THE VALUE OF TOTAL AND DIFFERENT LEUCOCYTES COUNT IN THE DIAGNOSIS OF APPENDICITIS

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Abstract

Appendicitis is the most common cause of the acute surgical abdomen in the children. Sometimes the diagnosis is not very easy, especially in small children. Beside clinical examination, laboratory tests were made in every patient hospitalized with acute appendicitis. We made a retrospective study comprising consecutive patients who were hospitalized in Pediatric Surgery Unit of County Hospital of Emergencies, Târgu-Mures, from the 1-st of January to 31-th December 2009, and had the diagnosis of acute appendicitis. There were 193 patients with acute appendicitis, 119 males and 76 females. We grouped them in three categories: small children (0- 5 years), mid age children (6- 11 years) and puberty children (12- 17 years). We recorded the number of total leucocytes, neutrophiles, lymphocytes and neutrophil: lymphocyte ratio. The aim of the study was to find out if these laboratory tests were helpful for the diagnosis of appendicitis. In only 58.08% of cases we had raised leucocytes count, in 59.6% raised neutrophiles count (but with percent of 70% in small children and 66% in mid age children). In 77.27% of cases we had low values of lymphocytes (but with percent of 82, 83% in small and mid age children). The neutrophil: lymphocyte ratio was up to 3.5: 1 in 55.05% of cases (in small children the percent was 77% and in mid age children, 70%). The decreased percent of lymphocytes and a neutrophil: lymphocyte ratio up to 3.5: 1 can be important for the diagnosis of appendicitis in small and mid age children. Instead these results the diagnosis of appendicitis remains mainly clinical. Normal values of laboratory tests can not delay an appendectomy decided on clinical examination.

Key words: appendicitis, laboratory, children

Introduction

Appendicitis is the most common cause of the acute surgical abdomen in children. This illness is reported mostly in older children. The diagnosis is made, especially recording the history and by the physical examination. Abdominal pain, defense, tenderness on percussion, nausea, vomiting are the signs and symptoms of appendicitis.

Beside these, we use to make in every case some laboratory test: hemoleukograme and urine summary. Laboratory studies are not very sensitive and not very specific for appendicitis. The number of white blood cells is usually elevated [1], also the number of neutrophiles [2] or even the eosinophiles [3]. The number of lymphocytes is decreased [4]. In the same studies, the neutrophil: lymphocyte ratio upper than 3.5: 1 [5] may be an appendicitis indicator.

The aim of this study is to find out if the laboratory tests mentioned before are helped us in the diagnosis of acute appendicitis.

Material and Methods

We made a retrospective study comprising consecutive patients who were hospitalized in Pediatric Surgery Unit of County Hospital of Emergencies, Târgu-Mures, from the 1-st of January to 31-th December 2009, and had the diagnosis of acute appendicitis. There were 193 patients with acute appendicitis. We recorded age, sex, clinical symptoms and signs. We also grouped the children in three categories: small children (0- 5 years), mid age children (6- 11 years) and puberty children (12- 17 years).

Laboratory investigations were carried out also in all patients. Total leukocytes were counted, also some different white cells: neutrophiles, lymphocytes, eosinophiles. The neutrophil: lymphocyte ratio was performed. The biological reference interval for our laboratory is 4- 12 white blood cell/$10^3\mu L$. The percent are 25-40 for neutrophiles and 50-70 for lymphocytes. All patients underwent appendectomy. The histological examination was obtained in all appendix.

Results

The age of these 193 patients ranged between 1 and 17 years. The average age was 10. In categories of age, there were 31 small children, 103 mid age children and 59 puberty children. The white cell count ranged between 4 and 31/ $10^3\mu L$.

After the histological examination, we grouped all the appendicitis in cataral, phlegmonous and perforated. There were 58 cataral appendix (29.79%), 91 phlegmonous appendix (46.46%) and 46 perforated appendix (23.73%). In small children (31 patients), we had 10 cataral appendix (32.25%), 6 phlegmonous appendix (19.35%) and 15 perforated appendix (48.40%). In mid age children (103 patients), we had 30 cataral appendix (29.13%), 51 phlegmonous appendix (49.51%) and 22 perforated appendix (21.36%). In puberty children (59 patients), we had 17 cataral appendix (28.21%), 33 phlegmonous appendix (55.93%) and 9 perforated appendix (15.26%). The percents of normal and uppers values of leucocytes in different types of appendicitis are presented in table 1, the percents of normal and uppers values of neutrophiles in table 2, the normal and low values of lymphocytes in table 3

and the neutrophiles: lymphocytes ratio in appendicitis is presented in table 4.
There were 119 males (60%): 21 small boys, 57 mid age boys and 40 puberty boys. Also, there were 76 females (40%): 10 small girls, 46 mid age girls and 19 puberty girls. The male: female ratio was 1.5: 1.

Table 1: Percents of uppers values of leucocytes in different types of appendicitis.

	appendicitis	biological reference interval	upper values
all children	total appendicitis	79 (41.91%)	116 (58.08%)
all children	cataral	36 (64.4%)	22(35.6%)
all children	phlegmonous	28 (31.5%)	63 (68.5%)
all children	perforated	15 (34%)	31(66%)
small children	total appendicitis	13 (41.94%)	18 (58.06%)
small children	cataral	7 (70%)	3 (30%)
small children	phlegmonous	1 (16.7%)	5 (83.3%)
small children	perforated	5 (33.3%)	10 (66.7%)
mid age children	total appendicitis	37 (35.92%)	66 (64.08%)
mid age children	cataral	17 (56.67%)	13 (43.33%)
mid age children	phlegmonous	14 (27.45%)	37 (72.55%)
mid age children	perforated	6 (27.27%)	16 (72.73%)
puberty children	total appendicitis	27 (40.68%)	32 (59.32%)
puberty children	cataral	10 (58.83%)	7 (41.17%)
puberty children	phlegmonous	13 (39.39%)	20 (60.61%)
puberty children	perforated	4 (44.44%)	5 (55.56%)

Table 2: Percents of uppers values of neutrophiles in different types of appendicitis.

	appendicitis	biological reference interval	Upper values
all children	total appendicitis	78 (40.4%(	117 (59.6%)
all children	cataral	27 (47.45%)	31 (52.55%)
all children	phlegmonous	37 (41.3%)	54 (58.7%)
all children	perforated	14 (29.78%)	32 (70.22%)
small children	total appendicitis	9 (29.03%)	22 (70.97%)
small children	cataral	3 (30%)	7 (70%)
small children	phlegmonous	1 (16.67%)	5 (83.33%)
small children	perforated	5 (33.33%)	10 (66.67%)
mid age children	total appendicitis	35 (34%)	68 (66%)
mid age children	cataral	14 (46.67%)	16 (53.33%)
mid age children	phlegmonous	18 (35.3%)	33 (64.7%)
mid age children	perforated	3 (13.64%)	19 (86.36%)
puberty children	total appendicitis	31 (52.54%)	28 (47.46%)
puberty children	cataral	8 (47.05%)	9 (52.95%)
puberty children	phlegmonous	18 (54.54%)	15 (45.46%)
puberty children	perforated	5 (55.55%)	4 (44.45%)

Table 3: Percents of low values of lymphocytes in different types of appendicitis.

	appendicitis	biological reference interval	low values
all children	total appendicitis	44 (22.73%)	151 (77.27%)
all children	cataral	19 (32.1%)	39 (67.79%)
all children	phlegmonous	17 (19.57%)	74 (80.43%)
all children	perforated	8 (17.03%)	38 (82.97%)
small children	total appendicitis	5 (16.13%)	26 (83.87%)
small children	cataral	2 (20%)	8 (80%)
small children	phlegmonous	0	6 (100%)
small children	perforated	3 (20%)	12 (80%)
mid age children	total appendicitis	18 (17.47%)	85 (82.53%)
mid age children	cataral	9 (30%)	21 (70%)
mid age children	phlegmonous	8 (15.69%)	43 (84.31%)
mid age children	perforated	1 (4.54%)	21 (95.46%)
puberty children	total appendicitis	19 (32.2%)	40 (67.8%)
puberty children	cataral	7 (41.17%)	10 (58.83%)
puberty children	phlegmonous	8 (24.24%)	25 (75.76%)
puberty children	perforated	4 (44.44%)	5 (55.56%)

Table 4: Neutrophiles: lymphocytes ratio.

	appendicitis	≤ 3.5 : 1	≥ 3.5 :1
all children	total appendicitis	88 (44.95%)	107 (55.05%)
all children	cataral	31 (52.55%)	27 (47.45%)
all children	phlegmonous	41 (45.66%)	50 (54.34%)
all children	perforated	16 (34.05%)	30 (65.95%)
small children	total appendicitis	7 (22.58%)	24 (77.42%)
small children	cataral	2 (20%)	8 (80%)
small children	phlegmonous	1 (16.67%)	5 (83.33%)
small children	perforated	4 (26.67%)	11 (73.33%)
mid age children	total appendicitis	30 (29.12%)	73 (70.88%)
mid age children	cataral	14 (46.67%)	16 (53.33%)
mid age children	phlegmonous	13 (25.49%)	38 (74.51%)
mid age children	perforated	3 (13.64%)	19 (86.36%)
puberty children	total appendicitis	32 (54.23%)	27 (45.77%)
puberty children	cataral	8 (47.05%)	9 (52.95%)
puberty children	phlegmonous	19 (57.57%)	14 (42.43%)
puberty children	perforated	5 (55.56%)	4 (44.44%)

Discussion

The diagnosis of acute appendicitis, especially in small children remains a delicate problem for every pediatric surgeon. Clinical examination, imagistic invetigations and laboratory tests help us to take the right decision in an acute abdominal pain.

Total and differential white cells may be modified in many patients with acute appendicitis. Also, there is a wide variation in the range of white leucocytes in healty children and in children with acute appendicitis. In our serie, half of the patients were mid age children (6- 11 years). In small children, half of the appendicitis were perforated. In older children, the percent of perforated appendicitis decreases at 21%, in mid age children and 15% in puberty children. Half of the appendix in those ages were phlegmonous.

Some studies reported a raised white blood cell count in more than 90% of patients [6], other studies only in 38% [7] of patients. In our series, total leucocytes are raised in 58.08% of patients. Almost half percents had phlegmonous appendicitis and 23% had perforated appendicits. In cataral appendicitis, total leucocytes count is raised in 35% of cases but this percent is higher in flegmonous and perforated appendicitis (66- 68%). In every category of children the percents are similar. Some authors

sugested [8] that leucocyte response declines in 0- 5 years-old children with appendicitis.

The upper number of neutrophiles in total appendicitis is in 59% of cases. There are more percents of neutrophiles in small children (70%) but less percents in mid age and pubertal children (66% and 47%). The percent of neutrophiles is more representaive in small children. There are studies [2] who claim that total neutrophile count serve as a predictive parameter for appendicitis, specially in association with leucocytosis [9].

The low number of lymphocytes in total appendicitis is in 77% of cases. This percent is more representative in perforated appendicites (82%). We found low number of lymphocytes specially in small children and in mid age children (80- 90%). In children at puberty, this number of lymphocytes is not so raised (55- 75%).

The neutrophil: lymphocyte ratio in total appendicitis is more than 3.5:1 in 55% of cases. This percent is raised in small and mid age children (77% and 70%) and is decreased in puberty children (45%). The decline number of lymphocytes and a neutrophil: lymphocyte ratio more than 3.5:1 can be an important value for appendicitis [4].

There were 60% of males and 40% of females with acute appendicitis. A raised percent of male with appendicitis [10] and a decreased percent of female with appendicitis [11] was found also in literature.

We could see from these tables that the number of total white blood cell is not so representative. From all children operated with acute appendicitis only 58.08% had upper values of leucocytes and 41.91% had normal values. It is not an sensitive indicator for appendicitis. Tables 3 and 4 show us that a decreased percent of lymphocytes is more representative, especially in small and mid age children. Also, the neutrophyles: lymphocytes ratio can be important in small and mid age children.

The operative decision was taken in all these patients despite the normal values of total and differential white blood cell count. We consider these decisions were good, because we had no cases of operative or postoperative mortality.

Conclusion

The dignosis of acute appendicitis is mainly clinical. Labotratory tests and echography can increase the diagnostic accuracy. We have to cosider all the values of total and differential white blood cell. There are not important only for the diagnosis of appendicitis, but there are relevant even for the biological status of the child. However, normal values of white blood cell would not delay an appendectomy decided on clinical examination.

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