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ORIGINAL PAPER

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Hip fractures in Hungary and Sweden – differences in treatment and rehabilitation

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Abstract Data of 1,337 consecutive hip fracture patients were registered during 1 year within a prospective comparative multicenter study comparing osteosynthesis techniques and rehabilitation results in Budapest, Hungary, in Sundsvall, northern Sweden, and in Lund, southern Sweden. In Budapest the mean age was 4–5 years lower than in Sweden, and more patients lived in their own home (91% versus 70% and 62%). Less intracapsular (41% versus 54% and 54%) and more trochanteric fractures (52% versus 40% and 35%) were observed in Budapest. Many more Hungarian patients returned home (68% versus 54% and 33%); however, their mortality rate 4 months later significantly exceeded that of the Swedish centres (24% versus 15% and 13%), and more had severe pain in the operated hip (27% versus 17% and 15%). Four months after double nail osteosynthesis of displaced cervical fractures, more patients (28%) had severe hip pain than after hemiarthroplasty (16%) in Budapest as compared to Lund or Sundsvall (19% and 22%). Mortality rate after 4 months following hemiarthroplasty and nailing (36% and 20%) was significantly higher than in the Swedish centres (14% and 11%).

Résumé Les données de 1337 malades consécutifs avec une fracture de la hanche ont été enregistrées pendant une année dans un étude multicentrique comparant les techniques d'ostéosynthèse et les résultats de la rééducation à Budapest, Hongrie et à Sundsvall et à Lund, Suède. À Budapest l'âge moyen était de 4–5 années plus faible qu'en Suède; plus de malades habitaient leur propre maison (91% contre 70% et 62%). Moins de fractures intracapsulaires (41% contre 54% et 54%) et plus de fractures trochanteriennes (52% contre 40% et 35%) ont été observé à Budapest. Beaucoup plus de malades hongrois ont regagné leur domicile (68% contre 54% et 33%), cependant leur mortalité en 4 mois a nettement dépassé celle des centres suédois (24% contre 15% et 13%). Plus de malades avaient des douleurs sévères dans la hanche opérée (27% contre 17% et 15%). Quatre mois après le traitement dans les fractures du col fémoral déplacées, les malades avec ostéosynthèse par clou double avaient des douleurs de hanche plus souvent (28%) qu'après avec hémiarthroplastie (16%) à Budapest comme comparé à Lund ou Sundsvall (19% et 22%). La mortalité quatre mois après hémiarthroplastie et enclouage (36% et 20%) était considérablement plus élevé à Budapest que dans les centres suédois (14% et 11%).

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Introduction

A prospective multicenter study focused on the results of surgical techniques and rehabilitation routines for hip fractures was started in Sweden in 1988 [22, 23]. Departments in several countries were invited to join the study: Finland [10], The Netherlands [2], Japan [13], and the United States. [24].

The aim of this paper was to compare the results of treatment in one Hungarian and two Swedish centres with regard to clinical, radiographic, and rehabilitation outcomes up to 4 months after the fracture. The fracture epidemiology and treatment policies present information to optimise the care of this economically demanding group of patients. Our data provides a reference for future comparisons with new systems of medical care.

Patients and methods

During a 1-year period, data concerning all hip fractures admitted to the National Institute for Traumatology in Budapest as well as to the two centres in Sweden, Lund (southern part) and Sundsvall (northern part) were registered. The study material was population

based in a random fashion in all centres. Data focused on background factors, hospital stay, patient resource demands, and quality of life, i.e. information concerning place of living, need for institutional care, consumption of home help, and pre- and postoperative ADL and locomotor activity. Functional parameters and place of living were followed for up to 4 months after the fracture.

In Budapest the principal treatment for impacted Garden I cervical fractures was osteosynthesis with three cancellous screws and a plate according to Manninger [5]. For undisplaced Garden II and for displaced Garden III-IV fractures admitted to hospital within 24 h, osteosynthesis was performed with two Smith-Petersen nails and a plate [16, 17]. In displaced fractures arriving after 24 h an arthroplasty was performed. If the patient's life expectancy was estimated to be less than 5 years a hemiarthroplasty was performed; otherwise, a total hip arthroplasty was performed.

In Sweden practically all cervical fractures were treated with osteosynthesis, in Sundsvall with two screws according to von Bahr [1] and in Lund with LIH hook pin osteosynthesis [21]. In Budapest and Sundsvall the majority of trochanteric fractures were operated with Ender nails or screw plate osteosynthesis. In Lund either screw plate or gamma nail was used. In all centres weightbearing was encouraged as soon as possible after surgery.

A total of 1,337 fractures were studied. Outcomes of the different treatment options were analysed separately for cervical and trochanteric fractures. The number of patients with basocervical and subtrochanteric fractures was rather small for comparison, and the number of cases in the groups of Garden I-II and trochanteric two-fragment and multi-fragment types was not large enough for statistical comparison.

Consequently, we focused this study on the displaced cervical fractures (Garden III-IV) to compare the percutaneous surgical methods used in Sweden with the open osteosynthesis and prosthetic surgery used in Budapest. Only patients aged 50 years or older were included in this comparison. The chi-square test and multiple stepwise linear regression analysis were used. A probability level of <0.05 was considered significant.

Results

All fractures

The mean age was lower in Budapest than in the Swedish centres (Table 1). The ratio of women was the same, but the percentage of patients living alone was lower in Budapest. The percentage of patients coming from their own home was high in Budapest, whereas patients coming from homes for the elderly were few. In Budapest 92% of patients came from independent living, defined as the sum of patients from their own homes and from homes for the elderly.

In Budapest the percentage of trochanteric fractures was high, whereas there were more undisplaced cervical fractures in Lund. The mean in-hospital time was similar in all centres, whereas the median in-hospital time was lower in the Swedish centres. The discharge rate to own home was higher in Budapest and Sundsvall compared to Lund.

At follow-up at 4 months an equal percentage of Hungarian and Swedish patients assessed their walking ability to have returned to the pre-injury status. Nevertheless, more Hungarian patients indicated severe hip pain.

Re-operation rate was lower in the Swedish groups. Mortality rate after 4 months in Lund was about half, and in Sundsvall about two thirds, of that in Budapest.

Displaced cervical fractures

In all centres 500 patients with displaced femoral neck fractures were admitted, of whom 487 were older than 50 years. Eighteen patients were treated without surgery and different surgical techniques were used in 41 patients, thus leaving 428 patients for the comparison (Table 2).

In Budapest, the mean age of hemiarthroplasty patients was 2 years higher compared to the osteosynthesis group. Of the patients treated with hemiarthroplasty, 91% were women. The number of patients from the osteosynthesis and hemiarthroplasty groups living alone in Budapest (29% and 38% respectively) was much lower than in the Swedish hospitals (52% and 57%). Admittance from own home was very high in Budapest (90% and 96% respectively). When patients living in homes for the elderly were added in Sweden, patients living independently amounted to 87%.

Hemiarthroplasty patients stayed longer in hospital compared to the double-nailed patients in Budapest and compared to Swedish patients. Discharge to own home was higher in Budapest and Sundsvall, but there were no great differences either in the rate of patients living independently or in return to pre-fracture living after 4 months.

Management of ADL, walking ability outdoors and indoors, and use of walking aids, did not differ greatly in the two Budapest groups before surgery. General walking ability was better after 4 months in the group with internal fixation. However, somewhat more patients in the hemiarthroplasty group felt that they could walk equally as well as before the fracture, and the number of patients without pain on weightbearing after 4 months was higher in the hemiarthroplasty group. On the other hand, the mortality rate was much higher in the hemiarthroplasty group.

Functional capacity in the Swedish patients was rather equal and similar to the Budapest pattern concerning walking, whereas the ADL-capacity was lower in Lund after 4 months. Similarly, the number of patients who assessed their walking ability to be equally as good at 4 months as before fracture was lowest in Lund. At the same time complaints about more severe pain were more usual in the Budapest osteosynthesis group.

During the period of primary admission reoperation rate was almost the same in all groups. After 4 months somewhat more patients had been re-operated in Sweden. In Budapest patients with arthroplasty were re-operated due to haematoma, infection, or fracture re-displacement. In Sweden re-operations were due to re-displacement or non-union of the fracture.

The mortality rate was higher in the Budapest study material at all times after fracture. The initial mortality rate during the period of primary admission was lower among arthroplasty patients. At 4 months, however, their mortality rate had climbed to more than one-third, almost double compared to the osteosynthesis patients in Budapest and three times that of the LIH hook-pin patients in Lund. Place of living and mortality rate up to 4 months after the fracture is illustrated in Fig. 1.

Table 1 Background variables and outcome for all hip-fracture patients

	Budapest	Sundsvall	Lund
Number of patients:	754	254	329
Mean age	74	78	79
Age range	16–98	47–95	23–100
Women (percent)	69	70	68
Left side (percent)	50	46	52
Living alone (percent)	30	55	58
Admitted from (percent)			
Own home	91	70	62
Homes for the elderly	1	13	23
Independent living	92	83	85
Fracture type (percent)			
Cervical	41	54	54
Basocervical	2	2	7
Trochanteric	52	40	35
Subtrochanteric	5	4	4
Operation type (percent)			
Two screws (von Bahr)	0	49	0
Two hook pins (LIH)	0	0	54
Three screws (Manninger)	5	0	0
Two nails (Manninger)	22	0	0
Screw-plate (DHS)	10	16	39
Ender	39	22	0
Other osteosynthesis	9	8	7
Hemiarthroplasty	7	2	0
Total hip	3	2	0
Not operated	5	1	0
Days in hospital			
Mean	18	18	15
Median	16	13	11
Discharged to (percent)			
Own home	68	54	33
Independent living	68	66	49
Origin	66	71	56
Manage ADL (percent)			
Before operation	90	72	83
2 weeks post-operation	62	53	62
4 months postop	81	62	64
Walking ability outdoors (percent)			
Before operation	76	63	66
4 months postoperation	53	44	45
Walking ability indoors (percent)			
Before operation	98	95	97
4 months post-operation	95	88	87
Walking with one cane or better (percent)			
Before operation	88	72	74
2 weeks post-operation	2	7	4
4 months post-operation	52	43	36
Walking with rollator/walking frame or better (percent)			
Before operation	98	93	97
2 weeks post-operation	71	79	88
4 months post-operation	96	87	87
Walking equally as well at 4 months as before fracture (percent)	15	17	15
Pain on weight-bearing at 4 months (percent)			
Quite a lot	27	15	13
A little	49	46	51
Not at all	24	39	36
Analgesics because of hip pain (percent)	36	28	33
Re-operation (percent)			
During primary admission	3.4	1.6	2.1
Within 4 months	5.4	8.3	5.8
Mortality rate (percent)			
Within 2 weeks	7.4	5.5	3
Within 1 month	13.1	8.7	5.8
Within 4 months	24	15.4	12.5

Table 2 Background variables and outcome for displaced cervical hip fracture patients age ≥50 years

	Budapest		Sundsvall v Bahr screws	Lund Hook pins
	Two nails	Hemiarthro-plasty		
Number of patients	147	56	101	124
Mean age	78	80	77	80
Women (percent)	71	91	67	69
Left side (percent)	56	54	52	55
Living alone (percent)	29	38	52	57
Admitted from (percent)				
Own home	90	96	77	62
Homes for the elderly	0	0	10	25
Independent living	90	96	87	87
Days in hospital				
Mean	15	27	18	16
Median	14	26	13	12
Days admission-operation	0.8	7	1.3	1.2
Discharged to (percent)				
Own home	70	62	61	37
Independent living	70	62	73	56
Origin	66	59	75	57
Manage ADL (percent)				
Before operation	87	96	75	85
2 weeks post-operation	64	54	60	71
4 months post-operation	83	77	61	53
Walking ability outdoors (percent)				
Before operation	79	79	66	68
4 months post-operation	52	36	49	42
Walking ability indoors (percent)				
Before operation	98	99	96	97
4 months post-operation	99	94	90	86
Walking with one cane or better (percent)				
Before operation	88	96	74	74
2 weeks post-operation	2	0	9	6
4 months post-operation	53	58	47	40
Walking with rollator/walking frame or better (percent)				
Before operation	98	100	95	99
2 weeks post-operation	80	74	80	94
4 months post-operation	87	100	89	91
Walking equally as well at 4 months as before fracture (percent)	15	23	21	6
Pain on weight-bearing at 4 months (percent)				
Quite a lot	28	16	19	22
A little	54	35	40	47
Not at all	18	48	41	31
Analgesics because of hip pain (percent)	35	32	24	35
Reoperation (percent)				
During primary admission	5.4	7.1	3	5.6
Within 4 months	8.8	7.1	13	12.9
Mortality rate (percent)				
Within 2 weeks	8	0	1	2.4
Within 1 month	14	7	3	4
Within 4 months	20.4	35.7	13.9	11.3

Chi-square analysis

The greatest difference between the Budapest and the two Swedish centres was in the mortality rate. Hence, we examined each factor to reveal those with significant effect on mortality rates in displaced cervical fractures at 2 weeks, 1 month, and 4 months after injury. In general, correlation proved to be significant between mortality rate and the place of living before injury and after treatment (“admitted from”, “discharged to”), pre-fracture walking ability, use of walking aids, and ADL activity. The mortality rate increased if the patients were admitted from a geriatric institute, if he or she was discharged to an acute care department, if surgery was not performed,

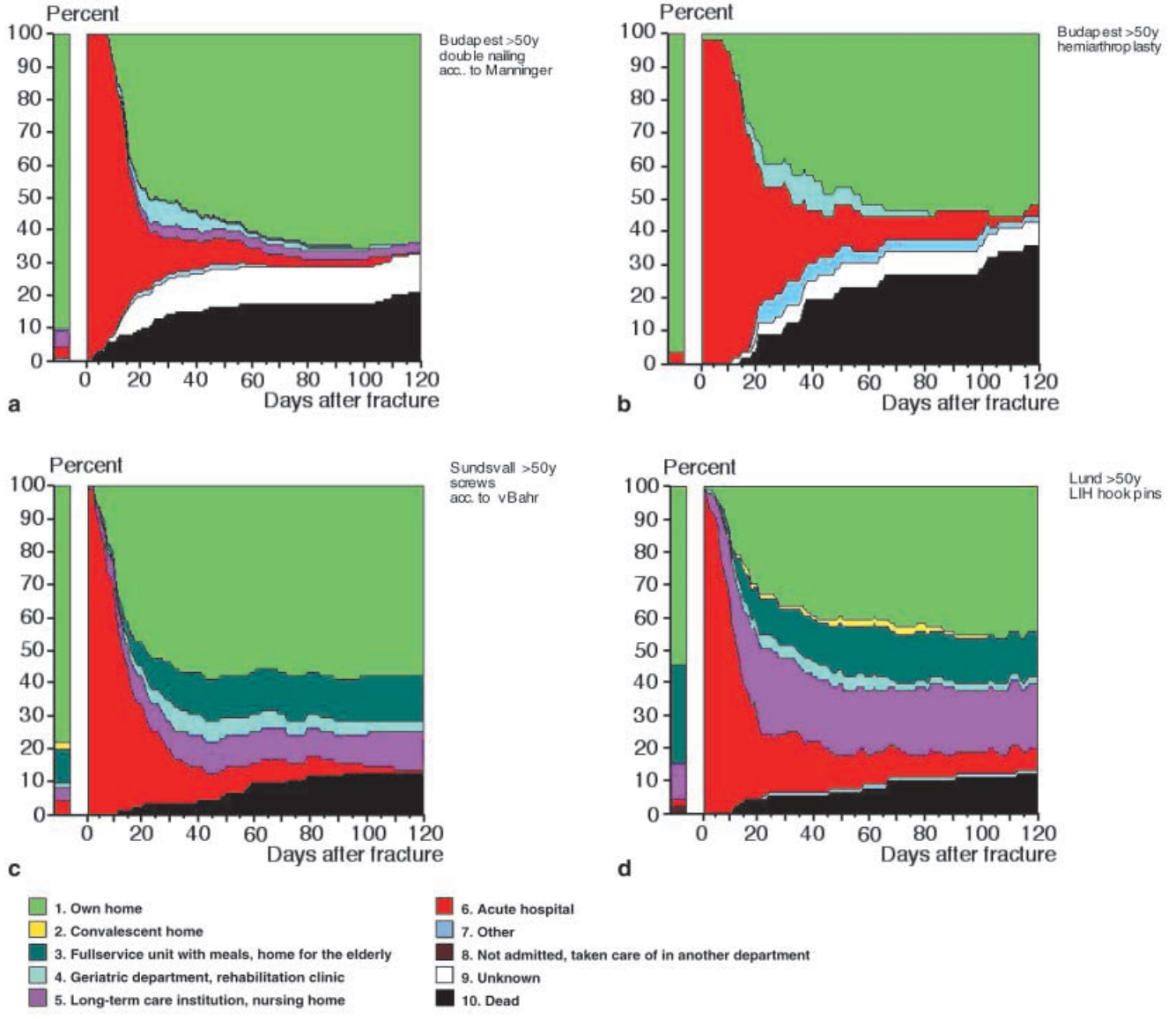

Fig. 1 Place of living before and up to 4 months after displaced Garden III-IV type of fractures in patients >50 years of age: **a** Budapest patients operated with two nails according to Manninger; **b** Budapest patients operated with hemiarthoplasty; **c** Sundsvall patients operated with von Bahr screws; **d** Lund patients operated with LIH hook pins

if the patient walked with two crutches or a cane, if he or she could not walk or manage ADL activity, and if re-operation was performed.

The mortality rate was higher in Budapest – the 1-month rate negatively influenced by double nailing and the 4-month rate by hemiarthroplasty. The 1-month mortality rate was significantly lower after screw osteosynthesis according to von Bahr, and after 4 months using LIH hook pins.

Multivariate analysis

Pre-operative variables, different outcome parameters of the total study material, and the group with displaced femoral neck fractures, were analysed with stepwise multiple linear regression analysis. Significant correlation was observed between age, pre-injury place of living, walking ability before injury, use of walking aids, prolonged in-hospital care, and late functional capacity and survival.

Patients treated with screw osteosynthesis according to von Bahr were discharged to their previous place of living at a higher percentage. In the total patient group the pre-fracture place of living was the determinant factor 4 months later. In cases with cervical fracture, treatment with the LIH hook pin showed a favourable effect with regard to patients' ability to return to their pre-fracture place of living.

Late walking ability was dependant on whether re-operation had been performed during the 4-month period. Hungarian patients treated with hemiarthroplasty or open fixation with three screws complained less of pain on weightbearing than patients treated with nailing.

The mortality rate was higher among male patients, as well as among patients subjected to a delay for surgery

and subsequent re-operation. Treatment with LIH hook pins or three screws proved to be favourable. Nailing was followed by an increase in early mortality, and treatment with hemiarthroplasty in increased late mortality.

Discussion

In Hungary the average life expectancy is 65 years for men and 74 years for women; in Sweden, life expectancy is 75 years and 81 years respectively [14]. This may explain the lower mean age in the total Hungarian study material, the higher percentage of patients below 50 years of age, and the more favourable initial functional capacity of patients in Budapest. There were more extracapsular hip fractures in the Budapest series. Such fracture distribution is well known from the southern as opposed to northern European countries [6, 12].

The rehabilitation facilities differed. In Sweden, well-organised home care and wider spectrum of service houses and rehabilitation hospitals were available. In Hungary, the lack of home-care services and homes for the elderly made it necessary for several elderly to manage in their own homes, balancing on the margins of their capability. After surgery the acute or chronic internal medicine department – without rehabilitation possibilities – was the main alternative in Budapest if the patient was not fit for discharge. Patients' pattern of living was, however, fairly constant in all cities at 1–2 months after discharge (Fig. 1).

Most Hungarian patients discharged to their own homes were taken care of by relatives, whereas patients in Lund managed on their own or had communal home help (25% of patients). In Sweden, patients were encouraged to improved mobilisation and rehabilitation in their own homes by district physiotherapists and nurses. If necessary, communal home help was offered. Swedish patients had on average 1 h of help per day.

The rehabilitation system is less developed in Hungary; consequently, it is not possible to give figures for hours of home help. As no alternative exists, the Hungarian patient had to be discharged home, increasing the burden on relatives who have no knowledge of rehabilitation, and neither time nor experience to encourage activation and walking. This lack of rehabilitation units and home care is probably reflected in the increased mortality rate in Budapest (Table 1).

Post-operative functional capacity of Hungarian patients deteriorated in most cases to a greater extent by the end of the second post-operative week compared to Swedish patients. Mortality data may explain why the same variables were better after 4 months. At the end of the fourth month every fourth patient had died in Budapest, every sixth or seventh in Sundsvall, and every eighth in Lund. Presumably, the lack of rehabilitation resulted in increased mortality: Hungarian patients in a deteriorating condition did not survive until the time of follow up.

The mean age of Hungarian patients treated by hemiarthroplasty was somewhat higher than in Swedish centres, and the number of women was greater. This may be explained by treatment policy: male Hungarian patients admitted with old injuries were usually younger and therefore treated with a total hip replacement.

In Scandinavia and Hungary the principle treatment of cervical fractures is osteosynthesis. This principle rests on the fact that with optimised osteosynthesis technique fracture healing after 2 years amounts to 80% [20, 21]. The same basic concept, i.e. primary osteosynthesis, was established in Hungary even earlier based on long-term experience as well as research in this field [15].

After 4 months the number of patients indicating no pain on weightbearing and walking equally as well as before the fracture was higher in the hemiarthroplasty group. This may be due to the earlier high mortality rate in this group (Table 2).

In Budapest the experience with primary selective hemiarthroplasty has been disappointing. As reflected in the higher mortality rate at 4 months our data suggest that older patients do not tolerate major operative procedures. This is in accordance with previous studies [2, 25]. Other authors, however, have the opposite view [9, 19].

Due to the somewhat increased early mortality rate and the increased number of patients complaining of severe hip pain at 4 months following osteosynthesis with two nails, surgical treatment in Budapest has been changed during recent years. All acute cervical fractures are now treated with percutaneous cannulated screws with a lateral plate [4, 7, 8]. Consequently in Sweden trials have been established to perform primary arthroplasty in the group of older patients with displaced cervical fractures [11].

Our present study showed that fracture patients treated with arthroplasty after 4 months had a higher mortality rate. Surviving patients had, however, a better functional outcome.

This first comparison of hip fracture patients between countries from western and former "eastern" Europe was advantageous for all parties. As a result of the comparison the centres in Budapest and Sundsvall changed their surgical methods. Establishment of a Swedish type of organisation in Budapest to improve rehabilitation possibilities would be advantageous, not only for the patient but also for the health care economy. For the patient, motivation is much higher with the need for every-day activities to be performed in one's own home. For society, the cost is much less. For example, in Sweden the cost of rehabilitation in an orthopaedic department is at least 50 times as expensive as rehabilitation in the patient's own home [3].

A standardised prospective comparison has proven efficient and the feedback of the results changed our treatment policies. Continuos audit of hip fracture care is recommended to monitor this large and resource-consuming group of elderly patients. The audit has attracted wide interest and resulted in a European collaboration project, Standardised Audit of Hip Fractures in Europe (SAHFE) [18].

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