

Risk factors for perforation in acute appendicitis

Dr.Imad Hasan Sagir*

* Specialist in General Surgery, Department of Surgery, Al-Diwaniya Teaching Hospital
Email: imad1972alzaidi@gmail.com

(Received 30 / 11 / 2013 , Accepted 28 / 12 / 2013)

الخلاصة:

أجريت هذه الدراسة المستقبلية على 720 مريض يعانون من التهاب الزائدة الدودية الحاد في ردهات قسم الجراحة ، في مستشفى الديوانية التعليمي خلال مدة ثلاث سنوات وذلك من شهر كانون الثاني 2010 الى شهر كانون الاول 2012، وقد تم خلال هذه الدراسة تحليل معلومات المريض الكاملة والتي تشمل التاريخ المرضي ،الفحص السريري ، التحاليل والفحوصات التي اجريت للمريض ، تفاصيل العملية الجراحية ، بالإضافة الى معلومات كاملة عن نتائج الفحص النسيجي للزائدة الدودية ، وقد تبين من خلال هذه الدراسة ان التهاب الزائدة الدودية الحاد كان أكثر شيوعاً في العقد الثاني من العمر (44,4%) وأكثر شيوعاً في الذكور (55,97%) منه في الإناث (44,02%) وقد كانت الزائدة الدودية منفجرة في 144 مريض (20%) وكانت نسبة الأنفجار أعلى في الذكور (56,25%) منه في الإناث (43,75%). عوامل الخطورة التي تؤدي الى زيادة نسبة انفجار الزائدة الدودية الملتهبة هي: أطراف العمر (الأطفال أقل من 10 سنوات والكبار أكثر من 60 سنة من العمر) ، التشخيص المتأخر للحالة (أكثر من 72 ساعة) ، مرض السكري ، المرضى الذين يتناولون دواء الستيرويد باستمرار، درجة حرارة الجسم المرتفعة أكثر من (38 م°) ، زيادة نسبة كريات الدم البيضاء (أكثر من 18000 /ملم³) ، موقع الزائدة الدودية الحوضي ، وجود انسداد في تجويف الزائدة الدودية وحالات الحمل. كانت معدلات المضاعفات مابعد العملية ومعدلات الرقود في المستشفى أعلى في حالات التهاب الزائدة الدودية المنفجر، وكان معدل الوفيات في حالات التهاب الزائدة الدودية المنفجر (2,08%) بينما لم تسجل حالات وفيات في التهاب الزائدة الدودية غير المنفجر، وبناءاً على ذلك فإن هذا يتطلب التركيز في علاج مثل هذه الحالات وذلك باستخدام المضادات الحيوية المناسبة قبل وبعد اجراء العملية الجراحية وكذلك اجراء العملية الجراحية بالسرعة الممكنة وبالدفقة المطلوبة لغرض الخروج بافضل النتائج.

Abstract:

This prospective study was carried out on 720 patients with acute appendicitis admitted to the surgical unit at Al-Diwaniya Teaching Hospital over a period of 3 years from January 2010 to December 2012. The data of the patients regarding clinical history, physical examination, investigations, operative findings and histopathology reports were analyzed. Acute appendicitis was more common in the second decade of life (44.4%) and was more common in males (55.97%) than in females (44.02%). Perforated appendicitis was found in 144 patients (20%). The incidence of perforated appendicitis was high in males (56.25%) as compared to females (43.75%). The risk factors for perforation in acute appendicitis include: extremes of age (< 10 years and > 60 years), delayed presentation (> 72 hours), diabetes mellitus, steroid dependency, elevated temperature (>38°C), raised WBC count (>18,000/mm³), pelvic appendix, obstructive appendicitis (fecolith), and pregnancy (the P-value was <0.05). The morbidity and mean hospital stay were more in perforated appendicitis than in non perforated appendicitis. The mortality rate in perforated appendicitis was (2.08%), while there was no death recorded in non-perforated appendicitis. We should be aggressive in the treatment of appendicitis in high risk patients, so once acute appendicitis is diagnosed, the expedient surgery and appropriate use of perioperative antibiotics can help to minimize the morbidity and mortality.

Introduction:

Acute appendicitis is still the commonest abdominal surgical emergency⁽¹⁾, with a lifetime risk of 7-8%, the highest incidence found in the second decade of

life^(1,2,3,4,5,6). Acute appendicitis is recognized as a clinical entity since 1500s, at that time it was called as perityphilitis. The first appendicectomy

was reported in literature in 1736. Then Reginald Fitz in 1886 established the role of appendicectomy in the management of acute appendicitis⁽⁴⁾. Soon afterwards, Charles Mc Burney described the clinical manifestations of acute appendicitis including the point of maximum tenderness in the right iliac fossa that now bears his name⁽¹⁾. Acute appendicitis is essentially a clinical diagnosis, but ultrasonography and contrast enhanced CT scanning can be of help^(1,7,8,9). Acute appendicitis can proceed to gangrene and perforation if not readily diagnosed and treated. Different factors are responsible for perforation in acute appendicitis at different age groups and this can be explained by the difference in immune status and aetiologies of appendicitis. Perforation in acute appendicitis is responsible for increased morbidity (6-17%), mortality, prolonged hospital stay and financial burden on the patients⁽³⁾. mortality rate in patients with perforated appendicitis, multiple comorbidities, and at the extremes of age, however, may approach 5% or even higher in some cases. Paediatric and geriatric patients are more likely to present later and with

Results:

Table (1):Age distribution of perforated appendicitis.

| Age (years) | Total cases | % | Perforated appendicitis | % | Males | % | Females | % |
|--------------|-------------|------------|-------------------------|-------|-----------|------------|-----------|------------|
| 1-10 | 102 | 14.16 | 41 | 40.19 | 21 | 25.92 | 20 | 31.74 |
| 11-20 | 320 | 44.44 | 54 | 16.87 | 31 | 38.27 | 23 | 36.50 |
| 21-30 | 170 | 23.61 | 14 | 8.23 | 9 | 11.11 | 5 | 7.93 |
| 31-40 | 49 | 6.80 | 8 | 16.32 | 4 | 4.93 | 4 | 6.34 |
| 41-50 | 28 | 3.88 | 6 | 21.42 | 4 | 4.93 | 2 | 3.17 |
| 51-60 | 26 | 3.61 | 5 | 19.23 | 3 | 3.70 | 2 | 3.17 |
| > 60 | 25 | 3.47 | 16 | 64.00 | 9 | 11.11 | 7 | 11.11 |
| total | 720 | 100 | 144 | | 81 | 100 | 63 | 100 |

As shown in table (1): the total number of cases was 720, the age range was from 1 year to 80 years, and the age mean was 21.98 years. Acute appendicitis was more common in the second decade of life

perforation. Risk of perforation in adult patients is variable, but at 36 hours from the onset of symptoms is about 2% and left untreated may increase about 5% every 12 hours⁽⁷⁾. The overall rate of perforated appendicitis is (25.8%)⁽¹⁰⁾.

Aim of Study:

To determine the rate and risk factors for perforation in acute appendicitis.

Patients and Method:

This prospective study was conducted at Al-Diwaniya Teaching Hospital, Department of Surgery from January 2010 to December 2012. A total number of 720 patients who presented with a clinical picture of acute appendicitis and who underwent emergency appendicectomy were included in the study. The data of the patients regarding clinical history, physical examination, investigations, operative findings, and histopathology reports were analyzed. Patients with negative appendicectomies were excluded from this study. Statistical analysis was carried out using the Chi-square test. The data are expressed as No. and % of cases. Differences were considered statistically significant if P-value < 0.05.

(44.44%) followed by third decade of life (23.61%). The total number of male patients was 403 (55.97%), while the total number of female patients was 317 (44.02%) with a male: female ratio about

of 1.3:1, so acute appendicitis is more common in males than in females. Perforated appendix was found in 144 patients, so the rate of perforation is 20%. The highest rates of perforation were seen in 2 age groups: (1) patients who are less than 10 years of age, in which there were 41 out of 102 patients (40.19%) with perforation, and (2) patients who are more than 60 years of age, in which there were 16 out of 25 patients (64.00%) with perforation, so perforated appendicitis is more common in the extremes of age.

Table (2): Sex distribution of perforated appendicitis.

| Perforated appendicitis | No. | % |
|-------------------------|-----|-------|
| Males | 81 | 56.25 |
| Females | 63 | 43.75 |
| Total | 144 | 100 |

As shown in table (2) :perforated appendicitis is more common in males than in females.

Table (3):Risk factors for perforated appendicitis.

| Risk Factors | Perforated | | Nonperforated | | P-value |
|--|------------|-------|---------------|-------|---------|
| | No. | % | No. | % | |
| Extremes of age(<10 years and > 60 years) | 57 | 39.58 | 70 | 12.15 | <0.05 |
| Delayed presentation (>72 hours) | 102 | 70.83 | 4 | 0.69 | <0.05 |
| Diabetes mellitus | 31 | 21.53 | 34 | 5.90 | <0.05 |
| Steroid dependency | 11 | 7.64 | 4 | 0.69 | <0.05 |
| Fever(Temperature > 38°C) | 118 | 81.94 | 260 | 45.14 | <0.05 |
| Raised WBC count (>18,000 \mm ³) | 130 | 90.28 | 286 | 49.65 | <0.05 |
| Pelvic appendix | 60 | 41.67 | 84 | 14.58 | <0.05 |
| Obstructive appendicitis (fecolith) | 65 | 45.14 | 200 | 34.72 | <0.05 |
| Pregnancy | 13 | 9.03 | 2 | 0.35 | <0.05 |

Perforated appendicitis =144

Non perforated appendicitis = 576

Table (4):Morbidity in perforated and non perforated appendicitis.

| Complications | Perforated appendicitis | Non perforated appendicitis |
|-------------------------|-------------------------|-----------------------------|
| Wound infection | 26 | 14 |
| Pulmonary complications | 10 | 4 |
| Wound dehiscence | 3 | - |
| Incisional Hernia | 5 | 2 |
| Bowel fistula | 1 | - |
| Peritonitis | 3 | - |
| Stress ulcer | 2 | - |
| DVT | 1 | - |
| UTI | 4 | 3 |
| Total | 55(38.19%) | 23(3.99%) |

The morbidity rate was more in perforated appendicitis (38.19%) than in non-perforated appendicitis. The most common complication in the perforated group was wound infection (18.05%) followed by pulmonary complications (6.94%).

N.B.Wound dehiscence and incisional hernia occurred in cases that had been explored by laparotomy.

Table (5): Mean hospital stay in each group.

| Patient 's group | Mean(days) |
|----------------------|------------|
| Perforated group | 6 |
| Non-perforated group | 3 |

Table (6): Mortality rate.

| Patient 's group | No. of patients |
|----------------------|-----------------|
| Perforated group | 3 |
| Non-perforated group | - |

The mortality rate was 2.08% in the perforated group ,while there was no death in non-perforated group.

Discussion:

Acute appendicitis ,the most common cause of abdominal surgical emergency ,shows different pathogenesis ,clinical presentation ,course and outcome in different patients⁽⁴⁾ .In our study acute appendicitis was more common in males than in females with a male:female ratio of about 1.3:1 and this observation is consistent with the findings in other studies ^(3,11) . The mean of age in this study was about 22 years which is similar to other studies ^(3,12,13) . The mean of age of patients having appendicitis is reported to be 33 and 31 years in studies from Hong Kong and Sweden respectively ,which is quite high compared to this study ^(14,15) .Acute appendicitis occurs sparsely in infants and the highest incidence is in the second and third decades of life ^(3,4,16) . In our study ,the highest incidence of acute appendicitis was in the second decade (44.4%) followed by third decade

(23.6%). The incidence of appendiceal perforation in acute appendicitis is estimated to be in the range of 20-30% which increases to 32-72% in patients above 60 years of age ^(17,18,19,20) . The perforation rate in this study was 20% with the maximum incidence being in the extremes of age (40% of patients below 10 years of age and 64% of patient above 60 years of age had perforated appendicitis).The reasons behind this high rate in children and elderly postulated to be due to the late and atypical presentation and delay in diagnosis and surgical intervention. In addition to that ,the presence of comorbid diseases and age specific physiological changes contribute to high incidence of perforation in elderly ^(21,22,23,24,25) . Delay in presentation was found by many author to be the reason behind the higher rate of perforation seen in patients with acute appendicitis ^(4,17,23,24,26) . Our study showed that perforation rate correlated

well with delayed presentation (pre-hospital delay). Diabetes mellitus, when accompanied by acute appendicitis, increases the morbidity and mortality because it impairs immunity. The progression of disease from acute appendicitis to perforated appendicitis is more rapid in diabetic patients as compared to non-diabetics⁽⁴⁾. According to our study, uncontrolled diabetes is strongly associated with perforated appendicitis and wound infection is common in such patients. Appendicitis is difficult to diagnose in steroid-dependent patients who are taking steroids for other illnesses like asthma and rheumatoid arthritis due to anti-inflammatory and immunosuppressive effects of steroids. Steroid-dependent patients usually present in hospital with advanced stages of appendicitis. Wound infection is common and wound healing is delayed in these patients⁽⁴⁾. Fever ($>38^{\circ}\text{C}$) was present in 81% of patients with perforated appendicitis as compared to 45% in non-perforated appendicitis, and this is in agreement with the findings of other studies^(26,27). Increased WBC count ($>18,000/\text{mm}^3$) was present in 90% of patients with perforated appendicitis as compared to 49% in non-perforated appendicitis. Again, this result is in agreement with other studies, and these studies had also shown a shift of WBC to the left^(21,27). The diagnosis of acute appendicitis may be delayed when the appendix is pelvic in position because there is usually complete absence of abdominal rigidity, and often tenderness over Mc Burney's point is also lacking and this can increase the incidence of perforated appendicitis⁽¹⁾. Obstruction of appendiceal lumen is essential for the development of appendiceal gangrene

and perforation^(1,4). The main causative agent for obstruction is fecolith which is composed of inspissated faecal material, calcium phosphates, bacteria and epithelial debris⁽¹⁾. Appendicitis is the most frequently encountered disease requiring surgical treatment during pregnancy⁽⁴⁾. The diagnosis is complicated by delay in presentation as early non-specific symptoms are often attributed to the pregnancy, the caecum and appendix are progressively pushed to the upper quadrant of the abdomen as pregnancy develops during the second and third trimesters. Fetal loss occurs in 3-5% of cases, increasing to 20% if perforation is found at operation⁽¹⁾. The postoperative complications were more in perforated appendicitis (38%) as compared to non-perforated group (3.9%), with the wound infection being the most common postoperative complication (18%). This can be attributed to delay in diagnosis and presence of co-morbid diseases^(4,20,27), and these findings are similar to other studies^(4,26). The mean hospital stay of the patients suffering from perforated appendicitis is significantly prolonged (6 days). Prolonged hospital stay is seen in elderly patients, diabetics, and in patients who suffered from postoperative complications like wound infection or had midline and right paramedian incision. The mortality rate in perforated appendicitis was 2.08%. Death is usually attributed to uncontrolled sepsis with its complications and severe medical diseases.

Conclusion and Recommendation

Perforated appendicitis is associated with high morbidity and mortality rates. The risk factors for perforation include extremes of age (less than 10 years and

more than 60 years of age) , delayed presentation (more than 72 hours), diabetes, steroid dependency, elevated temperature (more than 38 °C) , raised WBC count (more than 18,000/mm³) , pelvic appendix , obstructive appendicitis(fecolith) , and pregnancy. We should be aggressive in the treatment of appendicitis in the high risk patients , so once acute appendicitis is diagnosed ,the expedient surgery and appropriate use of perioperative antibiotics can help to minimize the morbidity and mortality.

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