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Atypical Mycobacterial Infection of the Port Sites: An Emerging Challenge in Laparoscopic Surgery

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ABSTRACT

Atypical mycobacterial infections are emerging as a common etiological agent of port site infections. This unique, nagging, treatment-refractory, frustrating complication neutralizes the advantages of laparoscopic surgery and increases morbidity, treatment-cost and leads to loss of confidence on operating surgeon. Knowledge of this entity as an emerging cause of port site infection and high index of suspicion are the key to early diagnosis and appropriate management of this rare but not uncommon infection.

KEY WORDS

Atypical mycobacterial infection; Port site infection; Laparoscopic Surgery; Sterilization

1. INTRODUCTION

Atypical mycobacterial infections at the laparoscopic port site are a frequent problem encountered in patients undergoing laparoscopic surgery. Atypical mycobacterial infections are infections caused by a species of mycobacterium other than Mycobacterium tuberculosis and Mycobacterium leprae. There are at least 30 species of Atypical Mycobacteria or Non-Tuberculous mycobacteria (NTM) or Mycobacteria other than tuberculosis (MOTT) causing disease in humans. Atypical mycobacteria may cause many different types of infections such as: Pulmonary disease, Lymphadenitis, Skin and soft tissue disease, and disseminated disease. The commonest ones are Mycobacterium chelonae, M. fortuitm, M. abscessus, M. flavescence, M. marinum, M. Ulcerans causing skin and sub-cutaneous tissue infections in both immunocompetent and immune-compromised patients and M. avium-intracellulare and M. kansasii causing lung disease in immune-compromised patients [1, 2]. Atypical mycobacteria are environmental organisms and most species have been isolated from either soil or water [3]. Infection with these acid-fast, rapid grower mycobacteria may occur at surgical sites. The non-tubercular mycobacteria can colonize in tape water, natural water, sewage and soil, thereby easily infecting solutions and disinfectants used in hospitals. Port-site infections with non-tubercular mycobacteria have been a source of significant morbidity in the patients operated with a laparoscopic procedure. The contaminated instruments deposit the endospores in subcutaneous tissue during laparoscopic procedure, which then germinates, followed by the appearance of symptoms after an incubation period of 3-4 weeks [4]. Erroneous cleansing, disinfection and sterilization of

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laparoscopic instruments are almost always responsible for such an outbreak [5]. Lack of knowledge about atypical mycobacterial infections and careless attitude towards sterilization methods lead to significant discomfort and morbidity to the patient. Infection of port sites with atypical mycobacteria is diagnosed on culture of tissue. It can be prevented by proper sterilization and storage of instruments. It is a preventable problem and can be treated by nonsurgical method. Our centre encountered 4 cases of atypical mycobacterial infection of port sites following laparoscopic surgery from elsewhere. These cases are presented so that one becomes aware of its presentation and maintains a high index of suspicion for its early diagnosis and appropriate management.

2. MATERIAL AND METHODS

All the 4 cases of atypical mycobacterial infection of the port sites reported to surgical OPD after developing port site swelling, pain and discharge 3-5 weeks after laparoscopic surgery, somewhere else outside district hospital Kargil, over a period of 3 years (February 2017-February 2020). Their immediate post-operative period was uneventful and had no history of any signs of surgical wound infection at the time of discharge. None of the patients complained of a febrile illness. All the 4 patients were non-diabetic, non-hypertensive, non-alcoholic and with no history of tuberculosis in the past.

3. CASE PRESENTATION

3.1 Case 1

A 50-year-old male patient presented 5 weeks after the laparoscopic Cholecystectomy. He had history of stitch removal on 12th postoperative day. However after 1 week of stitch removal, he noticed serous discharge from the wound and started induration, pain and pigmentation gradually over a period of 2 weeks. All the 4 ports were involved on presentation. Patient had undergone drainage of the larger epigastric port swelling with routine dressing and a course of antibiotic at a private clinic. As the swelling, induration, pain and discharge persisted even after 2 weeks of treatment, he visited the surgical OPD. Atypical mycobacterial infection was promptly suspected and treatment was started. Culture of the pus did not grow any organism but tissue culture of cavity wall biopsy latter yielded atypical mycobacteria (Figure 1, 2).

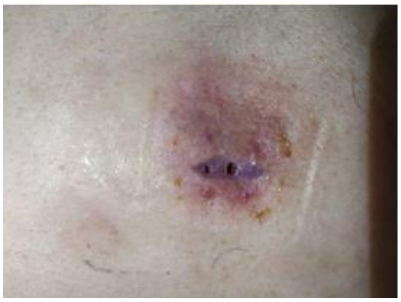

Figure 1: Showing swelling, sinus formation and pigmentation of 3rd port.

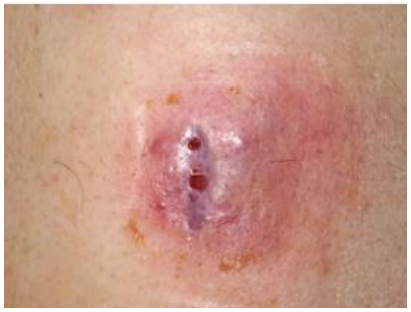

Figure 2: Second stage showing infected epigastric port with sinus formation.

3.2 Case 2

A 46-year-old female patient presented 4 weeks after the laparoscopic Cholecystectomy with painful erythematous swelling of epigastric and umbilical ports. Local examination showed a sinus discharging sero-purulent fluid from the epigastric port and erythematous swelling of umbilical port. Pus culture was negative. Tissue biopsy for culture was not taken for cosmetic reason. Prompt treatment was started on presentation with combination drug therapy for 2 months.

3.3 Case 3

56-year-old male patient presented 4 weeks after the laparoscopic cholecystectomy with swellings/ indurations of all 4 port sites with multiple secondary subcutaneous swellings adjacent to them. A small Sinus formation with mild serous discharge was present in only epigastric port. Prompt treatment was started on clinical suspicion and Amikacin was also injected for 5 days in persistent subcutaneous nodules after the completion of one month of treatment. A course of 2 months of combination drug treatment was helpful in resolving the infection in this patient (Figure 3a &3b and Figure 4).

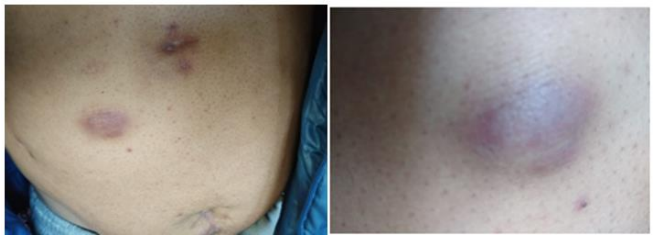

Figure 3a and 3b: Showing swelling of all 4 ports with subcutaneous nodules.

3.4 Case 4

A 34 year old female patient with secondary infertility had undergone laparoscopic tubal irrigation and endometrial curetting and presented with persistent umbilical port area swelling 6 weeks after the procedure. She had also got the endometrial culture report which was negative for mycobacterium tuberculosis but atypical mycobacterial growth was seen. PCR for mycobacterium tuberculosis of the endometrial biopsy was negative. A two month course of combination drug regime was completed. Both her infertility and umbilical port swelling resolved. Whether the umbilical port infection was because of the contaminated Cannula or because of the contaminated spilled peritoneal fluid or because of the uterine infection was not fully understood, in this case [Figure 4].

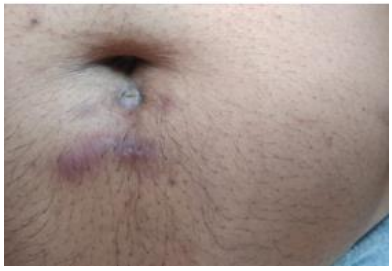

Figure 4: Fifth stage showing multiple secondary subcutaneous nodules with hyper-pigmentation of the skin surrounding the sinus.

4. DISCUSSION

Port site infections after laparoscopic surgery are of two broad varieties; the ‘early’ type which is the most common type and manifest within a week of the surgical procedure. Gram positive and gram negative bacteria are the usual offending organisms which are contracted from the native skin or infected surgical site. They usually respond well to the commonly used anti-microbial agents. The ‘late’ type is caused by atypical mycobacterium species which have an incubation period of 3-4 weeks. They show poor response to usual anti-microbial agents [6, 7].

Atypical mycobacterial species are widely distributed in water and soil and can therefore contaminate hospital instruments [8]. The port site infection due to atypical mycobacterial infection presents in the form of persistent multiple discharging sinuses or nodules. There may be pigmentation and induration at the port site, starting in a single port and spreading to others. There are five clinical stages of atypical mycobacterial port site infection [4, 9].

4.1. First stage

A tender nodule appears in the vicinity of the port site, at around 3-4 weeks following surgery.

4.2. Second stage

Increase in the size of the nodule, increased tenderness of the site along with other signs of inflammation with eventual formation of a discharging sinus.

4.3. Third stage

Reduce pain sensation following discharge of the purulent material and necrosis of the skin surrounding the port site.

4.4. Fourth stage

Chronic sinus discharge with serous fluid.

4.5. Fifth stage

Hyper-pigmentation of the skin surrounds the sinus and appearance of multiple nodules at different places.

In immune-competent individuals, skin and soft tissue infections by these non-tubercular mycobacteria often emerge in outbreaks. These outbreaks are commonly associated with various interventional procedures such as laparoscopic surgery, laser-assisted insitu keratomileusis, plastic surgery, breast implant surgery, liposuction and mesotherapy [10]. In the majority of the cases, the source of infection is direct or indirect contamination of the laparoscopic port sites due to colonized water. The endospores of the atypical mycobacteria, particularly M. chelonae, M. fortuitum, M. abscessus, M. flavescence and M. massiliense have an affinity for the dermis and the subcutaneous area. The protective factors within the peritoneum destroy the mycobacteria and prevent infection within the peritoneal cavity. After laparoscopic procedures, the infection starts at the 10mm port sites and latter it spreads sequentially to other ports. The microorganisms can be isolated through culture of affected tissue but takes a long time to grow and is also difficult to culture [11]. It is very important to make clinical diagnosis based on signs since culture of the pus collected from the port site is mostly negative for mycobacterial culture and AFB staining. Obtaining microbiological evidence and histopathological examination through tissue culture via cavity wall biopsy is though accurate but adds to trauma, disfigurement, difficult to obtain and also takes 3-4 weeks to isolate it from culture, leading to delayed treatment and increases morbidity, and hence makes clinical diagnosis the best option [12].

Blood tests done on the patients revealed an increased CRP due to inflammation but both white blood cell and differential count were normal, thus confirming absence of systemic infection. Molecular techniques such as PCR and restriction fragment length polymorphism should be used to identify non tubercular mycobacteria. Resistance to polymyxin-B disc (300ug) can be the simplest and most accurate method for rapid identification of M. chelonae.

Infections with atypical mycobacteria have been primarily reported after laparoscopic procedures. This is because, unlike open surgery, the instruments used here have a layer of insulation that restricts the use of the autoclave in the sterilization process. Also, proper mechanical cleansing of the instruments is not done, which leaves the deposit of blood and charred tissue that collects in the joints of the instruments during surgery. Contaminated instruments deposit the endospores in the subcutaneous tissue during the laparoscopic procedure, which then germinate following which clinical symptoms appear after an incubation period of 3-4 weeks. The current standard practice of immersing laparoscopic instruments in 2-2.5%gluteraldehyde solution for 20 minutes achieves only disinfection but not sterilization and so the spores often survive and cause infection. Furthermore, the source of infection is often the boiled tap water used for cleansing or rinsing of the instruments after immersion in gluteraldehyde [4,11,13,14].

There are several methods available for attaining proper sterilization of the laparoscopic instruments. The use of disposable laparoscopic instruments is the gold standard for prevention of infection. However, in India, reusable instruments are mostly used for laparoscopic surgeries. These instruments have multiple joints where dirt, grime and blood clots collect during surgery. The instruments

should be thoroughly mechanically cleansed after each use, with complete dismantling of parts to ensure removal of all organic soil [15]. This is best achieved by using an Ultrasonic technology which is available in some hospitals now. Current guidelines on infection control recommend a minimum exposure of 8-12 hours in gluteraldehyde to achieve the desired level of sporicidal activity and the use of higher concentration (3.4%) of gluteraldehyde disinfectants. Furthermore, proper disposal of gluteraldehyde based disinfectants should be followed, as these chemicals can be used for maximum of a 100 cycles or a period of 14 days (2.5% gluteraldehyde) or 28 days (3.4% gluteraldehyde). The count of cycles should be kept in the O.T to keep right potency of these chemicals to achieve the desired level of sterilization [12]. The practice of rinsing the instruments with boiled tap water to rinse off the gluteraldehyde should be replaced by autoclaved water to prevent re-contamination of mycobacterial spores on the instruments. Conventional autoclave can also be used for sterilization of the metallic Cannula and trochar of the ports. Sharing of instruments between different specialties in the O.T should also be discouraged. It is also been suspected that increased exposure to gluteraldehyde based disinfectants will select for drug resistant atypical mycobacterial strains as mutations caused by it leads to defect in porin expression in the bacterial cell walls, thus preventing the delivery of antibiotics into the mycobacterial cell thus making treatment more difficult [16]. Hence, it is necessary to limit gluteraldehyde disinfectants and replace it with ethylene oxide gas sterilization, as this has been shown to be highly effective in reducing atypical mycobacterial infection following laparoscopy [17]. Other liquid sterilizing agents such as Orthophthaldehyde (OPA; 0.55%) and Per-acetic acid may also be substituted instead of gluteraldehyde for high level disinfection with good efficacy. The contact time required for OPA to take effect is 12 minutes, at which time it destroys all bacteria, fungi and mycobacteria. The use of advanced sterilization system such as STERRAD, which uses gas plasma technology to kill spores at low temperature, is strongly recommended for sterilization of insulated laparoscopic instruments. Hydrogen peroxide gas plasma and vaporized hydrogen peroxide are very effective in killing non-tubercular mycobacteria. Another option is to keep instruments for 24 hours in a formaline gas chamber. However, the instruments must be thoroughly cleansed and dried for this process to be effective, as the presence of dirt and moisture prevents the penetration of formaline gas, thus giving the same disastrous results [18]. Rinsing the laparoscopic instruments with sterile autoclaved water followed by drying with alcohol or forced air and storage in a way that prevents recontamination and promotes drying would further safeguard qualities of the procedure.

Management of port site infection with atypical mycobacteria lack consensus. Second line anti-tubercular drugs including macrolides (Clarithromycin, Azithromycin), Quinolones (Ciprofloxacin), tetracyclines (Doxycycline) and aminoglycosides (Amikacin, Tobramycin) in various combinations have been used with promising results. Linezolid is found to be active against these organisms and used successfully in combination therapy. The duration of treatment may vary from 28 days to 3 months. Surgical excision or debridement should be reserved for critical cases only, where there is gross tissue destruction with necrosis of skin, and not for all cases [19].

With the establishment of laparoscopic surgery 2 1/2 years back at District Hospital Kargil, we have performed more than 200 cases of laparoscopic surgery and till date not a single case of atypical mycobacterial infection of port sites has been encountered from our hospital. It doesn’t mean we are immune but continuous education and strictly abiding the commandments of latest

sterilization techniques and latest infection control guidelines are the key to its prevention.

5. CONCLUSION

Atypical mycobacterial infections of the laparoscopic port sites are a result of breach in infection control standards in the operating theatre. Its prevention is challenging due to the fact that atypical mycobacteria are resistant to killing by disinfection due to their high lipid cell wall content and their existence within a bio-film. Meticulous sterilization protocols needs to be adhered and performing frequent audits are the key to prevention of this frustrating complication, as use of laparoscopic surgical procedures increase.

6. CONFLICT OF INTEREST

The author has no financial or any conflict of interest to declare.

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