

## Original Article

# Clinical Presentation of Soft-tissue Infections and its Management: A Study of 100 Cases

Baldev Singh, Sukha Singh, Sudhir Khichy, Avinash Ghatge

Department of Surgery,  
Government Medical College,  
Amritsar, Punjab, India

### ABSTRACT

**Background:** Soft-tissue infections vary widely in their nature and severity. A clear approach to the management must allow their rapid identification and treatment as they can be life-threatening. **Objective:** Clinical presentation of soft-tissue infections and its management. **Materials and Methods:** A prospective study based on 100 patients presenting with soft-tissue infections was done. All the cases of soft-tissue infections were considered irrespective of age, sex, etiological factors, or systemic disorders. The findings were evaluated regarding the pattern of soft-tissue infections in relation to age and sex, clinical presentation, complications, duration of hospital stay, management, and mortality. **Results:** The most commonly involved age group was in the range of 41–60 years with male predominance. Abscess formation (45%) was the most common clinical presentation. Type 2 diabetes mellitus was the most common associated comorbid condition. *Staphylococcus aureus* was the most common culture isolate obtained. The most common complication seen was renal failure. Patients with surgical site infections had maximum duration of stay in the hospital. About 94% of the cases of soft-tissue infections were managed surgically. Mortality was mostly encountered in the cases of complications of cellulitis. **Conclusion:** Skin and soft-tissue infections are among the most common infections encountered by the emergency physicians. Ignorance, reluctance to treatment, economic constraints, and illiteracy delay the early detection and the initiation of proper treatment. Adequate and timely surgical intervention in most of the cases is of utmost importance to prevent the complications and reduce the mortality.

**KEYWORDS:** *Clinical, etiology, management, outcomes, soft-tissue infections*

## INTRODUCTION

Soft-tissue infections are a common occurrence, generally of mild to modest severity, and are easily treated with a variety of agents. Superficial infections such as impetigo, erysipelas, cellulitis, and subcutaneous bursitis are common, and for the most part, they can be easily treated. In contrast, diffuse necrotizing infections may masquerade in many forms, delaying diagnosis and treatment. Edema out of proportion to erythema, subcutaneous gas, and skin vesicles are important markers of such necrotizing infections.<sup>[1-3]</sup>

Necrotizing soft-tissue infections (NSTIs) are highly lethal. The risk factors for death in these cases include age, extent of infection, delay in first debridement, impaired renal function, and degree of organ system dysfunction at the time of admission. Establishing the diagnosis of NSTI can be the main challenge in treating

patients with NSTI, and knowledge of all available tools is the key for early and accurate diagnosis.<sup>[4]</sup>

Diabetic foot ulcers (DFU) and concomitant infections are one of the most frequent complications in patients with diabetes mellitus. Diabetics develop chronic foot ulcers which can be limb or life-threatening. Chronic DFU are one of the most common indications for hospitalization in diabetics, and almost 50% of all the nontraumatic amputations are performed on diabetic patients.<sup>[5,6]</sup>

Monomicrobial infections are usually caused by hemolytic Group A *Streptococcus*, *Staphylococcus aureus*, or clostridial species. Group A streptococcal infections

**Address for correspondence:** Dr. Sukha Singh,  
328 Akash Avenue, Amritsar, Punjab, India.  
E-mail: [xpertscans@gmail.com](mailto:xpertscans@gmail.com)

### Access this article online

#### Quick Response Code:



**Website:** [www.nigerianjsurg.com](http://www.nigerianjsurg.com)

**DOI:** 10.4103/njs.NJS\_26\_16

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

**For reprints contact:** [reprints@medknow.com](mailto:reprints@medknow.com)

**How to cite this article:** Singh B, Singh S, Khichy S, Ghatge A. Clinical presentation of soft-tissue infections and its management: A study of 100 cases. *Niger J Surg* 2017;23:86-91.

involve younger patients, the extremities, and are associated with a streptococcal toxic shock-like syndrome.<sup>[7,8]</sup>

Clinical assessment of the severity of infection is crucial, and several classification schemes and algorithms have been proposed to guide the clinicians. However, most clinical assessments have been developed from either retrospective studies or from an author's own "clinical experience" illustrating the need for prospective studies with defined measurements of severity coupled to management issues and outcomes.<sup>[9]</sup>

In this study, we attempt to evaluate all the clinical conditions associated with soft-tissue infections including the predisposing factors as well as the coexisting morbidities and their treatment along with the prognosis.

### Aim and objectives

1. To evaluate the clinical patterns of soft-tissue infections including the incidence, presentation, etiological factors, and comorbid conditions
2. To assess the management and outcomes of soft-tissue infections including the complications, hospital stay, and mortality.

## MATERIALS AND METHODS

The present study is based on 100 patients presenting to Department of Surgery of Guru Nanak Dev Hospital, Government Medical College, Amritsar. This study evaluates the incidence of soft-tissue infections in patients, their clinical presentation as well as the management of such processes. The patients were enrolled after taking informed consent on basis of following inclusion and exclusion criteria after approval from the ethical committee.

### Inclusion criteria

1. All cases of soft-tissue infection were considered irrespective of age and both sexes
2. All cases of soft-tissue infection of any etiological factor
3. Any systemic disorder.

No exclusion criteria.

## RESULTS

The present study was conducted in the Department of Surgery at Guru Nanak Dev Hospital attached to Government Medical College, Amritsar. A total of 100 patients with diagnosis of soft-tissue infection were admitted in the hospital during our study and were studied prospectively. All the patients enrolled in the study completed the study.

### Age and sex distribution

In the present study, the most common age group involved in cases of soft-tissue infections was in the range of 41–60 years (41%) followed by age group of 21–40 years (29%), followed by age group of <20 years (17%), and followed by age group of 61–80 years (12%) and the least commonly involved age group was >80 years (1%). The minimum age encountered was 6 months and the maximum age was 85 years [Figure 1]. In our study, soft-tissue infections were seen more frequently in males with male to female ratio of 2.23:1 [Figure 2].

### Clinical presentation

In this study, abscess formation (45%) was the most common clinical presentation of soft-tissue infections followed by Fournier's gangrene (15%), followed by nonhealing ulcers and cellulitis (11%), followed by infected diabetic foot (5%), and followed by infected sebaceous cyst (5%), surgical site infection (4%), carbuncle and cold abscess (1%) each [Figure 3].

### Comorbid conditions

In this study, 43% cases presented with comorbid conditions associated with soft-tissue infections. Type 2 diabetes mellitus (32%) was the most common associated comorbid condition. Other comorbid conditions encountered in our study were hypertension, hepatitis C infection, HIV infection, carcinoma, cauda equina and other spinal cord lesions, stroke, and asthma [Figure 4].

### Microbiological culture

In the present study, 83% of the pus samples were cultured. Out of these, only 51 samples demonstrated significant microbial growth. There were 17 cases in which microbial cultures were not obtained. In these cases, it was either due to patient's refusal or due to nonrequirement in simple cases. *S. aureus* was the most common organism to be cultured (22%) followed by *Escherichia coli* (20%), *Klebsiella* (3%), *Acinetobacter*, *Pseudomonas*, *Proteus*, *Citrobacter freundii*, and coagulase-negative *S. aureus*, respectively [Figure 5].

### Complications

In our study, the most common complication of soft-tissue infections was renal failure seen in 10% of cases followed by multi-organ failure (renal failure and respiratory failure) seen in 2% of cases [Figure 6].

### Duration of stay

In this study, the total average duration of stay in the hospital was found to be 7.15 days. The average duration of stay of the patients with surgical site infections was 11.2 days, followed by Fournier's gangrene (10.8 days), followed

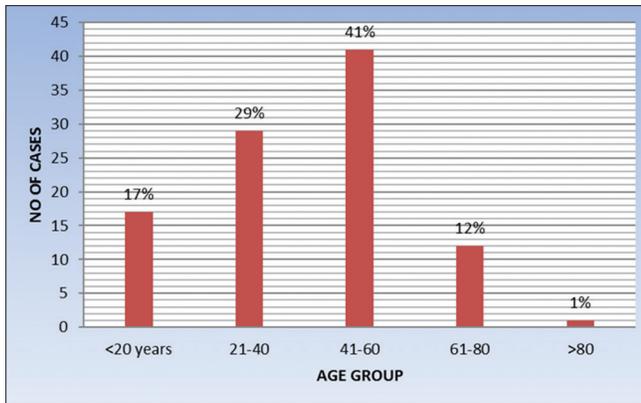


Figure 1: Age distribution of cases

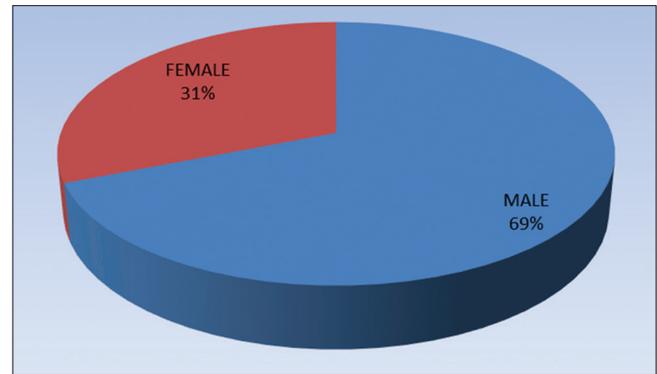


Figure 2: Sex distribution of cases

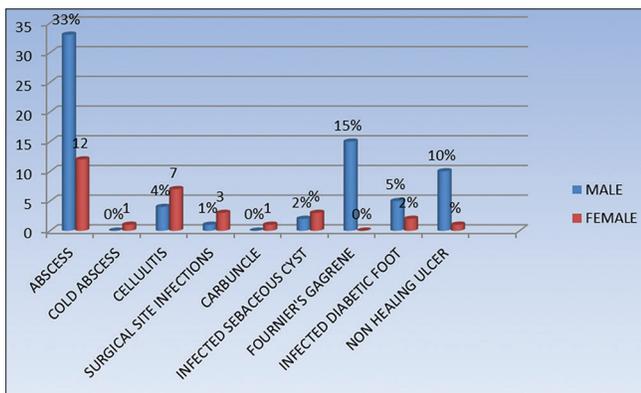


Figure 3: Clinical presentation of cases of soft-tissue infections

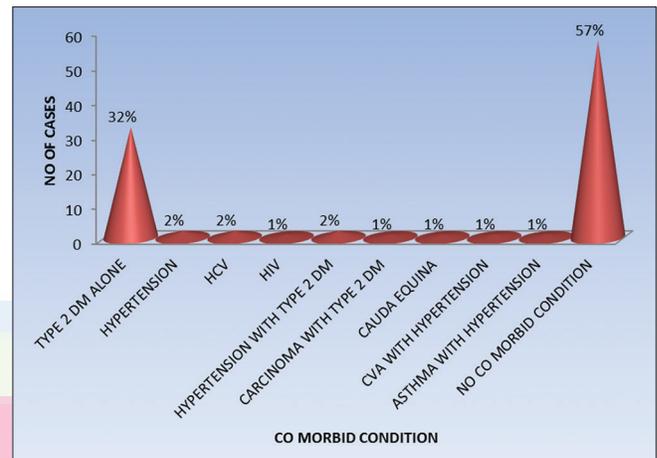


Figure 4: Comorbid conditions in cases with soft-tissue infections

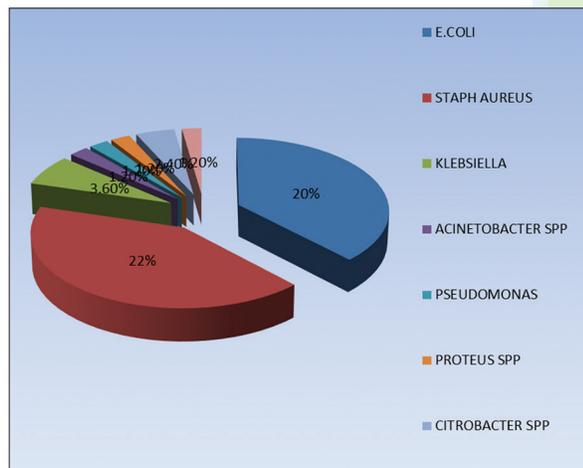


Figure 5: Distribution of organisms obtained in pus culture

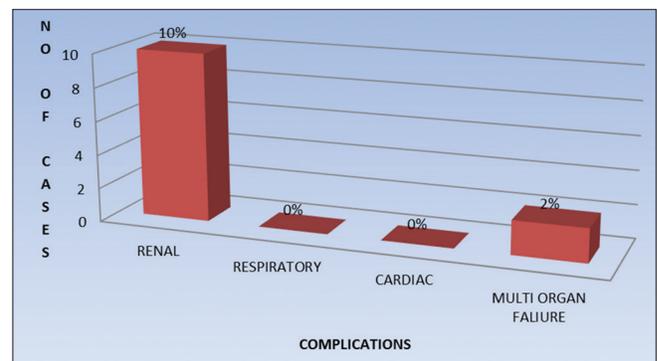


Figure 6: Complications associated with soft-tissue infections

by nonhealing ulcer (8.7 days), followed by infected diabetic foot (9 days) and so on. The least duration of stay in the hospital was seen in cases of infected sebaceous cyst (1 day) [Figure 7].

### Management

In this study, 94% of the cases of soft-tissue infections were managed surgically, and in the remaining 6% cases,

no surgical intervention was done. Most of the cases of soft-tissue infections in our study required surgical intervention either in the form of incision and drainage or debridement/excision. Out of the 6 conservatively managed patients of soft-tissue infections, there were 3 cases of cellulitis of the leg. Out of these 3 patients, one patient expired even after appropriate treatment and care. Other nonsurgically managed patients of soft-tissue

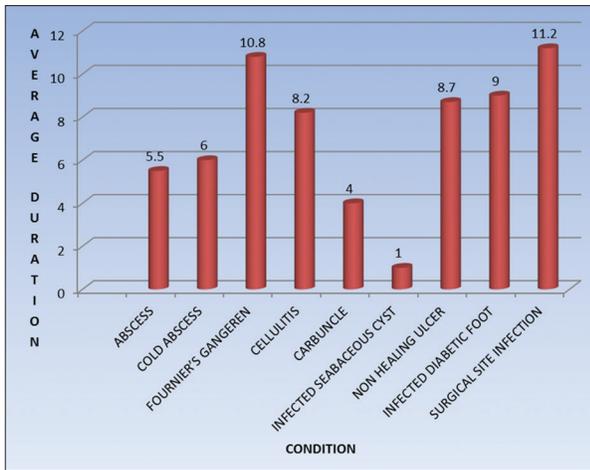


Figure 7: Duration of stay in hospital in cases of soft-tissue infections

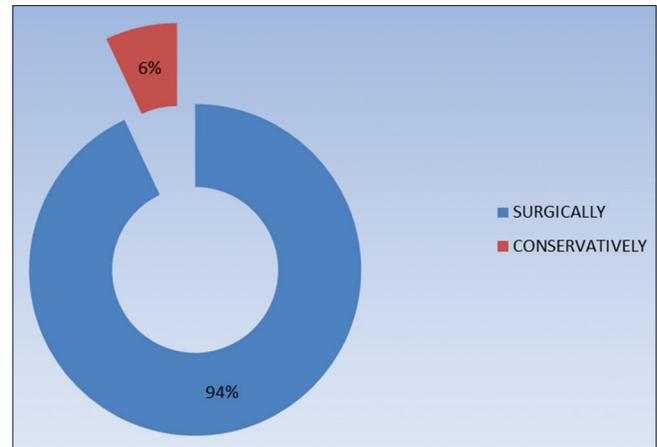


Figure 8: Management of the cases of soft-tissue infections

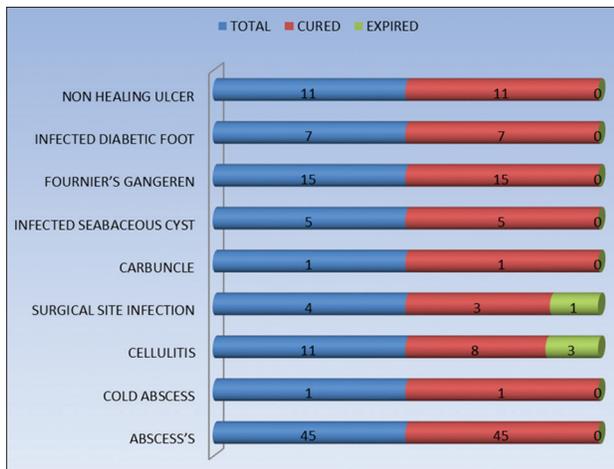


Figure 9: Mortality rate of various soft-tissue infections

infections were of Fournier's gangrene (1 case), parapharyngeal abscess (1 case), and surgical site infection (1 case) [Figure 8].

### Mortality

In the present study, mortality was seen in 4 cases (4%). Among these, 1 patient was operated for ileal perforation and subsequently developed surgical site infection culminating in death. The remaining 3 cases of mortality were attributable to cellulitis and its complications [Figure 9].

The most commonly involved age group was in the range of 41-60 years with male predominance. Abscess formation (45%) was the most common clinical presentation. Type 2 diabetes mellitus was the most common associated comorbid condition. Staphylococcus aureus (22%) was the most common culture isolate obtained. The most common complication seen was renal failure (10%) followed by multi-organ failure (2%). Patients with surgical site infections had maximum duration of stay in the hospital.

About 94% of the cases of soft tissue infections were managed surgically. Mortality was mostly encountered in the cases of complications of cellulitis.

### DISCUSSION

The present study was conducted in the Department of Surgery at Guru Nanak Dev Hospital attached to Government Medical College, Amritsar. A total of 100 patients with diagnosis of soft-tissue infection were admitted in the hospital during our study and were studied prospectively.

The most common age group involved in soft-tissue infections was in the range of 41–60 years (41%) and least involved was the age group >80 years (1%). In our study, soft-tissue infections were seen more frequently in males (m:f = 2.23:1). These findings are corresponding to previous similar studies by Lipsky *et al.*<sup>[10]</sup> and Ki and Rotstein<sup>[11]</sup> that the soft-tissue infections are common in adult males.

Abscess formation (45%) was most common clinical presentation of soft-tissue infections. In a similar study, Ellis Simonsen *et al.*<sup>[12]</sup> concluded that abscess formation was common occurrence in cases of skin and soft-tissue infections (SSTIs) attributable to the late presentation of such cases to the clinician.

In the present study, 43% cases were associated with comorbid conditions. Out of these, type 2 diabetes mellitus (32%) was the most common associated comorbid condition. Our study agrees with the study of Shen and Lu<sup>[13]</sup> in which the authors concluded that diabetes mellitus was the most common comorbid condition associated with soft-tissue infections.

*S. aureus* was the most common cultured organism (22%), followed by *E. coli* (20%) in cases of soft-tissue infections. This finding is in concordance with the study

by Mohanty *et al.*<sup>[14]</sup> in which the authors concluded that *S. aureus* was the most common isolate followed by *E. coli* and *Pseudomonas* species in abscesses obtained from the cases of soft-tissue infections.

About 94% of the total cases of soft-tissue infections were managed surgically. Most of the cases of soft-tissue infections in our study required surgical intervention, either in the form of incision and drainage or debridement/excision. In their study, Lee *et al.*<sup>[15]</sup> concluded that incision and drainage without adjunctive antibiotic therapy was effective in the management of skin and soft-tissue abscesses. Macfie and Harvey<sup>[16]</sup> in their study described that free drainage following incision and drainage was the safest treatment for the majority of abscesses. They further added that the antibiotics did not have any significant effect on healing time or recurrence and their routine use was not recommended. Therefore, our study correlates with the available literature on this subject. In the present study, we conclude that the preferred mode of treatment of soft-tissue infections is timely surgical intervention.

The most common complication in cases of soft-tissue infections was renal failure (10%). Thaichinda and Kositpantawong<sup>[17]</sup> in their study concluded that the most common complication in cases of soft-tissue infections was acute renal failure followed by multi-organ system dysfunction. Therefore, the findings of our study are in accordance with similar previous studies quoted in literature. In actual circumstances, even a single independent factor such as renal impairment or septicemia may trigger a reaction of events eventually leading to multi-organ failure.

The average stay of patients with soft-tissue infections was 11.2 days. This finding is closely related to the study of Namiduru *et al.*<sup>[18]</sup> in which the authors concluded that the soft-tissue infections extended the length of patient's hospital stay by 12.8 days. The average duration of stay in the hospital was also prolonged by comorbid conditions such as diabetes and renal disease.

In the present study, mortality was seen in 4 cases (4%). The risk factors for death included age, extent of infection, delay in first debridement, impaired renal function, and degree of organ system dysfunction at the time of admission. In our study, diabetes mellitus in conjunction with renal dysfunction or peripheral vascular disease accentuated mortality. In a retrospective study, Elliott *et al.*<sup>[19]</sup> described the factors affecting mortality in cases of NSTIs which were almost similar as seen in our study except diabetes mellitus. In their study, Elliott *et al.*<sup>[19]</sup> quoted that diabetes mellitus did not predispose to death

in cases of NSTIs. This difference can be attributed to the variations in the demographic pattern along with the scarcity of tertiary care facilities in the underdeveloped country as compared to the developed countries.

## CONCLUSION

SSTIs are among the most common infections encountered by emergency physicians. The knowledge about type of infection, causative organism, and the associated comorbid conditions is important for the timely management of such patients. Adequate and timely surgical intervention in most of the cases is of utmost importance to prevent complications and reduce the mortality.

Mortality in the cases of soft-tissue infections depends on various factors such as age, extent of infection, delay in first debridement, impaired renal function, and degree of organ system dysfunction at the time of admission. Furthermore, there are few other factors such as demographic variations, illiteracy, economic constraints, and the lack of tertiary care facilities which hinder the reduction in mortality rates.

The present study was done to find out all these aspects related to soft-tissue infections in a setup of developing country.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Stevens DL, Bisno AL, Henry F. Practice Guidelines for the Diagnosis and Management of Skin and Soft-Tissue Infections. Vol. 1373. IDSA Guidelines. Guidelines for Skin and Soft-Tissue Infections; 2005. p. 41.
2. Canoso JJ, Barza M. Division of Rheumatology, Tufts University School of Medicine, Boston, Massachusetts. *Rheum Dis Clin North Am* 1993;19:293-309.
3. Lewis RT. Soft tissue infections. *World J Surg* 1998;22:146-51.
4. Anaya DA, Dellinger EP. Necrotizing soft-tissue infection: Diagnosis and management. *Clin Infect Dis* 2007;44:705-10.
5. Boulton AJ. The diabetic foot: From art to science. The 18<sup>th</sup> Camillo Golgi lecture. *Diabetologia* 2004;47:1343-53.
6. Boulton AJ, Vileikyte L, Ragnarson-Tennvall G, Apelqvist J. The global burden of diabetic foot disease. *Lancet* 2005;366:1719-24.
7. Pessa ME, Howard RJ. Necrotizing fasciitis. *Surg Gynecol Obstet* 1985;161:357-61.
8. Chelsom J, Halstensen A, Haga T, Høiby EA. Necrotising fasciitis due to group A streptococci in Western Norway: Incidence and clinical features. *Lancet* 1994;344:1111-5.
9. Torralba KD, Quismorio FP Jr. Soft tissue infections. *Rheum Dis Clin North Am* 2009;35:45-62.
10. Lipsky BA, Moran GJ, Napolitano LM, Vo L, Nicholson S, Kim M. A prospective, multicenter, observational study of

- complicated skin and soft tissue infections in hospitalized patients: Clinical characteristics, medical treatment, and outcomes. *BMC Infect Dis* 2012;12:227.
11. Ki V, Rotstein C. Bacterial skin and soft tissue infections in adults: A review of their epidemiology, pathogenesis, diagnosis, treatment and site of care. *Can J Infect Dis Med Microbiol* 2008;19:173-84.
  12. Ellis Simonsen SM, van Orman ER, Hatch BE, Jones SS, Gren LH, Hegmann KT, *et al.* Cellulitis incidence in a defined population. *Epidemiol Infect* 2006;134:293-9.
  13. Shen HN, Lu CL. Skin and soft tissue infections in hospitalized and critically ill patients: A nationwide population-based study. *BMC Infect Dis* 2010;10:151.
  14. Mohanty S, Kapil A, Dhawan B, Das BK. Bacteriological and antimicrobial susceptibility profile of soft tissue infections from Northern India. *Indian J Med Sci* 2004;58:10-5.
  15. Lee MC, Rios AM, Aten MF, Mejias A, Cavuoti D, McCracken GH Jr., *et al.* Incision and drainage without adjunctive antibiotic therapy was effective management of CA-MRSA skin and soft tissue abscesses. *Pediatr Infect Dis J* 2004;23:123-7.
  16. Macfie J, Harvey J. The treatment of acute superficial abscesses: A prospective clinical trial. *Br J Surg* 1977;64:264-6.
  17. Thaichinda S, Kositpantawong N. Necrotizing skin and soft-tissue infections associated with septicemia: 7 cases report and review. *J Med Assoc Thai* 2008;91:117-23.
  18. Namiduru M, Karaoglan I, Çam R, Bosnak V, Özlem A. Preliminary data from a surveillance study on surgical site infections and assessment of risk factors in a university hospital. *Turk J Med Sci* 2013;43:156-62.
  19. Elliott DC, Kufera JA, Myers RA. Necrotizing soft tissue infections. Risk factors for mortality and strategies for management. *Ann Surg* 1996;224:672-83.

