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OXYURIASIS IN ONE THOUSAND CONSECUTIVE CASES OF APPENDICULAR DISEASE

Boyd B. Button
Instructor in Pathology

Norman W. Arends
Fellow in Pathology

The investigation of one thousand cases of appendiceal pathology was stimulated by the finding of the pin worm, Enterobius vermicularis or Oxyuris vermicularis, in the appendix, rather frequently, in the past months. Interest was further heightened by the observation that the majority of cases occurred in individuals with an average age above eighteen. Several questions presented themselves. First, what might be the actual percentage of oxyuriasis of the appendix as seen in our laboratory? Second, was there any cyclical or seasonal difference in incidence? Third, in what age group did most of the cases fall? Fourth, was there any difference in the sex incidence? And fifth, what was the diagnosis and the surgical procedure that followed?

As a starting point the case SP-44-11,000 (Laboratory Number for tissue) was arbitrarily picked. The study then progressed into the records of the past months and years. Case SP-44-10,996 was the first case found of appendicular involvement and was dated August 11, 1944. The last case found after tabulating consecutive cases was case SP-41-7145 dated May 26, 1941. The period of time covered was a little less than three and a quarter years.

The findings of this survey in their completed form are shown in Table I. It will be seen that oxyuriasis occurred in 2.2 per cent of our cases examined. Belding¹ states that the incidence of appendiceal invasion as reported by several investigators ranges from 1.2 to 18.2 per cent, the lowest percentage being in a series of 26,051 appendices. Strong² reports the findings of several writers which vary from 2.0 to 18.1 per cent. The higher of these percentages are those found in series of cases of appendicopathia in children. Since our series includes both children and adults, the lower figure obtained appears to be reliable and compatible with the findings of other investigators.

An examination of the seasonal incidence shows that our cases fell in all months of the year except April and May (See Table II). Probably if our total number of cases was much greater, these two months would also be represented. One observation might be made. It would appear that there are more cases in late winter than at any other time. However this observation may or may not be correct because it is based upon too few cases to be reliable. No reference to seasonal incidence could be found in the literature, but it is reasonable to assume that the incidence might
### TABLE I
One Thousand Cases of Appendicular Disease:

<table>
<thead>
<tr>
<th>Lesion or Pathology</th>
<th>Per Cent</th>
<th>No. Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Appendicitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Catarrhal</td>
<td>9.3</td>
<td>93</td>
</tr>
<tr>
<td>(b) With Empyema</td>
<td>.6</td>
<td>6</td>
</tr>
<tr>
<td>(c) With Gangrene</td>
<td>.4</td>
<td>4</td>
</tr>
<tr>
<td>(d) With Perforation</td>
<td>4.9</td>
<td>49</td>
</tr>
<tr>
<td>(e) With Perforation</td>
<td>1.2</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16.4</strong></td>
<td><strong>164</strong></td>
</tr>
<tr>
<td>Appendiceal Fibrosis</td>
<td>16.6</td>
<td>166</td>
</tr>
<tr>
<td>Carcinoid</td>
<td>.2</td>
<td>2</td>
</tr>
<tr>
<td>Chronic Appendicitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Catarrhal</td>
<td>.7</td>
<td>7</td>
</tr>
<tr>
<td>(b) Recurrent</td>
<td>50.8</td>
<td>508</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>51.5</strong></td>
<td><strong>515</strong></td>
</tr>
<tr>
<td>Diverticulum of Appendix</td>
<td>.1</td>
<td>1</td>
</tr>
<tr>
<td>Endometrosis of Appendix</td>
<td>.1</td>
<td>1</td>
</tr>
<tr>
<td>Fecal Stasis</td>
<td>.8</td>
<td>8</td>
</tr>
<tr>
<td>Fecolith</td>
<td>2.7</td>
<td>27</td>
</tr>
<tr>
<td>Mucocele of the Appendix</td>
<td>.1</td>
<td>1</td>
</tr>
<tr>
<td>OXYURIASIS</td>
<td>2.2</td>
<td>22</td>
</tr>
<tr>
<td>Periappendicitis</td>
<td>2.4</td>
<td>24</td>
</tr>
<tr>
<td>*Without Diagnosis of Disease</td>
<td>11.7</td>
<td>117</td>
</tr>
<tr>
<td><strong>Total Diagnoses</strong></td>
<td></td>
<td><strong>1048</strong></td>
</tr>
<tr>
<td>†Correction Factor</td>
<td></td>
<td><strong>-48</strong></td>
</tr>
<tr>
<td><strong>Total Cases</strong></td>
<td></td>
<td><strong>1000</strong></td>
</tr>
</tbody>
</table>

*Pathology was not considered to be of sufficient intensity to deserve a diagnosis.
†Two and three diagnoses were occasionally attached to one case of appendiceal pathology.

be higher in late winter during and after people in this section of the country have lived in closed quarters and in closer contact with one another perhaps than at any other time. This would agree with the present ideas of transmission and infestation.

Infestation is known to be effected by the transmission of the ova which may be carried beneath the fingernails or on the hands of the host who has scratched the peri-anal areas to alleviate the intense pruritis that is caused by the female in her nocturnal trips to lay her eggs outside the rectal canal. These ova thus accumulated may be spread to food, water, and clothing of those uninfested. In fact, Chandler quotes Nolan and
Reardon who found ova even on light fixtures in homes of heavily infected children. And because children are less scrupulously clean as a rule than adults, ova frequently reach the mouth to continue their life cycle. Again our findings agree with those generally accepted (See Table III). The largest percentage of cases occurred in children with an average age of eleven years. The youngest child affected in our series was six years of age while the limit for childhood was set at eighteen, one case occurring at this age. It is also of interest to note that forty per cent of the cases occurred in the adult with the oldest individual showing this parasitism thirty-two years of age. We must agree with Smith and Gault that the infestation is probably more prevalent in the adult than is usually thought.

A marked difference in incidence is drawn by the line of sex in our series. In all likelihood, it is due to the paucity of cases we have reviewed (See Table IV), for such authors as Strong and Belding gives ratios of 1 to 2 and 1 to 3 respectively, while our ratio is 1 male case to 6 female cases. This is an unexplained phenomenon. For although oxyuriasis of the appendix is thus more common in females, generalized oxyuriasis is said to be more common in males. We can shed no light on this problem.

The diagnosis of this appendiceal pathology and the subsequent course of treatment in our hospital is tabulated in Table V. This is mainly given as a matter of interest since its veracity is undetermined because of inaccurate requisitions received by the laboratory. It may be judged from
### TABLE III
**Age Incidence of Oxyuriasis:**

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of Cases</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total Children</strong></td>
<td><strong>13</strong></td>
<td><strong>59.9</strong></td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total Adults</strong></td>
<td><strong>9</strong></td>
<td><strong>40.1</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>22</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

### TABLE IV
**Sex Incidence of Oxyuriasis:**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Number of Cases</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>3</td>
<td>13.1</td>
</tr>
<tr>
<td>Female</td>
<td>19</td>
<td>86.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>22</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Ratio: Male/Female = 3/19—or approximately 1/6.
## TABLE V

Diagnosis and Surgical Procedure in Oxyuriasis of the Appendix:

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>No. of Cases</th>
<th>Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Appendicitis</td>
<td>6</td>
<td>Appendectomy Only</td>
</tr>
<tr>
<td>Chronic Appendicitis</td>
<td>4</td>
<td>Appendectomy Only</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>*Appendectomy Plus</td>
</tr>
<tr>
<td>Chronic Pelvic Inflammatory Disease</td>
<td>1</td>
<td>Appendectomy Only</td>
</tr>
<tr>
<td>Not Stated</td>
<td>8</td>
<td>Appendectomy Only</td>
</tr>
<tr>
<td>In Passing</td>
<td>1</td>
<td>†Appendectomy Plus</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>22</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Appendectomies plus oophorectomies.
†Appendectomy in passing at the time of pelvic surgery in the female.

the above table that in the great majority of cases oxyuriasis of the appendix causes much right sided pain and other symptoms similar to appendicitis of bacterial origin if not identical. Probably the latter is more nearly correct for Gradwohl states that oxyuris frequently produces lesions of the appendix. Bacteria of intestinal flora, which usually are inactive, penetrate through these lesions and become infective thus causing a great many cases of appendicitis.

More minute investigation of the problems unearthed was prevented by the small total number of cases found. As this number increases more information should be forthcoming.

**Summary**

In one thousand consecutive cases of appendiceal pathology as seen in our laboratory, 2.2 per cent showed oxyuriasis.

More cases of oxyuriasis of the appendix are seen in our laboratory during the late winter months. (?)

Most cases of oxyuriasis of the appendix in our series occur in children, but more cases occur in adults than is commonly realized.

More cases of appendiceal oxyuriasis occur in females than in males in our series.

Symptomatology in oxyuriasis of the appendix was very similar to acute or chronic appendicitis and appendectomy was usually the only procedure performed.
Bibliography


The association of primary carcinoma of the gallbladder with cholelithiasis has long been observed. There is a feeling among pathologists that this association is more than coincidental. Few instances of the tumor without calculi have been reported but there is a reasonable possibility that in these instances the calculi may have been lost at autopsy. The pathogenesis of carcinoma of the gallbladder is thought by some to be a succession of events with chemical and mechanical irritation being the initiating factors.

Autopsy No. 44-1710
Died: 6-12-44—11:50 a.m.
Autopsy: 6-12-44—2:00 p.m.
At the City Morgue

Clinical Data
"The deceased was found dead in her bed at her home. She was taken to a hospital by the police and pronounced dead."

External Examination
The body was that of an intensely icteric, emaciated, senile female said to have been 78 years old. Her length was 60 inches and her weight was estimated at less than 100 pounds. The scalp was covered with a good crop of gray hair. The pupils were equal in size but the conjunctiva was dry, suggesting that death had occurred quite a few hours prior to examination. The sclera were deeply icteric. The mouth was foul with fecal vomitus. There were no teeth in the upper jaw with snags in the lower jaw. A nodular swelling was noted on the left side of the neck, giving one the impression of an adenomatous goitre. The breasts contained no tumors and no cysts. The abdomen presented an old scar in the midline from above the umbilicus to the pubes. Fecal matter stained the buttocks and decubitus ulcers were noted about the buttocks. There was some edema of the lower extremities. A number of insect bites were noted here and there on the body.
Internal Examination

The subcutaneous fat was 2 cm. in thickness over the abdominal wall, a finding that was very surprising in view of the great emaciation of the body.

The pericardial sac contained 15 cc. of amber fluid. A milk spot was demonstrated over the anterior face of the heart and pericardium.

The heart measured 12 x 10 x 5 cm. The greatest diameter of the thorax at the upper level of the diaphragm was 21 cm. with a cardiothoracic ratio of 12/21. There were no thrombi in the pulmonary artery. The blood in the chambers of the heart was still fluid with little tendency to coagulation. This failure of coagulation we would judge to have been on the basis of the lack of vitamin K, associated with the obviously obstructive type of jaundice. The intimal layers of the cardiovascular system were deeply stained with bile. The mitral curtain was somewhat curled upon itself. There were no suggestions of coronary occlusive disease and there was very little atheromatous deposit in the aorta.

The pleural cavities presented some delicate adhesions involving chiefly the left side. The pleura throughout was somewhat sticky due to the great dehydration of the body. Adhesions were demonstrated between the fissures of the lungs. There was some pulmonary edema. There was little evidence of reinfection of tuberculosis in the apices.

The esophagus was dilated with fluid and debris.

The stomach was dilated with fluid having somewhat the "coffee grounds" character. There were no ulcers and no evidence of tumor involving the stomach. The intestines were lying low in the abdomen and down into the pouch of Douglas. A plastic exudate was demonstrated covering the intestines. Practically all the coils of the intestines were empty.

The great omentum was adherent in the right iliac fossa. The colon was adherent to the gallbladder by its hepatic flexure. There was a moderate amount of fecal matter in the lumen of the colon.

The appendix was adherent to the right tube and ovary.

The gallbladder was bound to the related structures by dense adhesions. The interior of the gallbladder presented three somewhat faceted calculi. One of these calculi was imbedded in the duct of the gallbladder and was fractured. A pale, fungating tumor mass involved the fundus of the gallbladder and extended into the liver substance.

In the gross this mass had all the characters of primary carcinoma of the gallbladder. The duct of the gallbladder and the common bile duct were surrounded by this tumor mass and its extensions. Complete obstruction of the biliary system was evident with great distention of the biliary tract throughout the liver.

The liver was softened and the bile ducts were dilated. Here and there extensions of carcinoma from the gallbladder could be demonstrated.
The pancreas presented some induration of the head with a suggestion of extension from the tumor already described.

The spleen measured 14 x 10 x 4 cm. and presented a rusty capsule suggestive of chronic congestive failure.

The urinary bladder was empty. The ureters were not dilated.

The kidneys measured respectively, left and right, 13 x 6.5 x 4 cm. and 11 x 5.5 x 3 cm. The right kidney presented some streaks of pale material suggesting active infection.

The suprarenal glands were somewhat indurated.

The internal genitalia suggested supravaginal hysterectomy with a cervical stump remaining. The tubes and ovaries showed adhesions matted them to this stump and the right tube and ovary to the appendix, as described above.

**Microscopy**

Sections of the gallbladder show abundant necrosis with here and there islands suggesting a colloid variety of carcinoma. As more viable tissue is reached an adenocarcinoma of grotesque architecture and comparatively small cells is demonstrated. This carcinoma extends directly into the substance of the liver. Extension is demonstrated along the cystic ducts, along the common duct and into the most proximal portions of the pancreas. The pancreas proper does not evidence a primary carcinoma and we are inclined to feel that this tumor had its primary origin in the gallbladder.

Sections of the liver show congestion, interstitial hemorrhage, hepaticogenous pigmentation and some necrosis. Here and there islands of adenocarcinoma are demonstrated, associated for the most part with the biliary canaliculi. In some respects these lesions give the impression of primary carcinoma though we are inclined to believe that they are secondary to the tumor in the gallbladder.

Sections of the pancreas show hyperplasia of the islands of Langerhans and invasion by the tumor described above but we do not demonstrate primary tumor of this organ.

Sections of the right kidney show edema in the medullary portion and about the collecting tubules. These tubules show staining of the epithelium, evidently by bile, and show some casts in the lumen of the tubules. Between the tubules there has been interstitial hemorrhage and accumulations of inflammatory wandering cells leading us to suspect the presence of active infection in the form of pyelonephritis. Some kidney destruction is demonstrated.

Postmortem blood chemical examination showed in the left ventricle, blood sugar—40 mgm. per 100 cc.; right ventricle—50 mgm. per 100 cc. There was not sufficient blood in the portal circulation to secure an adequate specimen for examination.
Postmortem serology showed the blood negative for syphilis by the precipitation method of Kahn and the complement fixation method of Kolmer.

*Anatomical Diagnosis*
- Dehydration
- Inanition
- Cholelithiasis
- Primary Carcinoma of Gallbladder
- Obstructive Jaundice

*Cause of Death*
- Carcinoma of the gallbladder with obstructive jaundice.
- Contributory: Cholelithiasis

*Summary*
A case of primary carcinoma of the gallbladder associated with cholelithiasis is reported.
Hypoglycemia as a part of the terminal inanition is noted.

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**ABERRANT PANCREAS: AUTOPSY REPORT OF A CASE**

**Otterbein Dressler**

*Professor of Pathology in the College and Special Deputy Coroner, City of Philadelphia*

In a previous communication a case was presented in which we had been able to demonstrate aberrant pancreatic tissue in the wall of a Meckel's Diverticulum. Within a very short space of time we have come upon another example of this anomaly but in a different location and under quite different circumstances. For the sake of brevity we are reporting only the autopsy summary rather than the full protocol.

Autopsy No. 44-2057
Died: 7-23-44, 3:20 p.m.
Autopsy: 7-24-44, 1:30 p.m.
At the City Morgue

*Case presented through the courtesy of Dr. Benjamin Gouley, Chief Coroner's Physician, City of Philadelphia.*
Clinical Data

"No medical attention. Cause unknown."

External Examination

The body was that of a white male, said to have been 60 years old. His length was 70 inches and his weight was estimated at 155-160 lbs. The head was bald except for a thin rim of gray hair. The pupils were equal in size. The face showed several days growth of whiskers. The mouth was in foul condition with loose and carious teeth. There was some postmortem lividity about the trunk. There were no areas of gross trauma and no edema. There were no evidences of caustic poisoning. A small umbilical hernia was noted.

Internal Examination

The subcutaneous fat was 2 cm. in thickness.

The pericardium contained 10 cc. of amber fluid.

The heart measured 15 x 10 x 7 cm. The myocardium was excessively softened, and tore readily. Advanced excessive calcification of the coronary arteries was demonstrated, most marked about the circumflex branch of the left coronary artery. Occlusive disease of the circumflex branch was quite evident. The aorta showed an abundance of atherosclerosis with some atheromatous ulcers in the abdominal portion.

The pleural cavities contained no fluid and were free of adhesions.

The lungs presented abundant edema with some congestion and no evidences of consolidation.

The esophagus presented no lesions.

The stomach was dilated with food but presented no other noteworthy lesions.

The intestines presented an adenomatous polyp, 3 cm. in greatest diameter, located in the ileum several meters proximal to the ileocecal valve.

The colon was empty.

The appendix presented no noteworthy lesions.

The gallbladder presented no noteworthy lesions.

The liver showed delicate adhesions connecting it with the diaphragm and the stomach. The cut surface was firm and moist.

The pancreas presented no noteworthy lesions.

The spleen measured 17 x 10 x 5 cm. and presented a firm, dry cut surface.

The prostate showed hyperplasia of the middle and the lateral lobes with no evidences of tumor.
The kidneys measured respectively, left and right, 13 x 6 x 4 cm. and 11 x 6 x 4 cm. Cortical cysts were demonstrated but the capsules stripped easily.

The suprarenal glands presented no noteworthy lesions.

**Microscopy**

Sections of the tumor mass from the intestines, referred to above, show it to be composed of elements presenting a remarkable reproduction of the pancreas. Acinar structures are demonstrated, composed essentially of more or less pyramidal shaped cells pointing into the lumen. Well defined ductal structures are demonstrated though they are somewhat grotesque. Islands of lighter stained elements we would interpret as representing islands of Langerhans. This lesion, therefore, represents an aberrant pancreas.

**Anatomical Diagnosis**

- Myomalacia
- Coronary Occlusive Disease
- Hyperplasia of Prostate
- Umbilical Hernia
- Pulmonary Edema
- Aberrant Pancreas of the Intestines

**Cause of Death**

Acute myocardial insufficiency, due to coronary occlusive disease.

**Summary**

A case of aberrant pancreas of the intestine is reported.

A previous case of aberrant pancreas is referred to.

**Bibliography**

NEW WORK

Surgical Disorders of the Chest
Diagnosis and Treatment

By J. K. DONALDSON, M.D., F.A.C.S.,
Major, M.C., Army of the United States; Diplomate American Board of Surgery; Associate Professor of Surgery in Charge of Thoracic Surgery, University of Arkansas School of Medicine, etc.

Octavo, 364 pages, illustrated with 127 engravings. Cloth, $6.50.

This new work enables physicians and surgeons to develop the new concepts of chest disorders in the light of vastly improved therapeutic possibilities. It is on the general practitioner that the patient depends for diagnosis and advice and he is the first to see the majority of these cases. Early diagnosis and proper recommendations are of the first importance.

The full discussion pertaining specifically to war injuries has been included. This work should so increase the diagnostic efficiency of the general practitioner that the patient will be brought to the chest surgeon's attention at the earliest possible moment. It will assist him to evaluate the practicability of major procedures and to form part of a well coordinated team.