

An analysis of appendectomies performed in a Labrador general surgery practice

Colin Clarkson, MD

General Surgery Resident, Memorial University of Newfoundland, St. John's, Nfld.

G. Narsing Pradhan, MD, FRCS(Ed), FRCSC

General Surgeon, Health Labrador Centre, Happy Valley–Goose Bay, Nfld.

Correspondence to:
Dr. Colin Clarkson,
155 Forest Road, Unit 30,
St. John's NL A1A 1E7

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Introduction: The main objective of our study was to determine the rates of negative appendectomies and perforated appendices at the Labrador Health Centre, and make a comparison with the rates published in the literature.
Methods: The study population consisted of all patients who underwent appendectomies during the 5-year period ending Apr. 3, 2006. The number and rates of negative appendectomies and perforated appendices were determined for each age and sex category.
Results: Of the 64 patients who were included in the study, 11% were found to have undergone negative appendectomies and 27% had perforated appendices. There was a clear trend toward decreasing perforation rates with increasing age as well as a trend toward increasing negative appendectomy rates with increasing age.
Conclusion: The rates of negative appendectomies and perforated appendices at the Labrador Health Centre are comparable with those published in the literature. Trends found in the data will help to guide future improvements in patient management.

Introduction : Notre étude visait principalement à déterminer les taux d'appendicectomie négative et d'appendice perforé au Centre de santé du Labrador et à les comparer avec les taux publiés dans la littérature scientifique.
Méthodes : La population étudiée était constituée de tous les patients ayant subi une appendicectomie au cours de la période 5 ans terminée le 3 avril 2006. Nous avons déterminé, pour chaque catégorie d'âge et chaque sexe, le nombre et le taux d'appendicectomies négatives et d'appendices perforés.
Résultats : Sur les 64 patients qui ont été inclus dans l'étude, on a constaté que 11 % avaient subi une appendicectomie négative et 27 %, un appendice perforé. Il y avait une tendance claire à la diminution des taux de perforation avec l'âge, ainsi qu'une tendance à l'augmentation des taux d'appendicectomie négative avec l'âge.
Conclusion : Les taux d'appendicectomie négative et d'appendice perforé au Centre de santé du Labrador se comparent à ceux qu'on a publiés dans la littérature scientifique. Les tendances révélées par les données aideront à guider des améliorations futures de la prise en charge des patients.

Introduction

Appendectomy is one of the most common abdominal operations performed on an emergency basis,[1–3] with an overall lifetime occurrence reported to range from 12% to 25%.[2] Diagnosing appendicitis can be difficult given the many potential causes of abdominal pain. However, delays in the diagnoses of acute appendicitis are associated with increased morbidity and mortality rates.[1] The use of diagnostic imaging in cases of suspected appendicitis has increased in recent years, with CT and ultrasonography (US) being the most commonly used modalities.

There are many articles in the literature addressing the usefulness of CT and US in diagnosing appendicitis, and the relative role each should play. Recent review articles and large trials

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suggest that CT is probably more accurate than US for diagnosing appendicitis in adults and adolescents.[1,3] The sensitivity and specificity reported for CT range from 90% to 100% and 91% to 99%, respectively, with US sensitivity and specificity reported as 75%–90% and 81%–100%, respectively.[1,3] The overall accuracy of CT has been reported to range from 93% to 100%, and that of US from 71% to 97%.[1,2]

Despite these relatively high reported rates, the diagnosis of appendicitis remains difficult to make at times. Variations in patient age, ability to cooperate, body habitus, the presence of pregnancy and the availability of CT and US, as well as the availability and skill of trained operators all have an effect on the ease with which a diagnosis can be made. Additionally, it is widely accepted that some diagnoses of acute appendicitis should be made purely on clinical grounds, and in those cases, operative intervention should not be delayed for the sake of imaging.

Given the difficulty of diagnosing appendicitis and the increased rates of morbidity and mortality associated with a delay in treatment, surgeons are often faced with a "statistical trade-off." If they are quick to take suspected cases of appendicitis to the operating room, the rates of negative appendectomy will be high. Along with this come the risks associated with general anesthetic and abdominal surgery, and the potential for delayed diagnoses of the true cause of the abdominal pain. In order to keep these risks to a minimum, the surgeon may instead opt for a more conservative approach to cases of suspected appendicitis, delaying the operation until a more definitive diagnosis can be made. Unfortunately, this method of lowering the rate of negative appendectomies may bring with it a subsequent increase in the rate of perforated appendices and, therefore, an increase in the rates of associated morbidity and mortality.

The main objective of our study was to determine the overall rates of negative appendectomies and perforated appendices at the Labrador Health Centre as well as the rates within specific age and sex categories. These rates were then compared with rates published in larger studies. This will serve as a quality analysis and the data may enable staff to focus on specific areas to improve patient care. The rates of negative appendectomies and perforated appendices determined in our study of a small northern community hospital will also be useful for future researchers to use as a comparison.

Methods

Our study was carried out at the Labrador Health Centre, which is located in Happy Valley–Goose Bay, Newfoundland and Labrador. The hospital usually maintains 28 beds, and in addition to serving the local population of about 8000 people, it serves a further 6000 people who live in the outlying coastal communities. There are a number of family physicians, 1 general surgeon and 1 obstetrician–gynecologist staffing the hospital, with other visiting specialists coming periodically.

Our study was a retrospective chart review. The study population consisted of all patients who underwent an appendectomy at the Labrador Health Centre during the 5-year period ending Apr. 3, 2006.

Patients were classified either as having a perforated

Table 1. Combined data for male and female patients, showing the number and rate of negative appendectomies and perforated appendices, grouped by various age categories

Age category, yr	Negative appendectomy	Perforated appendix	Total no. of appendectomies	% negative	% perforated
0–4	0	1	1	0	100
5–9	0	2	4	0	50
10–14	1	4	12	8	33
15–19	2	5	19	11	26
20–24	1	0	9	11	0
25–29	1	0	2	50	0
30–34	2	0	7	29	0
35–39	0	0	3	0	0
40–44	0	3	4	0	75
45–49	0	0	0	—	—
50–54	0	2	3	0	67
≤ 19	3	12	36	8	33
≥ 20	4	5	28	14	18
Total	7	17	64	11	27

appendix (noted at operation), a negative appendectomy (normal-appearing appendix at operation, subsequently confirmed by histology) or an inflamed appendix (either noted grossly during the operation or with subsequent histology). The number and rates of negative appendectomies and perforated appendices were determined for each age and sex category. Seven relevant articles focusing on rates of perforated appendices and negative appendectomies were reviewed and compared with our study.

Results

A total of 65 patient names were collected from the operating room log book. One patient was subsequently excluded from the study as there was no pathology report available. The main results of the study are organized in Table 1, with Table 2 and Table 3 showing the results for females and males separately. The overall negative appendectomy rate was 11%, with a 27% rate of perforation. Table 4 summarizes the demographics of the patients in the cohort studied, with Table 5 summarizing the operative findings in the 7 patients who were ultimately determined to have normal appendices.

Key points from the relevant articles have been summarized in Table 6, along with some of the data collected in our study.

Discussion

Seven relevant articles

The published rates of negative appendectomies

Table 2. Data for female patients showing the number and rate of negative appendectomies and perforated appendices grouped by various age categories

Age category, yr	Negative appendectomy	Perforated appendix	Total no. of appendectomies	% negative	% perforated
0–4	0	1	1	0	100
5–9	0	1	2	0	50
10–14	1	2	8	13	25
15–19	1	1	9	11	11
20–24	0	0	1	0	0
25–29	0	0	0	—	—
30–34	2	0	6	33	0
35–39	0	0	1	0	0
40–44	0	1	1	0	100
45–49	0	0	0	—	—
50–54	0	1	1	0	100
≤ 19	2	5	20	10	25
≥ 20	2	2	10	20	20
Total	4	7	30	13	23

Table 3. Data for male patients showing the number and rate of negative appendectomies and perforated appendices grouped by various age categories

Age category, yr	Negative appendectomy	Perforated appendix	Total no. of appendectomies	% negative	% perforated
0–4	0	0	0	—	—
5–9	0	1	2	0	50
10–14	0	2	4	0	50
15–19	1	4	10	10	40
20–24	1	0	8	13	0
25–29	1	0	2	50	0
30–34	0	0	1	0	0
35–39	0	0	2	0	0
40–44	0	2	3	0	67
45–49	0	0	0	—	—
50–54	0	1	2	0	50
≤ 19	1	7	16	6	44
≥ 20	2	3	18	11	17
Total	3	10	34	9	29

and perforated appendices vary widely (Table 6). The literature reviewed here showed negative appendectomy rates of 3.03% to 15.5%, and rates of perforation ranging from 16% to 35.08%. The rates found at the Labrador Health Centre are well within these ranges, with a negative appendectomy rate of 11% and a 27% rate of perforation. The literature shows a clear trend of decreasing perforation rates with increasing age, at least until early adulthood. This trend is also present in our data, with perforation rates of 33% in patients 19 years of age and younger, and 18% in patients 20 years of age and older.

Published perforation rates appear to be similar for female and male patients. In our study, the rates differed by 6%, with the perforation rates of 23% and 29% for female and male patients, respectively. Another trend that is present in our data, which is not apparent in the literature, is that our negative appendectomy rate increases with age, from 8% in patients younger than 19 years old to 14% in patients 20 years of age and older. This trend is present in both the male and female patient groups.

There are some limitations to this study. The relatively small number of patients within each of our various age and sex stratified subgroups makes it difficult to draw firm conclusions about perceived differences. Additionally, there are variations in the literature with respect to patient demographics, subgroup analysis and study findings, and this makes direct comparison difficult.

Table 4. Age range and mean age of patients with perforated and inflamed appendices

Cohort demographics	Age range, yr	Mean age, yr
Perforated		
Male	5–53	23.3
Female	4–53	21.3
Combined*	4–53	22.5
Inflamed		
Male	8–52	23
Female	8–39	19.6
Combined*	8–52	21.4

*Combined refers to data from both females and males.

Table 5. Summary of operative findings in patients who were classified as having normal appendices

Findings	No. of cases
Perforated jejunum	1
Ruptured ovarian cyst	1
Possible small bowel gastroenteritis	1
No pathology visualized	1
Mesenteric adenitis	2
No findings recorded	1
Total	7

Conclusion

In conclusion, of the 64 patients who were included in this study, 11% underwent negative appendectomies and 27% had perforated appendices. These rates at the Labrador Health Centre are comparable with those published in the literature. Trends found in the data may help to guide future improvements in patient management and will serve to assist future researchers looking for a comparable study population.

Competing interests: None declared.

Table 6. Summary of the published rates of negative appendectomies and perforated appendices reported in various categories

Study	Category	Negative, %	Perforation, %
Jablonski and Guagliardo[4]	Age 4–8	—	42
	Age 15–18	—	25
	Age 4–18	—	31
Ponsky et al[5]	Age 5–17	3.03	35.08
Bendeck et al[6]	Combined	9	25
	Males < 16	7	30
	Females < 16	22	31
	Males ≥ 16	4	25
	Females ≥ 16	11	23
York et al[7]	Nonimaged ages 2–17	4.4	14.6
	Imaged ages 2–17	10.4	15.1
Flum et al[8]	Combined	15.5	
Hale et al[9]	Combined	13	21
	Age ≤ 8	—	38
	Age ≥ 9	—	18
	Age ≥ 45	—	49
	Age ≤ 44	—	18
Temple et al[10]	Age ≥ 16	14	16
Current study	Combined	11	27
	Age ≤ 19	8	33
	Age ≥ 20	14	18
	Females all ages	13	23
	Females ≤ 19	10	25
	Females age ≥ 20	20	20
	Males all ages	9	29
	Males ≤ 19	6	44
	Males age ≥ 20	11	17

Note: Ages listed in years.
*Combined refers to data from males, females and all ages.

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