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CASE REPORTS

Surgical Site Infections with MRSA in Young Patients

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Abstract

Introduction: Surgical site infections (SSIs) pose a global health concern. While various pathogenic microorganisms can cause SSIs, a predominant causative agent is Staphylococcus aureus, particularly its methicillin-resistant strain (MRSA). MRSA, known for its resistance to multiple antibiotics, significantly complicates treatment options, leading to increased morbidity. In some cases, particularly among patients with pre-existing comorbidities, MRSA infections can prove fatal. Moreover, eradicating MRSA from hospital settings presents a formidable challenge.

This study aims to report on two young, otherwise healthy patients who developed MRSA infections in their surgical wounds during hospitalization.

Case Descriptions: A 22-year-old female patient developed an MRSA infection following an appendectomy and a 12-year-old male patient exhibited similar complications post-orchiopexy. In both cases, MRSA presence was confirmed through microbiological cultures a few days post-surgery. Repeated cultures indicated successful MRSA eradication after isolation and initiation of targeted antibiotic therapy based on antibiograms. Once their general health stabilized, the patients were discharged and continued outpatient antibiotic treatment for a prescribed duration.

Conclusion: These cases emphasize that MRSA infections, typically associated with elderly patients or those with underlying health conditions, can also occur in younger, healthier individuals. Eradicating these infections remains a significant challenge for healthcare facilities encountering MRSA.

Keywords: Staphylococcus aureus, Methicillin-resistant, young patients, Surgical site infections.

Introduction:

Numerous microorganisms play a role in the infection of surgical wounds, among which Staphylococcus aureus prominently features as a leading cause. A global rise in hospital-acquired diseases attributed to antibiotic-resistant bacteria is evident [1]. Statistical analyses reveal that over 30% of grave surgical infections stem from wound colonization by Methicillin-resistant Staphylococcus Aureus (MRSA), a bacterium incredibly challenging to eliminate [2]. The resistance of MRSA strains is partly due to their capacity to produce a distinct protein that diminishes the binding efficacy of β-lactam antibiotics (such as penicillin, cephalosporins, monobactams, and carbapenems) to the bacterial cell wall [3, 4]. This mechanism allows MRSA to continue cell wall synthesis even in the presence of these antibiotics, thereby limiting the options for effective eradication from surgical wounds [5].

In addition to surgical wound infections, MRSA is responsible for severe urinary and lower respiratory tract infections, bacteremia, skin infections, and others. Patients in intensive care and surgical units are particularly vulnerable

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to MRSA infections. These infections typically arise from contamination of wounds with the pathogen during surgical procedures, though postoperative inoculation during wound care is also a risk.

Despite various strategies to minimize surgical wound infections, only a few demonstrate efficacy, particularly in preventing MRSA. These strategies include the pre-surgical application of anti-staphylococcal nasal sprays [7], avoidance of hair removal in the operative field on the day of surgery, skin cleansing with potent disinfectants like chlorhexidine gluconate combined with alcohol, maintaining patient warmth during surgery through warm intravenous fluids, and blood glucose control in diabetic patients. Research indicates that preoperative antibiotic administration can reduce the risk of surgical wound infections. The selection of appropriate antibiotics is guided by institutional data on nosocomial pathogens [8].

Patients and Methods:

This study presents a detailed analysis of two cases involving severe surgical wound infections attributed to Methicillin-resistant Staphylococcus aureus (MRSA), observed shortly after surgical interventions. In September, these patients underwent surgery at the General Surgery Department of Tetovo Clinical Hospital.

Critical patient data, including age, gender, type of surgical procedure, and microbiological analysis results from wound swabs, were meticulously extracted from their medical records. Of particular interest to this study is the fact that both patients received antibiotic treatment in the preoperative period.

The diagnosis of MRSA as the causative agent of surgical wound infections was confirmed through wound swab cultures. The pathogen eradication was monitored after administering targeted antibiotics, as indicated by antibiogram results, and regular wound cleaning. This was accomplished by periodically obtaining swabs from the surgical wound to assess the presence of MRSA.

Case 1

A 24-year-old female patient was admitted to our clinic, exhibiting severe pain in the lower right quadrant. Palpation revealed marked tenderness and peritoneal signs. The patient reported the onset of pain five days prior, noting a continuous increase in intensity. Accompanying symptoms included elevated body temperature, fever, vomiting, weakness, and sweating. Before admission, she received antibiotic and antipyretic treatment from her primary care physician. A surgical consultation conducted a day before her clinic admission recommended the continuation of antibiotic therapy with Amoxiclav. Laboratory tests indicated leukocytosis with over 19,000 WBC/mm^3 and elevated C-reactive protein (CRP) levels at 174 mg/L.

Computed tomography scans revealed an advanced inflammatory process in the ileocecal region, characterized by an enlarged appendix, free fluid in the peri-appendiceal space, and free fluid in the correct Douglas pouch and inter-intestinal spaces.

Abdominal ultrasonography further confirmed an enlarged, edematous appendix with free fluid in the peri-appendicular region. The patient underwent surgery on the day of hospitalization. A transverse incision at the McBurney point was performed, revealing significant purulent discharge upon entering the abdominal cavity. A gangrenous, perforated appendix located in the retrocecal space was identified and removed. Intraoperatively, the patient received 1g of Ceftriaxone and 500mg of Metronidazole. An appendectomy was conducted with ligation of the appendicular artery and stump using Vicryl® 2/0 ligatures. Purulent fluid was aspirated from the Douglas pouch and abdominal space, followed by irrigation with saline. A Douglas drain was placed post-procedure. Postoperative treatment included Ceftriaxone (2x1g) and Metronidazole infusion (2x500mg).

Initially, the patient's condition improved, with reduced pain and temperature. However, on the third postoperative day, she exhibited symptoms of toxemia, including fever, high temperature, and vomiting. Laboratory findings revealed anemia (Er - 3.1, Hgb 11.2 g/dL, Hct - 30%), hypoproteinemia (42 g/L), hypoalbuminemia (25 g/L), elevated indirect bilirubin (11.1 μmol/L), increased CRP (175 mg/L), and high transaminase levels (AST - 121 U/L, ALT - 142 U/L). A foul-smelling, purulent discharge from the surgical wound was observed. The damage was reopened and cleansed with 10% betadine and saline, and a pus sample was sent for microbiological analysis, which identified MRSA sensitive to Vancomycin and Gentamicin. The patient was isolated and treated with these antibiotics for ten days. A wound swab taken on the fourth day post-therapy initiation showed no MRSA presence. Concurrently, the patient received two units of fresh blood, albumin solutions, and two units of fresh plasma. Her condition improved with the normalization of biochemical parameters and blood values. Ten days post-antibiotic treatment, with negative MRSA swabs and a clean wound, she was discharged in good condition, continuing wound care at our clinic. Two more swabs, taken until complete wound closure, tested negative for MRSA and other pathogenic microorganisms."

Case 2

A 12-year-old male patient was admitted to our clinic and diagnosed with right-sided cryptorchidism. The patient, who was overweight, exhibited underdeveloped genitalia. Inguinal ultrasonography revealed the testis located at the internal inguinal canal orifice level, which was underdeveloped for the patient's age. During the surgical procedure, the testicle was successfully mobilized and positioned in the scrotal pouch using the Dartos technique.

The patient was discharged satisfactorily the day following the surgery, with instructions to return for a follow-up three days later. On the third day post-discharge, the patient presented with symptoms of high fever (up to 39°C), weakness, and vomiting. Examination of the surgical site revealed redness, swelling, and discharge of foul-smelling pus. Immediate action was taken to remove the sutures, collect a pus sample for microbiological analysis, and thoroughly cleanse the wound using disinfectants and saline solutions. The patient was readmitted and isolated in a single room for treatment.

The microbiological analysis identified the presence of Methicillin-resistant Staphylococcus aureus (MRSA) and Enterococci, both sensitive to Vancomycin and Ampicillin. Treatment was initiated with Vancomycin at 40 mg/kg/day, administered in four divided doses every six hours, and Ampicillin at 400 mg/kg/day intravenously in divided doses every 6 hours, supplemented with intravenous Paracetamol. The patient's condition stabilized with normalization of body temperature and cessation of vomiting. Daily careful cleaning of the wound was conducted. A swab taken on the fifth day post-antibiotic initiation showed no presence of MRSA. The patient was discharged on the tenth day in stable condition, with a second wound swab negative for MRSA and the wound exhibiting clean and positive signs of healing. Ambulatory treatment continued in our clinic until the surgical wound was closed entirely.

Discussion

Surgical wound infections (SWIs) remain a significant concern in surgical practice, particularly abdominal surgeries [1, 2]. The incidence of SWIs varies globally, with reports ranging from 2.5% to 42% [9, 10]. Predominant causative agents include Staphylococcus aureus (S. aureus) from Gram-positive bacteria and E. coli and Klebsiella spp. from Gram-negative bacteria [11, 12, 13]. Notably, S. aureus is implicated in approximately 40% of these infections [15], mainly because over 80% of individuals harbor this pathogen on their skin or nasal passages. This becomes particularly problematic during surgical procedures, where any breach in skin integrity can lead to wound invasion by the pathogen.

A significant proportion of SWIs caused by S. aureus are due to Methicillin-resistant Staphylococcus aureus (MRSA) strains [11, 17]. MRSA infections are predominantly nosocomial, with patients acquiring these infections during hospital stays [18]. These infections are more common in elderly patients due to factors such as chronic diseases, weakened immunity, cardiorespiratory disorders, and diminished wound healing capacity. However, MRSA infections can also occur in younger individuals, as evidenced by two cases in our study where young patients developed complicated surgical wound infections. The primary source of such conditions is often the contamination of surgical wounds with MRSA colonizing hospital environments. Treatment of SWIs with MRSA necessitates potent antibiotics, including Vancomycin, doxycycline, trimethoprim-sulfamethoxazole, and linezolid. [21, 22, 23].

Risk factors for SWIs can be categorized into patient-related factors, some modifiable preoperatively, such as diabetes, obesity, smoking, infections during hospitalization, and malnutrition [24, 25, 26]. Nonmodifiable patient-related factors include age, malignant diseases, cytostatic therapy, recent radiotherapy, immunosuppressive medications, etc. Other factors increasing the risk of postoperative infections are related to surgical procedures, operating room conditions, and the sterility of materials and instruments [27]. The most common factor is airborne microbial contamination in the operating room, often from medical personnel [28].

Additional factors within this category that contribute to the risk of surgical wound infections include blood transfusions during the surgical intervention, the duration of the surgical intervention, the surgical technique used, the degree of contamination of the operative field during the operation, the presence of foreign materials in the wound, hypothermia, postoperative hyperglycemia, bacterial flora on the skin of the patient, contamination of the wound by the hands of the medical personnel or by the materials and instruments used during the surgical intervention, etc. [24,27,28].

Prophylactic measures to prevent SWIs include preoperative antibiotic administration, nasal decolonization with anti-staphylococcal agents, and avoiding preoperative hair removal [30]. During surgery, effective disinfection of the operative field and maintenance of normothermia are crucial [31, 32]. Postoperative care involves maintaining normal glucose levels and normothermia and monitoring for hematoma formation in the operative wound.

An essential aspect of preventing SWIs, particularly MRSA contamination, lies in the awareness and practices of medical personnel, especially nurses. This includes adherence to procedures for infection prevention, such as maintaining cleanliness, regular disinfection of premises, and compliance with personal protective measures like frequent hand disinfection and use of protective equipment. Sterilizing all tools and materials that come into contact with the patient's wound is critical.

Finally, continuous education of medical personnel through seminars, conferences, and workshops is paramount in emphasizing the importance of infection prevention and introducing various strategies for this purpose.

Conclusion

Infections caused by Staphylococcus bacteria, particularly Methicillin-resistant Staphylococcus aureus (MRSA) strains, present significant challenges in numerous hospital settings. Eradicating these bacteria from surgical wards is a complex yet crucial effort in mitigating the risk of nosocomial infections. Achieving this requires comprehensive strategies,

including regular disinfection of premises and facilities within surgical wards, thorough sterilization of instruments and materials that interact with patient wounds, and the consistent use of protective gear by medical personnel. This gear encompasses gloves, frequent hand washing and disinfection practices, and wearing face masks. Equally important is the ongoing education and training of medical staff, particularly nurses. This training should emphasize their critical role in preventing and eradicating pathogenic bacteria, especially Staphylococcus species, including MRSA, within their working environments.

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