

RESULTS OF MINOR FOOT AMPUTATIONS IN DIABETIC MELLITUS

Y S Wong, J C H Lee, C S Yu, B Y Low

ABSTRACT

The aim of this retrospective study is to study the outcome of surgery in diabetic patients with foot infections. The results of 54 local amputations performed by surgeons of different levels of experience for gangrene and/or deep infection confined to the toes in diabetic patients were studied. Failure of surgery is defined as any case that requires subsequent surgery. Twenty-two of the initial local amputations subsequently required higher amputations. The majority of these cases that failed were done by junior officers of Medical Officer and Registrar grade. In contrast, the cases done by senior surgeons are more likely to heal. Fifty-six percent of the initial operations done by Medical Officers failed. A similar pattern is also seen in repeat operations done by junior officers. Based on our findings, it is recommended that the decision making must be made by senior staff of at least Registrar grade. Repeat surgery should also be done by senior staff. Finally, continued training and supervision of junior staff are necessary to improve their technical expertise, judgment and knowledge.

Keywords: diabetes mellitus, foot infections, outcome of local amputations

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INTRODUCTION

The aim of this study is to study the outcome of surgery in diabetic patients with foot infections. We also hope to determine any factors which may affect the outcome.

MATERIALS AND METHODS

This is a retrospective study of 57 consecutive cases of diabetic patients with foot infections who had undergone surgery. Three patients were excluded because they absconded, thus leaving 54 cases for study. The study was carried out over two years from February 1990 to April 1992. Failure of surgery is defined as any case that requires subsequent surgery. The age range was 34 to 84 years with a mean age of 61 years. There were 26 male patients and 28 female patients. Fifty-one patients were non-insulin dependent and 3 patients were insulin dependent. Fifteen patients had associated hypertension and 11 patients had associated ischaemic heart disease. The average duration of diabetes mellitus was 10 years with a range of newly diagnosed to 30 years. Sixty-eight percent of patients had diabetes mellitus of a duration which is less than 10 years.

Duration of diabetes mellitus and surgical outcome

There is no correlation between successful outcome and the duration of diabetes mellitus.

Index operation and type of surgeon

Twenty-five (46.3%) of the index cases were done by surgeons of Medical Officers grade. Fourteen (25.9%) of the cases were done by Registrars. Nine (16.7%) of the cases were done by Senior Registrars and 6 (11.1%) were done by Consultants (Fig 1). Thus, the majority of initial cases were done by junior officers.

Surgical outcome and type of surgeon

The outcome of surgery varies markedly with the seniority of staff members. Fourteen (56%) of the index operations performed by Medical Officers failed, that is, the patients required another operation. Seven (50%) of index operations done by Registrars failed. These high failure rates contrasted sharply with the much better success rate in cases done by Senior Registrars and Consultants. Of the 9 cases done by the Senior Registrars, there was one failure whereas all the 9 cases done by the Consultants healed (Fig 2).

Number of repeat operations

There were 30 patients who required repeat operations when the wounds did not heal. Twenty-one patients underwent one repeat surgery, 7 patients underwent 2 repeat operations and 2 patients underwent more than 2 repeat operations. There was no case that had more than 4 repeat operations (Table I).

Results of first repeat surgery and the type of surgeon

A similar outcome of surgery is also seen in repeat cases done by junior grade of staff. Of the 9 repeat cases done by the Medical Officers, 4 healed and 5 did not. The failure rate was 55.6%. The failure rate in the 9 repeat cases done by the Registrars was 33.3%, that is 3 failures. The converse is seen in those repeat cases done by Senior Registrars and Consultants. Of the 13 repeat cases done by the Senior Registrars, there was one failure (7.7%). All 3 repeat cases done by the Consultants, healed (Fig 3).

Results of surgery done on more than one toe at the time of first operation and the type of surgeon

Except for the 2 cases done by the Registrars, the results were good as they all healed (Table II). The 2 cases done by the Registrars required further surgery in the form of below knee

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Fig 1 – Number of index operations and type of surgeon

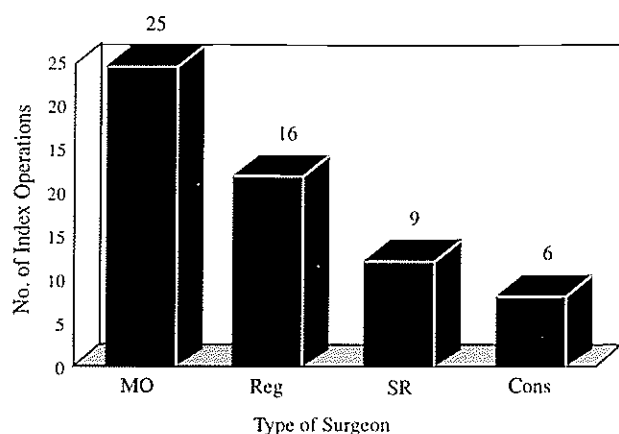


Fig 2 – Surgical outcome and type of operation

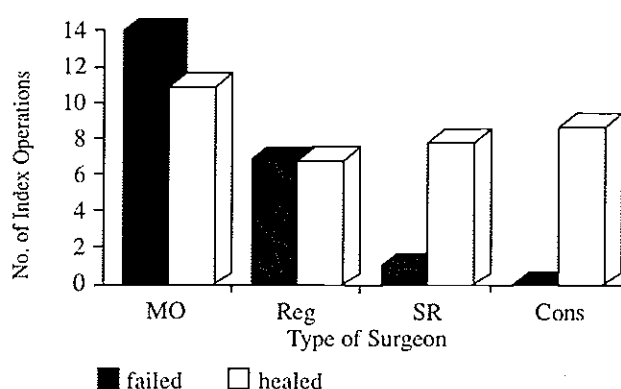
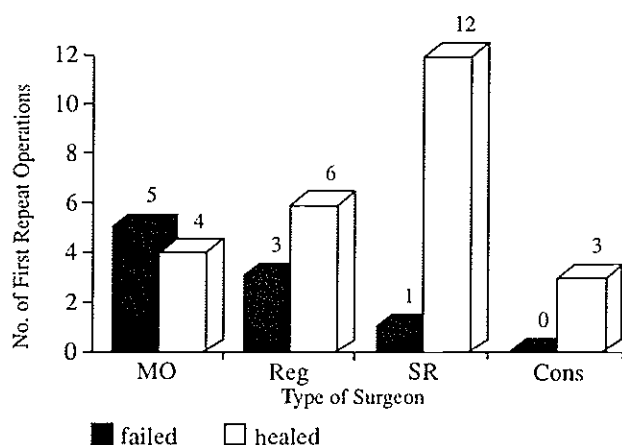


Table I – Number of Repeat Operations

• 1 Repeat operation	27 Cases
• 2 Repeat operations	7 Cases
• 3 Repeat operations	2 Cases
• >4 Repeat operations	0 Case

Fig 3 – First repeat operation done and type of surgeon



amputation. One of the cases subsequently died of chronic renal disease.

Repeat operations required for the adjacent toes after the index operation on one toe

Four of the cases done by Medical Officers required ray amputations of the adjacent toes. One of them required further

ray amputations, 2 required trans-metatarsal amputations and one, a below knee amputation (Table III). Two patients with ray amputations done by the registrars required further ray amputations of the adjacent toes. Both these cases did not heal and underwent further ray amputation in one case and a below knee amputation in the other. The single case done by the Senior Registrar for adjacent toes healed. No such case was done by the Consultants.

Table II – Surgical outcome in operations on more than one toe at time of first operation and type of surgeon

Type of surgeon	Number of cases	Outcome
Medical Officer	1	healed
Registrar	2	1 death 1 BKA
Senior Registrar	2	healed
Consultant	1	healed

BKA = below knee amputation

Table III – Number and types of repeat operations required for the adjacent toes after index operation

Type of Surgeon	Number of cases with ray amputation of adjacent toes	Outcome
Medical Officer	4	1 trans-metatarsal 1 BKA
Registrar	2	1 ray 1 BKA
Senior Registrar	1	healed
Consultant	0	0

Final operation as a high level amputation

Most of the cases that required a higher level of amputation were below knee amputations. There were 13 such cases. Seven of them were done by the registrars, 5 by the senior registrars and one by the consultant. The outcome was good except for one death. There was one case that required an above knee amputation which was done by a senior registrar with good outcome. Two cases of high level amputations were trans-metatarsal amputations which were done by senior registrars. These cases healed uneventfully.

Mortality

There were 4 deaths in the study. Two patients died from chronic renal failure at six weeks and two months respectively. Two patients died from acute myocardial infarction on the fourth post-operative day and at one month respectively.

DISCUSSION

From our study, we have determined that race and the duration of diabetes mellitus have no correlation to the successful outcome of surgery. What significantly influence the outcome is the level of the surgical expertise and experience. The more senior the surgeon, the more likely that the outcome of surgery will be successful. The converse is true. Possible reasons for these are firstly, that the correct decision making, judgment and technical expertise are directly related to experience and knowledge. The more senior surgeon is better able to determine the most distal functional amputation level with a reasonable potential to support wound healing^(1,2). A clinical examination of the foot including

assessment of the vascular and neurological status, the presence of deformities and the extent of infection is mandatory. The amputation level is decided after considering the various other factors that affect wound healing in these individuals such as tissue nutrition, immunological competence status as well as the rehabilitation potential of the patients^(1,2) and utilizing the guidelines proposed by English⁽³⁾ and Wagner⁽⁴⁾. Though it is well known that there is circulatory impairment with a prevalence rate of peripheral vascular lesions of 33%⁽⁵⁾ and neuropathic involvement of 60%⁽⁶⁾ in diabetic foot lesions, there is probably better appreciation of the fragility of local tissues in these patients by senior doctors and thus the careful handling of tissues at the time of surgery and the consequent better wound healing rates (Fig 2 and 3).

There is a high percentage of cases done by junior officers as most of the cases were emergency cases and deemed minor (Fig 1). Most of these had not had the benefit of direct supervision by more senior doctors. This may have a bearing on the outcome of the index operations. There were more cases that failed than healed (Fig 2). Interestingly, 9 or 26.5% of the repeat operations done by medical officers also had similar unsatisfactory failure rates (55.6%) (Fig 3). This contrast sharply with the high success rate in those repeat operations done by senior registrars and consultants. It is thus evident that repeat operations should be done by these group of surgeons to avoid repeat and "staged" surgeries.

There were 7 patients who required repeat operations not only on the initially operated toe, but on the adjacent toes. As the blood supply to adjacent toes comes from a common digital artery, it is not surprising that surgery on one toe can adversely affect the other. It is important to pay special care to tissue handling during surgery and avoid accidentally disrupting the blood supply to the adjacent toe. The use of electrocautery should be avoided. The surgeon should also be able to judge the extent of involvement of the adjacent toe and decide if surgery is also required for the adjacent toe at the initial sitting. It is interesting to note that in these cases where the adjacent toe required surgery subsequently, most of the repeat operations did not result in a

healed wound. Multiple and "staged" operations were required. Of the six cases, the final operation was a trans-metatarsal amputation in one patient and below knee amputation in two patients. These cases of repeat surgeries were also performed by junior officers (Table III). The poor outcome could reflect the more generalised and advanced circulatory and neuropathic impairment in these cases. It may also reflect on the level of expertise and surgical judgment of these junior officers. To avoid the repeat operations in this category of patients, it is recommended that such repeat operations in patients with adjacent toe involvement should be done by more senior doctors.

RECOMMENDATIONS

Based on our findings, we recommend that the decision-making must be made by senior staff of at least registrar grade. This would avoid "staged" surgery. Further, it is important that repeat surgery should be done by senior staff. Continued training and supervision of junior staff are necessary to improve their technical expertise, judgment and knowledge. Finally, an appreciation of the pathological processes in diabetes mellitus especially in wound healing is important if uniform and consistent good results are to be achieved.

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