

Impact of the use of post-surgical antibiotics in uncomplicated acute appendicitis

Impacto del uso de antibióticos postquirúrgicos en apendicitis aguda no complicada

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ABSTRACT

Introduction: Acute appendicitis is the most common abdominal emergency in the world and the most common non-elective surgery, which is as an objective for the treatment of acute appendicitis (appendicular perforation and abdominal sepsis), the use of subsequent antibiotics being a priority to surgery to prevent surgical site infections, however, currently, the use of antibiotics in patients operated on for appendicitis is not done indiscriminately and without a precise indication. **Objective:** To verify that the use of antibiotics in the postoperative of patients with acute uncomplicated appendicitis is not necessary. **Material and methods:** An analytical, prospective and longitudinal study of patients with a postoperative diagnosis of acute uncomplicated appendicitis was carried out from June 2017 to November 2018 at the “Dr. Aurelio Valdivieso” General Hospital. It included 128 patients, divided into two groups in a simple random manner: 64 cases (without postoperative antibiotic) and 64 controls (with postoperative antibiotic: ceftriaxone or cefotaxime). Leukocytes and C-reactive protein on the 1st, 3rd and 10th day of surgery, and postoperative infectious complications at 30 days and length of hospital stay were evaluated. **Results:** No significant differences in the incidence of surgical site infections were observed in either group. A difference was noted in the average hospital stay, 2.16 vs 1.88 ($p = 0.001$). **Conclusions:** The use of antibiotics in the postoperative of uncomplicated acute appendicitis does not affect the incidence of surgical site infections. Its systematic use in all patients is not justified. The use of prophylactic antibiotics should be done as dictated by clinical practice guidelines. Variation in their use will cause an increase in the incidence of surgical site infections.

RESUMEN

Introducción: La apendicitis aguda es la urgencia abdominal más común en el mundo, la cual tiene como objetivo prevenir las complicaciones asociadas al tratamiento tardío de la apendicitis aguda (perforación apendicular y sepsis abdominal), siendo la utilización de antibióticos en el postquirúrgico una medida para prevenir las infecciones del sitio quirúrgico. Sin embargo, en la actualidad el empleo de antibióticos en pacientes operados por apendicitis no complicada se efectúa de manera indiscriminada y sin una indicación precisa. **Objetivo:** Comprobar que los antibióticos en el postquirúrgico de pacientes con apendicitis aguda no complicada no son necesarios. **Material y métodos:** Se realizó un estudio analítico, prospectivo y longitudinal de pacientes con diagnóstico postquirúrgico de apendicitis aguda no complicada durante junio de 2017 a noviembre de 2018 en el Hospital General “Dr. Aurelio Valdivieso”, se incluyeron 128 pacientes, repartidos en dos grupos de manera aleatoria simple: 64 casos (sin antibiótico postquirúrgico) y 64 controles (con antibiótico postquirúrgico: ceftriaxona o cefotaxima). Se evaluaron las complicaciones infecciosas postquirúrgicas a 30 días y estancia hospitalaria, leucocitos y proteína C reactiva al primer, tercer y décimo día de intervención quirúrgica. **Resultados:** No se observaron diferencias significativas en ambos grupos en la incidencia de infección de sitio quirúrgico y en donde se apreció diferencia fue en la estancia hospitalaria promedio 2.16 versus 1.88 ($p = 0.001$). **Conclusiones:** La utilización de antibiótico en el postquirúrgico de apendicitis aguda no complicada no afecta la incidencia de infecciones de sitio quirúrgico, por lo que su empleo no debe realizarse de manera sistematizada en todos los pacientes. La administración de los antibióticos de manera profiláctica deberá efectuarse como dictaminan las guías de práctica clínica, por lo que alguna variación en su aplicación provocará un incremento en la incidencia de infección de sitio quirúrgico.

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INTRODUCTION

In Mexico, appendectomy is the most common emergency surgery, so the use of postoperative antibiotics is common.¹ Surgical site infections in acute appendicitis occur in 5-10% of patients,²⁻⁵ so the use of antibiotics aims at preventing postoperative infectious complications.¹ However, Corona and colleagues in a survey of general surgeons found an indiscriminate administration of antibiotics in appendectomized patients derived from lack of knowledge.¹ According to a Cochrane survey in 2005, antibiotics in patients with uncomplicated appendicitis should be used only prophylactically. Their use in the post-surgical period is debated.⁶ Other postoperative studies conclude that in acute appendicitis antibiotic prophylaxis should be used, as well as in the postoperative of complicated cases.⁷⁻¹¹ Retrospective studies support this view (Le and colleagues, Coakley and team, Ali and collaborators) and conclude that it increases hospital stay, hospital infections (urinary infections and pneumonia) and hospital costs.¹²⁻¹⁴ Concerning the Mexican guidelines, the Mexican Association of General Surgery (AMCG) does not make any recommendation regarding the use of antibiotics preoperatively,

transoperatively or postoperatively, and the National Center for Technological Excellence in Health (Centro Nacional de Excelencia Tecnológica en Salud, CENETEC) agrees with antibiotic prophylaxis, but does not comment on its postoperative use.^{15,16} These distinctions are specified in the WSES (World Society of Emergency Surgery) Guidelines: antibiotic prophylaxis in acute appendicitis and postoperative complicated appendicitis but not in uncomplicated appendicitis.¹⁷

MATERIAL AND METHODS

An analytical, prospective, longitudinal study was done at the General Hospital "Dr. Aurelio Valdivieso" in Oaxaca, from June 2017 to November 2018. A population sample of 128 patients between 15 and 74 years of age with clinical symptoms of acute appendicitis of up to 48 hours of evolution was selected. Antibiotic prophylaxis with third generation cephalosporin or quinolone, in case of allergy to cephalosporins, was administered. Those that, according to the macroscopic characteristics of the appendix corresponded to uncomplicated appendicitis, were included in the study and patients with overweight and obesity (BMI greater than 27.5), with type 1 and 2 diabetes mellitus, autoimmune diseases, liver diseases, hyperthyroidism and hypothyroidism, acquired immunodeficiency, and cancer were excluded.

A 95% confidence level ($\alpha = 0.05$). They all signed informed consent. They were divided into two groups in a simple randomized way, (*Table 1*). Group I, cases without postoperative antibiotics (31 men and 33 women), and control group II (27 men and 37 women) with postoperative administration of a third-generation cephalosporin or a quinolone (in case of history of allergies) for 24 hours after surgery and oral antibiotics for seven days. Leukocytes and C-reactive protein (CRP) were measured on admission, and on the third and tenth days after surgery (*Figures 1 and 2*). Only those patients with clinical signs of surgical site infection, pneumonia, urinary tract infection, or other remained hospitalized. Comparative analysis was carried out with IBM® SPSS® Statistic V23 software. χ^2 test and Mann-Whitney U were done.

Table 1: Comparison of groups.

	With antibiotic	Without antibiotic	p
Surgical site infection	0/64	1/64	0.314
Superficial infection of the incision	0/64	1/64	0.314
Deep incision infection	0/64	0/64	ND
Infection organ/space	0/64	0/64	ND
Urinary infection	1/64	0/64	0.314
Pneumonia	0/64	0/64	ND
Other	0/64	0/64	ND
Leukocytes on admission	14,839	13,788	0.202
Leukocytes on day 3	8,492	7,895	0.209
Leukocytes on day 10	7,924	8,561	0.504
CRP on admission	10.10	9.51	0.616
CRP on day 3	8.69	7.90	0.446
CRP on day 10	3.48	2.31	0.077
Days of hospital stay	2.16	1.88	0.001

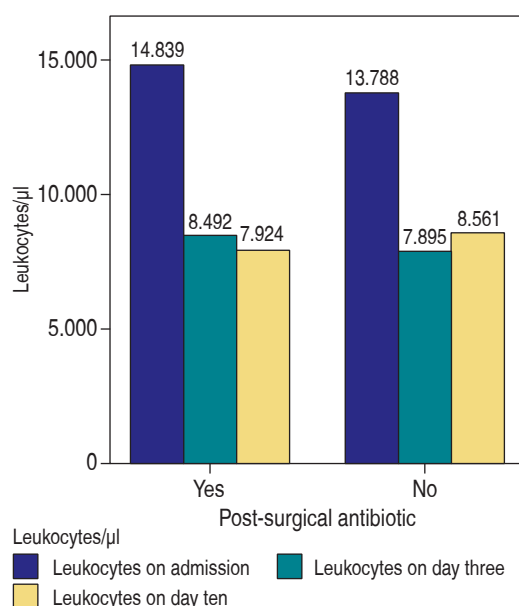


Figure 1: Leukocyte values/μl on admission, day three and day ten.

RESULTS

The number of surgical site infections for the group without postoperative antibiotics was 1 of 64, and none in the group with postoperative antibiotics. Deep incisional, organ/space infection, and pneumonia did not occur in either group. However, one case of urinary tract infection occurred in the group with postoperative antibiotics. The average hospital stay for the no antibiotic group was 1.88 days versus 2.16 days for the antibiotic group. We conducted χ^2 and Mann-Whitney U to compare the group without postoperative antibiotics versus the group with postoperative antibiotics.

DISCUSSION

The incidence of surgical site infections in uncomplicated appendicitis is 4-10% as reported by different authors,^{7-10,12,13,18} is different from our study (1.6%). Those studies included overweight patients with BMI greater than 27.5), type 1 and 2 diabetes mellitus, autoimmune diseases, liver diseases, hyperthyroidism, hypothyroidism, acquired immunodeficiency, and cancer, while ours excluded patients with those diseases.

Surgical site infections after uncomplicated acute appendicitis are a known risk. Different approaches have been described to reduce it.^{3,19-22} The use of antibiotics has been evaluated since their introduction. In 2005, the Cochrane group carried out a systematic review of 45 prospective, randomized controlled studies. They concluded that antibiotics should be given prophylactically. Their use in the postoperative is debated. From this analysis, randomized clinical trials were conducted by Abdhullan et al., Hussain et al., Hughes et al., and Mui et al.,⁸⁻¹¹ to evaluate their use, without antibiotic and with a postoperative antibiotic, and they concluded that antibiotics are not useful in patients with uncomplicated acute appendicitis to prevent surgical site infections. Such assertions are shared in our study. No difference in the incidence of wound infection was noted in patients whether they did or did not receive an antibiotic. In another study, Coakley et al.¹³ related the use of postoperative antibiotics in uncomplicated acute appendicitis to *Clostridium difficile* infection, urinary tract infections, and postoperative diarrhea. However, Hussain et al.⁹ observed no difference between the two groups, as in our study.

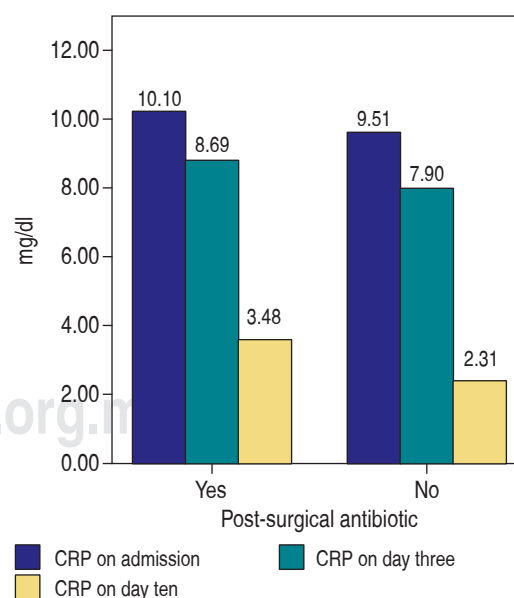


Figure 2: CRP values on admission, day three and day ten.

We did observe differences in hospital stay, which coincides with the report by Coakley and colleagues.¹³ These authors found differences between the leukocyte count of patients with postop antibiotics versus patients without them, which contrasts with our study where differences in leukocyte count and CRP were not found. Our study corroborates previous assertions. There is no difference in preventing surgical site infections in patients with uncomplicated acute appendicitis with or without antibiotics. The laboratory indicators (leukocytes and CRP) remain the same.

CONCLUSION

The incidence of surgical site infections in patients operated for uncomplicated acute appendicitis without the use of antibiotics is not increased. Antibiotics should be applied in properly selected patients with overweight or obesity (BMI greater than 27.5), type 1 and 2 diabetes mellitus, autoimmune diseases, liver diseases, hyperthyroidism or hypothyroidism, immunodeficiencies or cancer. The use of postoperative antibiotics in uncomplicated appendicitis increases hospital stay and does not increase comorbidities for other infections (pneumonia or urinary tract infection). We insist on the proper administration of antibiotic prophylaxis 30 minutes before the incision. These should be either ceftriaxone or cefotaxime, and ciprofloxacin in case of allergy. Variation in this behavior may result in increased surgical site infections.

REFERENCES

1. Corona-Cruz JF, Melchor-Ruan J, Gracida-Mancilla NI, Vega-Chavaje GR, Sánchez-Lozada R. Uso inapropiado de antibióticos en apendicitis aguda. Resultado de una encuesta a cirujanos mexicanos. *Cir Cir*. 2007; 75: 25-29.
2. Ronchetto F, Azzario G, Pistono PG, Guasco C. Gangrenous and perforating appendicitis in a provincial hospital: a 48-month retrospective study. Clinical and microbiological aspects, course and postoperative morbidity. *G Batteriol Virol Immunol*. 1990; 83: 27-41.
3. Sánchez-Santana T, del-Moral-Luque JA, Gil-Yonte P, Bañuelos-Andrío L, Durán-Poveda M, Rodríguez-Caravaca G. Efecto de la adecuación a protocolo de la profilaxis antibiótica en la incidencia de infección quirúrgica en apendicectomías. Estudio de cohortes prospectivo. *Cir Cir*. 2017; 3: 208-213.
4. Garcell HG, Arias AV, Sandoval CA, García EG, Gamboa ME, Sado AB, et al. Incidence and etiology of surgical site infections in appendectomies: a 3-year prospective study. *Oman Med J*. 2017; 32: 31-35.
5. Rafiq MS, Khan MM, Khan A, Jan H. Evaluation of postoperative antibiotics after non-perforated appendectomy. *J Pak Med Assoc*. 2015; 65 (8): 815-817.
6. Andersen BR, Kallehave FL, Andersen HK. Antibiotics versus placebo for prevention of postoperative infection after appendectomy. *Cochrane Database Syst Rev*. 2003; CD001439.
7. Daskalakis K, Juhlin C, Pählman L. The use of pre- or postoperative antibiotics in surgery for appendicitis: a systematic review. *Scand J Surg*. 2014; 103: 14-20.
8. Mui LM, Ng CS, Wong SK, Lam YH, Fung TM, Fok KL, et al. Optimum duration of prophylactic antibiotics in acute non-perforated appendicitis. *ANZ J Surg*. 2005; 75: 425-428.
9. Hussain MI, Alam MK, Al-Qahatani HH, Al-Akeely MH. Role of postoperative antibiotics after appendectomy in non-perforated appendicitis. *J Coll Physicians Surg Pak*. 2012; 22: 756-759.
10. Hughes MJ, Harrison E, Paterson-Brown S. Post-operative antibiotics after appendectomy and post-operative abscess development: a retrospective analysis. *Surg Infect (Larchmt)*. 2013; 14: 56-61.
11. Abdullah S, Vaithianathan R, Rajendiran K, Santhanam R. Randomized clinical trial of single versus three doses of cefazolin as prophylaxis for nonperforated acute appendicitis. *Int J Cur Res Rev*. 2012; 11: 124-130.
12. Le D, Rusin W, Hill B, Langell J. Post-operative antibiotic use in nonperforated appendicitis. *Am J Surg*. 2009; 198: 748-752.
13. Coakley BA, Sussman ES, Wolfson TS, Bhagavath AS, Choi JJ, Ranasinghe NE, et al. Postoperative antibiotics correlate with worse outcomes after appendectomy for nonperforated appendicitis. *J Am Coll Surg*. 2011; 213: 778-783.
14. Ali K, Latif H, Ahmad S. Frequency of wound infection in non-perforated appendicitis with use of single dose preoperative antibiotics. *J Ayub Med Coll Abbottabad*. 2015; 27: 378-380.
15. González-Cano JR, López-Betancourt G, Cedillo-Alemán EJ, Juárez-Parra MA, González-Aguirre D, López-Tapia JD, et al. Guía de Práctica Clínica. Apendicitis aguda. Asociación Mexicana de Cirugía General A.C. 2014. [enero 2019] Disponible en: <http://amcg.org.mx/images/guiasclinicas/apendicitis.pdf>
16. Diagnóstico de apendicitis. México: Secretaría de Salud; 2009. [enero 2019] Disponible desde: <http://www.cenetec.salud.gob.mx/interior/gpc.html>
17. Di Saverio S, Birindelli A, Kelly MD, Catena F, Weber DG, Sartelli M, et al. WSES Jerusalem guidelines for diagnosis and treatment of acute appendicitis. *World J Emerg Surg*. 2016; 11: 34.
18. Ahmed K, Connelly TM, Bashar K, Walsh SR. Are wound ring protectors effective in reducing surgical site infection post appendectomy? A systematic review and meta-analysis. *Ir J Med Sci*. 2016; 185: 35-42.
19. Romano A, Parikh P, Byers P, Namias N. Simple acute appendicitis versus non-perforated gangrenous appendicitis: is there a difference in the rate of

- post-operative infectious complications? *Surg Infect (Larchmt)*. 2014; 15: 517-520.
20. Harrop JS, Styliaras JC, Ooi YC, Radcliff KE, Vaccaro AR, Wu C. Contributing factors to surgical site infections. *J Am Acad Orthop Surg*. 2012; 20: 94-101.
 21. Golub AV, Kozlov RS, Pleshkov VG, Moskalev AP, Alibegov RA, Chelombitko MA. Surgical site infections after open appendectomy and effectiveness of complex approach to their prevention. *Khirurgiia (Mosk)*. 2016; 68-76.
 22. Xiao Y, Shi G, Zhang J, Cao JG, Liu LJ, Chen TH, et al. Surgical site infection after laparoscopic and open appendectomy: a multicenter large consecutive cohort study. *Surg Endosc*. 2015; 29: 1384-1393.

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