

APPENDICITIS



*“Strigops habroptilus”, Lithograph, John Gould’s, “The Birds of Australia”, 1869.
The flightless New Zealand parrot known as the Kakapo is critically endangered.*

It is an extremely fat bird. A good-size adult will weigh about six or seven pounds, and its wings are just about good for wiggling about a bit if it thinks it’s about to trip over something- but flying is completely out of the question. Sadly, however, it seems that not only has the kakapo forgotten how to fly, but it has also forgotten that it has forgotten how to fly. Apparently a seriously worried kakapo will sometimes run up a tree and jump out of it, whereupon it flies like a brick and lands in a graceless heap on the ground.

“Last Chance to See”, Douglas Adams, 1990.

As the great biologist Richard Dawkins put it, our evolutionary history is written all over us. Many animals, humans included, carry the vestiges of their own distant evolutionary history. Whilst superficially at first glance it appears most species are spectacularly well designed for their own ecological niche, closer scrutiny shows that in many instances there are in fact surprisingly numerous design faults. This is a result of how evolution works, it does not “go back to the drawing board”, to start afresh when confronted with new circumstances, rather it must adjust what it already has. Structures that were once useful, may become redundant, even worse, a positive hindrance under the new environment or circumstances the creature finds itself in.

A case in point is seen with the flightless birds, whose wings have regressed under conditions of predator free environments. Nowhere on Earth is this type of avian evolutionary trend more apparent than in New Zealand which boasts a fascinating array of these birds who have lost their ability to fly. Sadly the introduction of humans to New Zealand rapidly led to the extinction of one of the most spectacular groups of these creatures, the giant Moa. With the further introduction of cats and dogs the attrition of extinction of the flightless birds continues, one the Kiwi is even the national symbol of the land.

Another particularly fascinating example is the giant flightless parrot, the Kakapo. The Kakapo whilst not the largest parrot in the world, is certainly the heaviest, weighing up to 3.3 kilograms. It is the world’s only flightless parrot, yet its legs are so strong that it can climb and forage well above ground level, and it has been recorded at 100 feet in the canopies of forests. It is one of very few parrots that are nocturnal. Its eyes are set somewhat forward like an owl’s giving it binocular vision. Its hearing is acute but it makes one of the loudest bird calls known in the world, its booming nocturnal calls can be heard as far as five kilometres away! Its flightlessness, together with its very slow reproductive rate (they take up to nine years to reach reproductive maturity and only breed when certain specific types of food are available in abundance) make it very vulnerable to human and other predators. Once widespread over both main islands of New Zealand, their decline began with the settlement of the Maori about a millennium ago. By the time of European arrival, with introduced dogs and rats, its decline became precipitous. There are now none left in the wild, and all that remains is a critically endangered group of around 100 carefully guarded birds on a predator free island off the coast of mainland New Zealand. Frantic efforts are being made to save these fascinating creatures, before they are lost to the world forever, but hopes for their long term survival according to many experts are tragically slim.

Humans also carry the vestiges of their evolutionary history, and many of these put them at risk of ill health in their current world. The upright gait for example has led to no end of back related biomechanical torment. The maxillary sinuses in humans drain to the top of the cavity into the nose which is not a great idea when you want gravity to assist in the drainage of the cavity; this arrangement was fine however in our quadruped ancestors, with their snouts forward and to the ground! Yet another legacy of our evolutionary “baggage” can be found in our gut. The appendix is a vestige of a much larger caecum that our more herbivorous ancestors required, to house fermenting bacteria necessary in the digestion of cellulose. Today this structure is of no use to us, and in fact is a positive hindrance, due to its propensity to supuration in the form of acute appendicitis.

APPENDICITIS

Introduction

Appendicitis may occur at any age; however it is *rare* below the age of 2 years and uncommon in the elderly.

The maximum incidence is around 20 to 30 years of age.

Diagnosis can be problematic and a period of close observation may sometimes be required before the diagnosis becomes apparent.

The **Alvarado score** is useful for clinical risk stratification of suspected appendicitis.

Pathophysiology

The predominant cause is obstruction of the appendiceal lumen by:

- Faecolith

Rarely:

- Lymphoid hyperplasia
- Foreign body.

Complications:

These may include:

- Abscess formation
- Perforation with peritonitis
- Septicaemia.

Resolving appendicitis:

If the obstruction of the appendiceal lumen is relieved, acute appendicitis may resolve spontaneously. This can occur if the cause of the appendicitis is lymphoid hyperplasia or it may occur when a faecolith is expelled from the lumen.

Clinical Features

Important points of history:

1. GIT symptoms:
 - Anorexia (common)
 - Vomiting (but not usually protracted).
2. Pain:

- Initially referred and poorly localized to the umbilicus.
 - Later localized to the RIF, at McBurney's point (1/3 of the way from the ASIS to the umbilicus).
3. Mild dysuria may also occasionally be seen.
- An inflamed appendix near the urinary bladder or ureter can cause irritative voiding symptoms as well as pyuria.
 - Note therefore that the diagnosis of appendicitis *should not be dismissed* simply on the basis of the presence of dysuria or abnormal urinalysis.

Important points of examination:

1. General appearance:
 - Circumoral pallor is commonly seen.
2. Low grade fever:
 - This may (or may not) be present
 - If the temperature is high do not assume that it can't be appendicitis!
 - ♥ High fevers may indicate complications such as abscess or peritonitis
3. Tachycardia
4. RIF tenderness
5. Signs of peritonism:
 - Local guarding (voluntary or involuntary)
 - Rebound tenderness (percuss the abdomen)
 - Generalized rigidity is suggestive of perforation.
6. Less common signs of peritoneal irritation may include:
 - Psoas sign:
 - ♥ RIF pain elicited by movements of the psoas muscle, such as resisted hip flexion or hip extension with the patient in the left lateral position.
 - Obturator sign:

- ♥ The hip is flexed then internally and externally rotated, resulting in RIF pain.
 - Rovsing's sign:
 - ♥ Palpation in the left iliac fossa with sudden release produces pain experienced in the right iliac fossa.
 - Markle sign:
 - ♥ RIF pain elicited by hopping on the right leg.
 - Dunphy sign:
 - ♥ Sharp pain in the RIF elicited by a voluntary cough.
7. Always remember to also check the inguinal region and in males the scrotal region as well:
- RIF pain can actually be referred pain from the testes and, younger patients especially, may not volunteer testicular pain.
- Assumed RIF pain/appendicitis can be a cause of missed testicular torsions!
- Similarly look for possible incarcerated inguinal hernias.
8. Rectal examination:
- This is of little value, (it is non-specific, non sensitive and does not alter management) and is not routinely necessary.

Atypical Presentations:

Atypical presentations of appendicitis are relatively common!

Beware of the following clinical settings where the presentation of appendicitis may be atypical:

1. Extremes of age:
 - Elderly.
 - Very young.
2. Patients on steroids or other immunosuppressants
 - These suppress the usual signs and symptoms of inflammation.
3. Pregnancy
 - Especially late, where signs may be referred to the RUQ.

4. Obesity
5. Unusual position of the appendix.
 - Retrocaecal for example.
6. Patients with impaired ability to communicate (for whatever reason).

The Alvarado Risk Stratification Score for Possible Appendicitis

The **Alvarado score** for risk stratification in suspected acute appendicitis. ¹

Feature	Value
Symptom:	
Migration	1
Anorexia-acetone (in the urine)	1
Nausea-vomiting	1
Signs:	
Tenderness in right lower quadrant	2
Rebound pain	1
Elevation of temperature (>37.3°C)	1
Investigations:	
Leukocytosis (>10,000/mm ³)	2
Shift to the left (>75% neutrophils)	1

Total score 10

Score:

- | | |
|------|----------------------------|
| 1-4 | Appendicitis unlikely |
| 5-6 | Appendicitis possible |
| 7-8 | Appendicitis probable |
| 9-10 | Appendicitis very probable |

Differential Diagnosis:

The list of possible differential diagnoses is extensive and may include:

1. **Ectopic pregnancy**

2. Tubo-ovarian pathology
3. Mittelschmerz pain
4. Other GIT conditions including:

- **Crohn's disease**
- **Mesenteric adenitis**
- Diverticulitis.

Less commonly:

- Meckel's diverticulum, caecal volvulus, gastroenteritis, irritable bowel.

5. Urinary tract:

- e.g. renal colic or UTI.

6. Muscular:

- This may include round ligament strain seen in pregnancy.

7. Referred pain from another area

- An important consideration in males is referred testicular pain.

Investigations

None are necessary if the clinical findings are very suggestive, **apart from a bHCG in all women of childbearing age.**

When the diagnosis is less, certain investigations may be helpful in confirming the diagnosis and in ruling out alternative differential diagnoses.

The diagnosis may ultimately need to be a clinical one. A good history and clinical evaluation are therefore most important.

The following may be considered:

Blood tests

- FBE:
 - ♥ Neutrophilia is suggestive but a normal WCC does not exclude the diagnosis.
- CRP:
 - ♥ An elevated level is suggestive, but again cannot exclude the diagnosis.
- U&Es/ glucose

- **Beta HCG is mandatory in all women of childbearing age.**

Urine

- FWT to aid in excluding UTI (nitrites and protein).
- Note that leukocytes (mild pyuria) may be detected in cases of appendicitis.

AXR/CXR

- These will predominantly be to rule out other causes of abdominal pain such as obstruction or perforation. They are not useful for the diagnosis of appendicitis.

Ultrasound

- Pelvic ultrasound is useful in females, to help rule out other tubo-ovarian pathology.
- It is useful in children or pregnant women, where the ionizing radiation of a CT scan is best avoided.
- It is useful in those with radiographic contrast allergy
- It may show evidence of appendicitis. A normal pelvic ultrasound, however, does not rule out appendicitis.

CT scanning

- This is a much more sensitive modality than ultrasound.
- Is also useful in ruling out other pelvic/abdominal pathology.
- Again it cannot *definitively* rule out appendicitis.

Laparoscopy

- In women an exploratory laparoscopy may be considered.

Management

For suspected cases of appendicitis:

1. Initial resuscitation:
 - IV line and fluids as clinically required.
2. Nil orally.
 - Continue IV fluids, as clinically indicated.
3. Analgesia as required.

- Provision of analgesia does not interfere with the diagnosis of acute surgical causes of abdominal pain (e.g. appendicitis) in children.⁵
- Opioids may lessen symptoms, but will not generally obscure the *signs* of peritonism.

Intranasal fentanyl is a useful option in anxious children.

- Analgesia should *not* be withheld, whilst awaiting surgical opinion.

4. IV antibiotics:

These should be given immediately if the patient is systemically unwell.

They are also given pre-operatively once it has been decided to operate. Meta-analysis of trials has shown that prophylaxis is appropriate in all patients undergoing abdominal surgery.³

- IV Cephalothin

And

- IV Metronidazole

See latest antibiotic guidelines for full prescribing details and alternative regimes

Disposition:

Once the diagnosis of appendicitis is made, then operation will be necessary.

Refer all suspected cases to the surgical unit.

In less certain cases patients may be admitted for a period of ongoing observation.

References:

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