

Foot Care Knowledge and Practice among Diabetic Patients Attending Primary Health Care Centers in Jeddah City

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Abstract. Diabetics' knowledge and awareness on foot care are usually associated with less foot complications and better diabetic foot condition. A cross-sectional study to assess patients' foot care knowledge and practice was designed. A questionnaire to assess foot care knowledge and practices, and other related variables was conveyed through interviewing 747 diabetic patients in 7 representative primary health care centers in Jeddah city. A lower level of foot care knowledge than the optimum was noticed, particularly in daily observation to detect ulcers, and the selection of foot-ware suitable for diabetic patients. The weakness was encountered in the foot care practices such as using mirror for foot checkup and practices related to foot-ware. The practice score was significantly lower in patients with lower educational level. About two-thirds (66.5%) of the patients reported having one or more diabetic complications and 45.4% reported peripheral neuropathy. Findings indicate the need for starting a well organized and structured educational program designed for foot care in diabetics. Hence, an improved and better continuous program of periodic screens in high risk patients as to prevent diabetic foot problems and complications.

Keywords: Foot Care, Diabetic Foot, *Diabetes Mellitus*, Education, Primary Care.

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Introduction

Diabetes mellitus (DM) is a common major health problem in Saudi Arabia with prevalence rate of 23.7% among adults over 30 years old^[1]. Diabetic foot problems are one of the important complications of diabetes causing a major morbidity with a high cost worldwide^[2,3]. In Saudi Arabia, diabetic foot ulcer is a major cause of lower limb amputation^[4]. In the western region, it was the cause of 49.6% of the cases two decades ago, and is expected to increase^[4] as reported recently^[5,6].

Patients' awareness about proper foot care is important in preventing diabetic foot problems and amputation^[7,8]. In order to reduce the incidence of foot ulcers and complication, awareness should be translated to proper practice foot care. Patient's education contributes to less foot ulceration and subsequent amputations. Therefore, many scientific societies and organizations nowadays provide guidelines about the proper foot care education and practice^[9].

The aim of this study is to identify the present status of foot care knowledge and practice among diabetic patients in Jeddah city. Such information will be an essential step to improve the efforts given by our health system in certain related aspects.

Methodology

Jeddah is the second city in Saudi Arabia with a population reaching to 2.5 million.

The study was cross-sectional design and was conducted over a period of 12 weeks in the year 2009 (20 April - 12 July).

The Ministry of Health - Primary Health Care Centers in Jeddah being the major provider of the primary care, and are distributed over seven geographical sectors, in each sector there are 5-7 centers. From each sector, one center was chosen randomly. The targeted sample was to recruit 70 male and 70 female known diabetic patients - from each center, during the study period. Some centers were able to have the targeted sample, but some failed. This variability was due to the difference in the total number of diabetic patients attending each center. However, the total number of the patients enrolled in the study was 747.

The entry criteria was the history of diabetes of at least a one year duration.

The study method was a questionnaire about the knowledge (9 questions) and practice (11 questions) of foot care for diabetic patients. The information and practice questions asked by Meijer *et al.*^[10] were adapted with modifications. Also, there were other questions about diabetes complications, hypertension, certain risk factors and socio-demographic variables. The questionnaire was reviewed by 4 interested clinicians and piloted on a group of patients, plus changes were done to avoid ambiguity and enhance validity.

The weight and height was measured for each patient, and the Body Mass Index (BMI) was calculated. Obesity classification was done according to the World Health Organization criteria based on the BMI values (<http://apps.who.int>).

From each center, one male and one female nurse were chosen to participate in administering the questionnaire to the patients by interviewing them. The questionnaire was explained to the nurses, and a half day session was provided to refresh their basic knowledge about diabetic foot complications and foot care, as well as to train them on how to apply the research materials on the patients.

Approval for doing the study was taken from the Directorate of Health in Jeddah. The patients in the study were told about the objective of the survey as well as to encourage and thank them for their participation in the study. Moreover, ethical approval was obtained from King Abdulaziz University Hospital Research Ethical Committee.

One limitation in the study was that some diabetic patients, usually from a higher socio-economic classes, may not come to the Ministry of Health Primary Health Centers, and they take their follow-up in private sectors or in other governmental health sectors.

Data Entry and Statistical Analysis

The data analysis was done using SPSS program version 16; for the 9 knowledge questions, one score was given for each correct answers, The practice questions were scored as following: (Always = 3, Often = 2, Sometimes = 1, No = 0) making a total of 33 scores for those who always behave in healthy manner. As the results of the scores were not normally

distributed, the statistical associations were calculated using non parametric tests, namely Mann-Whitney *U* test, Kruskal-Wallis one-way analysis of variance, and Spearman's correlation analysis (*r*). For the qualitative variables; Pearson's chi-square (χ^2) and Fisher's exact test were used.

Results

A total of 747 known diabetics were studied. Their mean age group was 52.7 ± 11.9 years, male: female ratio was 1.02:1, and 92% were Saudi. About one third (32.6%) of the samples were illiterate and 11% completed university or have a postgraduate degree.

The mean duration of diabetes was 8.5 ± 6.3 years. Most (72.7%) of them were using oral hypoglycemic drugs, 22.7% were using insulin either alone or with oral hypoglycemic drugs and only few (4.7%) were on diet only.

Almost one quarter (26.9%) of the studied sample indicated that they were suffering from hypertension, and 15.5% indicated having hyperlipidemia. Regarding smoking 21.6% of the samples were smokers while 7.5% were ex-smokers. More than one-third (38.3%) of the patients were obese, 38.8% were overweight and only less than one quarter (21.9%) were normal (Fig. 1). Regarding diabetic complications, about two thirds (66.5%) of the patients reported that they had one or more complications. Figure 2 displays the percentages of the reported complications.

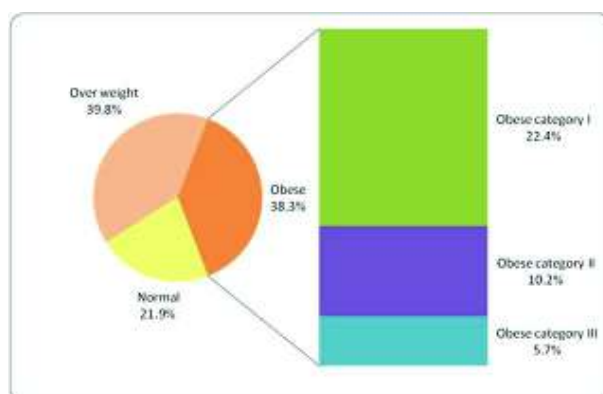


Fig. 1. Body Mass Index (BMI) values of the studied group.

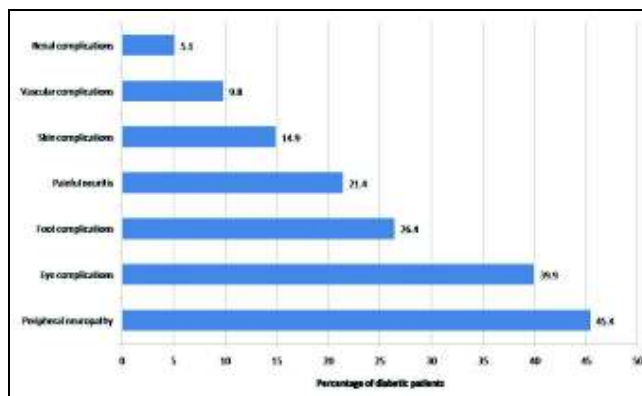


Fig. 2. Diabetes complications as reported by the studied group.

The median score of the knowledge was 7 of 9 while the median score of the practice was 14 of 33. Tables 1 and 2 show the frequency results of knowledge and practice questions. There is no significant relation between the knowledge median score and the studied socio-demographic variables, except for job status as those who were jobless had a lower knowledge median score (5) with $p = 0.008$ (Table 3). Behavior median score was significantly better in Saudis ($p = 0.001$), significantly positively related with the educational level ($p = 0.001$) and was significantly less in the jobless with $p < 0.001$ (Table 4).

Table 1. Knowledge of the studied group about the importance of certain items related to foot care arranged in descending order.

Items	Frequency of "Yes" Answers	Percentage (%)
Washing foot at least once daily	681	91.2
Not to walk barefooted	581	77.8
Care when clipping nails	576	77.1
Seeking medical advice when there is an ulcer	556	74.4
Daily checkup of the foot	488	65.3
Having appropriate shoes size	481	64.4
Drying foot after washing it	471	63.1
Daily observation of foot to detect any ulcer	449	60.1
Knowledge about shoes specifications	358	47.9

Table 2. Daily practice of activities related to foot care.

Activities related to foot care	Frequency of practicing							
	Always		Often		Sometimes		No	
	No	%	No	%	No	%	No	%
Assign time for foot care	166	22.3	136	18.3	254	34.1	189	25.4
Washing foot (Ablution at least once)	637	86.1	78	10.5	19	2.6	6	0.8
Drying foot after washing it	250	33.6	103	13.8	201	27.0	191	25.6
Using skin lotion or olive oil for the foot	234	31.4	99	13.3	242	32.4	171	22.9
Checking foot for presence of any ulcer	200	27.0	108	14.6	209	28.2	223	30.1
Using a mirror for foot checkup	25	3.4	18	2.4	53	7.1	648	87.1
Checking the foot by one of the family members	78	10.6	72	9.8	122	16.5	466	63.1
Not to walk barefooted	405	54.4	101	13.6	100	13.4	138	18.5
Wearing shoes	97	13.0	64	8.6	213	28.6	371	49.8
Checking the inside of the shoes	188	25.4	68	9.2	160	21.6	324	43.8
Wearing socks	129	17.3	82	11.0	234	31.4	301	40.3

Table 3. Knowledge scores of the studied diabetic patients about foot care according to their demographic characteristics.

Characteristics	Median Score	p
Nationality		
Saudi	7	0.102
Non Saudi	6	
Gender		
Male	6	0.935
Female	7	
Age groups		
< 30 years	6	0.103
30- < 40 years	7	
40- < 50 years	7	
50- < 60 years	7	
60+ years	6	
Education level		
Illiterate	7	0.215
Read and Write	7	

Primary	7	
Preparatory	6	
Secondary	7	
University	8	
Postgraduate	9	
<i>Type of the job</i>		
Has a job	7	0.008
Jobless	5	
Retired	6	
Housewife	6	

Table 4. Behavior scores of the studied diabetic patients regarding foot care according to their demographic characteristics.

Characteristics	Median Score	p
<i>Nationality</i>		
Saudi	14	0.001
Non Saudi	11	
<i>Gender</i>		
Male	15	0.933
Female	14	
<i>Age groups</i>		
< 30 years	15	0.442
30- < 40 years	16	
40- < 50 years	15	
50- < 60 years	14	
60+ years	14	
<i>Education level</i>		
Illiterate	13	0.001
Read and Write	14	
Primary	15	
Preparatory	15	
Secondary	16	
University and Postgraduate	16	
<i>Type of the job</i>		
Has a job	15	< 0.001
Jobless	10	
Retired	15	
Housewife	13.5	

A positive correlation between the knowledge scores and the practice score, as Spearman's rank correlation coefficient (Spearman's rho) revealed, statistically significant correlation ($p < 0.001$) with coefficient accounted for 0.559 (Fig. 3). No significant difference was found in the median scores of knowledge and the median scores of practice between patients with foot complication and those without foot complications (Table 5). Furthermore, there was no significant relation for the knowledge and practice median scores with the duration of diabetes (Table 6).

Fig. 3. Correlation between knowledge and self reported behavior scores regarding foot care.

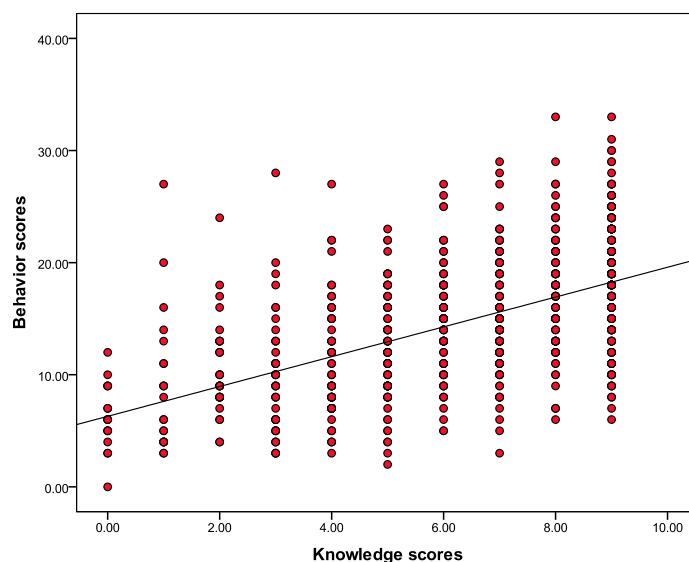


Table 5. Knowledge scores of the studied diabetic patients about foot care according to the presence of foot complications and duration of diabetes.

Foot Complications and Duration of Diabetes	Median Score	p
<i>Presence of foot complications</i>		
Yes	7	0.913
No	7	
<i>Duration of diabetes</i>		
< 10 years	6	0.061
10-20 years	7	
20+ years	7	

Table 6. Behavior scores of the studied diabetic patients about foot care according to the presence of foot complications and duration of diabetes.

Foot Complications and Duration of Diabetes	Median Score	p
<i>Presence of foot complications</i>		
Yes	14	0.506
No	15	
<i>Duration of diabetes</i>		
< 10 years	14	0.142
10-20 years	15	
20+ years	12.5	

Discussion

Diabetes is a metabolic syndrome which is associated with many comorbid conditions and risk factors. The sample report is not an exception as it was found that more than one quarter of the study group having hypertension and 15.5% having hyperlipidemia. This is a reminder about the importance of preventing and properly treating these conditions, which are important factors in increasing the risk of vascular complications and indirectly increasing the number of diabetic foot and lower limb amputations.

A more alarming problem is the huge percentage of over-weight (38.9%) and obese (38.3%) patients in the study group. This necessitates an effective program to deal with it in our community at large and particularly in the risky groups like diabetic patients. Smoking is still a major health problem as a significant number of our samples were smokers (21.6%).

Despite the limitations in investigating, the prevalence of diabetic complications by questionnaire, the findings of 66.5% of the study sample reported one or more diabetic complications and 45.4% reported peripheral neuropathy are very significant and indicate the need for better control of our diabetic patient.

Foot care knowledge is important for the prevention of foot problems. The median score in the studied group was favorable 7 of 9, but there is weakness in some knowledge aspects as discussed below.

Ideally, the diabetics should know the importance of every item asked; however, the results considered to be good if the percentage of

the right answers were $\geq 80\%$, acceptable if $\geq 70-79\%$, weak if only $\geq 50-69\%$ and very weak if $\leq 49\%$ were right.

The knowledge about the importance of washing foot at least once daily ranked on the top as 91.2% answered yes for it. However, most other knowledge results lie in the weak level, for example, only 65.3% know the importance of daily check of the foot inspire of the chronicity of diabetes among them, and the mean duration of diabetes in the study group was of 8.5 years. Of special importance are the results of the questions about the need for special characteristics of the shoes, as only 47.9% of the sample knows its importance in maintaining foot's health.

Many studies across the world showed the presence of inadequate knowledge of self foot-care in diabetic patients; Khamseh *et al.* in Iran^[11], Chanda *et al.* in India^[12], Meijer *et al.* in Netherlands^[10], Pollock *et al.* in England^[13], and Neil^[14] in a rural population in USA. All researchers indicated the need for foot care education programs and improving the way of delivering it.

In our primary health care centers, there was a diabetes and hypertension clinic in every center. The patient is usually given the education awareness while seen in the clinic and in some centers the health educator will also educate some patients. However, there is the lack of well structured educational programs which will improve the foot care knowledge and practice of the patients.

Knowledge and awareness are not enough in preventing foot disorders, as it must be translated to daily health practices. In the studied sample, this was disturbing as the median score of the foot-care practice was low 14 of 33, which indicates, the great need to improve it. Again, similar findings were addressed by other researchers even in developed countries^[10].

Of special importance was the practice related to the shoes as half of the study sample (49.8%) constantly do not wear the fully covered shoes. This of course relates to our culture in foot wear practice as most people do not wear the covered shoes. These practices of Saudis diabetic patients need to change. Comparing this result with the study done in Pakistan, which is a relatively of similar culture in certain aspects; Saudis have a higher percentage of wearing uncovered shoes as they

found that (22.2%) of males and (43.8%) of females patients were using open shoes^[15].

Furthermore, 43.8% of the patients do not check up the inside of their shoes and 40.3% do not wear socks. Schmidt *et al.* in Germany^[16] also found deficits regarding self-control of shoes and socks in her study. She acknowledged the need for more frequent education, especially for patients with a foot art risk.

The fifth section (25.6%) of the study sample do not dry their feet after washing them and 22.9% do not use skin lotion or olive oil for their feet. One quarter (25.4%) of the patients do not assign time on daily basis to care for their feet and 30.1% do not check their feet daily for the presence of any ulcer. This is worse than what the English do, as Pollock *et al.* reported in their study^[13] which they found that 18.5% failed to inspect their feet. However, this is slightly better than what people practice in Pakistan^[15] as 34% only inspect their feet daily.

Significant percentages of the studied group walk barefooted at different stages; only 54.4% mentioned that they never walked barefooted. Actually in one of the centers of the study which is located in a low socio-economic area, a nurse mentioned that she occasionally noticed patients, usually poor and of low education, come barefooted to the center. This result indicates that physicians need to concentrate more on education of this behavior, especially in low socio-economic areas.

In this study, the author did not ask whether the barefoot walking was outdoors or indoors. Neil in his study^[14] of 61 diabetic patients in the rural area in USA, noticed the problem of walking barefoot in many patients, especially inside their homes. Chandalia *et al.*^[17] study in India found that 0.6% of the 300 diabetic patients in their study walked barefoot outdoors and 45% walked barefoot indoors.

A very big percentage of our patients, 87.1% do not use mirror for feet checkup and 63.1% do not check the feet by one of their family members. Washing feet daily was very good as 86.1% of the patients said they always do, and this result is related to the religious action of ablution, which is performed by Muslims for more than one time daily. In Neil's study, 79.2% of those with foot ulcers and 80.6% of those without foot ulcers wash their feet once a day^[14]. Hasnain and Sheikh in

their study in Pakistan, also found a big percentage of diabetic patients (88.7%) wash their feet daily^[18].

The significant relation of having lower knowledge or behavior score in the jobless patients and the significant positive relation between the educational level and behavior score, indicates that the lower socioeconomic status is a risk factor for having patients with inadequate foot-care knowledge and practice; therefore, putting them at a higher risk for having diabetic's foot complication. Tseng in his study about prevalence and risk factors of diabetic foot problems in Taiwan^[19], concluded that particular attention should be focused on patients with a lower education level and those who use insulin. De Berardis *et al.*^[20] in their study of diabetic foot care in Italy, also advised to give more attention on patients with low socioeconomic level as they found the diabetic foot complication was more in patients with lower income and with lower education.

The positive correlation between the foot-care knowledge scores and behavior score is suspected as it confirms the importance of foot care education and improving knowledge are the first steps in improving foot-care practice in our patients.

As our study is cross sectional, the absence of significant difference of knowledge and practice between patients with foot complications and those without foot complications could be attributed to the fact that most patients who started to have complication will be keener in looking after their feet and to search for preventive tips.

It is hoped that as the duration of diabetes increases, the patients' foot-care knowledge and practice will improve. Accordingly, the absence of significant relation of the knowledge and the practice median scores with the duration of diabetes in this study may also indicate the need for more efforts to improve the foot-care knowledge and practice in our diabetic patients, particularly on those with longer history. Bell *et al.*^[21] in their study about foot self care practices, found that the practice was better in patients with diabetes duration ≥ 10 years compared to those with diabetes duration < 10 years.

This study was not intended to evaluate the foot care education given by the primary health care centers, but as to understand the level of foot care knowledge and practice of the study sample. This is not only related

to the efforts done by the primary health care centers, but also related to the care provided by other places where the patients may go for follow-up of their diabetes, such as secondary hospitals or the diabetes and hypertension centers in Jeddah. Alfadda and Bin Abdulrahman in their assessment of care for Type 2 diabetic patients at the primary care clinics of a referral hospital^[22], concluded that the care is not adherent to American Diabetes Association and suitable measures must be introduced in order to improve it. Any improvement plan should therefore target the health provider's entire, not only primary health care sector.

The effect of good education and educational programs about foot-care in decreasing the diabetic foot complications was addressed by many studies and articles^[23,24]. Actually, these articles and many other literatures are addressing not only the importance of education but also the need for a comprehensive prevention programs which include proper screening and concentration on high risk feet. An intervention review article in Cochrane^[25] about patient education for preventing diabetic foot ulceration, found that foot care knowledge and behavior of patients to be positively influenced by patient education in the short term and that there is weak evidence suggesting that patient education may reduce foot ulceration and amputations, especially in high-risk patients. However, this should not under-estimate the importance of foot care education as the reviewer mentioned that it could be the weakness in the methodology of the reviewed intervention which affected the results. It indicates the need to enhance the effectiveness of the present education programs.

Conclusions and Recommendations

There is weakness in foot care knowledge and more in the practice among diabetic patients living in Jeddah. The problem is more in patients with low educational level and those who are jobless. Obesity and overweight are still very prevalent in our diabetics and to a lesser degree smoking.

There is a need to start well structured foot care educational programs in our country. These programs should focus on the low socio-economic group of communities and to be delivered at various health sectors. The programs need to be in conjunction with a continuous program of periodic screening of high risk patients to prevent diabetes foot problems.

The other risk factors for diabetic foot, namely obesity, hyperlipidemia, smoking and hypertension need to be prevented and controlled well.

The effort of our mass media is needed to enhance the foot care education. The medical community needs to establish and activate diabetic patients' social groups to enhance foot care program and diabetes care in general.

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المعلومات والسلوكيات المتعلقة بالعاينة بالقدم لدى مرضى السكري المراجعين لمراكز الرعاية الصحية الأولية بجدة

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المستخلص. ترتبط معلومات ووعي مرضى السكري حول العاينة بالقدم بحدوث أقل للمضاعفات على القدم و التمتع بوضع أفضل للقدم عادة. تم تصميم دراسة مسحية مقطعية لتحديد المعلومات والسلوكيات المتعلقة بالعاينة بالقدم. حيث تم تقديم استبيان لتحديد المعلومات والسلوكيات المتعلقة بالعاينة بالقدم والعوامل ذات العلاقة من خلال مقابلة ٧٤٧ مريض سكري يترددون على ٧ مراكز رعاية صحية أولية ممثلة للقطاعات الجغرافية المختلفة في مدينة جدة. لوحظ وجود ضعف في معرفة المرضى بأهمية العاينة بالقدم، خاصة في معرفة أهمية الملاحظة اليومية لاكتشاف وجود قرحة في القدم وأهمية معرفة وجود مواصفات معينة للأحذية التي يرتديها مريض السكري. وكان الضعف أكثر في مستوى سلوكيات العاينة بالقدم مثل استخدام المرآة لمعاينة القدم والسلوكيات المتعلقة بالأحذية. وكان السلوك أضعف بدلالة إحصائية في المرضى ذوي المستويات الأقل في التعليم. وذكر ما يقارب من ثلثي المرضى (٥,٦٦%) أنهم يعانون من واحد أو أكثر من مضاعفات السكري، و٤,٤٥% بأنهم يعانون من الاعتلال العصبي المحيطي.

بينت النتائج أهمية البدء في تصميم برنامج منظم ومنسق بشكل جيد للنتقيف الصحي حول العناية بالقدم لمرضى السكري، ومن الأفضل أن يترافق مع برنامج مسح دوري لفحص القدمين في المرضى الأكثر عرضة للخطر لحماية المرضى من مضاعفات السكري على القدمين.

Flap Thickness Measurement Using the Amadeus Microkeratome

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Abstract. To evaluate the predictability of flap thickness measurement with the 160 micron head of the Amadeus microkeratome and its complications. A retrospective study of 100 eyes underwent LASIK where the flap was created with the 160 microns head of the Amadeus microkeratome. The flap measurement was done by applying the ultrasonic pachymeter on the center of the cornea before and after the cut, the difference was considered the flap thickness. The mean flap thickness for the right eye was 167 ± 16 for the right eye, 154 ± 19 for the left eye. The flap thickness had a highly significant positive correlation (Pearson correlation) with the corneal thickness while no correlation was found with the spherical equivalent, keratometer readings and flap diameter. The second cut was found to be thinner than the first cut. The 160 microns head usually give within the range of this reading, but not less. The second cut is usually thinner. This data will help the user of the microkeratome to estimate the residual bed thickness to avoid post LASIK ablation complications.

Keywords: LASIK, Flap, Microkeratome, Amadeus.

Introduction

Laser-assisted in situ keratomileusis (LASIK) has become a standard procedure in refractive surgery and offers many advantages over

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photorefractive keratotomy^[1-2]. However, the creation of a corneal flap was associated with a number of intraoperative complications (button hole, free cap, thin flap) or postoperative complications like flap striae, epithelial in growth^[2]. This depends on the microkeratome and the different corneal parameters^[3-5]. The Amadeus microkeratome flap measurements and its complications in a series of patients with myopia who had LASIK were evaluated.

Subjects and Method

A retrospective evaluation of 100 eyes was conducted for patients who underwent LASIK for myopia during year 2009 (cases where done in Dr. Erfan and Bagedo General Hospital and Eye Care Center in Jeddah, KSA). An exclusion criterion includes cornea with active or recurrent disease, corneal opacities, keratoconus and any local eye disease or systemic diseases that contraindicates refractive surgery.

All patients had a complete ophthalmological examination including cycloplegic refraction, corneal pachymetry, and corneal topography. The mean keratometric power of the 3 mm central cornea indicating the spherical equivalent power of the cornea within the 3 mm pupil zone was considered. Corneal thickness was determined as the mean of five measurements obtained from the center of the cornea by DGH pachymeter (DGH Technology, Inc, Exton, PA USA).

After obtaining informed consent and full procedure instructions, the patients had LASIK. All LASIK procedures were performed after an application of topical anesthesia (Benoxinate minims). The microkeratome handle was applied over the cornea with cent ration guided by the entrance pupil. The handle incorporate the motor and the suction ring as one assembled unit applied over the cornea. The manufacturer guidelines was followed for the 8.5 ring diameter of 8000/m blade oscillation, 2.5 mm/sec traverse speed and hinge width according to the keratometric readings (less than 42.25 width 1.0 mm, 42.5-45 width 0.8 and more than 45 widths 0.6 mm). Suction was applied till the unit indicated that a proper suction was achieved verified by applanation tonometer (65 mmHg). A single-use new blade was always used for both eyes, and the right eye was done first. Using the 160 mm plate, the motor was advanced and a nasal hinged lamellar flap was created. The ultrasonic pachymetry was applied on the center of the

cornea before flap creation and after flap creation on the central stromal bed on a dry surface. The differences between the two readings were considered the flap thickness. The length of the flap hinge and the maximum horizontal diameter was measured using a surgical caliper. Ablation was performed by the Allegretto wave light laser. The stromal bed was washed by balanced salt solution (BSS, Alcon Lab., Fort Worth, TX USA).

The flap was folded back in position, painted by a wet sponge to assure proper repositioning and was left to dry for two minutes. Eye protection was achieved by a transparent hard shield. Patients received Tobramycin, Dexamethasone Eye Drops, Ofloxacin 0.3% eye drops and preservative free tear natural for 15 days.

Patients were followed after one week, one month and three months for flap complications, refraction, visual acuity and pachymetry.

Results

The study included 100 eyes of 50 myopic patients. The average age of the patient was 23 years old (range from 19 to 42 years). The mean spherical equivalent for the right eye was 4.6 ± 1.8 diopter (D) and for the left eye was 4.8 ± 1.8 D. The mean keratometer reading for the right eye was 42.6 ± 1.3 D in the flattest axis and 44.2 ± 1.5 D in the steepest axis; for the left eye it was 41.9 ± 1.6 D in the flattest axis and 43.9 ± 1.8 D in the steepest axis. The mean corneal thickness for the right eye was 545.8 ± 41 m and 544 ± 40 m for the left eye. The mean flap diameter was 8.4 ± 7 mm for the right eye and 8.4 ± 6 mm for the left eye. The flap thickness measurement for the right eye was 167 ± 16 m and 154 ± 19 m for the left eye. Flap thickness had a highly significant positive correlation with corneal thickness (Right eye $r = 0.389$ $p = 0.005$, Left eye $r = 0.47$, $p = 0.001$).

A stepwise multiple regression formula was done to determine the joint contribution of the significant variables to flap thickness and corneal thickness was identified as the only specific predictor (Pearson correlation). There was no correlation with the spherical equivalent, keratometric reading and flap diameter (Table 1).

The microkeratome cut of the second eye gives usually a thinner flap in most of the cases.

Table 1. Correlation between flap thickness and different variables.

Variable	Pre-spherical Equivalent	Keratometry	Corneal Thickness	Flap Diameter
<i>Flap Thickness</i>				
r	0.316	0.073	0.389*	0.128
p	0.206	0.612	0.005	0.375

Stepwise regression formula:

Pearson correlation: * Correlation is significant at the 0.01 p level (2 – tailed)

Discussion

An ideal microkeratome would consistently produce a corneal flap of desired thickness. Most surgeons use the microkeratome labeling and the laser ablation depth to preserve the standard 250 μm of residual corneal tissue. The reproducibility of a determined flap thickness allows the surgeon to manipulate the parameter of the laser (optical zone, refraction) to be always in the safe residual corneal tissue.

This study, evaluates the 160 μm head of the Amadeus microkeratome in relation to the corneal thickness, refraction, keratometric reading and flap diameter. The recommendations of the manufacture to fix the speed of oscillation, motor advancement speed, hinge diameter and suction power according to the keratometric reading was followed.

In this study, the positive correlation with the flap thickness was the corneal thickness (right eye: $r = 0.389$, $p = 0.005$, left eye: $r = 0.47$, $p = 0.001$). The other variables have shown poor colorations.

In other studies, using the Amadeus microkeratome was found that the only factor that significantly correlated with flap thickness was the flat keratometric value in the first eye. This correlation was low ($r = 0.15$) and did not find a statistically significant correlation with the corneal thickness, and it was explained that the control vacuum setting was used in an attempt to reduce flap thickness^[6-7].

On the other hand, Yi and Joo using the SCMD® microkeratome noted a statistically significant positive correlation between flap thickness and corneal thickness ($r = 0.833$, $p = 0.001$)^[8].

In a study using the Hansatome microkeratome it was found that a weak positive correlation between preoperative pachymetry and flap thickness. The reason for this may be related to the fact that thicker

cornea is more compressible than thinner cornea as shown experimental in rabbit^[9].

There was a significant change between the second cut of the second eye, using the same blade. This was observed in multiple studies. This difference was attributed to the change in the sharpness of the blade. Several studies have shown that the blade edge sharpness deteriorated after multiple passes^[10-12]. Another possibility is that salt crystal from the dried balance salt solution (BSS) may have affected the microkeratome performance on the second eye^[11].

In this study, there was no flap complications attributed to the use of the microkeratome. The single piece design of the Amadeus microkeratome was easy to use, especially in eyes with narrow palpebral fissure. The flap diameter was sufficient to perform all ablation. The Amadeus microkeratome created a reproducible flap, the thickness was within the range of the reading 160 μ m head + 16 sd for the right eye and + 19 sd for the left eye. The surgeon has a good visibility of the corneal flap while performing the surgery, with the ability to abort the procedure in suspecting a complication. Flap thickness variation in LASIK plays an important role, mainly with high correction and thin cornea, because the residual corneal thickness is a crucial factor in preventing corneal ectasia^[12-14]. Thicker cornea is prone to produce thicker flap with the Amadeus 160 μ m head, knowing your microkeratome performance with a specific head will guide the surgeon for a better postoperative results.

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قياس سمك رقعة القرنية بواسطة جهاز الأماديوي القاطع للقرنية

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المستخلص. الغرض من الدراسة تقييم مدى التنبؤ لسمك رقعة القرنية بواسطة القاطع للقرنية أماديوي بالرأس ١٦٠ ميكرون. بدراسة بأثر رجعي ل ١٠٠ عين، تم إجراء عملية الليزك، وتم رفع رقعة القرنية بجهاز الميكروكيراتوم نوع أماديوس بواسطة الرأس ١٦٠ ميكرون، وتم قياس سمك القرنية بالموجات فوق الصوتية قبل وبعد الرفع. متوسط سمك القرنية للعين اليمنى 167 ± 16 ، و 154 ± 19 للعين اليسرى. وجه العلاقة الإحصائية بين سمك الرقعة وسمك القرنية أن سمك الرقعة أرقّ في العين الثانية دائماً. الرأس ١٦٠ ميكرون عادة تقطع في حدود هذه القراءة، وليس أقل ولكن دائماً القطع الثاني يكون أرقّ.