Serum albumin and deep infection in femoral neck fractures

A study of 437 cases followed for one year

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Summary. *Four hundred and thirty-seven patients with femoral neck fractures were studied to determine the value of serum albumin estimations on admission. Serum albumin is a good predictor of mortality, and patients with low levels should be given additional nutritional support. We found that the serum albumin level is not useful in predicting deep wound infection. The infection rate of 3% does not justify the use of antibiotic prophylaxis in general.*

Résumé. *Nous avons étudié rétrospectivement 437 patients avec des fractures du col fémoral pour retrouver la présence des infections profondes et des facteurs prédictifs de l'infection postopérative et de la mortalité. Le nombre de cas d'infection se montant à 3% ne motive pas un traitement antibiotique prophylactique en général. Le taux de sérum-albumine prédit bien la mortalité mais pas les infections postopératoires.*

Introduction

The rate of postoperative infection after pertrochanteric fractures can be reduced with antibiotic prophylaxis [13]. The incidence of deep wound infection after operation has not been established for femoral neck fractures, so it is not known whether or not such prophylaxis is essential.

Our aim has been to study the incidence of deep wound infection after operations on femoral neck fractures and to identify variables which might affect the rate of infection. We also wanted to investigate the mortality in this group of patients, and the nutritional and clinical factors that could be related to a poor prognosis.

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Patients and methods

A total of 492 patients with femoral neck fractures were admitted to Danderyd Hospital during 1993 and 1994; 15 received a primary total hip replacement and were not included in the study. The remaining 477 patients were treated with closed reduction and open or percutaneous internal fixation with two Olmed cancellous bone screws (Depuy-Olmed AB, Uppsala, Sweden). Prophylactic antibiotics were not used. The

Table 1. Demographic data

	n/total	%
Admitted from their own home	315/428	74
Discharged directly home	157/429	37
Severe heart disease	37/435	8
Metabolic disease	40/436	9
Malignancy	41/435	10
Previous stroke	40/436	9
Previous fragility fracture	73/437	17
Senile dementia	124/437	28
Rheumatoid arthritis	33/437	8

Table 2. Factors associated with deep wound infection according to univariate analysis

	Deep wound infection		
	Yes	No	P-value
Total number	13	415	
Age, years (mean, SD)	82 (11)	81 (9)	0.7
ASA score (I+II/III+IV+V)	9/4	297/118	0.8
S-albumin (mean, SD)	38 (5)	37 (4)	0.4
Operation time (minutes, mean, SD)	29 (11)	20 (8)	0.0009
B-Hemoglobin (mean, SD)	130 (11)	128 (13)	0.6
Rheumatoid arthritis (yes/no)	2/11	30/385	0.3
Gender (female/male)	6/7	310/105	0.02
Senile dementia (yes/no)	3/10	121/294	0.6

Table 3. Factors associated with death in the univariate and multivariate analysis

	One month			Twelve months				
	Yes	No	<i>P</i> -value (univariate analysis)	Yes	No	<i>P</i> -value (univariate analysis)	Odds ratio (logistic regression)	<i>P</i> -value (logistic regression)
Total number	26	400		103	320			
Age, years (mean, SD)	84 (7)	81 (9)	0.09	83 (8)	80 (9)	0.008	1.04	0.017
ASA score (I+II/III+IV+V)	11/15	294/106	0.0006	63/40	239/81	0.008		
S-albumin (mean, SD)	34 (5)	37 (4)	0.002	35 (5)	37 (4)	0.0001	0.87	0.00001
Operation time (minutes, mean, SD)	18 (6)	20 (8)	0.3	19 (10)	20 (8)	0.4		
B-haemoglobin (mean, SD)	126 (14)	128 (13)	0.5	127 (14)	128 (13)	0.5		
Rheumatoid arthritis (yes/no)	0/26	32/368	0.13	3/100	29/291	0.04		
Gender (female/male)	10/16	303/97	0.001	59/44	252/68	0.001	0.33	0.00014
Senile dementia (yes/no)	14/12	109/291	0.0001	48/55	75/245	0.004	2.68	0.0004

operations were performed in a conventional theatre, normally within 24 hours after admission.

The patients' demographic data are summarised in Table 1. Their hospital records were studied to find the variables which might affect the infection and mortality rate (Tables 2, 3). Deep wound infection was defined as an infection extending through the deep fascia.

The records of 40 patients were not found, but the mortality and eventual treatment for postoperative infections was evaluated in the remainder, as well as for the other patients in a central register. Some patients came from other parts of the country and could not be followed up at one year, so their data were incomplete with regard to mortality ($n=11$) and deep wound infection ($n=9$). For analysis of categorical variables, the chi-square test was used. Continuous variables were analysed with Student's *t*-test. *P*-values of <0.05 were considered significant. For the outcome variable mortality after one year, a logistic regression analysis was used, including four variables that were significant according to the univariate analysis.

Results

The complications, mortality and re-operations are listed in Table 4. Deep infection developed in 13 patients (3%, 95% CI (2.2, 3.8)) (Table 3). None of the patients lost to complete follow-up had been treated for a post-operative deep wound infection at any of the infection departments in Stockholm during this period.

Table 4. Complications after surgery for femoral neck fractures

	<i>n</i> /total	%
Deep wound infection	13/428	3
Mortality during the first month	26/426	6
Mortality during the first year	103/423	24
Reoperations during the first year	127/428	28
Total hip arthroplasty	39/428	9
Hemiarthroplasty	20/428	5
Girdlestone procedure	15/428	4
Only screws removed	47/428	11
Pseudarthrosis not operated on	6/428	1

The only factors associated with deep wound infection were the operating time and male sex (Table 2).

Twenty-six patients (6%) died during the first month postoperatively and 103 (24%) during the first year. For the patients whose records were missing ($n=40$), was the mortality rate 6% during the first month and 25% during the first year, nearly the same as the study patients. Variables associated with a higher mortality rate are presented in Table 3.

Discussion

The reported rate of infection after operations on hip fractures in general varies from 2% to 17% [11, 13]. Although several studies have been reported, their results are difficult to evaluate and compare because of too short follow-up [7], a mixture of neck and pertrochanteric fractures [11] or different treatments were used in the same study [1]. Our deep wound infection rate was low, 3%, indicating that general antibiotic prophylaxis should not be recommended for femoral neck fractures. However, since there was a positive correlation between the occurrence of deep wound infection and the operating time, antibiotic treatment might be considered when the this is prolonged.

Six percent of the patients died during the first month after operation, and the total mortality rate during the first year was 24%, similar to that reported by others [5, 10]. The expected mortality rate during one year in a normal population corrected for the same ages was 10.8% for men and 8.4% for women in 1994 (National Central Bureau of Statistics). The discriminant variables affecting mortality in this study, such as senile dementia, age and gender have been shown to be predictive as in other studies [4, 8, 9]. However, our finding that a low serum albumin level on admission was correlated with a higher mortality, has only been reported previously in a small study of orthopaedic patients [2], but the serum albumin has been shown to be associated with outcome in

other groups of patients [14]. Delmi et al. showed, in a randomised study of elderly patients with femoral neck fractures, that dietary oral supplements lowered the rate of postoperative complications and deaths [3]. Since serum albumin is also one indicator of the patient's nutritional status [12], a low level on admission in patients with a femoral neck fracture indicates those who might benefit from more intense nutritional support. Heramann et al. have found that patients with low levels on admission for acute illness were more likely to die, had a longer hospital stay, and were readmitted sooner and more frequently than patients with normal albumin levels [6].

We conclude that the postoperative infection rate was low in our study and we do not suggest that antibiotic prophylaxis should be used routinely. Serum albumin on admission cannot be used to predict postoperative deep wound infection, but reliably predicts mortality and can identify patients who might benefit from additional nutritional support.

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