

The influence of smoking on the level of lower limb amputation

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Abstract

A review of smoking habits of 77 vascular related amputees demonstrated a high incidence of smoking significantly greater for men than in the general population. Male smoking amputees with atherosclerosis related peripheral vascular disease were found to have a high risk of having an above-knee amputation. Those with diabetes mellitus whether male or female, smokers or not, had a significantly greater chance of having a below-knee amputation.

Overall, non-smokers were found more likely to have a below-knee amputation than an above-knee ($p < 0.05$).

Introduction

Smoking of cigarettes is still common and causes considerable mortality and morbidity (Balarajan, 1985). While the Tobacco Research Council reports that the smoking habits of the United Kingdom population is decreasing (Lee, 1976), the reduction is more significant in the under 45 year old individuals (The Royal College of Physicians, 1983).

Smoking is considered to be a significant factor in the aetiology of peripheral vascular disease of either atherosclerotic or diabetes mellitus origin (Black 1984). These two diseases are the major cause of lower limb amputations in Europe and the United States of America.

Considerable variation in the smoking habits of amputees is reported in the literature. Malone (1979) records 100 per cent of ex-servicemen smoking. Holden (1982) reported that in a group of 120 primary amputees 50 per cent of the males and 28 per cent of the females smoked whereas Stephen (1983) recorded only 28 per cent of patients admitting to smoking.

The influence of cigarette smoking on the ultimate level of lower limb amputation has apparently not been discussed and this study seeks to clarify this.

Method

In 1983 77 vascular associated primary lower limb amputees consecutively admitted to the Dundee Limb Fitting Centre were asked on admission by the author to state their smoking habits prior to the amputation. They were asked to assess their normal smoking habits in contrast to their current habits which might have been influenced by anti-smoking advice or preamputation stress.

Cigarette consumption was graded as follows:

1. Never
2. 0-5 cigarettes daily
3. 5-10 cigarettes daily
4. 10-15 cigarettes daily
5. 15-20 cigarettes daily
6. 20+ cigarettes daily

In addition basic patient information such as sex, age, causal condition and level of amputation was recorded on a purpose designed chart.

Results

The average age of the 77 patients was 70.1 years. There were 51 male and 26 females. Of these there were 40 per cent (31 cases) at above-knee level and 60 per cent (46 cases) at below-knee level. There was no difference between the sexes in relation to amputation level.

The cigarette consumption level for male and females is shown in Table 1. Overall 65 per cent of the patients smoked. It can be seen that 42 of the men (82.4%) were smokers, 24 of whom (57% of smokers) smoked more than 20 cigarettes a day and that only 8 (30.8%) of the females smoked, 4 of whom (50% of smokers) smoked more than 20 cigarettes a day.

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Table 1. Pre-operative cigarette consumption for male and female patients.

	Cigarette Consumption per Day						Smokers
	Non-smoker	0-5	5-10	10-15	15-20	20+	
Male	9	2	5	6	5	24	42
Female	18	1	-	1	2	4	8

Table 2. Pre-operative cigarette consumption by above-knee (AK) and below-knee (BK) amputees divided into principal amputation aetiology.

		Cigarette Consumption per day						Smokers
		Non-smoker	0-5	5-10	10-15	15-20	20+	
Atherosclerosis	AK	6	2	2	4	5	11	24
	BK	10	0	1	1	2	11	15
Diabetes Mellitus	AK	1	0	0	0	0	0	0
	BK	10	1	2	2	0	6	11

The cigarettes consumption levels for those with atherosclerosis and diabetes mellitus related amputations are compared in Table 2. It can be seen that those who had atherosclerosis and were smokers had a much higher risk of having an above-knee amputation than a below-knee one. In those who had diabetes mellitus no such distinction can be made.

The non-smokers in both groups had a significantly greater chance of having a below-knee amputation than their smoking counterparts ($p < 0.05$).

Tables 3 and 4 show the relationship between aetiology of amputation and the sex of the patient. No clear relationship was found between the number of cigarettes smoked and either the level or aetiology of amputations.

Although no smoking figures are available for this age group in the general population, a figure was obtained by extrapolation of the

results obtained by Heller et al (1983) on the assumption that the decline in cigarette smoking continued. Extrapolating to 1983 provided a predicted smoking level of 50 per cent for those over 60 years of age. Comparison with this figure and the 77 cases studied here revealed that a significantly larger proportion of atherosclerosis related male amputees smoked than in the general population ($p < 0.05$).

Table 3. Number of patients and aetiology of amputation-relationship with pre-amputation smoking.

	Smokers		Non-Smokers	
	Male	Female	Male	Female
Atherosclerosis (55)	33	6	4	12
Diabetes Mellitus (22)	9	2	5	6

Table 4. Level of amputation the sex of patients divided into smokers and non-smokers.

	Atherosclerosis				Diabetes Mellitus			
	Male		Female		Male		Female	
	AK	BK	AK	BK	AK	BK	AK	BK
Non-Smoker	0	4	6	6	1	4	0	6
Smoker	20	13	4	2	0	9	0	2

Discussion

Smoking is considered to be a significant risk factor associated with the development of peripheral vascular disease (Black, 1986). The reports on the smoking habits of primary amputees range from 100 per cent (Malone et al, 1979) to 28 per cent (Stephen, 1983). The present study found an overall smoking level of 65 per cent similar to that reported by Holden et al (1982).

The cigarette consumption of both male and female patients was found to be significantly greater than that recorded by Heller et al (1983) and greater than in the general population. The present study found that 57 per cent of the men and 50 per cent of the women smoked 20 cigarettes or more a day whereas Heller et al (1983) found an average consumption of eight cigarettes per day for men and six for women. In keeping with published figures it was found that more men were smokers (82.4%) than women (30.8%) (Lee, 1976; The Royal College of Physicians, 1983) (Tables 1 and 3).

The evidence shows that amputees represent a group who, being heavy smokers, are more prone to develop peripheral vascular disease leading to a significant degree of arterial compromise requiring amputation of lower limbs. Overall the smoking patients with atherosclerosis had a much higher risk of having an amputation at above-knee level than at below-knee. There was not one non-smoking male with peripheral vascular disease who had an above-knee amputation (Table 4). The non-smoking patients had a greater chance of having a below-knee amputation ($p < 0.05$). In contrast diabetes mellitus related amputation levels were uninfluenced by cigarette smoking, the diabetic patient however having a significantly greater chance of preserving the knee than those with atherosclerotic related peripheral vascular disease.

In the case of the diabetes mellitus group there was only one above-knee amputation whereas 21 had below-knee amputations and of these, 10 were non-smokers. It is likely that both factors are related to the lower incidence of cigarette smoking and the vascular pathology which in this case is a small vessel vasculitis. Of the diabetics, 50 per cent smoked involving 64 per cent of men and only 25 per cent of women which is a lower consumption than those who had atherosclerotic related peripheral vascular

disease. It was not demonstrated that the actual quantity of cigarettes smoked affected the ultimate level of amputation although 50 per cent admitted to smoking more than 20 cigarettes a day. This may relate to the reluctance of patients to admit their true consumption or it is possible that peripheral vascular disease is exacerbated by cigarettes in any quantity.

Penderson (1968) suggested that the key to the restoration of the elderly person is the preservation of the knee joint. The recognition that knee salvage is vital to the future well-being of the elderly amputee has led to the development of sophisticated vascular assessment methods enabling the surgeon to achieve up to 70 per cent below-knee amputation (Spence et al, 1984). The influence of cigarettes on the ultimate level of amputation has demonstrated that those who do not smoke have a greater chance of preserving their knees at amputation. This further emphasises the need for active encouragement to the anti-smoking campaign. The reduction in cigarette smoking habits in young people is encouraging and it remains to be seen if this influences the incidence of peripheral vascular disease related amputation and amputation level in the future.

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