



Research article

Patient's characteristics, management practices and outcome of re-laparotomies in a tertiary hospital in Tanzania

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ARTICLE INFO

Keywords:

Surgery
Relaparotomy
Complications
Mortality
On-demand relaparotomy

ABSTRACT

Background: Relaparotomy is an important indicator of the safety and quality of laparotomy in any surgical setting. Despite this, its measure in many low- and middle-income countries is scarce, Tanzania included. Understanding its existence will help curb it and mitigate its adverse outcomes by systematic improvement strategies. This study, therefore, aimed to examine characteristics of patients undergoing on-demand relaparotomy and their management outcomes at a tertiary level hospital in Tanzania.

Methods: A cross-sectional descriptive study was carried out in the department of surgery of Muhimbili National Hospital for one year in 2017–2018. All patients (of all ages and sex) who required an on-demand relaparotomy within 60 days of their index laparotomy were identified for inclusion into the study. Data were collected regarding patient's demography, clinical characteristics, index surgical procedure, indication for relaparotomy, number of re-laparotomies, complications during re-laparotomy, ICU admission, and mortality. Data were entered into SPSS version 23 for analysis where continuous variables were summarized as means with standard deviations and categorical variables summarized as the frequency with proportions. Ethical approval for the audit was obtained from the Muhimbili University of Health IRB.

Results: A total of 101 patients had undergone relaparotomy, with a relaparotomy rate among those primarily operated at our hospital of 7.6%. Their mean age was 37 years with equal sex distribution. The leading primary procedure had involved bowel resection and anastomosis (47.5%) with anastomotic leak being the leading reason for relaparotomy (37.6%) followed by intra-abdominal collection (29.7%), bowel fistula (19.8%) and wound dehiscence (18.8%). Electrolyte imbalance was the leading complication among the patients (22.9%) followed by anemia (21.5%), wound infection (18.9%) and Septicemia (11%). The overall mortality of rate was 39.6%.

Conclusion: On-demand relaparotomy carries a high mortality and morbidity at Muhimbili National Hospital in Tanzania. Addressing predictors and improving post-operative services are urgently needed.

1. Introduction

Adaptation to surgery has been reported to last 60 days, during which time the body is reacting to the surgical stress. Therefore, a relaparotomy is one that is occurring within the adaptation period [1]. Two types of relaparotomy do exist in practice: planned relaparotomy (PR) and On-Demand relaparotomy (OD). Any surgery occurring outside this adaptation period is termed as repeated surgery. By comparison, the PR strategy does not offer any outcome advantage over the OD group save for the additional demand for ICU space by the former [2]. Furthermore, OD strategy has been shown to result in a reduction of the need for

re-laparotomies, and healthcare costs in general [3]. Moreover, societal costs of care are significantly reduced by the OD strategy [4]. This makes OD strategy to be very useful in our setting where healthcare costs are not fully covered for.

At MNH, the OD strategy has been much popular for the benefits described above and the shortage of ICU space further favored it. However, no study had evaluated its safety in our local context, especially concerning the outcome of the patients. This picture of lack of critical care resources for the critically ill meant that the surviving sepsis guideline cannot be implemented in Sub Saharan Africa including Tanzania [5, 6]: except with significant modification. In light of this

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development, we sought to study the characteristics and treatment outcome of patients requiring an OD relaparotomy strategy at our institution.

2. Materials and methods

2.1. Design and setting

This was an observational descriptive cross-sectional study carried out at Muhimbili National Hospital from March 2017 to April 2018. The hospital serves as the national referral level facility with over two thousand beds. It receives elective surgery cases from all over the country and emergencies from Dar es Salaam which has a population of 5million people and surrounding coastal region with a population of 1million people. The hospital serves teaching purposes for the Muhimbili University of Health and Allied Sciences which also has the oldest residency program in general surgery within the country. The emergency unit is well functioning with 16 intensive care beds shared with other units within the hospital. The hospital handles general surgical cases as well as emergency conditions daily in its different functional units within the department of surgery.

2.2. Study population

The study was set in a population of patients undergoing an emergency laparotomy at the hospital. Patients were included if they had a laparotomy which was closed primarily but needed a relaparotomy within 60 days of the previous surgery. Additional conditions were patients of any age and sex, including those operated outside our hospital.

2.3. Data collection

Emergency lists and operating logs were examined daily to identify any laparotomy: patients who met the inclusion criteria stated above had their case notes pulled for examination. Data was collected either when a death occurred or the patient was successfully discharged from the hospital. A structured data collection instrument was developed to capture the study variables. Variables collected included: demography, the procedure performed at index surgery, time of the day (AM/PM) when the index and first relaparotomy were performed, nature of index surgery as Emergency/Elective, time to relaparotomy in days, indication for relaparotomy, frequency of relaparotomy, complication noted, ICU admission, duration of hospital stay, and outcome as dead or alive.

2.4. Measures

Procedure performed at index surgery was grouped as bowel resection and anastomosis if any part of the bowel was resected and primary anastomosis performed. Abdominal lavage when there was peritonitis with no documented source hence considered primary peritonitis. A specific procedure in identifiable organs was recorded as such. Relaparotomy indication was considered as the final procedure documented by the operating surgeon at relaparotomy. Bowel fistula was diagnosed if there was a bowel leak when primary surgery neither involved bowel perforation repair nor anastomosis. Anastomotic leak was diagnosed when there was evidence of a breakdown of the anastomotic suture line. The peritoneal collection was considered when there was persistent peritoneal collection with neither the evidence of a leak or a fistula. Burst abdomen occurred when there was complete dehiscence exposing the viscera to the atmosphere. When there was more than one indication for repeat surgery, the one carrying the most serious consequence was recorded.

The primary outcome of the measure was 30-day mortality calculated as the proportion of patients dying within 30 days of relaparotomy and secondary outcome measures were duration of hospital stay, post-operative complications, and the number of needed re-laparotomies.

2.5. Analysis plan

Data were checked for completeness and entered into SPSS version 23 for further analysis. Descriptive statistics were generated whereby continuous variables were summarized into means and standard deviations and categorical variables were summarized as the frequency with proportions.

2.6. Ethical consideration

The study received ethical approval from MUHAS IRB and MNH research, education, and consultancy bureau. The study involved observation of regular practice at the hospital hence posed no harm to the participants. Direct patients identifiers were removed during data entry and subsequent analysis. The study has the potential to benefit future patients presenting with abdominal conditions requiring surgery and/or relaparotomy.

3. Results

Overall 842 patients were primarily operated at MNH of which 64 (7.6%) had required an OD relaparotomy. Besides, another 37 patients were admitted having undergone surgery outside MNH and required urgent relaparotomy. We therefore, provide an analysis for the 101 patients who underwent relaparotomy. There was equal sex distribution among the patients with a median age of 33 (0.02–86) years with most of the patients being in the age group of between 26–50 years by 35 (34.7%). Most of the relaparotomy patients had their primary surgery done as an emergency and during the night, 77 (76.2%) and 61 (60.4%) respectively. The mean time to relaparotomy was 11.5 ± 5.9 (4–30) days with majority falling within the first 10 days in 53 (62.4%) of the patients. Majority of the relaparotomies were carried out during the day time, 90 (89.9%). Only 24 (23.8%) of patients had required more than one relaparotomy [Table 1].

From Table 2, we can see the procedures performed among the relaparotomy patients at index surgery and the indications of relaparotomy among operated patients at MNH. Procedures involving bowel resection and anastomosis (regardless of the site) were the most common among the group contributing to 49 (48.5%) cases. This was followed by appendectomy in 9 (8.9%) patients, abdominal lavage for primary peritonitis and colostomy formation each contributed 8 (7.9%) patients. The leading indication for re-laparotomy was anastomotic leak in 40 (37.6%) patients followed by peritoneal collection in 19 (18.87%), bowel fistula in 14 (13.9%), and in 13 (12.7%) patients the relaparotomy was non-diagnostic. For the 24 patients that had two or more relaparotomies, the anastomotic leak was recorded in 10 (50.0%), peritoneal collection in 6 (26.7%) and four each had burst abdomen and persistent bowel fistula.

Table 3 shows hospital stay, including ICU, and complications developed among the relaparotomy patients. The mean duration of hospital stay for all the patients was 17.75 ± 9.2 (3–54) with the majority staying between 10–20 days as was seen in 52 (51.5%) of the patients followed by a stay of 21–30 days in 27 (26.7%). Only 40 patients were admitted into ICU with a median stay of 6 days ranging from 1–24 days. Most of the patients stayed in the ICU for between 5 to 10 days 19 (47.5%). 375 complications were reported and the proportions presented are for the 101 patients to show the magnitude of occurrence for each. Electrolyte imbalance was the most reported in 81 (80.2%), followed by anemia in 76 (75.2%), and surgical site infection in 67 (66.3%). 40 patients succumbed to these complications giving a relaparotomy mortality rate of 39.6% [Table 3].

4. Discussion

This is the first study from East Africa in the English press that we know about covering on the topic of laparotomy outcomes, specifically

Table 1. Baseline characteristics of the relaparotomy patients at MNH in 2018 (n = 101).

Variable	Frequency (%)
Age group	
0–10	9 (8.9)
11–25	27 (26.7)
26–50	35 (34.7)
>50	30 (29.7)
Sex	
Male	50 (49.5)
Female	51 (50.5)
Hospital for index laparotomy	
MNH	64 (63.4)
Other hospital	37 (36.6)
Nature of index surgery	
Emergency	77 (76.2)
Elective	24 (23.8)
Time of index surgery	
Day	40 (39.6)
Night	61 (60.4)
Time to relaparotomy (days)	
<10	53 (62.4)
10–20	37 (26.7)
>20	11 (10.9)
Time of relaparotomy	
Day	76 (75.2)
Night	25 (24.8)
Number of re-laparotomies	
Once	77 (76.2)
More than once	24 (23.8)

Table 2. Primary procedure and indications for re-laparotomy at MNH in 2018, (n = 101).

Surgery	Frequency (%)
Primary Surgery	
Bowel resection	49 (48.5)
Appendectomy	9 (8.9)
Abdominal lavage	8 (7.9)
Colostomy	8 (7.9)
Uterine surgery	7 (6.9)
PUD repair	7 (6.9)
Cholecystectomy	3 (3.0)
Splenectomy	3 (3.0)
Others*	
Indications for 1st re-laparotomy	
Anastomotic leak	40 (39.6)
Peritoneal collection	19 (18.8)
Bowel fistula	14 (13.9)
Non diagnostic	13 (12.7)
Burst abdomen	12 (11.9)
Bleeding	3 (3.0)
Indications for 2nd re-laparotomy (24)	
Anastomotic leak	10 (50.0)
Peritoneal collection	6 (26.7)
Wound dehiscence	4 (16.7)
Bowel fistula	4 (6.6)

* 1 each for adhesiolysis, cystectomy and urinary diversion, gastrectomy, herniorrhaphy; 2 for Heller's myotomy.

Table 3. Showing ICU stay, hospital stay and complications among patients undergoing re-laparotomy at MNH.

Outcomes	Frequency
ICU stay in days (n=40)	
<5	11 (27.5)
5–10	19 (47.5)
>10	10 (25)
Hospital stay (days)	
<10	16 (15.8)
10–20	52 (51.5)
21–30	27 (26.7)
<30	6 (5.9)
Complications (n=375)	
Electrolyte imbalance	81 (80.2)
Anemia	76 (75.2)
Surgical Site Infection	67 (66.3)
Septicemia	39 (38.6)
Burst abdomen	27 (26.7)
Acute renal failure	21 (20.8)
Multiple organ failure	21 (20.8)
Pulmonary complication	12 (11.9)
Peritoneal collection	10 (9.9)
Bowel fistula	9 (8.9)
Anastomotic leak	7 (6.9)
Deep venous thrombosis	2 (2)
New perforation	3 (3)

focusing on re-laparotomies and their outcomes. While different terminologies are used with this regard, our focus was an urgent need for OD relaparotomy within 60 days of the index laparotomy. Performing this study at MNH was important first for its being at the apex of health care delivery in the country and secondly for being a surgical residency training center.

We have shown that the on-demand relaparotomy was high (7.6%) when compared to the expected rate of between 1% - 4% [7, 8]. This is even though the hospital does not handle highly specialized procedures. Centers reporting rates higher than this routinely carry out more complex cases and include the planned relaparotomy rates in their matrices [8]. Even though this was lower than that reported from a South African study of 24%, the mentioned study had included all categories of relaparotomy: planned and OD relaparotomy rates [9]. The lack of planned relaparotomy had some influence on the higher rates seen here unlike in centers that practice planned relaparotomy. To the surgeon and public health practitioners, the outcome of relaparotomy should be the single most important measure.

OD relaparotomy has been reported to carry higher morbidity and mortality rates among its victims. We report mortality for every 4 in 10 patients who underwent relaparotomy at MNH, a finding which is higher than that from by Unalp et al from Turkey [10]. Whether OD relaparotomy would have resulted in much lower mortality rates than what we have observed here has been ruled out [11]. But the practice of primary closure of the abdomens in which otherwise planned relaparotomy strategy would have been employed might not be without consequences in our setting. Decisions for such relaparotomy are always made late with serious complications including death [12]. Several factors related to our practice might not favor planned relaparotomy.

When planning for a PR, one needs to take into consideration the ease of availability of operating space, and intensive care services. MNH being a public hospital, like in many similar settings, has very few intensive care beds and a very high demand for operating slots. Furthermore, hospital costs are not fully covered by patients and by government subsidies. This would thus place enormous pressure on the already scarce resources: both financial and infrastructural.

The indications for relaparotomy in this study were not different from those reported by others [13, 14]. It is therefore prudent to say that most of the surgeries done had valid indications. Relaparotomy patients place enormous demands on health care systems, especially in low-income centers. With over occupied Intensive Care Unit (ICU) beds at the hospital, many patients did not get ICU admission. Just over 1 in 3 of the patients had ICU admission during the relaparotomy, despite multiple surgeries and complications requiring close monitoring. Managing patients with major electrolyte imbalances and metabolic derangements in the general wards would result in this high mortality as we saw. The focus should, therefore, be able to address the question of why such high mortality.

Patients undergoing relaparotomy should be given special consideration by the creation of post-operative wards offering high dependency services and close monitoring. At the same time, strategies to reduce relaparotomy rates are urgently needed. Such a strategy would first address the indications of relaparotomy. This study found higher rates of anastomotic leaks as indications for relaparotomy. Anastomotic leaks can be due to either of the following factors: the surgeon's technique including sutures and instrumentation; bowel perfusion status (hypotension and anemia), and patient's general nutritional status.

At MNH, surgeries done at night are usually done by residents with little supervision if at all present. Most of the surgeries we report here were done during the night shift; hence it is plausible that they were done by the later. It has been shown that an individual surgeon can be a risk factor for a leak following resection and anastomotic procedure [15]. More coaching and supervision of the surgeons in training are required to ensure that proper conditions and techniques in favor of stable and intact anastomosis are applied at all times. Since this observation, senior surgeons are now required to be present during all emergency surgeries. It will be nice to do a follow-up study on this topic to see if such a measure has brought some impact on anastomotic integrity.

Poor nutritional status has been observed as an independent risk factor for anastomotic failure in procedures that require resection and anastomosis [16]. We do not routinely assess our operative patients, both emergency and elective, for nutritional status. Patients in need of gastrointestinal surgery have always been reported to have some form of malnutrition at higher rates [17]. Malnutrition poses challenges to the surgical patient with regards to wound healing and the development of surgical infections [18], common causes of relaparotomy in our patients. It has thus been recommended to offer nutritional risk screening to all surgical patients at risk of malnutrition [19].

The presence of anemia in the preoperative period has been demonstrated to be an independent risk for developing anastomotic leak requiring re-operation [20]. Anemia was significantly present as a complication among relaparotomy patients. This might signify that patients had borderline hemoglobin levels pre-operatively or the anemia merely developed as part of the other complications related to injury response.

Addressing anastomotic leak should, therefore, be an important strategy if relaparotomy rates were to be reduced at MNH. More than half of the patients would not have required a relaparotomy if the anastomosis had not given away. Decisions on whether to perform primary anastomosis or delay it and cover with a stoma are the daily difficulties by the surgical team. Erring on the stoma side to delay an anastomosis for elective AM surgery would be a good initiative. Proper skills, appropriate suture selection, tissue handling, and viable bowel are all pre-requisites to perform a stable and intact bowel anastomosis and defect closure. "Getting it right the first time" should become the motto of all practicing surgeons and trainees.

For the remaining few inevitable cases, strategies to address relaparotomy outcomes would be to bring on board the radiology unit to assist with intra-peritoneal collections. This minimally invasive measure has been proved to be safe and effective [21]. Moreover, percutaneous catheter drainage for intra-abdominal collections has been shown to reduce both the need for re-exploration and open laparotomy related

mortality [22]. Up to one-third of our patients had relaparotomy secondary to intra-abdominal collections. It is therefore time to explore if the MNH radiology unit, with both CT scan and ultrasonography, can offer these services alongside their daily routines. The newly established interventional radiology unit should develop a protocol, with surgeons on how to handle patients who require relaparotomy for drainage of collections. Lastly, addressing time to relaparotomy is critical, but beyond the scope of this paper. It has been shown that shortening the time to relaparotomy is key to reduced mortality and morbidity [23].

One weakness that has to be taken into account is that this study focused more on patients in need of relaparotomy and not on all patients who underwent laparotomy. While the latter would have excluded patients not initially operated at MNH, it would have served the purpose of knowing exactly which procedures carried the highest risk for undergoing relaparotomy and their predictors. The second weakness of the design was that the study adopted a passive follow up whereby patients were expected to show up at the emergency: it is possible that this under-reports the true picture as some of the patients might book into other hospitals for relaparotomy. Despite all these shortcomings, it has provided hard evidence on the higher mortality among this group of patients.

5. Conclusion

OD relaparotomy carries a high mortality and morbidity at Muhimbili National Hospital in Tanzania. Addressing bowel anastomosis has the potential of reducing the OD relaparotomy rate at this hospital. Furthermore, exploring the feasibility of using intervention radiology and improved post-operative services has the potential of reducing mortality related to open surgery.

Declarations

Author contribution statement

A. Swallow: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

L. Akoko: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

L. Lema: Performed the experiments; Wrote the paper.

Funding statement

This work was funded by Ministry of health of the united republic of Tanzania as part of mentorship for surgical residents training.

Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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