CASE SERIES

Iatrogenic abdominal wall non-tuberculous Mycobacterial infections: a case series

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Introduction

Non tuberculous mycobacteria are opportunistic pathogens [1]. These organisms are implicated in delayed postoperative wound infections, most common being the Mycobacterium fortuitum [2]. Other frequently encountered rapidly growing atypical mycobacteria include *Mycobacterium abscessus* subsp. *abscessus*, *M. abscessus* subsp. *massiliense*, *M. chelonae*, and *M. porcinum*. These organisms are commonly found in environmental sources such as soil, dust, water, animals, and healthcare settings. Nosocomial transmission typically occurs through the use of inadequately sterilized medical equipment, particularly laparoscopic instruments[3]. The most common source being unsterile water used for cleaning the instruments [4]. A high degree of clinical suspicion is essential in cases of chronic postoperative wound infections to ensure timely diagnosis and prevent delays in initiating appropriate treatment [2]. Clinical features commonly include abscess formation, subcutaneous nodules, and draining sinuses [3]. Definitive diagnosis is established through culture of the causative organism from wound discharge or tissue biopsy. Management typically requires surgical intervention combined with antibiotic therapy guided by in-vitro sensitivity testing [2],[3].

This study aims to evaluate the demographic characteristics, clinical features, imaging sensitivity, and treatment outcomes in patients with iatrogenic non-tuberculous mycobacterial infections of the anterior abdominal wall.

Patients and methods

This was a retrospective study conducted in the Department of Abdominal Wall and General Surgery, in a tertiary care center from April 2012 to March 2015. All the patients who presented with multiple sinuses in the abdominal wall, or with a clinical diagnosis of iatrogenic abdominal wall atypical mycobacterial infections were included in this study. The data was collected retrospectively from the hospital's electronic database. The data included demographic, investigations and treatment profile. A total of 52 patients were included in this study based on the inclusion criteria. As institutional review board. Data was entered in Epidata and analysis was done in SPSS software version 18.0 (licensed by IBM) with the help of the statistician. Data was collected for the following variables like age, sex, Place, type of previous operation, duration of symptom from the time of operation, presence of multiple branching tracts, intra-peritoneal extension of operation, computerized tomography of abdomen, operative and antibiotic treatment received in our institution, microbiological and histopathological findings and recurrence of the disease over a follow up period of two years. All study variables were described using descriptive statistical methods. Continuous variables were summarised using the mean with standard deviation. For skewed variables the median with range was used. For categorical variables frequencies with percentages were used. Sensitivity and specificity of computerise tomography in predicting the presence of multiple sinuses and intra – peritoneal extension were analysed.

Results

As seen in Table 1, A total of 52 patients were included in this study, out of which 43 were females and 9 were males. The median age was 34 years with a range of 22 to 63 years. All 52 patients presented with discharging sinuses on the anterior abdominal wall. The median time to develop symptoms was 4 weeks. However, the duration to develop symptoms after operation or intervention ranges from 2 weeks to 7 weeks. The median time to present to our hospital was 7 months with a range of 2 months to 48 months. Out of 52 patients, one had infection following insulin injection, 28 patients had infections following laparoscopic surgery and 23 patients had infections following open surgery. All patients who developed infection following an operation had been operated in a secondary hospital. Ten patients have had initial treatment with anti-tuberculous drugs with no symptom relief. The other 42 patients did not have any previous treatment. Fifty patients

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were evaluated with abdominal imaging. As per Table 2, 41 patients had CT Sinusogram of the abdomen and 9 patients had ultrasonography of the abdomen. Two patients did not have any imaging done. Of the 41 patients who underwent CT scan, multiple branching tracts (Figure 1) were found in 23 patients and 9 patients had intra-peritoneal extension (Figure 2). Out of the 9 patients who underwent ultrasonography of the abdomen, multiple branching tracts were seen in 2 patients and intra-peritoneal extension was not seen any of the patients. All 52 patients underwent wide local excision of the anterior abdominal wall. Intra-operatively, 29 patients had multiple tracts and 8 patients were found to have intra-peritoneal extension. Intra-peritoneal extension and multiple branching are essential as removal of these tracts is important to prevent recurrence.

Table 1: Descriptive parameters of patients with atypical mycobacterium of the anterior abdominal wall

Parameter	Value
Total Patients (n)	52
Gender (Female: Male)	43:9
Median Age (Range)	34 years (22–63 years)
Median Time to Develop Symptoms	4 weeks (Range: 2–7 weeks)
Median Time to Present to Hospital	7 months (Range: 2–48 months)
Initial Treatment with Anti-TB Drugs	10 patients (No symptom relief)
No Prior Treatment	42 patients
Multiple Tracts	29 patients
Intra-peritoneal Extension	8 patients
Mycobacterium fortuitum	7 patients
Mycobacterium tuberculosis	1 patient
Histopathology	Non-necrotizing granulomatous inflammation (51 patients)
Recurrence	3 patients (1 without antibiotic therapy)

Figure 1: Figure depicting single and multiple tracts (white arrows) on CT Sinusogram

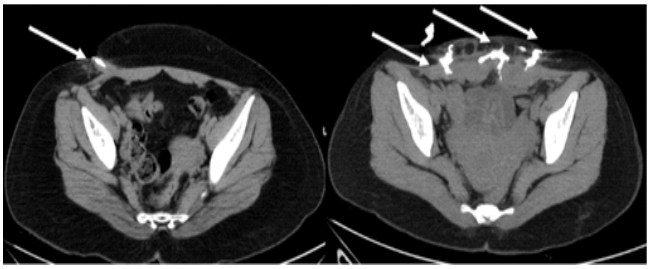

Figure 2: Figure depicting extraperitoneal and intraperitoneal extension on CT Sinusogram

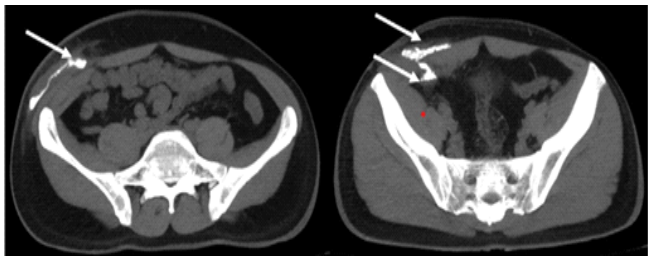

Table 2: Analysis of findings of multiple branching tracts and intraperitoneal extension on Computerized Tomography and ultrasonography

Imaging Modality	Total Patients	Multiple Branching Tracts	Intra-peritoneal Extension
CT Sinusogram	41	23	9
Ultrasonography	9	2	0
No Imaging Performed	2	-	-

Correlating the CT and intraoperative findings, we found that out of 9 patients who had intraperitoneal extension on CT, 4 patients actually had intraperitoneal extension in the operative findings. Similarly, out of 23 patients who had multiple branching tracts in CT, 22 patients had multiple tracts intraoperatively. As seen in Table 3, we found that the sensitivity, specificity, positive predictive value and negative predictive value of CT in detecting intra-peritoneal extension were 50.00, 84.84, 44.44 and 87.50 respectively. Similarly, the sensitivity, specificity, positive predictive value and negative predictive value of CT in detecting multiple sinus tracts were both found to be 75.86, 91.66, 95.65 and 61.11. Sensitivity and specificity for ultrasonography was not performed due to the decreased number for analysis.

Table 3: Analysis of findings of Computerized Tomography compared with intra-operative findings.

Finding	CT Finding	Intraoperative Finding	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)	Negative Predictive Value (%)
Intra-peritoneal Extension	9	4	50	84.84	44.44	87.5
Multiple Branching Tracts	23	22	75.86	91.66	95.65	61.11

All 52 patients underwent debridement, followed by antimicrobial therapy in 51 patients. One patient did not take antibiotic therapy due to personal reasons. Tissue cultures showed 8 patients were positive for MGIT (Mycobacterial Growth Indicator Tube) culture, of which 1 was positive for

TbPCR as well. Of these 8 patients, Mycobacterium fortuitum was noted in 7 and *Mycobacterium tuberculosis* was seen in 1. The remaining 44 patients did not show any growth on tissue culture or PCR. Histopathological examination showed evidence of non - necrotizing granulomatous inflammation in 51 patients. There was recurrence in 3 patients. Out of the 3 patients, one patient was the one who did not take the antibiotic therapy.

Discussion

Atypical mycobacterium is classified based on its rate of growth and pigmentation [2]-[4]. The most common among these is *Mycobacterium fortuitum* and *Mycobacterium Chelonae*, both belonging to the rapidly growing species [2]. They are predominantly present in the water and soil [5]. The common source of infection to human beings is predominantly by iatrogenic methods [2],[3],[6]. The most common being laparoscopic instruments.

Laparoscopic instruments have sleeves in which the bacteria can colonise. As most of the laparoscopic instruments are disinfected and not sterilised, the spores survive to cause the infection [2],[3],[6],[7]. In our series 28 out of 52 patients developed infections post laparoscopic procedure, 23 developed infections post open operation, and one patient developed infection following insulin injections. There are case reports of atypical mycobacterium following major abdominal general surgical procedures, abdominoplasty, liposuction and even reduction mammoplasty [6],[8],[9].

There is a predisposition for females with 43 out of 52 patients being females. This comprises 82.69%. This is similar to the literature as described [8],[10]. However, as per one study there was equal gender predisposition [2]. The median time to develop symptoms in our study was 4 weeks as compared to 3to 4 weeks as cited in the literature [3],[10]. This happens with a cutaneous manifestation after 4 weeks of colonisation. The median time to diagnosis in our study was 7 months. However, the median time to diagnosis was 103 days as per the literature [8].

They have an affinity towards skin and subcutaneous tissues. There are 4 stages of this disease described where it starts as a nodule and becomes a sinus [3],[5],[8]. There was not much literature on the incidence of intraperitoneal extension for this disease. According to literature, intraperitoneal extension is not commonly seen because there seems to be protective factors preventing intraperitoneal extension [2]. However, in our series, we found that 8 out of 52 patients had intraperitoneal extension, which comprises of 15.38%. The reasons are not known. Other than our case series, intraperitoneal extension is not described in the literature till date. This infection usually starts with one port and spreads to other areas by multiple tracts and subdermal tracts. Multiple tracts were found in 29 out of 52 patients in our series. This comprises of 55.76% of the population with the disease. Similarly, multiple tracts though present are not appreciated or highlighted in any other literature search till now. Most of the literature documents multiple sinuses but not multiple tracts except for one documented in literature [2].

Surgical debridement (extensive and aggressive removal of all tracts identified radiologically and intra-operatively) followed by antibiotics is essential for the removal of all tracts and to prevent recurrence [2],[3],[7]. As depicted in our study, multiple tracts and intraperitoneal extension can be detected by doing a CT Sinusogram. Surgical therapy should be complete despite it causing a huge raw surface. We allow the wound to heal with secondary intention.

Antimicrobial therapy is a must. There are reports of recurrence despite surgical and antimicrobial therapy but the frequency is very rare [2]. Poly-antimicrobial therapy is advocated for this pathology [1]-[3],[6],[11]. The common antibiotics to which these microbes are susceptible are quinolones, amikacin and doxycycline. In our institution our protocol is to give Amikacin, Clarithromycin and Ciprofloxacin for 3 months based on the antibiogram which is similar to the literature [2],[3],[6],[12]. Antimicrobial therapy is recommended for at least 3 months [1],[2],[12]. Recurrence rate in our series was 5.76% whereas in literature the recurrence rates are about 13-16% [2],[8].

Our series is the first to analyse the predictive values of CT in detecting intraperitoneal extension and multiple tracts, as removal of complete disease is essential in the treatment process. The specificity of CT in detecting intraperitoneal extension (84.84) and multiple tracts (91.66) was very high. Similarly, the positive predictive value of CT to identify multiple tracts (95.65) was also high. Hence, we recommend CT as the best modality of choice for the evaluation of this pathology. This will help in planning the operation and aid in the complete removal of all foci of infection. This will decrease the chances of recurrence.

Although the majority of cases in this series are post-surgical in origin, we have included one case of severe infection following an insulin injection. This case was retained due to its rarity and clinical relevance, as it highlights that even minor, routine procedures such as subcutaneous insulin

administration can result in serious infectious complications. We must send regular tissue cultures of tuberculous cultures, TBPCR and also for histopathology [2]. Proper sterilisation technique of instruments and needles is the best way to prevent this disease. We recommend autoclaving of metal instruments. For reusable instruments we recommend plasma sterilization or ethylene oxide sterilization [2]-[4].

Conclusion

The incidence of non-tuberculous Mycobacterial surgical site infections has increased in the laparoscopic era. A strong clinical suspicion is imperative in diagnosing this entity. Histopathological examination and mycobacterial cultures are mandatory for diagnosis. We recommend imaging with CT for all patients. Treatment involves wide excision of all lesions and administration of a combination of antibiotics for 3-6 months based on in vitro susceptibility. As per our hospital infection control guidelines, a combination of amikacin, clarithromycin and levofloxacin is the preferred antibiotic regimen.

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