Manual of Infection Control in Orthopaedic Surgery

Operation Theater Protocols and Patient Optimization

Parag Kantilal Sancheti
Ashok Shyam

Second Edition

Foreword
Javad Parvizi
Manual of Infection Control in Orthopedic Surgery
Operation Theater Protocols and Patient Optimization

Second Edition

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Foreword
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Dedicated
to

Our Patients
Who have motivated us to work for improvement of healthcare standards

Our Parents
Their endless love and support has been a constant source of inspiration to us
Mentors

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Infection is a devastating complication of surgical procedures. Periprosthetic joint infection (PJI) results in a terrible outcome of an otherwise successful surgical procedure, including significantly increased mortality. Recent studies have shown that patients developing PJI have worse ‘survivorship’, than patients with cancer. What is amazingly disappointing is that despite all efforts, the incidence of PJI has not changed over the last three to four decades. It is heartwarming to note that the medical community has taken the issue of infection seriously and is collectively orchestrating efforts to prevent this devastating complication. The center for disease control is in the final throw of publishing their surgical site infection (SSI) prevention guidelines. The World Health Organization (WHO) has just begun a similar effort to determine the strategies that can result in reduction of the SSI. In August 2013, an International Consensus Group convened 400 experts from 50 countries to establish best practice guides. These are some examples of the efforts in recent years that are attempting to strike at the heart of the issue in hand.

The book *Manual of Infection Control in Orthopedic Surgery: Operation Theater Protocols and Patient Optimization* is an example of elegant efforts that are invested to determine measures that can be effective in reducing infection after orthopedic procedures. The editors, Parag Sancheti, Rajeev Joshi, Ashok Shyam and Steve Rocha have produced a body of literature that is likely to be used by many, for the years to come. Congratulations to the editors and authors for producing this great masterpiece.

**Javad Parvizi** MD FRCS

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Rothman Institute at Thomas Jefferson University Hospital
Philadelphia, USA
Welcome to the second edition of the book *Manual of Infection Control in Orthopedic Surgery: Operation Theater Protocols and Patient Optimization*. The impact of the first edition was widely felt in the surgical community and it encouraged us to write the second edition of the book. Healthcare-associated infections or infections acquired in healthcare settings are the most frequent adverse events in healthcare delivery worldwide. Hundreds of millions of patients are affected by healthcare-associated infections worldwide each year, leading to significant mortality and financial losses for health systems.

World Health Organization (WHO) statistics have revealed that for every 100 hospitalized patients at any given time, 7 in developed and 10 in developing countries will acquire at least one healthcare-associated infection. In developing countries, financial constraints may inhibit acquisition of state-of-the-art equipment to prevent infection. Yet, the need for such nursing homes is evident from the fact that in developing country like India, recent statistics have revealed that the ratio of doctors to patients is 1:1,619.

The International Consensus Meeting for infection control in total knee replacement surgery held in Philadelphia under the auspices of Dr Javad Parvizi was an eye-opener for us to study, how we could control infection in orthopedic surgeries in developing countries like India. We are, however, diversified into studying the infection in not just arthroplasty, but trauma and spine as well. Holding the pattern similar to the first edition, we set out by discussing the various reasons that cause infection in the pre-, peri and intra-operative settings. We held meetings every week for almost a year and our team gradually grew with consultants volunteering to research different aspects of
possible causes of infection. With an emphasis on evidence-based medicine, we reviewed literature and where there were deficiencies, we relied on different opinions of stalwarts in the field of orthopedics. A consensus meeting was held wherein doctors from all over India, most of whom had tremendous experience in setting up their own hospitals and dealing with infections, were invited to review every aspect of the book and share their experience and knowledge on the same.

We developed guidelines keeping in mind the problems faced by smaller nursing homes with regards to space constraints and financial limitations. With a question-and-answer-based approach, we tried to make this book *Manual of Infection Control in Orthopedic Surgery: Operation Theater Protocols and Patient Optimization*, easy to read and simple to understand. We included common questions asked and tried to make the answers more applicable to conditions in nursing homes and smaller hospitals, which plays an important role in the healthcare delivery system in developing countries.

We were honored to be under the guidance of Dr KH Sancheti, Founder President of Sancheti Hospital. Dr Olivier Borens also reviewed our proceedings and his inputs were a constant source of inspiration for us to complete this endeavor. We had a lot of inputs from Dr Bharat S Mody, Dr Hemant M Wakankar and Dr Pramod P Neema and many others whose contributions have made this book what it is today.

We hope this book will guide orthopedic surgeons who are venturing to start their own hospitals. It would be a boon for postgraduates with simple answers to commonly asked questions as well. It would be an immense resource for anyone to understand and prevent infections in orthopedic practice.

*Parag K Sancheti*
Preface to the First Edition

Healthcare-associated infections or infections acquired in healthcare settings are the most frequent adverse events in healthcare delivery worldwide. Hundreds of millions of patients are affected by healthcare-associated infections worldwide each year, leading to significant mortality and financial losses for health systems.

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Parag K Sancheti
This project is an initiative of Sancheti Research Department. The idea of this project was conceived from the 'proceedings of the International Consensus Meeting on Periprosthetic Joint Infection' and we would like to thank Dr Javad Parvizi for inspiring us in writing this book.

We also received support from the Indian Orthopaedic Research Group and its members, and we thank them for their time and effort.

Special thanks to Dr Ravishek Kumar for taking time out to attend our weekly meetings from the start of the project and for his valuable inputs during discussion.

We thank Dr Olivier Borens for visiting us and spending time to go through the entire document and giving his constructive suggestions.

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Parag K Sancheti
Ashok Shyam
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INTRODUCTION
Sophisticated prevention strategies have been developed during the past two decades to lower the risk of infectious complications in orthopedic surgeries. However, there is no proper consensus or guidelines regarding management of postoperative infection. Orthopedic surgeons are still in a dilemma about appropriate antibiotic prophylaxis and regarding the treatment also. Moreover, diagnosis and management require close collaboration between surgeons, infectious diseases specialists, microbiologists and pathologists, as no well-defined internationally accepted criteria for diagnosis and simultaneous treatment of orthopedic infections have been developed. We present appropriate guidelines related to the surgical wound and infection management in the postoperative period.

What is the optimal dressing material for a wound after the surgery?
The optimal dressing material should be low adherent, transparent polyurethane dressing, which protects the wound and gives the opportunity to check the surgical incision site for any signs of wound infection. Silver-impregnated dressings have not been conclusively shown to reduce surgical site infections (SSIs). Topical antimicrobial agents should not be used for wound dressing after surgery.
Explanations

It is generally considered best practice to cover all surgical incisions postprocedure with a low adherence, transparent polyurethane dressings, which protect the wound and give the opportunity to check the surgical incision site for any signs of wound infection without disturbing the dressing itself. The advantages of using low adherent, transparent polyurethane film dressings in general are as follows:

- They allow postoperative inspection of the wound without disturbance of the dressing.
- They make the wound ‘waterproof’ to allow early showering or bathing, while at the same time acting both—a barrier to possible external bacterial contamination and to prevent cross contamination to other patients.
- Their low adherence allows relatively painless and easy removal when there is a need for a dressing change, such as when there is a build-up and leakage of exudates (oozing) from the incision site.
- They prevent any material from further contaminating the wound.
- They maintain an optimal moist wound environment without causing maceration of the surrounding skin, as the dressing material is permeable to moisture and gas.
- They prevent heat loss from the wound and maintain the optimal wound temperature.
- They provide a cost-effective approach to the wound management, as they reduce the number of dressing changes required and the pain experienced by the patient.

However, the Cochrane review study for the dressings for SSI in 2011 stated that there is no evidence to suggest that covering surgical wounds healing by primary intention with wound dressings reduces the risk of SSI or that any particular wound dressing is more effective than others in reducing the rates of SSI, improving scarring, pain control, patient
acceptability or ease of dressing removal.\textsuperscript{2} Hence, based on the current evidence, they concluded that decisions on wound dressing should be based on dressing costs and the symptom management properties offered by each dressing type.

Silver, as an antimicrobial agent, is particularly preferred, as it has a broad spectrum of antimicrobial activity with minimal toxicity toward mammalian cells at lower concentrations and has a less tendency than antibiotics to induce resistance due to its activity at multiple bacterial target sites.\textsuperscript{3} However, silver-impregnated dressings have not been conclusively shown to reduce SSI. Trial et al.\textsuperscript{4} conducted a randomized controlled trials (RCTs) where they compared silver-impregnated colloid dressings to non-silver dressings in treatment of variety of wound types including acute surgical wounds, infected and non-infected diabetic foot ulcers, and traumatic wounds. The above RCT failed to show any difference in terms of outcome in wound or ulcer healing and local infection rates. Hence, silver-impregnated dressings should not be used for routine, clean postoperative wound dressings. They are generally used as ‘advanced dressings,’ where the wound is difficult to heal, such as chronic ulcers and burn wounds.\textsuperscript{5}

Topical antimicrobial agents should not be used for surgical wounds that are healing by primary intention. Application of topical agents after surgery increases the risk of SSI.\textsuperscript{1}

**When is the first check dressing done after surgery and how often should it be done in postoperative period?**

First check dressing should be done 48 hours after surgery or prior to discharging the patient from the hospital whichever is later. After that, the dressing in postoperative period should be done only if the dressing is soaked or then at the time of stitch removal.
The first check dressing is done 48 hours after surgery, as the surgical dressings are generally soaked in immediate postoperative period due to small exudates or discharge from the drain or the incision site. After that, in case of clean surgical cases, it is done only if the dressing has been soaked again. However, for open/compound wound, daily dressing is required.

Hence, the frequency at which the dressings are changed should be determined individually and will depend on the type of surgery, on the kind of wound dressing used and on host factors of the patient.\(^6\)

**What is the protocol for drain management in postoperative period?**

For routine orthopedic surgeries, wound drains if kept should be removed after 24 hours after surgery or if the drain volume is less than 50 mL in the preceding 24 hours.

Closed suction drains reduce postoperative hematoma formation, but create an entry portal for bacteria and thus increase the risk of infection.\(^7\) Drinkwater et al.\(^8\) conducted a prospective clinical trial where wound drains were used in all patients having a total knee or total hip arthroplasty. Timing of drain removal and amount drained were recorded, and drain site swabs were sent with drain tips for bacteriology. The results of the above trial suggested that the likelihood of bacterial colonization increases, while wound drainage decreases with time. The authors concluded that the optimal time to remove drains is 24 hours after total joint arthroplasty.

However, a Cochrane review in 2011 about the use of surgical drains in orthopedic surgeries concluded that there is insufficient evidence from randomized trials to support or
refute the routine use of closed suction drainage in orthopedic surgery and further randomized trials are required before definite conclusions can be made. They pooled the results of various studies and indicated that there is no statistically significant difference in the incidence of wound infection, hematoma, dehiscence or reoperations between those allocated to drains and the undrained wounds. Gaines et al. also showed that there is no statistical difference in outcome between drained and undrained patients. The authors stated in orthopedics that, these devices have been used to decrease local edema, lessen the potential for hematoma or seroma formation, and to aid in the efflux of infection. However, the role of postoperative surgical drains in clean, elective cases has not been firmly established. Despite the paucity of clinical evidence demonstrating any benefit supporting their use, drains continue to be placed after elective orthopedic procedures.

Hence, we recommend that the timing of drain removal should be individualized according to the type of surgery. Drain can be removed after 24 hours for routine trauma, spine and arthroplasty cases. However, if large amount of drain volume is expected in such cases, drain should be removed, if the drain volume is less than 50 mL in the preceding 24 hours. For infected draining wounds also, the drain has to be kept for a longer time depending upon the amount of daily drainage.

**What is the protocol for routine urinary catheterization in postoperative period?**

Routine catheterization after orthopedic surgeries should be avoided. If at all urinary catheter is used, it can be kept for a maximum of 24–48 hours after surgery.

**Explanation**

Urinary catheters in the immediate postoperative period also acts as source of infection. Indwelling urinary catheters
routinely in place for longer than 2 days postoperatively may result in excess nosocomial infections. Among patients with urinary tract infections (UTIs), an estimated 3.6% will develop bacteremia, a condition that adds significantly to hospital stay and is a risk factor for death among elderly patients.11

We do not recommend routine catheterization for most routine orthopedic surgeries. However, for prolonged surgeries of more than 2 hours, many surgeons do catheterize the patients. We recommend that the urinary catheter should be removed in the morning after the day of surgery for such mobile patients. For spine cases, it can be removed 48 hours postsurgery. For patients who are immobile and require longer catheterization period, a condom catheter or a silicon catheter should be used.

**What is persistent wound drainage?**

Persistent wound drainage is defined as continued drainage from the operative incision site for greater than 72 hours.

**Explanation**

Studies in the literature have a wide range of definitions for persistent wound drainage (48 hours to 1 week). However, limiting wound drainage to 72 hours postoperatively allows for earlier intervention and may limit the adverse consequences of persistent drainage.

Weiss and Krackow et al.12 have defined persistent wound drainage as fluid drainage occurring for 4 consecutive days beyond postoperative day 5; drainage that would significantly wet or soak at least a 2’ × 2’ area of gauze dressing and drainage that emanated from the same specific site (s) along the wound. Persistent wound drainage after surgery is also defined by time, type of secretion (hematogenous or clear), site (wound secretion, secretion after removal of suction drains) and microbial content. Simple spotting of dressings
from poorly approximated wound edges, small areas of ulceration or marginal necrosis are not classified as persistent drainage.

**For persistent wound drainage, how and when the wound culture should be done? What is the role of swabs?**

Wound culture should be done in case of persistent wound drainage after 72 hours of surgery. In primary care, a swab is the most common method used for sampling a wound. Although biopsy or aspirates of pus are the ‘gold standard’ techniques, wound swabs can provide acceptable samples for bacterial culture, provided that the correct technique is used.

**Explantion**

Wound culture with the help of swabs is simple, inexpensive, non-invasive and convenient procedure for the majority of wounds. Swab sampling has been challenged on the basis that the superficial microbiology does not reflect that of deeper tissue and that subsequent cultures do not correlate with the presence of pathogenic bacteria. Also, if a swab sample is taken inappropriately (i.e. prior to wound cleansing and removal of devitalized superficial debris), the resulting culture has been considered to reflect only surface contamination and provide more false-negative results.13

If the wound is not purulent, it should be cleaned prior to swabbing. Some literature suggests that cleaning the wound before sampling is unnecessary; however, if the wound is not clean, it often leads to the isolation of multiple organisms, which may not be relevant and can generate laboratory results reporting ‘mixed bacterial flora’ rather than individual species. Cleaning removes the organisms present on the surface material, which are often different from those responsible for the pathology and allows for more accurate culture results. Wounds should be washed with sterile saline and then superficially debrided with a cotton-tipped swab.
Ideally, the patient should not have received recent antibiotic treatment before swabbing a wound, as this can affect the microbiological results. The recommended swabbing procedure (Levine method)\textsuperscript{14} are as follows:

- Apply sterile saline to moisten the head of the swab to increase the adherence of bacteria.
- Pass the swab over the wound area in a zigzag motion, while twisting the swab, so that the entire head of the swab comes into contact with the wound surface.
- Swab from the center of the wound outward to the edge of the wound.
- The swab should be pressed firmly enough that the fluid is expressed from the wound tissue (this may be painful for the patient).
- Repeat the process with a separate swab, if a pocket or sinus is present in the wound.

Swab culture is an important tool in the diagnosis of the infective organism. The Infectious Diseases Society of America (IDSA) guideline on the treatment of methicillin-resistant \textit{Staphylococcus aureus} (MRSA) infections recommend obtaining cultures to guide systemic antibiotic therapy in purulent skin infections (e.g., associated with purulent drainage or exudates).\textsuperscript{15}

Drinka et al.\textsuperscript{16} in their study about swab cultures of purulent skin infection have stated that swabs should be used to determine if the wound is acutely infected and to identify potential pathogens in a wound that is judged to be infected based on clinical criteria. According to the authors, practitioners who utilize swab cultures to guide antibiotic selection for mild infections treated in the nursing home, should ensure proper collection technique and be aware that the results may indicate colonization rather than infection.
What are the pharmacological recommendations?

We recommend against administration of oral or intravenous (IV) antibiotics to patients with persistent wound drainage.

Explanation

Currently there is little to no evidence to support the administration of antibiotics to the patients with draining wound. Although the rationale for this practice appears logical, in that one is attempting to prevent ingress of infecting organisms through draining wound, the issue of emergence of antibiotic resistance and adverse effects associated with administration of antibiotics cannot be overlooked. In addition, administration of an antibiotic is likely to mask the underlying infection or make diagnosis of infection difficult by influencing the culture result.\textsuperscript{17,18}

What is the protocol for anticoagulation in persistent draining wound and its effect on infection?

The decision about stoppage of anticoagulants should be based more on the clinical situation of the wound. These should generally be discontinued if there is persistent wound drainage for more than 48 hours. It is postulated that increased anticoagulation in a susceptible patient leads to increased wound soakage and consequently increased chances of infection.

Explanation

Generally, low molecular weight heparin (LMWH) is employed as a prophylactic agent for anticoagulation for most orthopedic surgeries. Advantages of LMWH over warfarin include its rapid onset of action and no need of monitoring after administration. However, its major adverse effect is increased risk of bleeding after administration. Monitoring of international normalized ratio (INR) value is also not beneficial, as LMWH does not affect it.\textsuperscript{19}
Postoperative wound complications, including the development of hematoma and wound drainage are the significant risk factors for infection in the postoperative period. Increased anticoagulation will result more likely in the development of hematoma and wound drainage.

Hence, the decision to stop anticoagulant should be made on the wound status. In case of persistent wound drainage beyond 48 hours, it is advisable to stop anticoagulant.

There is very little evidence in literature on the recommendation of anticoagulation in case of persistent wound drainage. Parvizi et al. in his study about whether excess anticoagulation leads to periprosthetic infection have concluded that a mean INR of greater than 1.5 was found to be more prevalent in patients who developed postoperative wound complications and subsequent prosthetic joint infection (PJI), and hence cautious anticoagulation to prevent hematoma formation and/or wound drainage is critical to prevent PJI and its undesirable consequences. However, the therapeutic level of anticoagulation is the value of INR between 2 and 3. Hence, maintaining the value of INR below 1.5 serves no purpose of anticoagulation. We, thus, recommend that the INR value should be maintained below 2.5.

**When should relook/debridement be done in persistent wound drainage?**

A wound that has been persistently draining for more than 5 days should be operated upon without delay.

**Explanation**

Studies have shown that the risk of infection increase after 5 days of wound drainage. Thus, performing surgical intervention after 5 days is most appropriate for preventing the increased risk of SSI in the postoperative period.

The dilemma faced by the operative surgeon is when, if at all, to perform an irrigation and debridement for persistent
wound drainage. If such drainage is culture positive, then immediate intervention may clearly seem appropriate. However, in culture negative draining wounds, a balance must be sought between:

- Early irrigation and debridement, where a certain percentage of procedures would not, in retrospect, be found to have been necessary.
- Delay of operative treatment, which might lead to frank deep infection of the prosthesis in a percentage of cases.
- The possibility of introducing infection with an additional operative procedure. \(^{21}\)

Drainage from the incision or from the drain site in the first few days after surgery can be managed with immobilization and sterile dressing changes. A strategy of immobilization and observation should not exceed 3–5 days. \(^{22}\) Waiting for 5 days for the wound to dry may be secondary to anticoagulation use; therefore holding off the surgical intervention until postoperative day 5 is reasonable.

**What are the modalities of investigation in a discharging wound?**

Serum erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) and white blood cells (WBCs) count are commonly used serological parameters, which are relatively non-specific markers.

Synovial fluid/aspirate analysis by arthrocentesis should also be employed in case of suspected prosthetic joint infection, if no overt clinical signs are present. Isolation of the causative organism by wound culture is the gold standard for diagnosis of infection. Blood culture may also be employed in case hematogenous spread of infection is suspected from other sites.

**Explanation**

Serum ESR and CRP are known sensitive markers of infection with relatively poor specificity and can be influenced by
other infectious and non-infectious inflammatory diseases, including extra-articular infection. The ESR and the CRP level normally rises rapidly after surgery, reaching peak levels, several days after the operation with the CRP level peaking slightly earlier than the ESR. In the absence of an inflammatory arthropathy or infection, the serum level of CRP usually returns to normal by about 3 weeks after the surgery. The combination of an elevated ESR and CRP with traditional thresholds has been shown to be a more accurate predictor of infection than isolated elevations of the ESR or CRP alone. The ESR and CRP levels should be serially monitored every 3 days, in case infection is suspected. A declining/increasing trend of their levels will help to prognosticate the infection status.

White blood cell count is also elevated with relative increase in the polymorphonuclear leukocytes (PMNs). Leukocytosis commonly accompanies infection and may serve as an early marker for a developing infection. Leukocytosis is defined as a WBC count more than 11.0 cells × 10^6/μL. However, postoperative leukocytosis is common after surgery and represents a normal physiologic response. In the absence of abnormal clinical signs and symptoms, we believe postoperative leukocytosis does not warrant further workup for infection.23

**Synovial Fluid Analysis**

A diagnostic arthrocentesis should be performed in all patients with suspected acute prosthetic joint infection unless the diagnosis is evident clinically. Synovial fluid analysis should include a total cell count and differential leukocyte count, as well as culture for aerobic and anaerobic organisms.24 The cut-offs used to indicate infection:

- Synovial WBCs count more than 10,000 cells/μL
- Synovial PMN percentage more than 90%.
Blood cultures for aerobic and anaerobic organisms should be done if fever is present, if there is acute onset of symptoms or if the patient has a suspected infection, or a concomitant pathogen, which will make the presence of a bloodstream infection more likely.  

**Microbiologic Cultures**  
The reference standard for diagnosing infection is the isolation of the responsible pathogen. However, standard microbiological cultures are only moderately sensitive and specific for diagnosing infection. A very low inoculum, adherent bacteria and the formation of small colony variants of microorganisms may limit detection. In addition, concurrent treatment with antimicrobial agents before sampling can prevent growth in the laboratory. Three specimens should be sent to the laboratory for accurate interpretation of the results. The diagnosis of orthopedic infections is established when all three specimens demonstrate growth of the same microorganism and the patient has clinically suspected infection.  

**Does hospital stay cause infection? What is the optimum stay for patient after surgery? What is the role of extended intensive care unit (ICU) stay causing infection?**  
Longer pre and postoperative hospital including ICU stay leads to increased chances of infection. There is no consensus or guidelines on the optimum stay after surgery.  

**Explanation**  
Longer hospital stay is an independent risk factor even after adjusting for age, previous medical comorbidities, wound problems and development of medical complications.  
One may hypothesize that with a longer hospital stay, patients are more likely exposed to nosocomial and virulent organisms that could result in later infection. In fact, the large
incidence of infection by resistant organisms may relate partly to this factor.\textsuperscript{27}

In case of clean surgeries, patient can be discharged on the 3rd day postoperatively after performing the first check dressing 48 hours postsurgery. Arthroplasty and spine patients can be discharged 5 days after surgery.

Farrin et al.\textsuperscript{27} in his study about postoperative factors causing SSI has stated that patients with MRSA were ‘more likely to have been in ICU, to have received antibiotics for more than 24 hours after the operation, to have had drains in place for more than 24 hours after the operation, and to have had more than 3 days of hospitalization immediately after surgery’.

Graf et al.\textsuperscript{28} in his study about infection control measures, has also shown that the well-known independent risk factor for SSI occurrence is caused because of prolonged stay by the patient within the hospital prior to surgery and this also increases the risk of subsequent SSI occurrence.

### SUMMARY

Monitoring of surgical wound in the postoperative period is essential to look for early signs of postoperative wound infection and to manage it accordingly. The optimal dressing material should be a transparent polyurethane dressing, which protects the wound and gives the opportunity to check the surgical incision site for any signs of wound infection. Silver-impregnated dressings have not been conclusively shown to reduce SSI. Topical antimicrobial agents are also to be avoided for wound dressing after surgery. The first check dressing should be done 48 hours after surgery. After that, the dressing in postoperative period should be done only if the dressing is soaked. Drains, catheter and IV line should be removed with a strict aseptic non-touch technique. Drains should be removed after 24 hours and urinary catheter should be removed after 48 hours of major surgeries.

Persistent wound drainage is defined as continued drainage from the operative incision site for more than 72 hours. A wound
that has been persistently draining for more than 5 days should be operated upon without delay. Serum ESR, CRP and WBC count are commonly used serological parameters, which are relatively non-specific markers. Synovial fluid analysis by arthrocentesis should also be employed in case of suspected prosthetic joint infection, if no overt clinical signs are present. Isolation of the causative organism by wound culture is the gold standard for diagnosis of infection.

Surgical debridement of the wound should be done in case of persistent wound drainage beyond postoperative day 5. We recommend against administration of oral or IV antibiotics to patients with persistent wound drainage. Anticoagulation should be stopped in case of persistent wound drainage beyond 48 hours. The IV antibiotics should be given for a period of 2 weeks followed by a period of 4 weeks of oral antibiotics or longer depending upon the status of infection.

REFERENCES


