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Audit of appendicectomies at Frere Hospital, Eastern Cape

A. D. ROGERS, M.B. CH.B.
M. I. HAMPTON, M.B. CH.B.
M. BUNTING, M.B. CH.B., F.C.S. (S.A.)
A. K. ATHERSTONE, M.B. CH.B., F.R.C.S. (GLAS.)
Department of Surgery, Frere Hospital, East London, E Cape

Summary

Objective. We sought to evaluate the surgical service in the central part of the Eastern Cape Province by reviewing the practice of appendicectomy at Frere Hospital. Specifically, it was our aim to compare the service to those patients who reside in and outside the East London metropolitan area and the outcomes of patients according to their operative finding.

Patients and methods. A retrospective study was performed on the medical records of all patients who underwent appendicectomy in a 26-month period. This entailed a thorough review of demographic factors, mode of presentation, operation factors and findings, and the postoperative course.

Results. In the study period, 436 appendicectomies were performed, of which 81% were performed after hours, with a consultant surgeon present in only 6% of cases. Of the group, 51% had a perforated appendix at surgery, and 12% a normal appendix. There was a significantly increased risk of perforation at the extremes of age and in patients from outside East London (63% v. 35% in East London). Those with perforated appendices stayed an average of 7.3 days in hospital, compared with 5 days for those with earlier appendicitis. Of the perforated group, 21% developed a complication, with 86% of all complications occurring in this group. The hospital stays were longer in those perforated appendices that were drained (10.7 days v. 6.1 days), and the rate of complications higher in this subgroup. Four patients died (1%) – all in the perforated group.

Discussion. The perforation rate in our setting is significantly higher than other published results. Patients with perforated appendices have longer hospital stays and are more likely to develop significant complications, including re-operation. Patients from outside East London, males and those at the extremes of age are more likely to have perforated appendices. This study lends little support to the advocates of drains, and recommends the use of non-absorbable sutures for skin closure. The majority of procedures are performed after hours by medical officers and registrars, but there is no evidence to suggest that this practice be altered, particularly in light of the high perforation rate. The main factor identified as contributing to the huge discrepancy between perforation rates (and hence morbidity) is delay in presentation to the operating surgeon for the region. Patient factors may contribute, but service factors are regarded as significant, including poor access to clinics and hospitals, transport and ambulance services, and the expertise of the referring medical staff. The need to improve the quality of patient care in the under-serviced rural areas of the Eastern Cape is highlighted.

'… formerly little more than a labour reservoir and a homeland of endemic ill-health'. (President Thabo Mbeki, 2004)

The Eastern Cape is the second-largest province and home to 14.6% of South Africa's population. Of these 6.4 million people, 45% are younger than 15 years, and 63.4% reside in a rural area.[1,2] The Eastern Cape ranks last in many categories of socio-economic development. More than half (54.6%) of the potentially economically active population in the Eastern Cape are unemployed (national average 41%). Only 52.3% of the population has the use of electricity (national average 63.5%) and only 62.4% have access to tap water. These factors contribute significantly to the burden of disease in the province. In addition, the Eastern Cape has less than a third of the number of medical practitioners employed in the Western Cape, for instance, and 15 times fewer specialists for the population.[1,2]

Frere Hospital is one of two hospitals that together constitute the East London Hospital Complex (ELHC), which supplies specialist medical care (including virtually all surgery) to the largest of three regions in the province. This large geographical area (incorporating the Amatole, Chris Hani and Ukhahlamba district municipalities) is home to 44% of the Eastern Cape population.[2]

Appendicectomy is the most common non-trauma-related emergency surgical procedure at Frere Hospital. We undertook a retrospective study of appendicectomies, believing it to be an excellent means of evaluating the surgical service as a whole in this region.

Studies from the developing world are important not just to improve the practice of medicine locally, but also to contribute to the international debate regarding the precise aetiology of the disease, which has remained elusive. Appendicitis also continues to evade the diagnostic acumen of the most experienced surgeons and the various advances in radiology.

While appendicitis may be a common emergency in our setting, its incidence is believed to be significantly lower than

that in First-World settings. The incidence in the UK, for instance, is believed to be about 52 per 100 000 population, whereas studies from South Africa have suggested an incidence of less than 9 per 100 000. Urbanisation and diets higher in refined sugars and lower in fibre have been hypothesised to account for the differences.[3-5]

In First-World settings, the mortality rate is now about 0.1%, whereas Third-World settings have stated mortality rates several times this number, ascribing the difference to delay in presentation and poor service provision.[3,6,7]

The mortality and morbidity rates are proportional to the number of perforated or ruptured appendices in one's practice. Several centres around the world have published their negative and perforated appendix rates (Table I). It is still widely believed that a negative rate of between 10% and 20% is acceptable in order to minimise the incidence of perforation with its increased morbidity. Perforation rates have ranged from 20% to 30%, and still higher with longer durations of symptoms before surgery.[7,8]

Materials and methods

The medical records of patients undergoing appendicectomy at Frere Hospital from 16 September 2003 to 16 November 2005 (a 26-month period) were collected. Cases were identified by review of the hospital operating theatre logbooks. Records were retrieved in 91% of cases. Histology and pathology reports were also studied.

A total of 436 appendicectomies were performed during the period. Thirty-six patients were excluded on the basis that the medical notes were either incomplete or could not be retrieved. We evaluated two main outcome measures (length of hospital stay and complications), operation factors (time of the procedure and grade of operating surgeon), as well as patient factors (home address and age at operation). Particular emphasis was placed on evaluating the effect that patient factors had on the operative finding. Operative findings were divided into normal appendix (including other pathologies), inflamed (any degree prior to perforation), and perforated. The effect of the operative finding on outcomes was also closely examined.

Data were collected in the form of categoric and continuous variables, and analysed where appropriate. Descriptive statistics are used throughout.

TABLE I. PERFORATION AND NEGATIVE RATES FROM AUDITS AROUND THE WORLD

City	Perforation	Normal
East London, 2007	**51%**	**12%**
Durban, 1998[9]	**43%**	**9%**
Johannesburg, 1997[4]	**22%**	**21%**
Kumasi, Ghana, 1996[10]	**39%**	**26%**
Lahore, 2005[11]	**-**	**5.9%**
Pondicherry, India, 2004[12]	**43%**	**2.6%**
Wellington, NZ, 2006[13]	**14%**	**21%**
Washington, 1997[8]	**21%**	**13%**
Reading, UK, 1993[14]	**18%**	**15%**
Los Angeles, 1997[16]	**28%**	**9%**
Sydney, 1999	**17%**	**20%**
Calgary, 1995[5]	**16%**	**14%**

Results

Demographics and presentation

During the 26-month period, 436 patients underwent appendicectomy (17 per month, 200 per year). Sixty-two per cent of the patients were resident outside East London. The remaining 38% were resident in East London (including Mdantsane). The mean age of the patients was 20.4 years (range 2 - 73), and 42% were aged between 11 and 20 years (Fig. 1). There were 204 males and 196 females.

Anorexia, right iliac fossa pain and vomiting were the most common presentations. Peri-umbilical pain and diarrhoea were rarely noted. There was a significantly higher incidence of appendicitis in the summer months (Fig. 2). The average length of history was 3.4 days. Patients who proved to have perforated appendices had a longer history (3.8 days v. 2.4 days). The average leucocyte count was 16.4 x 10^9/l in the perforated group, 14.4 in the inflamed group and 12.9 in the normal group.

The operation

Eighty-one per cent of the procedures were performed between 16h00 and 08h00 (Fig. 3), and as many as 27% after midnight. Only 19% were performed between 08h00 and 16h00. In the majority of cases, the most experienced surgeon present was either a medical officer or a registrar (30% and 55%, respectively). In only 6% of cases was a consultant surgeon present (Fig. 4). Of all the procedures, 82% were completed in less than an hour (Fig. 5).

In 82% of the procedures, access to the abdomen was achieved by an incision restricted to the right iliac fossa. No

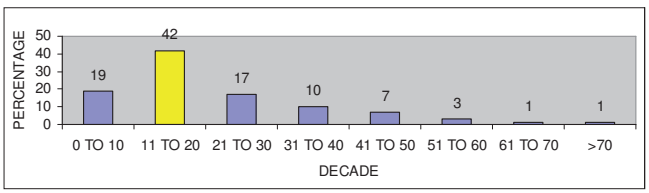

Fig. 1. Age of patients.

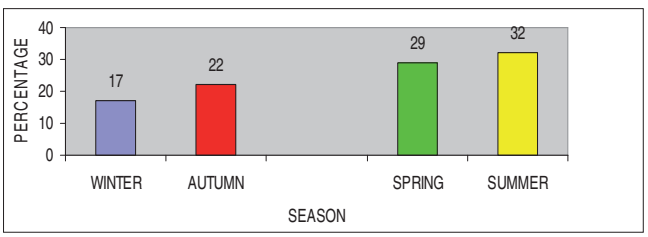

Fig. 2. Appendicectomies by season.

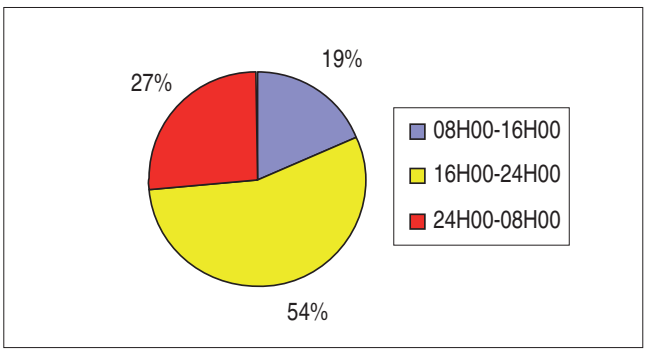

Fig. 3. Time of day of operation.

patient underwent laparoscopic appendicectomy. Twelve per cent of the patients were assigned a diagnosis of normal appendix; acute appendicitis accounted for 37% of cases, and perforated appendicitis for 51% (Fig. 6). There was a significantly increased risk of perforation at the extremes of age (<10 and >50 years) (Fig. 7) and in patients from outside East London (p<0.05) (Fig. 8).

Females had a significantly higher rate of normal appendices and a lower rate of perforation (Fig. 9). The most common causes for removal of normal appendices were pelvic inflammatory disease, right ovarian cysts, urinary infections, roundworm infestation, tuberculosis and hydatid disease. Several patients with clinically normal appendices had histological evidence of inflammation. Faecoliths were also present in the lumen of some of the patients with normal-looking appendices.

Drains were used in 18% of all cases, and in 28% of the perforated group. Nylon was used for skin closure in 67% of cases, and subcuticular vicryl in 30%. Intra-operative cultures were obtained in 55% of cases, and 96% of cases isolated a pathogen, most commonly *Escherichia coli*, *Enterococcus* and other *Streptococcus* species, and *Bacteroides* species.

Postoperative course

The mean length of hospital stay was 6 days (range 2 - 63). The patients from outside East London stayed 6.5 days on average, whereas those from East London stayed an average of 5.4 days (p=0.3). Those with perforated appendices stayed an average of 7.3 days, and those with normal and inflamed appendices for 4.5 and 5 days, respectively (p=0.05) (Fig. 10).

The average length of intravenous antibiotic therapy was 4 days. Antibiotics were administered to 96% of the patients. The two regimens most commonly used were cefuroxime and metronidazole, or ampicillin, gentamycin and metronidazole.

Six per cent of the patients required at least one further operation, and 12.5% of the patients developed a significant complication. The complication rates, including re-operation and intra-abdominal sepsis, were markedly increased in those

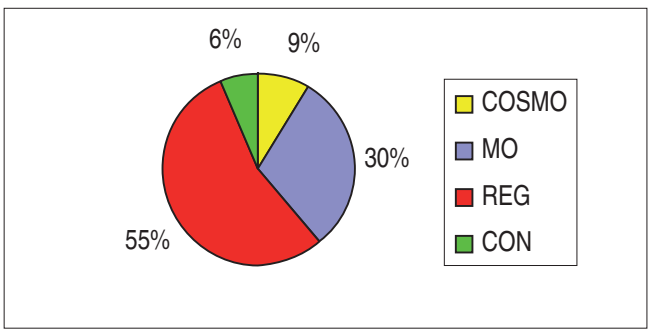

Fig. 4. Senior surgeon present.

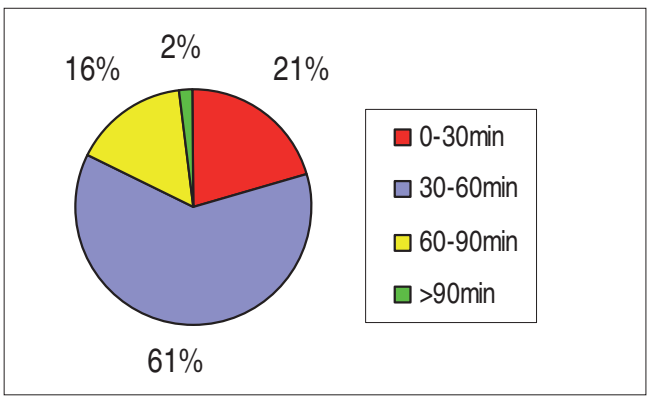

Fig. 5. Length of operation.

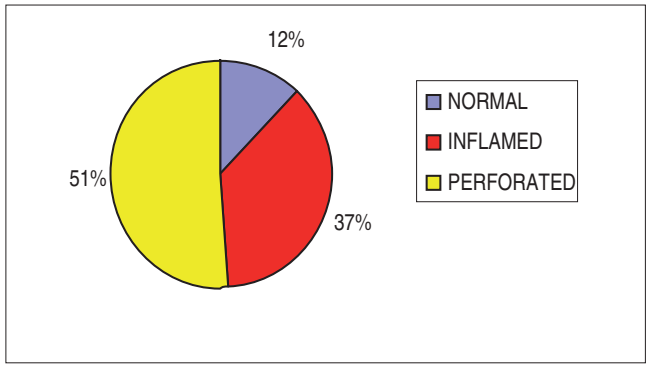

Fig. 6. Operative findings.

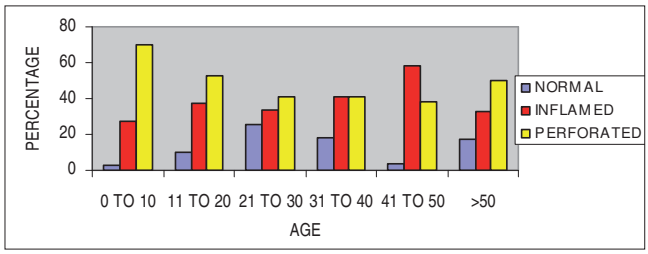

Fig. 7. Findings by age.

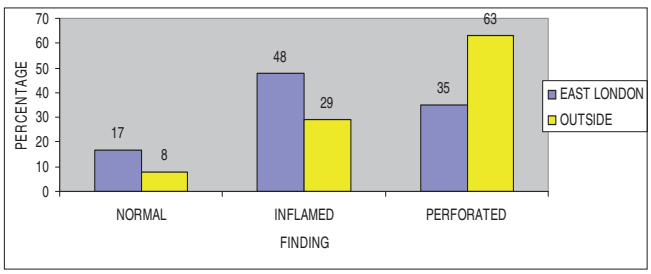

Fig. 8. Operative finding and patient address.

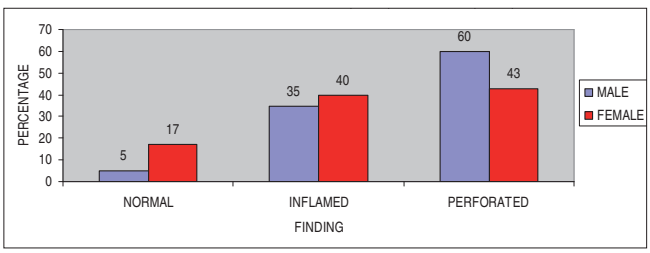

Fig. 9. Operative findings in men (N=204) and women (N=196).

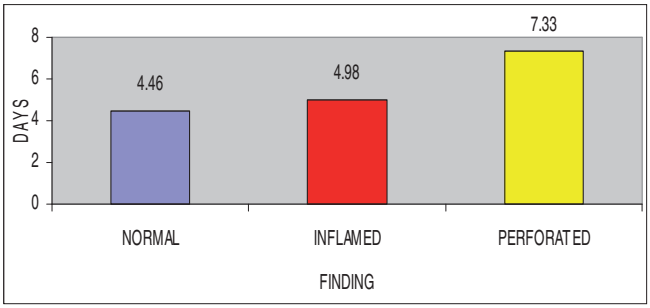

Fig. 10. Length of stay according to finding.

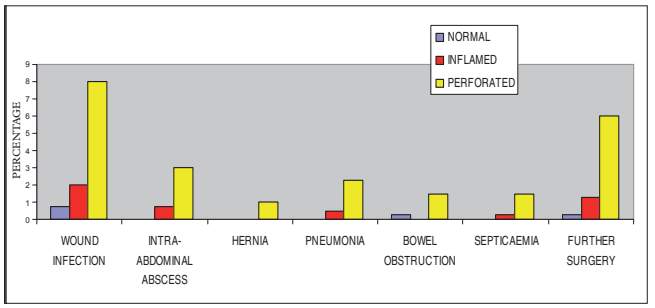

Fig. 11. Complications.

patients with perforation (Fig. 11). Of the perforated group, 21% developed a complication – 86% of the complications occurred in this group ($p<0.05$). The most common significant complication was major wound infection. Other prominent complications documented included pneumonia, bowel obstruction, intra-abdominal abscesses, and incisional hernias. There was no correlation between time of day of the procedure and the complication rate or length of stay.

Hospital stays were longer for patients with perforated appendices where drains were used (10.7 days v. 6.1 days) ($p<0.05$). The complication rates (intra-abdominal abscess, wound infections, wound dehiscence and hernia) were also slightly higher in those who had drains. The major wound infection rate in those patients who had subcuticular skin closure (most often with vicryl) was higher than the nylon group, even though vicryl was seldom used for skin closure for the perforated group.

There were 4 deaths in the series (1%), all in the perforated group.

Discussion

Two hundred appendicectomies are performed annually at Frere Hospital, constituting an incidence of about 15 per 100 000 in the central part of the Eastern Cape Province. Frere Hospital appears to have a lower negative appendix rate (12%) and a significantly higher perforated appendix rate (51%) than appears in the literature.

The results of our audit lend little support to the advocates of drains, even in our setting of a high rate of perforations. We feel that it is preferable to extend the incision to permit adequate peritoneal lavage, and recommend that non-absorbable sutures such as nylon be used for skin closure, particularly following the removal of a perforated appendix.[16,17]

The majority of appendicectomies are performed after hours by trainees rather than consultants. There appears to be no evidence to suggest that appendicectomies be delayed so that they are done during 'office hours', particularly in light of the high perforation rate.

The complication rate is higher, and hospital stays longer, in the perforated group. These extend to both infectious and non-infectious complications, and to the need for further surgery. The most obvious means of reducing all costs associated with the disease is therefore by correcting the factors responsible for perforation.

Patients from outside East London, males and those at the extremes of age, are more likely to have perforated appendices. Several studies in the literature have showed that perforation rates in the paediatric population are very much higher than in the average population, probably related to inability to communicate in the young. In older patients, delayed presentation and a decreased index of suspicion may account for their increased perforation rates. Other studies have also demonstrated the altered perforation and normal rates between the sexes.

A 12% negative rate is probably acceptable in light of the epidemic of sexually transmitted diseases in our setting.

Delay in presentation to the operating surgeon appears to account for the majority of the perforated cases and the discrepancy between the operative findings in East London residents and those from outside. Significant contributory factors may include patient ignorance, the use of traditional medicine, poor access to medical services, inadequately staffed referral centres, and the ambulance system. No improvements in perforation rates, and consequently complication rates, have been noted since similar (unpublished) audits were conducted in this unit over the past 10 years. Several studies have made it clear that the presence of a competent health care team and access to care are more important than any advanced technology available.

Appendicitis is more likely to afflict young individuals. One can extrapolate that the service provision for older, immobile individuals, with other surgical illnesses, is even less adequate. We hope that this study adds to the impetus of initiatives to improve medical service provision in the Eastern Cape Province, particularly to under-serviced rural areas. We further hope that rationalisation at the three major health complexes will not be to the detriment of the service as a whole.

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