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Original Research Article

Port site tuberculosis: is an epidemic on shore?

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ABSTRACT

Background: Bangladesh has to carry an extensive burden of tuberculosis in varied form of presentation. In the era of minimally invasive surgery (MIS) port site tuberculosis is usually a rare incidence. Among all the infections it has been identified as a prolong burden for both patients and surgeons. This study was done to notify such rare complication of MIS and tried to find out is there really an upsurge of this infection in Bangladesh.
Methods: This retrospective study was done an urban area of Bangladesh during September 2020 to June 2021. 483 laparoscopic surgeries were done by six different surgeons in 5 different hospitals during September 2020 to January 2021. All surgeons have minimum five years experiences in laparoscopic surgery. 20 minutes emersion of the laparoscopic instruments into activated glutaraldehyde solution 2% (CIDEX) was used as method of chemical sterilization. Other surgical instruments were sterilized by conventional autoclave method.
Results: Among them 87 patients developed port infections. 66 (75.86%) patients of this 87 developed non-healing ulcer. Biopsy from the ulcer showed granulomatous tissue in 56 patients and the other 10 was nonspecific inflammation. CAT I anti-TB chemotherapy was initiated to all the patients and all improved by this therapy. Use of 3.54% glutaraldehyde instead of 2% or immersion of instruments for a longer period (more than 20 minutes) could be tried in larger scale to prove its efficacy.
Conclusions: National tuberculosis control program (NTP) should give more emphasis on cutaneous tuberculosis as the morbidity of this disease is high. Surgeons of Bangladesh should admit and report such incidences as, if it is documented in other areas of the country, it may need to develop a national guideline to prevent and treat port site tuberculosis.

Keywords: Port TB, MIS, NTP

INTRODUCTION

Minimal invasive surgery (MIS) has changed the way people approach the surgery, as it gives both patient and surgeons flexibility as well as the reduced burden of hospital stay, prolonged recovery and wound infections. 1987 Phillip Mauret introduced the minimal invasive surgery techniques, which has been implemented in wide variety of surgical interventions. Due to its wide variety of usage, laparoscopic surgery presents with a unique array of its own complication, notably port site infection. Among the infections that occurs in this particular site,

tuberculosis is among the worst, because of its prolonged presence, medications required to treat the patients and the additional procedures a patient has to go through for the diagnosis and subsequent treatment of this condition.[1]

Bangladesh has to carry an extensive burden of tuberculosis in varied form of presentation. 361,000 cases of tuberculosis have been detected with approximate 38,000 deaths due to this infection in 2019.[2] Port site tuberculosis which usually a rare incidence among all the infections that occurs in the incision site following the procedure, has been identified as a prolong burden for both patients and surgeons as this presents mostly with "non-healing" ulcer and has to go through different procedures and drugs regimens which play a significant role for the morbidity of the patients.[3-5]

Mycobacterium tuberculosis, Mycobacterium fortuitum and *Mycobacterium chelonae* have been identified as the reason for port site tuberculosis infection either due to cutaneous source most likely from *Mycobacterium tuberculosis* while the nosocomial source has been designated to *Mycobacterium fortuitum* and *Mycobacterium chelonae* which can be found in natural water, soil, tap water among other sources.[3,6-8]

In Bangladesh there have been several publications in form of case presentation where in a hospital setting where patients were identified while suffering from port site tuberculosis. During the tenure from October 2005 to March 2015, 17 cases of port site tuberculosis were detected by Karim 2017, among 3740 patients undergoing laparoscopic procedures.[9] Baqui presented 2 cases of port site tuberculosis following laparoscopic cholecystectomy.[10]

There have been a significant number of cases within the period of last six months, so there is a need for the assessment of the required precaution to be done for the prevention of this. Such epidemic was reported in Brazil, so we need to identify that is there any such occurrence.[7] Thus, a study is required for the prevention and control of port site tuberculosis. This study was done to notify such rare complication of MIS and tried to find out is there really an upsurge of this infection in Bangladesh.

METHODS

This observational descriptive study was done during September 2020 to January 2021, 483 laparoscopic surgeries were done by six different surgeons in 5 different hospitals of Narayangonj, 66 (75.86%) of patients developed non-healing ulcer. Granulomatous tissue from the biopsy was found in 56 patients. Other 10 was non-specific inflammation. But as these patients were not improved by conventional treatment, so anti-TB therapy was initiated and all the patients improved from this therapy. Only one patient reported previous history of tuberculosis and which was cured before the surgery was conducted. Only one patient could not confirm the BCG vaccination, rest of the patient were vaccinated with BCG vaccination as per national extended program of immunization (EPI).

Inclusion criteria of the participants of the study: patients with non-healing ulcer following laparoscopic surgery, and patients improved following anti-tubercular therapy.

Information was collected from the hospital records; patients' autonomy was upheld with upmost care. Data was collected as it is present in the hospital records. Patients were selected from the hospital records from October 2020 to January 2021.

Data processing and analysis

Data was collected from the hospital records and were also recorded in digital formats for security and convenience for analysis. Differences in the distribution of categorical variables were assessed by Chi-square tests for independence and Cramer's V co-efficient.

A p value <0.05 was considered as statistically significant, Cramer's V>0.5 was considered strong association >0.3 was considered moderate consideration. Statistical analysis was conducted using Stata 14 by StataCorp LP, Texas, USA.

Ethical issues

All patients' data were collected from the hospital records. All the informations regarding the patients' identity were secured and no further use will be implemented of them. The data records will only be used for the purpose of identifying the steps to be required for the prevention and control of the disease. Institutional ethics review board of Anwar Khan Modern Medical College approved the study protocol (Ref: IERB - AKMMC/ECC/2020/09).

Procedural description

All the cases were performed by qualified surgeons having at least 5 years experiences in laparoscopic surgery. Patients were admitted in the morning of the surgery. Surgery was performed at noon and they were discharged on the following morning. Sips of water to liquid diet was allowed 6-8 hours after surgery. Three doses (one per operatively and two post operatively) of ceftriaxone or cefuroxime were used in all patients. Additional single dose of metronidazole was used per operatively in 18 patients with appendicitis, acute cholecystitis, empyema or bile leakage during surgery. Surgeries were performed under either general or spinal anesthesia.

Activated glutaraldehyde solution 2% (CIDEX) was used in case of chemical sterilization. 20 minutes emersion of the laparoscopic instruments were done. Other surgical instruments were sterilized by conventional autoclave method.

RESULTS

Among the 66 patients that were included in the study 64 (96.97%) were female patients and only 2 (3.03%) were male patients. As 55 of these operations were laparoscopic cholecystectomy (81.34%) laparoscopic appendectomy was conducted among 9 (13.64%) while laparoscopic appendectomy with cholecystectomy, diagnostic laparoscopy with tubal patency test and laparoscopic ovarian cystectomy were conducted each having frequency of 1.52% among 66 patients.

Table 1: Sex distribution among the patients.

Sex	Frequency	Percentage
Female	64	96.67
Male	2	3.03
Total	66	100.00

Patients were diagnosed with port TB highest in the month of October 2020 with 45 cases being detected with the mean of (38.8667±7.491) day of POD, min 28 days and maximum 60 days. In the month of November 2020, 13 cases were diagnosed with 43.30769±11.33126 days POD minimum being 29 and maximum being 65 days. In the month of December 2020, cases were dignosed with the mean of 33.6±1.81659 day POD, minimum being 32 days and maximum being 36 days and in the month of January 2021 only 3 cases were detected with mean of 40±8.660254 days POD with minimum 35 days and 50 days maximum.

Among 55 patients of laparoscopic cholecystectomy epigastric port was involved in 32 patients (60.38%) patients, right illiac port was involved in 9 patients (16.98%) patients, right hypochondriac port was involved 5 (9.43%) patients, epigastric and right illiac involvement were in 4 (7.55%) patients, and all 3 ports involvement were only among 2 patients (3.77%). Among 9 laparoscopic appendectomy patients all 3 ports infected in 4 patients (44.44%), right illiac port involvement 3 (33.33%) patients. Epigastric and hypogastric port were involved 1 each (11.11%). Laparoscopic ovarian cystectomy involved right illiac port infection only in 1 patients. Hypogastric port involvement presented on the 46th POD, longest and only one incidence, while epigastric port involvement were presented in mean 38.26471±8.027637 days of POD, while right illiac port presentation were on mean 42.92308±9.411531 days of POD. On histopatholgical findings 56 (84.85%) were found as granulomatous inflammation while 10 were diagnoses as non-specific inflammation. Presentation of the sypmtoms were abscess 41 (62.12%) and discharging sinus 25 (37.88%). Abscess required incision and drainage (I&D) for 26 patients (63.41%) and port excision were done in 13 (31.71%) while surgical debridgement was required for only 2 patients. For disrcharging sinus port excision were done for 2 patients (8%) while surgical debridgement were done for only 1 patient (4%) and rest 22 (88%) were managed with incision and drainage.

Table 2: Presentation of symptoms among the patients.

Symptoms	Frequency	Percentage
Abscess	41	62.12
Discharging sinus	25	37.88
Total	66	100.00

Presentation after the number of post operative days (POD) found to be independent of age, sex, presenting symptoms of port tuberculosis, antibiotic given during the procedure or the ports involved due to tuberculosis. Kruskal–Wallis equality of population rank test has been conducted to assess any correlation between these observations (Tables 5 and 6).

For the statistical significance Pearson's Chi-square for indipendence χ^2 (18, n=66) =33.82, p=0.013, Cramer's V=0.4133, indicating the operations that were conducted in October 2020 and specific ports (epigastric) that were involved have statistically significant association (Table 5). Similar analysis with antibiotics used during the operation and additional procedure required following the diagnosis of port tuberculosis showed Pearson's Chi-square for indipendence χ^2 (6, n=66) =23.6758, p=0.001, Cramer's V=0.4235, denoting that administration of cetriaxione during procedure have more occurance of insicion and drainage as additional procedure (Table 6).

Table 3: The presentation following the procedures according to month of presentation.

Month of operation	Number of patients	Mean days from procedure (days)	SD	Min days from procedure (days)	Max days of procedure (days)
October 2020	45	38.867	7.491	28	60
November 2020	13	43.308	11.331	29	65
December 2020	5	33.6	1.817	35	50
January 2021	3	40	8.660	35	50

Table 4: Name of operation conducted among the patients.

Name of operation	Frequency	Percentage
Diagnostic laparoscopy	1	1.52
Laparoscopic ovarian cystectomy	1	1.52

Continued.

Name of operation	Frequency	Percentage
Laparoscopic appendectomy	9	13.64
Laparoscopic appendectomy with cholecystectomy	1	1.52
Laparoscopic cholecystectomy	54	81.82
Total	66	100.00

Table 5: Chi-square test between month of operation and ports involved.

Month of operation	All 3 ports	Epigastric	Epigastric and right illiac	Hypogastric	Multiple	Right hypo-chondriac	Right illiac	Total
October 2020	4	22	2	0	1	4	12	45
November 2020	2	7	0	1	1	1	1	13
December 2020	0	4	0	0	1	0	0	5
January 2021	0	1	2	0	0	0	0	3
Total	6	34	4	1	3	5	13	66

Pearson Chi^2=33.82, probability=0.0133

Table 6: Chi-square test between per-operative antibiotics and additional procedures.

Per operative antibiotics	Additional procedures			
	Incision and drainage	**I and D with port excision**	**I and D with surgical debridement**	**Total**
Ceftriaxone	35	5	2	42
Ceftriaxone and metronidazole	12	4	1	17
Cefuroxime	0	6	0	6
Cefuroxime and metronidazole	1	0	0	1

Pearson Chi^2=23.68, probability=0.0006

Table 7: Indication of operation in tabulated form.

Indication of operation	Frequency	Percentage
Acute appendicitis	6	9.09
Acute cholecystitis with cholelithiasis	3	4.55
Chronic cholecystitis with cholelithiasis	3	4.55
Cholelithiasis	42	63.64
Chronic cholecystitis	4	6.06
Empyema gall bladder	1	1.52
Mucocele gall bladder	1	1.52
Ovarian cyst	1	1.52
Rec appendicitis	3	4.55
Rec. appendicitis with Ch. calculus cholecystis	1	1.52
Secondary infertility	1	1.52
Total	66	100.00

DISCUSSION

Laparoscopic surgery for cholecystectomy and appendectomy are procedures which is usually conducted more frequently among the female patients, hence the female: male ratio is more skewed towards female. In the case report and series of cases, it has also been shown that females tends to get infected more than males.[3,5,11] Durate and his colleague showed in his paper, the operation that was most susceptible to port-site tuberculosis was laparoscopic cholecystectomy about 56% and laparoscopic appendectomy about 7.1%, while in our observation we found 81.82% patients were due to cholecystectomy and laparoscopic appendectomy 13.64% cases.[7] This may also reflect that in Bangladesh the laparoscopic methods other than cholecystectomy and appendectomy are not widely practiced yet. Highest number of patients that were reported in the October 2020 seemed to declined towards January 2021 (Figure 2). The presentation following the procedure were mean 39.39394±8.37004 days with minimum 28 days and maximum recorded were 65 days which has a similar pattern in the outbreak in Brazil, though the recorded day

of presentation in that case were from 2 days to 185 days.[7] The mean age of the patients was 38.0303±11.59598 years compared to Brazil it was 44 years. Presentation of the symptoms were abscess and discharging sinus with frequencies 62.25% in favor of abscess, which compared to case series and reports very high, as discharging sinus was reported in 61.3% cases in Brazil.[3,7] This may show the reluctance of the patients to visit the physician and also the inability to health system of proper follow-up following the procedures. Upon further analysis, the involvement of the port site according to symptoms showed when only epigastric site was involved then the abscess and discharging sinus presentation was equal in number (17 each out of 34) while all the other port involvement the abscess presentation is higher than discharging sinus presentation. Histopathology of the specimens were found to granulomatous inflammation among 56 (84.85%) of patients while other 10 were non-specific inflammation, due to resource constrain PCR and other specific test for *Mycobacterial* could not be conducted. All the patients were prescribed category-1 anti-tubercular drug and all of the ulcer were healed. Only one patient reported to have previous history of tuberculosis which was treated with no presence of symptom during the procedure. In contrast to Brazil and India were most of the patient had to undergo surgical debridement 3 (4.55%) had to undergo that procedure and 15 (22.75%) had to go through port excision.[3,7,11] All the patients were vaccinated with BCG vaccine against tuberculosis. It has always been stipulated that the inadequate sterilization procedures have always been denoted as the major cause for the port-tuberculosis infections.[12-14] 2% alkaline glutaraldehyde for 20 minutes is being used as the procedure for the sterilization of the instruments. Failure to ensure any step may cause such spike of infection, American society for gastrointestinal endoscopy presented guideline for the sterilization of instruments in 1988 and updated again in 1996.[15,16]

There has been some significant association detected regarding different observation most significantly between the month of operation and port involved, which is demarcated that there was an element of sudden increase of the cases and which slowly subsided. Also, per-operative antibiotics and additional procedures also showed a statistically significant association which may be reviewed in the future that certain practice of antibiotic use may increase or decrease the possibility of the port infection. Because of the limitation of the study, conclusion could not be drawn from the data that which antibiotic regimen may or may not aggravate the condition of port tuberculosis, but the use of ceftriaxone and ceftriaxone with metronidazole requires certain scrutiny and extensive study.

Cutaneous tuberculosis makes up only a small proportion of all cases of extrapulmonary tuberculosis.[17] There are three ways in which cutaneous tuberculosis generally occurs: from an exogenous source (inoculation tuberculosis); from an endogenous source (secondary tuberculosis); and from a haematogenous source.[17] The organism in most cases is *Mycobacterium fortuitum*, an atypical mycobacterium that colonizes in soil and tap water. Its incubation period is 3–4 weeks and it presents as port site infection after 1 month of surgery.[18] Though minimal access therapy decontamination working group has recommended only 10 min soak for laparoscopic instruments with longer time if tuberculosis is suspected. Several publications however have highlighted failure of a 20 min instrument soak in 2% alkaline glutaraldehyde to sterilize instruments.[19,20]

Following are the proposed recommendations to prevent port site tuberculosis: thorough mechanical cleaning of instruments by ultrasonic technology; ETO gas sterilization or gas plasma sterilization of instruments is better than glutaraldehyde; if glutaraldehyde is used, 3.4% solution should be used for 8–12 hours for sporicidal action; metallic cannulas should be autoclaved or use disposable port cannulas; and use autoclaved water for rinsing instruments.[10,21,22]

The feasibility of these recommendations needs further evaluation because autoclaving of laparoscopic instruments have some risk of damage. Disposable cannulas, ultrasonic technology and ETO sterilization has some financial issues also. Use of 3.54% glutaraldehyde instead of 2% or immersion of instruments for a longer period (more than 20 minutes) could be tried in larger scale to prove its efficacy.

In COVID-19 pandemic even metastatic tubercular abscess which is a rare form of tuberculosis is even reported in Bangladesh.[24] That case report strikes our mind about the second way (from an endogenous source) of cutaneous tuberculosis. A country like ours a focal outbreak of tuberculosis is alarming as diagnosis and treatment of tuberculosis is always a challenge and many times depends upon high degree of suspicion.

CONCLUSION

National tuberculosis control program (NTP) should give more emphasis on cutaneous tuberculosis as the morbidity of this disease is high. Surgeons of Bangladesh should admit and report such incidences as if it is documented in other areas of the country, it may need to develop a national guideline to prevent and treat port site tuberculosis.

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