

## RELIABILITY OF GYNAECOLOGICAL EXAMINATION IN DIFFERENTIAL DIAGNOSIS OF APPENDICITIS IN WOMEN OF REPRODUCTIVE AGE

### POUZDANOST GINEKOLOŠKOG PREGLEDA U DIFERENCIJALNOJ DIJAGNOSTICI UPALE CRVULJKA ŽENA REPRODUKTIVNE DOBI

*Srećko Sabalić, Željko Glavić, Ljubo Begić, Damir Šimleša, Dujo Gverić, Damir Hodžić*

*Professional paper*

*Key words:* appendicitis, differential diagnosis, gynaecological examination, reproductive age, algorithm

**SUMMARY.** *The aim* of the study was to examine the differential-diagnostical reliability of gynaecological examination in women of reproductive age who have shown clinical symptoms of acute abdomen in the lower right quadrant, with a dilemma whether this was due to acute appendicitis or acute gynaecological disease. **Patients and methods.** During the 15-year period (from 1988 to 2003), there were 530 women of reproductive age who underwent surgery for suspected acute appendicitis at County Hospital in Požega. Case histories, intraoperative findings, pathohistological findings, as well as consultative gynaecological findings were analysed retrospectively. For statistical analysis  $\chi^2$  test was used, with measuring confidence intervals at the level of 95% ( $p < 0.05$ ). **Results.** Out of 530 women of reproductive age included in the study, 159 of them were referred to a gynaecological examination (group A) and 371 of them were not (group B). In the group A ( $n=159$ ), 34 (21.4%) women were diagnosed with a gynaecological disease intraoperatively even though the previous palpatory gynaecological findings were normal. In the group B ( $n=371$ ), 22 (5.9%) patients were diagnosed with a gynaecological disease intraoperatively but these patients were not referred to a gynaecologist at all. Among all the women at 34 was diagnosed an ovarian cyst, at 12 a tubo-ovarian abscess, at 9 a pelvic inflammatory disease and at 1 an ovarian torsion. A significant ( $p < 0.05$ ,  $\chi^2=26.516$ ; odds ratio=4.31; CI 95%=2.43–7.65) unreliability of bimanual gynaecological examination was found in diagnosing an acute gynaecological pathology in female patients who were referred to a consultation by a surgeon. **Conclusion.** The results of this study suggest a significant unreliability of bimanual gynaecological examination in differential diagnosis of acute abdomen in women of reproductive age. Clinical work should, at any rate, include other diagnostical methods (US; CT; laparoscopy, MRI), aiming at a more precise diagnosis, which would then lead to the application of a more adequate therapy.

*Stručni članak*

*Ključne riječi:* apendicitis, diferencijalna dijagnoza, ginekološki pregled, reproduktivna dob, algoritam

**SAŽETAK.** *Cilj rada* bio je istražiti diferencijalno dijagnostičku pouzdanost ginekološkog pregleda kod žena reproduktivne dobi koje imaju kliničku sliku akutnog abdomena desnog donjeg kvadranta uz postojanje dileme radi li se o akutnoj upali crvuljka ili akutnoj ginekološkoj bolesti. **Bolesnici i metode.** U 15 godišnjem razdoblju (od 1988. do 2003. godine) u Općoj županijskoj bolnici Požega operirano je 530 žena reproduktivne dobi zbog sumnje na akutni apendicitis. Retrospektivno su analizirane povijesti bolesti, intraoperacijski nalaz, patohistološki nalaz, te konzilijarni ginekološki nalaz. Statistička analiza učinjena je  $\chi^2$  testom uz mjerenje intervala pouzdanosti na razini od 95% ( $p < 0,05$ ). **Rezultati.** Od 530 žena reproduktivne dobi uključenih u studiju, 159 je bilo upućeno na ginekološki pregled (skupina A), a 371 nije (skupina B). U skupini A ( $N=159$ ) intraoperacijski je kod 34 žene nađena ginekološka bolest iako je prethodni palpatorni ginekološki nalaz bio uredan. U skupini B ( $N=371$ ) intraoperacijski je kod 22 bolesnice nađena ginekološka bolest, ali te bolesnice nisu bile upućene ginekologu. Od svih 530 žena u 34 nađena je rupturirana ovarijalna cista, tubo-ovarijalni absces u 12 bolesnica, u 9 upalni proces u maloj zdjelici i torzija ovarija u 1 bolesnice. Nađena je značajna ( $p < 0,05$ ,  $\chi^2=26,516$ ; odds ratio=4,31, CI 95%=2,43–7,65) nepouzdanost bimanualnog ginekološkog pregleda radi utvrđivanja akutne ginekološke patologije kod pacijentica upućenih na konzultaciju kirurga. **Zaključak.** Rezultati ovog rada upućuju na značajnu nepouzdanost bimanualnog ginekološkog pregleda u diferencijalnoj dijagnostici akutnog abdomena kod žena reproduktivne dobi. Svakako treba u kliničkom radu uključiti druge dijagnostičke metode (UZV, CT, laparoskopija, MRI) zbog postavljanja sigurnije dijagnoze, pa time i primjenjivanja adekvatnije terapije.

## Introduction

The differential diagnosis of acute appendicitis is numerous and varies significantly.<sup>1</sup> Despite technological advances, the diagnosis of appendicitis is still based primarily on the patient's history and the physical examination.<sup>2</sup> Diagnostic accuracy varies by sex, with a range of 78–92% in male and 58–85% in female patients. These differences reflect the fact that appendicitis may be extremely difficult to diagnose in women of reproductive

age due to the symptoms of acute gynaecological conditions. Gynaecological diseases such as ectopic pregnancy, endometriosis, ovarian torsion, pelvic inflammatory disease, ruptured ovarian cyst (follicular, corpus luteum), tubo-ovarian abscess in women of reproductive age often imitate the clinical symptoms of acute appendicitis and vice versa as well.<sup>1,3–7</sup>

In approximately 20% of all cases however, the diagnosis is incorrect and patients undergo surgery without

having acute appendicitis at all.<sup>3,8–10</sup> Approximately 7% of the population will have appendicitis in their lifetime<sup>11</sup> with the peak incidence occurring between the ages of 10 and 30 years.<sup>12</sup> Prompt diagnosis and surgical referral may reduce the risk of perforation and prevent complications. The elevated rate of appendectomies without histological evidence of acute inflammation, especially in young women, and the high perforation rate in small children and elderly patients reflect poor diagnostic accuracy.<sup>14</sup>

A surgeon often refers women of reproductive age with the clinical symptoms of acute abdomen to a gynaecological examination with the aim to diagnose the presence of acute gynaecological disease.

The search of the databases (Medline, Medscape, Dynamed) has shown no results for the studies which would deal with the diagnostic accuracy of the gynaecological examination itself in women of reproductive age who were originally referred to a surgeon, with suspected acute appendicitis.

The aim of this study was to examine the reliability of gynaecological examination in women of reproductive age who have shown clinical symptoms of acute abdomen.

## Patients and methods

All patients underwent surgery at County Hospital in Požega. This hospital offers its services to some 80,000 people in the region of the eastern part of Croatia. Case histories of patients with acute appendicitis who were operated in the Surgical Department in the period from 1988 to 2003 were analysed retrospectively.

The surgeon's referral of women patients of reproductive age to a gynaecological examination was analysed as well as intraoperative and histological findings. A female person, aged 15–45 was regarded as a woman of reproductive age. The women of reproductive age who were not examined by bimanual gynaecological examination but also by some other methods were excluded from the study.

The  $\chi^2$  test was used for the statistical data processing, with measuring confidence intervals at the level of 95% ( $p < 0.05$ ).

## Results

There were 2,716 patients who underwent surgery for acute abdomen at County Hospital in Požega in the period from 1988 to 2003. Among them, there were 1,692 patients (62.3%) that were operated on for suspected acute appendicitis. There were 946 males (55.6%) and 746 females (44.1%). The number of women of reproductive age was 547 (73.3%).

Pathohistological findings were not positive in 184 patients (10.9%) who underwent surgery for suspected acute appendicitis. Out of this number, there were 82 males (8.7%) and 102 females (13.7%). Appendicitis was not confirmed in 87 women of reproductive age (15.9%).

Out of 1508 patients with confirmed acute appendicitis, 289 patients (17.1%) were found to have perforated appendix intraoperatively.

In 17 women a gynaecologist, apart from bimanual gynaecological examination, carried out other diagnostic tests as well ultrasound (US), computed tomography (CT) and these women were excluded from the study. There were 530 women of reproductive age who met the criteria and were included in the study.

For preoperative examination 159 women were referred to a gynaecologist and 371 were not. In 56 women gynaecological disease was diagnosed intraoperatively (10.6%). Out of 159 women who were referred to a gynaecologist preoperatively, 34 (21.4%) women were diagnosed with gynaecological disease even though the gynaecologist excluded it. Out of 371 women who were not referred to a gynaecologist for an examination, 22 (5.9%) were diagnosed with gynaecological pathology (Table 1.).

A ruptured ovarian cyst (follicular, corpus luteum) was diagnosed in 34 patients, a tubo-ovarian abscess in 12, a pelvic inflammatory disease in 9 and an ovarian torsion in 1 woman (Table 2.).

During the same period, there were 114 women of reproductive age who underwent surgery for the acute ab-

Table 1. Correlation between a gynaecological examination and gynaecological pathology in women of reproductive age with suspected appendicitis  
Tablica 1. Povezanost ginekološkog pregleda i ginekološke bolesti u žena reproduktivne dobi sa sumnjom na upalu crvuljka

	Gynaecological pathology – Ginekološka bolest		
	Yes/Da	No/Ne	Total/Ukupno
Gynaecological examination	34	125	159
Ginekološki pregled	22	349	371
Total Ukupno	56	474	530

Table 2. Gynaecological disease established intraoperatively  
Tablica 2. Intraoperacijski nađena ginekološka bolest

Ruptured ovarian cyst/Prsnuta cista jajnika	34
Tubo-ovarian abscess/Tuboovarijski apsces	2
Pelvic inflammatory disease/Upalna zdjelična bolest	9
Ovarian torsion/Torzija ovarija	1
Total/Ukupno	56

Table 3. Incidence of the acute abdomen of the right lower quadrant with a suspected gynaecological disease in women of reproductive age operated at the Department of Gynaecology

Tablica 3. Učestalost akutnog abdomena desnog donjeg kvadranta sa sumnjom na ginekološku bolest kod žena reproduktivne dobi operiranih na odjelu ginekologije

Ruptured ovarian cyst/Prsnuta cista jajnika	58
Tubo-ovarian abscess/Tuboovarijski apsces	22
Pelvic inflammatory disease/Upalna zdjelična bolest	16
Ovarian torsion/Torzija ovarija	9
Endometriosis/Endometrioza	5
Appendicitis/Apendicitis	4
Total/Ukupno	114

domen of the lower right quadrant with a suspected gynaecological disease at the Department of Gynaecology. Out of that number, 4 patients were diagnosed with acute appendicitis intraoperatively (*Table 3.*)

A significant unreliability of bimanual gynaecological examination was found in diagnosing acute gynaecological pathology in patients referred to a consultation by a surgeon ( $p < 0,05$ ,  $\chi^2 = 26,516$ ; odds ratio = 4,31, CI 95% = 2,43–7,65).

## Discussion

Diagnosis of acute appendicitis, especially in certain high-risk groups within the population, still presents a considerable problem.<sup>2</sup> In approximately 20% of all cases however, the diagnosis is incorrect and patients undergo surgery without having appendicitis at all.<sup>3</sup>

Women of reproductive age certainly belong to a high-risk group in the case of adequate diagnosis of acute appendicitis. Gynaecological diseases often imitate clinical symptoms of acute appendicitis and vice versa.<sup>3–6</sup> This diagnostic problem has led to false-negative appendectomy rates as high as 30% in females of reproductive age. Flum et al.<sup>2</sup> found the uniform/homogenous incidence of misdiagnoses in women of reproductive age (23.6%–26.6%).

At the County Hospital in Pozega, the false-negative appendectomy rate was noted in 87 women of reproductive age (15.9%), while 56 patients (10.6%) were diagnosed with a gynaecological disease intraoperatively. In a review of medical records of 4,950 patients who underwent emergency appendectomy at the U.S. Department of Defense Hospitals worldwide, the false-negative appendectomy rate was noted to be 9% in male patients and 19% in female patients.<sup>15</sup>

For all these reasons patients with suspected acute appendicitis are often referred to a gynaecologist who will then confirm or remove any doubt for an acute gynaecological disease. This study has investigated whether the standard bimanual gynaecological examination was sufficiently reliable in making an adequate diagnosis. In all databases that we have searched no single study has been found which would deal with the reliability of gynaecological examination in women of reproductive age who were differentially diagnosed with suspected acute appendicitis or with an acute gynaecological disease.

We have analysed medical records in our hospital in the last 15 years and found out that the incidence of gynaecological pathology was 10.6% in women of reproductive age who underwent surgery for suspected acute appendicitis. In 159 women bimanual gynaecological examination was normal but 34 of them were diagnosed with gynaecological disease intraoperatively. 371 female patients were not referred to a gynaecologist and out of that number 22 patients were diagnosed with gynaecological disease (5.9%). All the data (*Table 1.*) obtained from the medical records have shown a significant unreliability of gynaecological examination ( $p < 0,05$ ,  $\chi^2 = 26,516$ , odds ratio = 4.3; CI 95% = 2.43–7.65).

Surgical removal of the appendix prior to perforation is the goal of treatment in patients with acute appendicitis. Of course, patients with clear clinical symptoms of acute appendicitis will not have to be sent to additional diagnostical tests, with the exception of patients with atypical symptoms, children, women of reproductive age and pregnant women.<sup>16</sup> For all the above reasons, there could be an objection to this study that only women of reproductive age without clinical symptoms of acute appendicitis were referred to a gynaecological examination and were, therefore, more likely to be diagnosed with a gynaecological disease. However, a gynaecologist examining such a patient has to bear in mind that these unclear physical manifestations were the actual reason why the woman was referred to a gynaecological examination. In the prospective studies, it could be planned that all women of reproductive age with suspected appendicitis would also be referred to a gynaecologist.

*Computerized tomography* (CT) has been shown to determine very accurately the presence of acute appendicitis in patients with atypical clinical symptoms. Three prospective studies have demonstrated that CT reduces the »negative« appendectomy rate to about 5% without a corresponding increase in the rate of perforation. This improved diagnostic accuracy was seen in all age groups, but was most prominent in those patients in whom the disease can be most difficult to diagnose – women of reproductive age and small children.<sup>17–19</sup> Balthazar et al.<sup>16</sup> demonstrated that CT led to an overall false-negative appendectomy rate of 4%, with a rate of 8.3% in female patients of childbearing age. This was accomplished without incurring an increase in the perforation rate, which, at 22%, was similar to that in previously published reports.<sup>20</sup> Rao et al.<sup>21</sup> found that helical CT is an excellent imaging option for differentiating appendicitis from most acute gynaecological conditions.

In a review of 21 studies enrolling more than 100 patients each, the median sensitivity and specificity of *ultrasound diagnostics* (US) in detecting acute appendicitis was 86% and 96% respectively and the median positive and negative predictive value was 92% and 93% respectively.<sup>22</sup>

Lim et al.<sup>23</sup> found that graded *compression sonography* is a valuable procedure for detecting acute appendicitis in pregnant women despite technical difficulty in performing it during the third trimester of pregnancy.

Also studied was the role of *laparoscopic exploration*. Some authors have found a significant reduction in number of unnecessary laparotomies, and an overall improvement of diagnoses in such situations.<sup>24–26</sup> Larson et al.<sup>25</sup> found that the use of laparoscopy in women of reproductive age detected only 7% of the patients who had their healthy appendix removed, compared with 34% in the open surgery group. They found among the women with a healthy appendix, that a gynaecological diagnosis was found in 73% after laparoscopy, compared with 17% after an open surgery. In another prospective study, laparoscopy was associated with a 5% negative appendectomy rate compared with 38% using physical examination and transvaginal US.<sup>26</sup>

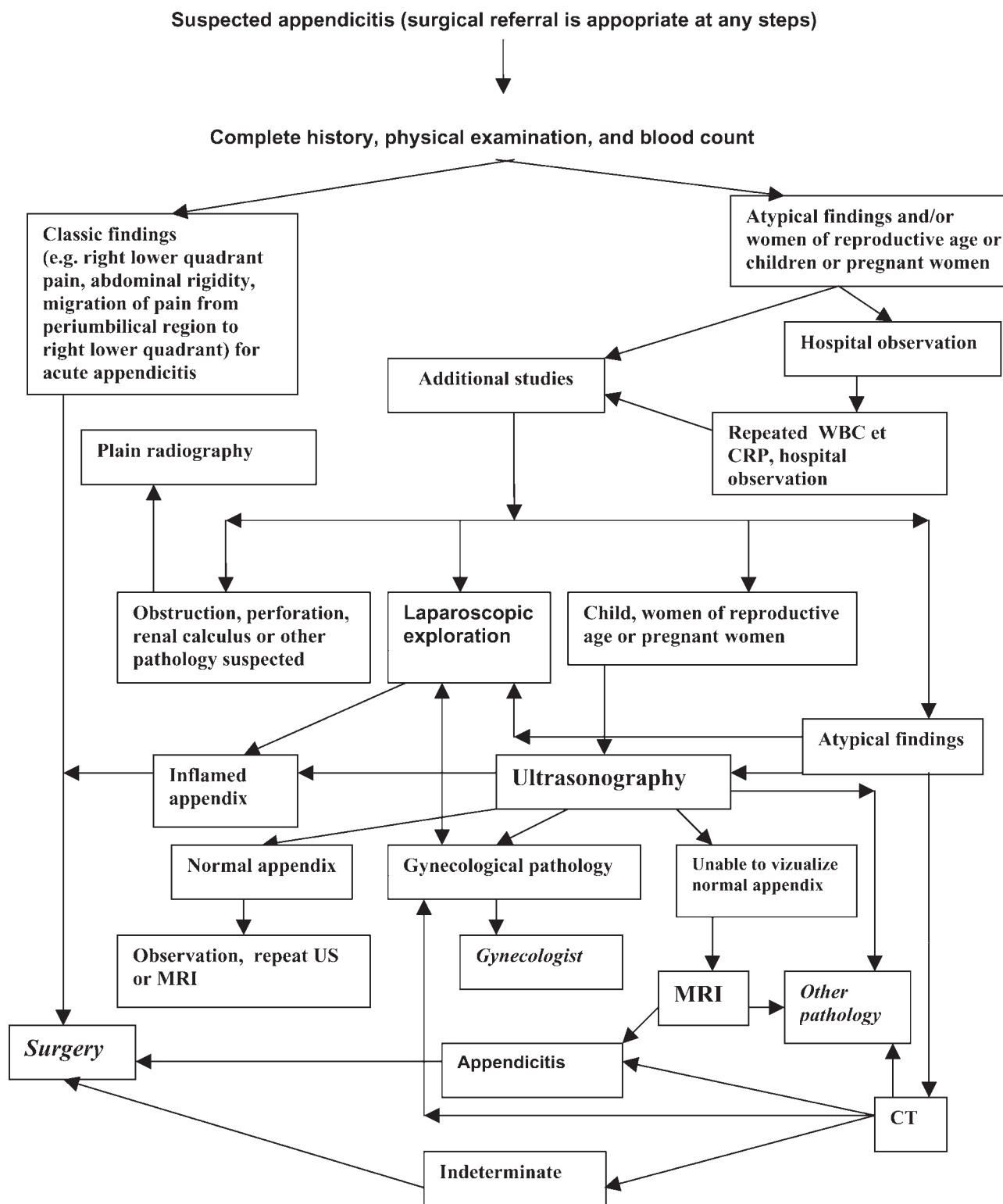


Figure 1. Diagnosis and Management of Appendicitis  
Slika 1. Dijagnoza i postupak pri apendicitisu

In contrast to these studies, Flum et al.<sup>2</sup> argue that the total number of misdiagnoses in all patients who underwent laparoscopic appendectomy was significantly higher than in the open appendectomy patients (29.1%, vs. 24.8%;  $p=0.02$ ).

Grönroos et al.<sup>27</sup> found that leukocyte and C-reactive protein count can help in differential diagnosis of appendicitis compared to acute gynaecological diseases. The results from a few studies indicate that magnetic resonance (MRI) is helpful in diagnosing acute appen-



ditis in certain patient populations (e.g., children, pregnant women).<sup>28</sup>

Diagnosis of acute appendicitis in women of reproductive age still presents a difficulty, largely due to a possible gynaecological disease. The results of our study have shown that the gynaecological examination in such patients is unreliable in diagnosing an acute gynaecological disease. It is our opinion that in such cases it is essential to use other diagnostic methods (US and/or MR in children and pregnant women, CT and/or laparoscopy in others) in making an adequate diagnosis, and consequently an adequate therapy.

An algorithm of diagnostic and therapeutic procedures in patients with the symptoms of acute appendicitis could be suggested based on our experience and the works of other authors<sup>16</sup> (Figure 1.).

## Literature

- Graffeo CS, Counselman FL. Appendicitis. *Emerg Med Clin North Am* 1996;14:653–71.
- Flum DR, Morris A, Koepsell T, Dellinger EP. Has misdiagnosis of appendicitis decreased over time? A population-based analysis. *JAMA* 2001;286(14):1748–53.
- Rothrock SG, Green SM, Dobson M, Colucciello SA, Simmons CM. Misdiagnosis of appendicitis in nonpregnant women of childbearing age. *J Emerg Med* 1995;13(1):1–8.
- Bongard F, Landers DV, Lewis F. Differential diagnosis of appendicitis and pelvic inflammatory disease. A prospective analysis. *Am J Surg* 1985;150(1):90–6.
- Nakhgevanly KB, Clarke LE. Acute appendicitis in women of childbearing age. *Arch Surg* 1986;121:105–5.
- Webster DP, Schneider CN, Cheche S, Daar AA, Miller G. Differentiating acute appendicitis from pelvic inflammatory disease in women of childbearing age. *Am J Emerg Med* 1993;11(6):569–72.
- Najem AZ, Barillo DJ, Spillert CR, Kerr JC, Lazaro EJ. Appendicitis versus pelvic inflammatory disease. A diagnostic dilemma. *Am Surg* 1985;51(4):217–22.
- Reynolds SL. Missed appendicitis in a pediatric emergency department. *Pediatr Emerg Care* 1993;9:1–3.
- Rothrock SG, Skeoch G, Rush JJ, Johnson NE: Clinical features of misdiagnosed appendicitis in children. *Ann Emerg Med* 1991;20:45–50.
- McCallion J, Canning GP, Knight PV, McCallion JS. Acute appendicitis in the elderly: a 5-year retrospective study. *Age Ageing* 1987;16:256–60.
- Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol* 1990;132:910–25.
- Schwartz SI. Appendix. In: Schwartz SI (ed.). *Principles of surgery*. 6th ed. New York: McGraw Hill, 1994;1307–18.
- Wilcox RT, Traverso LW. Have the evaluation and treatment of acute appendicitis changed with new technology? *Surg Clin North Am* 1997;77:1355–70.
- Treutner KH, Schumpelick V. Epidemiology of appendicitis. *Der Chirurg* 1997;1:68.
- Hale DA, Molloy M, Pearl RH, Schutt DC, Jaques DP. Appendectomy: a contemporary appraisal. *Ann Surg* 1997;225:252–61.
- Yerry L, Reginald WD, Wendell Y. Imaging for suspected appendicitis. *Am Fam Physician* 2005;71:71–8.
- Balthazar EJ, Rofsky NM, Zucker R. Appendicitis: the impact of computed tomography imaging on negative appendectomy and perforation rates. *Am J Gastroenterol* 1998;93:768–71.
- Rao PM, Rhea JT, Rattner DW, et al. Introduction of appendiceal CT: impact on negative appendectomy and appendiceal perforation rates. *Ann Surg* 1999;229:344.
- Schuler JB, Shortleeve MJ, Goldenson RS, et al. Is there a role for abdominal computed tomographic scans in appendicitis? *Arch Surgery* 1998;133:272.
- Wagner JM, McKinney P, Carpenter JL. Does this patient have appendicitis? *JAMA* 1996;276:1589–94.
- Rao PM, Feltmate CM, Rhea JT, Schulick AH, Noovelline RA. Helical computed tomography in differentiating appendicitis and acute gynecologic conditions. *Obstetrics & Gynecology* 1999;93:417–21.
- Franke C, Bohner H, Yang Q et al. Ultrasonography for diagnosis of acute appendicitis: results of a prospective multicenter trial. *World J Surg* 1999;23:141.
- Lim HK, Bae SH, Seo GS. Diagnosis of acute appendicitis in pregnant women: value of sonography. *Am J Roentogenol* 1992;159:539–42.
- Van Dalen R, Bagshaw PF, Dobbs BR, Robertson GM, Lynch AC, Frizelle FA. The utility of laparoscopy in the diagnosis of acute appendicitis in women of reproductive age. *Surgical Endoscopy* 2003;17:131–3.
- Larsson PG, Henriksson G, Olsson M, Boris J, Ströberg P, Tronstad SE, Skullman S. Laparoscopy reduces unnecessary appendectomies and improves diagnosis in fertile women. *Surgical Endoscopy* 2001;15:200–2.
- Borgstein PJ, Gordijn RV, Eijsbouts QAJ, Cuesta MA. Acute appendicitis – a clear-cut case in men, a guessing game in young women. A prospective study on the role of laparoscopy. *Surgical Endoscopy* 1997;11:923–7.
- Grönroos JM, Grönroos P. A fertile-aged woman with right lower abdominal pain but unelevated leukocyte count and C-reactive protein. Acute appendicitis is very unlikely. *Langenbeck's Arch Surg* 1999;384:437–40.
- Birnbaum BA, Wilson SR. Appendicitis at the millennium. *Radiology* 2000;215:337–48.

*Paper received:* 31. 02. 2005.; *accepted:* 10. 06. 2005.

*Adresa autora:* Mr. sc. Srećko Sabalić, dr. med., Opća županij-ska bolnica Požeга, Služba za kirurške bolesti, Osječka 107, 34 000 Požeга, Hrvatska