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SEVEN-YEAR FOLLOW-UP OF TOTAL HIP REPLACEMENT WITH THE BRUNSWIK PROSTHESIS

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One hundred and sixty-one non-infected total hip arthroplasties were reviewed on average 4 years post-operatively and 113 of these were reviewed again on average 7 years post-operatively. Non-infectious stem loosening was observed in 38% and required exchange operation in 20%. At review, 12 sockets (7%) were found to be loose. However, the mean hip scores were good, which could partly be explained by cases excluded because of revision.

Key words: arthroplasty; hip.

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In 1982, in Sweden, about 6,200 hips were replaced – an operative incidence approximating 0.7‰ of the population. However, the current need for total hip replacement has been estimated to be twice that (Lindberg 1982). Revision of failed total hip replacement accounted for 10% of the operations in 1982 (Ahnfelt et al. 1984).

The purpose of this study was to review the long-term functional results and the complications in a series of patients operated on with total hip replacement with the Brunswik design.

PATIENTS AND METHODS

In the Department of Orthopedic Surgery, Malmö General Hospital, in 1972–1974, 196 hips in 172 patients were replaced with a Brunswik total hip prosthesis. The operations were performed by 14 surgeons.

The prostheses in this study had a 35 mm head and a 13 cm long curved stem with a collar and were manufactured from a chrome-cobalt alloy. The cross-section of the stem was wedged. The socket was made of polyethylene and more than half-spherical – e.g. of a snap-fit design (Figure 1).

The female/male ratio was 2.2:1. The average age at the operation was 64 years in women and 63 years in men. The diagnoses are presented in Table 1.

All operations were performed in a conventional operating theatre through a postero-lateral approach without osteotomy of the greater trochanter. The operating time averaged 102 ± 28 min and the peroperative blood loss 1.8 ± 1 litre. Thrombosis prophylaxis – 500 ml dextran^{70} (Macrodex®, Pharmacia, Sweden) at surgery and on the second and fourth postoperative days – was given in all cases. Also, antibiotic prophylaxis – Cloxacillin 3 g for 7 days – was given in all but 13 cases.

Table 1. Reasons for total hip replacements

Diagnosis	Number of cases
Coxarthrosis	114
Complications following femoral neck fracture	25
CDH	6
Rheumatoid arthritis	4
Miscellaneous	12
Total	161

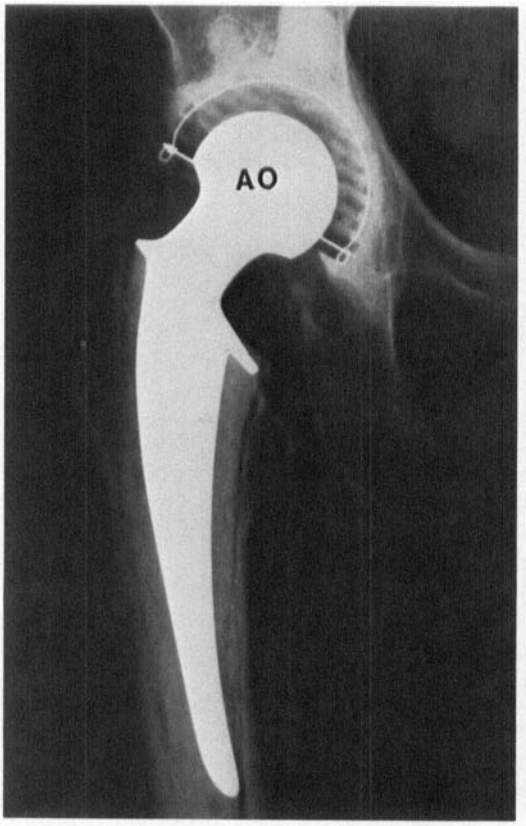

Figure 1. Brunswik prosthesis 6 years post-operatively. The stem is well surrounded by bone cement. No signs of metal-cement separation.

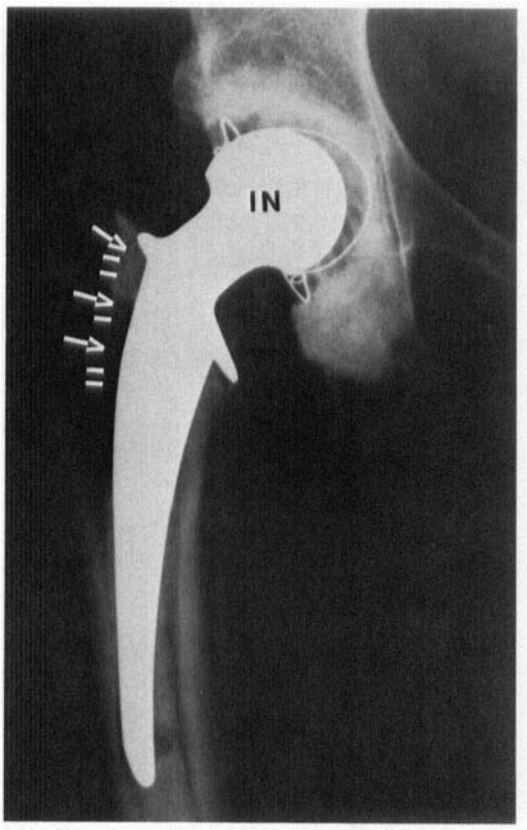

Figure 2. Brunswik prosthesis with signs of stem loosening, – e.g. metal-cement separation.

At the first examination, 35 hips were excluded for reasons presented in Table 2. The time between surgery and follow-up in the remaining 161 hips averaged 41 ± 12 months. At a second examination, on average 81 ± 9 months post-operatively, altogether 48 hips were "lost".

The functional results were classified according to the numerical system described by Merle d'Aubigné & Postel (1954), as modified by Charnley. Also, Charnley's groups A, B, BB and C were used (Charnley 1972, 1979). Category A patients are physically fit in all respects relating to function and have no disability other than the affected hip. Category B patients have both hips affected but are otherwise physically fit. Patients with boths hips replaced by a total hip are categorized BB. Category C is reserved for patients with other conditions directly impairing the act of walking such as cardiac insufficiency, gonarthrosis or rheumatoid arthritis.

Forty-one of the 161 hips had previously been operated upon using the following procedures: nailing because of femoral neck fracture 19, osteotomy 9, hemi-arthroplasty 6, arthrodesis 2 and various other methods 5.

Table 2. Hips excluded from the original material at the first examination

Reason for exclusion	Number of cases
Deaths	18
Previous operation with THR	7
Deep infection	5
Early revision (technical error)	1
Not available	4
Total	35

Table 3. Assessment of hip function according to Merle d'Aubigné & Postel (1954), modified by Charnley (1972 and 1979)

	First examination		Second examination	
	Number of hips	Average score	Number of hips	Average score
Pain				
Patient categories A, B, BB and C	161	5.1	113	5.3
Walking function				
Patient category A only	65	4.9	41	5.1
Range of motion				
Patient categories A, B, BB and C	161	4.8	113	5.0

Table 4. Walking function in category A, B, BB and C hips at the first and second examinations

	A	B	BB	C
Number of hips in each group				
First examination	65	15	60	21
Second examination	41	14	45	13
Average walking score				
First examination	4.9	4.1	4.3	3.3
Second examination	5.1	3.9	4.0	3.5

RESULTS

The function at the first and the second examinations is presented in Tables 3 and 4. With regard to pain and range of motion, the patient categories A, B, BB and C are grouped together since the differences were negligible. The average scores for all functional modalities were slightly increased at the second examination which could be explained by a number of loose and painful hips having been exchanged. The average score for walking function was about 5.0 in category A patients at both examinations. The average score was lower – about 4.0 – in both category B and BB patients. The average score was lowest in category C patients – about 3.5 at both examinations.

All non-infected patients were asked to describe their hip function in terms of asymptomatic, improved, unimproved or worse. At the first examination, 90% of the hips were asymptomatic or improved, in spite of the high rate of mechanical stem loosening.

Mechanical loosening of the stem – defined as a demarcation or radiolucent zone between the acrylic cement and the proximal, lateral edge of the prosthesis – was observed in 61/161 cases (38% (Figure 2)). Three of the loose stems fractured. About 3/4 of the patients with a loose femoral component suffered pain in the hip and thigh (Lindberg & Carlsson 1983).

Loosening of the socket, defined as radiographic migration, was seen in four patients at the first examination. At the second follow-up, another two sockets had migrated.

When this investigation was completed, 23 hips had been exchanged because of loosening of one or both prosthetic components. Another ten hips have since been revised because of loosening and one because of subluxation. The findings at the 33 exchange operations for aseptic loosening are presented in Table 5.

Table 5. Findings at exchange operations for non-infectious loosening

Loose component	Number of hips
Loose stem	21
Loose stem and socket	10
Loose socket	2

Dislocation occurred in 5/161 (3.1%) (Carlsson & Gentz 1977, Lindberg et al. 1982).

Obvious ectopic bone formation was observed in 31/161 (19%) and in the vast majority during the first post-operative year. This complication was not related to any specific diagnosis.

Deep infection was diagnosed in 6/196 cases including one hematogenous infection sustained 6 years post-operatively (3%).

No reliable data concerning deep vein thrombosis can be presented because phlebography of both legs was not routinely performed. However, there were six cases of pulmonary embolism, none of which was fatal.

DISCUSSION

The age and sex distribution in this study did not differ from the majority of previous investigations. However, compared with a group of patients operated on in our Department according to Charnley and described by Carlsson (1981), the present study included a relatively large number of patients with complications after femoral neck fractures and fewer, only four, patients with rheumatoid arthritis. This difference may be explained by an increasing restrictivity towards hemi-arthroplasty for the treatment of early and especially late complications following femoral neck fracture and a preference for low friction arthroplasty in rheumatoid patients.

There were few peroperative complications and the rate of deep infection (3%) was about that expected in patients operated on in a conventional theatre with systemic antibiotic prophylaxis (Carlsson et al. 1977, Lidwell et al. 1982).

Visuri et al. (1977) reported few cases of aseptic loosening in a series of 189 Brunswik prostheses (2%). However, the time of observation was considerably shorter than in the present investigation and, moreover, no information regarding the radiographic evaluation was presented. The rate of stem loosening in this study (38%) is at the upper limit of the 20–35% reported in other recent studies (Maier et al. 1977, Beckenbaugh & Ilstrup 1978, Gruen et al. 1979, Olsson et al. 1979, Carlsson & Gentz 1980). However, it is more remarkable that at the time of the second examination 14% of all cases included in this study had symptoms and radiographic signs of stem loosening necessitating an exchange operation.

In a series of Charnley total hip replacements and with a comparable time of observation and rate of loosening, only 3% of the hips required revision (Carlsson 1981). In June 1983 and thus with an observation period of 9–11 years, 20% of all Brunswik hips or about half of the cases with radiographic signs of stem loosening had been revised because of pain (Table 6). It could be argued that the Brunswik stem prosthesis reaches a more advanced stage of loosening than most other designs.

Radiographic migration of the socket was observed in six cases, not all of which required exchange operations. However, also a number of sockets without signs of migration were found to be loose at surgery for stem-loosening. Figures concerning socket loosening should generally be considered critically because the correlation between radiographic and clinical observations is poor (Tehranzadeh et al. 1981, Carlsson & Gentz 1983).

The mean hip function at the two examinations was good and corresponds with that reported by others (Eftekhar & Stinchfield 1973, Visuri et al. 1977, Griffith et al. 1978). The slight improvement between the first and the second examinations regarding all functional modalities may be explained by patients re-operated on because of component loosening and therefore being excluded from the second examination (Table 4).

In 1977, the Brunswik prosthesis was abandoned in our Department because the design was considered to be afflicted with a number of undesirable properties. The short, curved stem implied that it could easily be inserted in a varus position and as a consequence insufficiently surrounded by cement. The wedged cross-section of the stem was thought to cause undesirable forces and to crush the cement. Also, the snap-fit design of the socket was considered unsuitable because of the high risk of impingement between the socket itself and the collar of the stem prosthesis. This may result not only in socket loosening but also contribute to loosening of the stem. Total hip

prostheses with properties similar to the Brunswik design are still in use in other departments. These designs may also be associated with high rates of loosening.

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