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Incidental Appendectomy-current Management-narrative Review Article

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Review Article

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ABSTRACT

Incidental appendectomy has always been a matter of debate as to whether it should be performed or not. The morbidity and mortality of the procedure is low, and it allows histological examination to detect any abnormal pathology. The introduction of laparoscopic surgery has also made surgeons question if incidental appendectomy should be performed or not. We have conducted this narrative review article to look at the current indications, patients' demographics, and types of surgery that incidental appendectomy is performed on.

Keywords: Incidental appendectomy; prophylactic appendectomy; normal appendix; laparoscopic appendectomy.

1. INTRODUCTION

Incidental appendectomy is defined as a normal appendix that is surgically removed during surgery for another condition that is not related to acute appendicitis. This is commonly performed in women who undergo gynecological surgeries like abdominal hysterectomy and salpingo -

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oophorectomy. Incidental appendectomy is 12 times more frequent in women in the 33-to-48-year age group when compared to men. It is favored by some surgeons as it is easy to perform, associated with low complication rates and eliminates the risk of acute appendicitis in the future. Incidental appendectomy is different from prophylactic appendectomy where a normal appendix is removed in the absence of any other intra-abdominal pathology [1,2].

The World Society of Emergency Surgeons (WSES) recommends removal of a normal looking appendix that appears during surgery and when no other pathology can be found in the abdomen. The European Association of Endoscopic Surgeons (EAES) also recommends the removal of a normal looking appendectomy during surgery [3,4].

The decision to perform an incidental appendectomy is still debatable, with some advocating for this procedure in young patients who undergo certain gynecological procedures and pediatric surgical procedures. Certain factors that influence this include the lifetime risk of developing acute appendicitis, the function and utility of the appendix, and the histology of the removed appendix. It is reported to be cost effective in young patients, but the indication for incidental appendectomy will need to be carefully reviewed [5,6].

The introduction of laparoscopic surgery has made it easier to perform incidental appendectomy, as the procedure is easily performed, it is associated with decreased post operative complication and the hospital stay is decreased. It is also cost effective in reducing the risk of future appendicitis [7].

Currently there is no uniform consensus on the management of appendicular mass, and we have conducted this review article to investigate the various management options. We conducted a literature review using PUBMED, Cochrane database of clinical reviews and Google scholar looking for clinical trial, observational studies, cohort studies, systemic reviews, and meta-analysis from 1990 to 2022.We used the following keywords, “Incidental appendectomy”, “Prophylactic appendectomy”, “White appendix”, “laparoscopic Appendectomy”, All articles were in English language only. Further articles were obtained by manual cross referencing of the literature. Case reports and studies with less than 10 patients and editorials were excluded.

2. DISCUSSION

2.1 Incidental Appendectomy during Gynecological Surgeries

The feasibility of interval appendectomy done during gynecological surgeries was retrospectively evaluated by benoit et al. A total of 1,876 appendectomies were performed on these patients who underwent gynecological surgeries.82% of these cases were conducted laparoscopically and the patients with an appendiceal pathology was seen in 11.8%. There were no complications due to the appendectomy and this study concluded that incidental appendectomy was a safe and feasible option in complex gynecological surgeries [8].

A retrospective series done by Jocko et al, on 71 appendectomies that were conducted on patients who presented with endometriosis of pelvic mass or pain. A total of 59% of the appendiceal specimens came back with an abnormal pathology with patients who underwent surgery for endometriosis being the most common condition. There were no complications related to the appendectomy and this study supports the role of performing an incidental appendectomy [9].

Another retrospective series on 257 incidental appendectomies that were performed during patients that underwent total laparoscopic hysterectomies. There was no complication due to the appendectomy and only 9% of the appendectomy specimens were of an abnormal pathology. This study concluded that incidental appendectomy was safe and should be offered to patients who are undergoing elective gynecological surgeries [10].

Song et al conducted a study on 772 patients who underwent laparoscopic appendectomy for incidental appendectomy, and the post operative complications were low and there was no increase in the hospital stay and cost. This study concluded that incidental appendectomy should be performed in female patients [11].

The efficacy of incidental appendectomy was evaluated by wie et al on patients who underwent laparoscopic surgical treatment for ovarian endometrioma. Of the 106 patients who underwent incidental appendectomy, the histology showed that lymphoid hyperplasia was seen in 34.9% and endometriosis was seen in 11.3%. This study concluded that patients who

are going to undergo surgery for endometriosis would need to be counselled for appendectomy even if they have no clinical symptoms or the gross appearance of the appendix appears normal [12].

A review by allahqoli et al on appendiceal endometriosis showed that this condition was detected in 7.23% of incidental appendectomy specimens of patients who underwent laparoscopy for gynecological surgery. This review concluded that incidental appendectomy was safe and associated with no complications [13].

The role of diagnostic laparoscopy in the management of gynecological conditions in women was evaluated by aref et al, who conducted a prospective study on 235 patients. The post operative morbidity and mortality was low, and this study confirmed the importance of incidental appendectomy in preventing recurrence [14].

The conclusion from all these studies supports performing an incidental appendectomy during various gynecological surgeries like hysterectomy and oophorectomy. The only drawback from these studies was that they were predominantly retrospective in nature.

2.2 Incidental Appendectomy during Other Surgeries

The indication of interval appendectomy in the surgical treatment of ilio-colic intussusception was retrospectively studied by Delgado et al on 101 patients who underwent bowel resection. 77 patients underwent an incidental appendectomy and 24 did not undergo an incidental appendectomy. There was no difference in terms of post operative complications, recurrence rates and hospital stay. The results of this study showed that incidental appendectomy is a safe procedure, and it eliminates the lifetime risk of acute appendicitis [15].

Liu et al conducted a retrospective study on incidental appendectomy being performed during the surgical treatment of intussusception in children. A total of 30 patients underwent interval appendectomy and the operative time was prolonged and there was an increase in the cost hence this study concluded that further studies would need to be done to assess its efficacy [16].

A systemic review by davis et al on the clinical outcomes of incidental appendectomy, concluded that the procedure was safe, but it may be associated with long term complications like adhesions and the patient should be briefed on all the risk and benefits of performing an incidental appendectomy [17].

A systemic review by healy et al on the indication of incidental appendectomy during showed that most pediatric surgical procedures do not require this. The indication for incidental appendectomy should be carefully evaluated with the patient's diagnosis, medical history, and the risk of developing acute appendicitis [18].

Wang et al conducted a retrospective study on prophylactic appendectomy in obese patients who underwent abdominal surgeries. A total of 121 patients were included in the study and there was no increase in the operative time and the postoperative infective rates were low and it can be performed to prevent recurrence [19].

Incidental appendectomy has been advocated during transplant surgeries like in pancreatic transplant, as it prevents the risk of acute appendicitis and decreases the risk of graft loss and mortality, as surgery in transplant patients is usually associated with difficulty during surgery and the associated risk of graft infection if the patient developed acute appendicitis [20].

The role of incidental appendectomy being performed during radical cystectomy was prospectively assessed by gupta et al and they concluded that incidental appendectomy is not required. This was also confirmed by a survey by Neulander et al on incidental appendectomy being performed during radical cystectomy among urologist in the United States and the results showed that most of them did not perform it. A retrospective study by santhosi et al on the indication of incidental appendectomy during radical cystectomy showed no advantage of performing this procedure. The results from all these three studies showed that incidental appendectomy need not be performed during radical cystectomy [21–23].

There are some studies that favor performing incidental appendectomy as this was evaluated by Huttenbrink et al who performed this procedure during a robotic assisted laparoscopic prostatectomy and the results of this study showed that incidental appendectomy can be considered as it is associated with reduced

complication, and it eliminates the risk of future appendicitis [24].

Exner et al investigated the role of incidental appendectomy during surgery for colorectal cancer in his retrospective study. A total of 380 patients who underwent incidental appendectomy were done and there were no complications, and the cost was negligible. This study showed that incidental appendectomy can be safely done to prevent future complications [25].

The conclusion from all these studies showed that incidental appendectomy is still being performed on pediatric patients, but in adults, it is being performed in transplant surgeries and colorectal surgeries. Incidental appendectomies are not performed in urological surgeries. The drawback from these studies was that they were retrospective in nature.

2.3 Histopathological Examination of the Incidental Appendectomy Specimen

Birua et al conducted an observational study on the histopathological examination of the incidental appendectomy specimen on patients who had undergone laparotomy and the results showed that 74% of the macroscopic appearance were normal and microscopic examination was normal in 82% of the cases. 26% of the cases showed macroscopic features of inflammation, fibrosis, luminal obstruction and fecalith appearance. This confirmed that incidental appendectomy is indicated and should be done in patients who are undergoing surgery for other conditions like gynecological, urological, and other procedures [26].

Akbulut et al retrospectively assessed the histopathological specimen of 72 patients who underwent incidental appendectomy during liver transplant surgery and 72.2% of the specimens were normal, 9.7% fibrous obstruction and 6.9% acute appendicitis. These findings were compared to patients with acute appendicitis where only 6.3% of the histological findings were normal findings. This study showed that incidental appendectomy should be performed during major surgery [27].

A retrospective study by Singhal et al evaluated the histopathological examination of patients who had undergone appendectomy. Of the 190 appendectomy specimens, 58.2% of female patients had a macroscopically normal appendix compared to 28.8% of male patients. On further examination of the specimens in the female patients in up to 50% of the patients had other pathologies like serositis, luminal inflammation and lymphoid hyperplasia. This study concluded that incidental appendectomy should be performed in female patients who are undergoing other surgical procedures [28].

The importance of histological evaluation of the appendectomy specimen was highlighted by jones et al in their retrospective study where 1225 specimens were evaluated and 77% had features of acute appendicitis and 23% were normal.16% of the normal specimens had an atypical histology like, endometriosis, luminal obstruction, and chronic inflammation. This study highlighted the importance of histological examination of the appendectomy specimen [29].

Tartagila et al retrospectively evaluated the microscopic appearance of the incidental appendectomy specimen in patients who had undergone diagnostic laparoscopy for abdominal pain and the appendix had appeared normal. The study revealed that 76% of the appendix specimens revealed microscopic appearance of inflammation in most cases and normal appearance was seen in only 24% of the cases. As there was morbidity in only 2% of the cases, incidental appendectomy should be performed during diagnostic laparoscopy [30].

Obahiaghon et al evaluated the histopathology of the incidental appendectomy specimen retrospectively.129 incidental appendectomy specimens were evaluated and up to 58.1% showed abnormal pathology with acute inflammation being the most common pathology encountered. This study showed the importance of performing and incidental appendectomy [31].

The conclusion from all these studies was that the incidental appendectomy specimen should be sent for histological evaluation.

The histological analysis of the incidental appendectomy specimen by Tartaglia et al

2.4 The Use of the Appendix during Reconstructive Surgery

There has been a case for not performing an incidental appendectomy as the appendix can be used in certain surgical procedures. The Mitrofanoff procedure where the appendix is tunneled subcutaneously to the bladder and

Table 1. The histological analysis of the incidental appendectomy specimen by Tartaglia et al

N=numbers	Histological specimen	percentage
109	Catarrhal appendix	66
8	Phlegmonous appendicitis	5
5	Sclerotrophc appendix	3
3	Neuroendocrine lesion of the appendix	2
39	Normal appendix	24

brought out on to the anterior abdominal wall. This procedure was done for pediatric patients with neuropathic bladder and is one of the most common indications for clinical use of the appendix. The assessment of the histology of the appendix specimen is also important when performing this procedure [32,33].

In addition, the appendix can be used as a graft for ureteral interposition for both the upper or lower ureter in pediatric patients or in conditions where an ureteroureterostomy is not possible. Another indication is in pediatric patients who have a neurogenic bladder whereby an appendicovesicostomy is done to facilitate catheterization of urine [34,35].

2.5 The Cost Effectiveness of Interval Appendectomy

Albright et al conducted a retrospective study on the cost effectiveness of interval appendectomy during various abdominal surgeries. A total of 341 patients had undergone an interval appendectomy. The cost benefit was seen in patients above the age of 45 years for benign disease and in patients above the age of 50 years for malignant disease. Interval appendectomy can be safely performed with no additional cost reimbursement to the surgeon [36].

The incidence and cost of incidental appendectomy was reviewed by Sugimoto and newhall as a means of preventing future acute appendicitis. Both studies concluded that incidental appendectomy was cost effective in younger patients [37,38].

The conclusion from these studies was that incidental appendectomy was cost effective and does not lead to any additional cost to the patient.

3. CONCLUSION

Based on the available evidence the role for incidental appendectomy is slowly being phased out, with more surgeons opting not to perform this procedure. The risk of developing acute appendicitis and post-operative infections is low but incidental appendectomy has been suggested to be performed in patients between the age of 30 to 50 years of age. It should not be routine to perform an incidental appendectomy in all patients who undergo a laparotomy. The decision to perform an incidental appendectomy should take into consideration the age of the patient, the diagnosis, and co-morbidities of the patient. The use of laparoscopy has made it possible to visualize the appendix and decide if an incidental appendectomy is indicated. The reduced morbidity, stay in the hospital and post operative pain has made laparoscopic incidental appendectomy favored by surgeons. For young female patients it is better to perform an incidental appendectomy to prevent future attacks of appendicitis.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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