

## Life expectancy and social consequences of through-knee amputations

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### Abstract

Amputation surgery for gangrene of the lower limb has two primary goals, to save life and to bring the patients back to their previous living conditions. If this can be achieved with restored walking ability the result of the treatment is considered a full success.

The purpose of this paper is to describe the risk of death and possibility of returning through-knee amputees to their own home, relating the results to other major levels of amputation of the lower limb.

### Patients and methods

This series includes 310 patients with 320 amputations performed during the years 1971-1979. All amputations were due to gangrene of the lower limb. The mean age of the patients was 70 years (range 40-94)

Based on a retrospective examination of the records the placement before and after discharge from hospital was recorded as well as the mortality rate. Life tables for a comparative number of inhabitants were calculated from the official statistics.

For the calculation of life tables a decrement analysis was used and comparison made by Gehan's modified Wilcoxon test. For supplementary analysis Chi-square test, multivariate logistic analysis and multiple contingency tables were applied.

### Results

The primary level of amputation was through-knee (TK) in 21 per cent, above-knee (AK) in 33 per cent and below-knee (BK) in 46 per cent of cases (Table 1). The choice of level was

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significantly related to age, as the number of BK amputations decreased and AK amputations increased, whereas the number of TK amputations was constant ( $P < 0.03$ ).

The final level of amputation is influenced by the mortality in hospital and local wound complications leading to re-amputations at higher level. The final levels are listed in Table 1 following re-amputation after TK amputations in 20 per cent (13/66) and after BK amputations in 20 per cent (28/143) of cases. Consequently discharge from hospital could take place in 265 cases.

The primary level of amputation was used for the comparison of mortality statistics because this was influenced by the degree of local ischaemia and the general condition of the patient, which is affected by the systemic toxic effect of the gangrene.

The mortality rate in hospital is of less interest, as it is influenced by the duration of hospital stay, which was on average 77 days after TK, 47 days after AK and 81 days after BK amputations. A more meaningful impression of the systemic effect of the gangrene, as described by the choice of amputation level, is given by comparing the mortality rates 3 months after amputation. As seen from Table 2 the death rate at this time is about 22 per cent and is increasing with selection of a higher level of amputation. The table also demonstrates that the TK amputation is on average midway between the AK and BK levels

Table 1. Primary level of amputation in relation to level at discharge from hospital.

Level	Primary	Final
TK	66	48
AK	111	116
BK	143	101
Total	320 limbs	265 limbs

Table 2. Mortality rate in relation to primary level of amputation.

Level	3 months	1 year	3 years	5 years
TK	21% (14/66)	39% (26/66)	58% (38/66)	67% (44/66)
AK	40% (41/103)	54% (56/103)	70% (72/103)	77% (79/103)
BK	10% (14/141)	17% (24/141)	31% (44/141)	63% (89/141)
Total	22% (69/310)	34% (106/310)	50% (154/310)	68% (212/310)

not only anatomically, but also concerning the risk of death. This feature continues for the first five years postoperatively.

In Figure 1 the life expectancy is demonstrated for the average patient series and the three levels of amputation in relation to the expected survival rate. Although the level of amputation and age were significantly related further statistical analysis demonstrated the primary amputation level to be the most determining for the death rate ( $P < 0.0005$ ), whereas age only had secondary influence ( $P < 0.01$ ) on the long term prognosis of survival. The life-tables also demonstrate that the excess mortality continues for 6 months following AK amputation, 1 year following TK and 5 years following BK amputations.

Table 3 demonstrates the relations between choice of amputation level in accordance to the living conditions. A total of 18 per cent (55/320) of patients were living at institutions for long term nursing care prior to admission. For the purpose of prosthetic fitting the most possible distal level was chosen in patients admitted from home. Consequently only one third of patients had a primary AK amputation performed and every fifth a TK amputation. Among patients admitted from nursing homes the more distal

levels were often chosen to preserve leg length and thus stability in the sitting position.

Table 3. Placement on admission to hospital in relation to primary level of amputation.

Level	Admitted from home	Admitted from nursing home
TK	53 (20%)	13 (24%)
AK	82 (31%)	29 (53%)
BK	130 (49%)	13 (23%)
Total	265 patients	55 patients
Mean age	70 years	78 years

In Table 4 the placement after discharge from hospital is listed. It is seen that patients discharged to institutions for long term nursing care had generally higher levels of amputation than those discharged to their own home.

Table 4. Placement after discharge from hospital in relation to final level of amputation.

Level	Home	Rehabilitation institution	Nursing home	Total
TK	26 (18%)	3	19 (40%)	48
AK	55 (38%)	16	45 (39%)	116
BK	64 (44%)	14	23 (23%)	101
Total	145 (55%)	33 (12%)	87 (33%)	265

Table 5 demonstrates that only every fifth patient was discharged to a nursing home following survived amputation among those previously living in their own homes. The risk of final placement at an institution for long term nursing care is increased with the height of the amputation level.

Table 5. Final placement and amputation level for patients admitted from own home.

Final level	Home	Nursing home
TK	29/37 (78%)	8/37 (22%)
AK	68/91 (75%)	23/91 (25%)
BK	77/91 (85%)	14/91 (15%)
Total	174/219 (79%)	45/219 (21%)

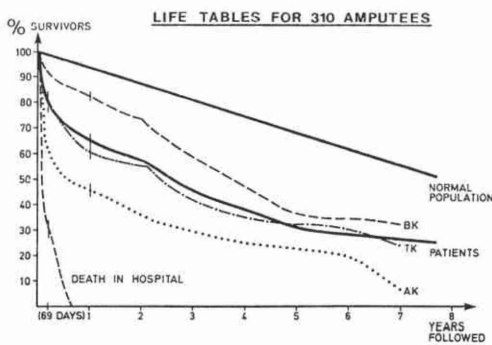


Fig. 1. Life expectancy for BK, TK and AK levels of amputation related to normal expected survival rate.

## Discussion

The primary goals of amputation surgery were fulfilled in 66 per cent (174/265) of patients admitted to hospital from their own home for amputation because of gangrene of the lower limb, as they returned alive to their previous surroundings. Among patients admitted from institutions for long term nursing care 76 per cent (42/55) survived and returned to their life in total dependence of other people. It is well known from previous publications that amputations are followed by a high immediate mortality; nearly every third patient dies within one year (Ebskov and Josephsen, 1980, Mandrup-Poulsen and Jensen, 1982). It is clearly demonstrated in this study that the mortality is related to the primary level of amputation in both the short and the long term. This is obvious for the immediate mortality, as the choice of amputation level is determined by the extent of the gangrene and consequently the systematic effect of toxic products released from the gangrenous leg. That the same influence on mortality is noted for years might suggest a more extensive arteriosclerotic disease, which also can explain the stronger relationship to age than to the level of amputation.

There is no doubt that for the majority of these elderly patients with a mean age of 70 years it is most important to be able to return home, although their spouse might have difficulties in accepting the partial lack of a limb. This paper clearly demonstrates that the TK amputation lies midway between the BK and the AK amputation in relation to the chances of survival and of returning to previous surroundings. The prognosis for future walking with a prosthesis is described in another paper in this issue.

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## REFERENCES

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