

## Laparoscopic Treatment for Complicated Acute Appendicitis in Children, Junior Athletes

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### Rezumat

#### *Tratamentul laparoscopic în apendicita acută complicată la copii, tineri sportivi*

**Introducere:** Lucrarea este un studiu retrospectiv ce prezintă experiența a 20 cazuri de apendicită acută complicată la copii, sportivi de performanță, rezolvate prin abord laparoscopic.

**Material și metodă:** A fost luată în studiu o serie de 20 de pacienți, cu vârsta între 3 și 17 ani (medie 10 ani), cu apendicită acută complicată operată laparoscopic, prezentând aspecte legate de complicațiile intra și postoperatorii, durata intervenției chirurgicale, durata spitalizării și revenirea lor la activitatea sportivă. Au fost excluse din studiu 4 cazuri în care s-a practicat conversia la tehnica clasică.

**Rezultate:** A existat un caz de supurație parietală la nivelul plăgii de trocar suprapubic rezolvată prin tratament local. Nu au existat abcese intraabdominale care să necesite drenaj. Un pacient a devenit febril în ziua a 3-a postoperator, necesitând schimbarea antibioterapiei. Durata de spitalizare a variat între 4 și 8 zile. Revenirea la antrenamentul zilnic anterior s-a realizat în 10 - 12 zile postoperator.

**Concluzii:** Apendicita acută complicată (peritonită generalizată, abces, plastron abcedat), odată contraindicație pentru abordul laparoscopic, reprezintă acum o alegere de primă intenție de tratament. Acest abord este și mai indicat celor care au nevoie de revenirea rapidă la o activitate fizică intensă. Experiența

inițială nu ne permite să tragem concluzii statistice, dar ne încurajează să continuăm aplicarea abordului laparoscopic ca primă intenție în această patologie.

**Cuvinte cheie:** apendicită acută complicată, abord laparoscopic, sportivi

### Abstract

**Background:** We present our experience in the first 20 cases of complicated acute appendicitis in children, junior athletes, managed laparoscopically.

**Materials and method:** We selected our first 20 patients, aged between 3 and 17 (median age 10), with complicated acute appendicitis treated laparoscopically. We analysed the intra- and postoperative complications, operative time, length of hospitalization and their return period to previous training. Four cases were excluded from the study because they were converted to open appendectomy (OA).

**Results:** One case developed a parietal abscess at the place of insertion of the suprapubic trocar and was treated locally. There were no cases with intraabdominal abscesses to require drainage. Fever on the 3<sup>rd</sup> postoperative day appeared in one patient which required reassessment of the antibiotic treatment. Length of hospitalization was between 4 and 8 days. The athletes resumed their sports activity after 10 - 12 days.

**Conclusion:** Complicated acute appendicitis (generalized peritonitis, localized abscess, perforated abscess), was once a contraindication for laparoscopic appendectomy (LA). Today LA is the first choice of surgical treatment for most of the surgeons. Due to the limited number of patients we have operated on laparoscopically up to this present paper we

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cannot draw a statistically significant conclusion, but the good results are encouraging us to continue using this approach as the first line treatment in children and more over for those who need a rapid return to intense physical activity.

**Key words:** complicated acute appendicitis, laparoscopic approach, athletes

## Introduction

Acute appendicitis is the most common pediatric abdominal surgical emergency. The classic open appendectomy described by McBurney in the 19<sup>th</sup> century has been gradually replaced by the laparoscopic appendectomy first performed by Kurt Semm in 1983. Due to the development and gradual adjustment in size of the laparoscopic instruments, this technique started to be used in pediatric surgery as well in the 90s.

Initially, complicated acute appendicitis was considered a relative contraindication for LA. Together with the gradual increase in technique expertise, laparoscopic surgery is today the main choice especially for complicated cases of acute appendicitis due to decreased parietal abdominal wall trauma and complications compared with OA (1).

## Materials and Method

We selected the files of the first 20 patients operated laparoscopically for complicated acute appendicitis during 2010-2011. The age of the patients varied between 3 and 17 years old (median age was 10), 12 boys and 8 girls. 11 of the patients were junior athletes. In all cases we had perforated appendicitis with: generalized peritonitis in 11 cases, localized perforation in 5 cases, 3 cases of localized appendicular abscess and one case of pelvic abscess in a 3 year-old admitted for pelvic tumor.

We analysed the surgical intervention length, intra and post intervention complications, the length of hospitalization and their return periode to previous training.

Four cases were excluded from the study because of conversion to OA: one due to a bleeding incident which we couldn't manage laparoscopically (poor visibility), one case of chronic generalized peritonitis with multiple adhesions and sepsis with hemodynamic instability during the surgical intervention (increased blood pressure, arrhythmia) and 2 cases of localized perforation which presented a challenge for laparoscopic dissection.

## Results

Patients were followed for 1-2 years. Length of hospitalization was between 4 and 8 days.

We had only one case of parietal wall abscess in the 4<sup>th</sup> postoperative day at the site of insertion of the suprapubic trocar used as the point of extraction for the sectioned

appendix. We released the suture in place, evacuated the pus and irrigated the wound thoroughly. The patient was discharged on the 6<sup>th</sup> day and was followed in the clinic regularly.

One patient with generalized peritonitis had fever (38.5°C) on the 3<sup>rd</sup> postoperative day. We reviewed the intravenous antibiotic treatment and administered it for another 5 days. The patient didn't require reintervention and was discharged on the 8<sup>th</sup> day.

The 3 year-old patient with pelvic abscess had a good post-operative evolution with no problems.

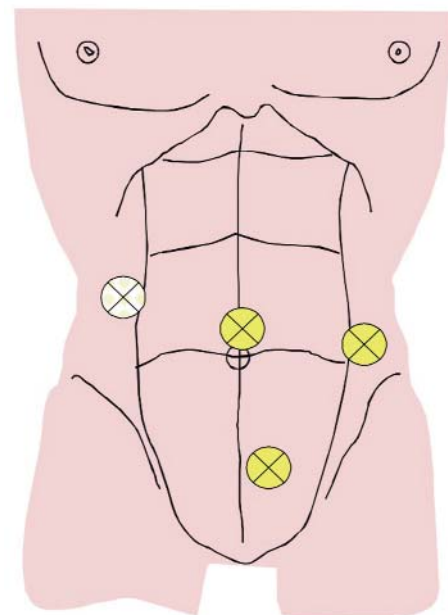
The operative time was between 50 and 150 minutes (median of 90 minutes). Intestinal transit was present after 1-3 days post intervention; we had no bowel obstruction syndrome during the following period.

The athletes started their sports activity 10 - 12 days after the operation, 4 out of the 11 having official competitions.

## Technical details

We used 3 or 4 trocars - in 3 cases where the cecum had to be pushed away using an extra trocar to reveal the appendix in the retrocecal and pelvic position. Two 10 mm trocars - one in the umbilical position for the laparoscope, inserted through open access and one in suprapubic position used for appendix removal from the abdominal cavity. The 3<sup>rd</sup> trocar was placed in the left lower quadrant. In those 3 cases when we used the 4<sup>th</sup> 5 mm trocar, it was placed in the right lower quadrant. (Fig. 1)

In patients with perforated appendicitis and generalized peritonitis we had a good view of the entire abdominal



**Figure 1.** Trocar placement in laparoscopic appendectomy (umbilical position for the laparoscope, suprapubic and left flank position for instruments, right flank and right upper quadrant position - trocars are optional)

cavity, including those areas hard to reach (Douglas pouch, parietocolic, subphrenic space), allowing us to suction the pus and wash thoroughly with saline. The mesoappendix was dissected with the mono or bipolar electrocautery. After double ligation at the base, the appendix was removed from the abdominal cavity in a latex bag.

In the case of perforated appendicitis with localized peritonitis the dissection was done with great care using blunt dissection with continuous aspiration of the discharged pus and viscerolysis. (Fig. 2)

In localized perforated appendicitis covered with omentum, we performed partial resection of the omentum to prevent drainage of the pus in the abdominal cavity.

In all 20 patients we placed drainage in the Douglas pouch (through the suprapubic trocar incision) and 3 patients had one extra drain in the right parietocolic space (through the right lower quadrant trocar incision). The drain was removed after 2 to 5 days when the child was afebrile with minimal serous fluid drainage.

The 3 year-old patient with localized pelvic abscess required 4 trocars for LA due to the difficult dissection caused by the tight peritoneal adhesions between the intestinal loops and the omentum that was covering the perforated appendix.

## Discussions

Acute appendicitis is the most frequent surgical emergency in the pediatric population. Complicated acute appendicitis was considered in the early beginning of laparoscopic surgery a relative contraindication. Together with increased technical skills and improved instruments, appendicular peritonitis has been more and more managed laparoscopically both by the general surgeons and pediatric surgeons (2,3).

Today there are many multicenter studies which compare the advantages and disadvantages of laparoscopic versus open appendectomy. The majority of these studies certify that with laparoscopic approach the length of hospitalization is shorter,

there are fewer parietal wall complications, lower percentage of bowel obstruction, faster restoration of the gastrointestinal transit, lower need for antibiotics and analgics, better cosmetic results and faster reintegration in the normal daily life (4,5,6).

The disadvantage of the laparoscopic technique is the longer operative time (50-150 minutes) which is significantly improved with increasing of the technical skills of the operative team.

In the first published studies the rate of septic intra-abdominal complications was much higher, requiring reintervention and drainage after laparoscopic intervention compared with open approach, but this difference was not statistically significant and many studies contradicted this finding (7,8).

Laparoscopic surgery in complicated acute appendicitis is more justified due to the increased number of parietal abscess cases in those operated with the classical approach. The length of the operative time is not much higher for LA compared to OA. The incision length in the case of peritonitis is much greater in OA (9,10).

Irrigation of the abdominal cavity in LA is done under visual control on its entire surface – Douglas pouch, parietocolic and subphrenic space. Placement of the peritoneal drainage is done under direct visualization.

In small children, under 5 years old, the rate of perforated appendicitis is higher (approximately 50%) and the diagnosis is much more difficult to set and usually delayed. Exploratory laparoscopy is a great choice for diagnosis and early treatment, young age not being a contraindication anymore.

The percentage of mechanical bowel obstruction post laparoscopy is lower due to smaller wall incisions, atraumatic instruments and better irrigation of the entire abdominal cavity under direct view. Intestinal transit is restored sooner due to atraumatic handle of the intestinal loops and immediate postoperative mobilization of the patient. All these benefits are even more evident in obese patients (11).



**Figure 2.** Intraoperative aspects of acute appendicitis with peritonitis. (A) Pus in pelvis. (B) Dissection of gangrenous perforated appendix

These first 20 patients we operated on, even though statistically not significant, can confirm the data already published internationally: few parietal wall suppurations (one case), no intraabdominal abscess which would require reoperation, no bowel obstruction. The length of the operation can be improved in time as we gather more experience. If we take into consideration the dissection difficulty created by the adhesions and the acute inflammatory syndrome, the length of the operation can be justified. The most technically difficult cases were of appendicular plastron (4 cases).

The youngest of the patients, a three year-old, was admitted with a pelvic tumor. We decided to explore the abdominal cavity due to the nonspecific clinical and lab results: normal CBC, no fever and ultrasound with no pathologic findings. During the systematic abdominal inspection we found a pelvic mass formed by the perforated appendix covered with intestinal loops. Even though viscerolysis was difficult, we were able to isolate and remove the appendix. The evolution of the patient was good with no complications. Intra-abdominal drainage was in place for 3 days and the patient was discharged on the 5<sup>th</sup> day (12).

## Conclusions

Laparoscopic appendectomy in children with complicated acute appendicitis (generalized peritonitis, localized abscess, perforated abscess), is an indication with certain benefits for the patient, due to reduced parietal trauma and septic complications, although the intervention is technically difficult in most times. Young age of the child (under 5 years) is not a contraindication for laparoscopic approach, but the diagnosis of acute appendicitis in this age group is frequently established with progressive complications of the disease.

Initial experience results encourage us to continue with laparoscopic approach as first choice in this pathology.

## Authors' contribution

All the authors had the same contribution.

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