

Clinical outcomes of Diabetic Foot Clinic at King Chulalongkorn Memorial Hospital

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Bangchokdee S, Tantisiriwat N, Janchai S. Clinical outcomes of Diabetic Foot Clinic at King Chulalongkorn Memorial Hospital. Chula Med J 2013 Jul – Aug; 57(4): 457 - 64

- Background** : *Diabetes-related lower extremity amputation is common and leads to poor quality of life. A comprehensive diabetic foot care can reduce amputation rate to 49 - 85%. Diabetic Foot Clinic was developed at the Department of Rehabilitation Medicine in 2004 to prevent foot ulcer and amputation. The authors aimed to evaluate the clinical outcomes of the Diabetic Foot Clinic, i.e. patient-related and ulcer-related outcomes.*
- Objective** : *To study clinical outcomes of patients treated at the Diabetic Foot Clinic.*
- Design** : *Descriptive study.*
- Setting** : *Department of Rehabilitation Medicine, King Chulalongkorn Memorial Hospital.*
- Materials and Methods** : *Medical records of patients who have continuously visited the Diabetic Foot Clinic for at least 1 year were retrospectively reviewed.*

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- Results** : *There were 124 patients; 57 males with the mean age of 62.6 years. The percentage of death was 1.6%. The causes of death were infected diabetic foot ulcer and cellulitis. The percentage of lower limb amputation was 8.9%. The major and minor amputations were 3.2% and 5.6% respectively. The percentage of patients underwent surgical procedures was 8.1%. The surgical procedures were debridement and surgical graft. In total, there were 124 ulcers in 69 patients. Regarding healed ulcer, there was 66.94% healed by 12 months.*
- Conclusions** : *Clinical outcomes of patients treated at Diabetic Foot Clinic showed percentage of death and amputation as 1.6% and 8.9% respectively, whereas the percentage of healed ulcer was 66.9%.*
- Keywords** : *Diabetic foot, foot ulcer, lower limb amputation.*

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Received for publication. June 20, 2012.

ศิริกรรัฐ บางโชคดี, ญัญญา ตันตศิริวัฒน์, ศิริพร จันทร์ฉาย. ผลการดูแลผู้ป่วยของคลินิกเท้าเบาหวานในโรงพยาบาลจุฬาลงกรณ์. จุฬาลงกรณ์เวชสาร 2556 ก.ค. - ส.ค.; 57(4): 457 - 64

- ที่มา** : การถูกตัดขาเป็นภาวะแทรกซ้อนที่พบได้บ่อยของโรคเบาหวานซึ่งส่งผลทำให้ผู้ป่วยมีคุณภาพชีวิตลดลง การดูแลเท้าเบาหวานแบบองค์รวมสามารถป้องกันการเกิดแผลที่เท้าและสามารถ ลดอัตราการถูกตัดขาได้ร้อยละ 49 - 85 คลินิกเท้าเบาหวานฝ่ายเวชศาสตร์ฟื้นฟู โรงพยาบาลจุฬาลงกรณ์เปิดให้บริการตั้งแต่วันที่ 2547 เพื่อลดการเกิดแผลและถูกตัดขา ผู้ศึกษาต้องการประเมินผลลัพธ์ในทางคลินิกในด้านที่เกี่ยวข้องกับผู้ป่วยและแผล
- วัตถุประสงค์** : ศึกษาผลของการดูแลผู้ป่วย คลินิกเท้าเบาหวานโรงพยาบาลจุฬาลงกรณ์
- รูปแบบการวิจัย** : การวิจัยเชิงพรรณนาย้อนหลัง
- สถานที่ทำการวิจัย** : ฝ่ายเวชศาสตร์ฟื้นฟู โรงพยาบาลจุฬาลงกรณ์
- วิธีการศึกษา** : ทบทวนบันทึกเวชระเบียนของผู้ป่วย คลินิกเท้าเบาหวานที่มาได้รับการรักษาต่อเนื่องอย่างน้อย 1 ปี
- ผลการศึกษา** : ผู้ป่วยเบาหวาน 124 คน เป็นชาย 57 คน มีอายุเฉลี่ย 62.6 ปี อัตราการเสียชีวิตคิดเป็น ร้อยละ 1.6 ซึ่งมีสาเหตุการเสียชีวิตมาจากภาวะการติดเชื้อของแผลเท้าเบาหวานและภาวะการติดเชื้อของเนื้อเยื่อที่ขา อัตราการถูกตัดขาคิดเป็นร้อยละ 8.9 โดยแบ่งเป็นอัตราการตัดในระดับขาและอัตราการตัดในระดับเท้าหรือบางส่วนของเท้าเท่ากับร้อยละ 3.2 และ 5.6 ตามลำดับ ผู้ป่วยที่เข้ารับหัตถการทางการผ่าตัดซึ่งได้แก่การตัดเนื้อเยื่อตายออกและการนำผิวหนังที่อื่นมาปิดแผลมีสัดส่วนคิดเป็นร้อยละ 8.1 มีแผลรวมกันทั้งหมด 124 แผล จากผู้ป่วย 69 คน โดยสัดส่วนของแผลที่หายในระยะเวลา 12 เดือนเท่ากับ ร้อยละ 66.9
- สรุป** : ผลการดูแลผู้ป่วยของคลินิกเท้าเบาหวาน พบว่าอัตราการเสียชีวิตและถูกตัดขาคิดเป็น ร้อยละ 1.6 และ 8.9 ตามลำดับขณะที่อัตราการหายของแผลคิดเป็นร้อยละ 66.9
- คำสำคัญ** : เท้าเบาหวาน, แผลที่เท้า, การตัดขา.

Lower extremity amputation is one of the major complications due to diabetes mellitus which impacts the quality of life or even causes death. More than 60% of non-traumatic amputations are related to diabetes. Significant risk factors of amputation were: age more than 60, infected wound, cardiovascular diseases, nephropathy, peripheral neuropathy and poor plasma glucose control.⁽¹⁾ Whereas factors related to ulceration were: peripheral neuropathy, poor vision, high plasma glucose, prior ulcer or amputation and onychomycosis of the foot.⁽²⁻⁴⁾

Regarding the comprehensive diabetic foot care, the rate of amputation could be reduced by 49 - 85%.⁽⁵⁾ The outcomes of foot care was determined by many factors such as ulcer healing, wound size, amputation rate, quality of life, ulcer free period and mortality rate. In 2004, the Diabetic Foot Clinic was established at the Department of Rehabilitation Medicine, King Chulalongkorn Memorial Hospital. The main purpose of this clinic is to prevent foot ulcer and amputation. A guideline of diabetic foot care was developed according to Louisiana State University (LSU) diabetes foot program. The knowledge of proper foot care and footwear selection was educated to the patients during their first visits. Foot screening was performed by physiatrists. Diabetic patients were categorized based on their risk to ulceration and amputation, to determine the level of management. The previous report of the 150 patients with diabetic foot, common foot problems were reported and categorized into groups which were: neurological (79.3%), musculoskeletal (74%), dermatological (67.3%) and vascular (39.3%). Callus and ulceration were 56% and 18%, respectively.⁽⁶⁾

From clinical follow up, the patients had improvements such as healing rate, lower rate of recurrent ulcer and lower amputation rate. However, the outcomes were not clearly determined. Hence, the authors would like to evaluate the clinical outcomes of the Diabetic Foot Clinic regarding patient-related and ulcer-related outcomes.

Materials and Methods

The medical records of patients who continuously attended the Diabetic Foot Clinic for at least 1 year from January 1st, 2006 to December 31st, 2009 were reviewed by the first author. The inclusion criterion was the complete medical records of patients who continuously attended clinic for at least 1 year. The exclusion criteria were incomplete medical records, medical records of patients who did not continuously attend the clinic and medical records of patients who attended less than 1 year.

The operational definition was used in this study to describe as of the following terms. Ulcer was defined as any break in the cutaneous barrier, usually extend through the full thickness of the dermis. Healed ulcer was defined as the ulcer that has complete epithelialization for at least 30 days. Recurrent ulcer was defined as the ulcer that has occurred at the same site after being healed for more than 30 days. The new ulcer was defined as ulcer occurred at different site at any time.⁽⁷⁾ Loss of foot protective sensation was defined as being unable to obtain any foot sensation derived from using 10-g (5.07) nylon monofilament for at least 1 area out of 10 tested areas.⁽⁸⁻⁹⁾ Ulcer area was measured as widest and lengthiest part and calculated in square centimeters. The size was categorized into major ulcers, which

were larger than 1 square centimeter, and minor ulcers which were 1 square centimeter or smaller.⁽¹⁰⁾ Risk to future lower limb amputation was categorized into four groups which were category 0 (no loss of protective sensation), category 1 (loss of protective sensation), category 2 (loss of protective sensation and evidence of high foot pressure which was callus and deformity or poor circulation) and category 3 (history of plantar ulceration, amputation or Charcot fracture).⁽⁸⁻⁹⁾ The outcomes were determined as patient-related outcomes and ulcer related outcomes. Patients who had poor outcomes were defined as patients who were dead, received amputations or other surgical procedures. The lower limb amputation was classified into minor amputation (amputation limited to the foot) and major amputation including below knee (BK) and above knee (AK) amputations. The ulcer related outcomes were determined as healed ulcer, recurrent ulcer and new ulcer.⁽¹⁰⁾

Statistical analysis

The data were analyzed by the SPSS software version 17.0. Descriptive data are presented as mean \pm standard deviation and percentage.

Results

There were 273 patients who attended the Diabetic Foot Clinic in the period of January 1st, 2006 to December 31st, 2009 ; however there were 124 patients who were eligible with inclusion criteria. Forty-six percent of these patients were male. Their demographic data and underlying diseases are shown in Table 1 and 2. Patients were categorized based on their risks to future lower limb amputation which were: category 0 (39.5%), category 1 (18.6%), category 2 (16.9%) and category 3 (39.5%). For patient related outcomes, there were 101 patients had good outcomes and 23 patients had poor outcomes as shown in table 3. Only one patient died from infected foot ulcer.

As for ulcer-related outcomes, a total of 124 ulcers were noted in 69 patients. The average area of all ulcers was 1.98 square centimeters. Of all the 124 ulcers, 56 were major and 68 were minor ulcers. Eighty-three ulcers healed (66.9%) and forty-one ulcers (33.1%) were not healed. Of the healed ulcers, 40.3%, 60.5 %, 64.5% and 66.9% were healed by 3, 6, 9 and 12 months, respectively (Figure 1). The mean duration of healing was 95 days, whereas the median duration was 78 days. During study period, there were 17 patients and 44 patients developed recurrent ulcer and new ulcer respectively.

Table 1. Demographic data.

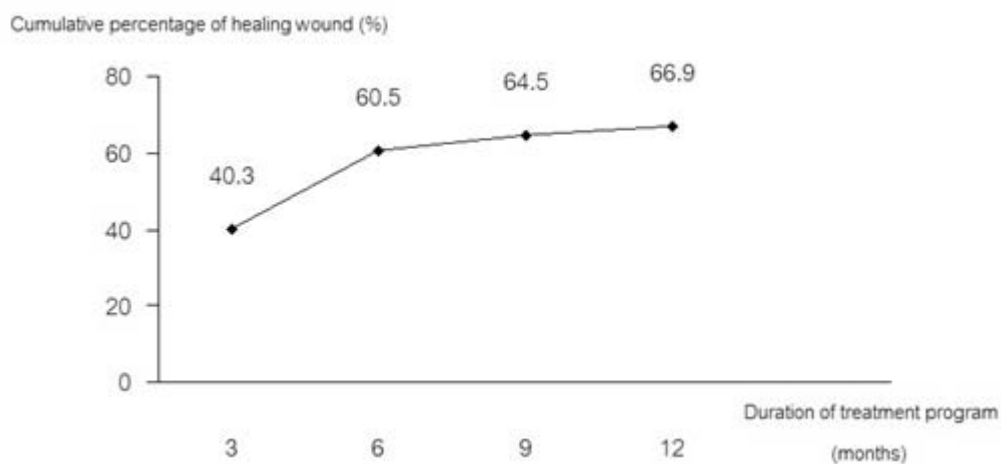
Demographic data (total n = 124 patients)	Mean \pm SD
Age (years)	62.6 \pm 12.2
Duration of diabetes (years)	12.4 \pm 8.9
BMI (kg /m ²)	25.5 \pm 4.7
HbA _{1c} (%)	7.7 \pm 1.3

Table 2. Underlying disease and previous status.

Underlying disease and previous status (total n = 124 patients)	N (%)
Previous ulcer	51 (41.1)
Previous amputation	30 (24.2)
Cerebrovascular disease	12 (9.7)
Coronary artery disease	36 (29.0)
Nephropathy	44 (35.5)
Retinopathy	43 (34.7)
Peripheral Vascular Disease	41 (33.1)
Peripheral neuropathy	82 (66.1)

Table 3. Patient related outcomes

Patient related outcomes (total n = 124 patients)	N (%)
Good outcomes	101(81.5)
Poor outcomes	
Death	2(1.6)
Surgical debridement or grafting	10(8.1)
Amputation	
Minor amputation	
Toe amputation	6(4.8)
Foot amputation	1(0.8)
Major amputation	
BK amputation	3(2.42)
AK amputation	1(0.8)

**Figure 1.** Relationship between rate of healed ulcer and duration of treatment program.

Discussion

Regarding patient-related outcomes, 3 studies were reported from 2006 to 2008. The first study was in 2006. Accordingly, Jeffcoate W *et al.* followed up 449 patients for 12 months and reported 16% mortality rate and 10.7% amputation rate.⁽¹⁰⁾ The second study was in 2007; Winkley K *et al.* followed up 253 patients for 18 months; 15.8% mortality rate and 15.5% amputation rate were documented. The amputations were mostly minor ones. Furthermore, most patients died from skin and soft tissue infections.⁽¹¹⁾ The last study was in 2008; Rerkasem K *et al.* followed up 73 patients for 19 months; 9.1% amputation rate was reported from this study.⁽¹²⁾ In comparison to the previous studies, the authors found our mortality and amputation rates lower. However, 8.1% of all patients needed surgical procedures for wound care, such as skin graft and debridement.

Regarding ulcer-related outcomes, there were 2 studies. The first was that of Jeffcoate W who reported the rate of ulcer healing at 6 months and 12 months were 52.1% and 59.2%.⁽¹⁰⁾ The second study was in 2009, Coerper S *et al.* followed up 704 patients.⁽¹³⁾ The patients without peripheral vascular disease were selected because the factor affected wound healing. The average area of ulcer was 1.18 square centimeters. The rates of ulcer healing at 3 months, 6 months and 12 months were 35%, 41% and 73%, respectively. In comparison to the previous studies, the average area in our study was larger, and higher rate of ulcer healing was seen at 3 months and 6 months. However, the rate of ulcer healing at 12 months was lower than the previous studies as the authors included patients with peripheral vascular

diseases which were 33.1% of all patients. According to the rate of ulcer recurrence, the authors found lower rate in comparison to the study of Coerper S *et al.* (33.6%).⁽¹³⁾

Conclusion

Clinical outcomes of patients treated at Diabetic Foot Clinic showed percentage of death and amputation as 1.6% and 8.9% respectively, whereas the percentage of healed ulcer was 66.9%.

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