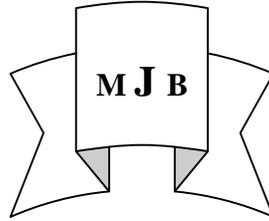


## Equal Sagittal Flap Versus Long Posterior Flap in Below Knee Amputation in Diabetic Foot Patients of AL-Najaf Governorate

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### **Abstract**

Treatment of infective-ulcerative-necrotic lesions of diabetic foot is of great challenge and is based on the optimization of metabolic control, correction of anemia, control of risk factor, removal of necrotic areas and specific antibiotic treatment based on culture and sensitivity test.

Non-healed ulcerative-necrotic lesions after reasonable period of optimum therapy is suggestive of the presence of absolute or relative ischemia (macro and micro angiopathy) and this make the limb salvage procedures of doubtful benefit .

A prospective study done on 33 patients , who were complaining from diabetic foot and they were undergone below knee surgical amputation, after failure of conservative treatment and appearance of progressive complications.

This study was done at Al-Sader Teaching Hospital , Orthopedic Department (October 2005-April 2008).

Diabetic foot evaluations were based on clinical assessment , including Wagner classification , laboratory tests, and Doppler study to evaluate lower limb arterial system .

The selection of types of surgery whether long posterior flap or equal sagittal flap were taken randomly by the same surgeon.

The mean of period between appearance of sign and symptoms of diabetes mellitus were 12.6 years for patients with long posterior flap and 13.5 years for patients with equal sagittal flap.

According to Wagner classification, there were 5 cases of class 4 and 3 cases for class 5 undergone long posterior flap, where as 3 cases with class 4 and 5 cases with class 5, undergone equal sagittal flap.

The success rate of wound healing was 84.2% for patients with long posterior flap and 80% for those with equal sagittal flap and so there was no statistical difference regarding wound healing of amputated stump whether long posterior flap or equal sagittal flap.

### **Aim of the study:**

To compare the wound healing of amputated stump regarding to the types of flap whether long posterior flap or equal Sagittal flap.

### **جراحة البتر تحت الركبة لمرضى القدم السكري في محافظة النجف الأشرف**

دراسة مقارنة بين إجراء العملية باستخدام الشريحة الخلفية الطويلة أو الشريحة الجانبية المتساوية

### **الخلاصة**

لمقارنة التئام الجروح في نهاية البتر تحت الركبة لمرضى القدم السكري بين إجراء العملية الجراحية باستخدام الشريحة الخلفية الطويلة أو باستخدام جراحة الشريحة الجانبية المتساوية.

دراسة مستقبلية أجريت على 33 مريضاً يعانون من مرض القدم السكري والذين يحتاجون إلى عملية بتر تحت الركبة لإنقاذ حياة هؤلاء المرضى ولإعادة تأهيلهم في المجتمع.

أجريت هذه الدراسة في شعبة جراحة العظام والكسور في مستشفى الصدر التعليمي للفترة من تشرين الأول 2005 وحتى نيسان 2008 . معظم الحالات كانت محالة من مركز الحكيم لعلاج داء السكري بعد فشل العلاج التحفظي أو ظهور مضاعفات مهددة للحياة مثل الغرغرينا.

تم تقييم المرضى بإجراء الفحص السريري الشامل والموضعي للقدم وتم إجراء جميع التحاليل المرضية اللازمة ، كذلك تم تقييم القدم السكري طبقاً لتصنيف واغرن للقدم السكري وكذلك إجراء فحص الأمواج الصوتية (الدوبلر) لتقييم حدة انسداد التشعب الشرياني للأطراف السفلى .

بالنسبة لقرار البتر تمت المصادقة عليه من قبل لجنة اختصاصيين مكونة من جراحي عظام ومفاصل وجراح اختصاصي في جراحة القلب و الأوعية الدموية.

اختيار نوع العملية تم بشكل عشوائي من قبل نفس الجراح وكان معدل الفترة الزمنية بين ظهور أعراض داء السكري وإجراء عملية البتر هو 12.6 سنة للمرضى الذين أجريت لهم جراحة الشريحة الخلفية الطويلة و 13.5 سنة للمرضى ذوي جراحة الشريحة الجانبية المتساوية.

بالنسبة لتوزيع المرضى حسب تصنيف واغرن ، كانت هناك 5 حالات ضمن المرحلة الرابعة من تصنيف واغرن و 3 حالات للمرحلة الخامسة للمرضى الذين أجريت لهم جراحة الشريحة الخلفية الطويلة ، بينما كانت هناك 3 حالات للمرحلة الرابعة و 5 حالات للمرحلة الخامسة لتصنيف واغرن للمرضى ذوي جراحة الشريحة الجانبية المتساوية.

أظهرت الدراسة أن نسبة النجاح كانت 84.2% للمرضى الذين أجريت لهم جراحة الشريحة الخلفية الطويلة ، و 80% بالنسبة للمرضى ذوي جراحة الشريحة الجانبية المتساوية .

لم تظهر الدراسة وجود أفضلية بالنسبة لالتزام الجروح في نهاية البتر بين المرضى الذين أجريت لهم جراحة الشريحة الخلفية الطويلة و جراحة الشريحة الجانبية المتساوية.

## **Introduction**

**A**mputation is the most ancient of all surgical procedures; amputation of an irreparably damaged or diseased limb is actually the first step in returning the patient to a normal and productive place in society, therefore the operation should be planned and performed with the same care and skill used in plastic and reconstructive operations [1,11,16].

Most amputations are performed for peripheral vascular disease (specially arteriosclerosis with diabetes mellitus ) [3,4].

Gangrene of limb caused by arteriosclerosis is more difficult to treat in the presence of diabetes mellitus, because the tissues heal poorly and are more susceptible to infection in diabetic patients, furthermore diabetic neuropathy, even sub clinical can cause delayed healing

when diminished sensation results in repeated but unnoticed injuries [1,3,5,16].

Because the skin's blood supply is much better on the posterior aspect of the leg than on the anterior or anterolateral side, below-the -knee amputation techniques for the ischemic limb are characterized by skin flap that favor the posterior side of the leg [7,14,16].

The long posterior flap technique popularized by Burgess is the most commonly used, but in Scandinavia the use of medial and lateral flaps of equal length as described by Persson is popular [6,12,16].

All techniques stress the need for preserving intact the vascular connection between skin and muscle by avoiding dissection along tissue planes and by constructing myocutaneous flaps [11,13].

**Patients and Methods**

A prospective study done at Al-Sadder Teaching Hospital(Orthopedic Department) from October 2005-April 2008.

Most of the cases referred from Al-Hakeem Diabetic Centre, as they were complaining of diabetic foot with failure of conservative treatment or appearance of complications like gangrene and multiple sinus discharge.

Below knee amputation performed on 35 patients , 2 patients died within 24 hours of operation were excluded , so the results reported in 33 patients only.

We performed amputation with long posterior flap in 19 cases, (9 cases were male, 6 cases were female),mean age was 63.3 years

While equal-sagittal flap done in 14 cases (8 cases were male and 5 cases were female ), mean age was 62.5 years.

The indications for amputation recommended by 2 orthopedic surgeons and one vascular surgeon after the evaluation of patient's conditions, which included clinical examination, complete laboratory tests including culture and sensitivity , ECG, Echocardiography ,Doppler study of lower limbs and X-ray of foot and chest[1,4] .

Diabetic foot then assessed locally according to Wagner classification system [8,10,14,17].

The indication for operation based mainly on clinical examination, Wagner classification and Doppler study[1,4].

**Table 1** Wagner classification system of diabetic foot[8,10,17].

Grade	Diabetic Foot lesion
0	No open lesion , may have deformity or cellulites
1	Superficial diabetic ulcer, partial or full thickness
2	Ulcer extension to ligament , tendon, joint capsule without abscess or osteomyelitis.
3	Deep ulcer with abscess , osteomyelitis or joint sepsis.
4	Gangrene localized to portion of forefoot or heel
5	Extensive gangrenous involvement of entire foot

Patients whose need for amputation above knee were excluded from the study.

The operation was done under general or spinal anesthesia and level of amputation at the junction of upper and middle third of the leg.

Equal-sized sagittal flaps including fascia and muscle are developed on medial and lateral aspect without separation between layers .

Tibia saw and beveled anteriorly,fibula cut 2 cm proximally ,ligation of arteries an veins separately ,suction drain put on and myodesis of muscular layers and suturing of deep fascia by vicryl two zero and suturing of skin by two zero silk.

Patients received antibiotic (cefotrioxone ) and metronidazole bottles for 72 hours postoperatively,

then discharge on oral antibiotics (cefixime) for another 5 days.

Clinical assessment of wound healing of amputated stump was done at regular interval 7<sup>th</sup> day postoperative, 3 weeks, 6 weeks, 3months and 6 months.

Biostatistics analysis was done at community medicine department in Medical collage , Kufa University.

**Results**

The selection of types of surgery of amputation were chosen randomly

and all surgery done by same surgeon .

The mean age of diabetic patients with long posterior flap was 63.3 years old , while the mean age for those patients with equal Sagittal flap was 62.5 years old (there were no significance of difference , P-value > 0.05.

Male to female ratio was 3:2 for long posterior flap, where as 1.6:1 which seem to be of no significance of difference of gender P-value > 0.05 . Table ( 2 ).

**Table 2** Distribution of diabetic patients according to types of amputation.

Type of surgery of amputated stump	Number of patients	Mean of patient age	sex	Number of amputation	Duration of diabetes mellitus
Long posterior flap	15	63.3 years	Female 6 (40%) Male 9 (60%)	19	12.65 years
Equal sagittal flap	13	62.5 years	Female 5(38.42%) Male 8(61.58%)	15	13.5 years

There were 5 patients undergoing long posterior flap surgery clinically assessed as Wagner 4 according to Wagner classification ( 26.3%), whereas equal flap (Wagner 4) was 3 patients (20%), also other indications were statistically of no significance difference , P-value > 0.05. Table (3).

**Table 3** Distribution of diabetic patients according to indication of amputation.

Type of surgery of amputated stump	Wagner stage 4	Wagner stage 5	Anaerobic infection	Multiple sinus discharge	Multiple causes
Long posterior flap	26.3%)5(	3(15.7%)	4(21.05%)	2(10.5%)	5(26.3%)
Equal Sagittal flap	3(20%)	5(33.3%)	2(13.3%)	3(20%)	2(13.3%)

The primary wound healing of amputated stump was shown in 12 patients ( 63.15%) with long posterior flap, where as 9 patients (60%) showed primary wound healing in

patients with equal Sagittal flap, so there were no significance of difference ( P-value > 0.05), table (4). Regarding complications of amputated stump wound healing, 4

patients (21.05%) with long posterior flap undergone secondary suturing within 3-6 weeks of amputation, and there were 3 patients (20%) had secondary suturing in patients with equal flap. P-value > 0.05. There were 3 patients (15.8%) undergone revision (high level)

surgical amputation in those with posterior flap , compared to 3 patients (20%) revision with equal Sagittal flap, although higher percent in equal flap, but still statistically not significant P-value > 0.05. Table (4).

**Table 4** Distribution of complications regarding wound healing of surgical stump.

Type of surgery of amputated stump	Primary healing (within 3 weeks)	Secondary suturing	Revision of amputation
Long posterior flap	12( 63.15%)	4 ( 21.05%)	3( 15.8%)
Equal sagittal flap	9(60%)	3 (20%)	3(20%)

$\chi^2=0.01$

df=2

P> 0.05



**Figure 1** Diabetic foot Wagner type 5



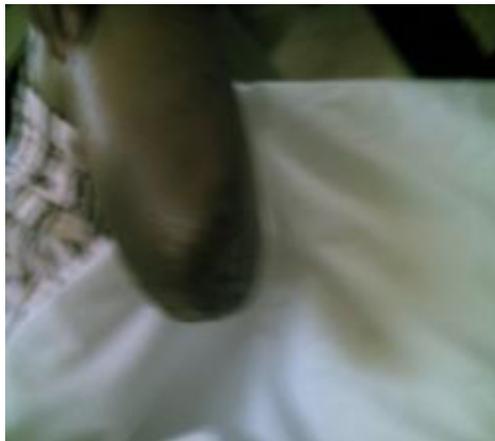
**Figure 2** Diabetic foot, Wagner Type 4



**Figure 3** Diabetic foot, long post flap , primary suturing



**Figure 4** long flap, needs revision surgery



**Figure 5** primary healing equal flap



**Figure 6** secondary healing of equal sagittal flap



**Figure 7** equal flap, need revision

### **Discussion**

Treatment of critical lower limb ischemia in diabetics is often a complex clinical problem for the diabetics' general condition and the local condition of the territory to be revascularized. for this reasons, often the only treatment for diabetics with ischemic-necrotic lesions is amputation[1,5,7,8].

The amputated stump and it's prosthesis must assure the walking and weight-bearing functions of amputated limbs, Burgess had repeatedly pointed out that a strong and dynamic stump must be created that will function as a motor and sensory end organs[6,13,16].

In Falstie et al study [9], the mean age of patients was 71 years and in Au' Chinese study(2) , the mean age was 72 years , where as in our study

the mean age were 63.3 years and 62.5 years for long posterior flap and Sagittal flap respectively, and the difference might be related to the fact that the previous studies done on limbs ischemia , while our study done on diabetic patients only.

Regarding to male to female ratio ,it was found 5:4 in the Scandinavian study of Falstie et al[9] , and this ratio was seem to be nearly equal to our study, where as the Chinese' study[2] was shown different result as male to female ratio was 4:7 and this might related to geographical difference of diabetes milletus distribution among different societies and they used many indicated pathology for amputation.

The success rate of wound healing of amputated stump was 90.6% in Yamanaka and Kwong study [18] ,

89% in Au K K study[2] for equal Sagittal flap amputations , where as in our study were 84.2% and 80% for long posterior flap and equal Sagittal flap respectively. we agreed with Falstie et al [9], in regarding to the rate of secondary wound healing where in our study were 21.05% for long posterior flap and 20% for equal Sagittal flap, and 22% rate of secondary wound healing in previous study.

We agreed with Thermansen et al [15] in that , there were no statistical difference between the two surgical techniques , whereas the study done by Au K K[2] was showed better results in equal Sagittal flap compared to long posterior flap.

### **Conclusion**

Apart from flap design, careful preoperative planning , attention to tissue handling and suturing technique are all essential to achieve the results.

### **References**

1-Armstrong D G , Frykberg G R et al : Diabetic foot disorder: A clinical practice guideline ;American collage of foot and ankle surgeon. Journal of foot ankle surgery.2000;39(5) p 51-60.  
 2-Au K K et al : Sagittal flaps in below knee amputation in Chinese patients. Journal of bone and joint surgery, volume 71-B, August 1989, page 597-598.  
 3-Beaty H J et al : Diabetic foot ,Chapter 46 : In Orthopedic Knowledge Update 6;American Academy of orthopedic surgeons. Rosemont ,Illinois. 1999.page 624-628.

4-Bongard O , Krahenbuhl B et al : Predicting amputation in severe ischemia : the value of transcutaneous PO2 measurement . Journal of bone and joint surgery, 70-B . 1988. P 465-468.

5- Brodesky J W, Myerson M S:Foot and Ankle Clinics :Diabetic Foot. Philadelphia P A , 1997. P 1-22.

6- Burgess E M, Matesen FA : Determining Amputation level in peripheral vascular disease , Journal of bone and joint surgery, (1981) 64-A:p 1493-1497.

7- Caballero E, Frykberg R G , et al: Diabetic foot infections. Journal of foot ankle surgery. 1998 ; 37 : p 244-254.

8- Chapman' s Orthopedic surgery:Diabetic foot , Chapter 116. section sex: The Foot. Third edition ,2002, CD-ROM. William and Wilkins.

9- Falstie J , Christensen K S , et al : Long posterior flap versus equal Sagittal flap in below knee amputation for ischemia. Journal of bone and joint surgery, 71-B .January 1989. p 102-104.

10- Frykberg G R : Diabetic foot ulcer : Pathogenesis and management. American Family Physician ; <http://www.aafp.org/online> (Internet).

11- Norman T K : Amputation general consideration; clinical orthopedic and related research journal . number 243, June 1989.p 3-16.

12-Persson B M: Sagittal incision for below-knee amputation in ischemic gangrene. Journal of bone and joint surgery, 1974,56-B . P 110-114.

13- Pizur M S , Gottschalk F , Smith D, et al: Functional outcome of below knee amputation in peripheral

vascular insufficiency : Multicentre review, Clinical orthopedic and related research Journal 1993,286.p 247-251.

14- Reiber G E, Boyko E J , Smith D G : Lower extremity foot ulcer and amputations in diabetic . In National Institute of Diabetic and Digestive – Kidney Disease, In National Diabetic Data Group; Diabetes in America , second edition, National Institute of Health.1995.

15- Thermansen N B : Below-Knee amputation for ischemic gangrene ; Prospective randomized comparison

of a transverse and a Sagittal operative technique. Acta orthopedica Scandenavia. 1977; 48 : 311-316.

16- Tooms S R:Amputation of lower extremity :Chapter 10; In Campbell's Operative Orthopedic by Terry Canale : 9<sup>th</sup> edition . Mosby, 1998.

17-Wagner F W: The Diabetic Foot ; Clinical Orthopedic journal ,1987;10;p 163-172.

18- Yamanaka M, Kwong P K : The side-to-side flap technique in below knee amputation . Clinical Orthopedic,1985; 20: p 75-81.