagnosis. The findings were compared with the literature.

RESULTS

Our series of 1,969 patients who underwent appendectomies between October 2002 and October 2009 were studied retrospectively. The rate of females-to-males was 811 : 1,158. It was found that the negative appendectomy values of males and females in our series of 1,969 patients were 173 (173/1,158; 14.94%) in males and 183 (183/811; 22.56%) in females. The difference was statistically significant ($P < 0.01$; Fig. 1). Of these women with a negative appendectomy, 5.8% were gynecologically-induced and 16.76%

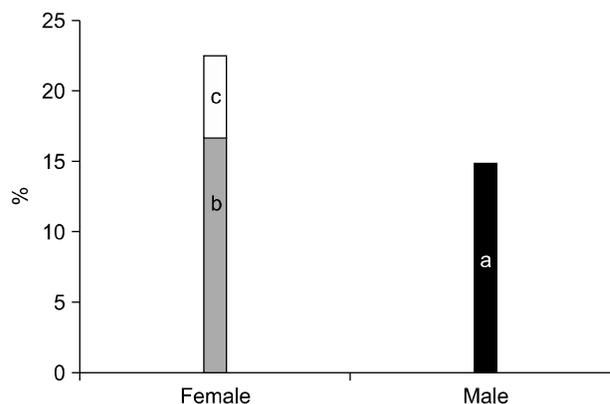


Fig. 1. Negative appendectomy. a, negative appendectomy in males; b, the causes of gynecology in females having negative appendectomy; c, gynecologic causes in females having negative appendectomy.

were nongynecologic causes.

It was determined that the leading cause of an acute abdomen in 47 (47/811; 5.8%) females who underwent appendectomy had gynecologic pathology. The mean age of the females with gynecologic pathology was 32.7 years (range, 18 to 48 years). The pathologic diagnoses of appendectomy specimens of 47 females in our series was determined as follows: 22 (46.8%), fecoliths in a normal appendix lumen; 15 (31.9%), lymphoid hyperplasia; and 10 (21.3%), appendix vermiformis. When the gynecologic pathologies of our 47 subjects were examined, it was determined that 34 (72.3%) had ruptured right ovarian cysts, 5 (10%) had ruptured left ovarian cysts, 2 (3.3%) had right tubo-ovarian abscesses, 2 (3.3%) had ectopic pregnancies, 2 (3.3%) had right salpingo-oophoritis, 1 (1.75%) had right ovarian torsion, and 1 (1.75%) had pelvic inflammatory disease (PID). The most common primary cause in these 47 subjects with gynecologic pathology was a ruptured right ovarian cyst (72.3%). In our series, no mortalities occurred.

DISCUSSION

Appendicitis is more common in males than females and the male-to-female ratio is 1.4:1. It is expected that 8.6% of males and 6.7% of females develop appendicitis during their lifetime. Young age is a risk factor and almost 70% of the cases with acute appendicitis are under 30 years

of age. The typical clinical process begins with intermittent, stomachache-like cramps thought to be caused by occlusion of the appendicular lumen. Pain can be partially or exclusively around the umbilicus, and can be difficult to localize. Typically, this is followed by nausea, although nausea may not occur. When inflammation becomes transmural and causes pyogenesis in the peritoneum covering the right lower quadrant, it is classically located in the right lower quadrant. With the change in the character of pain, the obtuse colic pain is replaced by constant and severe pain [2-5].

Huwart et al. [6] determined the frequency of detection of appendicoliths in normal appendices by multidetector row computed tomography (MDCT) with multiplanar reconstructions. This work consisted of 57 consecutive adult patients without symptoms suggesting appendicitis. The appendix was visualized in 47/57 (82%). An appendicolith was found in 13%. Intraluminal gas was identified in 87%. An appendicolith was found in a significant number of normal patients on MDCT, but does not represent a specific sign for appendicitis. An appendicolith is not a sign for appendicitis in all cases and may be seen in healthy humans [6].

Turan et al. [7] conducted a retrospective study that consisted of 56 patients who underwent surgery for gynecologic pathologies. Gynecologic surgery was performed with an incidental appendectomy under elective conditions. Gynecologic procedures were performed for leiomyoma uteri, adnexal masses, extrauterine pregnancies, endometrial hyperplasia, menometrorrhagia, chronic pelvic pain, sterilization, uterine perforation, hernias, endometriomas, and pelvic abscesses. Incidental appendectomy materials were examined histopathologically. The appendices were abnormal in 31 cases (55.36%), as follows: acute appendicitis in 3 cases, lymphoid hyperplasia in 21 cases, fibrotic obliteration in 6 cases, and endometriotic implants in 1 case. According to this work, incidental appendectomies without symptoms of acute appendicitis were performed together with gynecologic procedures and lymphoid hyperplasia existed in 21 cases. So, lymphoid hyperplasia does not equal acute appendicitis. Lymphoid hyperplasia is not a sign for appendicitis in all cases and may be seen in a normal appendix.

Pieper et al. [8] in an experimental model using the rabbit, determined the role of obstruction in the pathogenesis of acute appendicitis. The appendices were obstructed by a balloon catheter introduced via a cecostomy. In 15 rabbits, experimental obstruction of the appendix resulted in inflammatory changes in the wall of the appendix, which had histologic features similar to appendicitis in humans. Their experimental data suggest that obstruction is an important factor in the causation of acute appendicitis. Fecaliths and lymphoid hyperplasia in the non-inflamed appendix does not necessarily indicate acute appendicitis. In our series, the difference in negative appendectomy ratios between males and females was statistically meaningful ($P < 0.01$). In our series, gynecologic causes led to peritoneal irritation. Gynecologic events occurred together with right lower quadrant pain, and appendices were non-inflamed, so gynecologic events was accepted as a primary pathologic cause. The Alvarado Scoring System is a system used in the diagnosis of appendicitis. The following eight predictive factors are used in this system: localized sensitivity in right lower quadrant, leukocytosis, migration of pain, shift to the left, temperature elevation, nausea-vomiting, anorexia-acetone, and direct rebound pain [9].

Although we are in the era of laparoscopic surgery and modern CT, the negative appendectomy rates, defined as removal of a non-inflamed appendix, remain at a high rate (10-15%). The diagnostic algorithm to be proposed must aim at reducing the negative appendectomy rate [10].

In a study carried out by Chooi et al. [11], it was observed that the negative appendectomy rates in the series that did not have pre-operative imaging were 34.3% for females and 17.4% for males. However, the negative laparotomy rates in the series in which pre-operative imaging was available were 16.7% for females and 5.7% for males. The negative appendectomy rates and the rates of perforation are declining through pre-operative imaging, particularly CT.

In acute appendicitis, USG is the preferred imaging method due to the fact that it is easily applied and has no radiation effects. The sensitivity of USG in appendicitis ranges between 55% and 98%, and the specificity ranges between 78% and 100%. In infants and adults, the sensi-

tivity of CT in diagnosing acute appendicitis is higher compared to USG, but there is no remarkable difference in specificity. When the appendix cannot be visualized sufficiently well through USG, then CT is a diagnostic device to be preferred, especially in obese and critical patients. If we compare USG and MRI, it is clear that the rates of accuracy, sensitivity, and negative predictive values are higher than USG. Today, MRI is used in children and pregnant women that cannot be diagnosed by USG. Despite all these developments, the last decision for appendectomy depends on the findings of physical examination [12].

In a study carried out by Rao et al. [13], it was indicated that appendiceal CT reduced the negative appendectomy rate from 20% to 7%. Also, it was shown in the same study that appendiceal CT managed to decrease the rate of perforation from 22% to 14%. Diagnostic laparoscopy is useful in the cases having right lower quadrant pain. In particular, premenopausal women benefit more from diagnostic laparoscopy [14].

In the cases suspected of appendicitis, diagnostic laparoscopy is a new diagnostic device. If appendix is observed as normal in diagnostic laparoscopy of these cases, it is suggested in some studies that it should not be removed. However, this strategy is not accepted in general [15].

In ruptured ovarian cysts, acute conditions deteriorate within 12-24 hours. Doppler flow studies detect ovarian torsion. However, ovarian torsion can require oophorectomy. Before deciding on oophorectomy in laparoscopy, the ovary untwists and the colour is checked. Laparoscopy can be necessary in the diagnosis of PID. In ectopic pregnancy, USG is helpful for diagnosis [16].

Before diagnosing acute appendicitis, it is possible to examine the patient, and to observe the improvement or regression of the clinic, but this situation can increase the rate of perforated appendicitis. In the literature it is reported that the rate of complications (18%) in perforated appendicitis cases is lower than the complication rate (10%) in non-perforated appendicitis [17].

The reason why the rate of negative appendicitis is higher in females than males is the inclusion of gynecologic situations. Gynecologic consultation is not sufficient to reduce the rates of negative appendicitis in females. In

our study, the general surgeons interpreted acute appendicitis through physical examination, direct abdominal graphy and blood tests due to lack of urgent USG, CT, and diagnostic laparoscopy. Since they could not rule out acute appendicitis, the suspected cases underwent surgery and it was observed that the primary cause was gynecologic in some females. As a result, being a female should not lead to unjust treatment, and USG, CT, MRI, or diagnostic laparoscopy should be used in females with suspected acute appendicitis. Gynecologic consultation is not sufficient to prevent a negative appendectomy in causes of gynecologic events. According to the literature, we believe that pre-operative USG, CT/MRI, or diagnostic laparoscopy may be helpful for decreasing negative appendectomy rate.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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