

## Appendicitis Clinical Essay

With the described history, it becomes apparent that given the patients sex and age, that there are three main possible differential diagnoses. They are appendicitis, ectopic pregnancy or an inflamed Meckels diverticulum. I will briefly describe each of the three before explaining the explanation for the pain pattern described.

### i) Ectopic pregnancy

The ova develop in the ovary, and once a month in a pre menopausal woman, an ovum is discharged into the peritoneal cavity. One fimbria of the Fallopian tube attaches to the ovary, and upon release into the peritoneal cavity, there is a slight suction effect by the waving of the fimbria to draw the ova into the infundibulum of the Fallopian tube. Fertilisation usually takes place in the fallopian tube, extremely rarely in the peritoneal cavity. In some women, collections of pus may collect in the uterine tube, and due to this or other obstructions, may prevent the blastocyst from passing into the uterus. Consequently the blastocyst may implant in the mucosa of the fallopian tube (or more rarely in the peritoneal cavity itself), producing an ectopic pregnancy. Most commonly, implantation occurs at the Ampulla of the tube. If not diagnosed early, ectopic pregnancies may result in rupture of the Fallopian tube and haemorrhage into the abdominal cavity. Tubal rupture results in the death of the embryo and can result in serious consequences for the mother. Initially possibly presenting with the complaints described

### ii) Meckels diverticulum

Meckels diverticulum is a congenital anomaly that occurs in around 2% of the population. It is the embryological remnant of the vitello-intestinal duct connecting the intestine to the yolk sac. It appears as a finger-like pouch of length around 2 inches. It appears around 2 feet from the end of the ileum, i.e., the ileocecal junction, in the anti-mesenteric border – the site of attachment of the yolk stalk and the border of the intestine opposite the mesenteric attachment. It may be free or attached by a cord to the umbilicus. The diverticulum can become inflamed (in around 2% of people who have one) and produce pain, of a similar pattern to that described by the patient.

### iii) Appendicitis

The appendix can be described as a blind intestinal diverticulum, arising from the posteromedial aspect of the caecum inferior to the ileocecal junction. The appendix has its own mesentery – the mesoappendix which derives from the posterior side of the mesentery of the terminal ileum. The appendix can be located by following the taeniae coli, since where the three converge is the origin of the appendix. The length of the appendix may lie anterior to the ileum, the pelvis, tucked behind the caecum or behind the ascending colon. The lumen of the blind ended diverticulum can be blocked, which may result in it becoming infected and swollen. This may result in vascular obstruction of the appendicular artery (from the posterior caecal artery – SMA) which results in ischaemia, gangrene and possibly perforation resulting in peritonitis. Appendicitis also results in a pattern of pain as described by the patient.

## **The change in pain**

Gut irritation is detected by autonomic sensory neurones that travel with the sympathetic nerves in the bowel and the visceral peritoneum. The visceral peritoneum is that layer of peritoneum that covers the organs. Consequently, gastrointestinal pain is felt as an unlocalised general abdominal discomfort, and the pain is dull in nature as it originates from the visceral peritoneum. The appendix, ileum and ovary receives its sympathetic nerve supply via the least splanchnic nerve which originates from the sympathetic chain at the levels T10 and T11. The sensation from the organs and the visceral peritoneum travel via visceral sensory fibres with the sympathetic nerve to the spinal cord. The pain is interpreted by the brain as though the irritation occurred in the skin of the distribution of the spinal nerves of the spinal cord level. That is the dermatome of the cord level. The T10 distribution is periumbilical. Hence the pain is interpreted as originating from the areas supplied by the somatic nerves entering the spinal cord at the same level as the sensory nerves from the organ producing the pain. Hence the dull pain felt in the periumbilical region.

At later stages of the inflammation or other cause, the overlying parietal peritoneum may be irritated. The parietal peritoneum is the layer of peritoneum in contact with the abdominal wall. Afferent sensory fibres from this region of peritoneum and skin are carried by the inferior intercostals and subcostal nerves. These are somatic nerves and hence the pain felt by these are localised. The pain from parietal peritoneum irritation is sharp in nature, and in this case localised over the right iliac fossa. The inflamed parietal peritoneum is extremely sensitive to stretching. When digital pressure is applied over the site of the inflammation, the parietal peritoneum is stretched. When the fingers are suddenly removed, extreme sharp pain is usually felt – known as rebound tenderness.

Hence that is the anatomical explanation for the change in pain that is described by the patient in question.

## **The incision of an appendicectomy**

The surface marking for the appendix is known as McBurney's point. It is defined as the junction of the lateral third with the medial two thirds of a line joining the anterior superior iliac spine to the umbilicus and defines the position of the base of the appendix. Hence these anatomical landmarks would be used to locate the point. An incision is made around 10 cm's long, obliquely, inferiorly and medially in the right iliac fossa, centred over McBurney's point.

The type of skin incision used depends on the type of patient, the certainty of diagnosis and the preference of the surgeon. The incision that is most common and the one described above is known as the gridiron muscle splitting incision.

Initially the skin is incised as mentioned. The incision must pass through the subcutaneous tissue and fat including the superficial fascial layer. This exposes the aponeurosis of the external oblique muscle. The muscle is incised in the direction of its fibres – which run in an inferomedial direction. The muscle is nicked in the line of its fibres and the muscle is split the extent of the incision, which exposes the internal oblique muscle. The internal oblique and transversus abdominis are also split in the

line of their fibres. In this case the fibres of internal oblique run superomedially whilst transversus abdominis has fibres running almost transversely. The three flat muscles described are known as the rectus sheath. By splitting the muscles along their fibres lessens the chance of injuring the nerves supplying them, as well as the fact that the muscles are split without actually cutting any of the fibres. Also because each muscle layer runs in a different direction, the incision is well protected when the retracted layers are returned to their normal positions. Next the transversalis fascia, with the overlying rectus abdominis muscle is incised, and finally the parietal peritoneum is incised to expose the caecum. Consequently the abdominal cavity – the greater sac – has been opened and the search for the appendix can commence!

### **Peritoneal spaces**

The appendix was gangrenous and perforated. The symptoms that followed are consistent with peritonitis due to spread of infection. The result is that there is a collection of puss which is consequently drained.

There are two main peritoneal spaces that can be described – the greater sac and the lesser sac, and there are also two pouches that are created due to the invagination of the uterus and fallopian tubes – the rectouterine pouch of Douglas and the vesicouterine pouch.

The greater sac, is also known as the peritoneal cavity. It is the potential space that exists between the parietal and visceral peritoneal layers. It normally contains a thin layer of peritoneal fluid that lubricates the peritoneal spaces allowing the viscera to pass over each other. The cavity is closed in males, but in females there is a route by which the cavity is open to the exterior via the Fallopian tube, uterus and vagina. This peritoneal cavity into which the viscera invaginate from the posterior aspect, is known as the greater sac, and is often the site of peritonitis, for example due to penetration wounds such as stabbings as well as due to perforation of the viscera.

Due to the presence of a ventral mesentery as well as a dorsal mesentery at the level of the stomach, when the stomach rotates embryologically, there is the creation of a potential space posterior to the stomach with an opening – the epiploic foramen of Winslow on the right delineated by the free edge of the lesser omentum anteriorly, the second part of the duodenum inferiorly, the IVC posteriorly and the caudate lobe of the liver superiorly. This potential space is known as the lesser sac, and in posterior gastric ulcers there is the possibility of penetration through the lesser sac, allowing gastric contents to enter the peritoneal cavity.

The peritoneal spaces to be discussed are the pouches present in the pelvis. The peritoneum passes down the posterior abdominal wall and covers the anterior aspect of the second third of the rectum and then there is a reflection superiorly due to the invagination of the uterus into the peritoneal cavity with the fallopian tubes resulting in the creation of the broad ligament of the ovary which passes to reflect on the lateral abdominal wall on both sides. The result is the creation of a fold or pouch posterior to the uterus. This is known as the rectouterine pouch of Douglas. As the anterior aspect of the peritoneum covering the anterior uterus passes inferiorly, there is a final reflection onto the posterior wall of the bladder, and onto the anterior abdominal wall.

This creates a second pouch, known as the vesicouterine pouch. These are both peritoneal spaces within the peritoneal cavity into which puss could collect.

In the case of the patient described it would be likely that when the patient was standing, that the pus may pass inferiorly in the paracolic gutter on the posterior wall, into the pelvis, and thus into one of the spaces described – most likely the pouch of Douglas.