A prospective cross-sectional investigation of the clinical characteristics features and management of lower limb ulcers

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Abstract

Aim: To determine the clinical features and management of ulcers of the lower limb.

Methods: The Department of General Surgery conducted a prospective cross-sectional analysis. With the aid of computer-generated random numbers, 100 patients with chronic leg ulcers were chosen at random from those who visited the OPD or were admitted to the surgical ward. After determining the primary cause of leg ulcers, proper antibiotic coverage for gram positive, gram negative, and anaerobic organisms, proper glycaemic control, leg elevation, compression bandaging, total cessation of smoking and causative drugs, nutritional support, vasoactive agents to restore blood flow, nerve stimulation, and proper wound care with debridement slough excision are also recommended.

Results: The leg ulcers were more prevalent in the age group 40-70 years. Test of proportion showed that proportion of males 85% was significantly higher than that of females 15% (Z=9.74; p<0.0001). Thus the leg ulcers were more prevalent among males. Ulcers in the left leg (49%) was higher than that of right leg (47%) but it was not significant (Z=0.28; p=0.77). Only 3% of the patients were having ulcers in both legs. Most of the patients (61%) had ulcer at foot followed by gaiter (20%) and leg (19%). (Z=6.14; p<0.0001). Most of the ulcers were diabetic (37%) followed by venous (22%) (Z=2.31; p=0.01). Only 5% and 3% were malignant and trophic ulcers.

Conclusion: There has undoubtedly been a significant increase in the treatment of untreated leg ulcers, thanks to the availability of an array of investigational antibiotics and ever-improving dressing materials.

Keywords: Lower limb ulcer, Leg ulcer, chronic ulcer, Ulcer treatment

Introduction

A chronic leg ulcer (CLU), also known as a chronic lower limb ulcer, is a chronic wound on the leg that does not heal after three months of effective therapy or is not completely healed after a year [1]. Because of the ageing population and elevated risk factors for atherosclerotic occlusion including smoking, obesity, and diabetes, the rate of ulceration is increasing. Wounds with a "full thickness diameter" and a "late healing propensity" are classified as ulcers. Skin ulcers can cause the epidermis, dermis, and even subcutaneous fat to be lost completely [2]. Adults with chronic ulceration of the lower legs experience rising discomfort, friable granulation tissue, foul odour, and wound collapse rather than healing. As a consequence, there is socioeconomic distress as well as significant welfare and personal expenses [3]. Since lower leg ulcers are caused by a variety of causes, health providers must use an interdisciplinary approach to the systematic examination of the individual in order to determine the pathogenesis, a definitive diagnosis, and the best treatment options. A proper diagnosis is necessary to prevent ineffective care that can prolong wound healing, worsen the wound, or damage the patient. CLU is said to influence nearly every area of everyday life: pain is normal, sleep is frequently disrupted, mobility and job ability are often limited, and personal finances are frequently impacted [1,2]. Chronic ulceration of the lower leg, including the foot, is a common disorder that causes pain, social distress, and costs a lot of money. The prevalence rate (for all ulcers) varies from 1% in the adult population to 3-5% in the population over 65 years old [4,5]. Lower limb ulcers caused by venous insufficiency account for 70% of cases, arterial disease 10%, mixed aetiology ulcer 15%, and lesser recognised pathophysiological triggers account for 5% of leg ulcers [6]. For a rational approach towards patients with leg ulcers, it is important to have detailed knowledge about clinical picture, pathogenesis, diagnostic possibilities and treatment modalities of common
with range 20-75 years and the median age was 52.0 years. Test of proportion showed that the proportion of the patients with age between 40-70 years (84%) was significantly higher (Z=9.51; p<0.0001). Only 5% and 5% of the patients were with age<30 years and ≥70 years respectively. Thus leg ulcers were more prevalent in the age group 40-70 years. Test of proportion showed that proportion of males 85% was significantly higher than that of females 15% (Z=9.74; p<0.0001). Thus the leg ulcers were more prevalent among males.

Corrected chi-square test showed that there was no significant association between age and gender of the patients (p=0.22). Thus the leg ulcers were evenly distributed over ages among both in males and females.

The mean (mean±SD) age of the male patients was 52.65±12.21 years with range 20-75 years and the median age was 52.0 years. The mean (mean±SD) age of the male patients was 53.16±13.55 years with range 27-73 years and the median age was 52.5 years (Table 1).

T-test showed that there was no significant difference between mean age of males and females (t_{199}=0.47; p=0.60).

Most of the patients were engaged in agriculture (25%) followed by business (22%) and service (14%). 44% of the patients had habit of smoking, chewing tobacco and drinking of alcohol. Out of 44 patients having any kind of personal habit 12% had smoking followed by chewing tobacco (9%), (Table 2).

Ulcers in the left leg (49% 0 was higher than that of right leg (47%) but it was not significant (Z=0.28; p=0.77). Only 3% of the patients were having ulcers in both legs.

Most of the patients (61%) had ulcer at foot followed by gaiter (20%) and leg (19%). (Z=6.14; p<0.0001).

Most of the ulcers were diabetic (37%) followed by venous (22%) (Z=2.31; p=0.01). Only 5% and 3% were malignant and trophic ulcers (Table 3).
Table 3: Distribution of diagnosis of ulcers

| Diagnosis of ulcers | Number | %  |
|---------------------|--------|----|
| Diabetic            | 37     | 37 |
| Venous              | 22     | 22 |
| Traumatic           | 15     | 15 |
| Arterial            | 13     | 13 |
| Malignant           | 5      | 5  |
| Trophic             | 3      | 3  |
| Others              | 5      | 5  |
| Total               | 100    | 100|

Peripheral neuropathy (23%) was the most common type of ulcer followed by venous hypertension (22%). Only 1 (1%) case of sickle cell disease was found (Table 4).

In 79% of the ulcers microorganisms were found which was significantly higher than that of no growth (21%) \((Z=8.31; p<0.0001)\). Out of the microorganisms *Staphylococcus* (28%) was most common followed by *Pseudomonas* (14%) and *Klebsiella* (11%). Only in 2% of the ulcers, *Morganella* and *AFB* were present (Table 5).

Most of the patients (68%) had pain which was significantly higher than of no pain (32%) \((Z=5.16; p<0.001)\).

Table 4: Distribution of pathology of ulcers

| Pathology of ulcers               | Number | %  |
|-----------------------------------|--------|----|
| Peripheral neuropathy             | 23     | 23 |
| Venous hypertension               | 22     | 22 |
| Atherosclerosis                   | 14     | 14 |
| Peripheral neuropathy atherosclerosis | 11     | 11 |
| Trauma                            | 7      | 7  |
| TAO                               | 6      | 6  |
| SCC                               | 4      | 4  |
| Bony defect                       | 3      | 3  |
| Pressure sore                     | 3      | 3  |
| Tubercular ulcer                  | 2      | 2  |
| Vacuities                         | 2      | 2  |
| Poor hygiene                      | 1      | 1  |
| Leprosy                           | 1      | 1  |
| Sickle cell disease               | 1      | 1  |
| Total                             | 100    | 100|

Muscle (40%) was the most common base of the ulcers followed by bone (27%) and subcutaneous tissue (26%). Bone with tendon and only bone base was found in 7% of the cases. \((Z=1.41; p=0.12)\).

Table 5: Distribution of microorganisms

| Microorganisms      | Number | %  |
|---------------------|--------|----|
| *Staphylococcus*    | 28     | 28 |
| *Pseudomonas*       | 14     | 14 |
| *Klebsiella*        | 11     | 11 |
| *MRSA*              | 9      | 9  |
| *Streptococcus*     | 7      | 7  |
| *Proteus*           | 6      | 6  |
| *Morganella*        | 2      | 2  |
| Acid fast Bacilli   | 2      | 2  |
| No growth           | 21     | 21 |
| Total               | 100    | 100|

Table 6: Type of floor of ulcers

| Floor of ulcers                          | Number | %  |
|------------------------------------------|--------|----|
| Unhealthy granulation tissue and slough  | 36     | 36 |
| Pale granulation tissue and slough       | 22     | 22 |
| Minimal slough                           | 18     | 18 |
| Necrotic tissue                          | 7      | 7  |
| Unhealthy granulation tissue             | 5      | 5  |
| Fresh granulation tissue                 | 4      | 4  |
| Foul smelling slough                     | 3      | 3  |
| Raised granulation tissue at the wound edges | 3      | 3  |
| Raised abnormal granulation tissue       | 2      | 2  |
| Total                                    | 100    | 100|

Most of the floors of the ulcers were unhealthy granulation tissue and slough (36%) followed by pale granulation tissue and slough (22%). Only in 2% of the cases it was raised abnormal granulation tissue extending beyond the margin. \((Z=2.01; p=0.02)\), (Table 6).

55% of the ulcers had shallow edge followed by sloping (21%) and only 2% was undermined. Most of the margin of the ulcers were irregular (38%) which was significantly higher \((Z=2.37; p=0.0127)\) followed by thin bluish irregular (22%). Only 3% of the margin of ulcers was regular. 22% of the surrounding area was lipodermatosclerosis and hyper-pigmentation with itching. 32% of the discharge was...
slough with purulent discharge followed by serous (26%). In most of the cases debridement with dressing (30%) was done (Table 7).

Table 7: Type of surgical management

| Surgical management                          | Number | % |
|----------------------------------------------|--------|---|
| Debridement dressing                        | 30     | 30|
| Debridement dressing skin grafting          | 12     | 12|
| Debridement dressing disarticulation        | 11     | 11|
| Stripping Gsv/Ssv hook phlebotomy           | 10     | 10|
| Hook phlebotomy                             | 8      | 8 |
| Stripping Gsv/Ssv                           | 5      | 5 |
| Id debridement trans metatarsal amp         | 5      | 5 |
| Debridement dressing below knee amputation angiotherapy balloon angioplasty | 4 | 4 |
| Wide excision skin grafting                 | 3      | 3 |
| Debridement dressing midthigh-sympathectomise | 2 | 2 |
| Debridement dressing midthigh amputation angiotherapy balloon angioplasty | 2 | 2 |
| Debridement skin grafting dressing          | 2      | 2 |
| Debridement dressing below knee amputation  | 1      | 1 |
| Below knee amputation                       | 1      | 1 |
| Debridement dressing angiotherapy balloon angioplasty skin grafting | 1 | 1 |
| Midthigh amputation                         | 1      | 1 |
| Debridement dressing angiotherapy balloon angioplasty | 1 | 1 |
| Debridement dressing Midthigh amputation    | 1      | 1 |
| Total                                        | 100    | 100|

Discussion

A proportion test revealed that the proportion of patients aged 40 to 70 years (84%) was slightly higher (Z=9.51; p<0.0001) in this sample. Just 5% and 5% of the patients were under the age of 30 and 70 years, respectively. As a result, leg ulcers were more common in people aged 40 to 70. In their research, Cornwall et al. discovered that 70% of the patients were over the age of 70, and Callam et al. discovered that ulceration started before the age of 40 in 22% of the patients. The proportion of males who were 85 percent was slightly higher than the proportion of females who were 15 percent (Z=9.74; p<0.0001). As a result, males were more likely to develop leg ulcers.

According to different studies, females are more likely than males to develop chronic leg ulcers. Male predominance was observed in our sample, with a male to female ratio of 5.67:1. A hospital-based survey in India found a male-to-female ratio of 5.7:1, which is close to the male-to-female ratio in the United States. This may be because of the fact that in India males are more engaged in outdoor activities compared to female who remain indoors.

Corrected Chi-square test showed that there was no significant association between age and gender of the patients (p=0.22). Thus the leg ulcers were evenly distributed over ages among both in males and females.

The mean (mean±SD) age of the male patients was 52.65±12.21 years with range 20-75 years and the median age was 52.0 years. The mean (mean±SD) age of the male patients was 52.5 years with range 27-73 years and the median age was 52.5 years. T-test showed that there was no significant difference between mean age of males and females (t19=0.47; p=0.60).

No significant difference between sexes was found when age specific relative frequencies were compared (H=2.5357, DF =4, p=0.6383) in a study conducted in India. Most of the patients were engaged in agriculture (25%) followed by business (22%) and service (14%). As per the study conducted in China majority of leg ulcers were among the farmers and agricultural workers as in the present study.

44% of the patients had habit of smoking, chewing tobacco and drinking of alcohol. Out of 44 patients having any kind of personal habit 12% had smoking followed by chewing tobacco (9%). In a study on Indian patients found that there is a positive relationship between smoking and diabetes. Cigarette smoking has been reported to have an impact on wound healing through impairment of tissue oxygenation and local hypoxia via vasoconstriction. Tobacco smoke has high concentration of carbon monoxide, which binds haemoglobin, forming carboxyhemoglobin. Carboxyhemoglobin binds to oxygen with high affinity and thereby interferes with normal oxygen delivery to hypoxic tissues. Higher proportion of patients with smoking and drinking habit may be associated with greater population of diabetic leg ulcers in our study.

Ulcers in the left leg (49%) was higher than that of right leg (47%) but it was not significant (Z=0.28; p=0.77). Only 3% of the patients were having ulcers in both legs.

In a study from Nigeria showed 17 ulcers on Left leg (51.5%), 15 ulcers on right leg (45.5%) and 1 (3%) ulcer on both leg in a population of 33 patients. But laterality of leg ulceration has no impact on the outcome of leg ulcer.

Most of the patients (61%) had ulcer at foot followed by gaiter (20%) and leg (19%). Smoking has been reported to have an impact on wound healing through impairment of tissue oxygenation and local hypoxia. Tobacco smoke has high concentration of carbon monoxide, which binds haemoglobin, forming carboxyhemoglobin. Carboxyhemoglobin binds to oxygen with high affinity and thereby interferes with normal oxygen delivery to hypoxic tissues. Higher proportion of patients with smoking and drinking habit may be associated with greater population of diabetic leg ulcers in our study.
Most of the ulcers were diabetic (37%) followed by venous (22%) (Z=2.31; p=0.01). Only 5% and 3% were malignant and trophic ulcers. 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 [16]. All of these are based on population in western countries. But Indian study in prevalence of leg ulcer is limited to only one hospital based study. The study suggested that leprosy (40%), diabetes (23%), venous disease (11%), and trauma (13%) were among the causes of lower extremity wounds in patients attending that hospital. Thirteen percent of wounds were not directly linked to any known cause [8]. Arterial ulcer is seen among 13% patient in our study. In region where our hospital is present, prevalence of tobacco usage is about 50-65% in the population [17]. Higher rate of smoking and use of tobacco products, especially use of Beedi smoking in Indian male could be the cause of more number of male patients compared to female and higher number of arterial ulcer in our study [18]. Also incidence Burger’s disease among peripheral arterial disease is more in India (45-63%) than Europe (0.5-5.6%) [19]. Beedi smoking is prevalent in lower socioeconomic class people who also walk bare footed, so more vulnerable to trauma to foot. Poor education and poverty prevents them to attend health care facility promptly. The above mentioned causes may be the reason of more arterial ulcer in our study. Venous ulcers are significantly lower in our study (22%) compared to western studies. Only one study available in literature done by Malhotra on prevalence of varicose veins in Indian population, which showed the prevalence of varicose vein in rail road workers found to be 25.08% in south Indian and 6.8% in north Indian workers [20]. Leg ulcer due to malignancy, tuberculosis, neurotropic causes are seen rarely. Peripheral neuropathy (23%) was the most common type of ulcer followed by venous hypertension (22%). Only 1 (1%) case of sickle cell disease was found. In a community-based study from Chennai, south India, Pradeepa et al. measured the prevalence of DPN using VPT by biothesiometer. The prevalence in newly diagnosed patients was 19.5% and 27.8% in those with known diabetes [21]. However, the frequency of DPN in the subjects without diabetes was not studied. The higher proportion of peripheral neuropathy is due to higher proportion of diabetic leg ulcers in our study.

In 79% of the ulcers microorganisms were found which was significantly higher than that of no growth (21%) (Z=8.31; p<0.0001). Out of the microorganisms Staphylococcus (28%) was most common followed by Pseudomonas (14%) and Klebsiella (11%). Only in 2% of the ulcers, Morganella and AFB were present. Similar result was reported by Mathangi et al. in their study [22].

Most of the patients (68%) had pain which was significantly higher than of no pain (32%) (Z=5.16; p<0.001). Similarly study was reported by Hassan Ghassemi et al. [10].

Most of the ulcers were muscle deep containing unhealthy granulation tissue and slough with serous or purulent discharge, irregular or thin bluish margins, shallow edge followed by sloping edge, associated with lipodermatosclerosis and hyperpigmentation or induration. These findings were associated with more numbers of diabetic and venous leg ulcer patients in this present study.

Conclusion

As a result, the current research concluded that different cases of leg ulcers arouse a great deal of curiosity and are perplexing in terms of care. There has undoubtedly been a significant increase in the treatment of untreated leg ulcers, thanks to the availability of an array of investigational antibiotics and ever-improving dressing materials.

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