UNEXPECTED PATHOLOGICAL LESIONS OF APPENDIX: AN ANALYSIS OF 3000 SURGICAL SPECIMENS FROM SRI LANKA

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Abstract

Background: Unexpected pathological lesions are not infrequent findings in surgical specimens of appendix. Appendiceal malignancies are commonly encountered as incidental lesions.

Objective: To analyze the unexpected appendiceal pathological lesions encountered in surgical specimens in a sample of Sri Lankan patients.

Methods: A retrospective review of 3000 consecutive appendicectomy specimens and appendices in colectomy specimens received at the Department of Pathology, Faculty of Medicine, University of Peradeniya from 2001 to 2014.

Results: There were 2907 appendicectomy specimens and 93 colectomy specimens with an appendix. In appendicectomy specimens, there were 9 (0.3%) primary neoplasms of which 8 were malignant, 2 (0.06%) secondary carcinoma deposits, 7 (0.24%) endometriosis, 7 (0.24%) granulomatous inflammation, 2010 (69.1%) acute appendicitis and the rest (30%) were unremarkable. In the appendices of colectomy specimens, there were 4 (4.3%) primary neoplasms, all of which were malignant, 7 (7.5%) secondary carcinoma deposits, 1 (1.1%) granulomatous inflammation, 11 (11.8%) acute appendicitis and the rest (75.2%) were unremarkable. Of the 3000 specimens, 13 (0.4%) had a primary appendiceal neoplasm; 9 (0.3%) mucinous neoplasms, 3 (0.1%) NET G1 (carcinoids) and 1 (0.03%) sessile serrated adenoma. Of the mucinous neoplasms, 1 was an adenoma, 3 were low grade appendiceal mucinous neoplasms and 5 were adenocarcinomas. Caseous tuberculoid granulomata were present in 5/8 (62.5%) granulomatous appendicitis.

Conclusions: The commonest unexpected finding in the appendicectomy sample was primary malignant tumours (0.3%) and the commonest malignant tumour group was mucinous neoplasms. Secondary adenocarcinoma is the commonest pathology in the appendices of colectomy specimens. Most granulomatous appendicitis cases were suggestive of tuberculosis.

Key words: Appendix, appendicitis, incidental pathology, mucinous neoplasms, granulomatous appendicitis

ANGIOSARCOMA OF THE SPLEEN

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Abstract

A thirty seven year old previously healthy lady presented with episodes of vague left sided upper abdominal pain of three months duration. Investigations revealed anaemia and thrombocytopenia. The ultrasound scan and the computed tomography of the abdomen showed splenomegaly with multiple echogenic nodules suggestive of a lymphoproliferative disease. A splenectomy was done. Multiple hemorrhagic liver nodules were identified during the surgery. The histology revealed a well differentiated angiosarcoma of the spleen with secondary deposits in the liver. Primary angiosarcoma of the spleen is a rare mesenchymal malignant tumor of vascular origin and is a rare cause of hypersplenism due to sequestration of blood in the spleen.

Introduction

Hypersplenism occurs due to sequestration of blood in the spleen and increased phagocytosis of the cellular components of blood. Angiosarcoma of the spleen is a rare mesenchymal malignant tumour of vascular endothelial origin and is a rare cause of hypersplenism. The most common neoplasms of the spleen are of haematolymphoid origin, e.g.; secondary involvement or primary lymphomas.

The non haematolymphoid splenic tumours are rare, and of them the commonest is angiosarcoma, with an annual incidence of 0.14–0.25 per million1,2. The mean age of presentation ranges from 50 to 79 years3,4. This disease was first reported in 1879 with only 200 cases reported since then in the literature5.

Case Presentation

A thirty seven year old lady presented with episodes of vague left sided upper abdominal pain of three months duration. The past medical history was unremarkable. On examination, she was pale. Her abdomen was distended with massive splenomegaly. The liver was not palpable. Investigations revealed anaemia (hemoglobin 8.2 g/dl) and thrombocytopenia (platelets 97 × 109/l). Computerized tomography of the abdomen showed splenomegaly with multiple echogenic nodules suggestive of a lymphoproliferative disease. The liver was mildly enlarged and no focal lesions were seen. A laparotomy was performed and splenectomy was done. At laparotomy, multiple haemorrhagic liver nodules were observed. The cut surface of the spleen revealed multiple pale irregular solid lesions. Microscopy of these pale lesions showed extensive coagulative necrosis. The
months ago. There is no evidence of relapse of the disease.

Discussion

This patient’s clinical presentation and chest radiography closely mimicked tuberculosis. Repeatedly negative bacteriological tests for tuberculosis should alert clinicians to look for alternative diagnoses. The concomitant suppuration, which was pyelonephritis in our patient, along with the pulmonary lesions should raise the possibility of melioidosis. Since the detection of melioidosis in Sri Lanka is increasing, it is an important differential diagnosis to be considered in patients suspected of tuberculosis without microbiological confirmation. Early initiation of treatment is important as rapid deterioration with fatal outcome has been reported.

The infection is known to have a prolonged latent period with possible reactivation into acute and fulminating infection. The reactivation of the latent disease is often associated with concurrent diseases such as diabetes mellitus, chronic lung disease and chronic renal failure, which are considered as risk factors for developing Melioidosis. Use of steroids is also associated with an increased risk of Melioidosis. The steroid therapy for IgA nephropathy in our patient, probably would have resulted in immune suppression leading to activation of latent B. pseudomallei infection, acquired previously. This case report highlights the importance of considering other differential diagnoses in patients suspected of Tuberculosis as management of them differs and delayed treatment can significantly increase morbidity and mortality.

References


Although neuroendocrine tumours were the most well recognized incidental neoplasms of the appendix, mucinous neoplasms of the appendix are increasingly being recognized and in some published series these are the commonest primary appendiceal tumour group. The group mucinous neoplasms of the appendix comprises a spectrum of lesions: adenoma, low grade appendiceal mucinous neoplasm (those with questionable stromal invasion) and mucinous adenocarcinoma (those with unequivocal stromal invasion). Mucinous adenocarcinoma of the appendix is known to infiltrate the peritoneal surface replacing the peritoneal cells with tumour cells. It causes copious production and accumulation of mucus within the peritoneal cavity. This is an intractable stage with available treatment options and is known as pseudomyxomaperitonei (PMP). Although a neoplasm diagnosed as an adenoma should not show malignant behaviour, the entire spectrum of mucinous neoplasms has been reported to be associated with PMP. However, the risk of PMP with mucinous adenoma is low and most reported cases have been associated with “ruptured mucinous adenoma” which may have represented mucinous adenocarcinoma with deceptive stromal invasion. The reason for this controversy is that the predictors of malignant behavior in mucinous neoplasms, in the absence of unequivocal destructive invasion, are not fully determined. These tumours usually have mild cytological atypia and notorious to have deceptive stromal invasion patterns. Therefore, currently there are no universally accepted diagnostic criteria for mucinous tumours with equivocal morphological features. Mucinous neoplasms with questionable stromal invasion have been named in many ways in different classifications, as low grade appendiceal mucinous neoplasm (LAMN), mucinous tumours of uncertain malignant potential, mucinous tumours of low malignant potential and borderline tumours of the appendix. LAMN is the presently recommended term by the World Health Organization (WHO) 2010 tumour classification.

Appendiceal neuroendocrine tumours include carcinoid tumors, goblet cell carcinoids and mixed neuroendocrine – adenocarcinoma. Lymphomas and mesenchymal malignancies are less commonly encountered malignant appendiceal neoplasms. Benign mucosal lesions include hyperplastic polyps, diffuse mucosal hyperplasia and sessile serrated adenoma. Common non neoplastic incidental lesions include granulomatous appendicitis, parasitic infestations and endometriosis.

The frequency and the clinico-pathological profile of incidental appendiceal lesions in Sri Lanka have not been published. Therefore, we conducted the present study to analyze the appendiceal pathological lesions encountered in surgical specimens in a sample of Sri Lankan patients.

Materials and methods

This study is a retrospective review of 3000 consecutive appendicectomy specimens and appendices included in right hemicolectomy and total colectomy specimens, received at the Department of Pathology, Faculty of Medicine, University of Peradeniya, from 2001 to 2014. Histology of mucinous tumours were reviewed and reclassified according to WHO 2010 tumour
classification, as mucinous adenoma, LAMN and mucinous adenocarcinoma. Presence of intraperitoneal mucin collections was recorded when indicated in the request form.

Results

There were 2907 appendicectomy specimens and 93 right hemi colectomy and total colectomy specimens which included an appendix. The mean age of the appendicectomy sample was 25.3 ± 14.1 years and 1572 (54%) were males. The mean age of the colectomy sample was 46.3 ± 19.8 years and 37 (39.8%) were males.

In the appendicectomy sample, the indication for surgery was suspected acute appendicitis in 2490 (85.7%), suspected appendicular mass in 38 (1.3%) and laparotomy performed for other reasons in 33 (1.1%); the indication was not mentioned in 346 (11.9%). In the colectomy sample, indications for surgery were, malignancy elsewhere in the colon: 44 (47.3%), acute abdomen or suspected obstruction: 26 (28%), familial adenomatous polyposis: 3 (3.2%), appendicular masses: 2 (2.2%) and other reasons: (19.2%).

Grossly, in the appendicectomy specimens, there were 11 (0.4%) masses, 3 (0.1%) mucoceles, 1585 (54.5%) with features of inflammation only and 1308 (45%) were unremarkable. In the colectomy specimens, 3(3.2%) were appendicular masses, 1(1.1%) was a mucocele, 5(5.4%) were with features of inflammation and in 844(90.3%) the appendix was unremarkable.

Microscopically, in the appendicectomy specimens, 9 (0.3%) had a primary neoplasm of which 8 were either frankly malignant or had malignant potential (Table 1), 2 (0.06%) secondary carcinoma deposits, 7 (0.24%) endometriosis, 7 (0.24%) granulomatous inflammation and 2010 (69.1%) acute appendicitis; the rest (30%) were unremarkable. Four appendices with granulomatous inflammation had typical caseous tuberculous granulomata. Of these, two had the disease predominantly on the appendiceal serosa associated with peritoneal tuberculosis, one had associated ileo-caecal tuberculosis and the other was confined to the appendix. Only one patient was clinically suspected as having tuberculosis pre-operatively. In the rest, one had xanthogranulomatous appendicitis and the other two cases had non necrotizing granulomata associated with acute suppurrative appendicitis in appendicular masses. Twenty five (1.2%) appendices had nematodes in the lumina and identified as Enterobius vermicularis. Eighteen (72%) of those with nematode infestation were less than 24 years in age.

Microscopically, in the 93 appendices of colectomy specimens, 4 (4.3%) had a primary neoplasm, all of which were malignant (Table 1), 7 (7.5%) had secondary carcinoma deposits, 1 (1.1%) granulomatous inflammation which was consistent with tuberculosis associated with ileal tuberculosis and 11 (11.8%) had acute appendicitis; the rest (75.2%) were unremarkable. None had evidence of nematode infestation. Correlations of gross appearances of appendices with microscopy in appendicectomy and colectomy specimens are given in Tables 2 and 3.

Of the 3000 specimens, 13 (0.4%) had a primary appendiceal neoplasm: 9 (0.3%) mucinous neoplasms, 3 (0.1%) neuroendocrine tumours grade 1 (NET G1) (formerly known as carcinoid tumour) and 1 (0.03%) sessile serrated adenoma. The mean age of those with a primary appendiceal neoplasm was 47.8 ±19.2 years. The presentation patterns of these tumours are given in the Table 1.

HIV antibody test was negative. The ESR was 120 mm in the first hour. The CRP titre was 40 IU/L. Ultrasonography of the abdomen revealed a right side renal fullness compatible with pyelonephritis.

The initial chest radiograph (Figure 1) revealed a consolidation with cavity formation in the left upper lobe, for which the most common differential diagnosis is pulmonary tuberculosis.

![Figure 1. Chest radiograph showing a consolidation with cavity formation in the left upper lobe](image)

Sputum for acid fast bacilli (AFB) was negative and sputum AFB culture was also negative. Tuberculin test carried with 5TU of PPD showed an induration of 13 mm diameter. Melioidosis antibody titre was highly positive with a titre of 1/5120 and blood culture yielded Burkholderia species, probably B. pseudomallei. The culture was sensitive to Meropenem and Ciprofloxacin.

The patient was commenced on initial intensive phase of the management with intravenous Meropenem 1 g every 8 hours with close monitoring of the renal functions. His fever subsided within 72 hours and there was a dramatic improvement in his renal functions, white cell count, and CRP in the subsequent two weeks following treatment. Repeat chest radiography showed significant resolution of the pulmonary lesions (Figure 2) while the repeat ultrasound scan of the abdomen was normal and showed resolution of pyelonephritis.

![Figure 2. Chest radiography showing significant resolution of the pulmonary lesions](image)
**MELIOIDOSIS MIMICKING PULMONARY TUBERCULOSIS**

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**Introduction**

Melioidosis is caused by the soil bacterium *Burkholderia pseudomallei*. The bacterium is an oxidase-positive, motile gram-negative bacillus, showing bipolar staining. While most cases are considered to be from percutaneous inoculation, inhalation is also a well-recognized mode of infection.

Melioidosis is endemic in Southeast Asia, Northern Australia and the Indian subcontinent. Sri Lanka is situated in the endemic region for melioidosis and the incidence of the disease is increasing. Melioidosis can present with a variety of clinical manifestations. Clinical course may be acute, subacute or chronic. In subacute and chronic forms involving the respiratory system, the presenting features may resemble other chronic pulmonary infections including tuberculosis. Melioidosis tends to cause suppurrative visceral lesions which may accompany the pulmonary manifestations. It has been referred to as the ‘great mimicker’ by various authors. Presentations mimicking tuberculosis are important clinical considerations as a significant number of patients are diagnosed clinically as tuberculosis where the results of their bacteriological tests are negative. We report a case of melioidosis with a clinical presentation similar to tuberculosis.

**Case Presentation**

A 29 year old army soldier serving in Nuwara Eliya for the past 5 years, presented to our unit with intermittent fever, loss of appetite and loss of weight of 3 months duration. He also complained of a mild intermittent cough and loss of weight of 3 months duration. He had a history of IgA nephropathy, 6 months previously, and was on daily low dose corticosteroids. On examination of the patient, he had a temperature of 39 ºC. His pulse rate was 140/90 mmHg. Prior to his appointment to Nuwara Eliya he was engaged in paddy farming at Mahiyangana. He had a history of IgA nephropathy, detected 6 months previously, and was on daily low dose corticosteroids.

Examination revealed a febrile patient with a temperature of 39 ºC. His pulse rate was 112/minute while the blood pressure measured was 140/90 mmHg. Upon admission the patient developed right sided flank pain and renal angle tenderness was elicited on the same side. The rest of the system examination was unremarkable.

The hemoglobin concentration was 10.5 g/dl and the white blood cell count was 32.5×10⁹/mm³ comprising 74% neutrophils, 22% lymphocyte and 3% eosinophils. The platelet count was 464,000/mm³. Urine microscopy showed pyuria (field full pus cells/HPF), however the urine culture was sterile. The renal function tests were impaired revealing a blood urea level of 16.7 mg/dL and a creatinine value of 2.13 mg/dL. The serum electrolyte levels were normal. The liver function tests were within normal limits.

**Table 1. Clinical presentation patterns of primary appendiceal neoplasms**

<table>
<thead>
<tr>
<th>Type of neoplasm</th>
<th>Type of surgery</th>
<th>Clinical presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Appendice.</td>
<td>Colectomy</td>
</tr>
<tr>
<td>Mucinous neoplasms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adenoma</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>LAMN</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Adenocarcinoma</td>
<td>5*</td>
<td>3</td>
</tr>
<tr>
<td>Neuroendocrine tumours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NET G1 (Carcinoid)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sessile serrated adenoma</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>9</td>
</tr>
</tbody>
</table>

LAMN, low grade appendiceal mucinous neoplasm, NET G1, neuroendocrine tumour grade 1  
*Four were mucinous adenocarcinomas, one was unclassified.

**Table 2. Correlation of gross appearances of appendices with microscopic features in appendicectomy specimens**

<table>
<thead>
<tr>
<th>Gross app</th>
<th>Microscopic diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Neoplasm*</td>
<td>Acute Inflamm</td>
</tr>
<tr>
<td>Mass</td>
<td>11</td>
</tr>
<tr>
<td>Mucoceole</td>
<td>3</td>
</tr>
<tr>
<td>Inflammed</td>
<td>1585</td>
</tr>
<tr>
<td>Unremarkable</td>
<td>1308</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2907</td>
</tr>
</tbody>
</table>

*Two secondary carcinomas

**Table 3. Correlation of gross appearances of appendices with microscopic features in colectomy specimens**

<table>
<thead>
<tr>
<th>Gross app</th>
<th>Microscopic diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Neoplasm*</td>
<td>Acute Inflamm</td>
</tr>
<tr>
<td>Mass</td>
<td>3</td>
</tr>
<tr>
<td>Mucoceole</td>
<td>1</td>
</tr>
<tr>
<td>Inflammed</td>
<td>5</td>
</tr>
<tr>
<td>Unremarkable</td>
<td>84</td>
</tr>
<tr>
<td>TOTAL</td>
<td>93</td>
</tr>
</tbody>
</table>

*Seven secondary carcinomas

Of the mucinous neoplasms, 1 was an adenoma, 3 were LAMN and 5 were adenocarcinomas. Of the adenocarcinomas, four were mucinous type and one was unclassified. Gross appearances of these tumours were as follows, 3 had masses, 4 had thickened walls, 1 was ruptured with mucus on the serosa and 1 showed inflammation only. One had localized mucin in the right pelvic peritoneal cavity at the time of surgery.
None had synchronous ovarian tumours or secondary tumour deposits elsewhere. The mean age of the patients with mucinous neoplasms was 54.5 ± 14.05 years and 7 (78%) were females.

All neuroendocrine tumors present were NET G1 (carcinoid tumours) and they were incidental findings in appendicectomy specimens performed for suspected acute appendicitis (Table 1). The mean age of patients with carcinoids was 21.3±0.6 years and 2 (66.7%) of them were females.

Of the appendiceal tumours of the colectomy specimens, 7 were secondary carcinomas, of which 5 were direct invasions of caecal adenocarcinoma while two were deposits from adenocarcinoma elsewhere in the colon. Of the primary tumours, three were mucinous adenocarcinomas while the other was a sessile serrated adenoma.

**Discussion**

The most common pathology in appendicectomy specimens was acute inflammation and this was the only pathology in 69% specimens (Table 2). In colectomy specimens, acute inflammation was present only in 11.8% (Table 3). Acute inflammation of the appendix is commonly precipitated by factors that increase its intraluminal pressure, such as mucosal lymphoid hyperplasia in children, faecoliths, tumours and parasites. Therefore, acute appendicitis could be a secondary manifestation of the incidental lesions. Even in the absence of inflammation obstruction of the appendiceal lumen can produce colicky pain mimicking acute appendicitis.

The most important group of unusual findings in the appendicectomy sample is primary appendiceal malignancies which had a prevalence of 0.3% (Table 1). In published series the frequency of primary appendiceal malignancies ranged from 0.1% to 1.4%. In the colectomy specimens there were 3.2% with primary appendiceal malignancies. All malignancies in our series were of epithelial type and included, 5 adenocarcinomas, 3 LAMN and 3 NET G1 (carcinoid tumours). Of these tumours, 73% (8/11) were incidental findings during surgery or detected at pathological examination of appendicectomy specimens of patients suspected of acute appendicitis. The rest were present in colectomy specimens performed for right iliac fossa mass and exploration of an anterior abdominal wall sinus (Table 1).

Malignant mucinous neoplasms, which comprised 23% LAMN and 38.5% adenocarcinoma, were the largest primary tumour group in this series. In many published series mucinous neoplasms were the commonest group of primary appendiceal tumours. The main complications of appendiceal mucinous neoplasms are pseudomyxomaperitoneii (PMP) and distant metastasis.

PMP is described as accumulation of mucin and mucinous epithelial cells within the peritoneal cavity secondary to peritoneal spread of a mucinous neoplasm. PMP is most commonly due to spread from an appendiceal mucinous neoplasm and very occasionally from mucinous carcinoma from other sites, especially from colon.

When PMP is associated with ovarian mucinous neoplasms, almost always the primary tumour is present in the appendix. Low grade PMP is usually associated with LAMN and high grade PMP with appendiceal mucinous adenocarcinoma. Twenty percent prevalence of PMP had been reported among those with appendiceal mucinous neoplasms and the risk was highest for mucinous adenocarcinoma and lowest for medical teachers (2nd ed). Elsevier Churchill Livingston, 2005: 346-356.


process is time consuming and stressful, a majority of the students rated portfolio as a good learning tool. Literature also reveals positive effects on enhancing learning among undergraduate students at JIPMER, Pondicherry, India following the use of portfolio based learning and assessment in community based field work. A recent review of literature on educational effects of portfolios on undergraduate student learning concluded the main educational benefits as improvement in knowledge and understanding, increased self-awareness and engagement in reflection and improved student-teacher relationships.

It is believed that with a good induction program and careful planning of its content, portfolio has great potential for high quality learning. Supervisors play a crucial role during the mentoring process and it seems to be extremely demanding at times with increasing numbers of students. Nevertheless, Portfolio ensures workplace based learning and a more holistic assessment of the trainee.

Examiner perceptions of portfolio over a three year period carried out at the University of Dundee has revealed that portfolio process provides a holistic picture of the candidate and with adequate briefing of the co-examiner could agree upon the student grade, ensuring validity and reliability of the assessment tool.

A recent review by Dreissen reported quite good inter-rater reliabilities of portfolio assessment, which is contrary to the widespread belief that portfolio assessment is subjective. Results were also encouraging regarding the combined use of portfolios for learning and summative assessment. It can be concluded that portfolio is a desirable learning and assessment tool for professional courses of study and revalidation purposes.

Practice points

- Portfolio implementation has to be well designed and sustained with high level organizational support for greater effectiveness
- A flexible learner-centered format is preferred over a highly structured format as it could have a positive educational impact on learners
- A well orientated and committed mentor would enhance effective learning
- Summative assessment of portfolio contents can be reliable with multiple raters; however, it may be desirable to triangulate with other sources of assessment.

It is advised that those who plan to introduce portfolio-based learning and assessment organize a good induction program for students and staff both. Such a measure would allay anxiety among trainees and pave the way for promoting lifelong learning among health professionals.

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However, LAMN has also been reported in grossly unremarkable appendices. The mean age and the female predominance in mucinous neoplasms in the present study are consistent with the published literature.

The most common neuroendocrine tumour type in the appendix is NET G1 (carcinoid tumour) which has low grade malignant behaviour with a low risk of metastasis. As observed in our series, these tumours are often incidental findings in younger age groups. The frequency of NET G1 in appendectomy specimens range from 0.02-0.09% . In our series, all neuroendocrine tumours were NET G1, the frequency of which was 0.1% and constituted 23% of all primary appendiceal tumours. All were incidental findings in externally unremarkable appendices.

Apart from acute inflammation, the benign conditions encountered in our series were granulomatous inflammation and endometriosis. Granulomatous inflammation was present in 0.2% (7/2907) of appendectomy specimens and 1% 1/93 of appendices in colectomy specimens. Prevalence of granulomatous inflammation is known to vary geographically, it is 0.4% in a Western country, 0.3% in a Middle Eastern country and 2.4 to 2.9% in a South Asian country. Causes of granulomatous appendicitis include infectious causes such as tuberculosis and Yersinia, interval appendectomy, Crohn disease, foreign body related, idiopathic and sarcoidosis. The aetiology of granulomatous appendicitis too shows geographical variations and in endemic regions tuberculosis is a common cause and is the reason for higher prevalence of granulomatous appendicitis. In some series from India, almost all cases of granulomatous appendicitis had a histological picture consistent with tuberculosis. In our series, 57% 4/7 had
tuberculous appendicitis and three of them were associated with either peritoneal or ileo-caecal tuberculosis. In the West, Yersinia infection has been recognized as the commonest infectious cause of granulomatous appendicitis21,22. Furthermore in Western countries, most of the “previous idiopathic” appendicitis cases are considered to be either due to Yersinia infection or interval appendicectomy. Crohn disease is no longer recognized as a common cause of granulomatous appendicitis and isolated Crohn disease in the appendix, without the involvement of the rest of intestinal tract, is no longer considered a cause20,21. It is now accepted that, in countries where tuberculosis is non endemic, the majority of granulomatous inflammation in the appendix is due to prolongation of the acute inflammatory process associated with interval appendicectomy or due to recurrent attacks of acute appendicitis20,21. In our series, only two cases fulfilled criteria of interval appendicitis (recurrent attacks). Of the females who underwent appendicectomy 0.5% had endometriosis. All, except one, did not have associated acute appendicitis, indicating that the abdominal pain in these women may have been due to endometriosis.

Conclusions

The main unexpected findings in the appendices were the neoplasms, granulomatous inflammation and endometriosis. These findings were consistent with those of the rest of the world. The commonest unexpected finding in the appendicectomy sample was primary malignant tumours (0.3%) and the commonest malignant tumour group was mucinous neoplasms (low grade appendiceal mucinous neoplasms and mucinous adenocarcinomas). The majority of the tumours were incidental findings. Secondary adenocarcinoma was the commonest pathology in the appendices of colectomy specimens. As observed in other tuberculosis endemic countries, the commonest cause for granulomatous appendicitis was tuberculosis.

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Author Contributions

DLPD, KD and DNKB collected data and performed literature survey; SW and DLPD analyzed the data and wrote the paper; SW and NVIR performed the histological analysis of appendiceal neoplasms.

References


Learning process is identifying gaps in knowledge, skills or attitudes as the case may be. This leads to the next step, which is to draw up a plan to achieve the identified gaps in learning. Thinking of many options and prioritizing, selecting what should be done in the given context. The learner then executes the plan in order to accomplish the set goal.

Later the portfolio entry is completed with reflection on the entire process and accumulating evidence to show how he/she has accomplished his or her plan. In addition, learners are also encouraged to record failures and possible reasons as to why it is so. May be those become a learning experience for the second cycle, eventually resulting in a spiral.

What kind of material could be included in a portfolio?

It could be printed or electronic material that could be considered as evidence of actual work carried out by the student/trainee such as:

• Case reports

What do the learners and examiners say about portfolio based learning and assessment?

Literature on student perceptions of portfolio development process indicate that at undergraduate level, students are concerned about the high load of paper work which they have to manage along with their clinical training3.

Nevertheless, according to a study carried out in the International Medical University (IMU), Malaysia, although students have reported that the portfolio development...
“A collection of papers and other forms of evidence that learning has taken place”, “It is a purposeful collection of student work that exhibits the student’s efforts, progress and achievements in one or more areas. This collection represents a personal investment that is evident through the student’s participation in the selection, the criteria for judging the merit of the collection and the student’s self-reflection.”

In summary, portfolio is both a powerful learning and assessment tool, which is capable of capturing students’ learning in action. Key elements of a portfolio are the learner experiences and the reflections made on one’s actions. The reflections steer the learning process as well as the evidence of learning.

**Educational advantages of portfolios**

Portfolios are advertised as the instrument par excellence to enhance integrated, self-reflective, self-directed, longitudinal learning. It enables assessment of achievement of most of the program outcomes, specifically competencies such as self-regulated and lifelong learning and professional development. Like many complex skills, self-reflection is probably best learned by doing and preferably over an extended period of time. One of the highlighted strengths of this method is its ability to make a comprehensive assessment of student performance. One makes about the specific situation on one’s actions. The reflections steer the learning process as well as the evidence of learning.

Portfolios can become a window into the students’ heads, a means for both staff and student to understand the educational process at the level of individual learner. They can be powerful educational tools for encouraging students to take charge of their own learning.

“Portfolio offer a way of assessing student learning that is quite different from traditional methods. Achievement tests offer outcomes in units that can be counted and accounted portfolio assessment offers the opportunity to observe learners in a broader context: taking risks, developing creative solutions and learning to make judgments about their own performances.”

**Use of portfolios in medical education**

Many medical schools, for example, Faculty of Medicine Dundee, UK, Maastricht Medical school in the Netherlands, University of New South Wales, Australia, JIPMER, Pondicherry, India and International Medical University, Malaysia use portfolio as a means to train and assess undergraduate medical students.

With respect to postgraduate education, the Royal College of Physicians and Surgeons of Canada introduced a learning portfolio, to create opportunities for personal learning. Not only in the West, the Postgraduate Diploma in Medical Education conducted by the Postgraduate Institute of Medicine (PGIM) Colombo is portfolio based. It is heartening to note that in keeping with the trend, most of the boards of study at the PGIM are in the process of introducing portfolios as part of learning and assessment in the post graduate programs. Since development of a portfolio depends on learners’ experiences and guided reflection, it is also an ideal tool to be used for continuing professional development and revalidation purposes.

**Process of learning**

Portfolio encourages learners to learn more through their own experiences. According to Kolb, the experiential cycle starts with one’s own experience, followed by the reflection on one makes about the specific situation (Figure 1). The subsequent step of the