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Mucocele of the Appendix

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Abstract

Mucocele is a rare entity of the appendix associated with either neoplastic or non-neoplastic mucinous lesions of the appendix. Understanding the pathology and natural history is essential for early diagnosis and prompt treatment. Surgery is the mainstay of treatment. However, the approach and extent of surgical intervention poses a technical challenge to the surgeon. The paper reviews the pathology, diagnosis and management of this condition.

Key words: *mucocele, appendix, tumors, pseudomyxoma peritonei.*

INTRODUCTION

Primary neoplasms of the appendix are present in less than 2% of appendectomy specimens.[1] Mucocele of the appendix is a cystic dilatation of the appendix caused by obstruction of the lumen either by non-neoplastic or neoplastic lesions. The entity was recognised by Rokitansky in 1842 and was later named by Feren in 1876.[2] Appendiceal mucoceles are quite uncommon. Majority of them are picked up incidentally. Managing mucoceles of the appendix surgically is a challenge as it demands meticulous technique in view of morbid complications developing in the event of rupture.[3] Understanding the pathology and its

implications on the natural history of the disease as well as on the surgical outcome is of utmost importance. The paper reviews the pathology and management of this peculiar condition of the appendix.

PATHOLOGY

Mucocele of the appendix results from luminal obstruction. There is a localized or diffuse dilatation of the lumen by accumulation of an abnormal volume of mucus. The gross appearance is typical. (Figure 1) The non-neoplastic aetiology includes obstructing faecoliths, endometriosis, extrinsic compression or inflammatory conditions. Hyperplasia of the mucosa or rarely polyps can also lead to dilatation. The neoplastic aetiology of mucocele is worrisome. Tumours of the appendix may either be adenomas in the form of cyst adenoma or cystadenocarcinoma.[4] Mucinous lesions of the appendix have been classified into 4 pathologic entities based on the characteristics of the epithelium.[5 6]

A) Simple retention mucoceles resulting from non-tumoral obstruction of the appendiceal outflow. These rarely exceed 2 cm.
B) Mucoceles associated with local or diffuse hyperplastic villous epithelium (5-25% of mucoceles)
C) Mucinous adenomas or cystadenomas accounting for 63-84% of cases. These exhibit some degree of epithelial atypia and may assume dimensions of 6cm or more.
D) Malignant mucinous cyst adenocarcinomas constitute 11-20% of cases. These exhibit stromal invasion, desmoplasia and presence of epithelial cells in the peritoneal implants. The luminal distension is usually extremely severe.

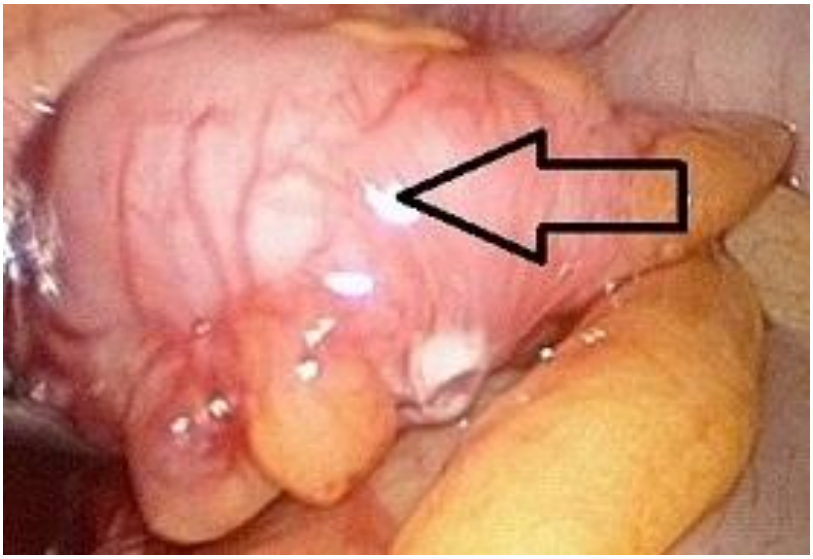

Figure1 Appearance of a mucocele.

(Marked by the black arrow)

The biological behaviour of mucinous neoplasms of the appendix is heterogeneous.[7] Mucinous cyst adenomas are the most benign with no risk of recurrence. However, mucinous cystadenocarcinoma is highly malignant with metastases to the lymph nodes and liver. Interspersed between these two polar forms are a multitude of neoplasms. Only a small percentage of these intermediate forms are associated with the development of pseudomyxoma peritonei (PMP).[8] The WHO classifies the entire spectrum of mucinous neoplasms as low grade malignancies. However in practice, the cystadenocarcinomas exhibit highest malignant potential.[9,10] Extra appendiceal mucin with epithelial cells is associated with high recurrence rate and development of pseudomyxoma peritonei (PMP).[9,11] PMP was formerly thought to be commonly associated with mucinous tumours of the ovary as well as mucocoele of the appendix. However, elaborate studies have revealed that ovary is rarely a source for PMP. The so called borderline mucinous tumours of the ovary are usually typically metastatic lesions from the appendix.[12] Understanding the difference between DPAM (disseminated peritoneal adenomucinosis) from PMCA (peritoneal mucinous carcinomatosis) is essential.[10] As the outcome and treatment varies significantly. DPAM remains localised to the abdomen without metastatic behaviour. Whereas, PMCA has aggressive metastatic and invasive potential.[10]

Clinical features

Majority of the mucoceles of the appendix are diagnosed incidentally.[13] Symptoms are vague ranging from diffuse abdominal pain to right iliac fossa pain. It usually affects the middle age population especially in females. Other symptoms include weight loss, nausea, vomiting, palpable masses, and distension of abdomen or development of new hernias.[14] A high degree of suspicion is necessary for pre-operative diagnosis of this rare entity.

Investigations

Imaging plays a significant role in the diagnosis and evaluation of both asymptomatic as well as symptomatic cases.[15] Conventional radiology may have a limited role to play. Plain abdominal x-rays may just reveal curvilinear right iliac fossa calcifications accompanied with a mass effect on the caecum, bowel or bladder. Barium enema may reveal non filling of the appendix, a well circumscribed lesion at the caecal site, extrinsic compression of the caecum and concentric ring appearance of mucosal folds of the caecum directed towards the appendiceal orifice. However, conventional radiographic findings are only suggestive and lack diagnostic authenticity.

Endoscopy

Colonoscopy may reveal a classical “volcano sign” characterized by an appendicular orifice seen in the centre of a firm mound covered by normal mucosa or a lipoma like submucosal mass.[16] (Figure2)

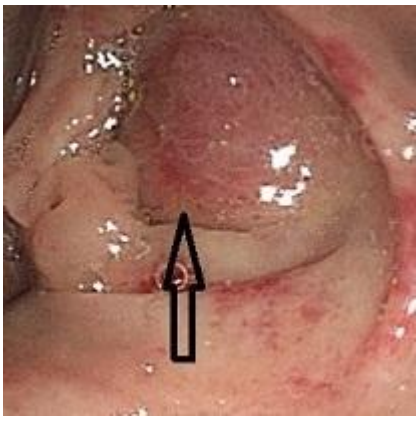

Figure 2 Colonoscopic appearance typically described as the "Volcano Sign".

(Marked by the black arrow)

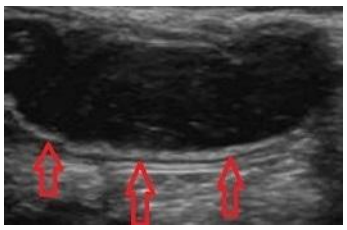

Figure 3 Ultrasound appearance of a mucocele marked by the red arrow.

(Marked by the red arrow)

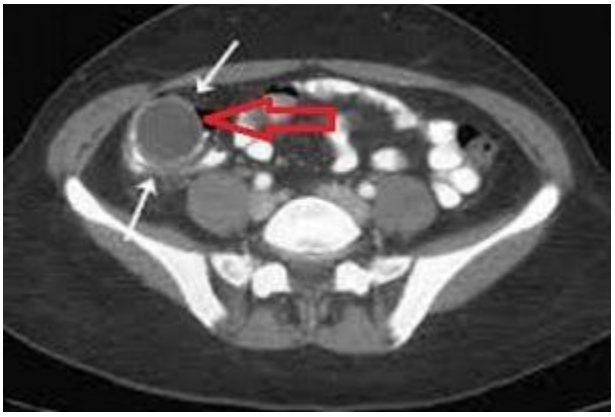

Figure 4 CT appearance of a mucocele.

(Marked by a red arrow)

Ultrasonography

This investigation is performer dependant. Hence, chances of missing the lesion continue to be high. If done properly by a skilled radiologist, mucinous neoplasms appear as elongated or ovoid cystic lesions in the known position of the appendix attached to the caecum. (Figure 3) Calcification of the appendix with distal acoustic shadowing accompanied with internal onion skin appearance due to laminated mucin is pathognomonic of mucocele of the appendix.[17,18] Rupture of the mucocele can also be picked up in a few cases.[18]

Contrast Enhanced Computerised Tomography

Contrast enhanced CT scan is relatively the best investigation for the diagnosis of mucocele of the appendix. CT appearances are typical. [18,19] These include a well encapsulated, round thin walled cystic mass. (Figure 4) Calcification is seen in more than 50% of cases. Whereas, enhancing nodules in the mucocele wall are typically suggestive of cystadenocarcinoma. Size of the mucocoele as ascertained by CT scanning has great diagnostic significance. Mucocoeles less than 2cm are rarely malignant whereas large mucocoeles greater than 6cm are usually associated with either a cystadenoma or cystadenocarcinoma as well as with a higher rate of perforation. Ascites if detected on CT scan suggests PMP. Visceral scalloping is a diagnostic finding of PMP and distinguishes it from fluid ascites. The mucin producing cells in PMP lack adhesiveness and are therefore frequently

dislodged on peristaltic movement. Majority of the mucinous material gravitates to the pouch of Douglas, rectovesical pouch, sub phrenic spaces as well as the surfaces of the liver and spleen. Metastasis to the liver in case of malignant lesions can also be detected. The association of mucocele of the appendix with colonic carcinomas and chronic ulcerative colitis needs special mention as there may be concomitant active lesions or a likelihood of this developing at a later day. Hence, surveillance for colonic cancers in patients who have suffered from mucocele of the appendix is pivotal.

Tumour Markers

CEA, CA 125 and Ca 19-9 have shown to be raised in malignant lesions. They serve as prognostic markers as well as for picking up recurrences following surgical intervention.[20]

Treatment

Surgery is the mainstay of treatment. A surgical algorithm is essential for both an unruptured as well as for a ruptured mucocele of the appendix.[21] If the base is free and size less than 2 cm then appendectomy with adjacent lymphadenectomy needs to be done. Frozen section is essential at the time of surgery. If the specimen is benign then follow is all that is needed. However if it reveals malignancy then aright hemicolectomy is warranted. If the caecum at the base is compromised and size exceeds 2 cm then typhlectomy is necessary. If detailed histopathological evaluation reveals malignancy then a formal hemicolectomy is done.

In ruptured mucoceles an appendectomy with lymphadenenectomy along with collection of the mucin is done. If the histology of the specimen shows bowel adenocarcinoma then aformal hemicolectomy is indicated. If mucinous adeno carcinoma is detected then various other factors have to be studied. If lymph nodes are positive then again a right hemicolectomy is necessary. If nodes are negative no further surgical refinement is necessary. If margins are positive atyphlectomy is necessary. Whereas if the margins are negative then the original surgical intervention is sufficient. If mucin positive cells are present then cytoreduction is essential.

Both laparoscopy as well as open approach have been described and advocated. Selection of the approach as well as the extent of surgery of surgery required are usually dictated by the extent of the disease process. Simple mucoceles or those associated with a benign cystadenoma can best be treated with a laparoscopic approach.[22, 23] However, one needs to be careful while operating. Grasping of the appendix specimen should be minimal, pneumoperitoneum pressure level should be low and a retrievable bag has to be used during a course of laparoscopic approach. Utmost care needs to be exercised to prevent rupture of the specimen with spillage of its contents during surgery. If the local pathology does not permit safe and meticulous dissection laparoscopically then it is prudent and safe to convert to open procedure. For any doubtful lesion it is best to convert to open especially in complicated or ruptured mucoceles.[24] For malignant mucinous

appendiceal malignancies, right hemi colectomy is advocated as the gold standard. However, studies have proved that there is no survival advantage with right hemicolectomy as compared to appendectomy.[25,26] Right hemicolectomy is indicated only in a select few cases. These cases necessitatethe following:

1) Total removal of the primary tumour or complete cytoreduction.
2) Lymph node involvement demonstrated by histopathological examination of the local lymph nodes
3) Non mucinous neoplasms identified by histology

PMP is a disastroussequel to rupture of mucocele of the appendix. The treatment for this condition ranges from watchful waiting to aggressive cytoreductive surgery accompanied with hyper thermic intra-operative peritoneal chemotherapy (HIPEC) or early post-operative intra peritoneal chemotherapy (EPIC).[26] The Sugar Baker procedure which includes complete peritonectomy with omentectomy accompanied with HIPEC has shown to improve long term survival and better regional control in malignant PMP's. Fluorouracil based systemic chemotherapy is the standard of care for patients of appendiceal origin. Surgery may not be immediately warranted in a few cases.[27] The risk of developing adenocarcinoma of the colon is six times later in patients with mucocele as compared to the general population. Hence surveillance for colonic cancer should be a part of the follow up protocol for those patients who have been treated for mucocele of the appendix.[28]

CONCLUSION

Mucocele of the appendix is a rare lesion of the appendix having neoplastic or non-neoplastic aetiology.

High index of suspicion is essential for pre-operative diagnosis.

Contrast enhanced CT scan is the diagnostic investigation.

Proper choice of surgical approach based on the extent of the disease is essential.

Malignant mucinous neoplasms leading to mucoceles accompanied by PMP have poor prognosis.

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