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Chapter 12

An Update on the Management of Endometriosis of the Appendix - Review

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Abstract

Endometriosis of the appendix is a condition predominantly observed in young women, characterized clinically by chronic lower abdominal pain. It represents one of the sites of extra-pelvic endometriosis, with diagnosis confirmed through histopathological evaluation of the appendix. A significant challenge for surgeons is determining whether an appendectomy should be performed. The advent of laparoscopic surgery has facilitated enhanced visualization of the pelvis and appendix. This chapter has been conducted to evaluate whether an appendectomy is warranted in all cases of endometriosis.

Keywords: Appendicular Endometriosis, Incidental Appendectomy, Intestinal Endometriosis, Endometriosis, and Laparoscopic Appendectomy

1. Introduction

Endometriosis is a pathological condition affecting the female reproductive system, characterized by the presence of endometrial-like tissue outside the uterine cavity. It predominantly occurs in women of reproductive age, specifically those between 25 and 35 years. Gastrointestinal tract involvement in endometriosis is observed in 12% to 37% of cases, with the rectosigmoid, appendix, caecum, and terminal ileum being the most frequently affected sites. The prevalence of appendiceal endometriosis ranges from 2.6% to 13%, often presenting as acute appendicitis or an appendicular mass, and is reported in 1% to 44.3% of individuals undergoing gynecological surgery. The serosal region is typically involved, with deeper infiltration extending to the muscular and submucosal layers [1–8].

Endometriosis of the appendix may manifest clinically without symptoms or with chronic right-sided abdominal pain. It can also present as acute appendicitis, with definitive diagnosis confirmed through histopathological examination of the appendix [9, 10]. Performing an appendectomy in patients with appendiceal endometriosis offers the benefit of alleviating chronic abdominal pain and mitigating the risk of future appendicitis. Additionally, there is a rationale for conducting an incidental appendectomy during gynecological surgery for endometriosis, as it is associated with reduced morbidity and mortality [11–15].

The advent of laparoscopic surgery has facilitated the diagnosis and treatment of appendiceal endometriosis, as it is associated with a reduction in postoperative complications and expedited recovery [16]. Several risk factors are linked to appendiceal endometriosis, including adenomyosis, right large endometrioma, bladder endometriosis, deep posterior pelvic endometriosis, left deep lateral pelvic endometriosis, and ileocecal endometriosis [17].

The Incidence of appendiceal endometriosis is notably elevated among women diagnosed with deep-infiltrating endometriosis, thereby justifying the consideration of appendectomy during surgical intervention for endometriosis. The pathogenesis of endometriosis is explained by three primary theories: retrograde menstruation accompanied by implantation and inadequate immunological clearance, coelomic metaplasia, and hematological and lymphatic metaplasia [18, 19].

Currently, there is no standardized consensus regarding the management of appendiceal endometriosis. This chapter aims to examine the role of appendectomy in the context of endometriosis and the application of laparoscopic surgery. We conducted a comprehensive literature review utilizing PUBMED, the Cochrane Database of Clinical Reviews, and Google Scholar, focusing on clinical trials, observational studies, cohort studies, case studies, systematic reviews, and meta-analyses published from 1970 to 2025. The search employed the following keywords: “appendicular endometriosis,” “incidental appendectomy,” “intestinal endometriosis,” “laparoscopic appendectomy,” and “endometriosis.” All selected articles were in English.

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2. Discussion

2.1. Laparoscopic appendectomy in endometriosis of the appendix

The advent of laparoscopic surgery in the treatment of patients with chronic lower abdominal pain or endometriosis has underscored the significance of inspecting and excising the appendix, as it may be implicated in the manifestation of abdominal pain [20]. A retrospective study conducted by [21] revealed that among 231 patients who underwent appendectomy, abnormal pathology was identified in 115 cases, with appendiceal endometriosis being the most prevalent pathology. The study concluded that the excision of the appendix is warranted during gynecological surgery for endometriosis [21].

Laparoscopic appendectomy is advantageous for patients experiencing chronic abdominal pain due to endometriosis, as it facilitates the examination of the peritoneal cavity and visualization of the pelvic organs. During laparoscopy, the appendix can be inspected, and the decision to perform an appendectomy can be made. This procedure is also associated with reduced morbidity and promotes early ambulation [22–26]. In a retrospective study by [27] involving 135 patients who underwent laparoscopy for endometriosis and concurrent appendectomy, the prevalence of endometriosis of the appendix was found to be 18%. The study concluded that appendectomy should be performed during laparoscopy for endometriosis [27].

In their retrospective study, [28] assessed the intraoperative findings and histopathological characteristics of the appendix in patients undergoing benign gynecological surgery. Their findings indicated that up to 68.2% of cases exhibited abnormal appendiceal pathology. The study concluded that inspecting the appendix is crucial when considering an appendectomy [28]. Similarly, [29] conducted a nonrandomized controlled trial involving 65 patients who underwent laparoscopy for symptomatic endometriosis, of whom 52 underwent appendectomy. Histological examination revealed abnormal appendiceal histology in 75% of these cases. This study also concluded that the appendix should be inspected during laparoscopy, and if abnormalities are detected, it should be excised [29].

Alsalilli et al. conducted a prospective evaluation of the histological findings and clinical outcomes in patients who underwent appendectomy during laparoscopy for chronic lower abdominal pain. Among the 100 patients who underwent the procedure, up to 20% of the appendiceal specimens tested positive for endometriosis. This study underscores the significance of performing an appendectomy in cases of chronic abdominal pain and affirms the safety of laparoscopic intervention. These findings are corroborated by retrospective studies conducted by [30, 31] which also emphasize the diagnostic value of laparoscopy in patients with chronic pelvic pain [30–32].

Peters et al. conducted a review on the safety and efficacy of performing appendectomy during laparoscopic surgery for benign gynecological conditions. They concluded that appendectomy should be performed in cases of benign gynecological conditions such as endometriosis, as the procedure is safe and associated with low morbidity [33] conducted a retrospective study on the safety and efficacy of incidental appendectomy during laparoscopic surgery for ovarian endometrioma. The study included 356 patients, of whom 172 underwent an interval appendectomy. Among the 172 appendix specimens, 52 exhibited abnormal presentations, and 16 were found to have endometriosis. This study concluded that incidental appendectomy does not increase morbidity or operative time and serves a diagnostic purpose [34].

2.2. Histopathological examination of endometriosis of the appendix

The histopathological examination of the appendix specimen is crucial for establishing a diagnosis in patients who have undergone an appendectomy, particularly when gynecological conditions such as endometriosis are potential causes of right lower abdominal pain. The diagnosis of endometriosis is confirmed through surgical excision and subsequent histopathological evaluation [35–38]. A systematic review and meta-analysis conducted by [39] underscores the significance of routine histopathological examination of the appendix post-appendectomy in identifying unexpected conditions, including endometriosis or malignancy [39].

Ross et al. conducted a histological evaluation of appendix specimens from patients with endometriosis who had undergone appendectomy. Their retrospective study revealed that up to 14.9% of cases were histologically diagnosed with endometriosis, underscoring the significance of performing appendectomy during surgical management for chronic abdominal pain associated with endometriosis [40]. Similarly, [41] performed a retrospective study on the histological evaluation of patients who had undergone appendectomy for endometriosis. This study demonstrated lumen obliteration with infiltration of endometrial-like stromal cells, with no evidence of malignancy, highlighting the critical importance of histological evaluation of the appendix [41].

Chandrasegaran et al. conducted an analysis of appendiceal pathologies in a cohort of 2,284 female patients, revealing a negative appendectomy rate of 31%. Among these cases, up to 14 instances were identified as appendiceal endometriosis. This study underscores the significance of endometriosis as a contributing factor to negative appendectomies[42, 43] performed a retrospective assessment of 51 appendiceal endometriosis specimens, with histological examination indicating involvement of the serosal and muscular layers, accompanied by lumen obliteration. This finding emphasizes the critical role of histological evaluation in appendiceal assessments [43]. Furthermore, a systematic review by [44]. On the routine histological evaluation of appendectomy specimens demonstrated that, despite the low incidence of abnormal findings, histopathological evaluation remains essential and should be routinely practiced [44].

Table 1: The prevalence of endometriosis of the appendix

Author	Sample size(N)	Study design	Prevalence of endometriosis
Harris et al [29]	52	Nonrandomized clinical trial	31%
Berker et al [21]	231	Retrospective study	44.3%
Moulder et al [19]	1876	Retrospective study	13.2%
Coratti et al [9]	149	Observational case-control study	14.7%
Ross et al [40]	609	Retrospective study	14.9%
Nikou et al [27]	135	Retrospective study	18%

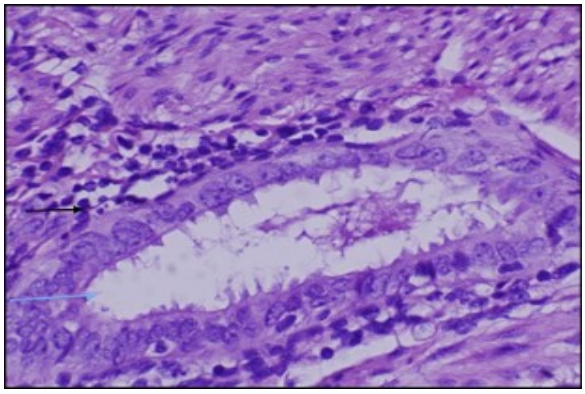

Figure 1: Microscopic examination of the appendix showing endometrial tissue in the appendix specimen

3. Conclusion

The significance of performing an appendectomy in patients presenting with chronic lower abdominal pain, as well as in asymptomatic patients with endometriosis, underscores the necessity of addressing this condition, which can be confirmed through histopathological evaluation. The application of diagnostic laparoscopy emphasizes the importance of inspecting the appendix and conducting an appendectomy. In patients undergoing other gynecological procedures, an incidental appendectomy is typically recommended to rule out endometriosis and prevent future instances of chronic abdominal pain. The gross appearance of the appendix may not reveal any abnormalities; therefore, appendectomy and histological evaluation are crucial for establishing a diagnosis of this condition.

Article Information

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References

[1] N. Agarwal and A. Subramanian. Endometriosis - morphology, clinical presentations, and molecular pathology. *Journal of Laboratory Physicians*, 2(01):001–009, 2010. doi:10.4103/0974-2727.66699.

[2] A. Bergqvist. Different types of extragenital endometriosis: a review. *Gynecological endocrinology: the official journal of the International Society of Gynecological Endocrinology*, 7(3):207–221, 1993. doi:10.3109/09513599309152504.

[3] G. Centini, A. Ginetti, I. Colombi, A. Cannoni, M. Giorgi, H. Ferreira, F. Fedele, M. Pacifici, F. G. Martire, E. Zupi, and L. Lazzeri. Endometriosis of the appendix: prevalence, associated lesions, and proposal of pathogenetic hypotheses. a retrospective cohort study with prospectively collected data. *Archives of Gynecology and Obstetrics*, 310(3):1669–1675, 2024. doi:10.1007/s00404-024-07650-8.

[4] T. Falcone and R. Flyckt-Rebecca. Clinical management of endometriosis. *Obstetrics and Gynecology*, 131(3):557–571, 2018. doi:10.1097/AOG.0000000000002469.

[5] N. Khetan, J. Torkington, A. Watkin, M. H. Jamison, and W. V. Humphreys. Endometriosis: presentation to general surgeons. *Annals of the Royal College of Surgeons of England*, 81(4):255–259, 1999.

[6] C. Cristescu, A. Velişcu, B. Marinescu, A. Pătraşcu, E. T. Traşcă, and O. T. Pop. Endometriosis - clinical approach based on histological findings. *Romanian journal of morphology and embryology = Revue roumaine de morphologie et embryologie*, 54(1):91–97, 2013.

[7] M. Schrempf, M. A. Kirmair, A. Mair, M. Hoffmann, C. Dannecker, M. Anthuber, and L. Anthuber. Incidence and clinical features of endometriosis in 2484 consecutive female patients undergoing appendectomy for suspected appendicitis—a retrospective analysis. *Langenbeck's Archives of Surgery*, 409(1), 2024. doi:10.1007/s00423-024-03328-6.

[8] A. S. Seydel, J. Z. Sickel, E. D. Warner, and H. C. Sax. Extrapelvic endometriosis: diagnosis and treatment. *American journal of surgery*, 171(2):239, 1996. doi:10.1016/S0002-9610(97)89557-8.

[9] F. Coratti, S. Vannuccini, C. Foppa, F. Staderini, A. Coratti, F. Cianchi, and F. Petraglia. Emergency surgery for appendectomy and incidental diagnosis of superficial peritoneal endometriosis in fertile age women. *Reproductive BioMedicine Online*, 41(4):729–733, 2020. doi:10.1016/j.rbmo.2020.06.008.

[10] J. J. Khoo, M. S. A. Ismail, and C. C. Tiu. Endometriosis of the appendix presenting as acute appendicitis. *Singapore Medical Journal*, 45(9):435–436, 2004. doi:10.18231/2456-9267.2018.0009.

[11] A. Adeboye, G. O. Ologun, D. Njoku, and J. Miner. Endometriosis of the vermiform appendix presenting as acute appendicitis. *Cureus*, 11(10):e5816, 2019. doi:10.7759/cureus.5816.

[12] L. Allahqoli, A. Mazidimoradi, Z. Momenimovahed, V. Günther, J. Ackermann, H. Salehiniya, and I. Alkatout. Appendiceal endometriosis: A comprehensive review of the literature. *Diagnostics*, 13(11), 2023. doi:10.3390/diagnostics13111827. MDPI.

[13] V. K. Mittal, S. P. Choudhury, and J. A. Cortez. Endometriosis of the appendix presenting as acute appendicitis. *American journal of surgery*, 142(4):519–521, 1981. doi:10.1016/0002-9610(81)90389-5.

[14] K. K. Singh, A. M. Lessells, D. J. Adam, C. Jordan, W. F. Miles, I. M. Macintyre, and J. D. Greig. Presentation of endometriosis to general surgeons: a 10-year experience. *The British journal of surgery*, 82(10):1349–1351, 1995. doi:10.1002/bjs.1800821017.

[15] J. K. Uohara and T. Y. Kobara. Endometriosis of the appendix. report of twelve cases and review of the literature. *American Journal of Obstetrics and Gynecology*, 121(3):423–426, 1975. doi:10.1016/0002-9378(75)90026-5.

[16] C. Bandeira Domiciano, P. A. De Araújo Alves, Xavier da Nóbrega Pereira, and A. L. G. Gadelha e xavier, b., nascimento de oliveira. *D. C., De Carvalho Nobre Felipe, D. H., Camilo Neto, G., Costa Filho, A. ENDOMETRIOSIS OF THE CECUM AND APPENDIX: REVIEW OF LITERATURE. Brazilian Journal of Implantology and Health Sciences*, 5(2):121–129, 2023. doi:10.36557/2674-8169.2023v5n2p121-129.

[17] M. Mabrouk, D. Raimondo, M. Mastronardi, I. Raimondo, S. Del Forno, A. Arena, N. Sutherland, A. Borgia, G. Mattioli, P. Terzano, and R. Seracchioli. Endometriosis of the appendix: When to predict and how to manage—a multivariate analysis of 1935 endometriosis cases. *Journal of Minimally Invasive Gynecology*, 27(1):100–106, 2020. doi:10.1016/j.jmig.2019.02.015.

[18] J. Hale, B. Scott, C. Suydam, and J. Brockmeyer. Endometriosis of the appendix: When appendicitis is less than straightforward. *Military medicine*, 188(11-12):e3730–e3733, 2023. doi:10.1093/milmed/usad233.

[19] J. K. Moulder, M. T. Siedhoff, K. L. Melvin, E. G. Jarvis, K. A. Hobbs, and J. Garrett. Risk of appendiceal endometriosis among women with deep-infiltrating endometriosis. *International Journal of Gynecology and Obstetrics*, 139(2):149–154, 2017. doi:10.1002/ijgo.12286.

[20] N. S. Al Oulaqi, A. F. Hefny, S. Joshi, K. Salim, and F. M. Abu-Zidan. Endometriosis of the appendix. *African health sciences*, 8(3): 196–198, 2008.

[21] B. Berker, N. LaShay, R. Davarpanah, M. Marziali, C. H. Nezhat, and C. Nezhat. Laparoscopic appendectomy in patients with endometriosis. *Journal of Minimally Invasive Gynecology*, 12(3):206–209, 2005. doi:10.1016/j.jmig.2005.03.003.

[22] E. Croce, S. Olmi, M. Azzola, and R. Russo. Laparoscopic appendectomy and minilaparoscopic approach: a retrospective review after 8 years' experience. *JSLS: Journal of the Society of Laparoendoscopic Surgeons*, 3(4):285–292, 1999.

[23] S. Gon, G. N. Barui, B. Majumdar, and S. J. Baig. Endometriosis of the appendix: A diagnostic dilemma. *Indian Journal of Surgery*, 72(S1):315–317, 2010. doi:10.1007/s12262-010-0087-3.

[24] R. Gupta, A. K. Singh, W. Farhat, H. Ammar, M. Azzaza, and A. lagha Mizouni. S., latifa. *M. Ben, Bouazzi, A., Ali, A. Ben. Appendicular endometriosis: A case report and review of literature. International Journal of Surgery Case Reports*, 64:94–96, 2019. doi:10.1016/j.ijscr.2019.07.046.

[25] B. P. St. John, A. E. Snider, H. Kellermier, S. Minhas, and J. M. Nottingham. Endometriosis of the appendix presenting as acute appendicitis with unusual appearance. *International Journal of Surgery Case Reports*, 53:211–213, 2018. doi:10.1016/j.ijscr.2018.10.048.

[26] J. Yoon, Y. S. Lee, H. S. Chang, and C. S. Park. Endometriosis of the appendix. *Annals of Surgical Treatment and Research*, 87(3): 144–147, 2014. doi:10.4174/astr.2014.87.3.144.

[27] A. F. Nikou, N. S. Tenzel, P. Hua, L. Orbuch, and I. K. Orbuch. Appendectomy should be performed during minimally invasive surgery for endometriosis. *Journal of the Society of Laparoendoscopic Surgeons*, 25(1), 2021. doi:10.4293/JSLS.2020.00095.

[28] V. I. Shavell, H. M. Mahdi, A. O. Awonuga, D. A. Edelman, J. D. Webber, R. M. Gidwani, M. Husain, and J. M. Berman. Appendectomy in the gynecological setting: Intraoperative findings and corresponding histopathology. *Gynecologic and Obstetric Investigation*, 71(3): 189–192, 2011. doi:10.1159/000317270.

[29] R. S. Harris, W. G. Foster, M. W. Surrey, and S. K. Agarwal. Appendiceal disease in women with endometriosis and right lower quadrant pain. *Journal of the American Association of Gynecologic Laparoscopists*, 8(4):536–541, 2001. doi:10.1016/S1074-3804(05)60617-2.

[30] K. Chao, S. Farrell, P. Kerdemelidis, and B. Tulloh. Diagnostic laparoscopy for chronic right iliac fossa pain: a pilot study. *The Australian and New Zealand journal of surgery*, 67(11):789–791, 1997. doi:10.1111/j.1445-2197.1997.tb04581.x.

[31] T. L. Lyons, W. K. Winer, and A. Woo. Appendectomy in patients undergoing laparoscopic surgery for pelvic pain. *The Journal of the American Association of Gynecologic Laparoscopists*, 8(4):542–544, 2001. doi:10.1016/s1074-3804(05)60618-4.

[32] M. AlSalilli and G. A. Vilos. Prospective evaluation of laparoscopic appendectomy in women with chronic right lower quadrant pain. *The Journal of the American Association of Gynecologic Laparoscopists*, 2(2):139–142, 1995. doi:10.1016/s1074-3804(05)80007-6.

[33] A. Peters and S. M. Mansuria. The role of appendectomy at the time of laparoscopic surgery for benign gynecologic conditions. *Current Opinion in Obstetrics and Gynecology*, 30(4):237–242, 2018. doi:10.1097/GCO.0000000000000466. Lippincott Williams and Wilkins.

[34] J. H. Lee, J. S. Choi, S. W. Jeon, C. E. Son, J. W. Bae, J. H. Hong, K. W. Lee, and Y. S. Lee. Laparoscopic incidental appendectomy during laparoscopic surgery for ovarian endometrioma. *American Journal of Obstetrics and Gynecology*, 204(1):28, 2011. doi:10.1016/j.ajog.2010.08.042. e1-28.e5.

[35] C. Douglas and O. Rotimi. Extragenital endometriosis - a clinicopathological review of a glasgow hospital experience with case illustrations. *Journal of Obstetrics and Gynaecology*, 24(7):804–808, 2004. doi:10.1080/01443610400009568.

[36] J. Langman, R. Rowland, and B. Vernon-Roberts. Endometriosis of the appendix. *The British journal of surgery*, 68(2):121–124, 1981. doi:10.1002/bjs.1800680218.

[37] O. Engin, B. Calik, M. Yildirim, A. Coskun, and G. A. Coskun. Gynecologic pathologies in our appendectomy series and literature review. *Journal of the Korean Surgical Society*, 80(4):267–271, 2011. doi:10.4174/jkss.2011.80.4.267.

[38] P. Stratton, C. Winkel, A. Premkumar, C. Chow, J. Wilson, R. Hearns-Stokes, S. Heo, M. Merino, and L. K. Nieman. Diagnostic accuracy of laparoscopy, magnetic resonance imaging, and histopathologic examination for the detection of endometriosis. *Fertility and sterility*, 79(5):1078–1085, 2003. doi:10.1016/s0015-0282(03)00155-9.

[39] V. P. Bastiaenen, W. M. Allema, C. E. L. Klaver, S. van Dieren, L. Koens, P. J. Tanis, and W. A. Bemelman. Routine histopathologic examination of the appendix after appendectomy for presumed appendicitis: Is it really necessary? a systematic review and meta-analysis. *Surgery (United States)*, 168(2):305–312, 2020. doi:10.1016/j.surg.2020.03.032.

[40] W. T. Ross, J. M. Newell, R. Zaino, A. R. Kunselman, G. J. Harkins, and A. S. Benton. Appendiceal endometriosis: Is diagnosis dependent on pathology evaluation? a prospective cohort study. *Journal of Minimally Invasive Gynecology*, 27(7):1531–1537, 2020. doi:10.1016/j.jmig.2020.01.009.

[41] J. Misdraji and F. M. Graeme-Cook. Miscellaneous conditions of the appendix. *Seminars in Diagnostic Pathology*, 21(2):151–163, 2004. doi:10.1053/j.semdp.2004.11.006.

[42] M. D. Chandrasegaram, L. A. Rothwell, E. I. An, and R. J. Miller. Pathologies of the appendix: A 10-year review of 4670 appendicectomy specimens. *ANZ Journal of Surgery*, 82(11):844–847, 2012. doi:10.1111/j.1445-2197.2012.06185.x.

[43] M. Noor, A. Chen, and R. S. Gonzalez. Clinicopathologic findings in gynecologic proliferations of the appendix. *Human Pathology*, 92:101–106, 2019. doi:10.1016/j.humpath.2019.08.004.

[44] H. A. Swank, E. J. Eshuis, D. T. Ubbink, and W. A. Bemelman. Is routine histopathological examination of appendectomy specimens useful? a systematic review of the literature. *Colorectal Disease*, 13(11):1214–1221, 2011. doi:10.1111/j.1463-1318.2010.02457.x.