

Effectiveness of Early Surgical Intervention for Cellulitis in Patients on Maintenance Haemodialysis: A Retrospective Analysis

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Abstract

Cellulitis of the lower limbs is common in patients on maintenance haemodialysis on account of depressed immune status of these patients. In the patients with normal renal function conservative treatment with anti biotics is usually adequate. Surgical intervention is needed only when the complications like abscess formation or necrosis is suspected. This is not so in the patients on maintenance haemodialysis, Conservative treatment with antibiotics has limited response in patients on maintenance haemodialysis and the cellulitis quickly gets complicated leading to a life-threatening situation. Hence early surgical intervention is recommended and is beneficial in these patients.

Keywords: Cellulitis; CKD; Dialysis; Conservative Treatment; Early Surgical Intervention; Blood Urea; Creatinine; WBC.

Introduction

Cellulitis is a common condition predominantly affecting the lower limbs in 70% of cases [2] and results in prolonged hospitalization, health care expense burden and loss of man hours. Cellulitis most often responds to the antibiotic therapy and surgical intervention is reserved only when there is suspicion of abscess formation, or necrotising infections etc.

Streptococcus- pyogenes, staphylococcus aureus,

nongroup A beta haemolytic streptococci and gram -ve bacilli are the commonest infective organisms responsible for cellulitis [2,3]. Apart from this common infective organism's cellulitis in CKD patients are associated with more virulent organisms like *Pseudomonas aeruginosa*, *Ecoli*, *Klebsiella*, *Enterobacter* [1], most of the times these organisms are drug resistant due to antibiotics over and injudicious use of these drugs. CKD is one of the commonest predisposing factor for cellulitis of the lower limbs along with or without other comorbid conditions like Diabetes, peripheral vascular disease, cardiac failure, immunosuppression. CKD is important cause for recurrence of cellulitis of lower limbs due to persistent lower limb oedema. In this patient's cellulitis is rapidly progresses to it advanced stage of necrotising fasciitis. This is due to poor functioning of the kidney which fails to eliminate metabolic wastes, bacterial toxins, leading to uraemia, septicaemia, which not only further deteriorates the renal function but also effects other systems and progresses to multi systemic disease leading to further deterioration in local and systemic immunity and becoming a vicious cycle

Patients with ESRD who are on Maintenance haemodialysis pose difficulties in management because:

- The infection increases the metabolic demands and increase the need for the renal replacement therapy
- The antibiotic therapy is to be chosen in such a way that the drug dosage do not worsen the renal function, and the dialysis does not affect the pharmako kinetics, pharmaco dynamics and the excretion adversely.
- Further on account of general depression of the immunity due to uremia even superficial

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infections like cellulitis progress rapidly to life threatening systemic infections.

Aim:

- a. To study the effectiveness of early surgical interventions in patients of cellulitis of lower limbs undergoing maintenance haemodialysis for ESRD.
- b. Compare the same to the conservative management in such patients.

Materials and Methods

All the records of the patients with cellulitis of lower limbs, undergoing maintenance haemodialysis at the Narayana general hospital attached to Narayana Medical college over a period of 3 years from 2011 to 2013 formed the data source for this study.

The above-mentioned patients were divided in to two groups depending on whether they were treated conservatively (20 patients) or subjected to early surgical intervention (26 patients).

Inclusion Criteria

Records of the all the patients who got admitted with cellulitis of the lower limbs and is cases of CKD on maintenance dialysis, who has under gone early surgical intervention on the day of admission, and those patients under gone conservative treatment, irrespective of age and sex, presence or absence of comorbid conditions, were included in the study.

Exclusion Criteria

Records of the patients who were cases of lower limb cellulitis, With CKD and with CKD and not on maintenance dialysis, cellulitis of the body parts other than lower limbs, and those left the treatment in the middle were excluded from the study.

All the patients were started on broad spectrum antibiotics, and the haemodialysis were carried out as per schedule irrespective of type of treatment, early surgical intervention group patients have under gone thorough debridement of non- viable and infected tissue till the reach of normal tissue, drainage of the infected fluid and pus collections, multiple fasciotomies were done. antibiotics were adjusted as per c/s report. regular surgical dressings were done.

The renal function tests including the blood urea, Serum creatinine, and haematological test total leukocyte count were obtained on the day of admission and 5 days following conservative and surgical interventions. For the study purpose the values of the blood urea, serum creatinine, and leucocyte counts were divided in to 4 and 5 groups respectively.

The effectiveness of interventions was compared in terms of the improvement in the renal functions and leukocyte counts as measured above.

Statistical analysis; the significance of analysis results were evaluated using chi square test, P value <0.05 were considered as significant.

Observations

There were 20 patients in the conservative group and 26 in the early surgical intervention group.

Table 1: Response of renal function to conservative and early surgical intervention groups

S. No.	Blood urea	Conservative group(N=20)			Early intervention group(N=26)		
		Day 1	Day5	P-value	Day 1	Day 5	P-value
1	46-65	2(10%)	2(10%)	0.995	0(0%)	10(38.46%)	0.001
2	66-85	6(30%)	9(45%)	0.20	6(23%)	10(38.46%)	0.10
3	86-105	10(50%)	8(40%)	0.975	12(46.1%)	6(23%)	0.05
4	>105	2(10%)	1(5%)	0.975	8(30.7%)	0(0%)	0.005
	Serum creatinine						
5	1.4-4.5	6(30%)	10(50%)	0.10	0(0%)	14(53.8%)	0.01
6	4.6-7.5	10(50%)	9(45%)	0.975	14(53.8%)	8(30.76%)	0.05
7	7.6-10.5	2(10%)	1(5%)	0.975	8(30.76%)	4(15.3%)	0.10
8	>10.5	2(10%)	0(0%)	0.10	4(15.3%)	0(0%)	0.05

Renal Function in Conservative Group

In conservative group Blood urea levels (Table1) on day of admission maximum no of patients (90%) (50%, 30% &10%each in 86-105, 66-85 &>105, 46-65,

groups respectively) were having higher values, these reports were compared with the blood urea values on the 5th day of treatment which revealed that 90% of the patients remain in the higher value groups even though 15% of patients have improved to 66-85 value

Table 2: Response of leucocyte counts to conservative and early surgical intervention groups

S. No.	Leucocyte count	Conservative group(N=20)			Early intervention group(N=26)		
		Day 1	Day 5	P- value	Day 1	Day 5	P-value
1	11100-14000	0(0%)	1(5%)	0.20	0(0%)	8(30.76%)	0.001
2	14100-16000	2(10%)	4(20%)	0.975	4(15.3%)	9(34.36%)	0.01
3	16100-18000	6(30%)	7(35%)	0.995	6(23%)	7(26.9%)	0.10
4	18100-20000	8(40%)	6(30%)	0.975	7(26.9%)	2(7.69%)	0.05
5	>20000	4(20%)	2(10%)	0.20	9(34.36)	0(0%)	0.002

group from 86-105 & >105 groups.

When serum creatinine levels were compared (Table 1) on day of admission 70% of the patients were in higher value groups (50% & 10% each in 4,6-7.5 & 7.6-10.5, >10.5, groups respectively) 30% in 1.4-4.5 group. when these values were compared with that of values of the 5th day of treatment which revealed 50% of the patients were in group 1.4-4.5, 20% of patients have improved to this group from other three groups.

When response of the total leucocyte count was compared (Table 2) on day of admission 90% of the patients were in higher count groups (40%, 30%, 20%, were in 18100- 20000, 16100-18000, >20000 group respectively) 10% of the patients were in counts 14100-16000 group. when compared with that of leucocyte counts on 5th day of treatment 75% of the patients remain in higher count groups where as 10% And 5% of patient’s improvement observed in 14100-16000 and 11100-14000 groups respectively.

In the conservative group, there is marginal response in respect to blood urea and creatinine values which are not statistically significant indicated by P values shown in table 1. Total leucocyte counts also has no statistically significant improvement indicated by P value shown in table 2. Out of the 20 patients in this group 30% of the patients had to undergo delayed surgical intervention, and 10% of the patients has under gone BK amputations.

In early surgical intervention group, Blood urea levels (Table 1) on the day of admission almost all the patients were in higher value groups, (46.1%, 30.7%, 23%, were in 86-105, > 105, 66-85 groups respectively) when these values were compared with the values on 5th day of treatment 38.46% of the patients each in 46-65, 66-85, value groups respectively (0%, & 23% on day 1) there is significant reduction in other two groups (23%, 0% in 86-105 & >105, respectively).

Serum creatinine values on day of admission (Table 1) showed that almost all patients was in higher value groups (53.8%, 30.7%, & 15.3% of patients were in 4.6-7.5, 7.6-10.5 & >105 groups respectively) when these values were compared with values of the 5th day of the treatment 53.8% of the patients were in

values 1.4-4.5, group (0% on day of admission) 30.7% of the patients were in values 4.6-7.5 group (53.8% of the patients on day of admission) 15.3% & 0% of the patients in 7.6-10.5 & >10.5 groups respectively.

Total leucocyte counts of the patients in this group (Table 2) on the day of admission showed that 34.6%, 26.9%, 23% & 15.3% of the patients were in counts >20000, 18100-20000, 16100-18000, & 14100-16000 groups respectively. When these counts were compared with that on the 5th day of the treatment which revealed that 30.76% of patients were in 11100-14000 group (0% on day of admission) 34.36%, 26.9%, 7.69%, & 0% of the patients in 14100-16000, 16100-18000, 18100-20000, & >20000 counts groups respectively.

This indicates there is not only statistically significant improvement in renal function in respect to blood urea and serum creatinine values indicated by P values in table 1 but also significant drop in the total leucocyte count indicated by P values in Table 2, which shows improvement in septicaemia also. None of the patients from this group has undergone BK amputations.

Discussion

In our retrospective study total of 46 patient’s records were analysed, out of the 46 patients 20 patients has under gone conservative treatment, and 26 patients has undergone early surgical intervention on the day of admission, and we have assessed the effective ness of the both forms of the treatment.

In conservative group on day of admission blood urea levels in majority of the patients were in higher value groups when compared with values on 5th day of the treatment there is only marginal shift of patients to lower level groups, similar response was observed even with serum creatinine values, which were not statistically significant. Whereas in case total leucocyte counts on day of admission were compared with that of counts on 5th day of treatment there is only marginal improvement to lower counts groups which is also statistically not significant, indicating there is no significant improvement in renal

parameters as well as in septic status and inflammatory parameters of the patients in this group.

Out of the 20 patients in this group 6 patients need to undergo delayed surgical intervention and 2 patients needed BK amputations due to worsening of the disease status. Similar observations of higher morbidity mortality have been noted by other authors [5,10,11] in patients who has undergone delayed surgical intervention.

When reports of the patients in early surgical intervention group were compared, with respect to blood urea and serum creatinine values on day of admission with the values of the 5th day of treatment significant no of the patients showed improvement in to lower value groups from higher value groups in which they were on day of admission. In case total leucocyte counts there was significant improvement of counts from higher value groups to lower value groups was observed. Indicating there is significant improvement in renal function as well as in septic status and inflammatory parameters .and decrease in morbidity as indicated by no BK amputations in this group.

In our study, we have found that early surgical intervention in patients of lower limb cellulitis with CKD and is on maintenance dialysis has showed significant improvement in overall patient's condition reflected by renal and haematological parameters, and also there is decrease in morbidity. Similar findings were observed by various authors in their studies on patients with necrotizing fasciitis [8,9,12] but their studies were also not focused on CKD patients. Decreased morbidity and mortality has been observed in patients who has undergone early surgical intervention and increased morbidity, mortality, acute renal failure and septic shock in patients who has undergone delayed surgical intervention was observed by other authors in their studies [4,6,7]

In these Patients due to uraemia which results in delayed hypersensitivity, impaired cell mediated immunity, slower acute local inflammatory response, persistent limb oedema, the Infection is rapidly progresses to its advanced stage of necrotising fasciitis and septicaemia which not only further deteriorates the renal function but also effects the functions of the other systems of the body leading to multi systemic disease this has become a vicious cycle. In order to break this vicious cycle in these patients priority goes to the control of site of infection [5] in the form of thorough debridement till the reach of normal tissue and multiple fasciotomies and drainage of infected fluid and pus collections This early surgical intervention not only eliminates the local anaerobic

conditions but also reduces the bacteria and its toxin load by providing continuous drainage of infective fluid as well as limb oedema fluid. This not only controls the local infection and tissue loss the but also improves the patients renal as well as other systemic functions, which leads to increased response to systemic antibiotics, haemodialysis and other supportive treatments. This is achieved not only with Early and aggressive surgical intervention but also in association with haemodialysis and systemic antibiotics, and regular surgical dressings.

Conclusion

Our study, showed early and aggressive surgical intervention in the patients of lower limb cellulitis with CKD on maintenance haemodialysis not only aids in the control of local infection and local tissue loss but also controls the effects of septicaemia and improves the renal function and decreases morbidity & mortality. Further it gives material for culture and antibiotic sensitivity to guide the antibiotic therapy. Even though results are encouraging this is a retrospective study confined to small group of patients. a large and prospective randomised controlled study is required.

Limitations of the study

Small study group

It is a retrospective study based on patient records
Randomisation was not possible.

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