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Case Series of Acute Abdominal Surgery in Rural Sierra Leone

Samuel J. McConkey, M.B.

Nuffield Department of Medicine, Oxford University, Room 7501, John Radcliffe Hospital, Oxford OX3 9DU, UK

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In many poor countries of the world the need for surgical treatment of acute abdominal emergencies is largely unmet. In some cases this service is provided by physicians with little postgraduate surgical training, and there is a paucity of published data on the outcomes of this service. This series of sequential cases of acute abdominal surgical emergencies from a hospital in rural Sierra Leone illustrates the causes, outcomes, and challenges in this setting. All patients with an acute abdomen from September 1992 until September 1994 who required surgery were identified by review of theater records, ward books, and patients' notes. Altogether, 173 cases were identified. Operative diagnoses included ectopic pregnancy ($n = 43$), strangulated hernia ($n = 45$) 15 of which required bowel resection, appendicitis ($n = 15$), normal appendix ($n = 4$), uterine rupture ($n = 9$), perforated ulcer ($n = 8$), tubal or pelvic abscess ($n = 7$), volvulus ($n = 6$), and others. Ninety percent survived to discharge after a median postoperative stay of 9.2 days (range 7–127 days). Of the 18 deaths, 83% occurred during the first 3 days. Factors associated with poor outcome were ileal perforation due to typhoid fever and resection of bowel after a strangulated hernia. These results show that acute abdominal surgery can be done at the district level in poor countries using limited facilities by staff without extensive surgical training. The outcomes are comparable to those from larger centers.

In resource-poor countries many people die from untreated abdominal emergencies. It is difficult to attract highly trained, experienced surgeons to rural areas throughout the world. In poor countries this problem is accentuated because a large proportion of the population lives in rural areas. Hospitals that provide care for surgical emergencies in rural areas are staffed by generalists who may practice surgery, pediatrics, medicine, obstetrics, and public health and also have managerial responsibility. What sort of surgical problems are met in such a situation, and what happens?

This study presents a retrospective case series of emergency abdominal surgery in one particular rural hospital performed by medical staff without postgraduate qualifications in surgery. It is hoped that it will allow comparisons between settings and demonstrate the limitations and possibilities in one specific situation with a unique combination of material resources and staff.

Correspondence to: S.J. McConkey, M.B., MRC Laboratories, PO Box 273, Banjul, The Gambia, West Africa

Situations and Methods

This study was set in a rural mission hospital in Sierra Leone, West Africa over a 2-year period. The hospital provided primary care for the surrounding chiefdom of about 40,400 people and second-level health care for a much larger population. Most of the populace were subsistence farmers who planted rice, cassava, corn, and vegetables. Some artisan diamond mining and industrial extraction of bauxite and rutile took place in the broader hospital catchment area. Many of the patients walked to the hospital or were carried in a hammock suspended from a horizontal pole that rested on two porters' shoulders. Some patients arrived by ambulance from one of four referral clinic-hospitals based at a university college, two mining companies, and a health center.

Facilities

The 120-bed hospital began in 1950 as a health center and developed into a multidepartmental district-type hospital. There was a purpose-built operating theater, an electrical autoclave, suction apparatus, oxygen concentrator, diathermy, two tiltable operating tables, and eight general instrument packs. Ketamine, spinal 5% lignocaine, and local lignocaine were used for anesthesia. An adequate range of oral and intravenous antibiotics and intravenous fluids were available. Intravenous prophylactic antibiotics were used at induction of anesthesia for all potentially contaminated operations. Autotransfusion was used for most of the uncontaminated cases of ruptured ectopic pregnancy. A storage facility for grouped blood was not available, so relatives or paid donors were grouped and bled as required.

In 1994, after the period described in this study, the hospital was forced to close owing to nearby escalating attacks by rebels on civilians. Subsequently, the staff and local population have been displaced to other parts of the country, some staff and local people have been kidnapped, and the chief and many others have been killed; at least one staff member died because of perinatal complications, and the buildings have been looted. It is unclear what will happen in the future.

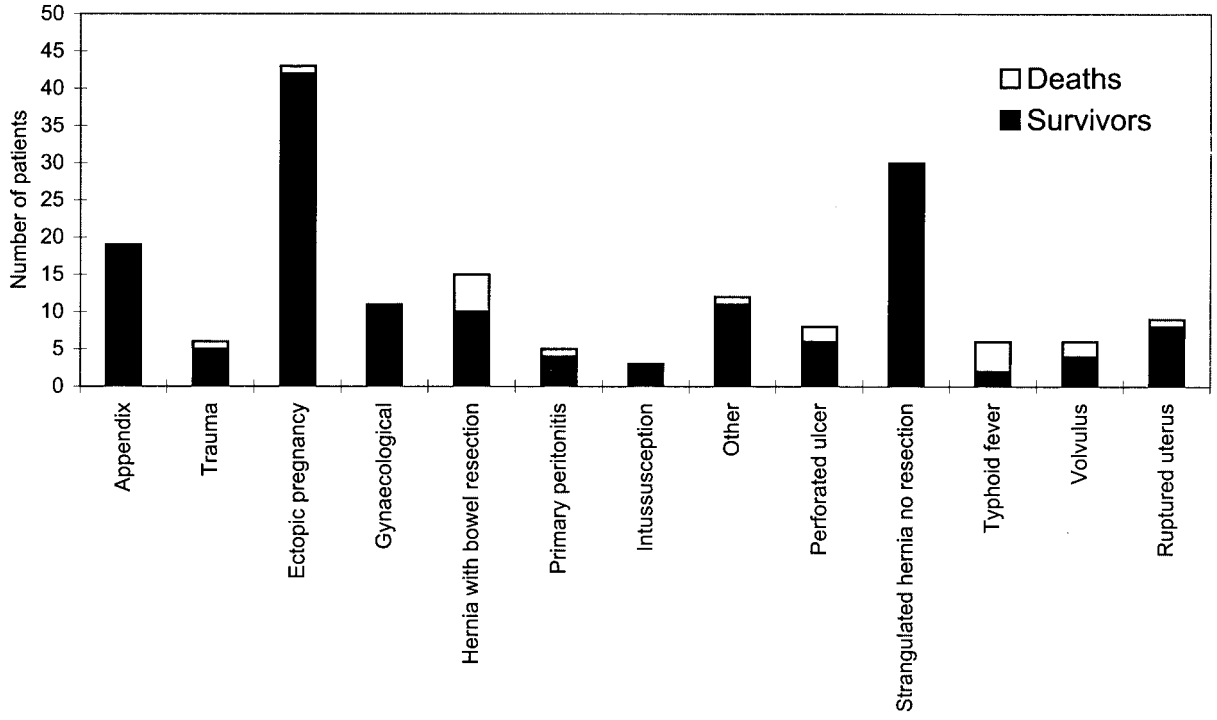

Fig. 1. Frequency and outcome of 173 subjects with an acute abdomen, by diagnostic category.

Staff

The operating theater was staffed by nurses and nurse aides with many years' experience. Anesthetics were administered by one of the nurses. During the study period there were one to four doctors serving the hospital at a time, and their length of stay ranged from 4 months to 2 years. Each had 2 to 4 years of prior postgraduate experience in the United States or Europe in family practice, pediatrics, or general medicine; none had completed formal surgical training.

Data Collection and Analysis

The discharge diagnosis, age (approximated), gender, length of stay, hospital survival, and presence of postoperative wound infection were determined retrospectively from the patient's case notes, theater procedure books, and ward discharge summaries. A large number of the patients did not know their age, so they were categorized as "adult" or "child."

Statistical analysis was done using EPI INFO 5.01 [1] as a database.

Table 1. Diagnoses of patients who were not in a major diagnostic category.

Age[a]	Gender	Diagnosis	Alive	Length of stay (days)
Child	M	Bowel perforation	Yes	16
Adult	M	Small bowel stricture	Yes	15
Adult	M	Ischemic bowel infarction	No	3
Adult	M	Ruptured liver abscess	Yes	U
Adult	M	Abdominal cocoon	Yes	U
Adult	F	Obstruction due to adhesions	Yes	9
Adult	M	Obstruction due to adhesions	Yes	29
Adult	M	Obstruction due to adhesions	Yes	13
Adult	F	Obstruction due to postop. adhesions	Yes	8
Adult	M	Intestinal obstruction	Yes	9
Adult	F	Intestinal obstruction with resection	Yes	19
Adult	M	Bleeding duodenal ulcer	Yes	38

U: unknown.
[a]Child: not yet reached adult height; Adult: adult height.

Results

The most common surgical operations performed at the hospital at that time were elective hernia repairs (approximately 140 per annum) and emergency cesarean sections (100 per annum). A total of 173 emergency acute abdominal operations were performed over the 2-year period. The diagnoses and survivals are shown in Figure 1. Those listed under "Other" are shown in Table 1.

Ruptured ectopic pregnancy was the most common reason for emergency abdominal operation (43 cases, 24.9% of total operations). Of these 43 ruptured ectopic pregnancies, 9 were found in women from the local chiefdom.

There were a total of 45 emergency hernia operations, including 15 (33%) that required resection of bowel. Among the 19 cases of appendicular surgery, there were 4 (21%) appendices that were macroscopically normal; there were also 5 macroscopically inflamed appendices (26%), 5 (26%) ruptured appendices, and 5 (26%) appendicular abscesses. Nine patients with a ruptured uterus underwent surgery. Eight of the ruptures were secondary to

Table 2. Diagnoses of 173 acute abdominal emergencies in individuals in Sierra Leone, by gender.

Diagnosis at surgery	Females	Males
Strangulated hernia	2	43
Ectopic pregnancy	43	
Appendix	8	11
Gynecologic condition	11	
Ruptured uterus	9	
Perforated peptic ulcer		8
Typhoid fever	1	5
Trauma		6
Volvulus		6
Primary peritonitis	2	3
Intussusception	2	1
Others	3	9
Total	81	92

prolonged obstructed labor. One was due to improper instrumentation of the uterus during an illegal abortion procedure, and she required resection of about 1 meter of necrotic bowel that had herniated into the vagina. The range of gynecologic conditions ($n = 11$) included pelvic and tubal abscesses and two cases of abortion complications. The six cases of volvulus usually involved the sigmoid colon. One case of compound volvulus of the sigmoid colon and one of volvulus of the small intestine were seen. Injuries due to trauma included blunt trauma to the liver and spleen and bullet wounds to the bowel. Abdominal cocoon was seen in one man in his twenties. He presented with abdominal distension and subacute obstruction. At laparotomy the ileum and most of the jejunum was folded back and forth on itself and was contained in a thick, whitish membrane. The membrane was removed and the adhesions divided. This condition has been described previously in adolescent girls.

Females comprised 47.1% of the total patients in this series. Among them, 53.1% had a diagnosis of ruptured ectopic pregnancy, 11.1% had a ruptured uterus, and 7.4% had a pelvic abscess. The diagnoses for male and female patients are shown in Table 2. Ten patients were less than 14 years of age, and their diagnoses included typhoid perforation, appendicitis, intussusception, and trauma to the spleen or small intestine.

Outcomes and Survival

Overall, 18 patients died in hospital (10.4%). Their diagnoses are shown in Table 3. Typhoid perforation and strangulated hernia requiring bowel resection were associated with a worse outcome than other diagnoses ($p < 0.05$, Fisher's exact test). Six who died were in a critical state before surgery (e.g., septic shock, uremia, hypotension). In retrospect, some of those who died would probably have survived if more experienced staff and better facilities had been available. For example, one young man died from abdominal infection and wound dehiscence 14 days after surgery for a perforated peptic ulcer. Reluctance to reoperate and lack of abdominal imaging may have contributed to his death. Another patient had massive intraabdominal bleeding 24 hours after unilateral salpingectomy. The lack of surgical experience and of stored blood for rapid transfusion may have been significant factors.

Table 3. Diagnoses of patients who died.

Age	Gender	Diagnosis	Days in hospital
Adult	M	Strangulated hernia with resection	2
Adult	M	Strangulated hernia with resection	1
Adult	M	Strangulated hernia with resection	7
Adult	M	Strangulated hernia with resection	3
Adult	M	Strangulated hernia with resection	1
Adult	M	Peritonitis	2
Adult	F	Ruptured ectopic pregnancy	3
Adult	F	Ileal necrosis, typhoid fever	3
3 Years	M	Typhoid perforation	6
Adult	M	Typhoid perforation	3
Adult	M	Typhoid perforation	
Adult	M	Perforated gastric ulcer	14
Adult	M	Intestinal infarction	1
Adult	F	Ruptured uterus	2
Adult	M	Perforated duodenal ulcer	
Adult	M	Compound sigmoid volvulus	1
Adult	M	Sigmoid volvulus	3
Child	M	Ruptured spleen	1

Length of Stay

Figure 2 shows the number of days spent in hospital for the 120 of 124 subjects for whom this information is available. The bimodal distribution corresponds to survivors and nonsurvivors. The median and mean length of stay for survivors were 9.2 and 13.5 days, respectively, and for nonsurvivors 2.4 and 3.7 days, respectively.

Wound Infection

The rate of early wound infections in 38 consecutive patients was 18%. Unfortunately, no information on postdischarge wound infections was available.

Discussion

This paper describes an unusual case series from a unique location; there is no comparable series in the surgical literature. There are notable limitations in the methods. No measure of disease severity or acute physiology score was recorded. Such a measure would help make meaningful comparisons to the experience of other institutions. Late follow-up data on the outcomes are unavailable, and a significant number of wound infections may have been missed. The quality of the diagnostic data varies depending on the diagnosis. Conditions unmistakable at surgery, such as ruptured ectopic pregnancy, are most certainly correctly diagnosed. Other conditions are less certain. Some of the cases categorized as typhoid perforation did not have a classic history or presentation; and at surgery two cases revealed patchy transluminal necrosis of the terminal ileum and ascending colon separated by areas of friable bowel wall, with multiple perforations in the necrotic areas. Both of these patients had a 2-week history of low-grade fever. The correct diagnosis may have been of another illness, such as enteritis necroticans [2] or chemical toxicity.

Comparisons

This case series underscores the prevalence of untreated inguinal hernia in men in this population. The expense of surgery and

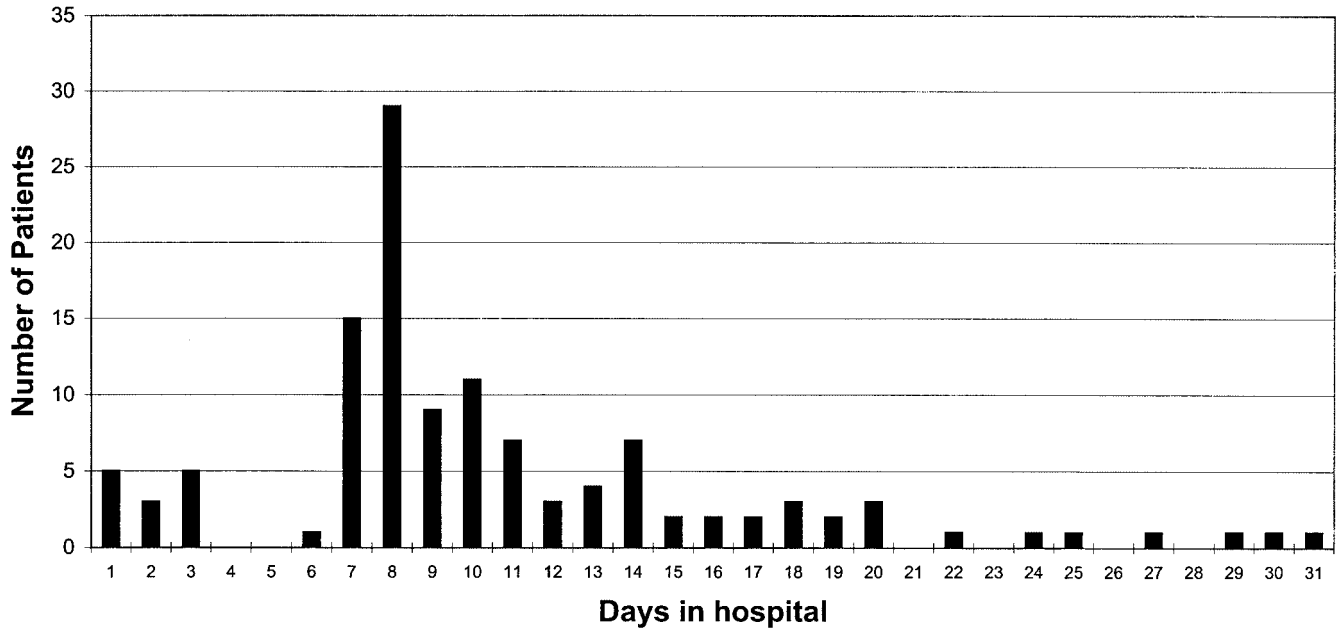

Fig. 2. Length of hospital stay of 120 subjects with an acute abdomen. Four additional subjects stayed longer than 31 days.

distance to a hospital are disincentives for elective repair. For many of the subsistence farmers, a period away from work may be impossible. That 33% of those who had acute hernia surgery required resection of necrotic bowel is a reflection of the severity at presentation. Some of the men had a history consistent with strangulation lasting 2 to 5 days before presentation to the hospital. The reasons for this are many, but, notably, transport is difficult and expensive. In University College Hospital, Ibadan, Nigeria between 1957 and 1966, approximately 22.5% of those with a strangulated hernia required resection of the intestine [3].

The prevalence of ruptured ectopic pregnancy in the community can be approximated from this series. The estimated population of the primary care catchment area in 1992 was 40,451 based on data from the 1985 census and the expected average annual population growth for Sierra Leone. The birth rate was 48 per 1000 population, so 1942 births could be expected each year. Assuming that all patients with ruptured ectopic pregnancy in the primary care area presented to the hospital then, the incidence of ruptured ectopic pregnancy is 2.3 per 1000 deliveries per year (95% confidence interval 1.1–4.4 per 1000 deliveries). The predominance of ruptured ectopic pregnancy in the series is striking. This diagnosis comprised 24.9% of all the operations and 53.1% of the surgery performed on women. Although this proportion is higher than results from Lagos, where only 5.2% of emergency abdominal surgery was performed for this diagnosis, the rate of ectopic pregnancy expressed as a proportion of total deliveries is lower than contemporary rates in the United States [4], where the rate of ectopic pregnancies in 1992 was 19.7 per 1000 reported pregnancies.

The overall mortality for all cases was 10%. As expected, it varies considerably with the diagnosis. There were no deaths due to appendicitis, strangulated hernias that did not require bowel resection, intussusception, or gynecologic cases. These results are similar to a 1988 series of cases of acute intestinal obstruction from a university teaching hospital in Accra, Ghana [5], which had a total mortality of 9.4%; however, the series from Accra was predominantly (59.8%) composed of strangulated hernias, with a bowel resection rate of only 10.6%. The overall mortality in a similar series from the same institution in Ghana during 1965 to 1967 was 11.5% [6]. Because the incidence of specific diagnoses varies in different reports, I focus here on the outcomes for each specific illness.

Comparisons for Specific Conditions

One death occurred in nine cases of a ruptured uterus (11%), a rate similar to those in other published series from Africa. Longombe et al., [7] working in eastern Zaire, reported a maternal mortality rate of 18.3% and perinatal mortality of 80.0% among 76 cases of ruptured uterus between 1980 and 1992. The occurrence of nine cases of ruptured uterus in Serabu during a 2-year period when there were only 629 admissions to the maternity ward and about 550 total deliveries indicate a high incidence of this condition; it corresponds to one rupture per 61 deliveries. The highest annual rate in the study from Zaire was one rupture per 96 deliveries. Eight of the nine women arrived at the hospital from other districts with an already ruptured uterus. This reflects a low level of primary maternity care and patchy availability of rapid operative delivery.

The mortality rate among women with a ruptured ectopic pregnancy was 2.3%. The one death was due to hemorrhagic shock caused by postoperative intraabdominal hemorrhage. The national mortality rate for ectopic pregnancies in the United States declined from 35.5 to 5.5 deaths per 10,000 ectopic pregnancies during the period 1970 to 1988 [8].

Mortality was high in cases of typhoid fever with perforation (66%) and strangulated hernia requiring bowel resection (33%). In view of these figures, there was a move toward nonoperative management of typhoid perforation in the hospital. The cause of death of many of patients with strangulated hernia was late pre-

sentation. Efforts to provide elective hernia repair on a wider scale and to promote recognition of strangulated hernia as a life-threatening surgical emergency by the population might improve the outcome.

The data on diagnosis reveal the large number of obstetric and gynecologic emergencies. Some are a reflection of the low level of health care available. For example, a ruptured uterus and a pelvic abscess could be prevented if good preventive and therapeutic care was available. This correlates with findings of others in India of high levels of untreated gynecologic diagnoses and complaints [9]. About half of the strangulated hernias were large direct hernias (data not shown), contrary to the accepted teaching that such hernias are unlikely to strangulate. The incidence of hernia seems to vary greatly in Africa, with high rates in Uganda and West Africa but lower rates in Zambia and southern Africa. This series does not provide good data on the incidence of hernia in the population. Appendicitis is unusual in this predominantly rural series compared to urban Nigeria.

The length of stay identifies three groups: those who died, those who had a good outcome, and those who had complications. The hospital stay for those with a good outcome is longer than it would be in Europe or the United States for a number of reasons. Most patients have to go home partly on foot. As travel for the purpose of returning for outpatient visits is expensive and difficult, it is better for the patient to stay locally until recovery is progressing satisfactorily and the sutures have been removed. Wound infection rates are high, although most of the operations were in either the contaminated or potentially contaminated category.

These results show one institution's experience in a rural area of a poor country without expensive facilities when surgery was done by general physicians who worked in an experienced unit with adequate basic facilities but a low level of supervision. The results illustrate the challenges and outcomes of complex, unusual surgical conditions. The particular institution described in this report has benefited in the past from the expertise of experienced general surgeons and surgical specialists who helped to train theater technicians, nurses, and general physicians and guided the development of the unit. This role for experienced surgeons in a health care system must be individualized to the specific situation but may expand in the future to address the huge unmet demand and requirement for surgery for life-threatening conditions in rural parts of poor countries. Issues of recognition and remuneration for such a contribution must be addressed. The provision of basic surgical-skills training on a much wider scale combined with the establishment and management of adequate surgical facilities could make a significant impact on the health of populations such as this one. The ready availability of rapid emergency cesarean section and emergency abdominal surgery can be considered a basic human need and should be available to all of us who inhabit this planet. How can we make this happen?

Résumé. Dans plusieurs pays en voie de développement dans le monde, le besoin de traiter les urgences abdominales aiguës n'est pas entièrement satisfait. Dans certains cas, les soins sont prodiqués par des médecins sans beaucoup de formation post-universitaire chirurgicale et il existe peu de publications faisant état des résultats dans ces services. Cette étude des urgences abdominales aiguës chirurgicales consécutives provenant d'un hôpital rural de Sierra Leone illustre les causes, l'évolution et les problèmes rencontrés dans ce scénario. On a identifié 173 cas d'abdomen aigu observés entre septembre 1992 et septembre 1994 ayant eu besoin de chirurgie en se servant de comptes-rendus opératoires, et des dossiers médicaux d'hospitalisation. Le diagnostic opératoire comprenait: une grossesse ectopique ($n = 43$), une hernie étranglée ($n = 45$) dont 15 qui ont nécessité une résection intestinale, une appendicite ($n = 15$), un appendice normal ($n = 4$), une rupture utérine ($n = 9$), une perforation d'ulcère ($n = 8$), un abcès tubaire ou pelvien ($n = 7$), un volvulus ($n = 6$), ou d'autres. 90% des patients ont survécu avec une durée médiane de séjour postopératoire de 9.2 jours (extrêmes 7–127 jours). Parmi les 18 décès, 83% se sont produits pendant les trois premiers jours. Les facteurs associés à une évolution néfaste étaient une perforation iléale ou une résection intestinale après hernie étranglée. Ces résultats montrent que la chirurgie de l'abdomen aigu peut se réaliser dans les pays en voie de développement avec des moyens limités sans formation post-universitaire extensive. Ces résultats sont comparables à ceux des autres centres plus importants.

Resumen. En los países más pobres del mundo no se logra un adecuado tratamiento quirúrgico de las emergencias abdominales agudas. En algunos casos los servicios son atendidos por médicos con poca capacitación quirúrgica de postgrado; es escasa la información publicada sobre los resultados de este tipo de servicio. La presente serie de casos consecutivos de emergencias quirúrgicas abdominales agudas en un hospital rural en Sierra Leone ilustra las causas, resultados y condiciones en este medio. La totalidad de los casos de abdomen agudo entre septiembre de 1992 y septiembre de 1994 que requirieron cirugía fueron identificados mediante la revisión de los registros operatorios, las historias clínicas y las notas de los pacientes. Ciento setenta y tres casos fueron identificados. Los diagnósticos operatorios incluyeron: embarazo ectópico ($n = 43$), hernia estrangulada ($n = 45$) que en 15 casos requirió resección intestinal, apendicitis ($n = 15$), apéndice normal ($n = 4$), ruptura uterina ($n = 9$), úlcera perforada ($n = 8$), absceso tubario o pélvico ($n = 7$), vólvulo ($n = 6$) y otros. Noventa por ciento de los pacientes sobrevivieron para ser dados de alta luege de una estancia postoperatoria media de 9.2 (rango 7–127) días. De las 18 muertes que se presentaron, 83% ocurrieron en los primeros 3 días. Los factores asociados con el deficiente resultado fueron: perforación ileal por fiebre tifoidea y resección intestinal luego de hernia estrangulada. Estos resultados demuestran que la cirugía abdominal aguda puede ser realizada en el nivel provincial en naciones pobres utilizando limitadas facilidades y por un cuerpo médico sin capacitación quirúrgica mayor. Tales resultados son comparables con los de la atención en centros de más alto nivel.

Acknowledgments

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