

Amputation Failure Experience at Mayo Hospital

I H MALIK A A ALI A M CHAUDHRY

Department of Surgery, K. E. Medical College/Mayo Hospital, Lahore

Correspondence to Dr. Ihtesham Hussain Malik E.mail: doctorihtesham@hotmail.com

This observational and noninterventional study was conducted with the objective of calculating the percentage of amputation failure along with identification of causative factors leading to failure and suggestion of measures for their prevention. The research work was carried out on 50 patients undergoing amputation in the Department of Surgery, Mayo Hospital, Lahore. All patients planned for amputation due either to vascular disease, diabetes, trauma, tumour, infection, some neurological cause or congenital problem were above 12 years of age, their thorough assessment and investigations being done prior to surgery. Besides baseline investigations, radiographs of the affected limbs, CT scan and MR scans were carried as and when required. All procedures were performed in accordance with the standard surgical techniques and postoperative course of all amputees was closely observed. It was realized that in six patients, the procedure failed; hence reamputation had to be done at a higher level, thus giving a failure rate of 12%. As regards the causes of failure of amputation, infection of the amputated stump was the commonest (8%) followed by joint contracture (2%) and ischaemic necrosis of the stump (2%). It was inferred that certain principles should be strictly adhered to in order to prevent failure of amputation stump (2%). It was inferred that very strict adherence to certain standard surgical principles during the preoperative, peroperative and postoperative settings is required in order to prevent failure of amputation.

Key words: Amputation, stump, prosthesis, amputee, rehabilitation

The word amputation is derived from the latin word, amputatio, meaning "cutting around" and was originally used to describe the removal of limbs or portion of limbs by knife. However, the term was also used to describe removal of other parts of the body such as breast or testicle¹. Commonly the term is restricted to surgical removal of a part of an entire limb, either upper or lower extremity and the term amputation failure is applied when it becomes necessary to revise the procedure.

Purpose of study

This study was carried out to:

- calculate the percentage of amputation failure
- identify causative factors responsible for failure of amputation and to calculate their frequency and percentage
- to enlist measures for patients' benefits in terms of giving him/her a healthy stump after the first operation and effective use of prostheses

The first main purpose of this study was to calculate the percentage of amputation failure. This was done by observing a certain number of patients under going amputations and monitoring the patients postoperatively to determine the cases that failed, and in whom revision had to be done at a higher level.

The second main purpose of the study was identification of causative factors responsible for failure of amputation along with calculation of their frequency and percentage. Again this was done by observing the amputees postoperatively to find out the common factors which led to failure. These observations were done to calculate the results amongst the different types of amputations performed in a predetermined sample of population.

The third most important objective of this study was to enlist measures for patients' benefits in terms of giving them a healthy stump after the first amputation and effective use of prostheses. This includes all recommendations and methods which should be adopted in order to avoid failure.

Amputation procedure was considered successful when there was a smooth postoperative recovery until the patient was discharged and referred to a limb-fitting center for prosthetic fitting.

Material and methods

This study was carried out on fifty patients at the North Surgical Ward of Mayo Hospital, Lahore.

Inclusion Criteria Fifty consecutive patients on whom the procedure of amputation was performed either due to vascular disease, diabetes, trauma, tumours, infection, neurological cause or congenital problem were included in this study. Both male and female patients above 12 years of age undergoing amputation either of upper or lower extremity were selected. Patients presenting in the emergency as well as those planned for the elective list were incorporated.

Exclusion Criteria: Cases of disarticulations and those cases in which guillotine amputation was performed and a definitive stump was not made were excluded from this study.

Study Design: An observational, non-interventional type of study was done. The basic theme of this study was to observe cases of amputation in order to pick up cases of amputation failure.

Results

This study was conducted on 50 consecutive cases of amputation performed at the North Surgical Ward of Mayo Hospital, Lahore. All the results have been presented in tabulated form.

Table 1. Types of amputation performed and their percentages.

Type of Amputation	n=	%age
Ray amputation	14	28
Transmetatarsal amputation	2	4
Below knee amputation	14	28
Above knee amputation	10	20
Finger amputation	4	8
Partial hand amputation	2	4
Below elbow amputation	1	2
Above elbow amputation	3	6

Table 2. Number and type of amputations which failed along with rates of failure.

Type of Amputation	n=	Cases which Failed	Rate of Failure
Ray amputation	14	1	7.14 %
Transmetatarsal amputation	2	1	50 %
Below knee amputation	14	3	21.42 %
Above knee amputation	10	1	10 %
Finger amputation	4	-	-
Partial hand amputation	2	-	-
Below elbow amputation	3	-	-
Above elbow amputation	1	-	-

Table 3 Causes of failure of amputation along with the age and sex of patients and causes of primary amputation.

Cases of Amputation which failed	Age / Sex	Cause of first amputation	Cause of failure
Ray amputation	60/F	Diabetic gangrene	Infection
Transmetatarsal amputation	45/F	Diabetic gangrene	Infection
Below knee amputation	65/F	RTA	Infection
Below knee amputation	55/F	Diabetic abscess	Contracture of knee joint
Below knee amputation	45/F	PVD	Ischaemic necrosis of the stump
Above knee amputation	20/F	RTA	Infection

PVD= Peripheral vascular disease, RTA= Road traffic accident

Table 4. Percentages of different causes which led to reamputation.

Causes of failure of amputation	%age amongst failed cases	%age amongst total cases
Infection	66.66	8
Joint contracture	16.66	2
Ischaemic necrosis of stump	16.66 %	2 %

Table 5. Level at which re-amputations were performed.

Amputations which failed	Level of re-amputation
Ray amputation	Transmetatarsal
Transmetatarsal amputation	Below knee
Below knee amputation	Above knee
Above knee amputation	Above knee at a higher level

Table 6. Age ranges of amputees and their percentages.

Age range in years	No. of amputations	%age
0-10	-	-
10-20	1	02 %
20-30	7	14 %
30-40	5	10 %
40-50	11	22 %
50-60	15	30 %
60-70	9	18 %
70-80	2	4 %
80-90	-	-
90-100	-	-

Table 7. Different causes of first amputation along with their percentages.

Causes of amputation	n	%age
Diabetes	27	54
Peripheral Vascular disease	10	20
Road traffic accidents	5	10
Machine injuries	3	6
Blast injuries	2	4
Failure of vascular repair	2	4
Tumours	1	2

Discussion

The first observation is that limb amputation is a procedure most commonly performed in elderly males. The frequency of LEAs is far greater than UEAs. Lower extremity amputation has been disproportionately labelled as a problem of older males^{2,3}.

This observation is comparable with the following data. In 1993, in the United States, out of the 127,000 limb amputation procedures done in acute care, non federal hospitals, 98,000 involved the lower extremity⁴.

All cases of amputation failure in which re amputations were done at a higher level were those of the lower extremity.

As regards the causes of first amputation, three main risk factors were identified for major limb amputations i.e., diabetes mellitus, male gender and road traffic accidents. Diabetics have 15 fold greater risk for LEA than the general population⁵.

Three main causes of failure of amputation were identified which are as follows in the decreasing order of frequency; Infection, Joint contractures, and Ischaemic necrosis of the amputated stump due to absent proximal pulse, infection of the stump was the commonest cause of failure. Infection tends to occur in the elderly patients who are either diabetic or already immunocompromised⁶. However, infection of the amputated stump is multi factorial, other elements of greatest importance being improper sterilization and lack of theatre safety⁷.

Rate of infection calculated in this study was the same as that found out in a retrospective study done on 72 patients with 77 lower limb amputations from 1993 to 1998 at the Singapore General Hospital⁸.

The frequency of failure due to joint contracture and Ischaemic necrosis of the stump were found to be parallel.

Joint contractures develop due to lack of post operative exercises which are essential for early mobility⁹.

The presence of popliteal pulse has been associated with a 97% success rate for BK amputations, as compared to 82% patients with absent popliteal pulses¹⁰.

An important indication for amputation is failure of vascular repair. Although no such case was picked up in this study, failure of vascular procedure does predict a need for a higher level of subsequent amputation¹¹.

Failure of amputation is not to be expected in expert hands particularly when cases are critically assessed by Senior members of the surgical team regarding the decision about the level of amputation¹². However, studies have shown no significant difference between Consultants, Registrars, and senior house officers for any out come measures¹³.

Another interesting observation made in this study was that all cases who required re amputation at a higher level were females above 40 years of age. In a study carried out on 27 patients with 35 limb amputations, logistic regression analysis revealed that lower temperature of the amputation site, being female and being elderly were significant risk factors in re amputation¹⁴.

Failure of amputation adds to patients' miseries since it provides an opportunity to brood on the forth-coming operation¹⁵.

Follow up of amputees suggested that lower extremity amputees were deeply concerned regarding the effective use of appropriate prostheses, rehabilitation and full return to social activities. There were statistically no significant differences in the costs between patients with good or poor function¹⁶. Quite unfortunately it was found out that after one year of amputation, majority of amputees had low walking skills and the walking distance was limited. They were often ADL dependant and their amputation greatly limited their daily function.

There is a desperate need to develop more efficient prostheses requiring less energy, having more durability and ultra light weightage, keeping in mind the requirements of all the age groups, professions and gender.

Moreover the prosthetic fitting techniques call for improvement.

Conclusion

The overall rate of amputation failure is 12% and the most common positive factor leading to reamputation at a higher level is infection of the amputated stump and its rate is 8%.

The logical outcomes drawn from this study are basically the measures which should be strictly followed in order to avoid failure:

1. Every candidate should be very carefully assessed by Senior surgeons prior to surgery
2. Where limb fitting facilities exist, the Surgeon should go for cone bearing amputation stumps in order to obtain the best cosmetic and functional results,

whereas if limb fitting facilities are limited, end bearing amputations should take preference

3. Once an amputation has been performed, the stump should be dressed adequately and at appropriate intervals of time
4. Physiotherapy should begin very soon including change of postures in bed and frequent exercises of the proximal joint in order to avoid contractures
5. Patients should be provided with an agreeable environment after amputation and encouraged as much as possible to participate enthusiastically in the rehabilitation programme
6. Successful rehabilitation of an amputee depends upon a team approach i.e a) the reference physician, b) the surgeon, c) the prosthetist d) the physiotherapist, e) the nurse, f) the social worker, g) the family, h) the patient.

References

1. Rang M. Thompson GH. History of amputation and prostheses. In: Kostuik JP. Amputation surgery and rehabilitation the Toronto Experience. 1st Ed. New York: Churchill Livingstone. 1981: 1-2.
2. Rith-Najarian S. Branchaud C. Beaulieu O. Gohdes D Simsonson G. Mazze R. Reducing lower extremity amputations due to diabetes. Applications of the staged diabetes management approach in a primary care setting. *J-Fam-Pract* 1998. 47(3): 127-32.
3. Yetzer E. Helping the patient through the experience of an amputation. *Orthop-Nurse* 1996. 15(6): 45-9.
4. Cutson TM, Bongiorno DR. rehabilitation of the older lower limb amputee: a brief review. *J-Am-Geriatr-Soc* 1996. 44(9): 1388-93.
5. Hazmy W. Mahmud M. Ashikin N. Jamila S. Yee LE. Shong HK. Major limb amputations in Seremban Hospital: a review of 204 cases from 1997-1999. *Med-J-Malaysia* 2001. 56 Suppl (C): 3-7.
6. Stringfellow SC, Cooper PJ. Above the knee amputation wound which dehiscd following surgery. *Br-J-Nurs* 2000. 9(12): S30
7. Pinzurs MS, Angelats J, Bittar T. Salvage of failed amputation about the hip in peripheral vascular disease by open wound care and nutritional support. *Am-J-Orthop* 1998. 27(8): 561-2.
8. Peng CW, Tan SG. Perioperative and rehabilitative ourcomes after amputation for inchaemic leg gangrene. *Am-Aced-Med-Singapore* 2000. 92(2): 168-72.
9. Munn MC, Espejo-De-Guzman MC, Boninger ML, Fitzgerald SG, Permod LE, Singh J. Predictive factors for successful early prosthetic ambulation among lower limb amputees. *J-Rehabil-Res-Dev* 2001. 38(4): 379-84.
10. Solagberu BA, Onawola KO. Lower limb amputations in a West African community: a new trend?. *Trop-Doct* 2001. 31(4): 250.
11. Melchiarre PJ, Findley T, Boda W. Functional outcome and comorbidity indexes in rehabilitation of the traumatic versus the vascular unilateral lower limb amputee. *Am-J-Phys-Med-Rehabil* 1996. 75(4): 9-14.
12. Chaloner EJ, Flora HS, Ham RJ. Amputations at the London Hospital. 1852-1857. *J-R-Soc-Med* 2001. 94(8): 409-12.
13. Campbell WB, Marriott S, Eve R, Mapson E, Sexton S. Factors influencing the early outcome of major lower limb amputation for vascular disease. *Am-R-Coll-Surg-Engl* 2001. 83(5): 309-14.
14. Ohsawa S, Iranori Y, Fukuda K. Lower limb amputation diabetic foot. *Arch-Orthop-Trauma-Surg* 2001. 121(4): 186-90.
15. Beekford-Ball J. The amputation of healthy limbs is not an option. *Br-J-Nurs* 2000. 9(4): 188.
16. Hermodsson Y, Persson BM. Cost of prosthesis in patients with unilateral transtibial amputation for vascular disease. A population-based follow-up during 8 years of 112 patients. *Acta-Orthop-Scand* 1998. 69(6): 603-7.