Acute (Early) Appendicitis

Patient and family information, brought to you by the Education Committee of APSA

Overview - "What is it?"

Appendicitis is inflammation/infection of the appendix. The appendix is a small extension of the intestine that is connected to the large intestine (colon). The appendix is usually located in the right lower side of the belly, and it is tubular in shape. Its length differs based on the age. The appendix has no known important function. Appendicitis is inflammation and infection of the appendix and often results from blockage of the appendix by stool (feces). Sometimes, the feces form a small stone called a fecalith. Other causes of appendicitis include swelling of lymph tissues within the appendix wall because of recent infection. Sometimes worms can also block the appendix. Once blockage of the appendix occurs, several things happen:

- The appendix cannot empty the mucus and fluid that it makes.
- The pressure in the appendix increases and it swells.
- Bacteria multiples inside the appendix.
- The swelling cuts off the blood supply to the appendix. If the infection continues, part of the appendix wall dies and results in a hole. This is how ruptured or perforated appendix happens.

There are 70,000 appendicitis cases in kids per year in the United States. Overall, 7% of people in the United States have their appendix removed during their lifetime.

Signs and Symptoms - "What symptoms will my child have?"

Early signs and symptoms: When inflammation in the appendix begins, there is pain around the middle of the belly near the belly button. The child may have decreased appetite and feels like vomiting. The pain never completely goes away and becomes sharper with time. Most children with appendicitis have low grade fever, usually less than 38.5°C (101.5°F). Higher levels of fever can be seen with ruptured appendicitis.

Later signs and symptoms: More than 24 hours after the pain starts, it moves to the right lower side of the belly. Sometimes, a child complains of right lower abdominal pain while walking, or refuses to stand up or walk due to pain. Younger children (younger than five years old) have a higher chance of having ruptured appendicitis because they may not be able to talk clearly about their symptoms. If the appendix ruptures, a high fever may be seen. There may be episodes of diarrhea.

Diagnosis - "What tests are done to find out what my child has?"

History: The doctor will obtain a history and perform a physical exam. This is important for diagnosis of appendicitis. The surgeon will be interested in the type and location of pain: right lower side that hurts with jumping, walking or other jarring movements. The doctor will ask whether the child may have nausea, vomiting, refusal to eat, fever or diarrhea.

Physical examination: Includes a careful abdominal examination performed by the surgeon. Other medical problems that cause belly pain will be investigated.

Laboratory tests: Bloodwork may be sent to look at suggestion of an infection. Urine may be tested for a bladder infection or a kidney stone. Female teenagers should have a urine pregnancy test.

Imaging: In some cases, the child's story and the examination by the doctor may be very convincing that appendicitis is present. If the diagnosis is not clear, other tests may be ordered.

- **Chest X-ray:** If there is a concern for pneumonia
- **Abdominal X-ray:** A belly X-ray looks for clues regarding what may be causing the pain in general.
- **Ultrasound:** Ultrasound is very helpful to diagnose appendicitis. A probe is placed over the belly and sound waves are used to look at the appendix. Ultrasound may be useful for girls to look at the ovaries.
- **Computed tomographic (CT) scan:** CT may be used if the diagnosis is still not clear, or if the surgeon still needs more information in a specific case. Unlike ultrasound, CT scans use radiation to obtain images. The child may be asked to drink a liquid that outlines the stomach and intestines. Sometimes, the contrast is given through the rectum. In some cases, an IV medicine is needed to help the CT get better pictures leading to a more accurate diagnosis.

Some hospitals may use an MRI to diagnose or confirm appendicitis. MRI has no radiation but takes more time to perform than a CT scan. It is not used very commonly at the present time.

Conditions that mimic appendicitis: Gastroenteritis (stomach flu), constipation, ovarian cyst, twisting of ovary (torsion), groin (inguinal) hernia, pneumonia, Meckel's diverticulum, inflammatory bowel disease, kidney diseases, urinary tract infection, intestinal obstruction, pregnancy. It is important to note that:

Children with history and physical exam findings that are convincing for appendicitis may not need any further tests.

In children with unclear cause of belly pain, there are several possibilities.

If the diagnosis of appendicitis is not clear, the doctor may recommend observation in the emergency room or hospital for a period of time. A doctor will examine the child every few hours to see if the pain gets better or worse. Ultrasound or CT may be done depending on the situation.

Treatment - "What will be done to make my child better?"

Since appendicitis is an infection, antibiotics are an important part of the treatment. Antibiotics are medicines that fight bacteria. It is given through the vein.

There is some evidence that show that early appendicitis may be treated by antibiotics alone. This requires a definite diagnosis of appendicitis with CT or ultrasound. This option, if appropriate, will be reviewed with you in detail by your surgeon. The exact treatment (days in the hospital, how many days of antibiotics are needed) and risks of using antibiotics alone should be carefully discussed with your surgeon.

Fluids are needed for patients with appendicitis. Since appendicitis causes loss of appetite, the patient may be dehydrated. Fluids are usually given through the vein.

Medicine is also given to the patient to help make their belly pain better.

Surgery: The standard way to treat appendicitis is by removing the appendix (appendectomy). This can be done the traditional way (open or larger incision) or laparoscopic. Open and laparoscopic appendectomy take the same amount of time to perform. One benefit of laparoscopy is that other abdominal structures can be examined using the video camera during surgery. Laparoscopy also has lower risks of wound infection.

Open appendectomy: The appendix is removed through a transverse open incision in the right lower part of the belly.

Laparoscopic appendectomy: In laparoscopic appendectomy, several small cuts (incisions) are made. Through one of the cuts, a video camera is placed. The surgery itself is done using small instruments placed through the other incisions. The usual number of incisions (cuts) for laparoscopic surgery vary from one (single port umbilical) to three. Sometimes an extra

cut is needed if the appendix is really ruptured and stuck. The placement of the incisions depends on the location of the appendix.

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Informed consent: A consent form is a legal document that states the tests, treatments or procedures that your child may need and the doctor or practitioner that will perform them. Before surgery, your doctor should tell you what the operation is, the goal of the surgery and other possible treatment options that are available. Your doctor should explain the risks and benefits of the surgery. You give your permission when you sign the consent form. You can have someone sign this form for you if you are not able to sign it. You have the right to understand your child's medical care in words you know. Before you sign the consent form, make sure all of your questions are answered. It is important to know that during surgery, there are things that can happen that your doctor may have not predicted before going in. He or she will explain these to you after the surgery.

Preparation for surgery: Your child will be given fluids, antibiotics, pain medicine prior to surgery.

Care after surgery in the hospital

- **Activity**: Typically, the child is encouraged to walk around as soon as possible.
- **Diet:** In patients with early appendicitis, patients are started on liquids after their surgery then advanced to a general diet.
- **Medicines:** Your child may need any of the following:
    - Antibiotics to help prevent or treat an infection caused by bacteria.
    - Anti-nausea medicine to control vomiting (throwing up).
    - Pain medicine which can include acetaminophen (Tylenol®), ibuprofen (Motrin®), or narcotics. These medicines can be given by vein or by mouth.

Home Care ("What do I need to do once my child goes home?")

Patients with acute appendicitis are usually discharged the same day as their surgery or the following day.

Diet: Your child may eat a normal diet after surgery.

Activity: Your child should avoid strenuous activity and heavy lifting for the first 1-2 weeks after laparoscopic surgery, 4-6 weeks after open surgery.

Wound care: Surgical incisions should be kept clean and dry for a few days after surgery. Most of the time, the stitches used in children are absorbable and do not require removal.

Your surgeon will give you specific guidance regarding wound care, including when your child can shower or bathe.

Medicines: Medicines for pain such as acetaminophen (Tylenol®) or ibuprofen (Motrin® or Advil®) or something stronger like a narcotic may be needed to help with pain for a few days after surgery. Stool softeners and laxatives are needed to help regular stooling after surgery, especially if narcotics are still needed for pain.

What to call the doctor for: Call your doctor for worsening belly pain, fever, vomiting, diarrhea, problems with urination, or if the wounds are red or draining fluid.

Follow-up care: Your child should follow-up with his or her surgeon 2-3 weeks after surgery to ensure proper post-operative healing.

Long-Term Outcomes ("Are there future conditions to worry about?")

Prognosis is excellent after surgery. Complications can include:

- **Wound infection:** This happens around 3% of the time. Most infections are treated by opening and draining the wound. Antibiotics may also be used in some cases.
- **Abscesses (pus pockets):** This is uncommon after early appendicitis but can occur anywhere between 5 and 20% of the time after appendectomy for ruptured appendicitis. If the abscess is small, antibiotics may treat it. If it is big, it may need to be drained. The technique is the same as described in the section "Ruptured Appendicitis with Abscess".
- **Small bowel blockage:** This can happen anytime from days to years after the operation due to scar that forms in the abdomen. It is less common if the operation is done by laparoscopy and also less common if the appendix was not ruptured before surgery. In general, it occurs about 3-5% of the time after appendectomy.

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