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A clinical study of ulcers of the leg: A prospective comparative study

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Abstract
Background: Chronic ulceration of the lower leg is a frequent condition, with prevalence in the population over 60 years of age. The incidence of ulceration is rising as a result of the ageing population and increased risk factors for atherosclerotic occlusion such as smoking, obesity and diabetes. The main causes are venous valve insufficiency, lower extremity arterial disease and diabetes, less frequent conditions are infection, Vasculitis, skin malignancies and ulcerating skin diseases such as Pyoderma Gangrenosum. For a proper treatment of patients with leg ulcers it is important to be aware of the large differential diagnosis of leg ulceration and to effectively manage the conditions.
Aims and objectives: To study the clinical features of various types of leg ulcers, types of investigation and its management of leg ulcers among the study group.
Methods: Prospective study of 200 cases of chronic leg ulcers admitted at Government general hospital, Guntur during the period September 2016 to October 2018 with regular dressing, debridement, treating the underlying systemic disease, skin grafting and amputation were done.
Results: In a study group of 200 cases, most of the patients with leg ulcers had an underlying systemic disease such as diabetes mellitus, venous Valvular insufficiency, arterial occlusion secondary to atherosclerosis, leprosy and malignancy.

Keywords: Chronic non-healing ulcer, diabetic leg and foot ulcer, varicose ulcer, tropic ulcer

Introduction
Chronic ulceration of the lower leg and foot is frequent condition and wide in distribution they may be associated with a number of Medical, Surgical & Dermatological condition the patient suffering is very immense, commonly seen in most of the surgical wards and OPD.
The incident of ulceration is more in aging population and increased risk factor for atherosclerotic occlusion such as smoking, obesity and Diabetics. Ulceration can be defined as wounds with "full thickness depth" and a "slow healing tendency" [1]. In general the slow healing tendency is not simply explained by depth and size. But caused by a underlying pathologic fact that needs to be removed to induce healing.
The problems of leg ulcer represent a wide spectrum of etiology, pathology, severity and morbidity. The main causes are venous valve insufficiency, lower extremity arterial disease and diabetes. Less frequent conditions are infections, vasculities, skin malignancies and ulcerating skin diseases such as pyoderma gangrenosum. But even rare condition exists such as recently discovered combination of vasculities and hypercoagulability. For a proper treatment of patients with leg ulcers, it is important to be aware of the large differential diagnosis of leg ulceration. The causes may be various but the anatomical situation of ulcers in the leg by itself can give rise to problems that can at times test the ingenuity and patience of the surgeons.
During the past three decades considerable knowledge has been gained regarding the physiology, anatomy, pathology and management of chronic leg ulcers. Despite all this the management of chronic leg ulcers is a fertile field for experimentation. Various studies have been conducted and a number of procedures and techniques have evolved with varying degree of success.
It is common to see patients with different types of ulcers due to various etiology and underlying systemic diseases. Moreover, leg and foot ulcers form a good bulk of patients in our hospital. Treatment of these ulcers forms a challenging task as well. Hence, therefore in my present study attempted to analyze the ulcers of the leg and foot. And also study the modern diagnosis and treatment of various ulcers.

Materials and Methods

Place of the study

The material for this study was drawn patients admitted to the Surgical Department, Government General Hospital, Guntur.

Study population

A total number of 200 cases were considered for this study. This group was a diversified one and included patients of both sexes and of all ages from 12 years and above, all religion and economic strata. This study included cases of stasis ulcers, diabetics with leg ulcers, traumatic ulcers, arterial ulcers and others.

Inclusion criteria

A detailed history was collected with particular reference to onset, duration and type of lesion, socioeconomic strata and occupational factors and systemic diseases. Any histories of similar ulcers were also noted.

A thorough systemic and local examination was carried out. The morphological features of ulcers i.e. - number, distribution of ulcer on leg or foot site and associated diseases like varicose veins, eczema or patches were noted.

Exclusion criteria

But while presenting only relevant positive and some important negative findings were shown to make the study brief and to avoid unnecessary repetitions.

Fig 1: Venous ulcer

Fig 2: Diabetic ulcer

Fig 3: Traumatic ulcer

Fig 4: Arterial ulcer (TAO)

Results

Table 1: Distribution of various types of chronic leg Ulcers (Total No. of patients studied: 200)

Sl. No	Etiological Type	No. of patients	Percentage
1.	Diabetic ulcer	68	34%
2.	Venous ulcer	48	24%
3.	Traumatic ulcer	32	16%
4.	Arterial ulcer	24	12%
5.	Malignant ulcer	10	5%
6.	Tropic ulcer	6	3%
7.	Other ulcers	12	6%

Among the 200 cases studied the commonest was found to be diabetic ulcer accounting for 68 cases (34%) followed by venous ulcer (24%), traumatic ulcer (16%), arterial ulcer (12%) malignant ulcer (5%), tropic ulcer (3%) and others 12 (6%).

According to Gilliland 95% of leg ulcers are due to vascular etiology and venous ulcers dominates accounting for up 90% of the cases. Arterial ulcers account for 5 & 10% and others are due to neuropathy or a combination of both (Young RJ) [2].

Table 2: Sex distribution of various types of chronic leg ulcers

Sex	No. of cases	Percentage
Male	172	86%
Female	28	14%

The above table indicate that chronic leg ulcers were more common in males than in females – males accounting for 86%. However, in other studies there has been no gross difference between male/female ratio.

Table 3: Age distribution of various types of chronic leg ulcers

Sl. No	Age group	No. of cases	Percentage
1.	12 – 20 above	2	1%
2.	21 – 30 years	11	5.5%
3.	31 – 40 years	48	24%
4.	41 – 50 years	48	24%
5.	51 – Above	91	45.5%

Incidences of leg ulcers in this study group were found to be maximum in the age group of 51 & above. Since, the patients of age group 0 – 12 years are taken care of under the department of pediatric surgery, they are not included in this study.

The youngest patient was 19 years old and the oldest were 80 years old. Cornwall *et al.* [3] in their study had 70% of the patients over the age of 70 years and according to a study done by Callam MJ [4] ulceration began before the age of 40 years in 22% of the patients.

Ulcers associated with diabetes mellitus

Out of 200 cases studied ulcers associated with diabetes mellitus accounted for 68 cases.

Table 4: Distribution of diabetic ulcers in the limbs

Sl. No	Side	No. of cases	Percentage
1	Right limb	32	47.6%
2	Left limb	34	50%
3	Bilateral	2	2.94%

From the above study, it is noted that diabetic ulcers were relatively common in the left limb accounting for 50% of cases.

Table 5: Sex distribution of diabetic ulcers

Sex	No of cases	Percentage
Male	52	76.48%
Female	16	23.52%

From the above study, it is noted that diabetic ulcers were relatively common in males accounting for 76.48% and less common in females accounting for only 23.52%.

Table 6: Age distribution of diabetic ulcers

Sl. No	Age group	No. of cases	Percentage
1	12 – 30 years	0	0%
2	31 – 40 years	6	8.9%
3	41 – 50 years	12	17.6%
4	51 - above	50	73.5%
	Total	68	100%

As noted above the maximum no of patients suffering from diabetic ulcers were in the age group of above 50 years accounting for about 73.5% of the cases.

Venous Ulcers

Out of the 200 cases studied ulcers associated with venous causes accounted of 48 cases.

Table 7: System affected in venous leg ulcers

System	No. of cases	Percentage
Long saphenous	31	64.5%
Short saphenous	3	6.2%
Both	10	21%
Deep veins	4	8.3%

In this study, long saphenous system was found to be by far the commonest system affected in case of venous ulcers accounting for 64.5%.

Table 8: Age distribution of Venous Ulcers

Sl. No	Age group	No. of cases	Percentage
1	12 – 30 years	6	12.6%
2	31 – 40 years	23	47.9%
3	41 – 50 years	11	22.9%
4	51 - above	8	16.6%

Venous ulcers were found to be the commonest between the age group 31 – 50 years.

Table 9: Sex distribution of venous ulcers

Sex	No. of cases	Percentage
Male	44	91.67%
Female	4	8.4%

Males were more commonly affected accounting for 91.6%. In other published studies it is noted that females have a slightly more preponderance over males.

Arterial ulcers

Out of 200 cases, 24 were arterial ulcers.

Table 10: Age distribution of various types of arterial ulcers

Sl. No	Age group	No of cases	Percentage
1	12 – 30 years	0	0
2	31 – 40 years	5	20.83%
3	41 – 50 years	11	45.83%
4	51% 70 years	8	33.33%

Arterial ulcers were found to be the most common ulcers in the age group of 41 to 50 years. Peripheral vascular diseases are 7 times more frequent in 60-year-old when compared to 70 years olds according to Hanson Carita [5].

Table 11: Pathology in arterial ulcers

Pathology	No of cases	Percentage
TAO	10	41.6%
Atherosclerosis	14	58.4%

Atherosclerosis was found to be the commoner association with arterial ulcers constituting 58.4%. The only other association with arterial ulcers was TAO accounting for 41.6%.

Traumatic Ulcers

A total no. of 32 traumatic ulcers were noted in the study group out of which 6 were associated with anemia. One of these ulcers was present on the joint surface. One of these ulcers was result of secondary infection following primary closure by suturing. The rest of the ulcers were that of avulsive type with some degree of skin loss.

Table 12: Location of the ulcer according to its types

Sl. No.	Type of ulcer	Gaiter Zone	Foot	Leg	Total
1	Diabetic	0 (0%)	60 (88.3%)	8 (11.7%)	68
2	Venous	42(87.5%)	1 (2.1%)	5 (10.4%)	48
3	Arterial	0 (0%)	24 (100%)	0	24
4	Malignant	0 (0%)	6 (60%)	4 (40%)	10
5	Others	1(8.33%)	8(66.66%)	3 (25%)	12

The venous ulcers occurred more commonly in the gaiter zone (87.5%). Whereas arterial and diabetic ulcers occurred mainly in the foot i.e., 100% and 88.37% respectively. About 60% of malignant ulcers occurred in the foot and rest of 40% in the leg.
According to Hanson Carita [5] ulcers below the line of shoe and feet are considered mostly caused by arterial insufficiency and or diabetes. Ulcers on the gaiter zone are mostly caused by venous insufficiency.

Table 13: Types of bacteria isolated from the ulcers

Sl. No	Pathogen	No of cases	Percentage
1.	Staphylococcus	26	28.9%
2.	Klebsiella	18	20%
3.	Proteus	14	15.5%
4.	Streptococcus	20	22.2%
5.	Pseudomonas	3	3.3%
6.	No growth	4	10%

Only 90 cases were sent for culture and sensitivity tests. Staphylococcus was found to be the most common pathogen accounting for 28.9% of the bacteriological isolates. This was followed by proteus, which accounted for 15.5%, Klebsiella which accounted for 20%, streptococcus and pseudomonas accounting for 22.5% & 3.3% each.
Staphylococcal infection is the most common infection is diabetic foot. Most foot infections are polymicrobial, staphylococcus is recovered from 33 to 50% of the cases.
Most of the patients in this study group belong to the lower socio-economic status.

Discussion

The prevalence of leg ulcers is probably 1% (Peter J Franksn *et al*) [6]. 62% of the leg ulcers are due to vascular aetiology (Finja

Jocken Hofer, *et al*.,) [7] and venous ulcers account for up to 51.3% of cases. Arterial disease accounts for 11%; most of the others are due to neuropathy, usually diabetic or a combination of these diseases (Yound JR) [2]. and among all chronic wounds lower extremity venous ulcer dominates the differential diagnosis accounting for up to 90% of the cases (Burton S. Claude) [8] (Callum M. J. *et al*.) [9].

In this study chronic ulcer with vascular etiology accounted for only 36% of all chronic ulcers. Out of this venous ulcers accounted for 24% and arterial ulcers accounted for 12%. Chronic ulcers associated with diabetes accounted for nearly 34%. Traumatic ulcers accounted for 16% of the cases. Malignant ulcers accounted for 5% and other ulcers for 6%.

As observed above the present study was not comparable with the published studies mentioned probably because of following reasons.

The study group of 200 patients was too small a number to draw any comparative conclusions. The other published studies were population based, controlled randomized or a group-based study which included different specialties where as this study was a nonrandomized and uncontrolled study.

Some investigators have classified diabetic ulcers as metabolic. The most important factors responsible for causation of ulcer in diabetes are the arteriosclerotic lesions in large leg arteries and or neuropathy resulting in decreased sensation. If diabetic ulcers in our study are considered vascular disorders rather than metabolic, the percentage of vascular ulcers in our study is about 66% - somewhat comparable to the above study. However, this is controversial and in diabetes it is a combination of factors that are to be considered in causation of leg ulcers.

Also according to Yound J. R. [2] and Boyd A. M. *et al*, [10] the distribution of different type of ulcers in different studies varies – 70% to 90% for venous ulcer, 5% to 15% for arterial ulcers and 1% to 5% for other ulcers.

As per studies done by Hansson Carita[5] on leg and foot ulcers, ulcers below the line of shoe and feet are considered mostly to be caused by arterial insufficiency and or diabetes. Ulcers on the medial aspect of the ankle in the gaiter zone are mostly caused by venous insufficiency.

In the present study, ulcers had the same site of distribution i.e., ulcers in the gaiter zone were mostly caused by venous insufficiency and ulcers in the foot below the line of shoes were mostly caused by arterial insufficiency and or diabetes.

About 42% of patients in our study had ulcers in the foot only. This is rather high figure in comparison to Hansson's study which showed about only 30% of the ulcers in the foot. This is probably due to more number of diabetic and arterial ulcers in our study.

Cornwall *et al*. [11] in his study had 70% of patients over the age of 70 years. The median age of all patients in this study was 45 years and 44% of the patients over the age of 45 years and had 70% of the patient over the age of 70 years. But according to study done by Callam M. J. [9] the elderly are not the only population at risk: In his study ulceration began before the age of 40 years in 22% of the population studied. In our study, ulceration began before the age of 40 years in 47.9% of the patients.

Peripheral vascular diseases increase with age and are 7 times more frequent in 60 years old patients when compared to 20 years old. (Hansson Carita) [5]. In this study, arterial and venous diseases were found to be maximum in the age group of 31 to50 years. This discrepancy may be due to the fact that, our study group patients in the above age group belong to the working class and the ulcers they suffer from hamper their working capacity making them seek medical help early. And also venous ulcers were found to be most common in the age group of 31 to 50 years which is rather early when compared to western studies as most of our patients belong to the working class which involved long hours of standing.

Arterial were found to be more common in the age group of 31 to 50 years which again is rather too early as compared to western studies, since we have in our study a significantly high number of TAO cases which are common in young adults.

In our study, there were more men 86% than women 14% with leg and foot ulcers. However, no differences between sexes were found when age specific relative frequencies for all ulcers were compared.

Elastic crepe bandages are the most important forms of treatment for venous ulcer patients (Rightor M. Myers M. B) [12]. In our study all the 48 patients who had venous ulcers wore for elastic crepe bandages stretched to 50% providing of around 14 mm Hg compression pressure under one layer. These patients were also subjected to local dressings and Bisgaard's line of management. Once the ulcers healed they were taken up for surgery. Out of the 48 patients, 44 were due to varicose veins and 4 due to deep vein thrombosis. Out of 48 patients with varicose veins, 44 underwent surgery in form of ligation and or Trendelenburg's operation and sub fascial ligation. 4 patients with deep vein thrombosis underwent skin grafting. The mean time for ulcer healing was 17.2 days.

The patient who underwent skin graft had his ulcer healed in 7 days only. A study of recurrences of venous ulcers could not be made due to inadequate time follow up.

Appropriate anti-diabetic therapy informs of plain insulin (Bovine), human actrapid/mixtard, antibiotics, the debridement and regular dressings were the important methods of treatment for diabetic ulcers in our study. Out of the 68 patients, 60 patients were managed with regular dressings; antibiotics slough excision and or debridement along with anti-diabetic therapy. Three patients underwent amputation as a life saving measure and one patient expired due to Medical causes. 6 patient underwent skin grafting and had his ulcer healed in 10 days. However, + the mean healing time was 26.43 days in overall diabetic ulcers.

Skin is the best dressing (Lister). It can be applied as a partial thickness graft or numerous pinch grafts. It is best reserved for large ulcers or those, which will not heal, by conservative management (Gilland E. L., John H. N. Wolf). [13] In this study, ulcers secondary to trauma were noted in 32 patients. Out of the 16 patients, 3 of them were found to be anemic, 2 had associated osteomyelitis of the calcaneum and one had an ulcer following a primarily sutured wound, which got infected. The rest of the 4 patients had avulsive injury with some degree of skin loss. One patient had an ulcer which was placed directly over the ankle joint. 9 patients out of the 32 underwent skin grafting. The mean healing time of these traumatic ulcers were 14.33 days. Those managed conservatively had a mean healing time of 17.6 days and those who had undergone skin grafts had a mean healing time of 10.25 days.

Conclusion

Clinical study of ulcers of the leg was carried out at Government general hospital, Guntur from September 2016 to October 2018. The study reveals certain important data. The highest number of cases was found to be ulcer of the leg associated with diabetes mellitus, ulcer due to venous valve incompetence, ulcers due to arterial occlusion secondary to atherosclerosis and TAO. Tropic ulcers associated with leprosy, traumatic ulcer and other ulcers

following snakebite and certain infections like pyoderma, gangrenosa. Though the causative factors are varied, diabetes mellitus and venous insufficiency were by far the more common factors. Underlying vascular disorders are the main etiological factors for leg and foot ulcers with diabetes forming a major risk factor. Diabetes was the commonest disease associated with chronic leg ulceration.

Thus, the study of various cases of leg ulcers arouses lot of interest and is mind bogging as far as the treatment of these cases are concerned. What with the availability of arsenal of investigation wide range of antibiotics and with ever improving dressing material, there is certainly a great improvement in treatment of chronic leg ulcers. Skin grafting when it becomes a choice for chronic ulcers with wide defects is indeed the right one.

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Conflict of interest

The authors declare that they have no conflict of interest.

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