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Original Research Article

Atypical mycobacterial infection in post laparoscopy surgical wounds: our observations and review of literature

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ABSTRACT

Background: Nontuberculous mycobacteria (NTM) are a rare cause of chronic surgical infection in humans. These infections are commonly seen in the setting of laparoscopic surgery, due to poor sterilization techniques. This case series analyses the clinical features and management of patients with biopsy proven NTM infection, with a review of the current literature.
Methods: Patients with chronic surgical site infections admitted to our surgical unit, over a 5-year period from January 2008 to December 2012 were analyzed in this study. A total of 24 patients with biopsy proven NTM were included. The clinical details, management protocol is discussed.
Results: A total of 24 patients were analysed. Most of our patients were females (n=16) and this infection was most commonly seen following laparoscopic cholecystectomy (n=10). The symptoms were usually benign but persistent watery or purulent discharge. *Mycobacterium fortuitum* and *Mycobacterium chelonae* were the predominant organisms isolated. All patients in this series were treated with extensive surgical debridement and long-term antibiotics. A multidrug antibiotic regimen consisting of Ciprofloxacin, Clarithromycin and Amikacin was used. All of our patients showed good response to treatment during stay and recurrence was seen in 3 patients who had delayed healing wounds.
Conclusions: NTM is not an uncommon infection and can occur following laparoscopic or open surgical procedures. Improper sterilization and reuse of laparoscopic or open instruments accounts for the majority of the cases. When laparoscopic instruments are reused, following strict sterilization protocols is necessary to prevent this infection. When established, this infection should be treated aggressively with adequate surgical debridement, followed by long term antibiotics.

Keywords: Debridement, Laparoscopic surgery, Nontuberculous mycobacteria, Sterilization

INTRODUCTION

More than a dozen mycobacterial species other than *Mycobacterium tuberculosis* (MTB) cause disease in humans. These are called atypical mycobacteria, mycobacteria other than tuberculosis (MOTT), or more commonly as *Non-Tuberculous Mycobacteria* (NTM). NTM are environmental organisms and most species have been isolated from either soil or water.[1-4] Infection with rapidly growing mycobacteria, such as *M. fortuitum* and *M. chelonae* may occur at surgical sites, or can be the result of wounds sustained in the environment by objects contaminated with soil or water.[1,2,5] Cellulitis, abscess formation, discharging sinuses and postoperative wound infections are the common clinical presentations of this infection. Surgical excision has been used to treat localized skin infections caused by NTM.[3] The histopathological examination and mycobacterial culture

of the tissue form the basis for accurate etiological diagnosis.[6]

It is generally advisable to initiate therapy with more than one antibiotic to prevent emergence of resistance. This case series is an analysis of 24 consecutive patients who presented with post-surgical, chronic subcutaneous atypical mycobacterial infection, the management protocol followed and the results of treatment.

METHODS

Patients with post-surgical, chronic surgical site infections admitted to the Department of Surgery, Unit III, Christian Medical College Hospital, Vellore, Tamil Nadu, India from January 2008 to December 2012 were included in this study. The case history, demographic details, investigations and treatment performed was obtained from the hospital data base.

A total of 35 patients presented with chronic surgical site infections and amongst these, a positive pathological report of granulomatous change (indicative of Non-Tubercular Mycobacterial infection), was noted in 24 patients. These patients were included in the analysis. The duration of follow-up ranged from 6 to 30 months.

A pre-operative imaging was performed on all patients to assess the extent of infection. This included a contrast enhanced Computed Tomography (CT) scan or a CT sinusogram. All patients had an extensive debridement performed which included laying open of sinus tracts and abscesses and removal of any prosthetic material (including mesh), if present. After debridement, the wounds were left open and allowed to heal by secondary intention. The tissue was sent for routine and Acid-Fast Bacillus (AFB) cultures. Nine patients had positive cultures and the most common strains isolated included *M. fortuitum* and *M. chelonae* (Table 3).

All patients were treated as in-patients for a duration ranging from 7-14 days post debridement. After confirmation of Atypical Mycobacterial infection, based on histopathology or by cultures, the patients were started on three drugs: Ciprofloxacin (or Levofloxacin), Clarithromycin and Amikacin. The antibiotics were continued for a period of 6 to 12 weeks.

RESULTS

A total of 24 patients were analyzed (Table 1).

Majority of the patients in this series were females (n=16), with a mean age of 42 years. The surgeries which they had undergone were varied including both open and laparoscopic, but this infection was commonly seen after laparoscopic cholecystectomy (n=10). None of the patients showed any signs of surgical wound infections, at the time of discharge. The initial stage of infection showed rounded erythematous swellings at the surgical site with mild to moderate pain. These lesions had then progressed to further swellings with discharge of sterile pus. None of the patients had signs of systemic infection such as fever. Symptoms were usually benign but persistent and distressing watery discharge, non-healing wound and occasional pus discharge. Five patients had undergone previous surgical curative attempts at outside centers and then presented with recurrence of infection. Six patients had infected prosthesis (hernia mesh) which had to be removed.

Table 1: Sex distribution.

	Male	Female	Total
Open	0	7	7
Lap	8	9	17
Total	8	16	24

Total number of cases with chronic surgical site infection=35; Total number of cases with granulomatous inflammation on histopathology n=24.

All the 24 patients had granulomatous change on histopathology and of these, 9 had cultures positive for NTM. *Mycobacterium fortuitum* and *Mycobacterium chelonae* formed the major strains seen in the present series (Table 2).

Table 2: Demographic profile.

Demographic data	
Mean age = 42 years	
Sex	
Male	8
Female	16
Co-morbidities	6
HTN	2
DM	2
Hypothyroidism	2
Initial surgery	
Lap cholecystectomy	10
LSCS	5
Lap hernia	3
Open hernia	2
Lap to open hernia	1
Lap gynec procedures	3
Treatment done: debridement, antibiotics	

Table 3: Strains grown on culture.

Strain	Number
M. fortuitum	4
M. chelonae	3
Others	2
Total	9

All of our patients showed good response to treatment and minor recurrence was seen in 3 patients who had delayed healing wounds. These three patients underwent

conservative management with continued dressings and antibiotics for a further period till the wounds healed.

DISCUSSION

Mycobacteria are gram-positive, slender, non-motile, non-spore forming, rod-shaped bacilli. Most mycobacteria are aerobic organisms, but some species may be microaerobic.[7] All mycobacteria are catalase-positive. The high lipid content of the bacterial cell wall provides the bacteria with resistance to acid and alkali.[8]

In 1959, a classification scheme for Mycobacterium was developed (Runyon). This scheme enabled mycobacteria to be classified according to rate of growth (slow or rapid) and production of pigment (yellow or orange). Runyon's scheme included:

- Group I Photochromogens which produced pigment on exposure to light
- Group II Scotochromogens which produced pigment in the dark
- Group III non-chromogens which produced no pigment
- Group IV rapid growers.

Runyon's classification scheme separates *Mycobacteria tuberculosis* from most of the 'atypicals'. A group of Mycobacterium are found in Group IV and referred to as the rapid growers. *M. chelonae* and *M. fortuitum* are the two well-recognized human pathogens found in this group. They are principally responsible for post-injection abscesses, wound infections and corneal ulcers. They occasionally cause pulmonary or disseminated disease. Water seems to be the main reservoir for environmental mycobacteria.[9]

Diagnosis of Mycobacteria is done by culture and histopathological examination which will show granuloma. Histopathological examination reveals features of granulomatous inflammation with either a foreign body or a tuberculous type of reaction in all the specimens. Although acid fast bacilli are reportedly seen in about one-third of cases, none of our patients had these detected on HPE. Culture of the debrided tissue is the most reliable way of diagnosis.[10]

Infections with atypical mycobacteria have been primarily reported after laparoscopic procedures.[6,11] In this case series, the majority of the infections were following laparoscopic surgery. Improper mechanical cleaning of the instruments and ports leaves debris on these instruments. Contaminated instruments deposit the endospores on to the subcutaneous tissue during the surgical process. Usually the current practice in India is to immerse instruments in 2-2.5% glutaraldehyde solution for 20 minutes which achieves disinfection but not sterilization.[12] Furthermore, the source of infection is often the boiled tap water used for cleansing of the instruments after immersion in glutaraldehyde.

The use of disposable laparoscopic instruments is the gold standard for prevention of infection.

The instruments should be thoroughly mechanically cleansed after each use, with complete dismantling of parts to ensure removal of all organic soil.[13] This is best achieved using an ultrasonic technology which is available in some hospitals. It is best to limit glutaraldehyde disinfectants and replace it with ethylene oxide gas sterilization, as this has been shown to be highly effective in reducing atypical mycobacterial infections following laparoscopy.[14] When liquid chemical sterilant are used, higher concentrations (3.4%) must be used and the exposure time should be increased to 8-12 hours to activate sporicidal activity. Furthermore, the water used to rinse the instruments should be autoclaved to prevent recontamination with spores post sterilization. The use of advanced sterilization systems such as STERRAD, which uses gas plasma technology to kill spores at low temperatures, or the use of ethylene oxide gas is strongly recommended for sterilization of insulated laparoscopic instruments.

There has been much controversy surrounding the proper line of treatment of NTM. These microorganisms show limited response to first line anti-tuberculous drugs. Thus, the standard treatment consist of combinations of second line anti-tubercular drugs including macrolides such as Clarithromycin, quinolones such as Ciprofloxacin or levofloxacin and aminoglycosides such as Amikacin.[15,16] It is recommended that the antibiotics be given for a minimum period of 3 months or for a period of 3-6 weeks after the wound heals completely in order to prevent recurrence.[17-18] The development of resistance during therapy is a recognized problem when mycobacterial infections are treated with only a single active drug.[19,20] Mutational resistance has been described for clarithromycin, azithromycin, rifampin and amikacin when used for NTM infections.[2] There have been reports of treatment of this infection with local injection of aminoglycoside antibiotic to the site, along with prolonged oral antibiotics.[14]

In this series, the treatment protocol followed included a thorough surgical debridement and initiation of appropriate long-term antibiotic therapy. Our hospital infection guidelines recommend surgical debridement followed by 3 months therapy with Ciprofloxacin (500mg twice daily) or Levofloxacin (750 mg once daily), Clarithromycin (500mg twice daily), and Amikacin (500 mg intravenous injection, once daily). Renal function has to be monitored while the patient is on long term aminoglycoside (Amikacin).

CONCLUSION

Non-Tubercular Mycobacterial infection is rare, but not uncommon. For early diagnosis and appropriate management, one should be aware of its presentation and have a have a high index of suspicion.

The most common, but preventable cause for this infection is improper sterilization techniques of surgical instruments and therefore is seen more commonly after laparoscopic surgery. The need for strict sterilization protocols, in particular for reusable laparoscopic instruments is vital to prevent these infections. Adequate surgical debridement and long term appropriate antibiotic treatment are important to achieve complete cure.

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